# APPENDIX 2-1

*Scoping Responses*

MKO
Tuam Road
Galway
H91 VW84

13th March 2024

**Re:** **Scoping Request for the proposed Historical Peat Extraction at Ballivor, Carranstown, Bracklin, Lisclogher & Lisclogher West Bogs Co. Westmeath/Meath.**

Dear Sir/Madam,

The following are the comments from this Division in relation to the proposed development:

If the proposed development will involve the felling or removal of any trees, the developer must obtain a Felling License from this Department before trees are felled or removed. A Felling Licence application form can be obtained from **Felling Section, Department of Agriculture, Food and the Marine, Johnstown Castle Estate, Co. Wexford**. Email: felling.forestservice@agriculture.gov.ie or Web gov.ie - Tree Felling Licences (www.gov.ie)

A Felling Licence granted by the Minister for Agriculture, Food and the Marine provides authority under the Forestry Act 2014 to fell or otherwise remove a tree or trees and/or to thin a forest for silvicultural reasons. The Act prescribes the functions of the Minister and details the requirements, rights and obligations in relation to felling licences. The principal set of regulations giving further effect to the Forestry Act 2014 are the Forestry Regulations 2017 (S.I. No. 191 of 2017).

The developer should take note of the contents of **Felling and Reforestation Policy** document which provide a consolidated source of information on the legal and regulatory framework relating to tree felling; gov.ie - Tree Felling Licences (www.gov.ie) As this development is within forest lands, particular attention should be paid to deforestation, turbulence felling and the requirement to afforest alternative lands.

In order to ensure regulated forestry operations in Ireland accord with the principles of sustainable forest management (SFM), as well fulfilling the requirements of other relevant environmental protection laws, the Department (acting through its Forest Service division) must undertake particular consultations, and give certain matters full consideration during the assessment of individual Felling Licence applications. This includes consultation with relevant bodies, the application of various protocols and procedures (e.g. Forest Service Appropriate Assessment Procedure), and the requirement for applicants on occasion to provide further information (e.g. a Natura Impact Statement).

Consequently, when the Forest Service is considering an application to fell trees, the following applies:

1. The interaction of these proposed works with the environment locally and more widely, in addition to potential direct and indirect impacts on designated sites and water, is assessed. Consultation with relevant environmental and planning authorities may be required where specific sensitivities arise (e.g. local authorities, National Parks & Wildlife Service, Inland Fisheries Ireland, and the National Monuments Service);

2. Where a tree Felling Licence application is received, the Department will publish a notice of the application before making a decision on the matter. The notice shall state that any person may make a submission to the Department within 30 days from the date of the notice. The notices are published online at: gov.ie - Felling Licence Applications (www.gov.ie)

3. Third parties that make a submission or observation will be informed of the decision to grant or refuse the licence, and on request, details of the conditions attached to the licence, the main reasons and considerations on which the decision to grant or refuse the licence was based, and where conditions are attached to any licence, the reasons for the conditions. Both third parties and applicants will be also informed of their right to appeal any decision within 14 days to the Forestry Appeals Committee. Felling Licence decision are published online at: gov.ie - Felling Licence Decisions (www.gov.ie)

It is important to note that when applying to **a Local Authority**, or **An Bord Pleanàla**, for planning permission where developments are:

a) subject to an EIA procedure (including screening in the case of a sub-threshold development) and any resulting requirement to produce an EIAR; and/or

b) subject to an Appropriate Assessment procedure (including screening) and any resulting requirement to a Natura Impact Statement (NIS); and

c) the proposed development in its construction or operational phases, or any works ancillary thereto, would directly or indirectly involve the felling and replanting of trees, deforestation for the purposes of conversion to another type of land use, or replacement of broadleaf high forest by conifer species,

1. that there is a requirement inter alia under the EIA Directive for an overall assessment of the effects of the project or the alteration thereof on the environment to be undertaken, including the direct and indirect environmental impact of the project;

   and

2. pursuant to Article 2(3) of the EIA Directive, the Department of Agriculture, Food and the Marine strongly recommends that, notwithstanding the fact that a parallel consent in the form of felling licence may also have to be applied for, any EIAR and/or NIS produced in connection with the application for planning permission to the Local Planning Authority or An Bord Pleanàla, should include an assessment of the impact of and measures, as appropriate, to prevent, mitigate or compensate for any significant adverse effects direct or indirect identified on the environment arising from such felling and replanting of trees, deforestation for the purposes of conversion to another type of land use, or replacement of broadleaf high forest by conifer species.

3. Please note that there must be absolute spatial consistency between the felling licence areas submitted to DAFM (second authority) and all related planning documents submitted to the first authority in respect of the felling area(s)

Yours sincerely,

_____

**Catherine Boyce**
**Felling Section**
**Department of Agriculture, Food and the Marine**
**Johnstown Castle**
**Co Wexford**

## Natalia Stolarska

**From:** Environmental Co-ordination (Inbox) <Environmental_Co-ordination@agriculture.gov.ie>
**Sent:** Thursday 14 March 2024 09:29
**To:** Grainne Griffin
**Subject:** FW: 191137f- rEIA Scoping Document for Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group, Co. Meath/Westmeath
**Attachments:** DAFM Forest Service_2024 Scoping Doc Cover Letter_2024.02.14.pdf; Ballivor Bog, Co Westmeath-Meath.pdf

You don't often get email from environmental_co-ordination@agriculture.gov.ie. Learn why this is important

**Caution:** This is an external email and may be malicious. Please take care when clicking links or opening attachments.

Good morning,

Please see observations attached from our Felling Division.

Regards,

Environmental Co-ordination Unit

---

**From:** Forestry Info <forestryinfo@agriculture.gov.ie>
**Sent:** Thursday, February 15, 2024 8:40 AM
**To:** Boyce, Catherine <Catherine.Boyce@agriculture.gov.ie>
**Cc:** Walsh, Ciaran <Ciaran.Walsh@agriculture.gov.ie>
**Subject:** FW: 191137f- rEIA Scoping Document for Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group, Co. Meath/Westmeath

Catherine

For your area.

Peg

---

**From:** Grainne Griffin <ggriffin@mkoireland.ie>
**Sent:** Wednesday, February 14, 2024 4:14 PM
**To:** Forestry Info <forestryinfo@agriculture.gov.ie>
**Cc:** Karen Mulryan <kmulryan@mkoireland.ie>
**Subject:** 191137f- rEIA Scoping Document for Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group, Co. Meath/Westmeath

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Dear Sir/Madam,

Following on from initial scoping in December 2021, please consider the below:

On behalf of Bord na Móna Plc and subsidiaries ('the Applicant'), MKO is preparing a remedial Environmental Impact Assessment Report (rEIAR) and remedial Natura Impact Statement (rNIS) to accompany a Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group. The Ballivor Bog Group comprises Ballivor, Carranstown, Bracklin, Lisclogher and Lisclogher West Bogs located approximately 2.2km west of Ballivor Village, Co. Meath, and 3.7km east of Raharney and 2.5km south-southeast of Devlin, both located in Co. Westmeath.

As part of the EIA process, we would welcome any comments that you may have in relation to the proposed project, including baseline data, survey techniques or potential impacts that should be considered as part of the assessment process and in the preparation of the rEIAR. In order to facilitate this, a Scoping Document providing details of the proposed project and the site of the proposed development is attached.

If you could return any comments or suggestions within four weeks upon this receipt, it would be much appreciated. If you require any further information, please do not hesitate to contact me.

Kind regards,
Gráinne.

**Gráinne Griffin**
Environmental Scientist BSc. MSc. CEcol.
**MKO**
Tuam Road, Galway, H91 VW84

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An Roinn Talmhaíochta, Bia agus Mara

Tá an t-eolas sa ríomhphost seo, agus in aon cheangaltáin leis, faoi rún agus tá sé dírithe ar an bhfaighteoir/na faighteoirí beartaithe amháin agus níor cheart ach dóibh siúd é a úsáid. D'fhéadfadh an t-eolas seo a bheith faoi réir pribhléid dhlíthiúil agus ghairmiúil. Mura tusa faighteoir beartaithe an ríomhphoist seo, níor cheart duit an teachtaireacht seo, nó aon chuid di, a úsáid, a nochtadh, a chóipeáil, a dháileadh nó a choinneáil. Má fuair tú an ríomhphost seo go hearráideach, cuir an

## Karen Mulryan

**From:** Environmental Co-ordination (Inbox) <Environmental_Co-ordination@agriculture.gov.ie>
**Sent:** 07 January 2022 15:09
**To:** EIAPlanning
**Subject:** RE: EPA Ref 2493 - Scoping Consultation under Article 5(2) of Directive 2014/52/EU (EIA Directive)

Hello
I wish to inform you that the Department of Agriculture, Food & the Marine has no observations re. the above at this time.
Kind regards

***An tAonad um Chomhordú Timpeallachta, An Rannóg um Athrú Aeráide agus Beartas Bithfhuinnimh,***
*Environmental Co-ordination Unit | Climate Change & Bioenergy Policy Division |*
**An Roinn Talmhaíochta, Bia agus Mara**
*Department of Agriculture, Food and the Marine*
**Pailliún A, Páirc Gnó Grattan, Bóthar Átha Cliath, Port Laoise, Co Laoise, R32 K857**
Pavilion A, Grattan Business Park, Dublin Road, Portlaoise, Co Laois, R32 K857
T +353 (0)57 868 9915 environmentalco-ordination@agriculture.gov.ie
www.agriculture.gov.ie

**From:** EIAPlanning <eiaplanning@epa.ie>
**Sent:** Friday 10 December 2021 12:17
**To:** An Bord Pleanala <bord@pleanala.ie>; An Taisce <planning@antaisce.org>; Environmental Co-ordination (Inbox) <Environmental_Co-ordination@agriculture.gov.ie>; Department of Arts, Heritage, Regional, Rural & Gaeltach Affairs <fem.dau@ahg.gov.ie>; Dept of Communications, Climate Action & Environment <corporatesupport.unit@dcenr.gov.ie>; Dept of Communications, Climate Action and Environment <wppr@dccae.gov.ie>; Failte Ireland <planning.applications@failteireland.ie>; Health & Safety Authority <chemicals@hsa.ie>; Health Service Executive <environmental.health@hse.ie>; Inland Fisheries Ireland <environlicensing@fisheriesireland.ie>; Irish Water <IWenvironmental@water.ie>; Minister for Transport, Tourism and Sport <minister@dttas.ie>; Teagasc <John.Spink@teagasc.ie>; The Heritage Council <aharvey@heritagecouncil.ie>; Meath County Council (Environment Section) <environment@meathcoco.ie>; Meath County Council (Planning Section) <planning@meathcoco.ie>; Westmeath County Council (Planning Section) <secretar@westmeathcoco.ie>; WestMeath CoCo <environment-wastemanagement@westmeathcoco.ie>
**Subject:** EPA Ref 2493 - Scoping Consultation under Article 5(2) of Directive 2014/52/EU (EIA Directive)

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Dear Sir /Madam,
I refer to the attached scoping request received by the Agency 02nd December 2021 in respect of the following:

- Applicant: Bord na Móna Plc and subsidiaries
- Location of Activity: Ballivor Bog Group, Bracklin, Ballivor, Lisclogher West, Lisclogher and Carranstown Bogs ,Co Meath/Westmeath.
- Class and Nature of Activity: 1.4 - The extraction of peat in the course of business which involves an area exceeding 50 hectares
- EPA Reference No: 2493

In order to satisfy the consultation requirements under Article 5(2) of Directive 2011/92/EU as amended by Directive 2014/52/EU (EIA Directive), please revert to the Agency with your comments on the scope and level of detail of the information to be included by the developer in the environmental impact assessment report within two weeks of the date of this letter/email.
For all further queries and correspondence relating to planning and EIA matters, please contact eiaplanning@epa.ie
Yours faithfully,
Environmental Licensing Programme

Environmental Licencing Programme
Office of Environmental Sustainability
An Clár um Cheadúnú Comhshaoil
Oifig um Inbhuanaitheacht Chomhshaoil

053-916 0600 (Switch)
eiaplanning@epa.ie
www.epa.ie

**From:** Karen Mulryan
**Sent:** Thursday 2 December 2021 18:50
**To:** EIAPlanning
**Subject:** 191137f- rEIA Scoping Document for Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group, Co. Meath/Westmeath

Dear Sir/Madam,

On behalf of Bord na Móna Plc and subsidiaries ('the Applicant'), MKO is preparing a remedial Environmental Impact Assessment Report (rEIAR) and remedial Natura Impact Statement (rNIS) to accompany a Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group. The Ballivor Bog Group comprises Ballivor, Carranstown, Bracklin, Lisclogher and Lisclogher West Bogs located approximately 2.2km west of Ballivor Village, Co. Meath, and 3.7km east of Raharney and 2.5km south-southeast of Devlin, both located in Co. Westmeath.

As part of the EIA process, we would welcome any comments that you may have in relation to the proposed project, including baseline data, survey techniques or potential impacts that should be considered as part of the assessment process and in the preparation of the rEIAR. In order to facilitate this, a Scoping Document providing details of the proposed project and the site of the proposed development is attached.

If you could return any comments or suggestions at your earliest convenience, it would be much appreciated. If you require any further information, please do not hesitate to contact me.

Yours sincerely,
Karen.

Karen Mulryan
Environmental Scientist BA MSc ACIfA IAI
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Fáilte Ireland
Turasóireacht Náisúnta
An tÚdara Eorbartha
National Tourism
Development Authority

# EIAR Guidelines for the Consideration of Tourism and Tourism Related Projects



**July 2023**


An tÚdarás Náisiúnta Forbartha Turasóireachta
Áras Fáilte, 88–95 Sráid Amiens
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## 1. Introduction

Tourism is a growing sector and substantial part of the Irish Economy. It contributes to both urban and rural economies in every part of the country. The impact and interaction of tourism with the environment is complex and the assessment of environmental impacts is of utmost importance to creating a sustainable tourism economy and protecting the natural resources that are so often a tourism attraction.

The purpose of this report is to provide guidance for those conducting Environmental Impact Assessment and compiling an Environmental Impact Assessment Reports (EIAR), or those assessing EIARs, where the project involves tourism or may have an impact upon tourism. These guidelines are non-statutory and act as supplementary advice to the EPA EIAR Guidelines outlined in section 2.

This guidance document has been prepared by Fáilte Ireland to update their EIA guidelines in line with changes in legislative and guidance requirements.

## 2. Background to this Document

Tourism is one of the largest and most important sectors of the economy, providing employment for approximately **260,000 people**, an economic contribution of **€9.5 billion**, and exchequer revenue of **€1.8 billion** in 2019, which helps fund other key public services.

In 2019 Ireland welcomed **9.7 million overseas visitors.**

Fáilte Ireland is the National Tourism Development Authority established by the Irish Government in May 2003. Fáilte Irelands role is to support the tourism industry and work to sustain Ireland as a high-quality and competitive tourism destination. They provide a range of practical business supports to help tourism businesses better manage and market their products and services.

Fáilte Ireland also work with other state agencies and representative bodies, at local and national levels, to implement and champion positive and practical strategies that will benefit Irish tourism and the Irish economy.

Fáilte Ireland promotes Ireland as a holiday destination through a domestic marketing campaign (DiscoverIreland.ie) and manage a network of nationwide tourist information centres that provide help and advice for visitors to Ireland.

Tourism related projects cover a broad range of plans, programmes and developments, from the Wild Atlantic Way to a single hotel conversion. These guidelines apply to projects involving or impacting upon tourism. A tourism plan, strategy or programme where it is part of the statutory plan making process under the Planning and Development Acts (as amended), may be more appropriately assessed by a Strategic Environmental Assessment (SEA) as discussed in the next section.

It should be borne in mind that EIA is required where there is anticipated to be a significant impact on the environment, where tourism projects are of a prescribed type or meet thresholds identified below.

Where Natura 2000 Designated Sites are potentially affected by tourism development Appropriate Assessment must be carried out by the appropriate authority in accordance with Article 6(3) of the EU Habitats Directive.

## 3. Legislation and Statutory Guidance

Environmental Impact Assessment is a procedure that ensures that the environmental implications of decisions are taken into account before planning based decisions are made. The assessment results in a report, called an Environmental Impact Assessment Report (EIAR).

### *Legislation*

These guidelines are produced under current EIAR legislative requirements, having regard to Directive 2011/92/EU (known as 'Environmental Impact Assessment' – EIA Directive), as amended by Directive EU 2014/52 which came into effect in May of 2017. These requirements were transposed into Irish Law on 1 September 2018 as most of the provisions of the European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. No. 296 of 2018) came into effect. The principle of both Directives is to ensure that plans, programmes and projects likely to have significant effects on the environment are made subject to an environmental assessment, prior to their approval or authorisation.

### *Statutory Guidance*

In response to the changes to the EIAR requirements under Directive EU 2014/52, the Environmental Protection Agency (EPA) developed Guidelines on the information to be contained in Environmental Impact Assessment Reports in May 2022. The Guidelines are a statutory document to be regarded by those preparing EIARs and the decision makers considering the EIARs.

Some of the key changes to the EIA Directive introduced by Directive 2014/52/EU are as follows:

- Additional information to be provided in the project description to describe the location of the project, the technologies and substances used, the construction of the project and required demolition;
- The requirement for consideration of alternatives has changed from a requirement to provide ‘An outline of the main alternatives studied by the developer and an indication of the main reasons for this choice, taking into account the environmental effects’ to ‘a description of the reasonable alternatives studied by the developer, which are relevant to the project and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the project on the environment’;
- A refinement of the environmental factors to be considered in the assessment with an increased focus on resource efficiency, climate change, biodiversity and disaster prevention;
- Changes to Prescribed Environmental Factors with ‘Land’ being added, ‘Human Beings’ replaced by ‘Population & Human Health’ and ‘Flora & Fauna’ replaced by ‘Biodiversity’;

- The developer is required to have competent experts to prepare the EIAR and the Board is required to have access to sufficient expertise to assess the EIAR;
- Requirement for the incorporation of mitigation and monitoring measures in consents and ensuring that developers deliver these measures;
- The requirements for the assessment of cumulative effects with existing and/or approved projects, taking into account existing environmental issues to be considered; and
- Reasoned decisions made with regard to the EIA outcomes must be provided.

In addition to the EPA statutory guidance, the Department of Housing has produced Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment in August 2018.

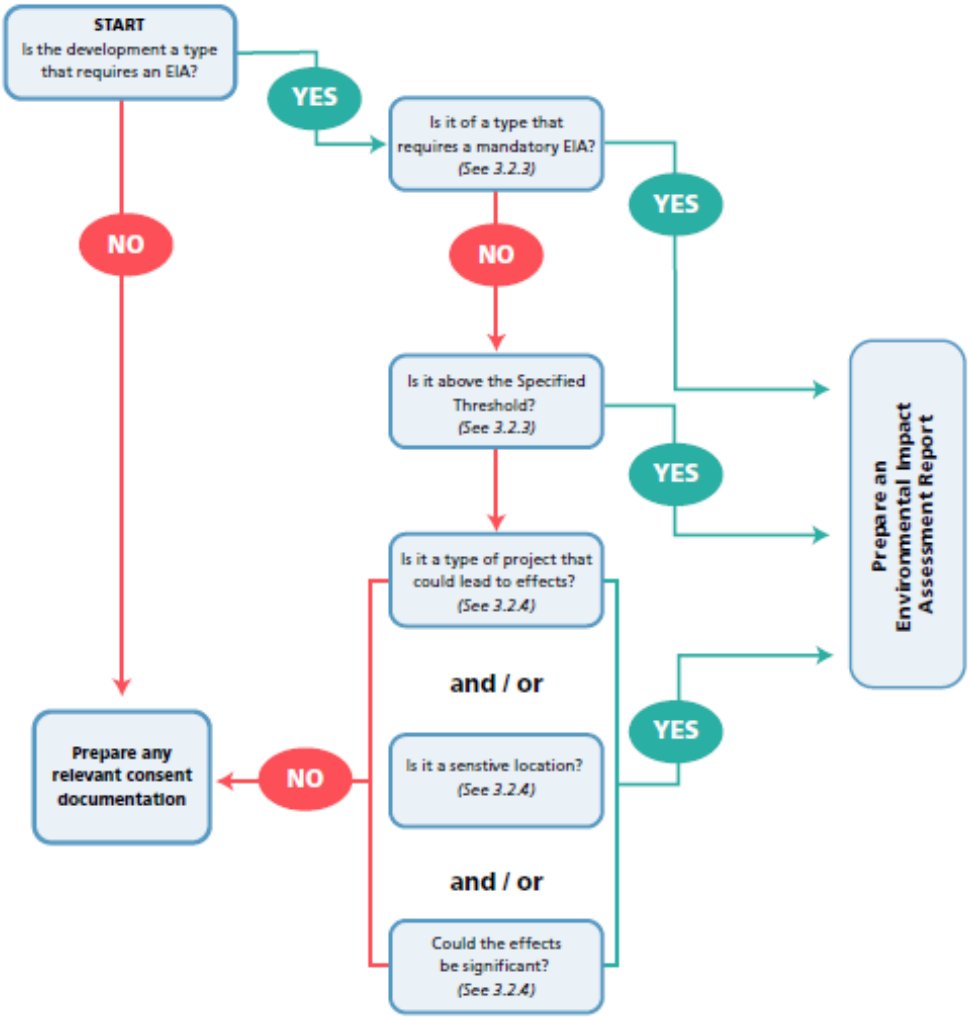
The process of EIA is set out in the EPA EIAR Guidelines, this document should be read in conjunction with and used as supplementary guidance to the EPA EIAR Guidelines. The process for ascertaining whether an EIAR is required is known as 'screening' and the process to determine the breath and scope of an EIAR is known as 'scoping'. Guidance on this can be found in Section 3.2 of the EPA Guidelines.

***Screening***

Through EIA Screening, developments are either considered as requiring an EIAR due to the project type or because they exceed a threshold level. The screening process begins by establishing whether the proposal is a 'project' as understood by the Directive (as amended).

The prescribed development types and thresholds are set out in Annex I and II of the EIA Directive as transposed into Schedule 5 of the Planning and Development Regulations 2010-2018 (as amended). Development which does not exceed these thresholds but may require an EIAR are called sub threshold. Sub-Threshold considerations are outlined in Schedule 7 of European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. No. 296 of 2018) as transposed from Annex III of the Directive. The Guidelines on Environmental Impact Assessment Reports note that projects at first glance may not appear to come under the Schedule but on closer examination when the process is further examined, they may do so because of the sensitivity or significance of the receiving environment etc. Sub threshold developments require an EIAR if they are likely to have significant environmental impacts and must undergo assessment for likely significant impacts through an EIAR screening report. The contents of a screening report for subthreshold development are contained in Annex III of the EIA Directive.

*Figure 1: EIAR Screening Process*




*(Taken from Fig 3.2 of the EPA Guidelines)*

Tourism locations should be identified as sensitive receptors in screening assessments for particular impacts, depending on scale and sensitivity, as they would in a full EIAR. Section 6 below can act as guidance for Screening Reports as well as for full EIAR.

The screening process for considering where an EIAR is necessary, is summarised above in Figure 1 (excerpted from Figure 3.2 of the EPA Guidelines).

Strategic Environmental Assessment (SEA) is a more strategic level of environmental assessment that examines plans, policies, objectives and programmes specifically rather than projects. For some tourism developments it may be more appropriate that they be examined through SEA, while individual projects or specific proposals are likely to be more assessed through EIAR. If a project is part of a plan, programme or policy/objective assessed by SEA there may still be a requirement for an EIAR for that development (subject to EIA Screening assessment).

*EIAR Scoping*

Scoping an EIAR is an opportunity to look at the breadth of issues and ensure that any areas of possible significant impact are assessed. Identifying sensitivities and stakeholders should take account of tourism facilities and consider Fáilte Ireland in scoping requests where necessary.

## 4. Assessing Tourism

There is no legal definition of 'tourism' in Irish legislation. The UNWTO definition of sustainable tourism is *"Tourism that takes full account of its current and future economic, social and environmental impacts, addressing the needs of visitors, the industry, the environment and host communities"*. This is widely accepted as a key definition of tourism as we move to a more sustainable future.

Tourism assessments are frequently carried out by economic consultants and by specific tourism consultants. It is always advisable, particular for tourism projects, that suitably qualified and experienced personnel are used to determine the impact of tourism related projects or to assess the impact of more general proposals on a tourism asset identified in a particular location. There is a requirement for EIAR under current legislation to contain a statement of competency within all EIAR documents, including screening and scoping reports.

***Projects which involve a tourism element***

Tourism projects are wide ranging and diverse. While there are some projects which cater to tourism and are easily identified as such - Hotels, Museums, etc. there are other projects where tourism is a key service or element, but which may not be immediately obvious – walking/cycling/forest trails, greenways, blueways, community facilities and others. EIAR conducted for developments containing tourist elements should be completed in accordance with the current guidance from the EPA.

Projects which include a tourism element can have potential for particular environmental effects which differ from a non-tourism development. These impacts can be intermittent, event related, inconsistent, dependent on weather, temporal, temporary or seasonal. This is considered within the prescribed environmental topics for EIAR outlined in Section 7 below.

***Projects which may have an impact upon tourism***

While tourism projects may be diverse, the projects which can impact tourism are considerably more wide ranging, from large infrastructural developments to local energy developments. Disruption to or suppression of a tourist resource or amenity can have very local or more strategic impacts, directly or indirectly- for example energy projects in a rural area can have both a negative and positive impact in different regards. There can be temporary, periodic or even seasonal impacts occurring during construction or operational periods.

According to the Fáilte Ireland Tourism Facts 2019 Report, the most important factors in determining the attractiveness of tourism destinations for visitors to Ireland are;

- Beautiful Scenery and Unspoiled Environment
- Hospitality
- Safety
- Nature, Wildlife and Natural Attractions
- History and Culture

- Pace of Life

These factors used for the promotion of tourism in Ireland are also barometers of sensitivity to change in tourism sensitive or dominant locations where development may have an impact upon the tourism asset. The potential for development to impact these sensitivities, and the environmental criteria under which they can be considered, are identified in section 7 of the guidelines.

## 5. Guiding Principles of EIAR

As outlined in the EPA EIAR Guidelines, the fundamental principles to be followed when preparing an EIAR, including screening and scoping, are:

- Anticipating, avoiding and reducing significant effects
- Assessing and mitigating effects
- Maintaining objectivity
- Ensuring clarity and quality
- Providing relevant information to decision makers
- Facilitating better consultation.

Environmental assessment should be undertaken in accordance with the European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018.

## 6. Consideration of Competency and Qualifications

As per Section 2.5 of the EPA Guidelines, EIAR is required to be completed by '*competent experts*'.

Contributors to the preparation of environmental impact assessment reports, including screening and scoping assessments, should be qualified and competent. Sufficient expertise, in the relevant field of the project concerned, is required for the purpose of its examination by the competent authorities in order to ensure that the information provided by the developer is complete and of a high level of quality so that a full and proper assessment can be undertaken.

For tourism related projects, or projects likely to affect tourism assets, competent experts in the area of tourism should be utilised in the environmental assessment.

The competency of all involved in the production of an EIAR or any related report (e.g. Screening and scoping) is required to be stated at the beginning of the EIAR report with further details as necessary in each following chapter.

Where tourism projects involve for example heritage or cultural components, input from heritage consultants, conservation architects, or historians may be required.

## 7. EIAR Requirements

The following are the key requirements for an EIAR under the current guidance. This is not a definitive list and should be read in conjunction with regulations.

- project description;
- assessment of alternatives considered;
- baseline assessment;
- assessment of effects;
- cumulative impact;
- interaction of impacts;
- mitigation & monitoring; and
- residual impacts

***Project Description***

Project descriptions are required to describe the whole project including site, scale, design and key factors. It is important that the EIAR and design team have a consistent understanding of the development description in full. The key requirements are outlined in section 3.5 of the EPA Guidelines however they identify the following;

- the location of the project
- the physical characteristics of the whole project
- the main characteristics of the operational phase of the project
- an estimate, by type and quantity, of the expected residues and emissions

The location of the project should include identifying key sensitive receptors (including tourism receptors). In the operational phase of the project any tourism based, or potentially tourism related activity, should be identified.

***Assessment of Alternatives***

The assessment of the various reasonable alternatives is an important requirement of the EIA process.

Where tourism projects are location dependent the assessment of reasonable alternatives should consider alternative methods, layouts, technologies and mitigations, detail the key considerations culminating in the selection of the option/design, the reasoning for these and the environmental effect of these decisions. This is particularly important for tourism projects which are often location tied. The EPA EIAR Guidelines indicate that it is generally sufficient to provide a broad description of each main alternatives and the key issues associated with each, showing how environmental considerations were taken into account in deciding on the selected option.

***Baseline Assessment***

Baseline descriptions are evidence based, current descriptions of environmental characteristics with consideration of likely changes to the baseline environment evidenced in planning histories, unimplemented permissions, and applications pending determination. Baseline assessments should identify any tourism sensitivities in the zone of influence of a development. This zone of influence of a development is highly dependent on its **Context, Character, Significance,** and **Sensitivity**, as outlined in the EPA EIAR Guidelines. These characteristics apply to both the development and the environment.

For example, in a tourism context;

The location of sensitive tourism resources that are likely to be directly affected should be highlighted, and other premises which although located elsewhere, may be the subject of in combination impacts such as alteration of traffic flows or increased urban development.

The character of an area from a tourism perspective should be described and the principal types of tourism in the area. Where relevant, the specific environmental resources or attributes in the existing environment which each group uses or values should be stated and where relevant, indicate the time, duration or seasonality of any of those activities.

The significance of the tourism assets or activities likely to be affected should be highlighted. Reference to any existing formal or published designation or recognition of such significance should be included. Where possible the value of the contribution of such tourism assets and activities to the local economy should also be provided.

If there are any significant concerns or opposition to the development known to exist among tourism stakeholders and interest groups, this should be highlighted. Identify, where possible, the particular aspect of the development which is of concern, together with the part of the existing tourism resource which may be threatened or impacted.

In addition, the baseline should include any methodologies employed in the study to obtain information, if particular databases are used to locate sensitive receptors they should be acknowledged. In relation to tourism information, the suggested information sources at the end of this document are a non-exhaustive list which may be of assistance in identifying tourism receptors.

***Impact Assessment***

The topics for consideration of impact are prescribed in the EIA Directive and transcribed into Irish law by the European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. No. 296 of 2018). Impact assessment should contain the likely significant effects of a development arising from both construction and operation of a development. Advice on describing the effects is contained within the EPA EIAR Guidelines and includes the **quality, significance, extent, probability, type** and **duration** of the effect, with particular descriptors for each. In describing effects upon tourism receptors these descriptors should take account of the particular aspects and sensitivities of tourism, for example a temporary annual effect from a development may have different impacts upon tourism if it falls at peak season rather than off-peak.

Impact assessment should be carried out as per EPA guidelines and the best practice for that prescribed topic. It may be considered appropriate to consider impact on tourism under the 'Population and Human Health' and / or 'Landscape' topics as suggested below.

### Population and Human Health

The consideration of tourism projects within the Population and Human Health is extensive, with impacts ranging from rural employment population impacts of seasonal tourism, to the health impact of air pollution from increased traffic in urban areas.

The impact upon tourism can be considered within this section through the sensitivities of Hospitality, Safety and Pace of Life. Changes in population can impact the perception of pace of life or safety in a particular location. Impacts upon these issues in areas which rely heavily on tourism or have a particular sensitive tourism generator should be considered in this section. The EPA guidelines makes reference to amenity *"..which may be relevant under 'Population and Human Health' and 'Landscape'"*.

### Biodiversity

Particular tourist activities can have a significant impact upon biodiversity. Landscapes which are 'unspoiled' can be attractors of tourism. However, the disturbance to ecology must be managed to minimise impacts.

Biodiversity is also a tourism asset and should be protected as such from other development and should be provided for in proposals where possible.

The assessment should also consider current Government policy on nature conservation as outlined in the National Biodiversity Action Plan 2017-2021 (NBAP) (and subsequent iterations (Including draft NBAP recently open for public consultation, to cover 2023 to 2027) which also includes Ireland's vision for biodiversity below.

*'That biodiversity and ecosystems in Ireland are conserved and restored, delivering benefits essential for all sectors of society and that Ireland contributes to efforts to halt the loss of biodiversity and the degradation of ecosystems in the EU and globally.'*

### Land, Soils and Geology

A link between tourism and this prescribed environmental factor, beyond the normal development impacts, is rare, however particular activities or facilities which use geological features may have an impact upon soils and geology, such as mountain biking trails, recreational uses of old quarries etc.

The impact upon Geotourism related to geoheritage within the natural environment, e.g., any impacts on UNESCO Global Geoparks, of which we currently have three on the island of Ireland; Copper Coast in Co. Waterford, Burren and Cliffs of Moher in Co. Clare, and Cuilcagh Lakelands in Cavan and Fermanagh should be considered (where applicable) in this section.

Indirect impacts such as material use for extensive landscaping and public realm should also be considered.

### Water

Tourism uses can be water intense, depending on development type. Recreational use of a surface water feature, water-based leisure centres etc have different impacts to standard development.

### Air Quality and Climate

Tourism impact upon air quality is dependent on the activity proposed and sensitivity of the location. If the tourism project includes a large increase in transportation services, collection of baseline air emission data is advised. Transportation emissions affect not only air quality, but also greenhouse gases. Changing climatic patterns due to climate change should be factored into this analysis.

### Noise and Vibration

A link between tourism and this prescribed environmental factor, beyond the normal development impacts, is rare, however the impact upon tourism of issues of noise and vibration can be significant. Construction adjoining hotels for example should consider the sensitivity of the development and ensure mitigation is in place.

### Material Assets; Traffic and Transport

The different transport patterns associated with tourism activities is a key impact of tourism and should be considered especially for tourism projects. These produce temporal and seasonal changes on the norm and specialist consideration and interpretation should be given. Tourism proposals should, where possible, be well served by public transport and should be accessible by modes other than the car. The impact of traffic on tourism assets can be substantial and can vary in severity according to season, the weather, etc. The impact of construction traffic can be a particular concern in tourism sensitive areas in terms of noise pollution and visual impact. The construction programme of developments should work to

avoid peak tourism periods in tourism areas and should consider planned or anticipated tourism events and festivals.

### Cultural Heritage

Cultural heritage can be a key component of tourism projects and the impact of tourism on the maintenance of cultural heritage should be given the utmost consideration, whether positive or negative. As a tourism attraction, cultural heritage should be strongly considered in non-tourism developments and the impact upon tourism considered as a potential impact.

### Archaeology

Archaeology can be of tourism interest and can be an attractive or key component of tourism projects. Archaeology can be a tourism attractor and given that national policy emphasis on the non-renewable nature of the archaeology and archaeological heritage, focus should be a presumption in favour of its preservation in-situ or where preservation in-situ is not the option chosen, there must be preservation by record (i.e. archaeological excavation and recording must take place) in line with statutory requirements.

### Material Assets; Waste Management

Tourism is a resource heavy activity and can impact waste streams and waste segregation. Impacts here should be considered strongly and with knowledge of the variation that arises from the particular tourist activity. Waste and Waste disposal issues can also impact the perception of an unspoiled environment, effecting tourism, which should be considered.

### Material Assets

Material assets outside of the material assets already referenced that should be considered are built services (utilities) and infrastructure. Tourism development should include impact assessment on built services (utilities) and infrastructure while non tourism related development should consider the effect on tourism, which should be considered.

### Landscape

The visual impact of a tourism development, especially in locations which are visually sensitive or renowned for their scenic or landscape beauty, should be considered carefully. A development intended to utilise or enjoy a particular vista or environment should minimise impact upon that environment.

***Major Accident and Natural Disaster***

There is a requirement for tourist developments to describe expected significant effects on the environment of the proposed development's vulnerability to major accidents and/or natural disasters relevant to it. Where appropriate measures should be identified to prevent or mitigate the significant adverse effects of such accidents or disasters, including resulting from climate change, on the environment and detail the preparedness for the proposed response.

***Interaction of Impacts***

Where two or more environmental impacts combine or interact they should be considered under the prescribed topics. It is best practice to provide a table of interactions within an EIAR or EIA Screening Report.

***Cumulative Impact***

The cumulative impact is that of the project combined with any known likely project which will interact or compound an environmental impact.

***Transboundary Impact***

Transboundary impacts should be included in EIAR. In the case of tourism, especially international travel, the transboundary impacts may not be proximate to the EIAR site.

***Mitigation & Monitoring***

Mitigation should follow the hierarchy of minimisation in descending order of preference- Avoid, Reduce, Remedy.

*Avoid* sensitive tourism resources- such as views, access and amenity areas including habitats as well as historical or cultural sites and structures.

*Reduce* the exposure of sensitive resources to excessive environmental impact.

*Reduce* the adverse effects to tourism land uses and patterns of activities, especially through interactions arising from significant changes in the intensity of use or contrasts of character or appearance.

*Remedy* any unavoidable significant residual adverse effects on tourism resources or activities.

Mitigation measures must be measurable and achievable within the bounds of the project.

With regard to Monitoring, Article 8a of the EIA Directive requires that:

*1. 'The decision to grant development consent shall incorporate at least the following information …*
*(b) any environmental conditions attached to the decision, a description of any features of the project and/or measures envisaged to avoid, prevent or reduce and, if possible, offset significant adverse effects on the environment as well as, where appropriate, monitoring measures. … 4 Member States shall ensure that the features of the project and/or measures envisaged to avoid, prevent or reduce and, if possible, offset significant adverse effects on the environment are implemented by the developer, and shall determine the procedures regarding the monitoring of significant adverse effects on the environment. The type of parameters to be monitored and the duration of the monitoring shall be proportionate to the nature, location and size of the project and the significance of its effects on the environment. Existing monitoring arrangements resulting from Union legislation other than this Directive and from national legislation may be used if appropriate, with a view to avoiding duplication of monitoring.'*

***Residual Impacts***

The residual impacts are the final predicted or intended impacts which occur after the proposed mitigation measures have been implemented.

## 8. Sources of information on Tourism

***Information available online***

*Fáilte Ireland*

Fáilte Ireland offers detailed research analysis and insights into the Irish Tourism Industry. The National Tourism Development Authority has a portfolio of research across a number of areas including facts and figures, Environmental Surveying and Monitoring, briefing papers and reports and visitor feedback. The Fáilte Ireland website has a dedicated research library which can be accessed here

Fáilte Ireland also manages an environmental surveying and monitoring database as part of the Wild Atlantic Way Operational Programme which can be accessed here. The purpose of this is to work with and demonstrate to our stakeholders and partners that we are committed to the sustainable development of the Wild Atlantic Way, and to be able to pre-empt and avoid environmental effects in the future should they occur.

*Discover Ireland:*

Operated by Fáilte Ireland, the Discover Ireland website includes comprehensive information on tourist attractions in destinations all around Ireland, including listings for activities, accommodation, events and experiences for every county, major town and region in Ireland. The website features elements from the four destination brands – Wild Atlantic Way, Ireland's Ancient East, Ireland's Hidden Heartlands and Visit Dublin and can be accessed here.

*Tourism Ireland*

Tourism Ireland is responsible for marketing the island of Ireland overseas as a holiday and business tourism destination. Tourism Ireland publishes a range of research documents including; visitor facts and figures, seasonal updates and industry insights which are accessible here

*Local Authorities*

Local Authorities are an invaluable source of information. They produce tourism strategies and audits of tourism assets within their jurisdiction. Local authorities will also produce landscape and seascape studies. Protected views and prospects as well as the record of protected structures and other designated protected buildings are contained within the Statutory Development Plans.

*Regional Assemblies*

Regional Assemblies can also be consulted on high level strategic tourism and potential Regional Spatial and Economic Strategies (RSESs) should be consulted.

Central Statistics Office

The Central Statistics Office (CSO) is Ireland's national statistical office and their purpose is to impartially collect, analyse and make available statistics about Ireland's people, society and economy. The Tourism and Travel Section of the Central Statistics Office is the major source for tourism statistics in Ireland and is updated regularly.

An Roinn Talmhaíochta, Bia agus Mara

Tá an t-eolais san ríomhphost seo, agus in aon ceangláin leis, faoi phribhléid agus faoi rún agus le h-aghaigh an seolaí amháin. D'fhéadfadh ábhar an seoladh seo bheith faoi phribhléid profisiúnta nó dlíthiúil. Mura tusa an seolaí a bhí beartaithe leis an ríomhphost seo a fháil, tá cosc air, nó aon chuid de, a úsáid, a chóipeál, nó a scaoileadh. Má tháinig sé chugat de bharr dearmad, téigh i dteagmháil leis an seoltóir agus scrios an t-ábhar ó do ríomhaire le do thoil.

## Natalia Stolarska

**From:** planning applications <planning.applications@failteireland.ie>
**Sent:** Friday 1 March 2024 12:32
**To:** Grainne Griffin
**Cc:** Karen Mulryan
**Subject:** RE: 191137f- rEIA Scoping Document for Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group, Co. Meath/Westmeath
**Attachments:** Fáilte Ireland EIAR Guidelines 2023.pdf

**Caution:** This is an external email and may be malicious. Please take care when clicking links or opening attachments.

Hello Gráinne,

Thank you for your email and scoping document regarding the Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group. Co. Meath/Westmeath.
Please see attached a copy of Fáilte Ireland's Guidelines for the Treatment of Tourism in an EIA, which you may find informative for the preparation of the Environmental Impact Assessment for the proposed project. The purpose of this report is to provide guidance for those conducting Environmental Impact Assessment and compiling an Environmental Impact Assessment Reports (EIAR), or those assessing EIARs, where the project involves tourism or may have an impact upon tourism. These guidelines are non-statutory and act as supplementary advice to the EPA EIAR Guidelines outlined in section 2.

Regards,

Yvonne

**Yvonne Jackson**
**Product Development-Environment & Planning Support | Fáilte Ireland**

88-95 Amiens Street, Dublin 1, D01 WR86
**M** +353 (0)86 0357590

Fáilte Ireland

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**From:** Grainne Griffin <ggriffin@mkoireland.ie>
**Sent:** Wednesday, February 14, 2024 4:51 PM
**To:** planning applications <planning.applications@failteireland.ie>

**Cc:** Karen Mulryan <kmulryan@mkoireland.ie>
**Subject:** 191137f- rEIA Scoping Document for Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group, Co. Meath/Westmeath

**[ATTENTION]** This email originated from outside of the organisation. Do not click links or open attachments unless you recognise the sender and know the content is safe.

Dear Ms Jackson,

Following on from initial scoping in December 2021, please consider the below:

On behalf of Bord na Móna Plc and subsidiaries ('the Applicant'), MKO is preparing a remedial Environmental Impact Assessment Report (rEIAR) and remedial Natura Impact Statement (rNIS) to accompany a Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group. The Ballivor Bog Group comprises Ballivor, Carranstown, Bracklin, Lisclogher and Lisclogher West Bogs located approximately 2.2km west of Ballivor Village, Co. Meath, and 3.7km east of Raharney and 2.5km south-southeast of Devlin, both located in Co. Westmeath.

As part of the EIA process, we would welcome any comments that you may have in relation to the proposed project, including baseline data, survey techniques or potential impacts that should be considered as part of the assessment process and in the preparation of the rEIAR. In order to facilitate this, a Scoping Document providing details of the proposed project and the site of the proposed development is attached.

If you could return any comments or suggestions within four weeks upon this receipt, it would be much appreciated. If you require any further information, please do not hesitate to contact me.

Kind regards,
Gráinne.

**Gráinne Griffin**
Environmental Scientist BSc. MSc. CEcol.
**MKO**
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## Karen Mulryan

**From:** planning applications <planning.applications@failteireland.ie>
**Sent:** 09 December 2021 09:54
**To:** Karen Mulryan
**Subject:** RE: 191137f- rEIA Scoping Document for Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group, Co. Meath/Westmeath
**Attachments:** Fáilte Ireland EIAR Guidelines.pdf

Hello Karen,

Thank you for your email and including Fáilte Ireland in the EIA process for past peat extraction activities at the Ballivor Bog Group located in Meath and Westmeath.

Please see attached a copy of Fáilte Ireland's Guidelines for the Treatment of Tourism in an EIA, which you may find informative for the preparation of the Environmental Impact Assessment for the proposed project. The purpose of this report is to provide guidance for those conducting Environmental Impact Assessment and compiling an Environmental Impact Assessment Reports (EIAR), or those assessing EIARs, where the project involves tourism or may have an impact upon tourism. These guidelines are non-statutory and act as supplementary advice to the EPA EIAR Guidelines outlined in section 2.

Regards & thanks,

Yvonne

**Yvonne Jackson**
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**From:** Karen Mulryan <kmulryan@mkoireland.ie>
**Sent:** Thursday 2 December 2021 18:52
**To:** planning applications <planning.applications@failteireland.ie>
**Subject:** 191137f- rEIA Scoping Document for Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group, Co. Meath/Westmeath

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Dear Sir/Madam,

On behalf of Bord na Móna Plc and subsidiaries ('the Applicant'), MKO is preparing a remedial Environmental Impact Assessment Report (rEIAR) and remedial Natura Impact Statement (rNIS) to accompany a Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group. The Ballivor Bog Group comprises Ballivor, Carranstown, Bracklin, Lisclogher and Lisclogher West Bogs located approximately 2.2km west of Ballivor Village, Co. Meath, and 3.7km east of Raharney and 2.5km south-southeast of Devlin, both located in Co. Westmeath.

As part of the EIA process, we would welcome any comments that you may have in relation to the proposed project, including baseline data, survey techniques or potential impacts that should be considered as part of the assessment process and in the preparation of the rEIAR. In order to facilitate this, a Scoping Document providing details of the proposed project and the site of the proposed development is attached.

If you could return any comments or suggestions at your earliest convenience, it would be much appreciated. If you require any further information, please do not hesitate to contact me.

Yours sincerely,

Karen.

Karen Mulryan
Environmental Scientist BA MSc ACIfA IAI

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Fáilte Ireland
National Tourism Development Authority

# EIAR Guidelines for the Consideration of Tourism and Tourism Related Projects



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## 1. Introduction

Tourism is a growing sector and substantial part of the Irish Economy. It contributes to both urban and rural economies in every part of the country. The impact and interaction of tourism with the environment is complex and the assessment of environmental impacts is of utmost importance to creating a sustainable tourism economy and protecting the natural resources that are so often a tourism attraction.

The purpose of this report is to provide guidance for those conducting Environmental Impact Assessment and compiling an Environmental Impact Assessment Reports (EIAR), or those assessing EIARs, where the project involves tourism or may have an impact upon tourism. These guidelines are non-statutory and act as supplementary advice to the EPA EIAR Guidelines outlined in section 2.

This guidance document has been prepared by Cunnane Stratton Reynolds on behalf of Fáilte Ireland to update their EIA guidelines in line with changes in legislative requirements.

## 2. Background to this Document

Tourism is one of the largest and most important sectors of the economy, providing employment for approximately **260,000 people**, an economic contribution of **€8.4 billion**, and exchequer revenue of **€1.78 billion** in 2018, which helps fund other key public services.

In 2018 Ireland welcomed **10.6 million overseas visitors.**

Fáilte Ireland is the National Tourism Development Authority. Fáilte Irelands role is to support the tourism industry and work to sustain Ireland as a high-quality and competitive tourism destination. They provide a range of practical business supports to help tourism businesses better manage and market their products and services.

Fáilte Ireland also work with other state agencies and representative bodies, at local and national levels, to implement and champion positive and practical strategies that will benefit Irish tourism and the Irish economy.

Fáilte Ireland promotes Ireland as a holiday destination through a domestic marketing campaign (DiscoverIreland.ie) and manage a network of nationwide tourist information centres that provide help and advice for visitors to Ireland.

Tourism related projects cover a broad range of plans, programmes and developments, from the Wild Atlantic Way to a single hotel conversion. These guidelines apply to projects involving or impacting upon tourism. A tourism plan, strategy or programme where it is part of the statutory plan making process under the Planning and Development Acts (as amended), may be more appropriately assessed by a Strategic Environmental Assessment (SEA) as discussed in the next section.

It should be borne in mind that EIA is required where there is anticipated to be a significant impact on the environment, where tourism projects are of a prescribed type or meet thresholds identified below.

Where Natura 2000 Designated Sites are potentially affected by tourism development Appropriate Assessment must be carried out by the appropriate authority in accordance with Article 6(3) of the EU Habitats Directive.

## 3. Legislation and Statutory Guidance

Environmental Impact Assessment is a procedure that ensures that the environmental implications of decisions are taken into account before planning based decisions are made. The assessment results in a report, called an Environmental Impact Assessment Report (EIAR).

### *Legislation*

These guidelines are produced under current EIAR legislative requirements, having regard to Directive 2011/92/EU (known as 'Environmental Impact Assessment' – EIA Directive), as amended by Directive EU 2014/52 which came into effect in May of 2017. These requirements were transposed into Irish Law on 1 September 2018 as most of the provisions of the European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. No. 296 of 2018) came into effect. The principle of both Directives is to ensure that plans, programmes and projects likely to have significant effects on the environment are made subject to an environmental assessment, prior to their approval or authorisation.

### *Statutory Guidance*

In response to the changes to the EIAR requirements under Directive EU 2014/52, the Environmental Protection Agency (EPA) developed Draft guidelines on the information to be contained in Environmental Impact Assessment Reports in August 2017. At the time of this document the guidelines have not been adopted from draft.

In addition to the EPA statutory guidance, the Department of Housing has produced Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment in August 2018.

The process of EIA is set out in the EPA EIAR Guidelines, which this document should be read in conjunction with and used as supplementary guidance to. The process for ascertaining whether an EIAR is required is known as ‘screening’ and the process to determine the breath and scope of an EIAR is known as ‘scoping’. Guidance on this can be found in Section 3.2 of the EPA Guidelines.

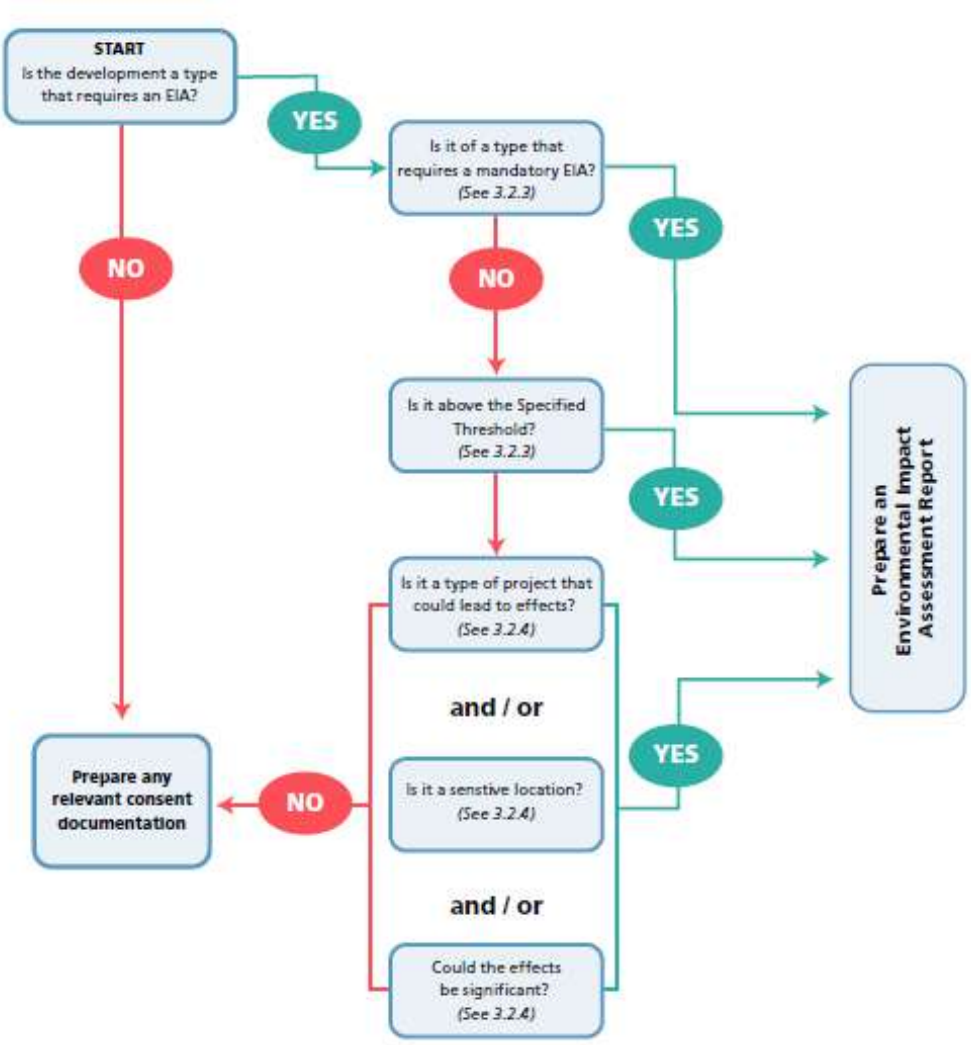
### *Screening*

Through EIAR Screening, developments are either considered as requiring an EIAR due to the project type or because they exceed a threshold level. The screening process begins by establishing whether the proposal is a ‘project’ as understood by the Directive (as amended).

The prescribed development types and thresholds are set out in Annex I and II of the EIA Directive as transposed into Schedule 5 of the Planning and Development Regulations 2010-2018 (as amended). Development which do not exceed these thresholds but may require an EIAR are called sub threshold. Sub-Threshold considerations are outlined in Schedule 7 of European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. No. 296 of 2018) as transposed from Annex III of the Directive. The Guidelines on Environmental Impact Assessment Reports note that projects at first glance may not appear to come under the Schedule

but on closer examination when the process is further examined, they may do so because of the sensitivity or significance of the receiving environment etc. Sub threshold developments require an EIAR if they are likely to have significant environmental impacts and must undergo assessment for likely significant impacts through an EIAR screening report. The contents of a screening report for subthreshold development are contained in Annex III of the EIA Directive.

*Figure 1: EIAR Screening Process*




*(Taken from Fig 3.2 of the EPA Guidelines)*

Tourism locations should be identified as sensitive receptors in screening assessments for particular impacts, depending on scale and sensitivity, as they would in a full EIAR. Section 6 below can act as guidance for Screening Reports as well as for full EIAR.

The screening process for considering where an EIAR is necessary, is summarised below in Figure 1 (excerpted from Figure 3.2 of the EPA Guidelines).

Strategic Environmental Assessment (SEA) is a more strategic level of environmental assessment that examines plans, policies, objectives and programmes specifically rather than projects. For some tourism developments it may be more appropriate that they be examined through SEA, while individual projects or specific proposals are likely to be more assessed through EIAR. If a project is part of a plan, programme or policy/objective assessed by SEA there will still be a requirement for an EIAR for that development.

*EIAR Scoping*

Scoping an EIAR is an opportunity to look at the breadth of issues and ensure that any areas of possible significant impact are assessed. Identifying sensitivities and stakeholders should take account of tourism facilities and consider Fáilte Ireland in scoping requests where necessary.

## 4. Assessing Tourism

There is no legal definition of 'tourism' in Irish legislation. The UNWTO definition of sustainable tourism is *"Tourism that takes full account of its current and future economic, social and environmental impacts, addressing the needs of visitors, the industry, the environment and host communities"* . This is widely accepted as a key definition of tourism as we move to a more sustainable future.

Tourism assessments are frequently carried out by economic consultants and by specific tourism consultants. It is always advisable, particular for tourism projects, that suitably qualified and experienced personnel are used to determine the impact of tourism related projects or to assess the impact of more general proposals on a tourism asset identified in a particular location. There is a requirement for EIAR under current legislation to contain a statement of competency within all EIAR documents, including screening and scoping reports.

***Projects which involve a tourism element***

Tourism projects are wide ranging and diverse. While there are some projects which cater to tourism and are easily identified as such - Hotels, Museums, etc. there are other projects where tourism is a key service or element, but which may not be immediately obvious - forest trails, community facilities and others. EIAR conducted for developments containing tourist elements should be completed in accordance with the current guidance from the EPA.

Projects which include a tourism element have potential particular environmental effects which differ from a non-tourism development. These impacts can be intermittent, event related, inconsistent, dependent on weather, temporal, temporary or seasonal. This is considered within the prescribed environmental topics for EIAR outlined in Section 7 below.

***Projects which may have an impact upon tourism***

While tourism projects may be diverse, the projects which can impact tourism are considerably more wide ranging, from large infrastructural developments to local energy developments. Disruption to or suppression of a tourist resource or amenity can have very local or more strategic impacts, directly or indirectly- for example energy projects in a rural area can have both a negative and positive impact in different regards. There can be temporary, periodic or even seasonal impacts occurring during construction or operational periods.

According to the Fáilte Ireland Tourism Facts 2018 Report, the most important factors in determining the attractiveness of tourism destinations for visitors to Ireland are;

- Beautiful Scenery and Unspoiled Environment
- Hospitality
- Safety
- Nature, Wildlife and Natural Attractions
- History and Culture
- Pace of Life

These factors used for the promotion of tourism in Ireland are also barometers of sensitivity to change in tourism sensitive or dominant locations where development may have an impact upon the tourism asset. The potential for development to impact these sensitivities, and the environmental criteria under which they can be considered, are identified in section 7 of the guidelines.

## 5. Guiding Principles of EIAR

As outlined in the EPA Draft EIAR Guidelines, the fundamental principles to be followed when preparing an EIAR, including screening and scoping, are:

- Anticipating, avoiding and reducing significant effects
- Assessing and mitigating effects
- Maintaining objectivity
- Ensuring clarity and quality
- Providing relevant information to decision makers
- Facilitating better consultation.

Environmental assessment should be undertaken in accordance with the European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018.

## 6. Consideration of Competency and Qualifications

As per Section 2.5 of the EPA Guidelines, EIAR is required to be completed by 'competent experts'.

Contributors to the preparation of environmental impact assessment reports, including screening and scoping assessments, should be qualified and competent. Sufficient expertise, in the relevant field of the project concerned, is required for the purpose of its examination by the competent authorities in order to ensure that the information provided by the developer is complete and of a high level of quality so that a full and proper assessment can be undertaken.

For tourism related projects, or projects likely to affect tourism assets, competent experts in the area of tourism should be utilised in the environmental assessment.

The competency of all involved in the production of an EIAR or any related report (eg. Screening and scoping) is required to be stated at the beginning of the EIAR report with further details as necessary in each following chapter.

Where tourism projects involve for example heritage or cultural components, input from heritage consultants, conservation architects, or historians may be required.

## 7. EIAR Requirements

The following are the key requirements for an EIAR under the current guidance. This is not a definitive list and should be read in conjunction with regulations.

- project description;
- assessment of alternatives considered;

- baseline assessment;
- impact assessment;
- cumulative impact
- interaction of impacts
- mitigation.

***Project Description***

Project descriptions are required to describe the whole project including site, scale, design and key factors. It is important that the EIAR and design team have a consistent understanding of the development description in full. The key requirements are outlined in section 3.5 of the EPA Guidelines however they identify the following;

- the location of the project
- the physical characteristics of the whole project
- the main characteristics of the operational phase of the project
- an estimate, by type and quantity, of the expected residues and emissions

The location of the project should include identifying key sensitive receptors (including tourism receptors). In the operational phase of the project any tourism based, or potentially tourism related activity, should be identified.

***Assessment of Alternatives***

The assessment of alternatives is a requirement of EIAR

Where tourism projects are location dependent the assessment of alternatives should consider alternative methods and technologies, detail the key considerations culminating in the selection of the design, the reasoning for these and the environmental effect of these decisions. This is particularly important for tourism projects which are often location tied. The developer is expected to consider reasonable alternatives. What is considered reasonable my vary from case to case.

***Baseline Assessment***

Baseline descriptions are evidence based, current descriptions of environmental characteristics with consideration of likely changes to the baseline environment evidenced in planning histories, unimplemented permissions, and applications pending determination. Baseline assessments should identify any tourism sensitivities in the zone of influence of a development. This zone of influence of a development is highly dependant on its **Context, Character, Significance,** and **Sensitivity**, as outlined in the Draft Guidelines. These characteristics apply to both the development and the environment.

For example, in a tourism context;

The location of sensitive tourism resources that are likely to be directly affected should be highlighted, and other premises which although located elsewhere, may be the subject of in combination impacts such as alteration of traffic flows or increased urban development.

The character of an area from a tourism perspective should be described and the principal types of tourism in the area. Where relevant, the specific environmental resources or attributes in the existing environment which each group uses or values should be stated and where relevant, indicate the time, duration or seasonality of any of those activities.

The significance of the tourism assets or activities likely to be affected should be highlighted. Reference to any existing formal or published designation or

recognition of such significance should be. Where possible the value of the contribution of such tourism assets and activities to the local economy should be provided.

If there are any significant concerns or opposition to the development known to exist among tourism stakeholders and interest groups, this should be highlighted. Identify, where possible, the particular aspect of the development which is of concern, together with the part of the existing tourism resource which may be threatened or impacted.

In addition, the baseline should include any methodologies employed in the study to obtain information, if particular databases are used to locate sensitive receptors they should be acknowledged. In relation to tourism information, the suggested information sources at the end of this document are a non-exhaustive list which may be of assistance in identifying tourism receptors.

***Impact Assessment***

The topics for consideration of impact are prescribed in the EIA Directive and transcribed into Irish law by the European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. No. 296 of 2018). Impact assessment should contain the likely significant effects of a development arising from both construction and operation of a development. Advice on describing the effects is contained within the Draft Guidelines and includes the **quality, significance, extent, probability, type** and **duration** of the effect, with particular descriptors for each. In describing effects upon tourism receptors these descriptors should take account of the particular aspects and sensitivities of tourism, for example a temporary annual effect from a development may have different impacts upon tourism if it falls at peak season rather than off-peak.

Impact assessment should be carried out as per EPA guidelines and the best practice for that prescribed topic. It may be considered appropriate to consider impact on tourism assets under the 'material assets' topic below.

### Population and Human Health

The consideration of tourism projects within the Population and Human Health is extensive, with impacts ranging from rural employment population impacts of seasonal tourism, to the health impact of air pollution from increased traffic in urban areas.

The impact upon tourism can be considered within this section through the sensitivities of Hospitality, Safety and Pace of Life. Changes in population can impact the perception of pace of life or safety in a particular location. Impacts upon these issues in areas which rely heavily on tourism or have a particular sensitive tourism generator should be considered in this section.

### Biodiversity

Particular tourist activities can have a significant impact upon biodiversity. Landscapes which are 'unspoiled' can be attractors of tourism. However, the disturbance to ecology must be managed to minimise impact. Biodiversity is also a tourism asset and should be protected as such from other development and should be provided for in proposals where possible.

### Land, Soils and Geology

A link between tourism and this prescribed environmental factor, beyond the normal development impacts, is rare, however particular activities or facilities which use geological features may have an impact upon soils and geology, such as mountain biking trails, recreational uses of old quarries etc. Indirect impacts such as material use for extensive landscaping and public realm should also be considered.

### Water

Tourism uses can be water intense, depending on development type. Recreational use of a surface water feature, water-based leisure centres etc have different impacts to standard development.

### Air Quality and Climate

Tourism impact upon air quality is dependent on activity proposed and sensitivity of the location.

### Noise and Vibration

A link between tourism and this prescribed environmental factor, beyond the normal development impacts, is rare, however the impact upon tourism of issues of noise and vibration can be significant. Construction adjoining hotels for example should consider the sensitivity of the development and ensure mitigation is in place.

### Material Assets; Traffic and Transport

The different transport patterns associated with tourism activities is a key impact of tourism and should be considered especially for tourism projects. These produce temporal and seasonal changes on the norm and specialist consideration and interpretation should be given. Tourism proposals should, where possible, be well served by public transport and should be accessible by modes other than the car. The impact of traffic on tourism assets can be substantial and can vary in severity according to season, the weather, etc. The impact of construction traffic can be a particular concern in tourism sensitive areas in terms of noise pollution and visual impact. The construction programme of developments should work to avoid peak tourism periods in tourism areas and should consider planned or anticipated tourism events and festivals.

### Cultural Heritage

Cultural heritage can be a key component of tourism projects and the impact of tourism on the maintenance of cultural heritage should be given the utmost consideration, whether positive or negative. As a tourism attraction, cultural heritage should be strongly considered in non-tourism developments and the impact upon tourism considered as a potential impact.

### Archaeology

Archaeology can be of tourism interest and can be an attractive or key component of tourism projects. Archaeology can be a tourism attractor but is generally not kept in situ except in key cases which could also be considered under cultural heritage.

### Material Assets; Waste Management

Tourism is a resource heavy activity and can impact waste streams and waste segregation. Impacts here should be considered strongly and with knowledge of the variation that arises from the particular tourist activity. Waste and Waste disposal issues can also impact the perception of an unspoiled environment, effecting tourism, which should be considered.

### Material Assets

Material assets are utilities and infrastructure. Tourism itself could be considered a material asset as its impact upon the economy and the infrastructure in place to support it is a material consideration in assessing economic impact.

### Landscape

The visual impact of a tourism development, especially in locations which are visually sensitive or renowned for their scenic or landscape beauty, should be considered carefully. A

development intended to utilise or enjoy a particular vista or environment should minimise impact upon that environment.

***Major Accident and Natural Disaster***

There is a requirement for tourist developments to describe expected significant effects on the environment of the proposed development's vulnerability to major accidents and/or natural disasters relevant to it. Where appropriate measures should be identified to prevent or mitigate the significant adverse effects of such accidents or disasters, including resulting from climate change, on the environment and detail the preparedness for the proposed response.

***Interaction of Effects***

Where two or more environmental impacts combine or interact they should be considered under the prescribed topics. It is best practice to provide a table of interactions within an EIAR or EIAR Screening Report.

***Mitigation***

Mitigation should follow the hierarchy of minimisation in descending order of preference- Avoid, Reduce, Remedy

*Avoid* sensitive tourism resources- such as views, access and amenity areas including habitats as well as historical or cultural sites and structures.

*Reduce* the exposure of sensitive resources to excessive environmental impact

*Reduce* the adverse effects to tourism land uses and patterns of activities, especially through interactions arising from significant changes in the intensity of use or contrasts of character or appearance.

*Remedy* any unavoidable significant residual adverse effects on tourism resources or activities.

Mitigation measures must be measurable and achievable within the bounds of the project.

***Cumulative Impact***

The cumulative impact is that of the project combined with any known likely project which will interact or compound an environmental impact.

***Transboundary Impact***

Transboundary impacts should be included in EIAR. In the case of tourism, especially international travel, the transboundary impacts may not be proximate to the EIAR site.

## 8. Sources of information on Tourism

### *Information available online*

*Fáilte Ireland*

Fáilte Ireland offers detailed research analysis and insights into the Irish Tourism Industry. The National Tourism Development Authority has a portfolio of research across a number of areas including facts an figures, briefing papers and reports and visitor feedback. The Fáilte Ireland website has a dedicated research library which can be accessed here

*Tourism Ireland*

Tourism Ireland is responsible for marketing the island of Ireland overseas as a holiday and business tourism destination. Tourism Ireland publishes a range of research documents including; visitor facts and figures, seasonal updates and industry insights which are accessible here

*Local Authorities*

Local Authorities are an invaluable source of information. They produce tourism strategies and audits of tourism assets within their jurisdiction. Local authorities will also produce landscape and seascape studies. Protected views and prospects as well as the record of protected structures and other designated protected buildings are contained within the Statutory Development Plans.

*Regional Authorities*

Regional Authorities can also be consulted on high level strategic tourism and potential Regional Spatial and Economic Strategies (RSESs) should be consulted.

Central Statistics Office

The Central Statistics Office (CSO) is Ireland's national statistical office and their purpose is to impartially collect, analyse and make available statistics about Ireland's people, society and economy. The Tourism and Travel Section of the Central Statistics Office is the major source for tourism statistics in Ireland and is updated regularly.

# Geological Survey Ireland's Publicly Available Datasets Relevant to Planning, EIA and SEA processes

**following European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018**

**(S.I. No. 296 of 2018)**

| Geological Survey Ireland Programme | Dataset | Relevant EIA Topic | Coverage | Description / Notes / Limitations | Link to Geological Survey Ireland map viewer |
|---|---|---|---|---|---|
| | | | | | |
| Geohazards | Landslide: National landslide database and landslide susceptibility map | Land & Soil/Climate/Landscape | National | Associated guidance documentation relating to the National Landslide Susceptibility Map is also available. | https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=b68cf1e4a9044a5981f950e9b9c5625c |
| Geohazards | Groundwater Flooding (Historic) | Water | Regional | Provide information of historic flooding, both surface water and groundwater. [A lack of flooding presented in any specific location of the map only indicates that a flood has not been detected. It does not indicate that a flood cannot occur in that location at present or in the future] | https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=848f83c85799436b808652f9c735b1cc |
| Geohazards | Groundwater Flooding (Predictive) | Water | Regional | Provides information on the probability of future karst groundwater flooding (where available). [The maps do not, and are not intended to, constitute advice. Professional or specialist advice should be sought before taking, or refraining from, any action on the basis of the flood maps] | https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=848f83c85799436b808652f9c735b1cc |
| Geohazards | Radon Map | Land & Soils/Air | National | | http://www.epa.ie/radiation/radonmap/ |
| Geoheritage | County Geological Sites as adopted by National Heritage Plan and listed in County Development Pla | Land & Soils/Landscape | Regional | All geological heritage sites identified by Geological Survey Ireland are categorised as CGS pending any further NHA designation by NPWS. | https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228 |
| Geological Mapping | Bedrock geology: | Land & Soils | National | 1:100,000 scale and associated memoirs. | https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=de7012a99d2748ea9106e7ee1b6ab8d5&scale=0 |
| Geological Mapping | Bedrock geology: | Land & Soils | Regional | 1:50,000 scale | https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=de7012a99d2748ea9106e7ee1b6ab8d5&scale=0 |
| Geological Mapping | Quaternary geology: Sediments | Land & Soils | National | 1:50,000 scale | https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=de7012a99d2748ea9106e7ee1b6ab8d5&scale=0 |
| Geological Mapping | Quaternary geology: Geomorphology | Land & Soils | National | 1:50,000 scale | https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=de7012a99d2748ea9106e7ee1b6ab8d5&scale=0 |
| Geological Mapping | Physiographic units: | Land & Soils | National | Broad-scale physical landscape units mapped at 1:100,000 scale in order to be represented as a cartographic digital map at 1:250,000 scale | https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=afa76a420fc54877843aca1bc075c62b |
| Geological Mapping | GeoUrban: Spatial geological data for the greater Dublin and Cork areas | Land & Soils | Regional | includes 3D models | https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=9768f4818b79416093b6b2212a850ce6&scale=0 |
| Geological Mapping | Geotechnical database | Land & Soils | National | Digitised geotechnical and Site Investigation Reports and boreholes which can be accessed through online downloads | https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=a2718be1873d47a585a3f0415b4a724c |
| Goldmine | Historical data sets including geological memoirs and 6" to 1 mile geological mapping records | land & Soils/Water | National | available online | https://secure.dccae.gov.ie/goldmine/index.html |
| Groundwater & Geothermal | Groundwater resources (aquifers) | Water | National | Data limited to 1:100,000 scale; sites should be investigated at local scale | https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef |
| Groundwater & Geothermal | Groundwater recharge. | Water | National | Data limited to 1:40,000 scale; sites should be investigated at local scale; long term annual average recharge | https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef |
| Groundwater & Geothermal | Groundwater vulnerability. | Water | National | Data limited to 1:40,000 scale; sites should be investigated at local scale | https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef |
| Groundwater & Geothermal | Group scheme and public supply source protection areas. | Water | National | Not all PWS / GWS have SPZ / ZOC. Check with IW / coco / NFGWS for private supplies. | https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef |
| Groundwater & Geothermal | Groundwater Protection Schemes | Water | National | Data is limited to scale of 1:40,000. Data does not include all of the source protections areas | https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef |
| Groundwater & Geothermal | Catchment and WFD management units. | Water | National | | https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef |
| Groundwater & Geothermal | karst specific data layers | water | National | For areas underlain by limestone, includes karst features, tracer test database; turlough water levels (gwlevel.ie). | https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef |
| Groundwater & Geothermal | Wells and Springs | Water | National | Not comprehensive, there may be unrecorded wells and springs | https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef |
| Groundwater & Geothermal | Groundwater body Descriptions | Water | National | Not exhaustive; only those in designated SACs; could be other GWDTEs; for more information contact NPWS / EPA / site investigations | https://www.gsi.ie/en-ie/programmes-and-projects/groundwater-and-geothermal-unit/activities/understanding-ireland-groundwater/Pages/Groundwater-bodies.aspx |
| Groundwater & Geothermal | Geothermal Suitability maps | land & Soils/Water | National | Also, Roadmap for a Policy and Regulatory Framework for Geothermal Energy, November 2020 | https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=9ee46bee08de41278b90a991d60c0b9e |
| Marine & Coastal Unit | INFOMAR - Ireland's national marine mapping programme; providing key baseline data for Ireland's | Water | National | | https://secure.dccae.gov.ie/GSI/INFOMAR_VIEWER/ |
| Marine & Coastal Unit | CHERISH - Coastal change project (Climate, Heritage and Environments of Reefs, Islands, and Headla | Water | Regional | | http://www.cherishproject.eu/en/ |
| Marine & Coastal Unit | Coastal Vulnerability Index (CVI). | water /Land & Soils | Regional | Currently the project is being carried out on the east coast and will be rolled out nationally | https://www.gsi.ie/en-ie/programmes-and-projects/marine-and-coastal-unit/projects/Pages/Coastal-Vulnerability-Index.aspx |
| Minerals | Aggregate potential | Land & Soils/Material Assets | National | Consideration of mineral resources and potential resources as a material asset which should be explicitly recognised within the environmental assessment process | https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=ee8c4c285a49413aa6f1344416dc9956 |
| Minerals | Active quarries | Land & Soils | National | | https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=ee8c4c285a49413aa6f1344416dc9956 |
| Minerals | Historic mines | Land & Soils/Cultural Heritage | National | Inventory and Risk Classification 2009. Environmental Protection Agency, Economic Minerals Division and Geological Survey Ireland (DECC). | https://gis.epa.ie/EPAMaps/default?easting=?&northing=?&lid=EPA:LEMA_Facilties_Extractive_Facilities https://www.epa.ie/enforcement/mines/ |
| Tellus | Geochemical data: multi-element data for shallow soil, stream sediment and stream water | Land & Soils | Regional | A national mapping programme | https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=6304e122b733498b99642707ff72f754 |
| Tellus | Airborne geophysical data including radiometrics, electromagnetics and magnetics | Land & Soils | Regional | A national mapping programme | https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=6304e122b733498b99642707ff72f754 |
| Tellus | urban geochemistry mapping (Dublin SURGE project), | Land & Soils | Regional | | https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=6304e122b733498b99642707ff72f754 |

**Notes:**

**1. The maps and data listed above are available on the Geological Survey Ireland map viewer https://www.gsi.ie/en-ie/data-and-maps/Pages/default.aspx**

**2. Please read all disclaimers carefully when using Geological Survey Ireland data**

**3. Geological Survey Ireland and Irish Concrete Federation published guidelines for the treatment of geological heritage in the extractive industry in 2008.**

An Roinn Comhshaoil,
Aeráide agus Cumarsáide
Department of the Environment,
Climate and Communications

Geological Survey
Suirbhéireacht Gheolaíochta
Ireland | Éireann

Gráinne Griffin
MKO
Tuam Road,
Galway, H91 VW84

28 February 2024

**Re: Bord Na Móna Plc Substitute Consent Application for Historical Peat Extraction at the Ballivor Bog Group, Co. Meath & Westmeath**

**Your Ref: 191137-F**
**Our Ref: 24/46**

Dear Gráinne,

Geological Survey Ireland is the national earth science agency and is a division of the Department of the Environment, Climate and Communications. We provide independent geological information and gather various data for that purpose. Please see our website for data availability. We recommend using these various data sets, when conducting the EIAR, SEA, planning and scoping processes. Use of our data or maps should be attributed correctly to 'Geological Survey Ireland'.

The publicly available data referenced/presented here, should in no way be construed as Geological Survey Ireland support for or objection to the proposed development or plan. The data is made freely available to all and can be used as independent scientific data in assessments, plans or policies. It should be noted that in many cases this data is a baseline or starting point for further site specific assessments.

With reference to your email received on the 14 February 2024, concerning the Bord Na Móna Plc Substitute Consent Application for Historical Peat Extraction at the Ballivor Bog Group, Co. Meath & Westmeath, Geological Survey Ireland would encourage use of and reference to our datasets. Please find attached a list of our publicly available datasets that may be useful to the environmental assessment and planning process. We recommend that you review this list and refer to any datasets you consider relevant to your assessment. The remainder of this letter and following sections provide more detail on some of these datasets.

**Geoheritage**

A national inventory of geoheritage sites known as County Geological Sites (CGSs) is managed by the Geoheritage Programme of Geological Survey Ireland. CGSs, as adopted under the National Heritage Plan, include sites that are of national importance which have been selected as the very best examples for NHA (Natural Heritage Areas) designation. NHA designation will be completed in partnership with the National Parks and Wildlife Service (NPWS). CGSs are now routinely included in County Development Plans and in the GIS of planning departments, to ensure the recognition and appropriate protection of geological heritage within the planning system. CGSs can be viewed online under the Geological Heritage tab on the online Map Viewer.

The audit for Co. Westmeath and Co Meath were completed in 2019 and 2007 respectively. The full reports can be found here and here. **Our records show that there are no CGSs in the vicinity of the peat extraction.**

**Groundwater**

Geological Survey Ireland's Groundwater and Geothermal Unit, provides advice, data and maps relating to groundwater distribution, quality and use, which is especially relevant for safe and secure drinking water supplies and healthy ecosystems. Proposed developments need to consider any potential impact on specific groundwater abstractions and on groundwater resources in general. We recommend using the groundwater maps on our Map viewer which should include: wells; drinking water source protection areas; the national map suite - aquifer, groundwater vulnerability, groundwater recharge and subsoil permeability maps. For areas underlain by limestone, please refer to the karst specific data layers (karst features, tracer test database; turlough water levels (gwlevel.ie). Background information is also provided in the Groundwater Body Descriptions. Please read all disclaimers carefully when using Geological Survey Ireland data.

**The Groundwater Data Viewer indicates aquifers classed as a 'Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones' and a 'Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones' underlie the Ballivor Bog Group.**

**The Groundwater Vulnerability map indicates the range of groundwater vulnerabilities within the area covered is variable. We would therefore recommend use of the Groundwater Viewer to identify areas of High to Extreme Vulnerability and 'Rock at or near surface' in your assessments, as any groundwater-surface water interactions that might occur would be greatest in these areas.**

GWClimate is a groundwater monitoring and modelling project that aims to investigate the impact of climate change on groundwater in Ireland. This is a follow on from a previous project (GWFlood) and the data may be useful in relation to Flood Risk Assessment (FRA) and management plans. Maps and data are available on the Map viewer.

Geological Survey Ireland has completed Groundwater Protection Schemes (GWPSs) in partnership with Local Authorities, and there is now national coverage of GWPS mapping. A Groundwater Protection Scheme provides guidelines for the planning and licensing authorities in carrying out their functions, and a framework to assist in decision-making on the location, nature and control of developments and activities in order to protect groundwater. **The Groundwater Protection Response overview and link to the main reports is here: https://www.gsi.ie/en-ie/programmes-and-projects/groundwater/projects/protecting-drinking-water/what-is-drinking-water-protection/county-groundwater-protection-schemes/Pages/default.aspx**

**Geohazards**

Geohazards can cause widespread damage to landscapes, wildlife, human property and human life. In Ireland, landslides, flooding and coastal erosion are the most prevalent of these hazards. We recommend that geohazards be taken into consideration, especially when developing areas where these risks are prevalent, and we encourage the use of our data when doing so.

Geological Survey Ireland has information available on landslides in Ireland via the National Landslide Database and Landslide Susceptibility Map both of which are available for viewing on our dedicated Map Viewer. Associated guidance documentation relating to the National Landslide Susceptibility Map is also available.

Geological Survey Ireland also engaged in a national project on Groundwater Flooding. The data from this project may be useful in relation to Flood Risk Assessment (FRA) and management plans, and is described in more detail under 'Groundwater' above.

**Geochemistry of soils, surface waters and sediments**

Geological Survey Ireland provides baseline geochemistry data for Ireland as part of the Tellus programme. Baseline geochemistry data can be used to assess the chemical status of soil and water at a regional scale and to support the assessment of existing or potential impacts of human activity on environmental chemical quality. Tellus is a national-scale mapping programme which provides multi-element data for shallow soil, stream sediment and stream water in Ireland. At present, mapping consists of the border, western and midland regions. Data is available at https://www.gsi.ie/en-ie/data-and-maps/Pages/Geochemistry.aspx.

**Guidelines**

The following guidelines may also be of assistance:

- Institute of Geologists of Ireland, 2013. Guidelines for the Preparation of the Soils, Geology and Hydrogeology Chapters of Geology in Environmental Impact Statements.
- EPA, 2022. Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIAR)

**Other Comments**

Should development go ahead, all other factors considered, Geological Survey Ireland would much appreciate a copy of reports detailing any site investigations carried out. The data would be added to Geological Survey Ireland's national database of site investigation boreholes, implemented to provide a better service to the civil engineering sector. Data can be sent to the Geological Mapping Unit, at mailto:GeologicalMappingInfo@gsi.ie, 01-678 2795.

I hope that these comments are of assistance, and if we can be of any further help, please do not hesitate to the Geological Survey Ireland Planning Team at GSIPlanning@gsi.ie.

Yours sincerely,

**Geoheritage and Planning Programme**

Enc: Table - Geological Survey Ireland's Publicly Available Datasets Relevant to Planning, EIA and SEA processes.

## Natalia Stolarska

**From:** DECC GSI Planning <GSIPlanning@GSI.ie>
**Sent:** Wednesday 28 February 2024 09:41
**To:** Grainne Griffin
**Cc:** DECC GSI Planning; DECC Planning Advisory
**Subject:** RE: EIS 24/46 - rEIA Scoping for past peat extraction activities at Ballivor, Co Meath/Westmeath
**Attachments:** 24_46 REIA scoping peat extraction Ballivor Co Meath.pdf; GSI datasets relevant to EIA & SEA_20210421.pdf

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Dear Gráinne,
With reference to your email received on the 14 February 2024, concerning the Bord Na Móna Plc Substitute Consent Application for Historical Peat Extraction at the Ballivor Bog Group, Co. Meath & Westmeath, please find attached response and dataset sheet from Geological Survey Ireland.

Yours sincerely,
Trish Smullen

**Trish Smullen** Geoheritage & Planning.
**Geological Survey Ireland**, Booterstown Hall, Booterstown Ave., Co. Dublin A94 N2R6.
**Email:** trish.smullen@gsi.ie **www.gsi.ie**
*A division of the Department of the Environment, Climate and Communications.*

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**From:** DECC GSI Planning <GSIPlanning@GSI.ie>
**Sent:** Thursday 15 February 2024 14:45
**To:** Patricia Smullen (DECC) <Trish.Smullen@gsi.ie>
**Cc:** DECC GSI Planning <GSIPlanning@GSI.ie>; DECC Planning Advisory <PlanningAdvisory@decc.gov.ie>
**Subject:** EIS 24/46 - rEIA Scoping for past peat extraction activities at Ballivor, Co Meath/Westmeath

EIS 24/46

Remedial EIA Scoping Document for Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group, Co Meath/Westmeath. Request for observations by MKO. Letter is enclosed.

Regards,

John

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**From:** Grainne Griffin <ggriffin@mkoireland.ie>
**Sent:** Wednesday 14 February 2024 16:55
**To:** Patricia Smullen (DECC) <Trish.Smullen@gsi.ie>; DECC GSI Planning <GSIPlanning@GSI.ie>
**Cc:** Karen Mulryan <kmulryan@mkoireland.ie>
**Subject:** 191137f- rEIA Scoping Document for Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group, Co. Meath/Westmeath

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Dear Ms Smullen,

Following on from initial scoping in December 2021, please consider the below:

On behalf of Bord na Móna Plc and subsidiaries ('the Applicant'), MKO is preparing a remedial Environmental Impact Assessment Report (rEIAR) and remedial Natura Impact Statement (rNIS) to accompany a Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group. The Ballivor Bog Group comprises Ballivor, Carranstown, Bracklin, Lisclogher and Lisclogher West Bogs located approximately 2.2km west of Ballivor Village, Co. Meath, and 3.7km east of Raharney and 2.5km south-southeast of Devlin, both located in Co. Westmeath.

As part of the EIA process, we would welcome any comments that you may have in relation to the proposed project, including baseline data, survey techniques or potential impacts that should be considered as part of the assessment process and in the preparation of the rEIAR. In order to facilitate this, a Scoping Document providing details of the proposed project and the site of the proposed development is attached.

If you could return any comments or suggestions within four weeks upon this receipt, it would be much appreciated. If you require any further information, please do not hesitate to contact me.

Kind regards,
Gráinne.

**Gráinne Griffin**
Environmental Scientist BSc. MSc. CEcol.
**MKO**
Tuam Road, Galway, H91 VW84

Offices in Galway and Dublin
mkoireland.ie | +353 (0)91 735 611

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## Karen Mulryan

**From:** CorporateSupport.Unit <CorporateSupport.Unit@decc.gov.ie>
**Sent:** 17 December 2021 08:27
**To:** EIAPlanning
**Cc:** CorporateSupport.Unit
**Subject:** Reply from DECC re EIS 21/422 - rEIA for Peat Extraction at Ballivor Bog in Counties Meath and Westmeath
**Attachments:** GSI datasets relevant to EIA & SEA_20210421.pdf; 21_422 rEIA Ballivor Bog Group, Co Meath & Co Westmeath.pdf

Good morning,

Please see attached and below a reply from Erin Leahy and Dr Clare Glanville (Senior Geologist) on behalf of Geological Survey Ireland (a division of the Department of Environment, Climate and Communications) for the subject below. Please forward an acknowledgement of receipt to CorporateSupport.Unit@decc.gov.ie at your earliest convenience.

Regards,
Enda Brady,
Corporate Support Unit,
Department of Environment, Climate and Communications

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**From:** GSI Planning <GSIPlanning@GSI.ie>
**Sent:** Wednesday 15 December 2021 16:48
**To:** CorporateSupport.Unit <CorporateSupport.Unit@decc.gov.ie>
**Cc:** Clare Glanville <Clare.Glanville@decc.gov.ie>; Trish Smullen <Trish.Smullen@gsi.ie>; GSI Planning <GSIPlanning@GSI.ie>; Erin Leahy <erin.leahy@gsi.ie>
**Subject:** EIS 21/422 - rEIA for Peat Extraction at Ballivor Bog in Counties Meath and Westmeath

Hello,

Please see attached for return to the EPA.

Kind regards,

Erin Leahy

---

**From:** GSI Planning
**Sent:** 13 December 2021 19:09
**To:** GSI Planning
**Subject:** EIS 21/422 - rEIA for Peat Extraction at Ballivor Bog in Counties Meath and Westmeath

**From:** EIAPlanning <eiaplanning@epa.ie>
**Sent:** Friday 10 December 2021 12:39
**To:** An Bord Pleanala <bord@pleanala.ie>; An Taisce <planning@antaisce.org>; Department of Agriculture Food and the Marine <environmentalco-ordination@agriculture.gov.ie>; Department of Arts, Heritage, Regional, Rural & Gaeltach Affairs <fem.dau@ahg.gov.ie>; CorporateSupport.Unit <CorporateSupport.Unit@decc.gov.ie>; WPPR <WPPR@decc.gov.ie>; Failte Ireland <planning.applications@failteireland.ie>; Health & Safety Authority <chemicals@hsa.ie>; Health Service Executive <environmental.health@hse.ie>; Inland Fisheries Ireland <environlicensing@fisheriesireland.ie>; Irish Water <IWenvironmental@water.ie>; Minister for Transport, Tourism and Sport <minister@dttas.ie>; Teagasc <John.Spink@teagasc.ie>; The Heritage Council <aharvey@heritagecouncil.ie>; Meath County Council (Environment Section) <environment@meathcoco.ie>; Meath County Council (Planning Section) <planning@meathcoco.ie>; Westmeath County Council (Planning Section) <secretar@westmeathcoco.ie>; WestMeath CoCo <environment-wastemanagement@westmeathcoco.ie>
**Subject:** RE: EPA Ref 2493 - Scoping Consultation under Article 5(2) of Directive 2014/52/EU (EIA Directive)

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Good Afternoon,

I refer to the below email. Please be advised that any comments should be provided within 4 weeks of this email – i.e 7th January 2022.

Kind Regards
EIA Planning

**From:** EIAPlanning <eiaplanning@epa.ie>
**Sent:** Friday 10 December 2021 12:17
**To:** An Bord Pleanala <bord@pleanala.ie>; An Taisce <planning@antaisce.org>; Department of Agriculture Food and the Marine <environmentalco-ordination@agriculture.gov.ie>; Department of Arts, Heritage, Regional, Rural & Gaeltach Affairs <fem.dau@ahg.gov.ie>; Dept of Communications, Climate Action & Environment <corporatesupport.unit@dcenr.gov.ie>; Dept of Communications, Climate Action and Environment <wppr@dccae.gov.ie>; Failte Ireland <planning.applications@failteireland.ie>; Health & Safety Authority <chemicals@hsa.ie>; Health Service Executive <environmental.health@hse.ie>; Inland Fisheries Ireland <environlicensing@fisheriesireland.ie>; Irish Water <IWenvironmental@water.ie>; Minister for Transport, Tourism and Sport <minister@dttas.ie>; Teagasc <John.Spink@teagasc.ie>; The Heritage Council <aharvey@heritagecouncil.ie>; Meath County Council (Environment Section) <environment@meathcoco.ie>; Meath County Council (Planning Section) <planning@meathcoco.ie>; Westmeath County Council (Planning Section) <secretar@westmeathcoco.ie>; WestMeath CoCo <environment-wastemanagement@westmeathcoco.ie>
**Subject:** EPA Ref 2493 - Scoping Consultation under Article 5(2) of Directive 2014/52/EU (EIA Directive)

Dear Sir /Madam,

I refer to the attached scoping request received by the Agency 02nd December 2021 in respect of the following:

- Applicant: Bord na Móna Plc and subsidiaries
- Location of Activity: Ballivor Bog Group, Bracklin, Ballivor, Lisclogher West, Lisclogher and Carranstown Bogs ,Co Meath/Westmeath.
- Class and Nature of Activity: 1.4 - The extraction of peat in the course of business which involves an area exceeding 50 hectares
- EPA Reference No: 2493

In order to satisfy the consultation requirements under Article 5(2) of Directive 2011/92/EU as amended by Directive 2014/52/EU (EIA Directive), please revert to the Agency with your comments on the scope and level of detail of the information to be included by the developer in the environmental impact assessment report within two weeks of the date of this letter/email.

For all further queries and correspondence relating to planning and EIA matters, please contact eiaplanning@epa.ie

Yours faithfully,
Environmental Licensing Programme

Environmental Licencing Programme
Office of Environmental Sustainability
An Clár um Cheadúnú Comhshaoil
Oifig um Inbhuanaitheacht Chomhshaoil

053-916 0600 (Switch)
eiaplanning@epa.ie
www.epa.ie

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**From:** Karen Mulryan <kmulryan@mkoireland.ie>
**Sent:** Thursday 2 December 2021 18:50
**To:** EIAPlanning <eiaplanning@epa.ie>
**Subject:** 191137f- rEIA Scoping Document for Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group, Co. Meath/Westmeath

Dear Sir/Madam,

On behalf of Bord na Móna Plc and subsidiaries ('the Applicant'), MKO is preparing a remedial Environmental Impact Assessment Report (rEIAR) and remedial Natura Impact Statement (rNIS) to accompany a Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group. The Ballivor Bog Group comprises Ballivor, Carranstown, Bracklin, Lisclogher and Lisclogher West Bogs located approximately 2.2km west of Ballivor Village, Co. Meath, and 3.7km east of Raharney and 2.5km south-southeast of Devlin, both located in Co. Westmeath.

As part of the EIA process, we would welcome any comments that you may have in relation to the proposed project, including baseline data, survey techniques or potential impacts that should be considered as part of the assessment process and in the preparation of the rEIAR. In order to facilitate this, a Scoping Document providing details of the proposed project and the site of the proposed development is attached.

If you could return any comments or suggestions at your earliest convenience, it would be much appreciated. If you require any further information, please do not hesitate to contact me.

Yours sincerely,

Karen.

Karen Mulryan
Environmental Scientist BA MSc ACIfA IAI
**MKO**
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
www.mkoireland.ie



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Tá eolas sa teachtaireacht leictreonach seo (agus b'fhéidir sa chomhaid ceangailte leis) a d'fhéadfadh bheith príobháideach nó faoi rún. Is le h-aghaidh an duine/na ndaoine nó le h-aghaidh an aonáin atá ainmnithe thuas agus le haghaidh an duine/na ndaoine sin amháin atá an t-eolas. Murab ionann tusa agus an té a bhfuil an teachtaireacht ceaptha dó bíodh a fhios agat nach gceadaítear nochtadh, cóipeáil, scaipeadh nó úsáid an eolais agus/nó an chomhaid seo. Más trí earráid a fuair tú an teachtaireacht leictreonach seo cuir, más é do thoil é, an té ar sheol an teachtaireacht ar an eolas láithreach. Deimhnítear leis seo freisin nár aims odh víreas sa phost seo tar éis a scanadh.

An Roinn Comhshaoil,
Aeráide agus Cumarsáide
Department of the Environment,
Climate and Communications

Geological Survey
Suirbhéireacht Gheolaíochta
Ireland | Éireann

Karen Mulryan
MKO
Tuam Road
Galway
H91 VW84

15 December 2021

**Re: rEIA Scoping Document for Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group, Co. Meath/Westmeath**

**Your Ref: 191137f**
**Our Ref: 21/422**

Dear Karen,

Geological Survey Ireland is the national earth science agency and is a division of the Department of the Environment, Climate and Communications. We provide independent geological information and advice and gather various data for that purpose. Please see our website for data availability. We recommend using these various data sets, when conducting the EIAR, SEA, planning and scoping processes. Use of our data or maps should be attributed correctly to 'Geological Survey Ireland'.

With reference to your email received on the 02 December 2021, concerning rEIA Scoping Document for Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group, Co. Meath/Westmeath, Geological Survey Ireland would encourage use of and reference to our datasets. Please find attached a list of our publicly available datasets that may be useful to the environmental assessment and planning process. We recommend that you review this list and refer to any datasets you consider relevant to your assessment. The remainder of this letter and following sections provide more detail on some of these datasets.

**Geoheritage**

A national inventory of geoheritage sites known as County Geological Sites (CGSs) is managed by the Geoheritage Programme of Geological Survey Ireland. CGSs, as adopted under the National Heritage Plan, include sites that are of national importance which have been selected as the very best examples for NHA (Natural Heritage Areas) designation. NHA designation will be completed in partnership with the National Parks and Wildlife Service (NPWS). CGSs are now routinely included in County Development Plans and in the GIS of planning departments, to ensure the recognition and appropriate protection of geological heritage within the planning system. CGSs can be viewed online under the Geological Heritage tab on the online Map Viewer.

The audits for Co. Meath and Co. Westmeath were carried out in 2007 and 2019 respectively. The full report details can be found here and here. **Our records show that there are no CGSs in the vicinity of the Bog Group.**

**Groundwater**

Geological Survey Ireland's Groundwater and Geothermal Unit, provides advice, data and maps relating to groundwater distribution, quality and use, which is especially relevant for safe and secure drinking water supplies and healthy ecosystems.

Proposed developments need to consider any potential impact on specific groundwater abstractions and on groundwater resources in general. We recommend using the groundwater maps on our Map viewer. which should include: wells; drinking water source protection areas; the national map suite - aquifer, groundwater vulnerability, groundwater recharge and subsoil permeability maps.

For areas underlain by limestone, please refer to the karst specific data layers (karst features, tracer test database; turlough water levels (gwlevel.ie). Background information is also provided in the Groundwater Body Descriptions. Please read all disclaimers carefully when using Geological Survey Ireland data.

**The Groundwater Data Viewer indicates two aquifers classed as a 'Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones' and a 'Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones', underlie the Bog Group. The Groundwater Vulnerability map indicates the area covered is variable. We would therefore recommend use of available datasets on our groundwater Map Viewer to assess potential impacts to groundwater in your EIAR.**

The Groundwater Protection Response overview and link to the main report is here: https://www.gsi.ie/en-ie/programmes-and-projects/groundwater-and-geothermal-unit/projects/protecting-drinking-water/what-is-drinking-water-protection/county-groundwater-protection-schemes/Pages/default.aspx.

**With regard to groundwater flooding, we recommend referring to our Groundwater and Geothermal Unit run GWClimate project; which is a groundwater monitoring and modelling project that aims to investigate the impact of climate change on groundwater in Ireland. This is a follow on from a previous project (GWFlood).**

**Geochemistry of soils, surface waters and sediments**

Geological Survey Ireland provides baseline geochemistry data for Ireland as part of the Tellus programme. Baseline geochemistry data can be used to assess the chemical status of soil and water at a regional scale and to support the assessment of existing or potential impacts of human activity on environmental chemical quality. Tellus is a national-scale mapping programme which provides multi-element data for shallow soil, stream sediment and stream water in Ireland. At present, mapping consists of the border, western and midland regions. Data is available at https://www.gsi.ie/en-ie/data-and-maps/Pages/Geochemistry.aspx. This page also hosts Geochemical Mapping of Agricultural and Grazing Land Soil of Europe (GEMAS) and lithogeochemistry (rock geochemistry) from southeast Ireland datasets. Geological Survey Ireland and partners are undertaking applied geochemistry projects to provide data for agriculture (Terra Soil), waste soil characterisation (Geochemically Appropriate Levels for Soil Recovery Facilities) and mineral exploration (Mineral Prospectivity Mapping).

**Other Comments**

Should development go ahead, all other factors considered, Geological Survey Ireland would much appreciate a copy of reports detailing any site investigations carried out. The data would be added to Geological Survey Ireland's national database of site investigation boreholes, implemented to provide a better service to the civil engineering sector. Data can be sent to the Geological Mapping Unit, at mailto:GeologicalMappingInfo@gsi.ie, 01-678 2795.

I hope that these comments are of assistance, and if we can be of any further help, please do not hesitate to contact me Clare Glanville, or my colleague Trish Smullen at GSIPlanning@gsi.ie.

Yours sincerely,



Clare Glanville
**Senior Geologist**
**Geological Survey Ireland**

Enc: Table - Geological Survey Ireland's Publicly Available Datasets Relevant to Planning, EIA and SEA processes.

An Roinn Comhshaoil, Aeráide agus Cumarsáide
Department of the Environment, Climate and Communications

Geological Survey
Suirbhéireacht Gheolaíochta
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# Geological Survey Ireland's Publicly Available Datasets Relevant to Planning, EIA and SEA processes

**following European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018**
**(S.I. No. 296 of 2018)**

| Geological Survey Ireland Programme | Dataset | Relevant EIA Topic | Coverage | Description / Notes / Limitations | Link to Geological Survey Ireland map viewer |
|---|---|---|---|---|---|
| | | | | | |
| Geohazards | Landslide: National landslide database and landslide susceptibility map | Land & Soil/Climate/Landscape | National | Associated guidance documentation relating to the National Landslide Susceptibility Map is also available. | https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=b68cf1e4a9044a5981f950e9b9c5625c |
| Geohazards | Groundwater Flooding (Historic) | Water | Regional | Provide information of historic flooding, both surface water and groundwater. [A lack of flooding presented in any specific location of the map only indicates that a flood has not been detected. It does not indicate that a flood cannot occur in that location at present or in the future] | https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=848f83c85799436b808652f9c735b1cc |
| Geohazards | Groundwater Flooding (Predictive) | Water | Regional | Provides information on the probability of future karst groundwater flooding (where available). [The maps do not, and are not intended to, constitute advice. Professional or specialist advice should be sought before taking, or refraining from, any action on the basis of the flood maps] | https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=848f83c85799436b808652f9c735b1cc |
| Geohazards | Radon Map | Land & Soils/Air | National | | http://www.epa.ie/radiation/radonmap/ |
| Geoheritage | County Geological Sites as adopted by National Heritage Plan and listed in County Development Pla | Land & Soils/Landscape | Regional | All geological heritage sites identified by Geological Survey Ireland are categorised as CGS pending any further NHA designation by NPWS. | https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228 |
| Geological Mapping | Bedrock geology: | Land & Soils | National | 1:100,000 scale and associated memoirs. | https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=de7012a99d2748ea9106e7ee1b6ab8d5&scale=0 |
| Geological Mapping | Bedrock geology: | Land & Soils | Regional | 1:50,000 scale | https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=de7012a99d2748ea9106e7ee1b6ab8d5&scale=0 |
| Geological Mapping | Quaternary geology: Sediments | Land & Soils | National | 1:50,000 scale | https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=de7012a99d2748ea9106e7ee1b6ab8d5&scale=0 |
| Geological Mapping | Quaternary geology: Geomorphology | Land & Soils | National | 1:50,000 scale | https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=de7012a99d2748ea9106e7ee1b6ab8d5&scale=0 |
| Geological Mapping | Physiographic units: | Land & Soils | National | Broad-scale physical landscape units mapped at 1:100,000 scale in order to be represented as a cartographic digital map at 1:250,000 scale | https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=afa76a420fc54877843aca1bc075c62b |
| Geological Mapping | GeoUrban: Spatial geological data for the greater Dublin and Cork areas | Land & Soils | Regional | includes 3D models | https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=9768f4818b79416093b6b2212a850ce6&scale=0 |
| Geological Mapping | Geotechnical database | Land & Soils | National | Digitised geotechnical and Site Investigation Reports and boreholes which can be accessed through online downloads | https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=a2718be1873d47a585a3f0415b4a724c |
| Goldmine | Historical data sets including geological memoirs and 6" to 1 mile geological mapping records | land & Soils/Water | National | available online | https://secure.dccae.gov.ie/goldmine/index.html |
| Groundwater & Geothermal | Groundwater resources (aquifers) | Water | National | Data limited to 1:100,000 scale; sites should be investigated at local scale | https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef |
| Groundwater & Geothermal | Groundwater recharge. | Water | National | Data limited to 1:40,000 scale; sites should be investigated at local scale; long term annual average recharge | https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef |
| Groundwater & Geothermal | Groundwater vulnerability. | Water | National | Data limited to 1:40,000 scale; sites should be investigated at local scale | https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef |
| Groundwater & Geothermal | Group scheme and public supply source protection areas. | Water | National | Not all PWS / GWS have SPZ / ZOC. Check with IW / coco / NFGWS for private supplies. | https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef |
| Groundwater & Geothermal | Groundwater Protection Schemes | Water | National | Data is limited to scale of 1:40,000. Data does not include all of the source protections areas | https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef |
| Groundwater & Geothermal | Catchment and WFD management units. | Water | National | | https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef |
| Groundwater & Geothermal | karst specific data layers | water | National | For areas underlain by limestone, includes karst features, tracer test database; turlough water levels (gwlevel.ie). | https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef |
| Groundwater & Geothermal | Wells and Springs | Water | National | Not comprehensive, there may be unrecorded wells and springs | https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef |
| Groundwater & Geothermal | Groundwater body Descriptions | Water | National | Not exhaustive; only those in designated SACs; could be other GWDTEs; for more information contact NPWS / EPA / site investigations | https://www.gsi.ie/en-ie/programmes-and-projects/groundwater-and-geothermal-unit/activities/understanding-ireland-groundwater/Pages/Groundwater-bodies.aspx |
| Groundwater & Geothermal | Geothermal Suitability maps | land & Soils/Water | National | Also, Roadmap for a Policy and Regulatory Framework for Geothermal Energy, November 2020 | https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=9ee46bee08de41278b90a991d60c0b9e |
| Marine & Coastal Unit | INFOMAR - Ireland's national marine mapping programme; providing key baseline data for Ireland's | Water | National | | https://secure.dccae.gov.ie/GSI/INFOMAR_VIEWER/ |
| Marine & Coastal Unit | CHERISH - Coastal change project (Climate, Heritage and Environments of Reefs, Islands, and Headla | Water | Regional | | http://www.cherishproject.eu/en/ |
| Marine & Coastal Unit | Coastal Vulnerability Index (CVI). | water /Land & Soils | Regional | Currently the project is being carried out on the east coast and will be rolled out nationally | https://www.gsi.ie/en-ie/programmes-and-projects/marine-and-coastal-unit/projects/Pages/Coastal-Vulnerability-Index.aspx |
| Minerals | Aggregate potential | Land & Soils/Material Assets | National | Consideration of mineral resources and potential resources as a material asset which should be explicitly recognised within the environmental assessment process | https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=ee8c4c285a49413aa6f1344416dc9956 |
| Minerals | Active quarries | Land & Soils | National | | https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=ee8c4c285a49413aa6f1344416dc9956 |
| Minerals | Historic mines | Land & Soils/Cultural Heritage | National | Inventory and Risk Classification 2009. Environmental Protection Agency, Economic Minerals Division and Geological Survey Ireland (DECC). | https://gis.epa.ie/EPAMaps/default?easting=?&northing=?&lid=EPA:LEMA_Facilties_Extractive_Facilities https://www.epa.ie/enforcement/mines/ |
| Tellus | Geochemical data: multi-element data for shallow soil, stream sediment and stream water | Land & Soils | Regional | A national mapping programme | https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=6304e122b733498b99642707ff72f754 |
| Tellus | Airborne geophysical data including radiometrics, electromagnetics and magnetics | Land & Soils | Regional | A national mapping programme | https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=6304e122b733498b99642707ff72f754 |
| Tellus | urban geochemistry mapping (Dublin SURGE project), | Land & Soils | Regional | | https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=6304e122b733498b99642707ff72f754 |

**Notes:**

**1. The maps and data listed above are available on the Geological Survey Ireland map viewer https://www.gsi.ie/en-ie/data-and-maps/Pages/default.aspx**

**2. Please read all disclaimers carefully when using Geological Survey Ireland data**

**3. Geological Survey Ireland and Irish Concrete Federation published guidelines for the treatment of geological heritage in the extractive industry in 2008.**

## Karen Mulryan

**From:** EIAPlanning <eiaplanning@epa.ie>
**Sent:** 21 January 2022 17:01
**To:** Karen Mulryan
**Subject:** 191137f- rEIA Scoping for Substitute Consent Application for Ballivor Bog Group, Co. Meath/Westmeath
**Attachments:** Ballivor Subcon Scoping - F1 - 2021.11.23 - 191137f compressed.pdf; RE: EPA Ref 2493 - Scoping Consultation under Article 5(2) of Directive 2014/52/EU (EIA Directive); Reply from DECC re EIS 21/422 - rEIA for Peat Extraction at Ballivor Bog in Counties Meath and Westmeath; RE: EPA Ref 2493 - Scoping Consultation under Article 5(2) of Directive 2014/52/EU (EIA Directive)

Re: **Scoping Opinion under Article 5(2) of Directive 2011/92/EU as amended by Directive 2014/52/EU (EIA Directive)**

EPA Reference No: 2493

Dear Ms Mulryan,
I refer to the request for a scoping opinion in relation to substitute consent for peat extraction activities at the Ballivor Bog Group, Co. Meath/Westmeath, received by the Agency on 02 December 2021. In accordance with the requirements of Article 5(2) of Directive 2011/92/EU as amended by Directive 2014/52/EU *on the assessment of the effects of certain public and private projects on the environment* (EIA Directive), the Agency has consulted with the Planning Authorities: Meath County Council and Westmeath County Council and the relevant prescribed bodies under Section 89 of the EPA Act. I attach copies of the responses received from the Department of Agriculture, Food and the Marine, the Department of Environment, Climate and Communications and Fáilte Ireland.

It should be noted that Bord na Móna Energy Limited was issued an Integrated Pollution Control (IPC) Licence (Register No. P0501) on 26 April 2000 for Class 1.4 of the First Schedule of the EPA Act 1992 '*the extraction of peat in the course of business which involves an area exceeding 50 hectares*' at Derrygreenagh Group, c/o Derrygreenagh Works, Rochfordbridge, Mullingar, County Westmeath.

Having regard to the specific characteristics of the project and likely impact on the environment, the Agency is of the opinion that the scope and level of detail to be included in the remedial environmental impact assessment report should as a minimum:

(i) address the matters raised in the responses received from the bodies detailed above;
(ii) have regard to the rehabilitation plan(s) required under Condition 10 of Licence Reg No. P0501 for any relevant bog areas;
(iii) consideration should be given to inclusion of any relevant bog areas in an enhanced rehabilitation scheme, e.g., under the Peatlands Climate Action Scheme (PCAS).
(iv) have regard to relevant water quality monitoring data. Any gaps in water quality data for receiving waters should be filled by a sampling programme over an appropriately representative period of time.

## Natalia Stolarska

**From:** EIAPlanning <eiaplanning@epa.ie>
**Sent:** Wednesday 27 March 2024 15:52
**To:** Grainne Griffin
**Cc:** Karen Mulryan
**Subject:** 191137f- rEIA Scoping Document for Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group, Co. Meath/Westmeath
**Attachments:** 191137f- rEIA Scoping for Substitute Consent Application for Ballivor Bog Group, Co. Meath/Westmeath; EPA_2024 Scoping Doc Cover Letter_2024.02.14.pdf

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**Re: rEIA Scoping for Substitute Consent Application for Ballivor Bog Group, Co. Meath/Westmeath**

Dear Ms Griffin,

I refer to your below correspondence dated 14 February 2024 regarding EIA scoping and a substitute consent application for peat extraction activities and your attached Scoping Document dated 2021. Please see attached Scoping Opinion under Article 5(2) of Directive 2011/92/EU as amended by Directive 2014/52/EU (EIA Directive) that was issued by the EPA to MKO (Consultants on behalf of Bord na Móna Plc) on 21 January 2022.

For all further queries and correspondence relating to planning and EIA matters, please contact eiaplanning@epa.ie

Yours faithfully,
Water, Energy and Business Support Programme

Water, Energy and Business Support Programme
Office of Environmental Sustainability
Oifig um Inbhuanaitheacht Chomhshaoil

Environmental Protection Agency

053-916 0600 (Switch)
eiaplanning@epa.ie
www.epa.ie

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**From:** Grainne Griffin <ggriffin@mkoireland.ie>
**Sent:** Wednesday, February 14, 2024 4:47 PM
**To:** EIAPlanning <eiaplanning@epa.ie>
**Cc:** Karen Mulryan <kmulryan@mkoireland.ie>
**Subject:** RE: 191137f- rEIA Scoping Document for Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group, Co. Meath/Westmeath

Dear Sir/Madam,

Please see revised email with full scoping document attached.

Following on from initial scoping in December 2021, please consider the below:

On behalf of Bord na Móna Plc and subsidiaries ('the Applicant'), MKO is preparing a remedial Environmental Impact Assessment Report (rEIAR) and remedial Natura Impact Statement (rNIS) to accompany a Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group. The Ballivor Bog Group comprises Ballivor, Carranstown, Bracklin, Lisclogher and Lisclogher West Bogs located approximately 2.2km west of Ballivor Village, Co. Meath, and 3.7km east of Raharney and 2.5km south-southeast of Devlin, both located in Co. Westmeath.

As part of the EIA process, we would welcome any comments that you may have in relation to the proposed project, including baseline data, survey techniques or potential impacts that should be considered as part of the assessment process and in the preparation of the rEIAR. In order to facilitate this, a Scoping Document providing details of the proposed project and the site of the proposed development is attached.

If you could return any comments or suggestions within four weeks upon this receipt, it would be much appreciated. If you require any further information, please do not hesitate to contact me.

Kind regards,
Gráinne.

**Gráinne Griffin**
Environmental Scientist BSc. MSc. CEcol.
**MKO**
Tuam Road, Galway, H91 VW84

Offices in Galway and Dublin
mkoireland.ie | +353 (0)91 735 611

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**From:** Grainne Griffin
**Sent:** Wednesday, February 14, 2024 4:40 PM
**To:** EIAPlanning <EIAPlanning@epa.ie>
**Cc:** Karen Mulryan <kmulryan@mkoireland.ie>
**Subject:** 191137f- rEIA Scoping Document for Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group, Co. Meath/Westmeath

Dear Sir/Madam,

Following on from initial scoping in December 2021, please consider the below:

On behalf of Bord na Móna Plc and subsidiaries ('the Applicant'), MKO is preparing a remedial Environmental Impact Assessment Report (rEIAR) and remedial Natura Impact Statement (rNIS) to accompany a Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group. The Ballivor Bog Group comprises Ballivor, Carranstown, Bracklin, Lisclogher and Lisclogher West Bogs located approximately 2.2km west of Ballivor Village, Co. Meath, and 3.7km east of Raharney and 2.5km south-southeast of Devlin, both located in Co. Westmeath.

As part of the EIA process, we would welcome any comments that you may have in relation to the proposed project, including baseline data, survey techniques or potential impacts that should be considered as part of the assessment process and in the

preparation of the rEIAR. In order to facilitate this, a Scoping Document providing details of the proposed project and the site of the proposed development is attached.

If you could return any comments or suggestions within four weeks upon this receipt, it would be much appreciated. If you require any further information, please do not hesitate to contact me.

Kind regards,
Gráinne.

**Gráinne Griffin**
Environmental Scientist BSc. MSc. CEcol.
**MKO**
Tuam Road, Galway, H91 VW84

Offices in Galway and Dublin
mkoireland.ie | +353 (0)91 735 611

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If you require any further information in relation to this matter, please contact the undersigned.
For all further queries and correspondence relating to planning and EIA matters, please contact eiaplanning@epa.ie

Yours faithfully,
Environmental Licensing Programme

Environmental Licencing Programme
Office of Environmental Sustainability
An Clár um Cheadúnú Comhshaoil
Oifig um Inbhuanaitheacht Chomhshaoil

053-916 0600 (Switch)
eiaplanning@epa.ie
www.epa.ie

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**From:** Karen Mulryan <kmulryan@mkoireland.ie>
**Sent:** Thursday 2 December 2021 18:50
**To:** EIAPlanning <eiaplanning@epa.ie>
**Subject:** 191137f- rEIA Scoping Document for Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group, Co. Meath/Westmeath

Dear Sir/Madam,

On behalf of Bord na Móna Plc and subsidiaries ('the Applicant'), MKO is preparing a remedial Environmental Impact Assessment Report (rEIAR) and remedial Natura Impact Statement (rNIS) to accompany a Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group. The Ballivor Bog Group comprises Ballivor, Carranstown, Bracklin, Lisclogher and Lisclogher West Bogs located approximately 2.2km west of Ballivor Village, Co. Meath, and 3.7km east of Raharney and 2.5km south-southeast of Devlin, both located in Co. Westmeath.

As part of the EIA process, we would welcome any comments that you may have in relation to the proposed project, including baseline data, survey techniques or potential impacts that should be considered as part of the assessment process and in the preparation of the rEIAR. In order to facilitate this, a Scoping Document providing details of the proposed project and the site of the proposed development is attached.

If you could return any comments or suggestions at your earliest convenience, it would be much appreciated. If you require any further information, please do not hesitate to contact me.

Yours sincerely,

Karen.

Karen Mulryan
Environmental Scientist BA MSc ACIfA IAI

**MKO**
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## Natalia Stolarska

**From:** INFO <Information@tii.ie>
**Sent:** Wednesday 20 March 2024 10:58
**To:** Grainne Griffin
**Cc:** Karen Mulryan
**Subject:** TII24-126264 - rEIAR Scoping response in relation to Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group, Co. Meath/Westmeath.

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**Dear Ms. Griffin,**

Thank you for your correspondence of 14 February 2024 in relation to the above rEIAR Scoping exercise. The position in relation to your enquiry is as follows.

Transport Infrastructure Ireland (TII) wishes to advise that it is not in a position to engage directly with planning applicants concerning proposed developments. TII will endeavour to consider and respond to planning applications referred to it given its status and duties as a statutory consultee under the planning acts. The approach to be adopted by TII in making such submissions or comments will seek to uphold official national road and light rail policy and guidelines including spatial planning and National Roads Guidelines for Planning Authorities (DoECLG, 2012). Regard should also be had to other relevant guidance available at www.TII.ie.

The issuing of this correspondence is provided as best practice guidance only and does not prejudice TII's statutory right to make any observations, requests for further information, objections or appeals following the examination of any valid planning application referred.

The rEIAR Scoping document circulated is a copy originally circulated in 2021 to which TII provided a response under ref. TII21-116436 in December 2021.

With respect to rEIAR scoping issues, the recommendations indicated below provide only general guidance for the preparation of an EIAR, which may affect the national road and light rail networks.

The developer/scheme promoter should have regard, inter alia, to the following:

- Official policy for development at or near national roads is set out in the DoECLG Spatial Planning and National Roads Guidelines for Planning Authorities (2012) available at https://www.gov.ie/en/collection/85b83-planning-guidelines-standards/,
- In addition, as part of TII's responsibilities for managing and improving the country's national road and light rail networks, TII sets development guidance and standards for traffic and road assessments and construction that may be necessary by reason of proposed development location, scale, or typology to be prepared to accompany applications for developments or works. Technical guidance and standards are contained in TII Publications, available at https://www.tiipublications.ie/,
- Consultations should be had with the relevant Local Authority/National Roads Design Office with regard to locations of existing and future national road schemes,
- TII would be specifically concerned with to potentially significant impacts the development would have on the national road network (and junctions with national roads) in the proximity of the proposed development; N51 and N52, national secondary roads,

- The developer should have regard to any Environmental Impact Statement or Assessment Report and all conditions and/or modifications imposed by An Bord Pleanála regarding road schemes in the area. The developer should have regard for any potential cumulative impacts,
- The developer, should have regard to TII's guidelines, including the Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes (March 2014),

- The EIAR should consider the Environmental Noise Regulations 2006 (SI 140 of 2006) and how the development will affect future action plans by the relevant competent authority. The developer may need to consider the incorporation of noise barriers to reduce noise impacts (see Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes (March 2014),
- It would be important that, where appropriate, subject to meeting the appropriate thresholds and criteria and having regard to best practice, a traffic and transport assessment (TTA) be carried out in accordance with relevant guidelines, noting traffic volumes attending the site and traffic routes to/from the site with reference to impacts on the national road network and junctions of lower category roads with national roads. TII's Traffic and Transport Assessment Guidelines (TII Publication No. PE-PDV-02045) should be referred to in relation to the proposed development with potential impacts on the national road network. The scheme promoter is also advised to have regard to Section 2.2 of the Guidelines which addresses requirements for sub-threshold TTA,

- The designers are asked to consult TII Publications to determine whether a Road Safety Audit is required,
- In the interests of maintaining the safety and standard of the national road network, the EIAR should identify the methods/techniques proposed for any works traversing/in proximity to the national road network,

- In relation to haul route identification, the applicant/developer should clearly identify the haul routes proposed and fully assess the network to be traversed. Separate structure approvals/permits, and other licences may be required in connection with the proposed haul route, including where temporary modification to the road network may be required. Consultation with relevant local authorities, Public-Private Partnership (PPP) Companies and Motorway Maintenance and Renewals Contractors (MMaRC) may also be required. All structures on the haul route should be checked by the applicant/developer to confirm their capacity to accommodate any abnormal load proposed, including abnormal weight load.

Notwithstanding any of the above, the developer should be aware that this list is non-exhaustive, thus site and development-specific issues should be addressed in accordance with best practice.

I trust that the above comments are of use in your EIAR preparation.

**Yours sincerely,**

**Alban Mills**
**Senior Regulatory and Administration Executive**
**Transport Infrastructure Ireland**

www.tii.ie info@tii.ie +353 (0)1 646 3600

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## Karen Mulryan

**From:** INFO <Information@tii.ie>
**Sent:** 08 December 2021 10:30
**To:** Karen Mulryan
**Subject:** RE: 191137f- rEIA Scoping Document for Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group, Co. Meath/Westmeath

**Dear Ms. Mulryan,**

I wish to acknowledge receipt of your email of 2 December 2021 relating to the above Remedial EIAR (rEIAR) Scoping exercise.

TII will endeavour to consider and respond to planning applications referred to it given its status and duties as a statutory consultee under the Planning Acts. The approach to be adopted by TII in making such submissions or comments will seek to uphold official policy and guidelines as outlined in the Section 28 Ministerial Guidelines 'Spatial Planning and National Roads Guidelines for Planning Authorities' (DoECLG, 2012). Regard should also be had to other relevant guidance available at www.TII.ie.

The issuing of this correspondence is provided as best practice guidance only and does not prejudice TII's statutory right to make any observations, requests for further information, objections or appeals following the examination of any valid planning application referred.

With respect to rEIAR scoping issues, the recommendations indicated below provide only general guidance for the preparation of an EIAR, which may affect the national road network.

The developer/scheme promoter should have regard, inter alia, to the following:

- Consultations should be had with the relevant Local Authority/National Roads Design Office with regard to locations of existing and future national road schemes,

- TII would be specifically concerned as to potential significant impacts the development would have on the national road network (and junctions with national roads) in the proximity of the proposed development; N51 and N52, national secondary roads,

- The developer should assess visual impacts from existing national roads,

- The developer should have regard to any Environmental Impact Statement and all conditions and/or modifications imposed by An Bord Pleanála regarding road schemes in the area. The developer should in particular have regard to any potential cumulative impacts,

- The developer, in preparing rEIAR, should have regard to TII Publications (formerly DMRB and the Manual of Contract Documents for Road Works),

- The developer, in preparing rEIAR, should have regard to TII's Environmental Assessment and Construction Guidelines, including the Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes (National Roads Authority, 2006),

- The rEIAR/EIS should consider the Environmental Noise Regulations 2006 (SI 140 of 2006) and, in particular, how the development will affect future action plans by the relevant competent authority. The developer may need to consider the incorporation of noise barriers to reduce noise impacts (see Guidelines for the Treatment of Noise and Vibration in National Road Schemes (1st Rev., National Roads Authority, 2004)),

- It would be important that, where appropriate, subject to meeting the appropriate thresholds and criteria and having regard to best practice, a Traffic and Transport Assessment (TTA) be carried out in accordance with

relevant guidelines, noting traffic volumes attending the site and traffic routes to/from the site with reference to impacts on the national road network and junctions of lower category roads with national roads. In relation to national roads, the TII's Traffic and Transport Assessment Guidelines (2014) should be referred to in relation to proposed development with potential impacts on the national road network. The scheme promoter is also advised to have regard to Section 2.2 of the NRA/TII TTA Guidelines which addresses requirements for sub-threshold TTA. Any improvements required to facilitate development should be identified. It will be the responsibility of the developer to pay for the costs of any improvements to national roads to facilitate the private development proposed as TII will not be responsible for such costs,

- The designers are asked to consult TII Publications to determine whether a Road Safety Audit is required,

- In the interests of maintaining the safety and standard of the national road network, the rEIAR should identify the methods/techniques proposed for any works traversing/in proximity to the national road network.

- TII recommends that that applicant/developer should clearly identify haul routes proposed and fully assess the network to be traversed. Where abnormal 'weight' loads are proposed, separate structure approvals/permits and other licences may be required in connection with the proposed haul route and all structures on the haul route through all the relevant County Council administrative areas should be checked by the applicant/developer to confirm their capacity to accommodate any abnormal 'weight' load proposed.

Notwithstanding any of the above, the developer should be aware that this list is non-exhaustive, thus site and development specific issues should be addressed in accordance with best practice.

I trust that the above comments are of use in your rEIAR preparation.

**Yours sincerely,**

**Alban Mills**
**Senior Regulatory & Administration Executive**
**Ref No. TII21-116436**

TII Iompaigh Iompair Éireann Transport Infrastructure Ireland
www.tii.ie info@tii.ie +353 (0)1 646 3600

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**From:** Karen Mulryan <kmulryan@mkoireland.ie>
**Sent:** Thursday 2 December 2021 19:04
**To:** INFO <Information@tii.ie>
**Subject:** 191137f- rEIA Scoping Document for Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group, Co. Meath/Westmeath

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Dear Sir/Madam,

On behalf of Bord na Móna Plc and subsidiaries ('the Applicant'), MKO is preparing a remedial Environmental Impact Assessment Report (rEIAR) and remedial Natura Impact Statement (rNIS) to accompany a Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group. The Ballivor Bog Group comprises Ballivor, Carranstown, Bracklin, Lisclogher and Lisclogher West Bogs located approximately 2.2km west of Ballivor Village, Co. Meath, and 3.7km east of Raharney and 2.5km south-southeast of Devlin, both located in Co. Westmeath.

As part of the EIA process, we would welcome any comments that you may have in relation to the proposed project, including baseline data, survey techniques or potential impacts that should be considered as part of the assessment process and in the

preparation of the rEIAR. In order to facilitate this, a Scoping Document providing details of the proposed project and the site of the proposed development is attached.

If you could return any comments or suggestions at your earliest convenience, it would be much appreciated. If you require any further information, please do not hesitate to contact me.

Yours sincerely,

Karen.

Karen Mulryan
Environmental Scientist BA MSc ACIfA IAI

**MKO**
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
www.mkoireland.ie

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## Natalia Stolarska

**From:** Transport GCU <GeneralCo-OrdinationUnit@transport.gov.ie>
**Sent:** Thursday 29 February 2024 10:23
**To:** Grainne Griffin; Transport GCU
**Cc:** Karen Mulryan
**Subject:** RE: 191137f- rEIA Scoping Document for Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group, Co. Meath/Westmeath

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Good morning,

Thank you for contacting the Department of Transport in relation to an rEIA Scoping Document for Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group, Co. Meath/Westmeath.

The Department has no observations to make at this point in time.

It would be appreciated if the Department of Transport could be kept informed of any updates in relation to this project.

Kind regards
Jacqui

**Jacqui Traynor**
*Central Policy, Coordination and Reform*
**An Roinn Iompair**
*Department of Transport*
**Lána Líosain, Baile Átha Cliath, D02 TR60**
Leeson Lane, Dublin, D02 TR60
T +353 (0)1 604 1177
gcu@transport.gov.ie www.gov.ie/transport

---

**From:** Grainne Griffin <ggriffin@mkoireland.ie>
**Sent:** Wednesday 14 February 2024 16:29
**To:** Transport GCU <GeneralCo-OrdinationUnit@transport.gov.ie>
**Cc:** Karen Mulryan <kmulryan@mkoireland.ie>
**Subject:** 191137f- rEIA Scoping Document for Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group, Co. Meath/Westmeath

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Dear Sir/Madam,

Following on from initial scoping in December 2021, please consider the below:

On behalf of Bord na Móna Plc and subsidiaries ('the Applicant'), MKO is preparing a remedial Environmental Impact Assessment Report (rEIAR) and remedial Natura Impact Statement (rNIS) to accompany a Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group. The Ballivor Bog Group comprises Ballivor, Carranstown, Bracklin, Lisclogher and Lisclogher West Bogs located approximately 2.2km west of Ballivor Village, Co. Meath, and 3.7km east of Raharney and 2.5km south-southeast of Devlin, both located in Co. Westmeath.

As part of the EIA process, we would welcome any comments that you may have in relation to the proposed project, including baseline data, survey techniques or potential impacts that should be considered as part of the assessment process and in the preparation of the rEIAR. In order to facilitate this, a Scoping Document providing details of the proposed project and the site of the proposed development is attached.

If you could return any comments or suggestions within four weeks upon this receipt, it would be much appreciated. If you require any further information, please do not hesitate to contact me.

Kind regards,
Gráinne.

**Gráinne Griffin**
Environmental Scientist BSc. MSc. CEcol.
**MKO**
Tuam Road, Galway, H91 VW84

Offices in Galway and Dublin
mkoireland.ie | +353 (0)91 735 611

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## Karen Mulryan

**From:** GCU - Reform Communications and Emergency Planning Divisional Mailbox <GeneralCo-OrdinationUnit@transport.gov.ie>
**Sent:** 16 December 2021 12:00
**To:** Karen Mulryan
**Subject:** FW: 191137f- rEIA Scoping Document for Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group, Co. Meath/Westmeath
**Attachments:** Ballivor Subcon Scoping - F1 - 2021.11.23 - 191137f compressed.pdf

Good morning Karen,

Thank you for your correspondence in relation to this project.

The Department of Transport has no observations to make at this point in time.

Kind regards
Jacqui

**Jacqui Traynor**
*Reform Communications Emergency Planning*

**An Roinn Iompair**
*Department of Transport*

**Lána Líosain, Baile Átha Cliath, D02 TR60**
Leeson Lane, Dublin, D02 TR60

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Jacquitraynor@transport.gov.ie www.gov.ie/transport

---

**From:** Karen Mulryan <kmulryan@mkoireland.ie>
**Sent:** Thursday 2 December 2021 18:47
**To:** TRAYNOR Jacqui <JacquiTRAYNOR@transport.gov.ie>; Dept of Transport <info@transport.gov.ie>
**Subject:** 191137f- rEIA Scoping Document for Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group, Co. Meath/Westmeath

Dear Sir/Madam,

On behalf of Bord na Móna Plc and subsidiaries ('the Applicant'), MKO is preparing a remedial Environmental Impact Assessment Report (rEIAR) and remedial Natura Impact Statement (rNIS) to accompany a Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group. The Ballivor Bog Group comprises Ballivor, Carranstown, Bracklin, Lisclogher and Lisclogher West Bogs located approximately 2.2km west of Ballivor Village, Co. Meath, and 3.7km east of Raharney and 2.5km south-southeast of Devlin, both located in Co. Westmeath.

As part of the EIA process, we would welcome any comments that you may have in relation to the proposed project, including baseline data, survey techniques or potential impacts that should be considered as part of the assessment process and in the preparation of the rEIAR. In order to facilitate this, a Scoping Document providing details of the proposed project and the site of the proposed development is attached.

If you could return any comments or suggestions at your earliest convenience, it would be much appreciated. If you require any further information, please do not hesitate to contact me.

Yours sincerely,

Karen.

Karen Mulryan
Environmental Scientist BA MSc ACIfA IAI

**MKO**
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Tá eolas sa teachtaireacht leictreonach seo a d'fhéadfadh bheith príobháideach nó faoi rún agus b'fhéidir go mbeadh ábhar rúnda nó pribhléideach ann. Is le h-aghaidh an duine/na ndaoine nó le h-aghaidh an aonáin atá ainmnithe thuas agus le haghaidh an duine/na ndaoine sin amháin atá an t-eolas. Tá cosc ar rochtain don teachtaireacht leictreonach seo do aon duine eile. Murab ionann tusa agus an té a bhfuil an teachtaireacht ceaptha dó bíodh a fhios agat nach gceadaítear nochtadh, cóipeáil, scaipeadh nó úsáid an eolais agus/nó an chomhaid seo agus b'fhéidir d'fhéadfadh bheith mídhleathach.

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**********

## Karen Mulryan

**From:** Hueston, Caroline <caroline.hueston@hse.ie>
**Sent:** 22 December 2021 11:33
**To:** Karen Mulryan
**Subject:** HSE submission Scoping for Substitute Consent Ballivor Bog Your ref: 191137f
**Attachments:** Cover letter Ballivor Bog rEIAR EHIS 2084.docx; HSE submission Ballivor Bog Co Meath Westmeath Scoping MKO 191137f EHIS 2084.docx

**Follow Up Flag:** Follow up
**Flag Status:** Flagged

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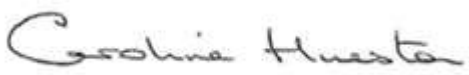
Karen
Please find attached the HSE submission in respect of the above. The Environmental Health Service is satisfied that assessment methods proposed in the Scoping Document address the significant potential impacts and have very few additional comments to make
Regards and best wishes for a Happy Christmas
Caroline



Environmental Health Officer
Environment OU
Ennistymon Health Centre
Ennistymon
Co. Clare
065 7071143
086 8236817

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An tOifig Náisiúnta um Sláinte Chomhshaoil
Feidhmeannacht na Seirbhíse Sláinte,
Urlár 2, Teach na Darach, Ascaill na Teile
Páirc na Mílaoise, An Nás, Co. Chill Dara.

National Office for Environmental Health Services
2nd Floor, Oak House, Lime Tree Avenue
Millennium Park, Naas, Co. Kildare
Eircode: W91KDC2

T: 045 880 442
ehnationaloffice@hse.ie

| | |
|---|---|
| **Date:** | 22 December 2021 |
| **Name:** | Karen Mulryan, MKO, Tuam Road, Galway |
| **Consultant's reference:** | 191137f |
| **Re**: | rEIA Scoping Report |
| **Proposed development:** | Substitute consent at Ballivor Bog Group, Co. Meath and Co. Westmeath |
| **Applicant:** | Bord na Mona PLC |
| **EHIS Reference:** | 2084 |

Dear Ms Mulryan

Please find enclosed the HSE Consultation Report in relation to the above proposal.

The following HSE departments were made aware of the consultation request for the proposed development on 7 December 2021

- Emergency Planning – Brendan Lawlor

- Estates – Helen Maher/Stephen Murphy
- Assistant National Director for Health Protection
- CHO – Des O'Flynn

If you have any queries regarding this report please contact me on the number below

Yours sincerely



Environmental Health Officer
Environment OU
Ennistymon Health Centre
Ennistymon
Co. Clare

**HSE EIAR Scoping Report**
**Environmental Health Service Consultation Report**
**(as a Statutory Consultee under the Planning and Development Acts 2000 (as amended) & Regulations made thereunder)**

| | |
|---|---|
| **Date:** | 22 December 2021 |
| **Proposed Development:** | Application for substitute consent for Ballivor Bog Group, Co. Meath/Westmeath |
| **Applicant:** | Bord na Mona PLC |
| **Our reference:** | EHIS 2084 |
| **Report to:** | Ms. Karen Mulryan, Environmental Scientist, MKO, Tuam Road, Galway |
| **Consultant's Reference**: | 191137f |
| **Type of consultation**: | Scoping Consultation |

**General Introduction**

The Environmental Health Service (EHS) is aware of the Supreme Court Judgement in regard to the granting of Substitute Consent and the process of remedial EIA published on the 2nd July 2020.

Supreme Court Record No: 9/19

High Court Record Number: 2014/342 JR

In this regard the leave to apply for Substitute Consent under section 177 and the granting of such is not consistent with the EIA Directives in that there should be public participation in the decision making on granting leave to apply for Substitute Consent and that the granting of this was not subject to an exceptionality test.

It is therefore the understanding of the EHS that the process of Remedial EIA (rEIA) and the granting of Substitute Consent will have to be subject to review and/or legislative change.

It is within this context that the EHS makes this submission.

The HSE will consider the final rEIAR accompanying the planning application and will in particular make comments to the Planning Authority on the methodology used for assessing the significant impacts and the evaluation criteria used in assessing the significance of the impact. Whilst it is accepted that rEIA is considering impacts that have occurred, reference will still be made to the following documents:

- Guidelines on the information to be contained in EIS (2002), 187kb

- Advice Notes on Current Practice in the preparation of EIS (2003), 435kb
- Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment

https://www.housing.gov.ie/sites/default/files/publications/files/guidelines_for_planning_authorities_and_an_bord_pleanala_on_carrying_out_eia_-_august_2018.pdf

EU publication: Environmental Impact Assessment of Projects Guidance on the preparation of the Environmental Impact Assessment Report, EU, 2017

http://ec.europa.eu/environment/eia/pdf/EIA_guidance_EIA_report_final.pdf

Adoption of the Directive (2014/52/EU) in April 2014 initiated a review of the above guidelines.

The draft new guidelines can be seen at:

http://www.epa.ie/pubs/consultation/reviewofdrafteisguidelinesadvicenotes/

Generally the EHS will consider if the rEIA has examined all significant impacts and provided the following information for each:

a) Description of the receiving environment including licencing compliance
b) Legislative framework
c) Description of the development
d) The nature and scale of the impact
e) An assessment of the significance of the impact
f) Mitigation measures
g) Residual impacts.
h) Peatland rehabilitation proposals

In particular the EHS will consider the impacts on, or from:

- Noise & Vibration
- Air Quality including dust
- Surface and Ground water quality
- Geological Impacts
- Ancillary facilities

The cumulative impacts should also be assessed and evaluated in the rEIA.

**The EHS has studied the document submitted by MKO on 2 December 2021 and is satisfied that the Scoping Document identifies the potential environmental effects (listed above) of the project which will be addressed in the rEIAR.**

**Population and Human Health**

Directive 2014/52/EU has an increased requirement to assess likely significant impacts on Population and Human Health, in the case of a rEIA this is the actual impacts on Population and Human Health. It is recommended that the wider determinants of health and wellbeing are considered in a

proportionate manner when considering the rEIA. Guidance on wider determinants of health can be found at www.publichealth.ie

**Non-Technical Summary**

The Non-Technical Summary is an important document to enable public access to the information. It should accurately summarise the rEIAR in non-technical language. It should identify the methodologies used and the criteria to evaluate the significant impacts and clearly state the mitigation that has been implemented. It should be easily referenced across to the main body of text.

**Public Consultation**

Meaningful public consultation with the local community should be carried out. All legitimate concerns from the public should be identified in the rEIA. The EIAR should clearly demonstrate how the outcome of consultation with the public influenced decision making within the EIA.

Environmental Health Office
Environment OU
Ennistymon Health Centre
Ennistymon
Co. Clare

## Natalia Stolarska

**From:** Jonathan Stirland (Housing) <Jonathan.Stirland@housing.gov.ie>
**Sent:** Friday 16 February 2024 15:02
**To:** Grainne Griffin
**Subject:** Co. Westmeath. Ballivor Bog Group

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**Date:** 16/02/2024
**Our ref:** WM-CON-A220310-0019
**Re: Co. Westmeath. Ballivor Bog Group**
**MKO is preparing a remedial Environmental Impact Assessment Report (rEIAR) and remedial Natura Impact Statement (rNIS) to accompany a Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group. The Ballivor Bog Group comprises Ballivor, Carranstown, Bracklin, Lisclogher and Lisclogher West Bogs located approximately 2.2km west of Ballivor Village, Co. Meath, and 3.7km east of Raharney and 2.5km south-southeast of Devlin, both located in Co. Westmeath.**

Dear Grainne Griffin

We refer to the consultation in relation to the above proposed development. Outlined below are the archaeological recommendations of the Department of Housing, Local Government and Heritage.

**Archaeology**

With regard to the above proposed development the Department has reviewed the Remedial Environmental Impact Assessment Report Scoping Document Substitute Consent for Peat Extraction at Ballivor Bog Group.

It is noted that the proposed development is large in scale. Given the extent and location of the proposed development it could impact on recorded monuments and subsurface archaeological remains.

In line with national policy, see Section 3.6 of the Framework and Principles for the Protection of the Archaeological Heritage 1999, the Department recommends that an archaeological impact assessment should be prepared to assess the impact of the development on the archaeological heritage. It is recommended that the assessment should be submitted with any further planning application. This will enable the Planning Authority and the Department to prepare an informed archaeological recommendation before a planning decision is taken.

**Archaeological Impact Assessment;**

1. The applicant is required to engage the services of a suitably qualified archaeologist to carry out an archaeological impact assessment of the development site. No sub-surface work should be undertaken until an archaeological assessment has been completed and commented on by this office.

2. The archaeologist should carry out any relevant documentary research and inspect

the development site. The ground impacts of the development on the Recorded Monument shall be assessed and described in detail.

**3.** Having completed the work, the archaeologist should submit a written report stating their recommendations to the National Monuments Service. Where archaeological material/features are shown to be present, preservation *in situ*, preservation by record (excavation) or monitoring may be required.

**Reason:** To ensure the continued preservation (either *in situ* or by record*)* of places, caves, sites, features or other objects of archaeological interest.

***Jon Stirland***
Seandálaí - *Archaeologist*
Seirbhís Séadchomharthaí Náisiúnta - *National Monuments Service*

**An Roinn Tithíochta, Rialtais Áitiúil agus Oidhreachta**
Department of Housing, Local Government and Heritage
**Teach an Chustaim, Baile Átha Cliath 1, D01 W6X0**
*Custom House, Dublin 1, D01 W6X0*

M +353 (0) 85 747 9528
T +353 (0)1

**Email:** Jonathan.Stirland@housing.gov.ie

## Karen Mulryan

**From:** Housing Manager DAU <Manager.DAU@housing.gov.ie>
**Sent:** 14 January 2022 14:38
**To:** Karen Mulryan
**Subject:** G Pre00299/2021 - 191137f- rEIA Scoping Document for Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group, Co. Meath/Westmeath
**Attachments:** G Pre00299-2021 MKO 191137f Ballivor Bog.pdf

A Chara,

Please find attached Heritage related recommendations for the above mentioned pre-planning application.

Regards
Diarmuid

**Diarmuid Buttimer**
*Executive Officer*

**An Roinn Tithíochta, Rialtais Áitiúil agus Oidhreachta**
**Department of Housing, Local Government and Heritage**
**Aonad na nIarratas ar Fhorbairt**
*Development Applications Unit*
**Oifigí an Rialtais**
*Government Offices*
**Bóthar an Bhaile Nua, Loch Garman, Contae Loch Garman, Y35 AP90**
Newtown Road, Wexford, County Wexford, Y35 AP90

—

Diarmuid.Buttimer@housing.gov.ie
Manager.DAU@housing.gov.ie

An Roinn Tithíochta,
Rialtais Áitiúil agus Oidhreachta
Department of Housing,
Local Government and Heritage

Your Ref: 191137f
Our Ref: G Pre00299/2021 (Please quote in all related correspondence)

14 January 2022

MKO
Tuam Road
Galway
H91 VW84

Via email: kmulryan@mkoireland.ie

**Proposed Pre Planning Development: MKO on behalf of Bord na Móna Plc.: for past peat extraction activities at the Ballivor Bog Group. The Ballivor Bog Group comprises Ballivor, Carranstown, Bracklin, Lisclogher and Lisclogher West Bogs located approximately 2.2km west of Ballivor Village, Co. Meath, and 3.7km east of Raharney and 2.5km south-southeast of Devlin, both located in Co. Westmeath: Ballivor, Carranstown, Bracklin, Lisclogher and Lisclogher West Bogs**

A chara

I refer to correspondence received in connection with the above. Outlined below are heritage-related observations/recommendations co-ordinated by the Development Applications Unit under the stated headings.

## Nature Conservation

The Department refers to your letter dated 2nd of December 2021, in regard to the preparation of a remedial Environmental Impact Assessment Report (rEIAR) and remedial Natura Impact Statement (rNIS) on behalf of Bord na Móna Plc and subsidiaries to accompany a Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group. Your letter indicates that a Remedial Environmental Impact Assessment Report (rEIAR) is currently being prepared which will accompany applications to An Bord Pleanála for Substitute Consent. The Department notes that MKO Planning and Environmental Consultants have been commissioned by Bord na Móna to act as consultants in relation to the application for Substitute Consent and as part of the EIAR process are engaging in consultation with prescribed bodies and other organisations seeking observations on the proposed applications and inputs in relation to scoping for environmental assessments.

The following observations are made by the Department in its role as a prescribed body under planning legislation and as the authority with overarching responsibility for nature conservation and the nature directives (i.e. the Birds and Habitats Directives). The observations are not exhaustive and are intended to assist you in addressing potential

impacts in relation to biodiversity and nature conservation in any environmental assessments you are preparing as part of applications for planning consent.

Given the scale of the application, the observations provided here are made without prejudice to any observations or recommendations that may be made by the Minister in the future.

In relation to environmental assessment which may be required both in relation to applications for substitute consent and future proposed development, the Department notes that consideration must be given to potential impacts to European sites. As you will be aware the Planning and Development Act, 2000 (as amended) requires that screening for appropriate assessment and where required, appropriate assessment be undertaken for all development proposals. This is required in order to meet the obligations arising from the provisions of Article 6(3) of the Habitats Directive. These requirements are addressed in more detail below.

In addition the Department draws your attention to the duties of public authorities in relation to nature conservation as set out in Regulation 27 of the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended). Public authorities are obliged, when exercising their functions, to take appropriate steps to avoid in European sites the deterioration of natural habitats and the habitats of species, as well as disturbance of species for which a site has been designated insofar as this disturbance could be significant in relation to the objectives of the Habitats Directive. Public authorities, in the exercise of its functions, must also strive to avoid pollution or deterioration of habitats outside Special Protection Areas in accordance with Regulation 27(4) and Article 4(4) of the Birds Directive.

**Matters relating to the Remedial Environmental Impact Assessment Report:**

Scope of the Project

The Department notes that the Substitute Consent process seeks to regularise historic peat extraction using two different harvesting methods, namely milling and sod moss for horticulture. The Department understands that on many of the bogs, turf cutting by third parties, is also taking place, primarily at the edge of uncut remnant raised bogs, often at the periphery of central peat extraction areas. Such areas are included in the map which accompanied your letter. The extent and scope of the developments for which consent is sought must be clearly defined in the rEIAR. Precise mapping of the project area should be included. Where third party turf cutting is not included in the applications to the Board, the cumulative impacts of any such peat extraction together with milling and sod moss production on the same bogs should be assessed.

Project description

The rEIAR should describe in detail the project activities, including the use of peat resources, which have taken place from 1st February 1990, when the EIA Directive (85/337/EEC) was transposed into Irish law. It is important that spatial and temporal details of peat resource

use and drainage operations are included. Scoping indicates that peat extraction related activities including the drainage of peat extraction areas, peat handling activities and ancillary works associated with peat extraction such as workshops, fuel storage area and canteens will be included in the rEIAR. The rEIAR should also include activities such as drain maintenance, settlement ponds and silt traps, disposal of silt, use and disposal of materials such as plastic sheeting, landscaping, mechanical and chemical clearance and destruction of vegetation. The timing of vegetation clearance operations should be provided to enable the assessment of impacts on habitats, flora and fauna.

The rEIAR should include consideration of any off-site but related projects including end use projects, such as the horticultural peat processing factory located at Ballivor. The rEIAR should also include an assessment of any other off-site projects linked to the main project by the movement / transport of material to other sites and locations.

In addition the rEIAR should also consider secondary projects, as appropriate. These are projects that arise largely because of the existence of the principal project, though they are usually not carried out by the developer of the principal project. Such projects include recreational land-use projects (e.g. development of walking and cycling facilities), and afforestation of cutaway bog.

The rEIAR should describe baseline environmental conditions as they were on 1st February 1990. The description of the baseline environment needs to be sufficiently accurate to provide a reliable reference against which impacts can be assessed. As the bog units have been in Bord na Móna's ownership since the reference date, significant internal sources of information should be available. Sources of external historical baseline information include data from state agencies such as EPA monitoring data, including river and lake water quality monitoring, bird, mammal, butterfly and plant atlases, aerial photography and reports, including raised bog reports available from the National Parks and Wildlife Service on request.

Impact Assessment

The rEIAR must contain a statement of the significant effects, if any, on the environment, which have occurred or which are occurring or which can reasonably be expected to occur because the development the subject of the application for substitute consent was carried out[1]. Potential impacts should be identified using the source-pathway-receptor approach. Impacts should be assessed by analysing the effects of each impact on ecological receptors. The ecological significance of such effects should then be reported in relation to each receptor and appropriate mitigation and/or remediation proposed. The rEIAR must identify and describe adequately the direct and indirect significant effects on the environment of the development[2]. Potential impacts which may be significant and which should be assessed include:

[1] Section177F(1)A(a) of the Planning and Development Act, 2000, as amended
[2] Section 177E(4A)(a) of the Planning and Development Act, 2000, as amended

1. Habitat loss (both temporary and permanent)[3]
2. Species loss (including loss of typical raised bog flora and fauna)[4]
3. Habitat Fragmentation
4. Hydrological and Hydrogeological impacts
5. Nature Conservation site impacts (e.g. proposed Natural Heritage Areas, Natural Heritage Areas, Nature Reserves etc.)
6. Emissions to air (dust, ammonia) from operations and storage of peat
7. Impacts to climate
8. Invasive species impacts
9. Increase in predation of ground nesting birds due to afforestation and habitat degradation
10. Ecological impacts of dumping
11. Disturbance to habitats and species both from operations and other activities (including recreational use)
12. Fires

The rEIAR should identify the extent of peatland habitats and species present during the timeframe of the historic peat extraction within the bog group and it should assess impacts from peat extraction and related works and activities on these habitats and species during that period up to the present date.

The primary emissions to water associated with peat harvesting are discharges arising from the bog surface water drainage channels. Water can be pumped and gravity fed. Environmental impacts generally relate to the release of suspended solids and ammonia to streams and rivers and to resultant hydromorphological alterations to these watercourses. All such potential impacts must be assessed. For example, there is evidence that high levels of ammonia are being released from peat-extraction activities during the draining process and along with suspended solids, may be causing ecological impacts in receiving water bodies[5].

It is the Department's understanding that EPA Integrated Pollution Control (IPC) licencing, limits the discharge of suspended solids to 35mg/l for all surface water outfalls from boglands within licenced areas. In addition there are a number of parameters monitored on a quarterly basis such as pH, flow, suspended solids, total solids, total phosphorus, total Ammonia, colour and Chemical Oxygen Demand (COD). It is important that the focus of impact

[3] The loss of habitat in the reference period should be quantified.
[4] Biodiversity loss (including typical raised bog flora and fauna) in the reference period should be quantified
[5] River Basin Management Plan for Ireland 2018 – 2021

assessment in relation to biodiversity should be on impacts to sensitive ecological receptors and not only on compliance with water quality standards as set down in EPA licences.

Environmental impact assessment should also take account of cumulative impacts which may arise as has been set out above.

Remedial measures

The rEIAR must also contain details of any appropriate remedial measures undertaken or proposed to be undertaken by the applicant for substitute consent to remedy any significant adverse effects on the environment and the period of time within which any proposed remedial measures will be carried out by or on behalf of the applicant[6].The Department recommends that any such measures should be based on the significant effects identified in the assessment and should be informed by the following:

- The requirements of the Habitats Directive (92/43/EEC), Birds Directive (2009/147/EC), Water Framework Directive (2000/60/EC), Wildlife Act 1976 (as amended) and the European Communities (Birds and Natural Habitats) Regulations, 2011 (as amended).
- National Peatlands Strategy 2015
- River Basin Management Plan for Ireland 2018 – 2021, or any succeeding plan
- National Biodiversity Action Plan 2017-2021, or any succeeding plan
- Climate Action Plan 2021 and National Climate Policy
- Planning policy at national, regional and local level

Remedial measures should not, however, rely on measures to be undertaken in the above plans but should be specific measures based on a full assessment to the project(s) to which the applications to An Bord Pleanála relate.

The Department notes that Bord na Móna is currently producing rehabilitation plans for all Bord na Móna bogs to stabilise former peat production areas and enhance biodiversity. Should measures included in such plans be included as remedial measures for the purposes of the developments under consideration, they should relate specifically to the significant effects identified in the rEIAR and should provide adequate remediation of these effects.

**Matters relating to Appropriate Assessment:**

As noted above the Department advises that screening for appropriate assessment and if required, appropriate assessment must be undertaken in respect of the peat extraction projects which are the subject of planning applications.

The peat harvesting activities associated with the Ballivor Bog Group have occurred upstream of, downstream of, and adjacent to European sites. Screening for appropriate

[6] Section 177F(1)(b) of the Planning and Development Act, 2000, as amended

assessment should focus on the likely significant effects of peat extraction and related activities on European sites noting that impacts to sites via air and water may occur over large distances. The Department is of the view that the preparation of a remedial Natura Impact Statement (rNIS) (see Section 177G of the Planning & Development Act 2000 (as amended)) may be required in relation to the planning application. You should note the specific requirements for a rNIS as set out in Section 177G(a) of the Planning and Development Act, 2000, as follows:

*"A remedial Natura impact statement shall contain the following:*

*(a) A statement of the significant effects, if any, on the relevant European sites which have occurred or which are occurring or which can reasonably be expected to occur because the development the subject of the application for substitute consent was carried out;"*

It is noted that the scope of any rNIS should include the timeframe from the date of enactment of the European Communities (Natural Habitats) Regulations, 1997 (26th February 1997) to the present date.

The rNIS should provide a full description of the development and each bog within the Ballivor Bog Group within the development.

All relevant stages, works and processes associated with site preparation, operation and decommissioning of the peat harvesting activities historically should be taken into account as part of the assessment undertaken subject to the appropriate legislative timeframe. This includes access provision, clearance and stripping of vegetation and overburden, expansion, extraction and processing operations over time, machinery and materials used, surface water and groundwater management, silt and sediment control, discharges and emissions, berms and landscaping, transportation infrastructure, waste storage and management, site restoration, reinstatement and after-use.

Any rNIS (and subsequent appropriate assessment) should examine the implications of the project, individually and in-combination with other plans and projects, for the Qualifying Interests (QIs), or the Special Conservation Interests (SCIs), of the European site(s) concerned, in view of the site's conservation objectives and in light of the best scientific knowledge in the field. Any assessment cannot have lacunae or gaps, and must contain complete, precise and definitive findings and conclusions. Where appropriate any rNIS must put forward mitigation or remedial measures and demonstrate clearly that these measures are effective in addressing the impacts identified and capable of full implementation. The timeframe during which these remedial or mitigation measures are to be carried out must also be indicated. The rNIS should form the basis for an appropriate assessment to be undertaken by the competent authority. Competent authorities can authorise a project only after having made certain that the project will not adversely affect the integrity of a European site(s). This is so when there is no reasonable scientific doubt as to the absence of such effects.

The Department recommends that any rNIS should consider the historic and current threats and pressures to European sites in its analysis. All impacts that have occurred should be identified and assessed and it should not be assumed that because compliance has occurred with licence conditions during peat harvesting operations (e.g. EPA IPC licence), that no adverse impacts have occurred to European sites. Scientific data available for the time period involved should be utilised including the Article 17 (Habitats Directive) assessment of conservation status reports (2007, 2013 & 2019) and the Article 12 (Birds Directive) status and trends of Ireland's bird species reports.

Some key impacts on European Sites from historic peat harvesting operations, which should be considered in any rNIS, include:

- Drainage
- Hydrological effects (both surface and ground water)
- Silt/Sediment run off via surface water & drains
- Particulate emissions from operations and storage of peat
- Ammonia emissions from operations
- Disturbance to habitats and species both from operations and other in-combination activities including, for example, recreational use
- Fires
- Invasive species
- Illegal dumping
- Habitat fragmentation
- Pumping of water off sites

The rNIS should focus on source-receptor pathways in identifying the impacts of peat harvesting activities and their effects. The ecological effects of specific impact that have occurred in relation to the habitats and species for which European sites have been designated should be assessed both individually and in-combination with other plans and projects and appropriate mitigation and remedial measures proposed as part of any assessment.

Future use

The Department recognises the opportunity for climate change mitigation through the rewetting and restoration of dry, bare cutaway bog, thereby lowering carbon emissions from these sites as well as restoring biodiversity and notes that this is an objective of the National Peatland Strategy 2015 and the Climate Action Plan 2021. Detailed and specific rehabilitation plans for sites will be required to achieve these outcomes. The Department is of the view that any proposed peat extraction or other proposed developments at such sites

must be designed taking full account of the detailed and specific requirements of rehabilitation planning at these sites. Rehabilitation plans should inform the peat extraction process so as to optimise the potential of any bog unit to recover after decommissioning, in terms of biodiversity, reductions in carbon emissions and all other ecosystem services.

The above observations/recommendations are based on the papers submitted to this Department on a pre-planning basis and are made without prejudice to any observations that the Minister may make in the context of any consultation arising on foot of any development application referred to the Minister, by the planning authority/ies, in the role as statutory consultee under the Planning and Development Act, 2000, as amended.

You are requested to send further communications to the Development Applications Unit (DAU) at **manager.dau@housing.gov.ie**.

Is mise le meas**,**



**Diarmuid Buttimer**
**Development Applications Unit**
**Administration**

## Karen Mulryan

**From:** Wendy Bagnall <wbagnall@meathcoco.ie>
**Sent:** 03 February 2022 12:10
**To:** Karen Mulryan
**Cc:** Loreto Guinan; Louise Heeney
**Subject:** RE: rEIA Scoping Document for Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group, Co. Meath/Westmeath

**Follow Up Flag:** Follow up
**Flag Status:** Flagged

Good afternoon Karen,

Please see below for your attention comments from MCC Heritage Officer, on behalf of Meath County Council:

'I have made comments in respect of the proposed project, including baseline data, survey techniques or potential impacts that should be considered as part of the assessment process and in the preparation of the rEIAR.

- *The scope of works proposed in the Biodiversity Section (5.2.4.6) should include reference to invasive species in accordance with European Communities (Birds and Natural Habitats) Regulations 2011 – Third Schedule (Regulations 49 and 50)*
- *Habitat Surveys should have regard to the extent of Annex I habitats on site – in particular – Annex I habitat Degraded raised bogs still capable of regeneration [code 7120]*
- *It is noted in section 4.2 - 'In compliance with the IPC licence P0501-01, draft Rehabilitation Plans have been produced by Bord na Móna for all Bogs in the Ballivor Bog Group It is a requirement of Condition 10 of the aforementioned IPC Licence, however, that following decommissioning of use or involvement of all or part of the site in the licensed activity, Bord na Móna prepares (to the satisfaction of the EPA) and implements a final Cutaway Bog Rehabilitation Plan for the Ballivor Bog Group. The discharge of Condition 10 will facilitate the permanent rehabilitation of the Ballivor Bog Group in conjunction with any parallel future end-uses (wind energy infrastructure)'.*

Please note:

- Meath County Development Plan 2021-2027 accessible from www.meath.ie.
- The county the subject lands are located within should be clearly illustrated on the mapping.

Regards Wendy Bagnall

For and on behalf of Meath County Council

_____

**Wendy Bagnall | Senior Executive Planner** | B Soc Sci | MRUP|Dip Law|MIPI

| Meath County Council | Planning Department|

Contact Details: wbagnall@meathcoco.ie| DD 353 46 9097505 |

Keep up to date: www.meath.ie|

**From:** Karen Mulryan <kmulryan@mkoireland.ie>
**Sent:** Tuesday 7 December 2021 14:38
**To:** Wendy Bagnall <wbagnall@meathcoco.ie>
**Cc:** Frank O'Donnell <frank.odonnell@meathcoco.ie>
**Subject:** RE: rEIA Scoping Document for Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group, Co. Meath/Westmeath

Good afternoon Wendy,

Thank you very much for getting back to me. Mid January is fine, we appreciate the busy period in the lead up to Christmas, paired back availabilities due to covid restrictions and Christmas shut down. We look forward to your feedback in the New Year.

Kind regards,

Karen.

Karen Mulryan
Environmental Scientist BA MSc ACIfA IAI

**MKO**
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
www.mkoireland.ie

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**From:** Wendy Bagnall <wbagnall@meathcoco.ie>
**Sent:** Tuesday 7 December 2021 14:34
**To:** Karen Mulryan <kmulryan@mkoireland.ie>
**Cc:** Frank O'Donnell <frank.odonnell@meathcoco.ie>
**Subject:** rEIA Scoping Document for Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group, Co. Meath/Westmeath

Good afternoon Karen,

I have been asked to address the provision of comments to yourselves on the rEIA.

Due to our current workloads this information will not be available until mid January.

Can you confirm if that timeline fits with your work programme,

Regards Wendy

For and on behalf of Meath County Council

_____

**Wendy Bagnall | Senior Executive Planner** | B Soc Sci | MRUP|Dip Law|MIPI

-: Meath County Council | Planning Department | Buvinda House | Dublin Road | Navan | C15 Y 291:

+353 46 9097505 |7: +353 46 9097001

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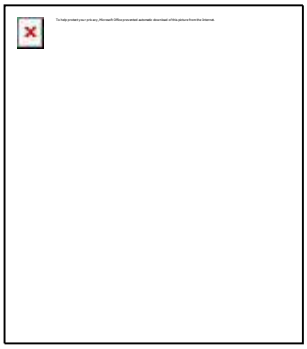

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**Meath County Council's new corporate headquarters are:**
**Buvinda House,**
**Dublin Road,**
**Navan,**
**Co. Meath, C15 Y291**

## Natalia Stolarska

**From:** IWT Info <info@iwt.ie>
**Sent:** Wednesday 21 February 2024 10:20
**To:** Grainne Griffin
**Subject:** Re: 191137f- rEIA Scoping Document for Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group, Co. Meath/Westmeath

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Dear Grainne,

Apologies for the delay in getting back to you.
We do not have the staff capacity to respond to this consultation at the moment but we will endeavour to respond if possible.

Kind regards,
Fabiola Vieira

On Wed, 14 Feb 2024 at 17:28, Grainne Griffin <ggriffin@mkoireland.ie> wrote:

> Dear Ms Vieira,
>
> Following on from initial scoping in December 2021, please consider the below:
>
> On behalf of Bord na Móna Plc and subsidiaries ('the Applicant'), MKO is preparing a remedial Environmental Impact Assessment Report (rEIAR) and remedial Natura Impact Statement (rNIS) to accompany a Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group. The Ballivor Bog Group comprises Ballivor, Carranstown, Bracklin, Lisclogher and Lisclogher West Bogs located approximately 2.2km west of Ballivor Village, Co. Meath, and 3.7km east of Raharney and 2.5km south-southeast of Devlin, both located in Co. Westmeath.
>
> As part of the EIA process, we would welcome any comments that you may have in relation to the proposed project, including baseline data, survey techniques or potential impacts that should be considered as part of the assessment process and in the preparation of the rEIAR. In order to facilitate this, a Scoping Document providing details of the proposed project and the site of the proposed development is attached.
>
> If you could return any comments or suggestions within four weeks upon this receipt, it would be much appreciated. If you require any further information, please do not hesitate to contact me.

Kind regards,

Gráinne.

**Gráinne Griffin**

Environmental Scientist BSc. MSc. CEcol.

**MKO**

Tuam Road, Galway, H91 VW84

Offices in Galway and Dublin

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Registered Charity (CRA) Number: 20010966
Facebook: IrishWildlifeTrust
Twitter: @irishwildlife
Phone: 01 445 7259 (landline available Wednesday-Thursday 9:30 to 5pm)

## Natalia Stolarska

**From:** Sabine Browne <Sabine.Browne@waterwaysireland.org>
**Sent:** Thursday 15 February 2024 12:12
**To:** Grainne Griffin
**Cc:** Karen Mulryan
**Subject:** RE: 191137f- rEIA Scoping Document for Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group, Co. Meath/Westmeath

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Good afternoon Gráinne,

This is not within any Zone of Influence of our waterways so we will not be commenting.

Kind regards,

**Sabine Browne**

---

**From:** Grainne Griffin <ggriffin@mkoireland.ie>
**Sent:** Wednesday, February 14, 2024 5:47 PM
**To:** Sabine Browne <Sabine.Browne@waterwaysireland.org>
**Cc:** Karen Mulryan <kmulryan@mkoireland.ie>
**Subject:** 191137f- rEIA Scoping Document for Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group, Co. Meath/Westmeath

Dear Sir/Madam,

Following on from initial scoping in December 2021, please consider the below:

On behalf of Bord na Móna Plc and subsidiaries ('the Applicant'), MKO is preparing a remedial Environmental Impact Assessment Report (rEIAR) and remedial Natura Impact Statement (rNIS) to accompany a Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group. The Ballivor Bog Group comprises Ballivor, Carranstown, Bracklin, Lisclogher and Lisclogher West Bogs located approximately 2.2km west of Ballivor Village, Co. Meath, and 3.7km east of Raharney and 2.5km south-southeast of Devlin, both located in Co. Westmeath.

As part of the EIA process, we would welcome any comments that you may have in relation to the proposed project, including baseline data, survey techniques or potential impacts that should be considered as part of the assessment process and in the preparation of the rEIAR. In order to facilitate this, a Scoping Document providing details of the proposed project and the site of the proposed development is attached.

If you could return any comments or suggestions within four weeks upon this receipt, it would be much appreciated. If you require any further information, please do not hesitate to contact me.

Kind regards,
Gráinne.

**Gráinne Griffin**

Environmental Scientist BSc. MSc. CEcol.

**MKO**
Tuam Road, Galway, H91 VW84

Offices in Galway and Dublin
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For the attention of Gráinne Griffin
Environmental Scientist
MKO
Tuam Road,
Galway, H91 VW84

**By Email**: ggriffin@mkoireland.ie

**Date:** 20th March 2023

**Re: EIA Scoping Request –**Substitute Consent Application at the Ballivor Bog Group.

Dear Gráinne Griffin

Uisce Éireann has received your email notification and accompanying report re. the proposed Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group.

Please see attached, Uisce Éireann's scoping opinion in relation to Water Services. On receipt of the planning referral, Uisce Éireann will review the finalised Environmental Impact Assessment Report (EIAR) as part of the planning process.

Queries relating to the terms and the EIA scoping opinions below should be directed to planning@water.ie

PP. *Ali Robinson*

**Geoffrey Burke**

Connections and Developer Services

**Stiúrthóirí / Directors:** Tony Keohane (Cathaoirleach / Chairman), Niall Gleeson (POF / CEO), Christopher Banks, Fred Barry, Gerard Britchfield, Liz Joyce, Patricia King, Eileen Maher, Cathy Mannion, Michael Walsh.
**Oifig Chláraithe / Registered Office:** Teach Colvill, 24-26 Sráid Thalbóid, Baile Átha Cliath 1, D01 NP86 / Colvill House, 24-26 Talbot Street, Dublin, Ireland D01NP86
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## Uisce Éireann's Response to EIA Scoping Requests

At present, Uisce Éireann does not have the capacity to advise on the scoping of individual projects. However, in general the following aspects of Water Services should be considered in the scope of an EIA where relevant;

a) Where the development proposal has the potential to impact an Uisce Éireann Drinking Water Source(s), the applicant shall provide details of measures to be taken to ensure that there will be no negative impact to Uisce Éireann's Drinking Water Source(s) during the construction and operational phases of the development. Hydrological / hydrogeological pathways between the applicant's site and receiving waters should be identified as part of the report.

b) Where the development proposes the backfilling of materials, the applicant is required to include a waste sampling strategy to ensure the material is inert.

c) Mitigations should be proposed for any potential negative impacts on any water source(s) which may be in proximity and included in the environmental management plan and incident response.

d) Any and all potential impacts on the nearby reservoir as public water supply water source(s) are assessed, including any impact on hydrogeology and any groundwater/ surface water interactions.

e) Impacts of the development on the capacity of water services (*i.e. do existing water services have the capacity to cater for the new development*). This is confirmed by Uisce Éireann in the form of a Confirmation of Feasibility (COF). If a development requires a connection to either a public water supply or sewage collection system, the developer is advised to submit a Pre-Connection Enquiry (PCE) enquiry to Uisce Éireann to determine the feasibility of connection to the Uisce Éireann network.

   All pre-connection enquiry forms are available from https://www.water.ie/connections/connection-steps/.

f) The applicant shall identify any upgrading of water services infrastructure that would be required to accommodate the proposed development.

g) In relation to a development that would discharge trade effluent – any upstream treatment or attenuation of discharges required prior to discharging to an Uisce Éireann collection network.

h) In relation to the management of surface water; the potential impact of surface water discharges to combined sewer networks and potential measures to minimise and or / stop surface waters from combined sewers.

i) Any physical impact on Uisce Éireann assets – reservoir, drinking water source, treatment works, pipes, pumping stations, discharges outfalls etc. including any relocation of assets.

j) When considering a development proposal, the applicant is advised to determine the location of public water services assets, possible connection points from the applicant's site / lands to the public network and any drinking water abstraction catchments to ensure these are included and fully assessed in any pre-planning proposals. Details, where known, can be obtained by emailing an Ordnance Survey map identifying the proposed location of the applicant's intended development to datarequests@water.ie

k) Other indicators or methodologies for identifying infrastructure located within the applicant's lands are the presence of registered wayleave agreements, visible manholes, vent stacks, valve chambers, marker posts etc. within the proposed site.

l) Any potential impacts on the assimilative capacity of receiving waters in relation to Uisce Éireann discharge outfalls including changes in dispersion / circulation characterises. Hydrological / hydrogeological pathways between the applicant's site and receiving waters should be identified within the report.

m) Any potential impact on the contributing catchment of water sources either in terms of water abstraction for the development (*and resultant potential impact on the capacity of the source*) or the potential of the development to influence / present a risk to the quality of the water abstracted by Uisce Éireann for public supply should be identified within the report.

n) Where a development proposes to connect to an Uisce Éireann network and that network either abstracts water from or discharges wastewater to a "protected"/ sensitive area, consideration as to whether the integrity of the site / conservation objectives of the site would be compromised should be identified within the report.

o) Mitigation measures in relation to any of the above ensuring a zero risk to any Uisce Éireann drinking water sources (Surface and Ground water).

*This is not an exhaustive list.*

**Please note**;

- Where connection(s) to the public network is required as part of the development proposal, applicants are advised to complete the Pre-Connection Enquiry process and have received a Confirmation of Feasibility letter from Uisce Éireann ahead of any planning application.

- Uisce Éireann will not accept new surface water discharges to combined sewer networks.

## Natalia Stolarska

**From:** Cillian Claffey(C) <cillian.claffey@water.ie>
**Sent:** Wednesday 20 March 2024 10:28
**To:** Grainne Griffin
**Cc:** Karen Mulryan
**Subject:** FW: 191137f- rEIA Scoping Document for Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group, Co. Meath/Westmeath
**Attachments:** Uisce Éireann_2024 Scoping Doc Cover Letter_2024.02.14.pdf; UisceÉireann_EIAScopingOpinion_Ballivor Bog Group.pdf

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Good morning Gráinne,

Hope you are keeping well today.

Please find attached Uisce Éireann's response to your EIA scoping request relating to Ballivor Bog Group,.

Could you please notify myself OR planning@water.ie upon submission on this planning application so that we can get a heads up and ensure we receive the referral in adequate time.

If you have any questions, please let me know and I will do my best to assist you with your query.

Kind regards,

**Cillian Claffey**
Development Management Planning

**Mallow**
**Uisce Éireann**
Teach na hAbhann Duibhe, Mala, Co. Chorcaí, P51 K3CX
**Uisce Éireann**
Blackwater House, Mallow, Co. Cork, P51 K3CX

**M** +353 89 260 3904
cillian.claffey@water.ie
**www.water.ie**
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---

**From:** Grainne Griffin <ggriffin@mkoireland.ie>
**Sent:** Wednesday 14 February 2024 17:26
**To:** Planning <Planning@water.ie>
**Cc:** Karen Mulryan <kmulryan@mkoireland.ie>
**Subject:** 191137f- rEIA Scoping Document for Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group, Co. Meath/Westmeath

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Dear Sir/Madam,

Following on from initial scoping in December 2021, please consider the below:

On behalf of Bord na Móna Plc and subsidiaries ('the Applicant'), MKO is preparing a remedial Environmental Impact Assessment Report (rEIAR) and remedial Natura Impact Statement (rNIS) to accompany a Substitute Consent Application for past peat extraction activities at the Ballivor Bog Group. The Ballivor Bog Group comprises Ballivor, Carranstown, Bracklin, Lisclogher and Lisclogher West Bogs located approximately 2.2km west of Ballivor Village, Co. Meath, and 3.7km east of Raharney and 2.5km south-southeast of Devlin, both located in Co. Westmeath.

As part of the EIA process, we would welcome any comments that you may have in relation to the proposed project, including baseline data, survey techniques or potential impacts that should be considered as part of the assessment process and in the preparation of the rEIAR. In order to facilitate this, a Scoping Document providing details of the proposed project and the site of the proposed development is attached.

If you could return any comments or suggestions within four weeks upon this receipt, it would be much appreciated. If you require any further information, please do not hesitate to contact me.

Kind regards,
Gráinne.

**Gráinne Griffin**
Environmental Scientist BSc. MSc. CEcol.
**MKO**
Tuam Road, Galway, H91 VW84

Offices in Galway and Dublin
mkoireland.ie | +353 (0)91 735 611




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Is don duine amháin nó don eintiteas amháin ainmnithe ar an seoladh an fhaisnéis agus d'fhéadfadh ábhar faoi rún, faoi phribhléid nó ábhar atá íogair ó thaobh na tráchtála de a bheith mar chuid den fhaisnéis. Tá toirmeasc ar aon daoine nó aon eititis; nach dóibh siúd an fhaisnéis- aon athbhreithniú a dhéanamh, aon atarchur a dhéanamh nó aon athdháileadh a dhéanamh, nó aon úsáid eile a bhaint as an bhfaisnéis, nó aon ghníomh a bhraithfeadh ar an bhfaisnéis seo a dhéanamh agus d'fhéadfaí an dlí a shárú dá ndéanfaí sin. Séanann Uisce Éireann dliteanas as aon ghníomh agus as aon iarmhairt bunaithe ar úsáid neamhúdaraithe na faisnéise seo. Séanann Uisce Éireann dliteanas maidir le seachadadh iomlán agus ceart na faisnéise sa chumarsáid seo agus séanann Uisce Éireann dliteanas maidir le haon mhoill a bhaineann leis an bhfaisnéis a fháil. Má tá an ríomh-phost seo faighte agat trí dhearmad, déan teagmháil leis an seoltóir más é do thoil é agus scrios an t-ábhar ó gach aon ríomhaire. D'fhéadfadh ríomhphost a bheith so-ghabhálach i leith truaillithe, idircheaptha agus i leith leasuithe neamhúdaraithe. Séanann Uisce Éireann

aon fhreagracht as athruithe nó as idircheapadh a rinneadh ar an ríomhphost seo nó as aon dochar do chórais na bhfaighteoirí déanta ag an teachtaireacht seo nó ag a ceangaltáin tar éis a sheolta. Tabhair faoi deara go bhféadfadh monatóireacht a bheith á dhéanamh ar theachtaireachtaí chuig Uisce Éireann agus ó Uisce Éireann d'fhonn ár ngnó a chosaint agus chun a chinntiú go bhfuiltear ag teacht le beartais agus le caighdeáin Uisce Éireann. Is cuideachta gníomhaíochta ainmnithe é Uisce Éireann atá faoi theorainn scaireanna, a bunaíodh de bhun fhorálacha na n-Achtanna um Sheirbhísí Uisce 2007-2022, a bhfuil a bpríomh-ionad gnó ag Teach Colvill, 24-26 Sráid na Talbóide, BÁC 1.

Go raibh maith agat as d'aird a thabhairt.

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Thank you for your attention.

Is don duine amháin nó don eintiteas amháin ainmnithe ar an seoladh an fhaisnéis agus d'fhéadfadh ábhar faoi rún, faoi phribhléid nó ábhar atá íogair ó thaobh na tráchtála de a bheith mar chuid den fhaisnéis. Tá toirmeasc ar aon daoine nó aon eititis; nach dóibh siúd an fhaisnéis- aon athbhreithniú a dhéanamh, aon atarchur a dhéanamh nó aon athdháileadh a dhéanamh, nó aon úsáid eile a bhaint as an bhfaisnéis, nó aon ghníomh a bhraithfeadh ar an bhfaisnéis seo a dhéanamh agus d'fhéadfaí an dlí a shárú dá ndéanfaí sin. Séanann Uisce Éireann dliteanas as aon ghníomh agus as aon iarmhairt bunaithe ar úsáid neamhúdaraithe na faisnéise seo. Séanann Uisce Éireann dliteanas maidir le seachadadh iomlán agus ceart na faisnéise sa chumarsáid seo agus séanann Uisce Éireann dliteanas maidir le haon mhoill a bhaineann leis an bhfaisnéis a fháil. Má tá an ríomh-phost seo faighte agat trí dhearmad, déan teagmháil leis an seoltóir más é do thoil é agus scrios an t-ábhar ó gach aon ríomhaire. D'fhéadfadh ríomhphost a bheith so-ghabhálach i leith truaillithe, idircheaptha agus i leith leasuithe neamhúdaraithe. Séanann Uisce Éireann aon fhreagracht as athruithe nó as idircheapadh a rinneadh ar an ríomhphost seo nó as aon dochar do chórais na bhfaighteoirí déanta ag an teachtaireacht seo nó ag a ceangaltáin tar éis a sheolta. Tabhair faoi deara go bhféadfadh monatóireacht a bheith á dhéanamh ar theachtaireachtaí chuig Uisce Éireann agus ó Uisce Éireann d'fhonn ár ngnó a chosaint agus chun a chinntiú go bhfuiltear ag teacht le beartais agus le caighdeáin Uisce Éireann. Is cuideachta gníomhaíochta ainmnithe é Uisce Éireann atá faoi theorainn scaireanna, a bunaíodh de bhun fhorálacha na n-Achtanna um Sheirbhísí Uisce 2007-2022, a bhfuil a bpríomh-ionad gnó ag Teach Colvill, 24-26 Sráid na Talbóide, BÁC 1.

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Thank you for your attention.

# APPENDIX 2-2

*Cumulative List*

Applications Granted pre 2010 by Townland within 1km of Substitute Consent Boundary

**Mucklin**

| Planning Reference | Development Description | Lodgement Date | Address |
|---|---|---|---|
| 0059 | INSTALLATION OF SEPTIC TANK WITH PERCOLATION AREA AND DOMESTIC GARAGE AND MAKING A | 25/01/2000 | MUCKLIN, BRACKLYN, MULLINGAR |
| 0195 | DORMER BUNGALOW WITH PURAFLO WASTE WATER TREATMENT SYSTEM | 30/01/2001 | MUCKLIN, BRACKLYN, MULLINGAR |
| 062205 | PERMISSION TO CONSTRUCT A BUNGALOW WITH A PROPRIETARY WASTE WATER TREATMENT SY | 04/07/2006 | MUCKLIN, BRACKLYN, MULLINGAR |

**Clondalee More**

| Planning Reference | Development Description | Lodgement date | Address |
|---|---|---|---|
| 001877 | to build an extension to the rear of an existing dwelling with a puraflo waste water treatment system from that | 29/09/2000 | Clondalee More, Co. Meath |
| 002102 | building of a dormer type dwelling & domestic garage, installation of septic tank & percolation area & opening | 20/11/2000 | Clondalee More, Co. Meath |
| 01666 | alteration & extension to house & erection of double garage | 08/06/2001 | Clondalee More, Co. Meath |
| 01878 | building adormer bungalow with a puraflo waste water treatment system & new entrance onto public road | 18/07/2001 | Clondalee More, Co. Meath |
| 921122 | to extend and alter dwelling | 24/09/1992 | Clondalee More, Co. Meath |
| 931070 | re-location of septic tank and new percolation area | 21/10/1993 | Clondalee More, Co. Meath |
| 93732 | erection of a dwelling and septic tank | 16/07/1993 | Clondalee More, Co. Meath |
| 951241 | to retain the septic tank to serve a three bed-room stone cottage | 03/11/1995 | Clondalee More, Co. Meath |
| 98750 | to build a bungalow, domestic garage & septic tank | 08/05/1998 | Clondalee More, Co. Meath |
| ta20431 | erection of bungalow, domestic garage, septic tank, puraflo effluent treatment unit, percolation area and open | 20/12/2002 | Clondalee More, Co. Meath |
| TA50095 | 2 storey domestic extension to rear, comprising new sitting room / dining room, bedroom on upper floor. Rem | 21/03/2005 | Clondalee More, Co. Meath |
| TA60355 | development will consist of extension and alterations to existing dwelling. | 28/07/2006 | Clondalee More, Co. Meath |
| TA70379 | to erect new slatted shed and ancillary site works | 27/06/2007 | Clondalee More, Co. Meath |
| TA70380 | to erect a new straw-bedded shed and ancillary site works | 27/06/2007 | Clondalee More, Co. Meath |
| TA70387 | to erect new straw-bedded shed, new slurry tank, new dungsted and ancillary site works | 03/08/2007 | Clondalee More, Co. Meath |
| TA70391 | to erect new slatted shed and ancillary site works | 28/06/2007 | Clondalee More, Co. Meath |
| TA803118 | (1) renovations/alterations to our existing one and a half storey dwelling (2) the construction of a one and a ha | 10/11/2008 | Clondalee More, Co. Meath |

**Killagh**

| Planning Reference | Development Descrioption | Lodgement Date | Address |
|---|---|---|---|
| 001129 | ERECT HOUSE & INSTALL SEPTIC TANK AND PERCOLATION AREA | 08/08/2000 | Killough, Killucan |
| 001133 | Relocate Septic Tank | 08/08/2000 | Killough, Killucan |
| 0017 | 1 HOUSE WITH SEPTIC TANK AND PERCOLATION AREA | 13/01/2000 | Killough, Killucan |
| 052173 | TO CONSTRUCT A BUNGALOW TYPE DWELLING, SITE BOUNDARIES, NEW ENTRANCE ON TO THE PU | 22/06/2005 | Killough, Killucan |
| 062337 | Construct a two storey house and proprietary effluent treatment system at Killagh, Delvin, Co Westmeath | 17/10/2006 | Killough, Killucan |
| 95732 | CONSTRUCTION OF TWO-STOREY DWELLING AND SEPTIC TANK | 16/11/1995 | Killough, Killucan |
| 96838 | ERECTION OF DWELLING HOUSE, SEPTIC TANK AND PERCOLATION AREA | 18/10/1996 | Killough, Killucan |
| 99326 | HOUSE AND SEPTIC TANK | 29/03/1999 | Killough, Killucan |

**Stonestown**

| Planning Reference | Development Description | Lodgement date | Address |
|---|---|---|---|
| 00392 | BUNGALOW, SEPTIC TANK AND PERC. AREA | 27/03/2000 | STONESTOWN, DELVIN |
| 00823 | TWO STOREY HOUSE, SEPTIC TANK AND PERC. AREA | 09/06/2000 | STONESTOWN, DELVIN |
| 011198 | ERECTING HOUSE AND INSTALLING SEPTIC TANK / TREATMENT PLANT | 30/10/2001 | STONESTOWN, DELVIN |
| 021150 | NEW DWELLING HOUSE AND SEPTIC TANK | 25/10/2002 | STONESTOWN, DELVIN |
| 0235 | RETAINING POLYTHENE TUNNELS, GREEN HOUSE AND SETTING OUT AREA AND PERMISSION FOR | 18/01/2002 | STONESTOWN, DELVIN |
| 032174 | DWELLING HOUSE AND SEPTIC TANK | 24/07/2003 | STONESTOWN, DELVIN |
| 032269 | FOR MOBILE HOME & SEPTIC TANK | 14/11/2003 | STONESTOWN, DELVIN |
| 032305 | NEW DWELLING HOUSE, SEPTIC TANK AND DOMESTIC GARAGE | 18/12/2003 | STONESTOWN, DELVIN |
| 042288 | SINGLE STOREY DWELLING, ENTRANCE, SEPTIC TANK AND PERCOLATION AREA AND ALSO TO DEM | 08/10/2004 | STONESTOWN, DELVIN |
| 042319 | BUNGALOW WITH A PROPRIETARY TREATMENT SYSTEM | 05/11/2004 | STONESTOWN, DELVIN |
| 052257 | TO CONSTRUCT A DORMER BUNGALOW AND DOMESTIC GARAGE WITH A SEPTIC TANK AND PERCC | 22/08/2005 | STONESTOWN, DELVIN |
| 052360 | SINGLE STOREY DWELLING, ENTRANCE AND CONNECTION TO EXISTING SITE SERVICES. | 18/11/2005 | STONESTOWN, DELVIN |
| 052383 | TO CONSTRUCT A BUNGALOW DWELLING HOUSE, A DOMESTIC GARAGE, INSTALL A PURAFLO TRE | 09/12/2005 | STONESTOWN, DELVIN |
| 062034 | TO CONSTRUCT 1 NO. DORMER / ONE AND A HALF STOREY DWELLING WITH A PROPRIETARY WAS | 03/02/2006 | STONESTOWN, DELVIN |
| 062145 | TO CONSTRUCT 1. NO DORMER BUNGALOW TYPE DWELLING WITH DETACHED GRANNY FLAT UNIT | 10/05/2006 | STONESTOWN, DELVIN |
| 072095 | NEW SLATTED CATTLE SHED WITH UNDERGROUND SLATTED SLURRY STORAGE, NEW CONCRETE | 28/03/2007 | STONESTOWN, DELVIN |
| 072209 | TO CONSTRUCT A TWO STOREY EXTENSION TO EXISTING SINGLE STOREY DWELLING HOUSE, INS | 05/06/2007 | STONESTOWN, DELVIN |
| 981437 | DEMOLISHING REAR EXTESNION, ERECTING NEW DORMER EXTENSION TO REAR, CONVERTING SH | 30/12/1998 | STONESTOWN, DELVIN |
| 991083 | 1 NO. BUNGALOW & SEPTIC TANK | 24/08/1999 | STONESTOWN, DELVIN |
| 991338 | HOUSE AND SEPTIC TANK | 14/10/1999 | STONESTOWN, DELVIN |

**Ballynakeagh**

| Planning Reference | Development Description | Lodgement Date | Address |
|---|---|---|---|
| 032033 | TO RECONSTRUCT AND EXTEND EXISTING DWELLING WHICH WILL CONSIST OF 1 NO. BEDROOM, B | 19/02/2003 | BALLYNASKEAGH,, RAHARNEY,, CO. WESTMEATH |
| 062115 | TO CONSTRUCT A SUN LOUNGE TO FRONT OF EXISTING DWELLING AND A UTILITY wc AND BEDROC | 12/04/2006 | BALLYNASKEAGH, DELVIN |
| 072035 | CHANGE OF HOUSE DESIGN ON A PREVIOUSLY APPROVED PLANNING APPLICATION (PREVIOUS PL | 16/02/2007 | BALLYNASKEAGH,, RAHARNEY,, CO. WESTMEATH |
| 072238 | TO CONSTRUCT A NEW SITE ENTRANCE AND DRIVEWAY TO EXISTING BALLYNASKEAGH HOUSE. TH | 15/06/2007 | BALLYNASKEAGH,, RAHARNEY,, CO. WESTMEATH |
| 082015 | to construct a storage shed (approx. size 158sq.m) and domestic garage and all ancillary site development wc | 23/01/2008 | BALLYNASKEAGH,, RAHARNEY,, CO. WESTMEATH |
| 90197 | EXTENSION AND RENOVATIONS TO EXISTING DWELLING | 05/04/1990 | BALLYNASKEAGH,, RAHARNEY,, CO. WESTMEATH |

**Craddanstown**

| Planning Reference | Development Description | Lodgement Date | Address |
|---|---|---|---|
| 01230 | CONSTRUCTION OF DWELLING HOUSE WITH SEPTIC TANK AND PERCOLATION AREA | 28/02/2001 | CRADDANSTOWN, RAHARNEY, CO WESTMEATH |
| 062383 | Permission to constuct a new dormer bungalow, domestic garage, proprietary treatment plant and percolation | 16/11/2006 | CRADDANSTOWN, RAHARNEY, CO WESTMEATH |
| 062413 | To construct 1 No. Two storey dwelling and detached domestic garage, install a proprietary waste water treatr | 06/12/2006 | CRADDANSTOWN, RAHARNEY, CO WESTMEATH |
| 062429 | Permission to construct a 11/2 storey dwelling and domestic garage with a proprietary waste water treatment s | 15/12/2006 | CRADDANSTOWN, RAHARNEY, CO WESTMEATH |
| 072032 | CONSTRUCT A DORMER STYLE BUNGALOW AND DOMESTIC GARAGE WITH A SEPTIC TANK AND PE | 14/02/2007 | CRADDANSTOWN, RAHARNEY, CO WESTMEATH |
| 072038 | TO CONSTRUCT A NEW TWO STOREY DWELLING HOUSE, DOMESTIC GARAGE, SEPTIC TANK & PER | 19/02/2007 | CRADDANSTOWN, RAHARNEY, CO WESTMEATH |
| 072168 | Construct a detached domestic garage located to the side of existing dwelling, also construct a stable building | 09/05/2007 | CRADDANSTOWN, RAHARNEY, CO WESTMEATH |
| 072257 | TO CONSTRUCT A SLATTED SHED AND SILAGE SLAB WITH ALL ANCILLARY SITE WORKS | 26/06/2007 | CRADDANSTOWN, RAHARNEY, CO WESTMEATH |
| 082092 | Permission to construct a new dormer bungalow dwelling house, proprietary treatment plant and percolation a | 04/04/2008 | CRADDANSTOWN, RAHARNEY, CO WESTMEATH |
| 082101 | Planning permission to demolish existing dwelling house and planning permission to erect a new replacement | 16/04/2008 | CRADDANSTOWN, RAHARNEY, CO WESTMEATH |
| 082157 | Retention permission for a single storey garage & home office to the rear of the existing dwelling house | 09/06/2008 | CRADDANSTOWN, RAHARNEY, CO WESTMEATH |

**Bracklin**

| Planning Reference | Development Description | Lodgement Date | Address |
|---|---|---|---|
| 01228 | RETENTION OF DOUBLE GARAGE TO SITE | 28/02/2001 | BRACKLIN, CO WESTMEATH |
| 02194 | Relocating septic tank & percolation area | 28/02/2002 | BRACKLIN, CO WESTMEATH |
| 032310 | NEW DWELLING HOUSE, SEPTIC TANK AND DOMESTIC GARAGE | 23/12/2003 | BRACKLIN, CO WESTMEATH |
| 055281 | CONSTRUCTING A SEPTIC TANK WITH PERCOLATION AREA | 10/06/2005 | BRACKLIN, CO WESTMEATH |
| 072102 | OF DEVELOPMENT AS BUILT AND CHANGE OF HOUSE PLANS FROM THAT GRANTED UNDER FILE RE | 30/03/2007 | BRACKLIN, CO WESTMEATH |
| 092018 | Retention permission for an existing 4550 cubic meter slurry storage tank and external sump at Bracklyn, Delv | 17/02/2009 | BRACKLIN, CO WESTMEATH |
| 092025 | Permission for a pig rearing unit to accommodate 744 sows, facilities to rear weaners to 30kgs, staff facilities, | 03/03/2009 | BRACKLIN, CO WESTMEATH |

**Martinstown**

| Planning Reference | Development Descriotion | Lodgement Date | Address |
|---|---|---|---|
| 99274 | EXTENSION TO BUNGALOW | 16/03/1999 | MARTINSTOWN, CROOKEDWOOD |
| 99504 | DORMER BUNGALOW AND SEPTIC TANK | 04/05/1999 | MARTINSTOWN, COLLINSTOWN |
| 99658 | BUNGALOW, SEPTIC TANK AND PERCOLATION AREA | 28/05/1999 | MARTINSTOWN, FORE |
| 99765 | RETAINING HOUSE, GARAGE, SEPTIC TANK AND ENTRANCE TO SITE | 18/06/1999 | MARTINSTOWN, DELVIN |
| 99788 | DOMESTIC GARAGE | 24/06/1999 | MARTINSTOWN, DELVIN |
| 99805 | CONSTRUCT 3 NO. DWELLINGS, PERCOLATION AREAS AND SEPTIC TANKS | 28/06/1999 | MARTINSTOWN,, DELVIN |
| 981289 | ERECT BUNGALOW & SEPTIC TANK | 25/11/1998 | MARTINSTOWN,, CROOKEDWOOD,, MULLINGAR |
| 981352 | EXTENSION TO EXISTING DWELLING | 10/12/1998 | MARTINSTOWN,, COLLINSTOWN |
| 981366 | CHANGE OF HOUSE TYPE ON PREVIOUSLY GRANTED FILE REF. 98/841 | 15/12/1998 | MARTINSTOWN,, DELVIN |
| 98841 | BUNGALOW & SEPTIC TANK | 10/08/1998 | MARTINSTOWN,, DELVIN |
| 9888 | BUNGALOW AND SEPTIC TANK... | 05/02/1998 | MARTINSTOWN,, CROOKEDWOOD |
| 991171 | EXTENSION TO EXISTING KITCHEN, CONVERTING EXISTING GARAGE TO BEDROOM AND BUILDING N | 08/09/1999 | MARTINSTOWN, CROOKEDWOOD, MULLINGAR |
| 991411 | 1 HOUSE AND SEPTIC TANK | 27/10/1999 | MARTINSTOWN, DELVIN |
| 991592 | 2 HOUSES AND SEPTIC TANKS | 01/12/1999 | MARTINSTOWN, DELVIN |
| 991664 | 2 BUNGALOWS, SEPTIC TANKS AND PERCOLATION AREAS | 14/12/1999 | MARTINSTOWN, DELVIN |
| 96153 | CONSTRUCTION OF LIVING ROOM AND BEDROOM EXTENSION | 05/03/1996 | MARTINSTOWN,, COLLINSTOWN,, CO. WESTMEATH |
| 96210 | KNOCKING DOWN EXISTING STABLES & BUILD BUNGALOW ON SAME SITE | 25/03/1996 | WOOD COTTAGE,, MARTINSTOWN,, CROOKEDWOOD |
| 96698 | ERECTION OF DORMER DWELLING HOUSE AND SEPTIC TANK | 30/08/1996 | MARTINSTOWN,, CROOKEDWOOD,, MULLINGAR |
| 97678 | DWELLING HOUSE, SEPTIC TANK AND PERCOLATION AREA | 15/07/1997 | MARTINSTOWN,, DELVIN |
| 97857 | ADDITION OF DORMER WINDOWS AND 2 NO. EN-SUITE BATHROOMS TO FIRST FLOOR | 08/09/1997 | DERRAVARAGH LODGE,, MARTINSTOWN,, CROOKEDWOOD |
| 9797 | ALTERATIONS AND EXTENSION TO DWELLING HOUSE | 14/02/1997 | MARTINSTOWN,, DELVIN |
| 981137 | BUNGALOW, SEPTIC TANK AND PERCOLATION AREA | 16/10/1998 | MARTINSTOWN,, FORE |
| 91294 | RECONSTRUCTION, INSTAL SEPTIC TANK & RETAIN DEV | 09/05/1991 | MARTINSTOWN,, CROOKEDWOOD,, MULLINGAR |
| 91344 | ERECTION OF BUNGALOW AND SEPTIC TANK | 04/06/1991 | MARTINSTOWN TD., COLLINSTOWN |
| 92248 | ERECTION OF HOUSE AND SEPTIC TANK | 02/10/1992 | MARTINSTOWN,, DELVIN. |
| 9225 | ERECTION OF HOUSE & INSTALLATION OF SEPTIC TANK | 20/01/1992 | MARTINSTOWN,, COLLINSTOWN |
| 9226 | EXTENSION TO HOUSE | 20/01/1992 | MARTINSTOWN,, COLLINSTOWN |
| 935 | EXTENSION TO HOUSE | 05/01/1993 | ROSE COTTAGE,, MARTINSTOWN,, DELVIN |
| 94524 | ERECTION OF NEW BUNGALOW AND SEPTIC TANK | 19/08/1994 | MARTINSTOWN,, DELVIN |
| 94681 | CONSTRUCT BUNGALOW AND SEPTIC TANK | 18/11/1994 | MARTINSTOWN,, DELVIN |
| 90191 | ERECTION OF DWELLING HOUSE | 04/04/1990 | MARTINSTOWN,, CROOKEDWOOD,, MULLINGAR. |
| 90346 | EXTENSION TO HOUSE & INSTALLATION OF SEPTIC TANK | 07/06/1990 | MARTINSTOWN,, CROOKEDWOOD |
| 90388 | ERECTION OF HOUSE AND SEPTIC TANK | 28/06/1990 | MARTINSTOWN,, CROOKEDWOOD,, MULLINGAR |
| 90555 | SEPTIC TANK & CONVERT OUTBUILDING TO BATHROOM | 20/09/1990 | MARTINSTOWN,, COLLINSTOWN |
| 72425 | dormer type dwelling house, septic tank, percolation area & all necessary site development works | 06/12/2007 | Martinstown, Collinstown, Co. Westmeath |
| 075209 | CONSTRUCTING A 4 BAY SLATTED SHED WITH UNDERGROUND SLURRY STORAGE TANK AND DUNC | 10/04/2007 | MARTINSTOWN, CROOKEDWOOD |
| 082118 | To demolish existing garage/store and full planning permission is being sought to construct bakery building, pi | 29/04/2008 | Martinstown, Collinstown, Co. Westmeath |
| 065415 | ALTERATION AND EXTENSION TO EXISTING DWELLING | 24/08/2006 | DERRAVARAGH LODGE,, MARTINSTOWN,, CROOKEDWOOD,, MULLINGAR, CO. WESTMEATH |
| 065506 | RECONSTRUCTION AND EXTENSION TO EXISTING DWELLING CONSISTING OF A 72 SQ.M. EXTENSIC | 12/10/2006 | LAKEHOUSE 2, MARTINSTOWN, CROOKEDWOOD, MULLINGAR |
| 065628 | ERECTING A CLADDED SHEEP HOUSING UNIT, LOOSE BOX STABLING, SAND ARENA, CONTAINMENT | 14/12/2006 | MARTINSTOWN, CROOKEDWOOD, MULLINGAR |
| 072092 | SINGLE STOREY DWELLING WITH EFFLUENT TREATMENT SYSTEM, PERCOLATION AREA AND ASSO | 27/03/2007 | MARTINSTOWN,, COLLINSTOWN,, CO. WESTMEATH |
| 072331 | FOR A DORMER TYPE DWELLING HOUSE, DOMESTIC GARAGE, SEPTIC TANK AND PERCOALTION AF | 29/08/2007 | MARTINSTOWN,, COLLINSTOWN,, CO. WESTMEATH |

| | | | |
|---|---|---|---|
| 072400 | to construct 1 no. dormer/storey and a half type dwelling and detached domestic garage and store; form new e | 14/11/2007 | Martinstown, Delvin, Co. Westmeath |
| 052195 | CONSTRUCTING A NEW ENTRANCE ONTO THE PUBLIC ROAD, AND THE CONSTRUCTION OF A 4 BEL | 07/07/2005 | MARTINSTOWN, DELVIN |
| 052341 | TO CHANGE HOUSE DESIGN FROM THAT GRANTED UNDER PLANNING REF NO: 03/2204 BY CONVER | 27/10/2005 | MARTINSTOWN, COLLINSTOWN |
| 062037 | EXTENSION TO DWELLING HOUSE | 08/02/2006 | MARTINSTOWN, DELVIN |
| 062112 | A NEW TWO STOREY DWELLING WITH SINGLE STOREY WING AND ASSOCIATED GARAGE, SEPTIC T | 10/04/2006 | MARTINSTOWN, DELVIN |
| 062242 | THE DEVELOPMENT WILL CONSIST CONSTRUCTION OF SLATTED SHED AND SLURRY TANK | 31/07/2006 | MARTINSTOWN, COLLINSTOWN |
| 065189 | DEMOLITION OF EXISTING SINGLE STOREY EXTENSION ON THE NORTH FACING ELEVATION WITH P | 20/04/2006 | MARTINSTOWN, CROOKEDWOOD |
| 035096 | CONSTRUCTING 1 NO. EXTENSION TO EXISTING BUNGALOW AND TO CONNECT TO EXISTING SEPTI | 07/03/2003 | MARTINSTOWN, CROOKEDWOOD, MULLINGAR |
| 042014 | NEW DWELLING HOUSE AND SEPTIC TANK | 19/01/2004 | MARTINSTOWN,, DELVIN,, CO. WESTMEATH |
| 042214 | ERECT A ONE AND A HALF STOREY EXTENSION (131.73 M SQ) TO THE GABLE END OF EXISTING SIN | 27/07/2004 | MARTINSTOWN,, COLLINSTOWN,, CO. WESTMEATH |
| 045052 | CONSTRUCTION OF HOUSE, SEPTIC TANK AND PERCOLATION AREA | 30/01/2004 | MARTINSTOWN, CROOKEDWOOD, MULLINGAR |
| 01477 | TWO SLATTED SHEDS WITH FEED PASSAGE WAYS, ONE STRAW SHED WITH FEED PASSAGE AND S | 20/04/2001 | MARTINSTOWN, CROOKEDWOOD |
| 02130 | RETAINING RENOVATIONS TO EXISTING DWELLING HOUSE | 14/02/2002 | MARTINSTOWN, FORE |
| 02246 | RENOVATING AND EXTENDING EXISTING SINGLE STOREY DWELLING TO A DORMER BUNGALOW | 12/03/2002 | MARTINSTOWN, CROOKEDWOOD |
| 02908 | NEW DWELLING HOUSE AND SEPTIC TANK | 23/08/2002 | MARTINSTOWN, DELVIN, CO. WESTMEATH |
| 032082 | DORMER BUNGALOW, SEPTIC TANK AND PERCOLATION AREA. | 28/04/2003 | MARTINSTOWN |
| 032204 | TO CONSTRUCT A BUNGALOW WITH A PROPRIETARY WASTE WATER TREATMENT SYSTEM | 28/08/2003 | MARTINSTOWN,, COLLINSTOWN,, CO. WESTMEATH |
| 001351 | DORMER BUNGALOW, GARAGE AND SEPTIC TANK | 22/09/2000 | MARTINSTOWN, DELVIN |
| 0021 | BUNGALOW, SEPTIC TANK AND PERCOLATION AREA | 13/01/2000 | MARTINSTOWN, DELVIN |
| 00483 | TWO STOREY EXTENSION TO REAR OF HOUSE | 13/04/2000 | MARTINSTOWN, COLLINSTOWN |
| 01115 | CONVERSION OF EXISTING STABLES TO EXTENSION OF DWELLING HOUSE | 05/02/2001 | WOOD COTTAGE, MARTINSTOWN, CROOKEDWOOD |
| 011196 | CHANGE SITE BOUNDARIES FROM THAT GRANTED UNDER PLANNING REGISTER NO. 01/423 | 26/10/2001 | MARTINSTOWN, COLLINSTOWN |
| 01412 | CONSTRUCTION OF FRONT PORCH AND ALTERATION/RENOVATION OF DWELLING | 05/04/2001 | MARTINSTOWN, COLLINSTOWN |

**Grange More**

| Planning Reference | Development Description | Lodgement Date | Address |
|---|---|---|---|
| 97309 | BUNGALOW AND SEPTIC TANK | 14/04/1997 | GRANGE MORE,, RAHARNEY |
| 99120 | 1 HOUSE AND SEPTIC TANK | 11/02/1999 | GRANGE MORE,, RAHARNEY |
| 99654 | BUNGALOW, SEPTIC TANK AND PERCOLATION AREA | 28/05/1999 | GRANGE MORE,, RAHARNEY |

**Bolandstown**

| Planning Reference | Development Description | Lodgement Date | Address |
|---|---|---|---|
| 00603 | BUNGALOW WITH SEPTIC TANK AND PERC. AREA | 08/05/2000 | BOLANDSTOWN, DELVIN |
| 052061 | TO INSTALL NEW SEPTECH 2000 WASTEWATER TREATMENT SYSTEM AND PERCOLATION AREA | 06/04/2005 | BOLANDSTOWN, DELVIN |
| 991630 | BUNGALOW WITH SEPTIC TANK AND PERCOLATION AREA | 07/12/1999 | BOLANDSTOWN, DELVIN |

**Ballyhealy or Ballinure**

| Planning Reference | Development Description | Lodgement Date | Address |
|---|---|---|---|
| 001333 | HOUSE WITH SEPTIC TANK AND PERC. AREA AND COMMON ENTRANCE ON SITE NO. 2 - 99/682 REFE | 18/09/2000 | Ballyhealy, Devlin |
| 00245 | DORMER BUNGALOW, SEPTIC TANK AND ENTRANCE | 29/02/2000 | Ballyhealy, Devlin |
| 00733 | DORMER BUNGALOW, SEPTIC TANK AND PERC. AREA | 25/05/2000 | Ballyhealy, Devlin |
| 032107 | RETENTION OF BEDROOM (INSTEAD OF DOMESTIC GARAGE AS INDICATED ON PREVOIUS PLAN) | 16/05/2003 | Ballyhealy, Devlin |
| 032288 | OF DETACHED MUSIC ROOM TO THE REAR OF EXISTING BUNGALOW | 05/12/2003 | Ballyhealy, Devlin |
| 042033 | TO CONSTRUCT A DORMER BUNGALOW AND A PROPRIETARY WASTE WATER TREATMENT SYSTEM | 13/02/2004 | Ballyhealy, Devlin |
| 062117 | TO CONSTRUCT 1 NO. DORMER TYPE DWELLING AND DOUBLE GARAGE TO CONNECT TO EXISTING | 13/04/2006 | Ballyhealy, Devlin |
| 062181 | A FRONT PORCH, SINGLE STOREY EXTENSION TO THE REAR OF EXISTING DWELLING, RETENTION | 02/06/2006 | Ballyhealy, Devlin |
| 062281 | TO ERECT A DWELLING HOUSE, SEPTIC TANK AND PERCOLATION AREA | 01/09/2006 | Ballyhealy, Devlin |
| 072053 | PERMISSION TO CONSTRUCT A 1 1/2 STOREY DWELLING AND DOMESTIC GARAGE WITH A PROPRIE | 01/03/2007 | Ballyhealy, Devlin |
| 082252 | Permission to retain a conservatory to the south of existing one and a half storey dwelling. | 30/10/2008 | Ballyhealy, Devlin |
| 092059 | Permission to retain an existing building (loading bay) with a freezer storage building attached, portable timbe | 20/05/2009 | Ballyhealy, Devlin |
| 91116 | EXTENSION TO HOUSE | 28/02/1991 | Ballyhealy, Devlin |
| 94322 | ERECTION OF HOUSE & SEPTIC TANK | 13/05/1994 | Ballyhealy, Devlin |
| 95245 | CONSTRUCTION OF SLATTED CATTLE SHED WITH UNDERFLOOR SLURRY TANK AND ALSO OUTDOO | 20/04/1995 | Ballyhealy, Devlin |
| 9639 | FITTING OUT AND INSTALLATION OF A NEW PITCHED SLATED ROOF, WINDOWS, PORCH AND NEW S | 26/01/1996 | Ballyhealy, Devlin |
| 96777 | RENOVATE LODGE AND BUILD 3-BEDROOMS, KITCHEN, BATHROOM EXTENSION AND SEPTIC TANK | 26/09/1996 | Ballyhealy, Devlin |
| 98187 | RETAINING DWELLING AND SEPTIC TANK & ERECTING DOMESTIC OUT-HOUSE | 04/03/1998 | Ballyhealy, Devlin |
| 98972 | BUNGALOW AND SEPTIC TANK | 08/09/1998 | Ballyhealy, Devlin |
| 991194 | WORKSHOP | 10/09/1999 | Ballyhealy, Devlin |
| 991447 | RETAINING EXISTING EXTENSION TO HOUSE | 04/11/1999 | Ballyhealy, Devlin |
| 991702 | 1 HOUSE AND PURAFLO SEWERAGE TREATMENT SYSTEM | 17/12/1999 | Ballyhealy, Devlin |
| 99682 | 2 NO. HOUSES AND SEPTIC TANKS | 04/06/1999 | Ballyhealy, Devlin |
| 062181 | A FRONT PORCH, SINGLE STOREY EXTENSION TO THE REAR OF EXISTING DWELLING, RETENTION | 02/06/2006 | BALLYHEALY, DELVIN, CO. WESTMEATH |
| 062281 | TO ERECT A DWELLING HOUSE, SEPTIC TANK AND PERCOLATION AREA | 01/09/2006 | BALLYHEALY OR BALLINURE, DELVIN |
| 991702 | 1 HOUSE AND PURAFLO SEWERAGE TREATMENT SYSTEM | 17/12/1999 | BALLYHEALY OR BALLINURE, DELVIN |

**Riverdale**

| Planning Reference | Development Description | Lodgement Date | Address |
|---|---|---|---|
| 00184 | NEW FRONT PORCH AND EXTENSION TO REAR OF DWELLING | 21/02/2000 | RIVERDALE, RAHARNEY |
| 00522 | BUNGALOW, SEPTIC TANK, GARAGE AND PERC. AREA | 18/04/2000 | RIVERDALE, RAHARNEY |

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|---|---|---|---|
| 00819 | TWO STOREY HOUSE, GARAGE, SEPTIC TANK AND PERC. AREA | 09/06/2000 | RIVERDALE, RAHARNEY |
| 00912 | SINGLE STOREY EXTENSION TO EXISTING COTTAGE | 28/06/2000 | RIVERDALE, RAHARNEY |
| 011035 | BUNGALOW, SEPTIC TANK AND PERC. AREA | 04/09/2001 | RIVERDALE, RAHARNEY |
| 011172 | RETAINING AND EXTENDING EXISTING FACTORY | 18/10/2001 | RIVERDALE, RAHARNEY |
| 021049 | CONSTRUCTING 1 NO. DORMER STYLE DWELLING, SEPTIC TANK, PERC. AREA AND ASSOC. SITE W( | 27/09/2002 | RIVERDALE, RAHARNEY |
| 0269 | DORMER HOUSE, GARAGE, SEPTIC TANK AND PERC. AREA | 28/01/2002 | RIVERDALE, RAHARNEY |
| 032061 | RETAIN EXISTING BAF WASTE WATR TREATMENT UNIT AND PERCOLATION AREA | 03/04/2003 | RIVERDALE, RAHARNEY |
| 042092 | BUILD A NEW EXTENTION, BATHROOM, KITCHEN AND BEDROOMS AND GARAGE AND CONSERVATO | 14/04/2004 | RIVERDALE, RAHARNEY |
| 042153 | RETENTION AND CONTINUATION FOR A 2 YEAR PERIOD OF GRAVEL EXTRACTION, PROVISION OF L( | 03/06/2004 | RIVERDALE, RAHARNEY |
| 062246 | TO CONSTRUCT 1 NO. BUNGALOW TYPE DWELLING, PROPRIETARY WASTEWATER TREATMENT SY( | 02/08/2006 | RIVERDALE, RAHARNEY |
| 062400 | To construct a storey & a half type dwelling and detached domestic garage & store, install a proprietary waste | 28/11/2006 | RIVERDALE, RAHARNEY |
| 072146 | TO CONSTRUCT AN EXTENSION TO THE REAR & RAISE ROOF LEVEL OF EXISTING SINGLE STOREY I | 25/04/2007 | RIVERDALE, RAHARNEY |
| 082171 | planning permission to erect new dwelling house, septic tank treatment system, percolation area and ancillary | 02/07/2008 | RIVERDALE, RAHARNEY |
| 082190 | Full Planning permission is sought for the demolition of all the flat roof additions to the existing dwelling house | 21/07/2008 | RIVERDALE, RAHARNEY |
| 082218 | The extension of use of an existing quarry granted under planning reference 04/2153 for the extraction of sanc | 12/09/2008 | RIVERDALE, RAHARNEY |
| 082253 | To construct 4 No. dormers and retention permission for 2 No. gable windows to existing dwelling. Also retenti | 31/10/2008 | RIVERDALE, RAHARNEY |
| 092012 | Planning permission to carry out alterations to perviously granted planning file ref no. 08/2171, erect new dwel | 03/02/2009 | RIVERDALE, RAHARNEY |
| 9022 | ERECTION OF HOUSE | 18/01/1990 | RIVERDALE, RAHARNEY |
| 90336 | RE-ROOF, EXTEND,RETAIN EXT.ALTER FRONT & NEW SHED | 31/05/1990 | RIVERDALE, RAHARNEY |
| 91218 | HOTEL/COUNTRY CLUB WITH 10 GUEST (+2 STAFF) ROOMS | 17/04/1991 | RIVERDALE, RAHARNEY |
| 91317 | 15 BEDROOMS,BAR EXT. & ASSOC.SEWERAGE TREATMENT | 20/05/1991 | RIVERDALE, RAHARNEY |
| 97772 | CONVERTING BUNGALOW TO DORMER BUNGALOW AND ADDING BAY WINDOW TO FRONT OF SAID | 07/08/1997 | RIVERDALE, RAHARNEY |
| 981425 | HOUSE AND SHED, SEPTIC TANK AND PERCOLATION AREA | 23/12/1998 | RIVERDALE, RAHARNEY |
| 99158 | BUNGALOW, SEPTIC TANK AND PERCOLATION AREA | 17/02/1999 | RIVERDALE, RAHARNEY |
| 99813806 | Construct new entrance and carpark at Riverdale House, Canal Banks, Athlone. | 18/03/1999 | RIVERDALE, RAHARNEY |

**Clonmorrill**

| Planning Reference | Development Description | Lodgement date | Address |
|---|---|---|---|
| 052033 | TO CONSTRUCT A ONE AND A HALF STOREY DWELLING AND TO INSTALL A PROPRIETARY WASTE W | 24/02/2005 | CLONMORRILL,, DELVIN,, CO. WESTMEATH |
| 072042 | CONSTRUCTION OF A GARAGE (60 SQ. METRES) AND ATTACHED CAR-PORT (34 SQ. METRES) | 21/02/2007 | CLONMORRILL,, DELVIN,, CO. WESTMEATH |
| 95606 | ERECTION OF HOUSE | 06/09/1995 | CLONMORRILL,, DELVIN,, CO. WESTMEATH |
| 96857 | ERECTION OF DWELLING HOUSE, SEPTIC TANK AND PERCOLATION AREA | 25/10/1996 | CLONMORRILL,, DELVIN,, CO. WESTMEATH |

**Coolronan**

| Planning Ref | Development Description | Lodgement Date | Address |
|---|---|---|---|
| 1290 | to erect revised dormer type dwelling with link to domestic garage from that previously granted under planning | 20/06/2000 | Coolronan, Ballivor, Co Meath |
| 1898 | change of house type, site layout, entrance location and biocycle unit from that of P00/1898 | 04/10/2000 | Coolronan, Ballivor, Co Meath |
| 0037 | to build bungalow, domestic garage & puraflo effluent treatment system under current Ref. No. 00/37 | 20/01/2000 | Coolronan, Ballivor, Co Meath |
| 00672 | storey & a half extension to existing storey & a half cottage & for provision of septic tank | 03/04/2000 | Coolronan, Ballivor, Co Meath |
| 011300 | the erection of a replacement dwelling & use of existing old dwelling as domestic fuel store, building domestic | 24/10/2001 | Coolronan, Ballivor, Co Meath |
| 01274 | building an extension to rear of existing dwelling and to replace existing roof, also to construct septic tank and | 16/03/2001 | Coolronan, Ballivor, Co Meath |
| 01777 | to retain alterations and extension to public house, including toilets, corridor and change of use from shop and | 25/06/2001 | Coolronan, Ballivor, Co Meath |
| 01876 | the erection of a two storey residence, septic tank & percolation area, garage & stables | 17/07/2001 | Coolronan, Ballivor, Co Meath |
| 01978 | to build a bungalow & domestic garage, install septic tank & percolation area & open new entrance | 07/08/2001 | Coolronan, Ballivor, Co Meath |
| 90430 | installation of septic tank and provision of percolation area | 04/04/1990 | Coolronan, Ballivor, Co Meath |
| 911082 | erection of four stables | 13/09/1991 | Coolronan, Ballivor, Co Meath |
| 9279 | back extension to existing dwelling | 27/01/1992 | Coolronan, Ballivor, Co Meath |
| 92941 | to retain shed for storage of machinery and turf... | 07/08/1992 | Coolronan, Ballivor, Co Meath |
| 961360 | to erect a bungalow, garage, septic tank, percolation area and new entrance | 07/11/1996 | Coolronan, Ballivor, Co Meath |
| 971722 | to demolish house and shed and erect new dwelling, septic tank and puraflo system | 04/12/1997 | Coolronan, Ballivor, Co Meath |
| 97615 | to make alterations to ground floor living rooms, to install additional window and entrance door in front elevatic | 09/05/1997 | Coolronan, Ballivor, Co Meath |
| 981795 | to build dwelling house & domestic garage, instal septic tank & percolation area & make improvements to exis | 07/10/1998 | Coolronan, Ballivor, Co Meath |
| 981843 | to build a two storey house with septic tank & percolation area & to alter existing entrance for domestic use | 14/10/1998 | Coolronan, Ballivor, Co Meath |
| 9825 | to erect a bungalow, septic tank and percolation area | 16/01/1998 | Coolronan, Ballivor, Co Meath |
| 9872 | to build dwelling house and domestic garage, install septic tank and percolation area and make new entrance | 26/01/1998 | Coolronan, Ballivor, Co Meath |
| 991936 | to amend front elevation from that previously granted under planning reference number 98/1843 | 22/09/1999 | Coolronan, Ballivor, Co Meath |
| 992051 | to build dormer type dwelling,install septic tank and puraflo effluent treatment system, build domestic garage a | 08/10/1999 | Coolronan, Ballivor, Co Meath |
| 99572 | to amend condition 1 of previous planning reference number 98/1843 relocating position of house on revised s | 29/03/1999 | Coolronan, Ballivor, Co Meath |
| 99966 | to modify existing agricultural entrance for new entrance into existing house | 12/05/1999 | Coolronan, Ballivor, Co Meath |
| FS8047 | Construction of a clubhouse | 11/03/2008 | Coolronan, Ballivor, Co Meath |
| TA20081 | demolition of existing derelict cottage and shed and for construction of detached bungalow, detached domesti | 08/03/2002 | Coolronan, Ballivor, Co Meath |
| TA20208 | a dwelling house, domestic garage, septic tank, percolation area and to erect splayed entrance to site | 31/05/2002 | Coolronan, Ballivor, Co Meath |
| TA30042 | erection of domestic garage incorporating store at rear of house | 12/02/2003 | Coolronan, Ballivor, Co Meath |
| TA30248 | alterations to dwelling house to include dormer windows in front elevation with increased ground floor area fro | 10/07/2003 | Coolronan, Ballivor, Co Meath |
| TA30291 | a two-storey dwelling, domestic garage, septic tank, percolatioln area and widen and recess existing entrance | 31/07/2003 | Coolronan, Ballivor, Co Meath |
| TA30314 | extension to 'Swan Inn' Licenced Premises, comprising the provision of additional toilets to east end of premis | 21/08/2003 | Coolronan, Ballivor, Co Meath |

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| TA40048 | the conversion of existing bungalow into a dormer bungalow and retention and permission for completion of pa | 12/02/2004 | Coolronan, Ballivor, Co Meath |
| TA40264 | replacement of septic tank and percolation area, retention of outbuildings to rear, extension to rear and porch | 28/07/2004 | Coolronan, Ballivor, Co Meath |
| TA40350 | the erection of a two storey extension to side and rear of an existing house, erection of a storage ... | 15/09/2004 | Coolronan, Ballivor, Co Meath |
| TA50188 | development which will consist of the extension and modifications at side and rear of existing single storey cot | 17/06/2005 | Coolronan, Ballivor, Co Meath |
| TA50219 | a dwelling and septic tank. Revisions from that previously submitted under current reg. number TA/50219 incl | 27/06/2005 | Coolronan, Ballivor, Co Meath |
| TA50292 | development will comprise of the construction of a dwelling, an approved waste water treatment system to EP. | 13/07/2005 | Coolronan, Ballivor, Co Meath |
| TA60167 | retention to retain (a) house side extension, (b) house rear extension and (c) retain garage/shed | 03/07/2006 | Coolronan, Ballivor, Co Meath |
| TA60188 | 1 no. two storey dwellinghouse complete with detached garage/store, septic tank, percolation area, entrance c | 22/05/2006 | Coolronan, Ballivor, Co Meath |
| TA60239 | to erect a storey and a half styled dwelling height 9.725m, with separate domestic garage height 6.41m, a sep | 11/07/2006 | Coolronan, Ballivor, Co Meath |
| TA60243 | the erection of a dormer style dwelling, septic tank, BAF treatment plant and new entrance | 26/05/2006 | Coolronan, Ballivor, Co Meath |
| TA60252 | a bungalow type dwelling, domestic garage, BAF proprietary wastewater treatment system, percolation area a | 30/05/2006 | Coolronan, Ballivor, Co Meath |
| TA60328 | erect two new slatted sheds | 19/07/2006 | Coolronan, Ballivor, Co Meath |
| TA60354 | development will consist of demolishing existing front porch and constructing a new front porch and a two stor | 28/07/2006 | Coolronan, Ballivor, Co Meath |
| TA60428 | development will consist of a 192sqm extension to cattle sheds, a 150,000 gallon effluent storage tank and du | 10/11/2006 | Coolronan, Ballivor, Co Meath |
| TA60450 | development will consist of the erection of a one and half storey residence also domestic garage and proprieta | 22/09/2006 | Coolronan, Ballivor, Co Meath |
| TA60524 | development will consist of constructing a clay pigeon shooting range including a single storey club house, a s | 24/11/2006 | Coolronan, Ballivor, Co Meath |
| TA70102 | retention of private greyhound schooling track | 08/03/2007 | Coolronan, Ballivor, Co Meath |
| TA70508 | detached dormer style dwelling, detached domestic garage, proprietayr domestic effluent treatment system, st | 30/08/2007 | Coolronan, Ballivor, Co Meath |
| TA70509 | storey and a half type dwelling, domestic garage, proprietary wastewater treatment system, percolation area a | 30/08/2007 | Coolronan, Ballivor, Co Meath |
| TA70554 | habitable roof space including 3 No. dormer windows to front and 2 No. dormer and 1 no. velux windows to ba | 26/10/2007 | Coolronan, Ballivor, Co Meath |
| TA70568 | constructing a bungalow with proprietary waste water treatment system | 27/09/2007 | Coolronan, Ballivor, Co Meath |
| TA802059 | a new dwelling, detached garage with mini-treatment plant & percolation area & to close existing entrance & to | 08/07/2008 | Coolronan, Ballivor, Co Meath |
| TA900412 | (1) the construction of a dormer two storey type dwelling (2) domestic garage (3) recessed entrance (4) BAF e | 26/03/2009 | Coolronan, Ballivor, Co Meath |

**Cockstown**

| Planning Ref | Development description2 | Lodgement Date | Address |
|---|---|---|---|
| 92086 | The erection of a 30m high antenna support structure with 3 no. panel antennas and 3 no. dishes attached to | 17/07/2009 | Cockstown, Delvin |

**Robinstown**

| Planning Reference | Development Description | Lodgement Date | Address |
|---|---|---|---|
| 991701 | to build extension to dwelling | 17/08/1999 | Robinstown, Ballivor, Co Meath |
| TA60461 | double sided slatted cattle accommodation with associated concrete apron to store wrapped silage bales and | 05/10/2006 | Robinstown, Ballivor, Co. Meath |

**Carranstown Great**

| Planning Reference | Development Description | Lodgement date | Address |
|---|---|---|---|
| 672 | storey & a half extension to existing storey & a half cottage & for provision of septic tank | | Carranstown Great, Ballivor, Co Meath |
| TA50090 | dormer extension over existing single storey section of dwelling together with new storey extension to front to i | 18/03/2005 | Carranstown Great, Ballivor, Co. Meath |
| TA50141 | (1)demolition of existing bungalow and construct a replacement dormer bungalow incorporating a granny flat ( | 25/05/2005 | Carranstown Great, Ballivor, Co. Meath |
| TA70375 | a dormer type dwelling, domestic garage, proprietary wastewater treatment system, percolation area and oper | 26/06/2007 | Carranstown Great, Ballivor, Co. Meath |
| TA70630 | the construction of a detached dormer style dwelling, detached domestic garage, the installation of a proprieta | 07/11/2007 | Carranstown Great, Ballivor, Co. Meath |

**Lisclougher Great**

| Planning Reference | Development Description | Lodgement Date | Address |
|---|---|---|---|
| 1180 | BUNGALOW, SEPTIC TANK & PERCOLATION AREA | | LISCLOGHER GREAT, DELVIN |
| 1604 | Bungalow | 24/11/2000 | LISCLOGHER GREAT, DELVIN |
| 574 | DORMER BUNGALOW WITH SEPTIC TANK AND PERC. AREA AND TO DEMOLISH EXISTING COTTAGE | 27/04/2000 | LISCLOGHER GREAT, DELVIN |
| 2827 | CONSTRUCT DOMESTIC GARAGE, BUNGALOW, SEPTIC TANK AND PERCOLATION AREA | 02/08/2002 | LISCLOGHER GREAT, DELVIN |
| 32039 | TO DEMOLISH SHED AND CONSTRUCT EXTENSION TO DWELLING HOUSE AND CHANGES TO EXISTI | 28/02/2003 | LISCLOGHER GREAT, DELVIN |
| 32281 | TO EXTEND EXISTING DWELLING HOUSE BY WAY OF CONVERTING SAME TO DORMER BUNGALOW | 28/11/2003 | LISCLOGHER GREAT, DELVIN |
| 42348 | NEW DWELLING HOUSE AND SEPTIC TANK WITH EFFLUENT TREATMENT SYSTEM | 15/12/2004 | LISCLOGHER GREAT, DELVIN |
| 52206 | TO EXTEND EXISTING DWELLING HOUSE AND PERMISSION TO RETAIN EXISTING DOMESTIC GARGA | 15/07/2005 | LISCLOGHER GREAT, DELVIN |
| 072144 | CONSTRUCT A NEW 4 BAY SLATTED SHED WITH UNDERGROUND SLURRY STORAGE TANKS AND 4 I | 24/04/2007 | LISCLOGHER GREAT, DELVIN |
| 72380 | consist of the erection of two-storey dwelling house and domestic garage with proprietary waste wate... | 25/10/2007 | LISCLOGHER GREAT, DELVIN |
| 72381 | to construct a one and half storey dwelling and domestic garage with a swptic tank and percolation area | 30/10/2007 | LISCLOGHER GREAT, DELVIN |
| 92549 | ERECT HOUSE AND INSTALL SEPTIC TANK | 04/09/1992 | LISCLOGHER GREAT, DELVIN |
| 93180 | EXTENSION & ALTERATION OF RESIDENCE | 19/03/1993 | LISCLOGHER GREAT, DELVIN |
| 9593 | SLATTED CATTLE SHED AND SILAGE SLAB WITH EFFLUENT TANK | 13/02/1995 | LISCLOGHER GREAT, DELVIN |
| 96611 | ERECT BUNGALOW WITH SEPTIC TANK AND PERCOLATION AREAS, AND TO PROVIDE ENTRANCE T | 02/08/1996 | LISCLOGHER GREAT, DELVIN |
| 991302 | 1 NO. HOUSE AND SEPTIC TANK | 06/10/1999 | LISCLOGHER GREAT, DELVIN |

Derryconnor

| Planning Ref | Development Description | Lodgement Date | Address |
|---|---|---|---|
| 961437 | septic tank, percolation area and well | 28/11/1996 | Derryconor, Ballivor, Co Meath |

**Killaghconnigan**

| Planning Reference | Development Description | Lodgement Date | Address |
|---|---|---|---|
| 1810 | retention of raised roof line to accommodate dormer storage & first floor windows to front & rear of existing dw | 14/09/2000 | Killaconnigan, Mullingar Road, Ballivor, Co. Meath |
| 1811 | alterations & renovations incorporating change of front elevation comprising two bay windows & porch to front | 14/09/2000 | Killaconnigan,, Mullingar Road,, Ballivor, Co. Meath |
| 11252 | construction of two storey childcare facility & ancillary works including temporary proprietary waste water treatment system. The propose | | Mullingar Road, Killaconnigan, Ballivor |
| 1707 | temporary accommodation for a period of three years comprising three classrooms each for approximately 30 students,access ramps an | | Ballivor National School, Killaconnigan, Ballivor, , Co Meath |
| 951136 | to alter and extend existing house | 04/10/1995 | Killaconnigan,, Ballivor,, Co. Meath |

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| 95239 | revised layout for previously granted dormer extension and internal alterations (planning ref. no. P94/705) | 03/03/1995 | Elm Grove,, Killaconnigan,, Ballivor, Co. Meath |
| 95292 | to erect a self-contained dormer roof extension to rear of existing house | 06/04/1995 | Killaconnigan,, Ballivor,, Co. Meath |
| 981908 | to erect a thirty metre high antennae support structure with GSM telecommunications antennas, radio link dish | 27/10/1998 | Killaconnigan, Ballivor, Co Meath |
| 98762 | to build a granny flat | 08/05/1998 | Killaconigan,, Ballivor,, Co. Meath |
| FS15007 | proposed change of use and refurbishment of the existing 545m2 national school building to a proposed new | 05/02/2015 | Old National School, Killaconnigan, Ballivor, Co Meath |
| TA30445 | retention of a 30 metre high antenna support structure carrying 6 no. GSM antennas and 3 No. 0.6m diameter | 27/11/2003 | Killaconnigan , Ballivor , Co. Meath |
| TA50228 | development will consist of dormer dwelling, entrance and driveway with all services connected to the mains s | 07/06/2005 | Killaconnigan , Ballivor , Co. Meath |
| TA60028 | the construction of a dormer dwelling, detached domestic garage, proprietary effluent treatment system and si | 27/01/2006 | Killaconnigan Td., Ballivor, Co. Meath |
| TA60526 | development will consist of an overground circular slurry storage tank with a capacity of 1067 cubic metres. Th | 07/11/2006 | Killaconnigan , Ballivor , Co. Meath |
| TA70011 | development will consist of (1) the change of use of the existing domestic garage at the rear of my dwelling to | 19/01/2007 | Killaconnigan , Ballivor , Co. Meath |
| TA70055 | retention of conversion of attic space to living accommodation together with modifications to elevations and in | 13/02/2007 | Killaconnigan, Ballivor, Co. Meath |
| TA70192 | the retention and completion of the dwelling currently under construction (Planning Reg. Ref. TA-60028). The | 01/06/2007 | Killaconnigan Td, Ballivor, Co. Meath |
| TA70232 | construction of a new 16 class room primary school and associated site works | 01/05/2007 | Killaconnigan, Ballivor, Co Meath |
| TA70682 | replacement dwelling for existing dwelling being demolished and replaced with dormer type dwelling. The deve | 11/12/2007 | Killaconnigan, Ballivor, Co. Meath |
| TA70722 | 30 metre high lattice support structure carryign GSM telecommunications equipment, associated equipment c | 20/12/2007 | Killaconnigan, Ballivor, Co. Meath |
| TA800656 | retention of detached shed with 4 no. stables attached | 06/03/2008 | Killaconnigan, Ballivor, Co. Meath |
| TA801018 | the demolition of an existing house, garage and shed, and replacement with a two storey dwelling house and | 03/04/2008 | Killaconnigan, Ballivor, Co. Meath |
| ta900185 | of the existing 30- metre high telecommunications support structure carring antennas and link dish with assoc | 11/02/2009 | Killaconnigan, Ballivor, Co. Meath |
| TA900265 | of the attachment of 3 no. radio aerials to the existing 30m mast (these will be attached to the mast by 1m tow | 26/02/2009 | Killaconnigan, Ballivor, Co. Meath |
| TA900350 | (1) Proposed to extention to front of dwelling, (2) Proposed bay window with roof to front of dwelling, (3) Propo | 12/03/2009 | Killaconnigan, Ballivor, Co Meath |
| TA901089 | detached storey and a half style dwelling, detached domestic garage, proprietary domestic effluent treatment | 10/07/2009 | Killaconnigan, Ballivor, Co Meath |

**Clonycavan**

| Planning Reference | Development Description | Lodgement Date | Address |
|---|---|---|---|
| 90166 | septic tank and to extend and renovate to dwelling | | Clonycavan,, Ballivor,, Co. Meath |
| 95323 | to alter and extend existing house | 23/03/1995 | Clonycavan,, Ballivor,, Co. Meath |
| TA20232 | revised site and revised plans in relation to the construction of a new dormer dwelling house with septic tank a | 20/06/2002 | Clonycavan,, Ballivor,, Co. Meath |
| TA30507 | to retain an existing two storey dwelling house on an enlarged site with revised site boundaries and positionin | 23/12/2003 | Clonycavan,, Ballivor,, Co. Meath |

**Woodtown West**

| Application Reference | Development Description | Lodged Date | Address |
|---|---|---|---|
| 991927 | to erect dwelling, garage, well, septic tank and percolation area | 20/09/1999 | Woodtown West, Athboy, Co Meath |
| TA40254 | the retention of change from single storey dwelling to dormer type dwelling and change of site boundaries and | 06/05/2004 | Woodtown West, Athboy, Co Meath |
| TA60049 | demolition of derelict dwelling and the construction on the same ground of a two storey dwelling house, to con | 21/02/2006 | Woodtown West, Kildalkey, Co. Meath |
| TA60054 | development will consist of the erection of dormer type bungalow and domestic garage with proprietary waste | 14/02/2006 | Woodtown West, Athboy, Co. Meath |
| TA60204 | development will consist of the erection of bungalow as a replacement house with proprietary waste water trea | 08/06/2006 | Woodtown West, Athboy , Co. Meath |
| TA70360 | slatted cattle shed with loose lie back, silage slab and apron farmyard manure store, loose shed containing ca | 21/06/2007 | Woodtown West, Athboy, Co Meath |
| 141 | carry out development on land as described hereunder, to construct single storey dwelling, septic tank and pe | 04/02/2000 | Woodtown West, Athboy, Co Meath |
| 90790 | erection of house and garage | 19/06/1990 | Woodtown West,, Athboy,, Co. Meath |
| 93310 | septic tank and percolation area | 05/04/1993 | Woodtown House,, Woodtown West,, Athboy |

**Carranstown Little**

| Planning Reference | Development Description | Lodgement date | Address |
|---|---|---|---|
| 98186 | to build bungalow and domestic garage, install septic tank and percolation area and open new entrance | 16/02/1998 | Carranstown Little, Ballivor,, Co. Meath |
| TA60069 | repalcement dwelling for existing dwelling being replaced with dormer dwelling, domestic garage, proprietary w | 20/02/2006 | Carranstown Little, Ballivor, Co. Meath |

Applications Granted post 2010 within 1km of Substitute Consent Boundary

| Application Number | Development Description | Development Address | ApplicationType |
|---|---|---|---|
| 211324 | an extension to the existing dwelling to include  a part single storey / part dormer extension to rear, single storey extension to front / side, | Robinstown , Ballivor , Co. Meath. | PERMISSION |
| 212428 | renovation of the existing dwelling and the construction of a new connecting two storey dwelling, upgrading of the existing entrance to fa | Clondalee , Hill of Down , Enfield Co. Meath A83 F | PERMISSION |
| 21281 | development consists of a Sheep Shed with Sheep Handling Yard, Meal Storage Bin, Concrete Apron, Farm Access Road, Agricultural Ent | Woodtown West , Athboy , Co. Meath | PERMISSION |
| 221656 | amendments to planning register no. 21/2428.  The amendments include the increase in footprint and height of the new connecting dwel | Clondalee , Hill of Down Enfield , Co. Meath A83 P | PERMISSION |
| 231042 | the construction of a two storey style dwelling, detached domestic garage, a domestic wastewater disposal system, new site entrance ar | Robinstown , Ballivor , Co. Meath | PERMISSION |
| 23254 | detached domestic store shed/garage incorporating plant room area and home office with non-habitable loft storage space overhead.  Th | Clonygrange , Ballivor , Co. Meath | PERMISSION |
| 23297 | the construction of a one and a half storey, 4 bedroom dwelling, a domestic garage, use existing site access, new percolation area and tr | Pipe Lane , Coolronan Ballivor , Co Meath | PERMISSION |
| TA150349 | development will consist of a storey and a half type dwelling, domestic garage, proprietary wasterwater treatment system with associate | Carranstown Great , Ballivor , Co. Meath | PERMISSION |
| TA150738 | retention permission for essential structural repairs to date including roof & porch replacements and foundations to future extension, pla | Cloneycavan , Ballivor , Co. Meath | PERMISSION |
| TA151297 | to retain existing dog kennels, enclosures & associated structures.  The Rescue Centre contains (a) 4 no. timber kennels, (b) 2 no. concre | Coolronan Dog Rescue Centre , Coolronan Ballivo | RETENTION |
| TA160710 | the proposed demolition of an existing cottage type dwelling house together with the proposed decommissioning of existing septic tank a | Coolronan , Ballivor , Co. Meath | PERMISSION |
| TA161174 | development will consist of permission to build a storey and a half type dwelling, domestic garage, install septic tank and percolation are | Carranstown Great , Ballivor , Co. Meath | PERMISSION |
| TA161197 | the development will consist of the construction of new slatted tanks below ground level with a cow housing unit above ground level and | Clondalee , Hill of Down Enfield , Co. Meath | PERMISSION |
| TA170047 | a single storey dwelling, a detached domestic garage, a proprietary domestic effluent  treatment system, shared site entrance previously | Coolronan , Ballivor , Co. Meath | PERMISSION |
| TA180421 | a single storey dwelling, a detached domestic garage, waste water disposal system, site entrance and all associated site works | Clonycavan , Ballivor , Co. Meath | PERMISSION |
| TA180485 | EXTENSION OF DURATION OF PLANNING PERMISSION TA130317 - Single storey dwelling, detached domestic garage, proprietary domes | Coolronan , Ballivor , Co. Meath | EXTENSION OF DURATION |
| TA201217 | change of house type from a single storey type dwelling to a storey and a half type dwelling and revisions to the site layout plan as previou | Coolronan , Ballivor , Co Meath | PERMISSION |
| 156135 | To erect a guyed wind monitoring mast, with instruments,up to 100m in height, at Lisclogher Bog, Lisclogher Great, Co Westmeath. The p | Lisclogher Bog , Lisclogher Great , Co Westmeath | PERMISSION |
| 156143 | To Renovate and extend existing semi-detached dwelling. One and a half storey extension to the side & rear of existing dwelling, construc | Ballyhealy , Delvin , Co Westmeath | PERMISSION |
| 156218 | Construction of a single storey dwelling with converted attic, Domestic Garage & store, to install proprietary waste water treatment syste | Martinstown , Delvin , Co Westmeath. | PERMISSION |
| 166082 | Construction of an extension to the side of our existing dwelling, to include a dining & living area with 4 no. velux windows with all ancillar | Ballinacor , Delvin , Co Westmeath | PERMISSION |
| 176101 | construction of a three bay cattle shed with ancillary facilities, two underground slatted tanks, cattle handling facilities and associated si | Craddanstown , Raharney , Co.Westmeath | PERMISSION |
| 176274 | permission of existing dwelling house and ancillary site works. | Bogach Farm , Craddenstown , Raharney | RETENTION |
| 186120 | construction of a two storey extension to rear of existing dwelling, construction of 1st floor porch extension over existing porch, renovate | Clonleame , Delvin , Co.Westmeath | PERMISSION |
| 186246 | to develop an existing entrance and upgrade it to forestry harvesting standard(bell mouth entrance) onto public road to facilitate access t | Bracklin , Delvin , Co Westmeath | PERMISSION |
| 186322 | a) demolition of existing dungstead, b) construction of an agricultural building to include Cubicles and underground slatted slurry tanks, | Craddanstown , Raharney , Co.Westmeath | PERMISSION |
| 186354 | construction of a two storey dwelling, detached domestic garage & store, install a proprietary wastewater treatment system and all assoc | Bracklyn , Delvin , Co.Westmeath | PERMISSION |
| 196104 | construction of a new two storey type dwelling, domestic garage, installation of a new septic tank & percolation area, new vehicular entra | Grangemore , Raharney , Co.Westmeath | PERMISSION |
| 196174 | for a private dwelling house, proprietry effluent treatment system and percolation area, domestic garage, entrance onto public road and | Craddenstown , Raharney , Co Westmeath | PERMISSION |
| 206054 | Construction of a 83.9 sq.m extension to existing storey and a half type dwelling and all ancillary site services. | Craddenstown , Raharney , Mullingar | PERMISSION |
| 206221 | Retention permission and  permission for development at this site as follows: (i) retention of existing 80 metre meteorological mast whic | Bracklin , County Westmeath | RETENTION |
| 206226 | Retention permission for external milk tank adjacent to existing milking parlour and all associated site works | Craddanstown. , Raharney , County Westmeath. | RETENTION |
| 21506 | to retain existing conservatory to south | Ballynacor , Delvin , Co. Westmeath | RETENTION |
| 21620 | Retention permission for continued use of an existing Guyed  Wind Monitoring Mast with instruments, 100m in height on its lands at Liscl | Lisclogher Bog , Lisclogher Great , County Wstmea | RETENTION |
| 21659 | for a private dwelling house, proprietary effluent treatment system and percolation area, domestic garage, entrance onto public road and | Craddenstown , Raharney , Co Westmeath | PERMISSION |
| 22245 | construction of agricultural shed consisting of cubicles, feeding area and underground slatted slurry storage tanks and all associated site | Craddanstown , Raharney , Co.Westmeath | PERMISSION |
| 22520 | (a) construct a single storey extension to rear of existing dwelling and (b) RETENTION PERMISSION for existing ground floor bedroom (pre | Ballynacor , Delvin , Co.Westmeath | PERMISSION |
| 22550 | to construct one number detached single storey dwelling, one number detached single storey garage, to create new entrance to public ro | Ballynacor , Delvin , Co.Westmeath | PERMISSION |
| 2360242 | The development will consist of the renovation and extension to an existing detached bungalow and outbuildings, the installation of a wa | Craddenstown , Raharney , Co. Westmeath | PERMISSION |
| 2360401 | construction of a new bungalow type dwelling house, domestic garage, new vehicular entrance, septic tank and percolation area and all | Craddenstown , Raharney , Mullingar | PERMISSION |
| 156142 | A single storey dwelling, septic tank, sewage treatment system, percolation area, domestic garage, new entrance and all ancillary site wo | Lisclougher , Delvin , Co Westmeath | PERMISSION |
| 166259 | erect a guyed wind monitoring mast with instruments up to 100m in height. The purpose of the proposed mast is to assess the suitability | Lisclogher Bog , Lisclogher Great , Co.Westmeath | PERMISSION |
| 166313 | to construct a bungalow with converted attic, install proprietary waste water treatment system with percolation area with all associated s | Mucklin , Delvin , Co Westmeath | PERMISSION |
| 206242 | One number  residential dwelling consisting of two part single, one part two storey house, associated garage/shed/workshop, approved v | Mucklin , Delvin , Co Westmeath | PERMISSION |

EIA Points within 5km of Substitute Consent Boundary

| Portal Ref | Competent Authority | Competent Authority Ref | Location | Description |
|---|---|---|---|---|
| 2018039 | Meath County Council | TA181090 | Moyfin, Longwood, County Meath | The development will consist of a (a) importation of inert excavation spoil comprising natural materials of clay, silt, sand, gravel or stone for the purposes of restoration of a previously extracted area (QY1) to restor the site to a beneficial agricult |
| 2019031 | Westmeath County Council | 186221 | Hodgestown, Killucan, Co Westmeath N91 HY92 | a 2,400m2 pig building with associated site work. IPPC licence number P0713-03 relates to this farm. |
| 2020077 | An Bord Pleanála | 307278 | The following Bord na Móna bogs - Bracklin, Carranstown, Ballivor, Kinnegad and Ballybeg located in Counties Meath, Offaly and Westmeath. | peat extraction carried out by the Applicant since 2012, drainage and silt ponds, temporary peat stock piles and temporary rail lines hard standing and car parking areas, buildings, offices, bunded diesel tanks, fenced storage areas, gates. |
| 2021201 | An Bord Pleanála | ABP-311565-21 | Ballagh (Mullingar Rural E.D.), Billistown, Ballynacor, and Bracklin, | Construction and operation of a 9 turbine wind farm, a110kV electrical substation and associated electrical grid connection, and all associated ancillary infrastructure and developments. |
| 2023049 | An Bord Pleanála | | south-southeast of Delvin, Co. Westmeath, c. 4km | 26 wind turbines, 2 Met masts, 4 temporary construction compounds, temporary security cabins, 2 borrow pits, a permanent substation & control buildinings, parking and associated works, 10-year permission & 30 year operation |
| 2024052 | An Bord Pleanála | ABP-319448-24 | Development and associated works on land within the townlands of Clonmellon, Kilrush Upper, Kilrush Lower, Newtown, Ballinlig, Carnybrogan, | Proposed Development will consist of an 8 no. turbine wind farm development, substation, cable corridor and associated works |

ABP Cases for Largescale Development within 5km of Substitute Consent Boundary

| ABP Case | Development Description | Address | Planning Authority | Category |
|---|---|---|---|---|
| 306236 | Leave to apply for substitute consent for peat extraction. | Derrygreenagh Bog, Bracklin, Co. Westmeath, Carranstown, Co. Meath and Co. Westmeath, Ballivor, Co. Meath and Co. Westmeath, Ballybeg, Co. Offaly. | Westmeath County Council | Substitute Consent |
| 306996 | Importation of insert excavation spoil comprising natural materials of clay, silt, sand, gravel or stone for the purposes of restoration of a previously extracted area (QY1) | Moyfin, Longwood, Co Meath | Meath County Council | Appeals |
| 308608 | Retention and development of 80 metre meteorlogical mast. | Bracklin , County Westmeath | Westmeath County Council | Appeals |
| 311565 | Wind Farm Development including 9 turbines and all associated works | Bracklin, County Westmeath and Coolronan, County Meath | Westmeath County Council | SID (Not incl LAP SID cases) |
| 316212 | Proposed development of 26 wind turbines and associated works | at the Ballivor Bog Group, County Meath and County Westmeath | Westmeath County Council | SID (Not incl LAP SID cases) |
| 318979 | Request to enter pre ? application consultation pursuant to Section 177E(IA) of the Planning and Development Act 2000, as amended for historical peat extraction and all associated works within the Ballivor Bog Group. | Ballivor, Carranstown, Bracklin, Lisclogher and Lisclogher West bogs, Counties Meath and | Meath County Council | Substitute Consent |
| 319448 | Proposed Development of an 8 no turbine wind farm development and associated works | Clonmellon, Kilrush Upper, Kilrush Lower, Newtown, Ballinlig, Carnybrogan, Cavestown and | Meath County Council | SID (Not incl LAP SID cases) |
| 311646 | Leave to Apply for Substitute Consent | Ballivor, Carranstown, Bracklin, Lisclogher and Lisclougher West | Meath County Council | Substitute Consent |

# APPENDIX 4-1

*IPC Licence 501-01*

Headquarters,
Johnstown Castle Estate,
County Wexford, Ireland

# INTEGRATED POLLUTION CONTROL LICENCE

| | |
|---|---|
| **Licence Register Number:** | 501 |
| **Licensee:** | Bord na Móna Energy Limited |
| **Location of Activity:** | Derrygreenagh Group,<br>c/o Derrygreenagh Works<br>Rochfordbridge<br>Mullingar<br>County Westmeath |

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# *Glossary of Terms*

| | |
|---|---|
| The Agency | Environmental Protection Agency. |
| The Licensee | Bord na Móna Energy Limited, Boora, Leabeg, Tullamore, County Offaly. |
| Location of Activity | Derrygreenagh Works, Rochfordbridge, Mullingar, County Westmeath. |
| AER | Annual Environmental Report. |
| Annually | All or part of a period of twelve consecutive months. |
| BATNEEC | Best Available Technology Not Entailing Excessive Cost. |
| Bi-annually | All or part of a period of six consecutive months. |
| COD | Chemical Oxygen Demand. |
| Daily | During all days of plant operation, and in the case of emissions, when emissions are taking place; with no more than 1 measurement on any one day. |
| Day | Any 24 hr. period. |
| Day-time | 0800 hrs to 2200 hrs. |
| dB(A) | Decibels (A weighted). |
| Dust sensitive location | Any dwelling house, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other facility or area of high amenity which for its proper enjoyment requires the absence of dust at nuisance levels. |
| EMP | Environmental Management Programme. |
| EWC | European Waste Catalogue (94/3/EEC, see also Agency Guidance Note on the EWC) |
| Fortnightly | At least 20 measurements in a calendar year with no more than one measurement in any one week. |
| IPC | Integrated Pollution Control. |
| Leq | Equivalent continuous sound level. |
| Lighting-up time | 30 minutes after sun set. |
| Local Authority | Meath County Council; Offaly County Council; Westmeath County Council. |
| Monthly | At least 12 times per year at approximately monthly intervals. |

| | |
|---|---|
| Night-time | 2200 hrs to 0800 hrs. |
| Noise sensitive location | Any dwelling house, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other facility or area of high amenity which for its proper enjoyment requires the absence of noise at nuisance levels. |
| Quarterly | All or part of a period of three consecutive months beginning on the first day of January, April, July or October. |
| Screenings | Wood, stone and other debris removed from milled peat (by screening) prior to introduction to processing |
| Standard Methods | As detailed in "Standard Methods for the Examination of Water and Wastewater", (prepared and published jointly by A.P.H.A., A.W.W.A & W.E.F) 19th Ed. 1995, American Public Health Association, 1015 Fifteenth Street, N.W., Washington DC 20005, USA. |
| TA Luft | Technical Instructions on Air Quality Control - TA Luft in accordance with art. 48 of the Federal Immission Control Law (BImSchG) dated 15 March 1974 (BGBI. I p.721). Federal Ministry for Environment, Bonn 1986 and amendments. |
| Waste disposal operation | Means any of the operations included in the Third Schedule to the Waste Management Act 1996. |
| Waste recovery operation | Means any of the operations included in the Fourth Schedule to the Waste Management Act 1996. |
| Weekly | During all weeks of plant operation, and in the case of emissions, when emissions are taking place; with no more than one measurement in any one week. |

# *Reasons for the Decision*

The Agency is satisfied, on the basis of the information available that, subject to compliance with the conditions of this licence, any emissions from the activity will comply with and not contravene any of the requirements of Section 83(3) of the Environmental Protection Agency Act, 1992.

In reaching this decision the Agency has considered the application and supporting documentation received from the applicant, all submissions and objections received and the report of its inspectors.

# *Activities Licensed*

In pursuance of the powers conferred on it by the Environmental Protection Agency Act, 1992, the Agency hereby grants a licence to:

Bord na Móna Energy Limited, Boora, Leabeg, Tullamore, County Offaly

under Section 83(1) of the said Act to carry on the following activity,

:- the extraction of peat in the course of business which involves an area exceeding 50 hectares

at lands labelled as Derrygreenagh Group on Location Map Drawings 2.1 and 2.2 (Attachment 2) of the IPC Application subject to the following fourteen Conditions, with the reasons therefor and associated schedules attached thereto.

# *Conditions*

## Condition 1 Scope

1.1 The activity shall be controlled, operated, and maintained and emissions shall take place as set out in this Integrated Pollution Control licence. All programmes required to be carried out under the terms of this licence, become part of this licence.

1.2 No alteration to, or reconstruction in respect of, the activity or any part thereof which would, or is likely to, result in a material change or increase in:

1.2.1 The nature or quantity of any emission,

1.2.2 The abatement/treatment or recovery systems,

1.2.3 The range of processes to be carried out,

1.2.4 The fuels, raw materials, intermediates, products or wastes generated,

or any changes in:

1.2.5 The site management and control with adverse environmental significance

shall be carried out or commenced without prior notice to, and without the prior written agreement of, the Agency.

1.3 This licence is for the purposes of IPC licensing under the EPA Act, 1992 only and nothing in this licence shall be construed as negating the licensee's statutory obligations or requirements under any other enactments or regulations.

1.4 Any reference in this licence to 'site' shall mean the plan area outlined in black and labelled Derrygreenagh Group on Location Map Drawings 2.1 and 2.2 of Attachment 2 in the IPC licence application.

*Reason: To clarify the scope of this licence.*

## Condition 2 Management of the Activity

2.1 The licensee shall establish and maintain an Environmental Management System (EMS) which shall fulfil the requirements of this licence. The EMS shall assess all operations and review all practicable options for the use of cleaner technology, cleaner production and the reduction and minimisation of waste, and shall include as a minimum those elements specified in the Conditions 2.2 to 2.7 below:

2.2 Environmental Management Programme (EMP)

2.2.1 The licensee shall, not later than six months from the date of grant of this licence, establish and maintain an EMP, including a time schedule, for achieving objectives and targets. The EMP shall thereafter, form part of the AER and shall be agreed with the Agency prior to implementation. It shall include:

(i) designation of responsibility for targets;

(ii) the means by which they may be achieved;

(iii) the time within which they may be achieved.

2.2.2 The EMP shall as a minimum include the following objectives:

(i) Minimisation of suspended solids movement to surface water systems via peatland surface water drainage channels during development and operation of boglands.

(ii) Rationalisation of surface water discharge points.

(iii) Investigation of reed-bed systems for final polish of silt pond discharges.

(iv) Reduction of fugitive dust emissions during loading and transfer operation on the bog and during unloading operations at the tippler and works yard areas.

(v) Provision of measures to protect dust sensitive areas.

(vi) Provision of measures to prevent suspended solids from works yards entering surface waters.

(vii) Reuse of silt pond waste.

(viii) Collection, storage and reuse of polyethylene covering.

(ix) Use of reusable material for stockpile protection.

(x) Use of wind power technology for pumped drainage.

(xi) Separation of storm water runoff from process and non-process areas.

(xii) Effective spill/leak management of mobile fuelling units.

(xiii) Replacement (and remediation where necessary) of all underground fuel tanks.

2.2.3 A report on the programme, including the success in meeting agreed targets, shall be prepared and submitted to the Agency as part of the AER. Such reports shall be retained on-site for a period of not less than seven years and shall be available for inspection by authorised persons of the Agency.

2.3 Documentation

2.3.1 The licensee shall establish and maintain an environmental management documentation system which shall be to the satisfaction of the Agency.

2.3.2 The licensee shall issue a copy of this licence to all relevant personnel whose duties relate to any condition of this licence.

2.4 Corrective Action

2.4.1 The licensee shall establish procedures to ensure that corrective action is taken should the specified requirements of this licence not be fulfilled. The responsibility and authority for initiating further investigation and corrective action in the event of a reported non-conformity with this licence shall be defined.

2.5 Awareness and Training

2.5.1 The licensee shall establish and maintain procedures for identifying training needs, and for providing appropriate training, for all personnel whose work can have a significant effect upon the environment. Appropriate records of training shall be maintained.

2.5.2 Personnel performing specifically assigned tasks shall be qualified on the basis of appropriate education, training and/or experience, as required.

2.6 Responsibilities

2.6.1 The licensee shall ensure that a person in charge, as defined under the terms of the Environmental Protection Agency Act, 1992 shall be available on-site at all times when the activity is in operation. The person in charge shall also be available to meet with authorised persons of the Agency at all reasonable times.

2.7 Communications

2.7.1 The licensee shall, within six months of date of grant of this licence, put in place a programme to ensure that members of the public can obtain information concerning the environmental performance of the licensee at all reasonable times.

2.7.2 The licensee shall submit to the Agency, by 1 March each year commencing in 2001, an AER which shall be to the satisfaction of the Agency. This report shall include as a minimum the information specified in *Schedule 4 Recording and Reporting to the Agency* and shall be prepared in accordance with any relevant guidelines issued by the Agency.

*Reason: To make provision for management of the activity on a planned basis having regard to the desirability of ongoing assessment, recording and reporting of matters affecting the environment.*

# Condition 3 Interpretation

3.1 Emission limit values for emissions to atmosphere in this licence shall be interpreted in the following way:-

3.1.1 Dust deposition at dust sensitive locations.

(i) No value shall exceed the emission limit value.

3.2 Emission limit values for emissions to water in this licence shall be interpreted in the following way:-

3.2.1 Non-Continuous Monitoring:

(i) Eight out of ten consecutive results, on the basis of 24 hr flow proportional composite sampling, shall not exceed the emission limit value. No individual daily result similarly calculated shall exceed 1.5 times the emission limit value.

(ii) 75% of grab samples for each monitored discharge shall not exceed the emission limit value; and no individual grab sample value shall exceed 3 times the emission limit value.

3.3 Noise

3.3.1 Noise from the activity shall not give rise to sound pressure levels (Leq,T) measured at noise sensitive locations which exceed the limit value(s) by more than 2 dB(A).

*Reason : To clarify the interpretation of emission limit values fixed under the licence.*

# Condition 4 Notification

4.1 The licensee shall notify the Agency by both telephone and facsimile, if available, to the Agency's Headquarters in Wexford, or to such other Agency office as may be specified by the Agency, as soon as practicable after the occurrence of any of the following:

4.1.1 Any release to atmosphere resulting in significant impairment of, or significant interference with amenities or the environment.

4.1.2 Any emission which does not comply with the requirements of this licence.

4.1.3 Any incident with the potential for environmental contamination of surface water or groundwater, or posing an environmental threat to air or land, or requiring an emergency response by a Local Authority.

The licensee shall include as part of the notification, date and time of the incident, details of the occurrence, and the steps taken to minimise the emissions and avoid recurrence.

4.2 The licensee shall make a record of any incident as set out in Condition 4.1 above. The notification given to the Agency shall include details of the circumstances giving rise to the incident and all actions taken to minimise the effect on the environment and minimise wastes generated.

4.3 A summary report of reported incidents shall be submitted to the Agency as part of the AER. The information contained in this report shall be prepared in accordance with any relevant guidelines issued by the Agency.

4.4 In the case of any incident as set out in Condition 4.1 above which relates to discharges to water, the licensee shall notify the appropriate Regional Fisheries Board, as soon as practicable after such an incident.

4.5 In the event of any incident, as set out in Condition 4.1.3 having taken place, the licensee shall notify the appropriate Local Authority as soon as practicable, after such an incident.

4.6 In the case of any incident, as set out in Condition 4.1.3, which has the potential to impact the conservation objectives of the Special Areas of Conservation and Natural Heritage Areas identified in Attachment 10.1 of the IPC application having taken place, the licensee shall notify Dúchas of the Department of Arts, Heritage, Gaeltacht and the Islands as soon as practicable after such an incident.

4.7 The licensee shall as part of their AER, or more frequently as may be necessary, notify and supply maps to the Agency of boglands, and discharges from same, intended to be included in the subsequent years' development and operational programmes.

*Reason : To provide for the notification of incidents and update information on the activity.*

# Condition 5 Emissions to Atmosphere

5.1 Boiler Combustion Efficiency shall be tested annually and results reported on annually as part of the AER.

5.2 The licensee shall ensure that all operations on-site shall be carried out in a manner such that air emissions and/or dust do not result in significant impairment of, or significant interference with amenities or the environment beyond the site boundary.

5.3 Within three months of the date of grant of the licence, the licensee shall submit to the Agency for agreement, a proposal for the identification and monitoring of Dust Sensitive Locations (DSL's) on and off site for dust deposition. A report on this monitoring shall be submitted annually as part of the AER.

5.4 Activities on-site shall not give rise to dust levels off site at any Dust Sensitive Location which exceed an emission limit of 350 mg/m$^2$/day. [The sampling method to be in accordance with German TA Luft Immission Standards for Particle Deposition (IW1)].

5.5 In relation to Dust Control the licensee shall, within six months of date of grant of this licence, develop and implement procedures to ensure that:

- shelter belts are planted in sensitive areas,
- harvesting in sensitive areas is avoided during windy weather,
- where possible machinery use grassed pathways,
- headlands are kept clean and free of excessive loose peat,
- stockpiles are sheeted where possible,
- moving machinery maintains slow speeds when travelling along dusty headlands,
- when harvesting, the jib is maintained low to the stockpile,
- shelter belts are planted around outloading facilities,
- road transported peat is adequately covered (sheeted or similar),
- wind breaks are planted where-ever possible.

*Reason: To provide for the protection of the environment by way of control, limitation, treatment and monitoring of emissions.*

# Condition 6 Emissions to Water

6.1 No specified emission to water shall exceed the emission limit values set out in *Schedule 1(i) Emissions to Water* subject to Condition 3 of this licence. There shall be no other emissions to water of environmental significance.

6.2 The licensee shall within three months of date of grant of this licence submit to the Agency for approval, a proposal for a surface water discharge monitoring location programme. This programme shall, *inter alia*, have regard to the current status of each bogland (virgin, under development, operational or worked out), sensitivity of the receiving water, status of silt pond upgrade programme. This programme shall be reviewed and revised as necessary each year as part of the AER.

6.3 Monitoring and analyses of each agreed emission monitoring location shall be carried out as specified in *Schedule 1(ii) Monitoring of Emissions to Water* of this licence. A report on the results of this monitoring shall be submitted to the Agency quarterly.

6.4 The licensee shall, within six months of date of grant of licence, present a proposal for the installation (on a long term basis) of a composite sampler to one representative discharge point within the licensed area. The proposal shall set out the rationale for selection of the nominated discharge point as well as the sampling programme. The

results of this monitoring are to be reported each year as part of the AER. Any proposal to relocate the composite sampler is to be dealt with under Condition 6.3.

6.5 A summary report of emissions to water shall be submitted to the Agency as part of the AER. The information contained in this report shall be prepared in accordance with any relevant guidelines issued by the Agency.

6.6 The licensee shall, within six months of the date of grant of licence, develop and implement a programme to ensure that all drainage water from all boglands in the licensed area is discharged via an appropriately designed silt pond treatment arrangement. The programme, to be implemented within a period to be agreed with the Agency, shall ensure that all discharges associated with operational boglands should be prioritised within this programme.

6.7 Within three months of the date of grant of licence, the licensee shall prepare an operational procedure for de-silting of the silt ponds. The procedure shall as a minimum provide for visual inspection of all ponds on a fortnightly basis. The de-silting roster shall be based on recommendations of such visual inspection. A log of visual inspection and de-silting shall be maintained and a summary report on the de-silting programme shall be included in the AER. The licensee shall, within twelve months of the date of grant of this licence, demonstrate to the satisfaction of the Agency that the programme of inspection is adequate.

6.8 Silt ponds serving operational bogs shall be cleaned as a minimum twice a year, once before ditching and once before harvesting, and more frequently as inspections may dictate (refer Condition 6.7).

6.9 Within six months of the date of grant of licence, the licensee shall prepare a programme, for agreement with the Agency, to upgrade all the sedimentation pond treatment systems. The programme shall, *inter alia*, address provision of additional ponds, weir or pipe installation (inlet and outlet), pond configuration, use of baffles, performance efficiency and frequency of de-silting. The upgrade shall have regard to the minimum silt pond specifications detailed in Condition 6.10.

6.10 Within three years of date of grant of this licence all existing silt ponds serving operational bogs shall achieve the following minimum performance criteria (flood periods excepted):

- Maximum flow velocity < 10 $cms^{-1}$
- Silt design capacity of lagoons, minimum 50 $m^3$ per nett ha of bog serviced

All new ponds installed shall be designed to achieve these stated minimum design criteria.

6.11 All silt ponds prone to flooding shall be de-silted by 1$^{st}$ November of each year. Excavated sludge shall be removed for disposal to a location outside the flood plain.

6.12 In respect of silt control the licensee shall, within nine months of date of grant of this licence, prepare and implement procedures to ensure that:

- drainage manholes are protected and maintained free of excessive peat,
- headlands are kept clean and free of excessive loose peat,
- all new manholes and outfalls are set well back from turning grounds, drivers of bog plant do not turn short (over drains) at headlands,
- harrows, millers, ridgers do not drag loose peat onto manholes or into drains, outside harrow spoons are directed away from drains,

- silt run-off, while piping or ditching, is minimised,
- outfalls are controlled to minimise silt discharge during cleaning operations,
    - drains are ditched in dry weather,
    - while ditching, outfalls are blocked and ditch towards outfall,
    - outlets from stockpile field drains are blocked during stockpile loading,
    - field drains adjacent to stockpiles are cleaned as soon as practicable after stockpile loading,
    - adequate room is allowed for rail bed beside Peco stockpiles,
    - all fields that have been milled are ridged at the end of the production season,
    - all fields liable to winter flooding have been cleared of milled peat or re-compacted at the end of the production season.

*Reason: To provide for the protection of the environment by way of control, limitation, treatment and monitoring of emissions.*

# Condition 7 Waste Management

7.1 Disposal or recovery of waste shall take place only as specified in *Schedule 2(i) Hazardous Wastes for Disposal/Recovery* and *Schedule 2(ii) Other Wastes for Disposal/Recovery* of this licence and in accordance with the appropriate National and European legislation and protocols. No other waste shall be disposed of/recovered either on-site or off-site without prior notice to, and prior written agreement of, the Agency.

7.2 Waste sent off-site for recovery or disposal shall only be conveyed to a waste contractor, as agreed by the Agency, and only transported from the site of the activity to the site of recovery/disposal in a manner which will not adversely affect the environment.

7.3 A full record, which shall be open to inspection by authorised persons of the Agency at all times, shall be kept by the licensee on matters relating to the waste management operations and practices at this site. This record shall as a minimum contain details of the following:

7.3.1 The names of the agent and transporter of the waste.

7.3.2 The name of the persons responsible for the ultimate disposal/recovery of the waste.

7.3.3 The ultimate destination of the waste.

7.3.4 Written confirmation of the acceptance and disposal/recovery of any hazardous waste consignments sent off-site.

7.3.5 The tonnages and EWC Code for the waste materials listed in *Schedule 2(i) Hazardous Wastes for Disposal/Recovery* and *Schedule 2(ii) Other Wastes for Disposal/Recovery* sent off-site for disposal/recovery.

7.3.6 Details of any rejected consignments.

A copy of this Waste Management record shall be submitted to the Agency as part of the AER for the site.

7.4 Within nine months of the date of grant of licence, the licensee shall submit to the Agency for agreement, a proposal for identification and management of all ash and screening disposal areas. Once agreed, the proposal shall be implemented within a time-scale stipulated by the Agency.

*Reason: To provide for the disposal of waste and the protection of the environment.*

# Condition 8 Noise

8.1 Activities on-site shall not give rise to noise levels off site at any noise sensitive location which exceed the following sound pressure limits ($Leq_{,30min}$) subject to Condition 3 of this licence:

Day-time: 55 dB(A)

Night-time: 45 dB(A).

8.2 There shall be no clearly audible tonal component or impulsive component in the noise emission from the activity at any noise sensitive location.

*Reason: To provide for the protection of the environment by control of noise.*

# Condition 9 Water Protection

9.1 Surface & Groundwater Protection - Workshop areas and Depots

9.1.1 No potentially polluting substance or matter shall be permitted to discharge to off-site surface waters, off site storm drains or groundwaters.

9.1.2 Monitoring and analyses of surface water discharges shall be carried out as specified in *Schedule 3 Monitoring of Workshop/Depot Surface Water Run-off* of this licence. A report on the results of this monitoring shall be submitted to the Agency quarterly.

9.1.3 In the event that any analyses or observations made on the quality or appearance of surface water runoff should indicate that contamination has taken place, the licensee shall carry out an immediate investigation to identify and isolate the source of the contamination,

(i) put in place measures to prevent further contamination and to minimise the effects of any contamination on the environment,

(ii) and notify the Agency as soon as is practicable.

9.1.4 Within twelve months of the date of grant of licence, all tank and drum storage areas shall be rendered impervious to the materials stored therein. In addition, tank and drum storage areas shall, as a minimum be bunded, either locally or remotely, to a volume not less than the greater of the following;

(i) 110% of the capacity of the largest tank or drum within the bunded area

(ii) 25% of the total volume of substance which could be stored within the bunded area.

9.1.5 Drainage from bunded areas shall be diverted for collection and safe disposal.

9.1.6 The integrity and water tightness of all the bunding structures and their resistance to penetration by water or other materials stored therein shall be tested and demonstrated by the licensee to the satisfaction of the Agency and shall be reported to the Agency within eighteen months from the date of grant of this licence and every two years thereafter. A report on such tests shall be included in the AER.

9.1.7 Within twelve months of the date of grant of licence, the loading and unloading of fuel oils shall be carried out in designated areas protected against spillage and leachate run-off. While awaiting disposal, all materials shall be collected and stored in designated areas protected against spillage and leachate run-off.

9.1.8 With the exception of roof water, all surface water discharges from workshop areas shall, within twenty-four months of date of grant of this licence, be fitted with oil interceptors.

9.1.9 A maintenance/cleaning log for all oil interceptors and septic tanks shall be maintained. This log shall also record the observations made during weekly inspections of all oil interceptors and bi-annual inspections of septic tanks.

9.1.10 An inspection for leaks on all flanges and valves on over-ground pipes used to transport materials other than water shall be carried out weekly.

9.1.11 The provision of a catchment system to collect any leaks from flanges and valves of all over ground pipes used to transport material other than water shall be examined.

9.1.12 The licensee shall undertake a programme of testing and inspection of underground fuel pipelines to ensure that all underground fuel lines are tested at least every three years. A report on the first testing shall be submitted to the Agency within twelve months of the date of grant of licence and as part of the AER thereafter.

9.1.13 The licensee shall have in storage an adequate supply of containment booms and/or suitable absorbent material to contain and absorb any spillage.

9.1.14 The licensee shall within twelve months of the date of grant of licence, arrange for the removal and safe disposal of waste oil and oil contaminated soil from the scrap storage area at Derrygreenagh Works.

9.1.15 The licensee shall maintain a log of bi-annual inspections of all rail and tractor transported fuelling units. These inspections as a minimum should record any damage or leaks or flaws in rolling stock that could result in accidental spillage.

*Reason: To provide for the protection of surface waters and groundwater.*

# Condition 10 Cutaway Bog Rehabilitation

10.1 Following termination of use or involvement of all or part of the site in the licensed activity, the licensee shall:

10.1.1 Decommission, render safe or remove for disposal/recovery, any soil, subsoils, buildings, plant or equipment, or any waste, materials or substances or other matter contained therein or thereon, that may result in environmental pollution.

10.1.2 Implement the agreed cutaway bog rehabilitation plan (refer Condition 10.2).

10.2 Cutaway Bog Rehabilitation Plan:

10.2.1 The licensee shall prepare, to the satisfaction of the Agency, a fully detailed and costed plan for permanent rehabilitation of the cutaway boglands within the licensed area. This plan shall be submitted to the Agency for agreement within eighteen months of the date of grant of this licence.

10.2.2 The plan shall be reviewed every two years and proposed amendments thereto notified to the Agency for agreement as part of the AER. No amendments may be implemented without the written agreement of the Agency.

10.3 The Rehabilitation Plan shall include as a minimum, the following:

10.3.1 A scope statement for the plan, to include outcome of consultations with relevant Agencies, Authorities and affected parties (to be identified by the licensee).

10.3.2 The criteria which define the successful rehabilitation of the activity or part thereof, which ensures minimum impact to the environment.

10.3.3 A programme to achieve the stated criteria.

10.3.4 Where relevant, a test programme to demonstrate the successful implementation of the rehabilitation plan.

10.3.5 A programme for aftercare and maintenance.

10.4 A final validation report to include a certificate of completion for the Rehabilitation Plan, for all or part of the site as necessary, shall be submitted to the Agency within six months of execution of the plan. The licensee shall carry out such tests, investigations or submit certification, as requested by the Agency, to confirm that there is no continuing risk to the environment.

*Reason: To make provision for the proper closure of the activity ensuring protection of the environment.*

# Condition 11 Monitoring

11.1 The licensee shall carry out such sampling, analyses, measurements, examinations, maintenance and calibrations as set out in Schedules:-

*Schedule 1(ii) Monitoring of Emissions to Water*

*Schedule 3 Monitoring of Workshop/Depot Surface Water Run-off*

of this licence.

11.2 Where the ability to measure a parameter is affected by mixing before emission, then, with prior written agreement from the Agency, the parameter may be assessed before mixing takes place.

11.3 All automatic monitors and samplers shall be functioning at all times (except during maintenance and calibration) when the activity is being carried on unless alternative sampling or monitoring has been agreed in writing by the Agency for a limited period. Prior written agreement for the use of alternative equipment, other than in emergency situations, shall be obtained from the Agency.

11.4 Monitoring and analysis equipment shall be operated and maintained as necessary so that monitoring accurately reflects the emission or discharge.

11.5 The frequency, methods and scope of monitoring, sampling and analyses, as set out in this licence, may be amended with the written agreement of the Agency following evaluation of test results.

11.6 The licensee shall clearly identify and label all emission points.

11.7 The licensee shall install on all emission points such sampling equipment, including any data-logging or other electronic communication equipment, as may be required by the Agency. All such equipment shall be consistent with the safe operation of all sampling and monitoring systems.

11.8 The licensee shall provide safe and permanent access to the following sampling and monitoring points:

(i) Waste storage areas on-site,

(ii) Surface water discharges,

(iii) Dust sampling locations,

and safe access to any other sampling and monitoring points required by the Agency.

*Reason: To ensure compliance with the requirements of other conditions of this licence by provision of a satisfactory system of measurement and monitoring of emissions.*

# Condition 12 Recording and Reporting to Agency

12.1 The licensee shall record all sampling, analyses, measurements, examinations, calibrations and maintenance carried out in accordance with the requirements of this licence.

12.2 The licensee shall record all incidents which affect the normal operation of the activity and which may create an environmental risk.

12.3 The licensee shall record all complaints of an environmental nature related to the operation of the activity. Each such record shall give details of the date and time of the complaint, the name of the complainant and give details of the nature of the complaint. A record shall also be kept of the response made in the case of each complaint. The licensee shall submit a report to the Agency, during the month following such complaints, giving details of any complaints which arise. A summary of the number and nature of complaints received shall be included in the AER.

12.4 The format of all records required by this licence shall be to the satisfaction of the Agency. Records shall be retained on-site for a period of not less than seven years and shall be available for inspection by the Agency at all reasonable times.

12.5 Reports of all recording, sampling, analyses, measurements, examinations, calibrations and maintenance as set out in *Schedule 4 Recording and Reporting to the Agency* of this licence, shall be submitted to the Agency Headquarters as specified in this licence. The format of these reports shall be to the satisfaction of the Agency. One original and three copies shall be submitted as and when specified.

12.6 Provision shall also be made for the transfer of environmental information, in relation to this licence, to the Agency's computer system, as may be requested by the Agency.

12.7 All reports shall be certified accurate and representative by the licensee's Plant Manager or other senior officer designated by the Plant Manager.

12.8 All written procedures controlling operations affecting this licence shall be available on-site for inspection by the Agency at all reasonable times.

12.9 The frequency and scope of reporting, as set out in this licence, may be amended with the written agreement of the Agency following evaluation of test results.

*Reason: To provide for the collection and reporting of adequate information on the activity.*

# Condition 13 Emergency Response

13.1 The licensee shall, within six months of date of grant of this licence, ensure that a documented Emergency Response Procedure is in place which shall address any emergency situation which may originate on-site. This Procedure shall include provision for minimising the effects of any emergency on the environment.

*Reason: To provide for the protection of the environment.*

# Condition 14 Financial Provisions

14.1 Agency Charges

14.1.1 The licensee shall pay to the Agency an annual contribution of £4,070 or such sum as the Agency from time to time determines, towards the cost of monitoring the activity as the Agency considers necessary for the performance of its functions under the Environmental Protection Agency Act, 1992. The licensee shall in 2001 and subsequent years, not later than January 31 of each year, pay to the Agency this amount updated in accordance with changes in the Consumer Price Index from the date of the licence to the renewal date. The updated amount shall be notified to the licensee by the Agency. For 2000, the licensee shall pay a pro rata amount from the date of this licence to December 31 2000. This amount shall be paid to the Agency within one month of the date of grant of this licence.

*Reason: To provide for adequate financing for monitoring and financial provisions for measures to protect the environment.*

## *Schedule 1(i) Emissions to Water*

**Emission Point Reference No.:** All surface water outfalls from boglands within the licensed area

**Location :** As detailed in Section 11 and Attachment 11 of the IPC licence application form, and any additional locations as may be agreed under Condition 4.7

| Parameter | Emission Limit Value |
|---|---|
| **Suspended Solids** | 35 mg/l |

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## *Schedule 1(ii) Monitoring of Emissions to Water*

**Emission Point Reference No's.:** As agreed under Condition 6.3

| Parameter | Monitoring Frequency | Analysis Method/Technique |
|---|---|---|
| **pH** | Quarterly | Standard Methods |
| **Flow** | Quarterly | Agreed Method |
| **Suspended Solids** | Quarterly | Standard Methods |
| **Total Solids** | Quarterly | Standard Methods |
| **Total Phosphorus** | Quarterly | Standard Methods |
| **Ammonia** | Quarterly | Standard Methods |
| **Colour** | Quarterly | Standard Methods |
| **COD** | Quarterly | Standard Methods |

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## *Schedule 2(i) Hazardous Wastes for Disposal/Recovery*

| Waste Materials | Method of disposal/recovery Notes 1 - 4 |
|---|---|
| **Lubricating Oils** | Agreed hazardous waste disposal contractor. |
| **Hydraulic Oils** | Agreed hazardous waste disposal contractor. |
| **Oil/Fuel Filters** | Agreed hazardous waste disposal contractor. |
| **Lead Acid Batteries** | Agreed hazardous waste disposal contractor. |
| **Fluorescent lights** | Agreed hazardous waste disposal contractor. |
| **Degreasing still-bottoms** | Agreed hazardous waste disposal contractor. |
| **Anti- freeze liquid** | Agreed hazardous waste disposal contractor. |
| **Other** Note 4 | |

Note 1: The licensee may treat, reuse, recycle or recover waste subject to the prior written agreement of the Agency.

Note 2: Any variation from those contractors named in the IPC licence application, or subsequent agreements, must have the prior written agreement of the Agency. In cases where a previously agreed waste contractor is considered by the Agency not to exercise due care in respect of the transport and disposal of the licensee's waste, the Agency may at any time instruct a licensee to stop using this contractor.

Note 3: Other method to be agreed with the Agency.

Note 4: No other waste shall be disposed of/recovered on or off-site without prior notice to, and prior written agreement of the Agency.

## *Schedule 2(ii) Other Wastes for Disposal/Recovery*

| Waste Materials | Method of disposal/recovery Notes 1 - 4 |
|---|---|
| **Scrap Metal / Welding Rods** | Agreed waste recovery contractor. |
| **Ash/Cinders** | Agreed waste disposal contractor/On- site landfill. |
| **Polythene covering** | Agreed recycling disposal contractor. |
| **Wooden pallets and timber** | Agreed waste disposal/recovery contractor. |
| **Hand cleansing rags** | Agreed waste disposal contractor. |
| **General Office & Canteen Waste** | Agreed waste disposal contractor. |
| **Paint waste** | Agreed waste disposal contractor. |
| **Other** Note 4 | |

Note 1: The licensee may treat, reuse, recycle or recover waste subject to the prior written agreement of the Agency.

Note 2: Any variation from those contractors named in the IPC licence application, or subsequent agreements, must have the prior written agreement of the Agency. In cases where a previously agreed waste contractor is considered by the Agency not to exercise due care in respect of the transport and disposal of the licensee's waste, the Agency may at any time instruct a licensee to stop using this contractor.

Note 3: Other method to be agreed with the Agency.

Note 4: No other waste shall be disposed of/recovered on or off-site without prior notice to, and prior written agreement of the Agency.

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## *Schedule 3 Monitoring of Workshop/Depot Surface Water Run-off*

**Emission Point Reference No's.:** All surface water discharges from workshops and depots associated with the licensed activity.

| Parameter | Monitoring Frequency | Analysis Method/Technique |
|---|---|---|
| **Visual inspection** | Weekly | - |
| **COD** | Monthly | Standard Methods |

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# *Schedule 4 Recording and Reporting to the Agency*

Completed reports shall be submitted to: The Environmental Protection Agency
Headquarters, PO Box 3000
Johnstown Castle Estate
Co Wexford
Ireland

**or** Any other address as may be specified by the Agency

Reports are required to be forwarded as set out below:

## Recurring Reports:

| Report | Reporting Frequency | Report Submission Date |
|---|---|---|
| **Surface Water (Schedule 1(ii) and Schedule 3)** | Quarterly | Ten days after end of the quarter being reported on. |
| **Complaints (where these arise)** | Monthly | Ten days after end of the month being reported on. |
| **Annual Environmental Report (AER)** | Annually | 1 March of each year |

| Annual Environmental Report Content | |
|---|---|
| • Emissions to water summary | • Environmental management programme - proposal |
| • Waste management report. | • Environmental management programme - report |
| • Resource consumption summary | • Reported incidents summary |
| • Complaints summary | • Bog development and operational programme |
| • Air emissions report (dust/boiler efficiency) | • Bog rehabilitation progress report |
| • Report on de-silting programme | • Bund integrity (every two years, refer Condition 9.1.6) |
| • Surface water discharge monitoring location programme | • Integrity of underground fuel pipelines (refer Condition 9.1.12) |

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## Once-off Reports:

| Report | Report Submission Date |
|---|---|
| **Bund integrity assessment.** | Within eighteen months of the date of grant of licence. |
| **Environmental management programme proposal.** | Within six months of the date of grant of licence. |
| **Proposal for dust monitoring locations (Condition 5.3)** | Within three months of the date of grant of licence. |
| **Proposal for surface water monitoring locations (Condition 6.2)** | Within three months of the date of grant of licence. |
| **Proposal for installation of a composite sampler (Condition 6.4)** | Within six months of the date of grant of licence. |
| **Programme for fitting of silt ponds to all bog discharges (Condition 6.6)** | Within six months of the date of grant of licence. |
| **Upgrade of sedimentation pond treatment system (Condition 6.9)** | Within six months of the date of grant of licence. |
| **Proposal for screenings disposal (Condition 7.4)** | Within nine months of the date of grant of licence. |
| **Integrity of underground fuel pipelines (Condition 9.1.12)** | Within twelve months of the date of grant of licence. |
| **Bog rehabilitation programme (Condition 10.2)** | Within eighteen months of the date of grant of licence. |

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**Signed on behalf of the Agency**

**Padraic Larkin**

_____

**Director/Authorised Person**

**Dated this 26th day of April 2000**

Headquarters
P.O. Box 3000
Johnstown Castle Estate
County Wexford
Ireland

# TECHNICAL AMENDMENT A
# TO
# IPPC LICENCE

| | |
|---|---|
| **Licence Register Number:** | P0501-01 |
| **Licensee:** | Bord na Mona Energy Limited |
| **Location of Facility:** | Derrygreenagh Group,<br>c/o Derrygreenagh Works,<br>Rochfordbridge, Mullingar,<br>County Westmeath. |

# *Reasons for the Decision*

The Environmental Protection Agency is satisfied, on the basis of the information available, that subject to compliance with the conditions of Integrated Pollution Prevention and Control (IPPC) licence Reg. No. P0501-01 granted on the 26th April 2000, as well as any amendments noted herein, any emissions from the activity will comply with and not contravene any of the requirements of Section 83(5) of the Environmental Protection Agency Acts, 1992 to 2012.

# *Technical Amendment*

In pursuance of the powers conferred on it by Section 96(1)(c) of the Environmental Protection Agency Acts, 1992 to 2012, the Agency amends the licence, granted to Bord na Mona Energy Limited (Derrygreenagh Group), for an installation located at Derrygreenagh Works, Rochford Bridge, Mullingar, County Westmeath.

Henceforth, the licence shall be read in conjunction with the amendments set out below.

This technical amendment is limited to the following Glossary of Terms and Condition(s):

# *Amendments*

## Amend Glossary of Terms as follows

| | |
|---|---|
| **Extractive waste** | As defined in regulation 3(2) of the Waste Management (Management of Waste from the Extractive Industries) Regulations, 2009, SI 566 of 2009. |
| **Waste facility** | As defined in regulation 3(2) of the Waste Management (Management of Waste from the Extractive Industries) Regulations 2009, SI 566 of 2009. |

## New Conditions

***Add condition 7.5 to include the following after condition 7.4.***

7.5 Extractive Waste Management

The licensee shall draw up a Waste Management Plan (to be known as an Extractive Waste Management Plan) for the minimisation, treatment, recovery and disposal of extractive waste. This Plan shall meet the requirements of regulation 5 of the Waste Management (Management of Waste from the Extractive Industries) Regulations, 2009. The Plan shall be submitted for agreement by the Agency by the 31st December 2012. The Plan shall be reviewed at least once every five years thereafter in a manner agreeable to the Agency and amended in the event of substantial changes to the operation of a waste facility or to the waste deposited. Any amendments shall be notified to the Agency.

All extractive waste shall be managed in accordance with the Extractive Waste Management Plan. A report on the implementation of the Extractive Waste Management Plan shall be provided in the AER.

***Add condition 7.6 to include the following after condition 7.5.***

7.6 Waste Facility

(i) No new waste facility may be developed or an existing waste facility modified unless agreed by the Agency.

(ii) The licensee shall ensure that all existing waste facilities are managed and maintained to ensure their physical stability and to prevent pollution or contamination of soil, air, surface water or groundwater.

(iii) The licensee shall ensure that all new waste facilities are constructed, managed and maintained to ensure their physical stability and to prevent pollution or contamination of soil, air, surface water or groundwater.

(iv) Operational measures shall be continuously employed to prevent damage to waste facilities from personnel, plant or equipment.

(v) The licensee shall establish and maintain a system for regular monitoring and inspection of waste facilities.

(vi) All records of monitoring and inspection of waste facilities, as required under the licence, shall be maintained on-site in order to ensure the appropriate handover of information in the event of a change of operator or relevant personnel.

***Add condition 7.7 to include the following after condition 7.6.***

7.7 Excavation Voids

7.7.1 Unless otherwise agreed by the Agency, only extractive waste shall be placed in excavation voids.

7.7.2 When placing extractive waste into excavation voids for rehabilitation and construction purposes, the licensee shall, in accordance with regulation 10 of the Waste Management (Management of Waste from the Extractive Industries) Regulations, 2009, and the Extractive Waste Management Plan:

(i) Secure the stability of the waste.

(ii) Put in place measures to prevent pollution of soil, surface water and ground water.

(iii) Carry out monitoring of the extractive waste and excavation void.

This technical amendment shall be cited as Amendment A (in pursuance of Section 96(1)(c) of the EPA Acts 1992 to 2012) to IPPC Licence Register No. P0501-01.

**Sealed by the Seal of the Agency on this the 27th day of September, 2012.**

**PRESENT when the seal of the Agency was affixed hereto**

**Patrick Byrne, Authorised Person**

Headquarters
P.O. Box 3000
Johnstown Castle Estate
County Wexford
Ireland

# TECHNICAL AMENDMENT C
# TO
# INTEGRATED POLLUTION CONTROL LICENCE

| | |
|---|---|
| **Licence Register Number:** | P0501-01 |
| **Licensee:** | Bord na Móna Energy Limited |
| **Location of Installation:** | Derrygreenagh Group<br>c/o Derrygreenagh Works<br>Rochfordbridge<br>Mullingar<br>County Westmeath |

# *Reasons for the Decision*

The Environmental Protection Agency is satisfied, on the basis of the information available, that subject to compliance with the conditions of licence Reg. No. P0501-01 granted on the 26 April 2000, and amended on 27 September 2012 (Technical Amendment A) and 18 June 2013 (Technical Amendment B) as well as any amendments noted herein, any emissions from the activity will comply with and not contravene any of the requirements of Section 83(5) of the Environmental Protection Agency Act 1992 as amended.

A screening for Appropriate Assessment was undertaken to assess, in view of best scientific knowledge and the conservation objectives of the site, if the proposed activity comprising of a change to the IPC-licensed site boundary, individually or in combination with other plans or projects is likely to have a significant effect on a European Site(s). In this context, particular attention was paid to the European sites at Lough Ennell SAC (site code 685), Lough Ennell SPA (site code: 4044), Raheenmore Bog SAC (site code: 582), River Boyne and River Blackwater SAC (site code: 2299), River Boyne and River Blackwater SPA (site code: 4232), Split Hills and Long Hill Esker SAC (site code 1831) and Mount Hevey Bog SAC (site code 2342) and the Agency considered, for the reasons set out below, that the proposed activity is not directly connected with or necessary to the management of those sites as European Sites and that it can be excluded on the basis of objective scientific information, that the proposed activity, individually or in combination with other plans or projects, will have a significant effect on a European site, and accordingly the Agency determined that an Appropriate Assessment of the proposed activity is not required.

It has been determined that the proposed activity does not have the potential for significant effects on any European site due to not involving any physical works.

# *Technical Amendment*

In pursuance of the powers conferred on it by Section 96(1)(c) of the Environmental Protection Agency Act 1992 as amended, the Agency amends the licence, granted to Bord na Móna Energy Limited, Derrygreenagh Group, c/o Derrygreenagh Works, Rochfordbridge, Mullingar, County Westmeath.

Henceforth, the licence shall be read in conjunction with Amendment A issued on 27 September 2012, Amendment B issued on 18 June 2013 and the amendments set out below.

This technical amendment is limited to the following:

Condition 1.

# *Amendments*

## New Conditions or Amended Conditions

*Amend Condition 1.4 of the licence, to read as follows:*

1.4 Any reference in this licence to 'site' shall mean the plan area outlined in black and labelled Derrygreenagh Group on Location Map Drawings 2.1 and 2.2 of Attachment 2 in the IPC licence application, excluding the area of land referred to in Condition 1.3 of Waste Licence Register Number W0275-01 granted by the Agency on 19 February 2014.

This technical amendment shall be cited as Amendment C to the licence.

**Sealed by the Seal of the Agency on this the 25th day of February, 2014**

**PRESENT when the seal of the Agency was affixed hereto**

**Mary Turner, Authorised Person**

Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

Headquarters
P.O. Box 3000
Johnstown Castle Estate
County Wexford
Ireland

# TECHNICAL AMENDMENT B
# TO
# INTEGRATED POLLUTION PREVENTION & CONTROL LICENCE

| | |
|---|---|
| **Licence Register Number:** | P0501-01 |
| **Licensee:** | Bord na Mona Energy Limited |
| **Location of Facility:** | Derrygreenagh Group<br>c/o Derrygreenagh Works<br>Rochfordbridge<br>Mullingar<br>County Westmeath |

# *Reasons for the Decision*

The Environmental Protection Agency is satisfied, on the basis of the information available, that subject to compliance with the conditions of Integrated Pollution Prevention and Control (IPPC) Licence Reg. No. P0501-01 granted on the 26 April 2000 (and amended on 27 September 2012), as well as any amendments noted herein, any emissions from the activity will comply with and not contravene any of the requirements of Section 83(5) of the Environmental Protection Agency Acts, 1992 to 2013.

# *Technical Amendment*

In pursuance of the powers conferred on it by Section 96(1)(c) of the Environmental Protection Agency Acts, 1992 to 2013, the Agency amends the licence, granted to Bord na Mona Energy Limited (Derrygreenagh Group), for an installation located at Derrygreenagh Works, Rochfordbridge, Mullingar, County Westmeath.

Henceforth, the licence shall be read in conjunction with Amendment A issued on 27 September 2012, as well as the amendments set out below.

This technical amendment is limited to the following; Glossary of Terms, Conditions and Schedule:

# *Amendments*

**Amend Glossary of Terms as follows**

**Trigger level** A parameter value, the achievement or exceedance of which requires certain actions to be taken by the licensee.

## New and Amended Conditions

***Amend Condition 6.2 of the licence to read as follows.***

6.2 The licensee shall, by the 1st August 2013, submit for agreement by the Agency a revised proposal for a surface water discharge monitoring programme. This programme shall have regard to the following:

(i) The current status of each bogland (virgin, under development, operational or worked out);
(ii) The sensitivity of the receiving water;
(iii) The relevant River Basin Management Plan;
(iv) The nature, magnitude and variability of the discharges;
(v) The reliability of the silt ponds control measures; and,
(vi) The status of the silt pond upgrade programme.

The revised surface water discharge monitoring location programme shall ensure that a representative selection of all surface water emission points from boglands within the licensed area is monitored annually and that all emission points are monitored at least once every five years. Surface water emission points shall be monitored as set out in Schedule 1(ii) *Monitoring of Emissions to Water* of this licence.

***Add Condition 6.13 to include the following after Condition 6.12.***

6.13 The licensee shall trend the monitoring results for total ammonia and determine any statistically significant relationship that exists between the results and the current status of each bogland (virgin, under development, operational or worked out), rainfall, silt pond control measures or other factors. The licensee shall report annually as part of the AER on the trends and on any statistically significant relationship identified.

*Add Condition 6.14 to include the following after Condition 6.13.*

6.14 The licensee shall, by 1 August 2013, establish a suitable trigger level for total ammonia in surface water discharges. The licensee shall have in place a response programme to address the attainment or exceedence of the trigger level value. This response programme shall include the necessary actions to ensure there will be no emissions to surface water of environmental significance.

## New Schedules or Amended Schedules

*Amend Schedule 1(ii) Monitoring of Emissions to Water to read as follows:*

## *Schedule 1(ii) Monitoring of Emissions to Water*

**Emission Point Reference No's.:** As agreed under Condition 6.2

| Parameter | Monitoring Frequency | Analysis Method/Technique |
|---|---|---|
| **pH** | Quarterly | Standard Methods |
| **Flow** | Quarterly | Agreed Method |
| **Suspended Solids** | Quarterly | Standard Methods |
| **Total Solids** | Quarterly | Standard Methods |
| **Total Phosphorus (as P)** | Quarterly | Standard Methods |
| **Total Ammonia (as N)** | Monthly[Note 1] | Standard Methods |
| **Colour** | Quarterly | Standard Methods |
| **COD** | Quarterly | Standard Methods |

**Note 1:** The frequency of monitoring can be reduced with agreement by the Agency under Condition 11.5 of this licence.

This technical amendment shall be cited as Amendment B to the licence.

Sealed by the Seal of the Agency on this the 18th day of June, 2013

PRESENT when the seal of the Agency was affixed hereto

Mary Turner, Authorised Person

Headquarters
P.O. Box 3000
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# TECHNICAL AMENDMENT C
# TO
# INTEGRATED POLLUTION CONTROL LICENCE

| | |
|---|---|
| **Licence Register Number:** | P0501-01 |
| **Licensee:** | Bord na Móna Energy Limited |
| **Location of Installation:** | Derrygreenagh Group<br>c/o Derrygreenagh Works<br>Rochfordbridge<br>Mullingar<br>County Westmeath |

# *Reasons for the Decision*

The Environmental Protection Agency is satisfied, on the basis of the information available, that subject to compliance with the conditions of licence Reg. No. P0501-01 granted on the 26 April 2000, and amended on 27 September 2012 (Technical Amendment A) and 18 June 2013 (Technical Amendment B) as well as any amendments noted herein, any emissions from the activity will comply with and not contravene any of the requirements of Section 83(5) of the Environmental Protection Agency Act 1992 as amended.

A screening for Appropriate Assessment was undertaken to assess, in view of best scientific knowledge and the conservation objectives of the site, if the proposed activity comprising of a change to the IPC-licensed site boundary, individually or in combination with other plans or projects is likely to have a significant effect on a European Site(s). In this context, particular attention was paid to the European sites at Lough Ennell SAC (site code 685), Lough Ennell SPA (site code: 4044), Raheenmore Bog SAC (site code: 582), River Boyne and River Blackwater SAC (site code: 2299), River Boyne and River Blackwater SPA (site code: 4232), Split Hills and Long Hill Esker SAC (site code 1831) and Mount Hevey Bog SAC (site code 2342) and the Agency considered, for the reasons set out below, that the proposed activity is not directly connected with or necessary to the management of those sites as European Sites and that it can be excluded on the basis of objective scientific information, that the proposed activity, individually or in combination with other plans or projects, will have a significant effect on a European site, and accordingly the Agency determined that an Appropriate Assessment of the proposed activity is not required.

It has been determined that the proposed activity does not have the potential for significant effects on any European site due to not involving any physical works.

# *Technical Amendment*

In pursuance of the powers conferred on it by Section 96(1)(c) of the Environmental Protection Agency Act 1992 as amended, the Agency amends the licence, granted to Bord na Móna Energy Limited, Derrygreenagh Group, c/o Derrygreenagh Works, Rochfordbridge, Mullingar, County Westmeath.

Henceforth, the licence shall be read in conjunction with Amendment A issued on 27 September 2012, Amendment B issued on 18 June 2013 and the amendments set out below.

This technical amendment is limited to the following:

Condition 1.

# *Amendments*

## New Conditions or Amended Conditions

*Amend Condition 1.4 of the licence, to read as follows:*

1.4 Any reference in this licence to 'site' shall mean the plan area outlined in black and labelled Derrygreenagh Group on Location Map Drawings 2.1 and 2.2 of Attachment 2 in the IPC licence application, excluding the area of land referred to in Condition 1.3 of Waste Licence Register Number W0275-01 granted by the Agency on 19 February 2014.

This technical amendment shall be cited as Amendment C to the licence.

**Sealed by the Seal of the Agency on this the 25th day of February, 2014**

**PRESENT when the seal of the Agency was affixed hereto**

**Mary Turner, Authorised Person**

# APPENDIX 4-2

***Bord na Móna Cutaway Bog Decommissioning and Rehabilitation Plans***

Bord na Móna

# Ballivor Bog

# Cutaway Bog Decommissioning and Rehabilitation Plan 2024

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This document seeks to address the requirements of Condition 10.2 of IPC License Ref. P0501-01:

> "*The licensee shall prepare, to the satisfaction of the Agency, a fully detailed and costed plan for permanent rehabilitation of the cutaway boglands within the licensed area.*"

*This licence condition requires Bord na Móna agree with the EPA the measures that will provide for rehabilitation, i.e. stabilisation of Ballivor Bog upon cessation of peat production and compliments the licence requirement to decommission the site.*

***Rehabilitation** generally comprises site stabilisation with natural colonisation with or without targeted management.*

*Industrial peat production has now fully ceased at Ballivor Bog.*

*Bord na Móna have defined the key rehabilitation outcome at Ballivor Bog as environmental stabilisation.*

*Any consideration of any other future after-uses for Ballivor Bog, such as renewable energy, will be conducted in adherence to the relevant planning guidelines and consultation with relevant authorities and will be considered within the framework of this rehabilitation plan.*

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| Document Control Sheet | |
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| Document File Path: | |
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| This document comprises: | DCS | TOC | Text (Body) | References | Maps | No. of Appendices |
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## NON-TECHNICAL SUMMARY

- Bord na Móna is updating the draft rehabilitation plan for Ballivor Bog, which is located west of the town of Ballivor, in Co. Meath and Co.Westmeath.
- Ballivor Bog is part of the Ballivor-Derrygreenagh Bog Group with Lisclogher East Bog and Lisclogher West Bog located to the north and Carranstown Bog and Bracklin Bog located to the south of Ballivor Bog.
- Ballivor Bog formerly supplied a range of commercial functions including the supply of horticultural peat, sod peat, and milled peat.
- Industrial peat harvesting is now finished at Ballivor Bog, having ceased in June 2020.
- While Ballivor Bog was utilised for industrial peat production from 1940s until 2020, the bog still has relatively deep residual peat. Much of the former industrial production area currently comprises of bare peat. Within the former production area there are some already established pioneer peatland habitats.
- This rehabilitation plan has been prepared as Bord na Móna as part of obligations to carry out peatland rehabilitation via an IPC License issued by the Environmental Protection Agency (IPC Reg Ref. 0501-01).
- The key objective of peatland rehabilitation is environmental stabilisation. This means developing habitats and vegetation back onto the bare peat (putting a "skin" back onto the peat), and minimising effects to downstream waterbodies. Typical cutaway peatland communities such as Birch woodland, fen habitat and *Sphagnum*-rich embryonic bog communities are expected to develop.
- In general, soggy ground conditions are preferred. This means the remaining peat is wet and that plants that prefer wetter conditions, like Bog Cotton and Reeds will thrive.
- Rehab measures will include drain-blocking and other measures to raise water levels to the surface of the bog, thus encouraging the development of naturally functioning cutaway peatland habitats.
- Many Bord na Móna bogs cannot be restored back to raised bog, as so much peat has been removed and the environmental conditions have been modified. However other natural habitats will develop like shallow wetlands with Reedbeds and Birch woodland, and in time a naturalised peatland can be restored.
- The rehabilitation of Ballivor Bog will support biodiversity including plants, insects, birds and mammals. This includes some species that are rare and protected in the wider landscape. It will increase the national area of native woodland. Many wetland habitats in the wider landscape have been reclaimed for agriculture and other uses and peatland rehabilitation is an opportunity to create new wetland habitats.
- These rehabilitation measures will be planned by a team consisting of expert ecologists and engineers. It is a guiding principle of Bord na Móna rehabilitation planning that no actions or activities will be undertaken that would negatively impact on adjacent land. No boundary drains will be blocked. Water will still leave the bog via the existing outlets.
- It will take some time for vegetation and habitats to fully develop at Ballivor Bog, and a peatland ecosystem to be restored. However, it is expected that most of the bare peat will be developing pioneer habitats after 10 years.
- Bord na Móna have submitted a planning application to An Bord Pleanála for a renewable energy project called Ballivor Wind Farm (Ref. PA25M.316212; https://www.ballivorwindfarmplanning.ie/). This proposed development has been submitted for planning permission, and the proposed layout design has informed the rehabilitation and constraints on Ballivor Bog. It is expected that peatland rehabilitation for Ballivor Bog will be carried out alongside or after the proposed Wind Farm construction.
- Any other proposed development will be planned in adherence to relevant planning guidelines and will consider the rehabilitation and the condition of the site.

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- Peatland rehabilitation of these bogs will bring a range of benefits to the local community via improvements to the local landscape and is also important for supporting national policies and strategies in relation to reduction of carbon emissions from these peatlands, supporting biodiversity and improvements to water quality.

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# 1. INTRODUCTION

Bord na Móna operates under IPC Licence issued and administered by the EPA to extract peat within the Ballivor-Derrygreenagh bog group (Ref. P0501-01). As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. Ballivor bog is part of the Ballivor-Derrygreenagh bog group (see Appendix I for details of the bog areas within the Ballivor-Derrygreenagh bog group). Ballivor Bog is located in Counties Meath and Westmeath.

This plan is a specific rehabilitation plan for the bog and outlines:

- Description of site management and status.
- Main issues and approaches to rehabilitation.
- Consultation to date with interested parties.
- Interaction with other policy and legislative frameworks (Appendix V).
- The planned rehabilitation goals and outcomes.
- The scope of the rehabilitation plan.
- Criteria which define the successful rehabilitation and key targets to validate rehabilitation.
- Proposed rehabilitation actions.
- Proposed timeframe to implement these measures.
- Budget and Costings.
- Associated aftercare, maintenance and monitoring.

Note: This plan should be read in conjunction with the accompanying Map book: Ballivor Bog Decommissioning and Rehabilitation Plan - Ballivor Bog GIS Map Book.

Bord na Móna announced in January 2021 the complete cessation of industrial peat production across its estate. Peat extraction ceased in Ballivor Bog in June 2020.

This draft rehabilitation plan outlines the proposed approach to be taken for IPC compliance in respect of Ballivor Bog. Bord na Móna is fully committed to meeting its obligations relating to rehabilitation and decommissioning under the Integrated Pollution Control Licence.

In April 2023, Bord na Móna Powergen Ltd lodged a planning application to An Bord Pleanála (Ref. PA25M.316212) for a development consisting of 26 no. wind turbines and associated works at the Ballivor Bog Group, known as Ballivor Wind Farm (https://www.ballivorWind Farm.ie/). The proposed wind farm is located on Ballivor bog, Carranstown bog, Bracklin bog, Lisclogher bog and agricultural land adjacent to Bracklin bog. This application was made directly to An Bord Pleanála as 'Strategic Infrastructure Development' (SID) under the provisions of Section 37E of the Planning and Development Act 2000, as amended (the Act). This position was confirmed by An Bord Pleanála in correspondence to the Applicant dated 5th April 2022 following pre-application consultations with the Board under Section 37B of the Act (ABP-307471-20). A separate EIAR and accompanying NIS was undertaken for the proposed wind farm development. At the time of writing, a decision had not yet been made by An Bord Pleanála with regards this application.

Bord na Móna has developed a number of onshore wind developments on lands which were previously subject to peat extraction, such as Mount Lucas Wind Farm and Cloncreen Wind Farm. These developments, among others, have demonstrated that peatland rehabilitation and wind farm development can co-exist successfully. The rehabilitation plan outlines how the site will be rehabilitated along with the construction and operation of the proposed Wind Farm. Further details of this proposed Wind Farm development can be obtained at the project website (Bord na Móna Wind Farm | Ballivor Wind Farm).

This rehabilitation plan has been specifically developed to integrate the proposed Ballivor Wind Farm development. It assumes that planning permission for the project will be granted in the future. If planning permission is not granted for this project, then Bord na Móna will revise the rehabilitation plan. Bord na Móna is fully committed to meeting its obligations relating to rehabilitation and decommissioning under the Integrated Pollution Control Licence.

It has been proposed by the Government that Bord na Móna carry out a Peatlands Enhanced Decommissioning, Rehabilitation and Restoration Scheme on its peatlands. This proposal is also known colloquially as the 'Peatlands Climate Action Scheme' (PCAS). The additional costs of the scheme are supported by the Government through the Climate Action Fund and Ireland's National Recovery and Resilience Plan, administered by the Department of Environment, Climate and Communications (DECC), while the National Parks and Wildlife Service (NPWS) will act as the scheme regulator. The Peatlands Climate Action Scheme is expected to operate between 2021-2025. Over 13,000 ha of cutaway peatlands have been rehabilitated as part of this scheme to date, across multiple Bord na Móna peatlands. Enhanced rehabilitation measures that have been proposed as part of PCAS are **NOT** proposed as part of this draft Ballivor rehabilitation plan at this stage. The potential implementation of enhanced rehabilitation measures at Ballivor Bog will be dependent on the selection of Ballivor Bog as a site to be included in PCAS.

## 1.1 Constraints and Limitations

This document seeks to address the requirements of Condition 10.2 of IPC License Ref. P0501-01:

> "*The licensee shall prepare, to the satisfaction of the Agency, a fully detailed and costed plan for permanent rehabilitation of the cutaway boglands within the licensed area.*"

This document covers the area of **Ballivor Bog**.

Industrial peat extraction at Ballivor Bog permanently ceased in 2020 (with bog development for peat extraction having commenced in 1948).

It is anticipated that the combination of rehabilitation measures and natural colonisation will result in environmental stabilisation. Nevertheless, it will still take some time (30-50 years) for naturally functioning wetland and peatland ecosystems to fully re-establish.

Parts of Ballivor Bog (within and outside the areas owned and under the control of Bord na Móna) are currently being used by domestic turf cutters for intensive private sod peat production. These areas are ecologically and hydrologically linked to the area owned by Bord na Móna where rehabilitation is planned. It is beyond the scope of this rehabilitation plan to address turf cutting issues on Ballivor Bog that are outside of the control of Bord na Móna. Nevertheless, Bord na Móna are aware of such issues which may constrain the proposed rehabilitation actions, and this rehabilitation plan considered potential impacts of these on the delivery of the stated objectives.

Rehabilitation in other areas of the bog may also be constrained due to other property issues or issues such as rights of way. Several Rights of Way exist at or around the margin of Ballivor Bog, most of which lead to known turbary areas.

Bord na Móna is about to seek consent for a proposed renewable energy development at Ballivor and rehabilitation under IPC license compliance will be undertaken in a phased approach along with construction of the proposed development, should consent be granted.

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# 2. METHODOLOGY

This draft rehabilitation plan was developed with a combination of desktop and field surveys, along with consultations with internal and external stakeholders. The development of this rehabilitation plan considered **recently published** guidance issued by the EPA in 2020 – **Guidance on the process of preparing and implementing a bog rehabilitation plan**.

The ecological information and site information collected during the Bord na Móna ecological baseline survey, additional confirmatory site visits (covering the period 2012 to 2021 inclusive) and monitoring and desktop analysis forms the basis for the development of the rehabilitation plan for the bog, along with:

- Experience of 40 years of research on the after-use development and rehabilitation of the Bord na Móna cutaway bogs (Clarke, 2010; Bord na Móna, 2016);
- Significant international engagement during this period with other counties in relation to best-practice regarding peatland rehabilitation and after-use through the International Peat Society and the Society for Ecological Restoration (Joosten & Clarke, 2002; Clarke & Rieley, 2010; Gann *et al*., 2019);
- Consultation and engagement with internal and external stakeholders;
- GIS Mapping;
- BNM drainage surveys;
- Bog topography and LIDAR data;
- Previous research studies on site, and;
- Hydrological modelling.

## 2.1 Desk Study

The desk study involved collecting all relevant environmental and ecological data for the study area. The development of the rehabilitation plan also takes account of research, experience and engagement with other peatland restoration and rehabilitation projects and peatland research including Irish, UK, European and International best-practice guidance (full citations are in the References Section):

- Anderson *et al*. (2017). An overview of the progress and challenges of peatland restoration in Western Europe.
- Barry, T.A. et al (1973). A survey of cutover peats and underlying mineral soils. Soil Survey Bulletin No. 30. Dublin, Bord na Móna and An Foras Taluntais.
- Bonn *et al*. (2017). Peatland restoration and ecosystem services- science, policy and practice.
- Carroll *et al*. (2009). *Sphagnum* in the Peak District. Current Status and Potential for Restoration. Moors for the Future Report No 16.
- Clark & Rieley (2010). Strategy for responsible peatland management.
- Eades *et al*. (2003). The Wetland Restoration Manual.
- Farrell & Doyle (2003). Rehabilitation of Industrial Cutaway Atlantic Blanket Bog, NW Mayo, Ireland.
- Feehan, J. (2004). A long-lived wilderness. The future of the north midlands peatland network. Department of Environmental Resource Management, UCD.
- Foss, P.J., Crushell, P. & Gallagher, M.C. (2017) Title: Counties Longford and Roscommon Wetland Study. Report prepared for Longford and Roscommon County Councils.
- Gann *et al*. (2019). International Principles and Standards for the practice of Ecological Restoration.

- Hinde *et al*. (2010). *Sphagnum* re-introduction project: A report on research into the re-introduction of *Sphagnum* mosses to degraded moorland. Moors for the Future Research Report 18.
- Joosten & Clarke (2002). Wise Use of mires and peatlands – Background and Principles including a framework for Decision-making.
- Lindsay (2010). Peatbogs and Carbon: A Critical Synthesis to Inform Policy Development in Oceanic Peat Bog Conservation and Restoration in the Context of Climate Change.
- Mackin *et al*. (2017). Best practice in raised bog restoration in Ireland. Irish Wildlife Manuals, No. 99. National Parks and Wildlife Service,
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Additional on-line resources were also incorporated into the desk study, including:

- Ballivor-Derrygreenagh Integrated Pollution Control Licence (P0501-01);
- Ballivor-Derrygreenagh Annual Environmental Reports;
- Review of the National Biodiversity Data Centre (NBDC) webmapper;
- Inland Fisheries Ireland (IFI) Reports;
- Environmental Protection Agency database (www.epa.ie);
- EPA Guidance on Requests for Alterations to a Licensed Industrial or Waste Activity;
- BirdWatch Ireland online data (including I-WeBS and CBS datasets; www.birdwatchireland.ie);
- Geological Survey of Ireland - National Draft Bedrock Aquifer map;
- Geological Survey of Ireland - Groundwater Database (www.gsi.ie);
- Historic Environment Viewer at https://webgis.archaeology.ie/historicenvironment/
- National Parks & Wildlife Services Public Map Viewer (www.npws.ie);
- Water Framework Directive catchments.ie/maps/ Map Viewer (www.catchments.ie);

- OPW Indicative Flood Maps (www.floodmaps.ie);
- CFRAM Preliminary Flood Risk Assessment (PFRA) maps (www.cfram.ie);
- River Basin Management Plan for Ireland 2018 – 2021;
- Bord na Móna Annual Report 2023.
- Spatial data in respect of Article 17 reporting, available online at https://www.npws.ie/maps-and-data/habitat-and-species-data/article-17.

## 2.2 Consultation

A number of stakeholders have been identified during the course of Bord na Móna's rehabilitation and Biodiversity Action Plan activities and are contacted during the rehabilitation planning process for their views. See Section 4.

## 2.3 Field Surveys

Bord na Móna carried out a baseline ecological survey of all of its properties in 2009-2012 and developed habitat maps. As part of this exercise, Ballivor Bog was surveyed in December of 2011 and May of 2012.

Additional ecological walk-over surveys and visits have taken place at Ballivor Bog between 2011-2021 and have been referenced where necessary. Habitat maps have been updated, where required. This rehabilitation plan is informed by the original baseline survey as well as any subsequent confirmatory site walk-over surveys and visits, and updates to baseline data.

Habitat mapping followed best-practice guidance from Smith *et al.* (2011). Map outputs including all habitat maps and target notes were produced using GIS software application packages (ArcGIS). General marginal habitats and other habitats that had not been modified significantly by industrial peat extraction were classified using Fossitt *et al*. (2000). Plant nomenclature for vascular plants follows Stace (2010), while mosses and liverworts nomenclature follows identification keys published by the British Bryological Society (2010). A more detailed Bord na Móna classification system was previously developed for classifying pioneer cutaway habitats as Fossitt categories were deemed not to be detailed enough for cutaway bog (much of cutaway bog could be classified as Cutover Bog - PB4).

A detailed ecological survey report for Ballivor Bog is contained in Appendix II.

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# 3. SITE DESCRIPTION

Ballivor Bog is located approximately 5km east of Raharney in Co. Meath and Co. Westmeath along the R156 Raharney to Ballivor Road. Approximately half of Ballivor Bog was in active (milled) peat production until relatively recently (2020); however, an area in the southwest (previously used for sod peat) has not been in production for a number of years and has begun to re-vegetate.

It is part of the Ballivor-Derrygreenagh Bog group and a BnM railway links the site to Carranstown Bog to the north and further north again to Bracklin Bog. Much of the extant peat that remains at Ballivor is "red" or "*Sphagnum*" peat. Ballivor Bog has a gravity drainage regime.

A large proportion of Ballivor which was in peat production until recently is dominated by bare peat. A section in the north east has not been in production since the mid 1980s. Since industrial peat production withdrew from this area, natural re-vegetation has occurred. A mixture of Birch scrub and dry Heather-dominated vegetation now dominates this section of the site along with some Birch woodland (WN7), silt ponds and a small area of pioneering cutaway habitats. Very little bare peat exists in this area and trees have been steadily spreading across all areas within this section.

The northern section of Ballivor is dominated by a former "works" area. This comprises former offices, sheds, roads and areas where lorries were loaded with peat. A small section of remnant raised bog is still located in this vicinity. This remnant bog is in relatively good condition and has been used by a local school for educational purposes.

See Drawing number BNM-ECO-02-01 titled ***Ballivor Bog: Bog Site Location***, included in the accompanying Mapbook[1], which illustrates the location of Ballivor Bog in context to the surrounding area.

## 3.1 Status and Situation

### *3.1.1 Site history*

Development of Ballivor bog commenced in 1948 with the installation of drainage, with peat extraction ceasing in June 2020. The western margin of the bog includes a small section of remnant raised bog.

### *3.1.2 Current land-use*

Industrial peat production has now permanently ceased at Ballivor Bog. Approximately fifty percent of the surface comprises bare peat.

Site infrastructure and structures are mapped in the accompanying Mapbook, see drawing number BNM-ECO-02-02. Some marginal areas to the east south-east and west of the Bord na Móna boundary are used for private turbary.

### *3.1.3. Socio-Economic conditions*

Bord na Móna has historically been a vital employer for the rural community of the Midlands of Ireland. Bord na Móna compiled a report on the role of peat extraction in the midlands historically in which they report that in

[1] Ballivor Bog Decommissioning and Rehabilitation Plan - Ballivor Bog GIS Map Book 2022

1986, by the end of Bord na Móna's Third Development Programme, a total of twenty-three work locations had been established around the country. The company had an average employment of approximately 4,688 in the mid 1980's, with a peak employment of 6,100 during the production season, which placed it among the country's largest commercial employers. The importance of such levels of employment were largely due to its regional concentration in the Midlands and the lack of alternative employment opportunities at the time.

According to the Energy Crop Socio-Economic Study undertaken by Fitzpatrick Associates in 2011, there were an estimated 1,443 jobs supported by the peat-to-power industry in Ireland at the time, some 81% of which were located in the catchment areas of the three peat-fired generating stations (Lough Ree, West Offaly, and Edenderry Power Stations). These constituted jobs in the plants and in peat extraction, jobs indirectly supported in upstream supply industries and jobs induced through the trickle-down effects of the wages and salaries of those supported directly or indirectly.

In respect of Ballivor Bog, jobs included in the above study would have included those to facilitate extraction of peat at this site, and associated processing and transfer to the relevant power station.

As the primary employer in many Midland counties, Bord na Móna played a central role in building communities through several initiatives, including Education bursaries, support of local sporting clubs, the provision of community gain funds, charity programmes and the provision and building of amenity areas."

These job numbers have now declined with the cessation of peat extraction at this bog. It is anticipated that rehabilitation under IPC license conditions will provide some employment for a team of workers for a period of time (> 1 year).

## 3.2 Geology and Peat Depths

### *3.2.1 Sub-soil geology*

The underlying geology comprises Waulsortian limestone[2]. The site is underlain with both gravel and marl. Gravel sub-soil has been exposed in places within the production-related cutaway area, which was noted on the west side of the site when carrying out field surveys in September 2021.

### 3.2.2 *Peat type and depths*

Large sections of Ballivor still contain significant areas of "*Sphagnum*" peat. Peat depths range from less than half a meter to greater than 2.6m.

## 3.3 Key Biodiversity Features of Interest

Potential embryonic bog *Sphagnum*-rich communities are establishing on some areas of old sod-peat cutaway. There are old records of Red Grouse present in margins of site. This is a Red-listed bird species of breeding concern in Ireland. Subsequent surveys have indicated that this was probably some released birds as there have been no further records of breeding Grouse (Biosphere Environmental Services, 2014). The site is used occasionally by

[2] https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=de7012a99d2748ea9106e7ee1b6ab8d5&scale=0

Peregrine and small flocks of Lapwing and Curlew in the winter. The marginal habitats found around the fringes of the site including scrub and Birch woodland. The small bog remnant adjacent to the entrance is now zoned for biodiversity.

### *3.3.1 Current habitats*

The most common habitats present at Ballivor include (in order of dominance) (Codes refer to Heritage Council habitat classification, (Fossitt, 2000)):

- Bare peat (PB4)
- Dry Heather-dominated vegetation (PB4)
- Dry grassland dominated by Purple Moorgrass (GS4)
- Disturbed vegetation 9ED3)
- Access routes (rail lines and tracks including gravel embankments and associated habitats such as dry grassland communities (GS2) and scrub)
- Scrub (WS1)
- Raised bog (PB1)
- Cutover Bog (PB4)
- Bog woodland (WN7) (on cutover bog dominated by Birch and/or Scot's Pine)
- Scrub (WS1) (on old cutover bog)
- Wet grassland (GS4)
- Buildings and artificial surfaces (BL3) (roads, tracks and hard surfaces along access routes)

See Drawing number BNM-ECO-23-02-17 titled ***Ballivor Bog: Current Habitat Map*****,** included in the accompanying Mapbook, which illustrates the habitats at Ballivor Bog.

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| | |
|---|---|
|  <br>*Bare peat and degraded bog habitat at Ballivor (May, 2020)* |  <br>Bog cotton *at Ballivor (May, 2020)* |
|  <br>*Sphagnum at Ballivor bog (May, 2020)* |  <br>*Raised bog remnant at Ballivor Bog (May, 2020)* |

*Table 1: Photos of Habitats at Ballivor Bog*

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### *3.3.2 Species of conservation interest*

In previous surveys by Bord na Móna Ecologists, several bird species were noted including Red Grouse droppings (December, 2011), Snipe, Whooper Swan (flying over the site, December, 2011), Raven, Curlew calling along the southern boundary of the site (December, 2011), Lapwing, Kestrel, Wheatear as well as other more common species included Meadow Pipit, Heron, Wood Pigeon, Blackbird, Robin and Magpie.

Mammal species including badger, fox (scats were deposited on the high bog at several locations) and hare (noted on the high bog) have all been recorded at Ballivor bog, as well as Common Frog. Signs of Deer were noted at several locations around the site with some tracks across the bog and within some of the Birch woodland.

### *3.3.3 Invasive species*

NBDC holds records for the high impact invasive species Canadian Waterweed (*Elodea canadensis*), recorded in the wider area of the site. A broad range of common garden escapes are also occasionally present around the margins of Bord na Móna bogs. Although spatial overlap with the rehabilitation work is expected to be limited, any invasive species, where necessary, will be treated in line with best practice during rehabilitation.

## 3.4 Statutory Nature Conservation Designations

Ballivor has no overlapping designated sites.

The nearest EU Designated sites to Ballivor Bog are as follows:

- River Boyne and River Blackwater SAC (site code: 002299) and River Boyne and River Blackwater SPA (site code: 004232) located approx. 1.2km to the south of the site;
- Mount Hevey Bog SAC (site code: 002342) (also a pNHA) located approx. 3.5km south.

The nearest nationally Designated site to Ballivor Bog is Molerick Bog NHA (site code: 001582) located south. The nearest non-statutory designated sites i.e. proposed Natural Heritage Areas (pNHAs), in the wider area include the Royal Canal pNHA and Mount Hevey Bog pNHA, both located to the south.

### *3.4.1 Other Nature Conservation Designations*

The Ramsar Convention entered into force in Ireland on 15th March 1985. Ireland currently has 45 sites/wetlands designated as Wetlands of International Importance (Ramsar Sites). These cover a surface area of 66,994 ha. There are no Ramsar Sites in the local vicinity of Ballivor Bog (i.e. within 3km). The closest Ramsar Sites to Ballivor Bog are Lough Derravarragh, Lough Iron, Lough Ennell and Lough Owel, all of which are circa 18 km west of the site, as well as Raheenmore Bog circa 30 km south west of the site.

See Figures *BNM-ECO-02-23: Ballivor Bog Proximity to Designated Sites* in the accompanying map book.

## 3.5 Hydrology and Hydrogeology

Ballivor bog forms part of the Boyne Catchment (Catchment ID : HA 07) as defined by the EPA under the Water Framework Directive (WFD) and is situated within the Boyne_SC_050 Sub-Catchment. A tributary of the Deel River is located at the south of the site. A tributary of the Boyne River is located along the eastern boundary of the site. The bog is located within the Eastern river basin district, along the floodplain of the river Boyne east of

the town of Mullingar. Ballivor bog contains several drainage pathways which primarily drain in an easterly direction towards the River Boyne. Ballivor Bog has a gravity-based drainage system.

GSI data indicates that the underlying geology of Ballivor Bog comprises Waulsortian limestone[3].This unit is classified as a Locally Important Aquifer (Bedrock which is Moderately Productive only in Local Zones), with a small section that is a Poor Aquifer (Bedrock which is Generally Unproductive except for Local Zones). A south-west to north-east trending fault line crosses the bog. No data exists concerning depth to bedrock. There are also no mapped karst features within the surrounding area.

Quaternary Sediment maps show Ballivor underlain by peat, yet surrounded by inorganic deposits, including Till derived from limestones to the east, south and west, as well as some Gravels derived from Limestones and Lacustrine sediments to the south and south-east. GSI Groundwater mapping indicates that there is generally low and moderate vulnerability in the surrounding area with some higher vulnerability areas to the east and south. While Groundwater Vulnerability is typically used to indicate the susceptibility to groundwater pollution, it can provide a useful proxy indication of likely groundwater flow rates in the surrounding area.

## 3.6 Emissions to surface-water and watercourses

Drainage is an important feature of industrial peat production and there were extensive field drains maintained throughout bog areas to facilitate industrial peat production annually, each of which eventually drains into a terminal silt pond that allows for settlement of suspended solids before entering the main river systems. In accordance with the existing Integrated Pollution Control licence, all drainage water from boglands in a licensed area is discharged via an appropriately designed silt pond treatment arrangement as required in Condition 6.6. of the licence. Industrial peat production has now permanently ceased at Ballivor Bog.

Silt ponds are the key silt control infrastructure to control potential emissions from industrial peat production sites. As required under licence, BNM have a number of procedures for how it manages and maintains its silt pond network. The silt that builds up in silt ponds is excavated on a regular basis by Bord na Móna to facilitate an efficient level of silt control. Silt ponds will continue to be maintained during the rehabilitation and decommissioning. Silt pond decommissioning will be considered when sites are deemed to be on a trajectory of environmental stability and peatland rehabilitation has been completed.

Ballivor bog has six treated surface water outlets to the River Boyne catchment. There are five that discharge to tributaries of the Ballivor River, which in turn discharge to the River Boyne (EPA code: 07B04), and one to the Clondalee More watercourse (EPA code: 07C77), a tributary of the Deel (Raharney) (EPA code: 07D01). The Deel (Raharney) is also a tributary of the River Boyne.

The River Boyne was listed as being under pressure from peat extraction in the 2nd cycle of the River Basin Management Plan for Ireland, but are not indicated as remaining so in the third cycle which is currently out for consultation. Peat extraction was not identified as a pressure in the second cycle of the river basin management plan and is not indicated as being so in the third cycle.

Details of silt ponds and associated surface water discharge points are illustrated on drawing number BNM-ECO-02-SP01 ***Ballivor Bog Sampling Points*** and drawing number BNM-ECO-02-WQ01 ***Ballivor Bog Water Quality Map***

[3] https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=de7012a99d2748ea9106e7ee1b6ab8d5&scale=0

included in the accompanying Mapbook, which illustrate the various drainage and water quality infrastructure present at Ballivor.

There is a robust monitoring program to track and verify any changes in baseline water quality conditions pre and post decommissioning and rehabilitation so that the success or otherwise can be tracked and verified for the National Parks & Wildlife Service, Environmental Protection Agency and Local Authority Water Program, amongst a range of stakeholders.

Rehabilitation of cutaway peatland is closely linked with control of emissions. One of the criteria for successful rehabilitation is stabilisation through re-vegetation, which will stabilise all substrates and in turn remove the need for further silt control measures. This site is largely bare peat with some areas beginning to revegetate. Re-wetted peat also aids the primary objective of stabilizing peat, as when peat is re-wetted it is not vulnerable to wind erosion. Re-wetted peat and the development of wet peatland habitats can also act as sinks for silt and mobile peat, and increases additional retention time for solids, and the peatland vegetation can quickly stabilise this material within blocked drains on site (by acting like constructed wetlands).

Water quality of water discharges from restored peatlands normally improves as a result of bog restoration measures and the restoration of natural peatland processes (Bonn *et al*., 20017). Bog restoration is also expected to improve water attenuation of the site as the drains are blocked, slowing water movement and water release from the site. Restored peatlands help slow the release of water and aid the natural regulation of floods downstream (Minayeva *et al*., 2017). The National River Basin Management Plan (NRBMP) 2018-2021 (DHPCLG, 2017) is the key national plan for Ireland to achieve the objectives of the Water Framework Directive (WFD). The NRBMP outlines how key actions such as the Bord na Móna peatland rehabilitation is expected to have a positive impact on water quality and help the NWBMP deliver its objectives in relation to the WFD.

Water will still discharge from designated emission points when rehabilitation at Ballivor has been completed. This discharge will have improving water quality and there will be increased wetland attenuation, meaning slower release of water. This is expected to have a positive impact on status of the key water body receptor, the Boyne River, and is expected to support the future status of the waterbody as being of Good Status.

### Decommissioning and Rehabilitation Programme Water Quality Monitoring

Water quality monitoring will be established. There will be initial quarterly monitoring assessments of the site to determine the general status of the site, the condition of the silt-ponds, assess the condition of the rehabilitation work, asses the progress of natural colonisation, monitoring of any potential impacts on neighbouring land and general land security. The number of site visits will reduce after 2 years to bi-annually. These site visits will assess the need to additional rehabilitation.

Monitoring results will be maintained, trended and reported on each year as part of the requirement to report on Condition 10.1 of the IPC Licence on Bog Rehabilitation in the Annual Environmental Report, which will be available in April each year at www.epa.ie.

The parameters to be included (as per condition 6.2 of the IPC Licence) include monthly monitoring for pH, Flow, Suspended Solids, Total Solids, Total Phosphorus, Total Ammonia, Colour, and COD.

This sampling regime on a selected number of silt ponds will be carried out over a two-year cycle. The original (licence) requirement was for a quarterly sampling regime.

## 3.7 Fugitive Emissions to air

The bog is no longer in industrial peat production. Rehabilitation of the cutaway peatland will seek to re-wet the dry peat where possible and re-vegetate all areas (whether wet or dry). Collectively, ceasing industrial peat production, re-wetting and re-vegetating will minimise any risk of emission to air from dust.

## 3.8 Carbon emissions

The bog is likely to be a carbon source as it is a drained (degraded) peatland with some active drainage, which facilitates the oxidation of peat. Peat extraction generally transforms a natural peatland which acts as a modest carbon sink into a cutaway ecosystem which is a large source of carbon dioxide (2–5 t C/ha/year) (Waddington & McNeil, 2002; Alm *et al*., 2007; Wilson *et al*., 2007, Wilson *et al*., 2015). Furthermore, they are also a significant source of methane (Huttunen *et al*., 2003; Laine *et al*., 2007a) as a consequence of the conditions within the peat body that provide a suitable environment for the microbial breakdown of plant litter and root exudates. Degraded peatlands also release carbon/GHG emissions via the fluvial/aquatic pathway (Dissolved Organic Carbon – DOC, Suspended Solids/Particulate Matter, degassing of GHGs from water).

The EPA-funded CarbonRestore Project (Renou-Wilson et. al. 2012) found that rewetting of drained peatlands can lead to restoration of functional peatland, such as the return of typical plant and animal species, which in turn may lead to the restoration of peat-formation and the C-sink function. The EPA NEROS project carried out GHG flux research at Moyarwood Bog and found that Moyarwood Bog was overall a Carbon sink (sink for $CO_2$ and a source for Methane) 6 years after bog restoration was carried out (Renou-Wilson et al. 2018).

It is expected that Ballivor Bog will become a reduced Carbon source/part carbon sink following rehabilitation. The potential of any cutaway site to develop as a carbon sink in the longer-term depends on the success of the rehabilitation measures, the extent of development of *Sphagnum*-rich or other peat-forming habitats, the balance of carbon fluxes from different cutaway habitats and future climatic conditions. Much of this site is expected to develop *Sphagnum*-rich habitats, fen, heath and Birch woodland along with some wetland habitats with open water, Reed Swamp and fen habitats. Birch woodland is expected to develop on the drier mounds and peripheral headlands.

## 3.9 Current ecological rating

(Following NRA (2009) Evaluation Criteria)

This site can be rated as having a **low local ecological value (E)** as it is dominated milled production bog and bare peat. Some sections of the site including re-vegetating areas, marginal habitats and the woodland on the mineral island have a high local ecological value **(D).**

# 4. CONSULTATION

## 4.1 Consultation to date

Consultation seeks to engage an audience of relevant stakeholders at both a national and local level. National stakeholders have been identified from varied bog restoration and rehabilitation efforts undertaken by Bord na Móna over the past 40 years, with particular emphasis on engagement with stakeholders during their Biodiversity Action Plan programme, since 2010. National Stakeholders includes relevant government departments and agencies, relevant semi-state bodies, NGOs and other environmentally-focused groups with a national remit.

There has been ongoing consultation about rehabilitation, biodiversity and other general issues over the years about Ballivor-Derrygreenagh bog group, including Ballivor Bog, with various stakeholders in relation to:

- General consultation with range of stakeholders at annual Bord na Móna Biodiversity Action Plan review days 2010-2018;
- Meetings and site visit with local community group - Meath-Westmeath Bog Group regarding rehabilitation of Bracklin Bog between 2013 - 2016.
- Meeting with Westmeath County Council regarding general rehabilitation plans for BnM bogs and BnM BAP (2016)
- Midlands & East Regional WFD Operational Committee (River Basin Management Plans),
- The proposed development of the nearby Ballivor wind farm,
- Archaeological Liaison Committee (National Museum of Ireland & Dept of Culture Heritage and the Gaeltacht).

There has been ongoing consultation about the planning and construction of Ballivor Wind Farm (Bord na Móna Wind Farm | Ballivor Wind Farm) as part of the planning process for that particular proposed development. This project website describes the project and has up to date project newsletters.

To inform the current Plan, both national and local stakeholders, including neighbours whose land adjoins Ballivor Bog and local representatives of national bodies (such as Regional National Parks and Wildlife Service staff) and relevant offices in County Councils (such as the Heritage or Environmental Offices) will be contacted. Any identified local interest groups will be sought and informed of the opportunity to engage with this rehabilitation plan, and when identified invited to submit their comments or observations in relation to the proposed rehabilitation at Ballivor Bog.

All correspondence received will be acknowledged and evaluated against the rehabilitation work proposed here, and the final draft of the Ballivor Bog Rehabilitation Plan will contain a review of the consultation.

## 4.2 Issues raised by Consultees

N/A Yet as consultation has not commenced.

## 4.3 Bord na Móna response to issues raised during consultation

N/A Yet as consultation has not commenced.

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# 5. REHABILITATION GOALS AND OUTCOMES

The rehabilitation goals and outcomes outline what Bord na Móna want to achieve by implementing the rehabilitation. These include:

- Meeting conditions of IPC Licence.
- Stabilisation or reduction in water quality parameters of water discharging from the site (e.g. suspended solids).
- Reducing pressure on receiving waterbodies that have been classified as At Risk from peatlands and from peat extraction, via stabilization or improving water-quality from this bog, and therefore, reducing pressures.
- Integrating peatland rehabilitation with future planned renewable energy infrastructure on site. It is proposed to re-wet areas in the surrounding cutaway peatland, where possible.
- Optimising hydrological conditions for the protection of exposed archaeological structures, their retention in situ and preservation into the future.
- The main goal and outcome of this plan is the successful rehabilitation (environmental stabilisation) of peatlands used for industrial peat production at the bog in a manner that is acceptable to both external stakeholders and to Bord na Móna and which optimise climate action and other ecosystem service benefits.

The rehabilitation goals and outcomes take account of the following issues.

- Natural colonisation will form the basis for the environmental stabilisation of the bare peat areas. Re-wetting of the cutaway, where possible, is a general rehabilitation strategy. The main target will be to maintain water-levels close to the peat surface, and to avoid the creation of large-water bodies. Re-wetting and water levels close to the peat surface accelerates the re-vegetation processes, the development of vegetation cover and therefore environmental stabilisation. There is already significant potential for the creation of wet cutaway habitats at Ballivor Bog due to the local topography (localised basins).
- It will take some time for stable naturally functioning habitats to fully develop at Ballivor Bog. This will happen over a longer time-frame than the implementation of this rehabilitation plan.
- Re-wetting residual peat will initially maintain and enhance the carbon storage capacity of the bog. There is scientific consensus that restoration of hydrology in damaged bog can improve carbon storage, water storage and attenuation and help support biodiversity both on the site and in the catchment (See Section 3.8). This will reduce Carbon emissions from the site from a larger carbon source to a smaller Carbon source/part Carbon sink. In time, the site has the capacity to develop in part as a Carbon sink.
- Rehabilitating former industrial peat production bog will also in the longer-term support other ecosystem services such as such the development of new habitat to support biodiversity and local attenuation of water flows from the bog.
- WFD status in receiving water bodies can be affected by peatlands and peat extraction but is also affected by other sources such as agriculture. In addition, receiving water bodies that are assessed as At Risk from peatlands and from peat extraction are likely to have several contributary sources of impacts (private peat extraction and Bord na Móna). Reducing pressures due to former peat extraction activities at Ballivor will contribute to stabilising or improving water quality status of receiving water bodies in general.

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Ultimately, improving the WFD status of the receiving waterbody will depend on reducing pressure from a range of different sources, including peatlands in general (private and Bord na Móna).

- Re-wetting in general will benefit the future preservation of most known and unknown archaeological features. An Archaeological Impact Assessment (AIA) is to be carried out.

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# 6. SCOPE OF REHABILITATION

The principal scope of this enhanced rehabilitation plan is to rehabilitate the bog. This is defined by:

- The area of Ballivor Bog.
- EPA IPC Licence - Ref. P0501-01. As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. Ballivor bog is part of the Ballivor-Derrygreenagh bog group.
- The local environmental conditions of Ballivor Bog mean that deep peat and dry cutaway measures are the most suitable rehabilitation approach for this site. Ballivor Bog does have residual deep peat along with shallower areas.
- The key goals and outcomes of rehabilitation are set by Bord na Móna. Bord na Móna have defined the key goal and outcome of rehabilitation at Ballivor Bog as **environmental stabilisation**, **optimising residual peat re-wetting, and the development of compatible habitats.**
- The cutaway is already developing a mosaic of woodland, grassland, wetland and cutaway peatland habitats. Part of this cutaway has largely stabilised. Rehabilitation is proposed to enhance residual peat re-wetting in these areas while taking account of future infrastructure and land-uses.
- Proposed land-use. Bord na Móna are currently developing a renewable energy project called Ballivor Wind Farm. This proposed project has been submitted for planning permission. The proposed renewable energy project will have a footprint on Ballivor Bog and has been mapped as a constraint in the rehabilitation plan.
- Rehabilitation of Ballivor Bog will support multiple national strategies of climate action, biodiversity action and other key environmental strategies such was the Water Framework Directive.
- The time frame for the delivery of the planned rehabilitation will be undertaken according to available resources and appropriate constraints.
- It is not proposed to carry out rehabilitation on all marginal or peripheral cutover bog zones. Generally, these bog remnants are narrow, or are subject to turbary, and do not have positive bog restoration prospects.

## 6.1 Key constraints

- **Bog conditions.** Rehabilitation outcomes of sites are constrained by the environmental characteristics of these particular areas. Drain blocking can be widespread in scale with each field drain being blocked (e.g. Kellysgrove) or more localised with targeted drain-blocking (e.g. Mountlucas Wind Farm) and both can be very effective. This can be used in conjunction with local topographical features like natural hollows to manage water levels or with other typical features of cutaway peatlands like high peat fields, which act as berms to hold water to some extent. Active management to create low berms to manage water-levels and create shallow wetland habitats dominated by emergent vegetation has also been successfully developed (e.g. Mountlucas Wind Farm, Bruckana Wind Farm, Oweninny, Lough Boora Discovery Park, Ballycon). In conjunction with the wind farm development and associated roads and embankments there will be further opportunities to manage water-levels using the new construction as a partial embankment, where possible. Material (peat and sub-soil) side-casted from the road construction can be used to develop low berms that would then prevent the adjacent cutaway from draining directly into the drains along the roads. This technique has been used at Mountlucas and Bruckana Wind Farm. Overflow pipes will be used to maintain maximum water levels across the cutaway and allow excess

surface water to flow into the drainage channels beside the roads and other infrastructure. Managing the cutaway in this way means that the cutaway can stay wet, while excess surface water can drain away through the drainage infrastructure.

- **Future land-use.** Planned renewable energy development. It is expected that the site will be part of the proposed Ballivor Wind Farm. This project has been submitted for planning permission. Any proposed rehabilitation measures will be integrated to enable any future renewable energy development. It is expected that the proposed development footprint associated with the renewable energy will be < 4% of the overall site. The potential impact of this infrastructure on the rehabilitated area is expected to be relatively minor and it does not change the overall goals and outcomes of the proposed rehabilitation (re-wetting residual peat) for the overall site. The key objective will be environmental stabilisation and re-wetting of the cutaway areas between the proposed Wind Farm infrastructure.
- The EIAR for the proposed Ballivor Wind Farm development details issues related to peat management during construction. In summary, during construction for access tracks, hardstands and other areas, peat is excavated from the cutaway, moved to the side, graded into berms not more than 1 m and allowed to natural re-vegetate This has proven successful during construction of Mountlucas Wind Farm. In the event that natural re-vegetation was unsuccessful, then other measures such as re-seeding would be considered.
- **Surrounding landscape and neighbours.** Another key constraint is the interaction between the Bord na Móna sites and the surrounding landscape. Care has to be taken that no active rehabilitation management is carried out that could negatively and knowingly impact on surrounding land. This includes any hydrological management on neighbouring farmland. It is anticipated that the work proposed here (blocking drains and re-wetting cutaway peatlands) will not have any flooding impacts on adjacent land.
- **Coillte.** Coillte have planted some conifer plantation on cutover bog along the north-western margins of this bog. It is not proposed to change or affect any conifer or commercial forestry via rehabilitation.
- **Turbary.** There are a number of small, isolated area (constraint), to the south, west and north-west of the bog that are subject to active turbary.
- **Archaeology**. Should any previously unknown archaeological material be uncovered during the rehabilitation works, it will be avoided and reported to Bord na Móna Archaeological Liaison Officer and the National Museum of Ireland.
- **Public Rights of Way**. Where a public right of way or similar burden exists on Bord na Móna property, consideration will be given to ensuring that this remain intact where possible. In some instances, depending upon previous land uses and management, alternative solutions may be required. These will be explored in consultation with local communities and statutory bodies during the consultation work associated with the decommissioning and rehabilitation work described here.

## 6.2 Key Assumptions

- It is assumed that Bord na Móna will have all resources required to deliver this project.
- It is expected that weather conditions will be within normal limits over the rehabilitation plan timeframe. Long periods of wet weather have the capacity to significantly affect ground conditions and constrain drain blocking and other ground activities.

## 6.3 Key Exclusions

The scope of this rehabilitation plan does not cover:

- The longer-term development of stable naturally functioning habitats to fully develop at Ballivor Bog. The plan covers the short-term rehabilitation **actions** and **an additional monitoring and after-care programme** to monitor the rehabilitation and to respond to any needs.
- This plan is not intended to be an after-use or future land-use plan for Ballivor Bog.
- The longer-term management of this site, potentially as a nature conservation site, or for amenity, or for other uses in the future.

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# 7. CRITERIA FOR SUCCESSFUL REHABILITATION

This section outlines what criteria will be used to indicate successful rehabilitation and what critical success factors are needed to achieve successful rehabilitation. All criteria used to indicate successful rehabilitation will be measured to validate the achievement of the rehabilitation goals and outcomes and validate the completion of the rehabilitation.

The key objective of this enhanced rehabilitation plan is **environmental stabilisation** and the stabilisation of any emissions from the site that related to the former industrial peat extraction activities.

Rehabilitation is generally defined by Bord na Móna as

- stabilisation of bare peat areas via targeted active management (e.g. drain-blocking/re-wetting) slowing movement of water across the site and encouraging natural colonisation; and
- mitigation of key emissions (e.g. potential suspended solids run-off).

## 7.1. Criteria for successful rehabilitation to meet EPA IPC licence conditions:

- Rewetting of residual peat in the former area of industrial peat production to offset potential run off of suspended solids and to encourage and accelerate development of vegetation cover via natural colonisation, and reducing the area of bare exposed peat. See Table 7.1 for a summary of the criteria for successful rehabilitation and associated monitoring. The target will be the delivery of measures and this will be measured by an aerial survey after rehabilitation is completed.
- That there is a stabilizing/improving concentration of suspended solids and ammonia in discharges from Bord na Móna sites, associated with the measures undertaken to stabilize the peat surface by the blocking of the internal drainage system and the maximized rewetting of the peat surface. This will be demonstrated by developing a stable or downward trajectory of water quality indicators (suspended solids and ammonia) towards what would be typical of a re-wetted cutaway bog. This will be measured via water quality monitoring (suspended solids and ammonia) for at least 2 years after the rehabilitation has been completed.
- Receiving water bodies have been classified under the River Basin Management Plan and this classification includes waters that are At Risk from peatlands and peat extraction. The success criteria will be that the At Risk classification will see improvements in the associated pressures from this peatland or if remaining At Risk, that there is an improving trajectory in the pressure from this peatland.

With regard to predicting and estimating likely trends that might materialize or could be considered as a target, monitoring of surface water ammonia emissions from Longfordpass bog in Littleton over 3 yrs., post cessation of peat extraction with ongoing rehabilitation, were considered. These are indicating a downward trend in Ammonia concentrations (Figure 7.1).

Similarly monitoring of surface water ammonia emissions from a Corlea bog in Mountdillon over the past 3 yrs. post cessation of peat extraction with ongoing rehabilitation, indicate downward trends.

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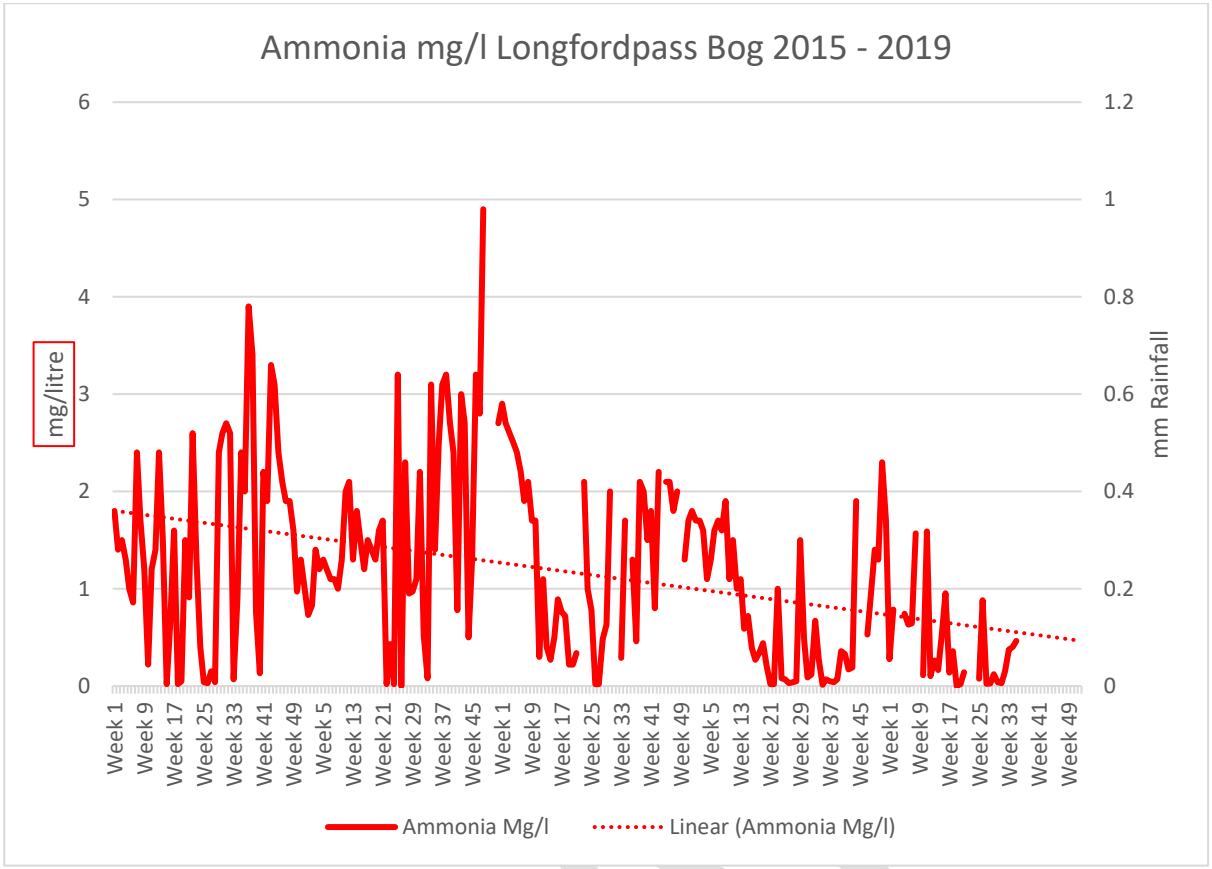


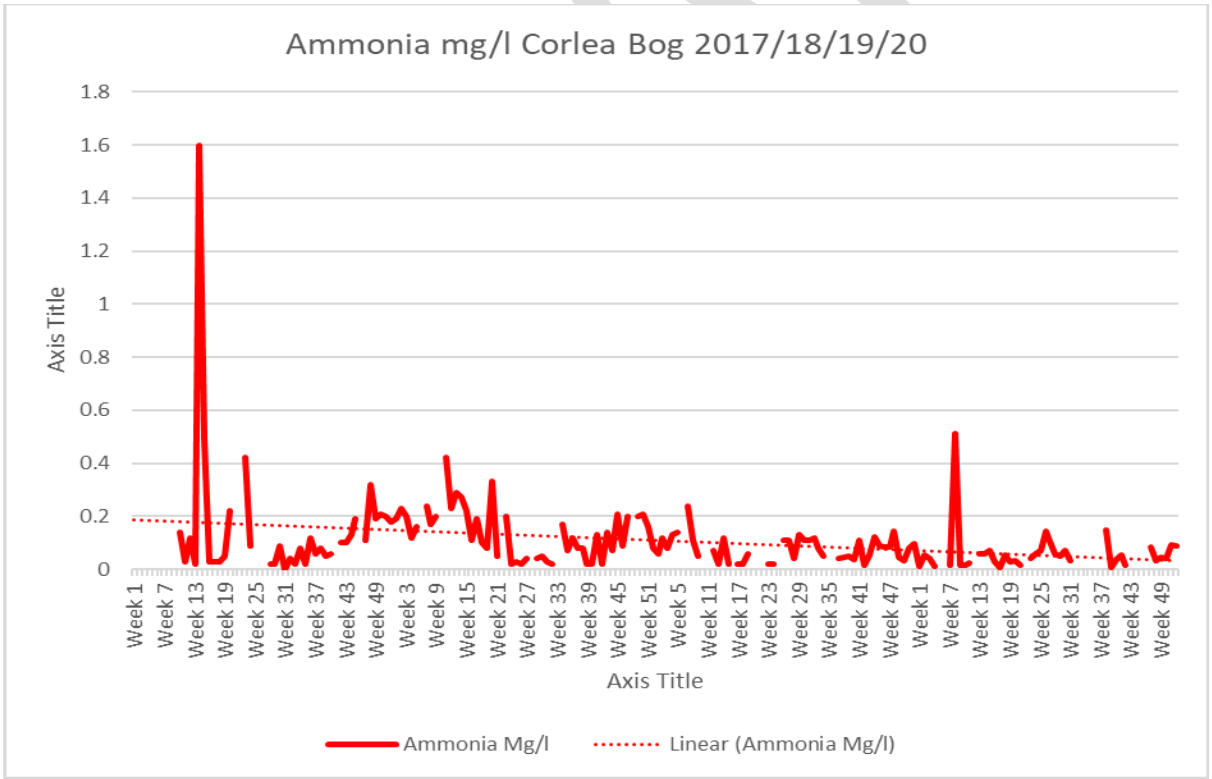


**Figure 7.1.** Ammonia levels over the period 2015-2019/2020 at Longfordpass and Corlea.

**Table 7.1. Summary of Success criteria, targets, how various success criteria will be measured and expected time-frames.**

| Criteria type | Criteria | Target | Measured by | Expected Time-frame |
|---|---|---|---|---|
| IPC validation | Rewetting in the former area of industrial peat production | Delivery of rehabilitation measures<br>Restoration of hydrological regime | Aerial photography after rehabilitation has been completed – to demonstrate measures (drain-blocking)<br>Establishment of a baseline for future monitoring of bare peat, vegetation establishment and habitat condition | 3 years |
| IPC validation | Key water quality parameters<br>Ammonia, Phosphorous, Suspended solids, pH and conductivity | Reduction or stabilisation of key water quality parameters associated with this bog | Water quality monitoring for a period after rehabilitation has been completed | 2 years |
| IPC validation | Reducing pressure from peat production on the local water body catchment (WFD) | Where this section of the water body, that this bog drains to, has not been identified as under pressure from peat extraction, that the intervening EPA monitoring programme associated with its Programme of Measures for this water body, confirms that its classification remains at not being at risk from peat extraction associated with activities at this bog. | EPA WFD monitoring programme | WFD schedule |

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## 7.2. Critical success factors needed to achieve successful rehabilitation as outlined in the plan

The achievement of successful rehabilitation as outlined in the plan requires:

- **Funding to pay for resources required to deliver the planned rehabilitation (Bord na Móna).** Bord na Móna maintains a Provision on its balance sheet to pay for these future costs when industrial peat extraction ceases. Bord na Móna is fully committed to meeting its obligations relating to rehabilitation and decommissioning under the Integrated Pollution Control Licence.
- **Bord na Móna to have sufficient resources (staff and training) to deliver the planned rehabilitation with required associated skills and competencies.**
- **Bord na Móna to have sufficient resources (suitable machinery) and staff to maintain this machinery.**
- **Weather conditions to be within normal limits over the rehabilitation plan timeframe.** Long periods of wet weather have the capacity to significantly affect ground conditions and constrain the delivery of rehabilitation. The potential impact of wet weather on ground conditions can be reduced by appropriate planning and management. Bord na Móna have significant experience of managing these issues through 70 years of working in these peatland environments.
- **Rehabilitation measures to be effective.** The rehabilitation measures proposed in this plan are based on 40 years of Bord na Móna experience of peatland management and best practice applied internationally in peatland management. Measures proposed in this plan have already been shown to be affective at other sites. Bord na Móna will apply a flexible and adaptable approach to the more innovative rehabilitation measures proposed in this plan**.** If measures are not initially effective, Bord na Móna will review any requirement for additional practical rehabilitation.
- **Natural colonisation of vegetation to develop semi-natural habitats at a rate within the normal limits.** The development of naturally functioning semi-natural habitats on degraded bog takes time. Pioneer vegetation can develop relatively quickly (3-10 years) and wetland habitats can develop relatively quickly. Birch woodland make take 20-30 years to develop. However, it may take 50 years for active raised bog vegetation to re-develop on ground that was previously cutaway. Different environmental conditions will have a significant impact on the rate of natural colonisation, and as a result of the combination of different environmental conditions and the application of different rehabilitation measures, there will be a variety of habitat outcomes.
- **Rehabilitation measures have been designed to accelerate and work with natural colonisation and other natural processes.** Bord na Móna experience of rehabilitation has shown that re-wetting improves conditions for natural colonisation and that natural colonisation is accelerated where the environmental conditions are most suitable. Rehabilitation measures have been designed to modify the conditions of areas within sites where conditions are less suitable for natural colonisation (modifying hydrology, topography, nutrient status or availability of potential seed sources).
- **Monitoring to be robust and effective.** Rehabilitation Monitoring will be established to validate the success of rehabilitation as required by Condition 10 of the IPC Licence and to verify the benefits of the proposed enhanced measures to optimise climate action. This will focus on a collecting a range of scientific data that can then quickly be adapted and into metrics that can be used to measure changes in various ecosystem services.

# 8. REHABILITATION ACTIONS AND TIME FRAME

Peatland rehabilitation requires detailed planning and the use of data from desktop surveys and field surveys. This data in association with topographical and hydrological modelling will be important in planning the future peatland landscapes and planning the use of the most appropriate rehabilitation methodologies to maximise climate action benefits. Hydrological modelling indicates those areas that are likely to re-wet when drains are blocked, based on the current topography, and areas where water levels may have to be modified, where needed. Enhanced rehabilitation measures will look to optimise hydrological conditions for re-wetting peat in other areas. This planning is also essential for matching the most sustainable rehabilitation methodology to the most suitable cutaway environment to maximise the benefits of the resource outlay (maximising cost/benefit).

A number of illustrative figures have been produced to inform Rehab Planning and Design, including Aerial Photography, Peat Depths, LiDAR Surface Maps; these are included in the accompanying Mapbook as the drawings referenced below:

BNM-ECO-02-22 titled ***Ballivor Bog: Aerial Imagery 2020***

BNM-ECO-02-04 titled ***Ballivor Bog: Peat Depths***

BNM-ECO-02-03 titled ***Ballivor Bog: LiDAR Map***

The distribution of these measures is provisionally outlined in drawing titled BNM-ECO-02-20 ***Ballivor Bog: Standard Rehabilitation Measures*** in the accompanying Mapbook**.**

These rehabilitation measures for Ballivor bog will include (see Table 8.1):

- A widespread drain-blocking programme will be implemented across the cutaway, where possible. This will have to be planned in association with the wind farm infrastructure. In general, field drains will be blocked where possible to re-wet cutaway and re-wet to the optimum water-level. More intensive measures will be targeted towards the bare peat.
- Less intensive measures (targeted drain-blocking) will be used in areas where habitats have already established.
- Measures including drain blocking (3/100 m), modifying outfalls and managing water levels with overflow pipes.

*Table 8.1: Types of and areas for rehabilitation measures at Ballivor Bog.* Note that the types of rehab and areas of rehab may change in response to stakeholder consultation and refinement of the enhanced rehabilitation measures.

| Type | Code | Description | Area (Ha) |
|---|---|---|---|
| Deep Peat Cutover Bog | DPT1 | Regular drain blocking (3/100 m) + blocking outfalls and managing water levels with overflow pipes | 398 |
| Dry Cutaway | DCT1 | Blocking outfalls and managing water levels with overflow pipes | 39 |
| Marginal Land | MLT1 | No work required | 65 |
| Other | | Silt-ponds | 6 |
| | | Constrained Areas (wind farm footprint) | 137 |
| **Total** | | | **644.03** |

## 8.1 Completed and ongoing

- A significant part of the site has already re-vegetated, with pioneer vegetation maturing and developing a mosaic of typical cutaway peatland habitats with Birch woodland predominating. Bare peat areas within the older cutaway areas are reducing. Natural re-colonisation of the cutaway so far has been quite effective. Other parts of the site (younger cutaway) are naturally colonising for more than 10 years and are developing a mosaic of cutaway habitats.

## 8.2 Short-term planning actions (0-1 years)

- Seek formal approval of the rehabilitation plan from the EPA.
- Develop a detailed site plan outlining how the various rehabilitation methodologies will be applied to Ballivor Bog. This will take account of peat depths, topography, drainage and hydrological modelling (See map for an indicative view of the application of different rehabilitation methodologies).
- A drainage management assessment of the proposed enhanced rehabilitation measures will be carried out and any issues identified resolved and the rehabilitation plan adapted.
- A review of issues that may constrain rehabilitation such as known rights of way, turbary and existing land agreements is to be carried out.
- A review of remaining peat stock to be carried out.
- An ecological appraisal of the potential impacts of the planned rehabilitation on the presence of sensitive ground-nesting bird breeding species (e.g. breeding waders) is to be carried out. The scheduling of rehabilitation operations will be adapted, where required.
- Ensure all activities comply with the environmental protection requirements of the IPC Licence.
- Carry out Appropriate Assessment (AA) of the Rehabilitation Plan.
- Track implementation and enforcement of the relevant IPC Licence conditions, the mitigation measures (AA) and other environmental control measures during the implantation of the rehabilitation plan.

## 8.3 Short-term practical actions during/post the proposed Wind Farm construction (0-2 years)

- There will be ongoing monitoring of the site and appropriate rehabilitation planning during the proposed Wind Farm construction phase.
- Side-casted material from the wind farm road and drainage construction will be used to create low berms to help manage water levels and prevent surface water draining directly into the new drains. Pipes to be inserted, where required, to manage water-levels flowing off the cutaway and into the wind farm drainage.
- Carry out proposed measures as per the detailed site plan. This will include intensive drain blocking and targeted hydrological management prescriptions in the cutaway around and between the Wind Farm infrastructure. All rehabilitation will be carried out with regard to best practice environmental control measures (Appendix III).
- Monitor the success of rehabilitation measures in relation to developing suitable hydrological conditions.
- Carry out the proposed monitoring, as outlined.

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- Silt ponds will be monitored during this period and there will be continued maintenance and cleaning to prevent potential suspended solids run-off from the site during the rehabilitation phase.

## 8.4 Long-term (Post Wind Farm construction) (>3 years)

- Site conditions and drainage are likely to change somewhat after the construction of the wind farm, so continued assessment could be made of further rehabilitation and maintenance works such as localised drain blocking and berm creation in association with the wind farm infrastructure. Similar rehabilitation works have already been carried out successfully at Mountlucas Wind Farm in County Offaly.
- Evaluate success of short-term rehabilitation measures outlined above and remediate where necessary.
- Delivery of a monitoring, aftercare and maintenance programme (See section 10.2 below).
- Decommissioning of silt-ponds will be assessed and carried out, where required.
- Reporting to the EPA will continue until the IPC License is surrendered.

## 8.5 Long-term (Post Wind Farm decommissioning)

- At this stage it is expected that the site will have no bare peat cover and that the entire site will be developing a suite of maturing cutaway habitats that reflect the mosaic of environmental conditions. The wind farm infrastructure will have been integrated into the landscape and there are likely to be other land-uses across the site including amenity.

## 8.6 Timeframe (when finalised)

- **Year 1**: Short-term planning actions.
- **Year 1**: Short-term practical actions.
- **> Year 3**: Long term practical actions. Evaluate success of short-term rehabilitation measures outlined above and remediate where necessary.
- **> Year 3**: Decommission silt-ponds, if necessary.

## 8.7 Budget and costing

Bord na Móna maintains a provision on its balance sheet to pay for the future costs of **standard** rehabilitation and decommissioning when industrial peat extraction ceases. This is updated every year - for more information see the Bord na Móna Annual Report (Bord na Móna 2023). Bord na Móna is fully committed to meeting its obligations relating to rehabilitation and decommissioning under the Integrated Pollution Control Licence.

At this time, a 'standard' rehabilitation provision (sufficient to discharge the requirement of Condition 10 in the licence) has been allocated to the site based on the area of different cutaway types across the site (See BNM-ECO-02-20).

Specific peatland rehabilitation measures that may be conditioned as part of the planning conditions for the proposed Ballivor Wind Farm will be funded via the Wind Farm construction programme.

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# 9. AFTERCARE AND MAINTENANCE

## 9.1 Programme for monitoring, aftercare and maintenance

This programme for monitoring, aftercare and maintenance has been designed to meet the Conditions of the IPC Licence. This is defined as:

- There will be **initial quarterly monitoring assessments** of the site to determine the general status of the site, the condition of the silt ponds, assess the condition of the rehabilitation work, monitoring of any potential impacts on neighbour's land, general land security, boundary management, dumping and littering.
- The number of these site visits will reduce after 2 years to bi-annually and then after 5 years to annual visits.
- These monitoring visits will also consider any requirements for further practical rehabilitation measures.
- The **baseline condition of the site will be established** post-rehabilitation implementation by using an aerial survey to take an up-to-date aerial photo, when rehabilitation is completed. This will be used to verify completion of rehabilitation measures. The extent of bare peat will be assessed using this baseline data, and habitat maps will be updated, if needed. It is proposed that sites can be monitored against this baseline in the future.
- **Water quality monitoring** at the bog will be established. The main objective of this water quality monitoring will be to establish a baseline and then monitor the impact of peatland rehabilitation on water quality from the bog.
- Monitoring results will be maintained, trended every six months and reported on each year and as required, as part of the requirement to report on Condition 10.1 of the IPC Licence on Bog Rehabilitation in the Annual Environmental Report, and will be provided to LAWPRO and the EPA as required to inform progress and national monitoring requirements under the WFD. These results will also be available in April each year as a requirement of the Annual Environmental Report at www.epa.ie.
- The parameters to be included (as per condition 6.2 of the IPC Licence) include monthly monitoring for pH, Suspended Solids, Total Solids, Total Phosphorus, Total Ammonia, Colour, and COD and DOC.
- If, after two years, key criteria for successful rehabilitation are being achieved and key targets are being met, then the water quality monitoring will be reviewed, with consideration of potential ongoing research on site. The water quality data, the aerial surveys and the habitat mapping will be collated and will be submitted to the EPA as part of the final validation report.
- Where other uses are proposed for the site that are compatible the provision of biodiversity and ecosystem services, these will be assessed by Bord na Móna in consultation with interested parties. Other after-uses can be proposed for licensed areas and must go through the required assessment process and planning procedures.

## 9.2 Rehabilitation plan validation and licence surrender – report as required under condition 10.4

***IPC License Condition 10.4.*** *A final validation report to include a certificate of completion for the Rehabilitation Plan, for all or part of the site as necessary, shall be submitted to the Agency within six months of execution of the plan. The licensee shall carry out such tests, investigations or submit certification, as requested by the Agency, to confirm that there is no continuing risk to the environment.*

Reporting to the EPA will continue until the IPC License is surrendered. The bog will be included in the full licence surrender process as per the Guidance to Licensees on Surrender, Cessation and Closure of Licensed Sites EPA, 2012, when:

- The planned rehabilitation has been completed;
- The key criteria for successful rehabilitation has been achieved and key targets have been met;
- Water quality monitoring demonstrates that water quality of discharge is stabilising or improving; and
- The site has been environmentally stabilised.

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## APPENDIX I: BOG GROUP CONTEXT

The Ballivor-Derrygreenagh Bog Group comprises 11 discrete and defined bog units within Co's. Offaly, Westmeath and Meath (and one site used for transport – Hill of Down Railway). There are two main sub-groups; Ballivor (7 sites) and Derrygreenagh (5 sites). Nearly all of the Derrygreenagh sub-group and all of the Ballivor sub-group is located within the River Boyne catchment. A small portion of the western side of Toar Bog is located in the River Shannon catchment. Each bog area further comprises a range of habitats from bare milled former peat extraction areas to re-colonising cutaway to workshops areas and transport infrastructure.

Industrial peat extraction in the Ballivor-Derrygreenagh Bog Group ceased in 2020.

The Ballivor Bogs sub-group is located close to Ballivor Town in Co. Meath and most of the bogs extend across the Meath and Westmeath border. The Bord na Móna Ballivor Peat Moss factory is located 4 km from Ballivor Village on the margin of Ballivor Bog. An industrial railway links Ballivor to Carrenstown, Bracklin and Lisclogher East. Milled peat was supplied from Ballivor, Carrenstown, and part of Bracklin to Ballivor peat moss factory for horticultural products, with milled fuel peat being transported via road to Lough Ree Power (Lanesborough Co. Longford).

Intensive decommissioning and rehabilitation for the Ballivor-Derrygreenagh Bog Group started in 2021 at a number of individual bogs.

Industrial peat extraction in the Ballivor-Derrygreenagh Bog Group ceased in 2020. Decommissioning for the Ballivor-Derrygreenagh Bog Group started in 2021 at a number of individual bogs. Enhanced rehabilitation as part of the Peatland Climate Action Scheme (PCAS) has been carried out at Carranstown Bog and Lisclogher West Bog.

Bord na Móna is currently developing a wind energy project called Ballivor Wind Farm. This proposed project has been submitted for planning permission. Bord na Móna are also continuing to review its landbank for future potential renewable energy projects.

A breakdown of the component bog areas for the Ballivor-Derrygreenagh Bog Group IPC License Ref. PO-501-01 is outlined in Table Ap-2.

*Table Ap-2: Ballivor-Derrygreenagh Bog Group names, area and indicative status (Derrygreenagh Energy Peat sub-group)*

| Bog Name | Area (ha) | Stage of development | Land-Use and History | Peat Production Cessation | Rehab Plan Status |
|---|---|---|---|---|---|
| Ballivor | 654 | Industrial peat production commenced at Ballivor in the 1940s.<br>Some sections have been cutaway. Some sections still have relatively deep residual peat. | Ballivor Bog formerly supplied a range of commercial functions including the supply of horticultural peat, sod peat and latterly; fuel peat for Lough Ree Power.<br>Some sections were never re-developed to milled peat and have revegetated as cutaway..<br>Some areas of cutaway are developing pioneer cutaway vegetation communities.<br>Expected to be part of the proposed Ballivor Wind Farm. Submitted for planning. . | 2020 | Draft updated 2024 |

| Bog Name | Area (ha) | Stage of development | Land-Use and History | Peat Production Cessation | Rehab Plan Status |
|---|---|---|---|---|---|
| Bracklin | 680 | Industrial peat production commenced at Bracklin in the 1940s.<br>Some sections have been cutaway. Some sections still have relatively deep residual peat. | Bracklin Bog formerly supplied a range of commercial functions including the supply of horticultural peat, sod peat and latterly; fuel peat for Lough Ree Power.<br>The main section was never re-developed to milled peat and has revegetated as mature cutaway habitats<br>Bare peat is prevalent in the western section, which was in milled peat extraction. A separate specific rehabilitation plan for Bracklin West has been finalised and approved by EPA and rehab in this area is ongoing.<br>Bracklin expected to be part of the proposed Ballivor Wind Farm. Submitted for planning. | 2020 | Bracklin West rehab plan finalised 2023<br>Bracklin Drat rehab plan updated 2024 |
| Carrenstown | 306 | Industrial peat production commenced at Carrenstown in the 1980s.<br>The majority of the site has relatively deep peat. | Carrenstown Bog formerly supplied a range of commercial functions including the supply of horticultural peat and latterly; fuel peat for Lough Ree Power.<br>The majority of the site is bare peat. There are cutaway habitats developing on the eastern side.<br>Expected to be part of the proposed Ballivor Wind Farm. Submitted for planning.. | 2020 | Finalised in 2022<br>Rehabilitation ongoing |
| Lisclogher East | 486 | Industrial peat production commenced at Lisclogher East in the 1950s.<br>Part of the site is cutaway while there is a mosaic of residual peat depths. | Lisclogher East formerly supplied sod turf both for fuel and horticulture. This bog was never re-developed to supply milled peat.<br>The majority of the bog is developing cutaway habitats and there is a mosaic of bare peat areas where there has been recent sod peat extraction. | 2020 | Draft updated 2024 |
| Lisclogher West | 239 | Lisclogher West was drained in 1980s.<br>The bog is drained and still has residual vegetation in places. | Lisclogher West was drained but never fully developed for industrial peat extraction. | N/A | Finalised in 2023.<br>Rehabilitation ongoing |
| Kinnegad | 352 | Industrial peat production commenced at Kinnegad in the 1980s.<br>The majority of the site still has relatively deep peat. | Kinnegad Bog formerly supplied a range of commercial functions -mainly the supply of horticultural peat and latterly; fuel peat for Lough Ree Power.<br>The majority of the site is bare peat. | 2020 | Draft 2017 |
| Hill of Down Railway | 22 | | Rail link – not used for peat extraction | N/A | |
| Ballybeg | 847 | Industrial peat production commenced at Ballybeg in the 1950s.<br>Most of the site is cutaway | Ballybeg Bog formerly supplied a range of commercial functions including the supply of horticultural peat and fuel peat for Edenderry Power.<br>Much of the site is bare peat. The northern half has been cutaway and is establishing cutaway habitats.<br>Expected to be part of the proposed Derrygreenagh Energy Project, which is currently in pre-planning. | 2020 | Draft 2023 |
| Derryarkin | 710 | Industrial peat production commenced at Derryarkin in the 1950s. | Derryarkin Bog formerly supplied a range of commercial functions including the supply of | 2015 | Draft 2023 |

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| Bog Name | Area (ha) | Stage of development | Land-Use and History | Peat Production Cessation | Rehab Plan Status |
|---|---|---|---|---|---|
| | | Most of the site is cutaway | fuel peat for Rhode Power Station, Croghan Brickette Factory and Edenderry Power.<br>Most of the site is developing cutaway habitats. Some re-wetting was carried out in the past.<br>Part used for gravel extraction.<br>Expected to be part of the proposed Derrygreenagh Energy Project, which is currently in pre-planning. | | |
| Derryhinch | 337 | Industrial peat production commenced at Derryhinch in the 1950s.<br>There is a mosaic of residual peat depths left | Derryhinch Bog formerly supplied a range of commercial functions including the supply of fuel peat for Rhode Power Station, Croghan Brickette Factory and Edenderry Power.<br>Most of the site is bare peat with emerging cutaway habitats.<br>Part of the site was used to trial herb production | 2020 | Draft 2023 |
| Drumman | 1,122 | Industrial peat production commenced at Drumman in the 1950s.<br>Most of the site is cutaway | Drumman Bog formerly supplied a range of commercial functions including the supply of fuel peat for Rhode Power Station, Croghan Brickette Factory and Edenderry Power.<br>Most of the site is developing cutaway habitats. Some re-wetting was carried out in the past.<br>Part used for gravel extraction.<br>Part of the site was used to trial herb production.<br>Part of the site is used for log storage (biomass).<br>Expected to be part of the proposed Derrygreenagh Energy Project, which is currently in pre-planning. | 2020 | Draft 2023 |
| Toar | 445 | Industrial peat production commenced at Toar in the 1980s.<br>Most of the site has deep residual peat. | Toar Bog formerly supplied a range of commercial functions including the supply of horticultural peat and fuel peat for Edenderry Power.<br>Most of the site is bare peat.<br>Part of the site is used for log storage (biomass) | 2020 | Draft 2021 |

See Drawing number BNM-ECO-03-01 titled Ballivor-Derrygreenagh Bog Group, included in the accompanying Mapbook which illustrates the location of Bracklin Bog and the Ballivor-Derrygreenagh Bog Group in context to the surrounding area.

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# APPENDIX II: ECOLOGICAL SURVEY REPORT

**Ecological Survey Report**

*Note: This report outlines an ecological survey of the bog. This report should not be taken as a management plan for the site as other land-uses may still be considered. Information within this report may inform the development of other land-uses and identify areas with particular biodiversity value.*

| | | | |
|---|---|---|---|
| **Bog Name:** | **Clondalee (Ballivor)** | **Area (ha):** | 654ha |
| **Works Name:** | Ballivor | **County:** | Westmeath & Meath |
| **Recorder(s):** | DF | **Survey Date(s):** | 20/12/2011 and 02/05/2012 |

**Habitats present (in order of dominance)**

The most common habitats present at this site include:

- (Codes refer BnM classification of pioneer habitats of production bog. See Appendix I).
- Bare peat (BP) (Codes refer BnM classification of pioneer habitats of production bog. See Appendix I).
- Dry Heath (dheath)
- Dry grassland dominated by Purple Moorgrass (gMol)
- Disturbed vegetation (DisWill, DisCF)
- Access routes (rail lines and tracks including gravel embankments and associated habitats such as dry grassland communities (GS2) and scrub)
- Scrub (WS1) (eBir, oBir and cBir)
- Raised bog (PB1) (Codes refer to Heritage Council habitat classification, (Fossitt 2000), See Appendix I.)
- Cutover Bog (PB4)
- Bog woodland (WN7) (on cutover bog dominated by Birch and/or Scot's Pine)
- Scrub (WS1) (on old cutover bog)
- Wet grassland (GS4)
- Buildings and artificial surfaces (BL3) (roads, tracks and hard surfaces along access routes)

**Description of site**

Clondalee Bog, also known as Ballivor Bog, is located approximately 5km east of Raharney in Co West Meath along the R156 Raharney to Ballivor Road. Approximately half of the site is in active peat production; however an area in the south west of the site has not been in production for a number of years and has begun to re-vegetate. Some work has been carried out within the past year (2011) to clear vegetation within this area in order to facilitate further peat production in this area.

This area was surveyed in December 2011 in order to determine the extent of the vegetation in this area and also to determine what birds were using the area as some local resident had voiced their concern regarding the impact of vegetation removal and bird species using these areas.

The area in the south west corner of the site had largely re-vegetated since peat production in this area last took place in the late 1980's. The majority of the areas had developed dry heath and Birch scrub. The most northerly area within this section had developed a mix of dry heath and closed Birch throughout while the more southerly areas were less mature

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with Birch scrub being confined to the old drainage ditches with dry heath and bare peat in between. An active rail line still runs through this section.

This area of the site was walked with the local Conservation Ranger (Triona Finnan). Birds observed on the site included Snipe, Red Grouse, Raven, Whooper Swan (flying overhead), Meadow Pipit, Greenfinch and a single Lapwing, while a lone Curlew was heard close to the south of the site. It would be unlikely that Curlew have been using the site to breed.

Red Grouse are a red-listed bird species of breeding concern in Ireland and their dropping have been found amongst a section of pioneer Heather on the site.

Two significant areas of potential embryonic bog communities have developed on a section of cutaway bog that has been allowed to revegetate. These areas consisted of open water, Bog Cotton, Soft Rush with large amounts of *Sphagnum cuspidatum*.

The remainder of the site was surveyed in May 2012. A large proportion of the site is dominated by bare peat and is in active peat production. A section of the site in the north east of the site has not been in production since the mid 1980's. Since peat production withdrew from this area, natural re-vegetation has occurred. A mixture of Birch scrub and dry heath now dominates this section of the site along with some Birch woodland (WN7), silt ponds and a small area of pEang. Very little bare peat exists in this area and trees have been steadily spreading across all areas within this section.

The northern section of the site is dominated by a "works" area. These areas consisted of offices, sheds, roads and areas where lorries are loaded with peat. Any fuel peat that is harvested on the site is transported to Lough Ree Power in Longford. To the north of the works area a small section of remnant raised bog is still located. This area is in relatively good condition and has been used by a local school for educational purposes. Cattle have access to this area and have caused some poaching. An area of agricultural grassland is located adjacent to the remnant section of raised bog and this area is rented to a local farmer who grazes cattle on it.

No Curlew were noted on the site during the ecological survey in May 2012.

**Designated areas on site (cSAC, NHA, pNHA, SPA other)**

None.

The River Boyne and Blackwater SAC is located 1.3 km to the south of the site.

**Adjacent habitats and land-use**

Habitats around the margins of the site include:

- Improved grassland (GA1) and wet grassland (GS4) that are both grazed by cattle.
- Other typical marginal peatland habitats are present including remnant high bog (PB1), cutover bog (PB4), scrub (WS1) and Birch woodland (WN7).
- Conifer plantations (WD4) have been developed adjacent to the site at several locations.
- There is some active peat cutting by private individuals on the high bog both inside and outside the BnM boundary.

**Watercourses (major water features on/off site)**

- A tributary of the Deel River is located at the south of the site.
- A tributary of the Boyne River is located along the eastern boundary of the site.

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- This bog is located within the Eastern river basin district.

**Peat type and sub-soils**

Peat depth information is only available for approximately one third of Ballivor. Of the area measured a large proportion contained in excess of 2.6m of peat. Only the horticultural peat is harvested from Ballivor but it is planned that the fuel peat will be brought to Lough Ree Power Station in Longford.

The bog is underlain with a mixture of marl and gravel.

**Fauna biodiversity**

Several bird species were noted on the site during the survey.

- Red Grouse droppings (Dec (2011)
- Snipe
- Whooper Swan (flying over the site, Dec 2011)
- Raven
- Curlew calling along the southern boundary of the site (Dec 2011)
- Lapwing
- Kestrel
- Wheatear
- Other more common species included Meadow Pipit, Heron, Wood Pigeon, Blackbird, Robin and Magpie.

**Mammals**

- Signs of Deer were noted at several locations around the site with some tracks across the bog and within some of the Birch woodland.
- Hare was noted on the high bog.
- Fox scats were deposited on the high bog at several locations.
- Badger.

**Other**

- Frog

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## APPENDIX III. ENVIRONMENTAL CONTROL MEASURES TO BE APPLIED TO BOG REHABILITATION

- Bog restoration/rehabilitation measures will be restricted to within the footprint of the proposed rehabilitation area.
- The proposed rehabilitation will have due regard to noise limits and hours of operation (i.e. dusk and dawn) to minimise any potential disturbance on resident and local fauna that utilise the site and immediate environs.
- All plant and equipment for use will comply with the Construction Plant and Equipment Permissible Noise Levels Regulations (SI 359/1996).
- The proposed activities will be restricted to daylight hours and there will be no requirement for artificial lighting.
- Silt ponds will be inspected and maintained as per the IPC Licence.
- During periods of heavy precipitation and run-off, activities will be halted.
- Measures will be carried out using a suitably sized machine and, in all circumstances, excavation depths and volumes will be minimised where possible.
- All machines will be regularly checked and maintained prior to arrival at the site to prevent hydrocarbon leakage.
- Hoses and valves will be checked regularly for signs of wear and will be closed and securely locked when not in use.
- Fuelling and lubrication of equipment shall only be carried out in designated areas away from surface water drainage features and ecologically sensitive areas.
- Waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the site for disposal or re-cycling.
- Vehicles will never be left unattended during refuelling.
- No direct discharges to waters will be made. No washings from vehicles, plant or equipment will be carried out on site.
- All plant refuelling will take place using mobile fuel bowsers. Only dedicated trained and competent personnel will carry out refuelling operations.
- Mobile storage such as fuel bowsers will be bunded to 110% capacity to prevent spills. Tanks for bowsers and generators shall be double skinned. When not in use, all valves and fuel trigger guns from fuel storage containers will be locked. All pumps using fuel or containing oil will be locally and securely bunded where there is the possibility of discharge to waters.
- Potential impacts caused by spillages etc. during rehabilitation will be reduced by keeping spill kits and other appropriate equipment on-site.
- Site activities will be carried out in accordance with 'best practice'. In order to ensure compliance and implementation of 'best practice', these measures will be communicated to relevant Bord na Móna staff and updated as required.

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# APPENDIX IV. BIOSECURITY

The potential for importation or introduction of non-native plant species (such as Japanese Knotweed, Himalayan Balsam, etc.) during future rehabilitation management, such as drain-blocking using excavators, has the potential to result in the establishment of invasive species within the site. Section 49 of the European Communities (Birds and Natural Habitats) Regulations 2011 prohibits the introduction and dispersal of invasive alien species (particularly plant species) listed on Part 1 (third column) of the 'Third Schedule'.

This section aims to reduce the risk from, and impacts of, invasive species and protecting biodiversity on lands under Bord na Móna ownership. Rehabilitation and decommissioning in the bog will have due regard to the relevant biosecurity measures outlined below:

- Records of problematic invasive species within the various bog units will be marked out with signs to highlight areas of infestation to personnel.
- All plant machinery will be restricted from disturbing known colonies of invasive species.
- All plant machinery will avoid unnecessary crossings to adjoining lands.
- Good site hygiene will be employed to prevent the introduction and spread of problematic invasive alien plant species (i.e. Japanese Knotweed (*Fallopia japonica*), Himalayan Balsam (*Impatiens glandulifera*), Himalayan Knotweed (*Persicaria wallichii*), etc.) by thoroughly washing vehicles prior to entering the area.

The biosecurity measures outlined above are in line with best practice guidelines issued by the National Roads Authority (NRA, 2010) – The Management of Noxious Weeds and Non-native Invasive Plant Species on National Roads and broadly based on the Environment Agency's (2013) – The Knotweed Code of Practice: Managing Japanese Knotweed on Development Sites (Version 3, amended in 2013, accessed on the Environment Agency's website on the 11th of July 2016).

In addition to the above, Best Practice measures around the prevention and spread of Crayfish plague[4] will be adhered with throughout all rehabilitation measures and activities.

[4] https://www.biodiversityireland.ie/projects/invasive-species/crayfish-plague/

# APPENDIX V. POLICY AND REGULATORY FRAMEWORK

Bord na Móna Plc is a publicly owned company, originally established in 1934 to develop some of Ireland's extensive peat resources for the purposes of economic development and to support energy security. In the decades since its establishment the company has employed tens of thousands of people in its fuel, energy, and horticultural growing media businesses. For much of its history the company's support of important national policy aims has been enabled and encouraged in a variety of ways by Government.

Today, Bord na Móna is undertaking a number of highly significant actions in support of climate policy. These actions involve a radical transformation and decarbonisation of nearly the entire Bord na Móna business. This transformation will be driven by unlocking the full potential of our land and creating significant value for Ireland and the Midlands in particular.

Bord na Móna is an integral part of the economic, social, and environmental fabric of Ireland and Irish life. As a key employer in the Midlands, the company is conscious that its obligations go beyond purely commercial and environmental – there is also a social responsibility to employees and the communities served by Bord na Móna. It is the company's role and absolute priority to ensure that its long-term strategy delivers on all of these important areas in a robust and balanced way.

There are a wide range of policies, plans, legislation and land designations that inform the development of this Bord na Móna peatland rehabilitation plan. Bord na Móna have also developed and operate various policies and strategies that also inform the development of this rehabilitation plan.

## 1 EPA IPC Licence

Bord na Móna operates under IPC Licence issued and administered by the EPA to extract peat within the Ballivor-Derrygreenagh Bog Group (Ref. PO-501-01). As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. The bog is part of the Ballivor group. This regulatory requirement is the main driver of the development of this rehabilitation plan.

## 2 National Climate Policy

The National Policy Position establishes the fundamental national objective of achieving a transition to a competitive, low carbon, climate-resilient and environmentally sustainable economy by 2050. It sets out:

- the context for the objective;
- clarifies the level of GHG mitigation ambition envisaged; and
- establishes the process to pursue and achieve the overall objective.

The evolution of climate policy in Ireland will be an iterative process based on the adoption by government of a series of national plans over the period to 2050. GHG mitigation and adaptation to the impacts of climate change are to be addressed in parallel national plans – respectively through the National Climate Action Plan. The plans will be continually updated, as well as being reviewed on a structured basis at appropriate intervals and, at a minimum, every five years. This will include early identification and ongoing updating of possible transition pathways to 2050 to inform sectoral strategic choices.

Bord na Móna is following a decarbonisation programme aimed at reducing the carbon emissions from its activities. Industrial peat production has now ceased and several other decarbonisation measures are being

implemented. The company aims to further develop renewable energy and resource recovery markets with a key objective of reducing the carbon intensity of all products. In addition, the carbon emission mitigation benefits associated with the post-peat extraction rehabilitated peatland following re-wetting, revegetation and colonisation of significant areas with native woodland will make a significant contribution to achieving the State's carbon emission reduction targets.

## 3 National Peatlands Strategy

The National Peatlands Strategy (2015) contains a comprehensive list of actions, necessary to ensure that Ireland's peatlands are preserved, nurtured and become living assets within the communities that live beside them. It sets out a cross-governmental approach to managing issues that relate to peatlands, including compliance with EU environmental law, climate change, forestry, flood control, energy, nature conservation, planning, and agriculture. The Strategy has been developed in partnership between relevant Government Departments/State bodies and key stakeholders through the Peatlands Council.

The strategy recognises that Ireland's peatlands will continue to contribute to a wide variety of human needs and to be put to many uses. It aims to ensure that Ireland's peatlands are sustainably managed so that their benefits can be enjoyed responsibly. It aims to inform appropriate regulatory systems to facilitate good decision making in support of responsible use. It also aims to inform the provision of appropriate incentives, financial supports and disincentives where required. The strategy attempts to strike an appropriate balance between different needs, including local stakeholders like turf-cutters and semi-state bodies such as Bord na Móna.

In line with a National Peatlands Strategy recommendation, a Peatlands Strategy Implementation Group (PSIG), was established, assisted in the finalisation of the Strategy, is overseeing subsequent implementation and will report to Government on an annual basis on the implementation of the actions and principles contained within the Strategy.

Bord na Móna is a key stakeholder in the National Peatlands Strategy and the Peatlands Strategy Implementation Group. The strategy recognises the potential for some Bord na Móna sites to be restored and to contribute to the national SAC and NHA network of protected raised bog sites. The strategy (agreed in 2015) also recognises the various different values of cutaway bog and developed six key principles (with Bord na Móna) for the after-use of cutaway bog.

- Bord na Móna will continue to assess and evaluate the potential of the company's land bank, using a land use review system. The assessment will help prepare a set of evidence-based management plans for the various areas of peatland. These plans will also inform its cutaway bog rehabilitation.
- The policy of Bord na Móna is not to open up any undrained new bogs for peat production.
- Lands identified by Bord na Móna as having high biodiversity value and/or priority habitats will be reserved for these purposes as the proposed future land use.
- Generally, Bord na Móna cutaway bogs that flood naturally will be permitted to flood unless there is a clear environmental and/or economic case to maintain pumped drainage.
- In deciding on the most appropriate afteruse of cutaway peatlands, consideration shall be given to encouraging, where possible, the return to a natural functioning peatland ecosystem.
- This will require re-wetting of the cutaway peatlands which may lead in time to the restoration of the peatland ecosystem.

- Environmentally, socially and economically viable options should be analysed to plan the future use of industrial cutaway peatlands, in conjunction with limiting factors as outlined in Bord na Móna's Strategic Framework for the Future Use of Peatlands.

The National Peatlands Strategy highlights the importance and value of developing peatland rehabilitation plans for Bord na Móna cutaway sites and implementing this peatland rehabilitation. Some of these principles have now been superseded by the company's decision to cease industrial peat extraction. The National Peatlands Strategy is currently being reviewed by Government.

## 4 Draft National River Basin Management Plan 2022-2027 (Water Framework Directive)

The National River Basin Management Plan (Department of Housing, Planning, Community and Local Government 2017) is the key national plan for Ireland to achieve the objectives of the Water Framework Directive (WFD). In broad terms, the objectives of the WFD are (1) to prevent the deterioration of water bodies and to protect, enhance and restore them with the aim of achieving at least good status and (2) to achieve compliance with the requirements for designated protected areas.

The NRBMP 2018-2021 outlined how peat extraction can be a potentially significant pressure on various water quality parameters. Peatland rehabilitation of Bord na Móna cutaway (in addition to other measures) was part of the WFD (2018-2021) programme of measures. The NRBMP 2018-2021 takes account of the fact that Bord na Móna was in the process of phasing out the extraction of peat for energy production, that it set a target to rehabilitate 9,000 ha of cutaway bogs (covering 25 peatlands) by 2021 (in 2018) and will look to implement best-available mitigation measures to further reduce water quality impacts caused by peat extraction while the phasing-out process is taking place. This NRBMP 2018-2021 rehabilitation target was superseded by the acceleration of the Bord na Móna de-carbonisation programme and the Scheme **(PCAS)**.

The development of site rehabilitation plans and the delivery of peatland rehabilitation by Bord na Móna was expected to have a positive impact on water quality and will help the NRBMP 2018-2021 deliver its objectives in relation to the Water Framework Directive and is one of the five key principle actions.

The draft NWBMP 2022-2027 describes how the number of waterbodies impacted by peat, industry and forestry have decreased by 10, 10 and 5 waterbodies, respectively since the second cycle. Impacts on water quality and river habitat arising from peat and peat extraction and associated drainage include the release of ammonium and fine-grained suspended sediments, and physical alteration of aquatic habitats. Drainage of peatlands also results in changes to the hydromorphological condition of rivers.

The draft NWBMP 2022-2027 outlines how maintaining and restoring Irish bogs will lead to a decrease in waterborne carbon leaching to levels comparable with intact bogs as well as reducing losses of peat silt and ammonia. Vegetation on the surface of the peat can also slow the flow of water over the land surface. Based on the EPA's most recent reports, peat extraction and drainage are impacting on 106 water bodies across the country, with peat the single pressure on 28 of these water bodies. However, compared to the data in the second-cycle plan, the number of water bodies impacted by peat has decreased.

The cessation of industrial peat extraction by Bord na Móna in 2021 was expected to have a significant positive impact on water quality of receiving water courses by reducing the impact of peat extraction as a key pressure on particular water courses. This is now being supported by the results and conclusions of the draft NWBMP 2022-2027.

## 5 National Biodiversity Action Plan 2016-2021

The National Biodiversity Action Plan 2016-2022 has a vision that biodiversity and ecosystems in Ireland are conserved and restored, delivering benefits essential for all sectors of society and that Ireland contributes to efforts to halt the loss of biodiversity and the degradation of ecosystems in the EU and globally. Ireland's 2nd National Biodiversity Action Plan outlines the main policies, strategies, actions and targets in relation to biodiversity. This plan has several Bord na Móna specific objectives and actions including implementing the BnM Biodiversity Action Plan 2016-2021 and overlaps with both the National Peatlands Strategy and the National Raised Bog Special Areas of Conservation Management Plan 2017-2022.

## 6 National conservation designations

Bord na Móna operates in a wider landscape that also includes a network of European and National nature conservation sites (Special Areas of Conservation (SACs), Special Protection Areas (SPAs), National Heritage Areas (NHAs, cNHAs) and National Nature Reserves). Bord na Móna will take account of this network of conservation objectives and their conservation objectives when developing these rehabilitation plans. It is expected that peatland rehabilitation will, in general, benefit the conservation objectives of this network of nature conservation sites.

## 7 National Raised Bog Special Area of Conservation Management Plan 2017-2022.

The National Raised Bog Special Area of Conservation Management Plan 2017-2022 sets out a roadmap for the long-term management, restoration and conservation of protected raised bogs in Ireland. The Plan strikes an appropriate balance between the need to conserve and restore Ireland's raised bog network as part of Ireland's commitments towards the EU Habitats Directive, and the needs of stakeholders and gives recognition to the important role that communities have to play in the conservation and restoration of raised bogs. The National Raised Bog Special Areas of Conservation (SACs) Management Plan 2017-2022 is part of the measures being implemented in response to the on-going infringement action against Ireland in relation to the implementation of the EU Habitats Directive, with regard to the regulation of turf cutting on the Special Areas of Conservation (SACs). The then Minister for Arts, Heritage and the Gaeltacht, also published a **Review of Raised Bog Natural Heritage Area Network** in 2014.

Bord na Móna has played a key role in the development of the National Raised Bog Special Area of Conservation Management Plan 2017-2022 and the Review of the Raised Bog Natural Heritage Area Network. Several Bord na Móna sites were assessed by the National Parks and Wildlife Service as part of the above Plan and Review and there is an expectation that several Bord na Móna sites will be designated as SACs and NHAs in the future. This will reinforce the network of protected raised bog sites and replace in part sites that will be de-designated as they have been deemed to be significantly damaged and are deemed to have no raised bog restoration prospects. PCAS is expected to restore several sites that will contribute to The National Raised Bog Special Areas of Conservation (SACs) Management Plan 2017-2022 targets in relation to the restoration of raised bog habitat.

Bord na Móna has also responded to the needs of the NRBMP and provided several sites to the government for the relocation of turf-cutters from SACs. This is part of a suite of ongoing bog conservation measures in the NRBMP to manage turf-cutting in protected sites. Bord na Móna and the National Parks and Wildlife Service continues to engage regarding the ongoing relocation of turf-cutters from protected raised bog sites.

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## 8 All-Ireland Pollinator Plan 2021-2025

The All-Ireland Pollinator Plan 2021-2025 outlines key objectives and actions to protect and support pollinating insects and the habitats they rely on. A Bord na Móna specific action in this plan includes the adoption of pollinator-friendly management within the Bord na Móna network of sites. One action to help achieve this objective is habitat rehabilitation and restoration, where possible, of pollinator-friendly habitats, including peatland habitats.

## 9 Land-use planning policies

As Bord na Móna operates in many counties across Ireland, it is important to note the respective development plans in these counties. Many of the existing development plans recognise the potential that exists in the after-use of cutover/cutaway peatlands. Bord na Móna seeks to work with all of the relevant local authorities to ensure that the most appropriate after-uses are reflected in local planning policy. The following areas of consistent importance are of both direct and indirect relevance to Bord na Móna: heritage, tourism, biodiversity/conservation, landscape, renewable energy, and economy/enterprise.

## 10 National Archaeology Code of Practice

Bord na Móna operates under an agreed Code of Practice regarding archaeology with the Department of Arts, Heritage and the Gaeltacht and the National Museum of Ireland which provides a framework to enable the Company to progress peat extraction whilst carrying out archaeological mitigation. (https://www.archaeology.ie/sites/default/files/media/publications/cop-bord-na-mona-en.pdf

The Code replaced a set of Principles agreed with the Department of Arts, Heritage and the Gaeltacht in the 1990s. Under the Code Bord na Móna, the Minister and Director work together to ensure that appropriate archaeological mitigation is carried out in advance of peat extraction.

- BNM must ensure that any monuments or archaeological objects discovered during peat extraction are protected in an appropriate manner by following the Archaeological Protection Procedures.
- BNM must ensure that any newly discovered monuments on Bord na Móna lands are reported in a timely manner to the National Monuments Service of the Department of Arts, Heritage and the Gaeltacht.
- BNM must ensure that any archaeological objects discovered on Bord na Móna lands are reported immediately to the Duty Officer of the National Museum of Ireland.
- Bord na Móna will adhere to the Archaeology Code of Practice relating to management of any archaeological finds that may arise during cutaway peatland rehabilitation and decommissioning.

## 11 Bord na Móna Biodiversity Action Plan 2016-2021

Rehabilitation of industrial peatlands is a key objective of the Bord na Móna Biodiversity Action Plan 2016-2021. This action plan outlines the main objectives and actions around biodiversity on Bord na Móna lands. The Bord na Móna Biodiversity Action Plan also outlines key International and European policy in relation to biodiversity. This includes the **United Nations Convention on Biodiversity 2011-2020 (CBD)** and **European Biodiversity Strategy to 2020**. Further details of these policies and Bord na Móna s responses can be found in the Bord na

Móna Biodiversity Action Plan (Bord na Móna 2016). Both policy documents highlight targets such as reducing pressure on biodiversity, promoting sustainability, habitat restoration and benefits of ecosystem services.

One example of a key CBD target is:

- *"Restore at least 15% of degraded areas through conservation and restoration activities."*

The EUs headline target for progress by 2020 is to:

- *"halt the loss of biodiversity and the degradation of ecosystems in the EU by 2020, restore them as far as feasible, while stepping up the EU contribution to averting global biodiversity loss."*

This rehabilitation plan is aligned to the CBD target and the EU Biodiversity Strategy target and will help Ireland meet its commitment to these international Biodiversity polices.

## 12 Bord na Móna commitments

Bord na Móna made the commitment in 2009 not to develop any new peatland sites for industrial peat production. The company has continued to work with different stakeholders.

The company announced that industrial peat production would be cut by over 50 percent in 2019 and would entirely cease over most of its lands by the mid-2020s. Rehabilitation measures would continue to be carried out with the focus on re-wetting and rehabilitation of cutover and cutaway areas in line with national policies (such as the National Peatland Strategy, the National Biodiversity Action Plan, the Climate Action Plan 2019, the Water Framework Directive, etc.) and rehabilitation guidelines set down by the Environmental Protection Agency. To date, 15,000 hectares of cutaway and cutover bog have been rehabilitated using this approach with 5,000 hectares in active rehabilitation.

In line with Bord na Móna's accelerated decarbonisation programme, the company made a further commitment to a significantly larger rehabilitation target. This was reflected in our plans to rehabilitate a further 20,000 hectares of cutaway and cutover bog to wetland and woodland mosaics by 2025. In addition, we planned to restore a further 1,000 hectares of raised bog habitat by 2025.

The above commitments have now been followed by the decision by the company to cease industrial peat extraction and rehabilitate a target of 33,000 ha between 2021-2025.

These commitments outline the importance of peatland rehabilitation to Bord na Móna. The company will continue to demonstrate environmental responsibility and continue to deliver on these commitments in relation to peatland rehabilitation and in relation to the future management of these lands to maximise their benefits, particularly their ecosystem service benefits, along with the sustainable development of a portion of the land bank for other uses, such as renewable energy.

## 13 Bord na Móna Strategic Framework for the future use of cutaway peatlands 2020 (Draft)

The general after-use strategy of Bord na Móna is outlined in the Bord na Móna Strategic Framework for Future-Use of Cutaway Bogs 2020 (draft document). This document outlines how Bord na Móna's cutover peatland estate is complex in nature with great variability in terms of peat depths, peat types, drainage, subsoil condition and environmental value. Thus, future options require consideration on a site-specific basis, also bearing in mind the considerable internal variation within bogs. The development of the land-bank will also take account of

national needs, while also taking account of the various national legislation, policies and plans related to the management of peatlands. In general, Bord na Móna will seek to balance and optimise commercial, social, and environmental value of these sites, and develop integrated land-uses, while taking account of the need for sustainability and their biodiversity value.

Any consideration of other future after-uses for Bord na Móna land such as development or other mixed uses will be conducted following the relevant planning guidelines and consultation with relevant authorities and will be considered within the framework of this peatland rehabilitation plan.

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# APPENDIX VI. DECOMMISSIONING

## 1. Condition 10 Decommissioning

This is a requirement of the applicable Integrated Pollution Control Licence issued by the Environmental Protection Agency. This condition 10.1 requires the following:

*10.1 Following termination of use or involvement of all or part of the site in the licensed activity, the licensee shall:*

*10.1.1 Decommission, render safe or remove for disposal/recovery, any soil, subsoils, buildings, plant or equipment, or any waste, materials or substances or other matter contained therein or thereon, that may result in environmental pollution.*

The main success criteria pertaining to successfully complying with this condition is ensuring that no environmental liability remains from this infrastructure and material and that the bog can be deemed suitable for surrender of the license under section 95 of the EPA Acts. This is achieved by Bord na Móna identifying and quantifying any mechanical and infrastructural resources that were installed in the bog to enable the development and production operation at the site. This list is then refined to identify any items that would be deemed as possibly resulting in environmental pollution, should they not be removed.

Typically, these items/infrastructures would be any remaining, unconsolidated plant, equipment and attachments, waste materials, unused raw materials such as land drainage pipes, remaining peat stockpiles, stock pile covering, pumps, septic tanks and fuel tanks.

In relation to this bog, the list and tasks would be as follows:

| Item | Description | Ballivor Decommissioning Plan |
|---|---|---|
| 1 | Clean-up of remaining or unconsolidated waste or materials located in Bogs, Yards, Buildings and Offices | Clean-up of Bog |
| 2 | Cleaning Silt Ponds | Cleaning Silt Ponds |
| 3 | Decommissioning Peat Stockpiles | Peat Stockpile Management |
| 4 | Decommissioning or Removal of Buildings and Compounds | Not relevant |
| 5 | Decommissioning Fuel Tanks and associated facilities | Not relevant |
| 6 | Decommissioning and Removal of Bog Pump Sites | Not relevant |
| 7 | Decommissioning or Removal of Septic Tanks | Where required |

In addition, condition 7 of the licence requires these now defined waste items to be disposed of or recovered as follows:

7.1 Disposal or recovery of waste shall take place only as specified in *Schedule 2(i) Hazardous Wastes for Disposal/Recovery* and *Schedule 2(ii) Other Wastes for Disposal/Recovery* of this licence and in accordance with the appropriate National and European legislation and protocols. No other waste shall be disposed of/recovered either on-site or off-site without prior notice to, and prior written agreement of, the Agency.

7.2 Waste sent off-site for recovery or disposal shall only be conveyed to a waste contractor, as agreed by the Agency, and only transported from the site of the activity to the site of recovery/disposal in a manner which will not adversely affect the environment.

7.3 A full record, which shall be open to inspection by authorized persons of the Agency at all times, shall be kept by the licensee on matters relating to the waste management operations and practices at this site. This record shall as a minimum contain details of the following:

7.3.1 The names of the agent and transporter of the waste.

7.3.2 The name of the persons responsible for the ultimate disposal/recovery of the

waste.

7.3.3 The ultimate destination of the waste.

7.3.4 Written confirmation of the acceptance and disposal/recovery of any hazardous waste consignments sent off-site.

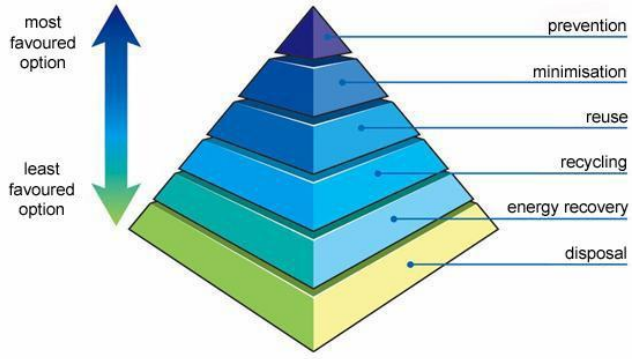
7.3.5 The tonnages and EWC Code for the waste materials listed in *Schedule 2(i) Hazardous Wastes for Disposal/Recovery* and *Schedule 2(ii) Other Wastes for Disposal/Recovery* sent off-site for disposal/recovery.

7.3.6 Details of any rejected consignments.

A copy of this Waste Management record shall be submitted to the Agency as part of the AER for the site.

As required by the licence, these waste items will be removed for recycling or disposal, using external contractors with the required waste collection permits, approved under 7.2, with waste records maintained as required under 7.3.

Where possible, Bord na Móna will utilize the appropriate waste hierarchy to identify waste that can reused or recycled ahead of disposal.




The validation of the success of condition 10.1 is carried out through an Independent Closure Audit (ICA), followed by and EPA Exit Audit (EA) and the eventual partial or full surrender of the licence.

## APPENDIX VII. GLOSSARY

**Cutaway Bog:** A Bord na Móna site generally becomes cutaway when it is economically unviable to continue industrial peat extraction or when the majority of peat has been removed.

**Deep peat cutover bog.** Deep peat cutover bog is defined as former raised bogs that have been in industrial peat production, where production has ceased but the residual peat depth is typically in excess of 2m. *Sphagnum* mosses are key species of raised bogs and the majority of the peat mass is formed from these mosses. *Sphagnum* species and other raised bog species are a key part of raised bog habitat function and prefer more acidic, nutrient poor, water-logged conditions. Typical raised bog *Sphagnum* mosses and other bog species do not thrive with the more typical alkaline water chemistry of cutover bog but do grow well in these more acidic conditions where peat has been re-wetted. There is potential to re-develop embryonic *Sphagnum*-rich plant communities in these conditions if the peat can be re-wetted. This brings the opportunity of re-developing embryonic *Sphagnum*-rich vegetation communities that are considered Carbon sinks or peat-forming habitats and restoring the carbon sequestration function of these sites.

**Dry cutaway bog:** Cutaway bog is categorised as dry cutaway where it is not practical or feasible to re-wet these areas completely. It is inevitable that some areas of cutaway will remain relatively dry due to the heterogenous topography of the cutaway, as well as requirements for continued drainage on site for identified after-uses, or off site in relation to neighbouring lands or other infrastructure. Ridges and mounds of glacial deposits can become exposed during peat extraction and form a heterogenous topographical mosaic separated by basins. Dry cutaway may have very thin or no residual peat where ridges and mounds have been exposed. The exposed sub-soils are a mix of glacial gravels, muds and tills that can be quite free-draining. Dry cutaway may also have deeper residual peat but in a location (ie. at the margin) where the peat cannot be re-wetted due to boundary constraints. Dry cutaway may also develop in situations where there a relatively steep slope that inhibits re-wetting. The majority of dry cutaway will develop towards grassland, heath, scrub and dry woodland habitats.

**Environmental stabilisiation:** The key objective of peatland rehabilitation is environmental stabilisation. This means developing habitats and vegetation back onto the bare peat, slowing water movement across the bog, minimising effects to downstream waterbodies and meeting the conditions of the IPC Lisence. This is achieved by a combination of re-wetting, where possible, and natural colonisation of the former cutaway, with or without intervention**.** Habitats will develop that reflect the underlying environmental conditions. Other after-use development may also serve to act as environmental stabilisiation.

**Marginal land.** Marginal land is defined as land around the margin of the industrial peat production area. This margin generally contains a range of habitats including scrub, Birch woodland, cutover bog and raised bog remnants. It has a variety of land-uses including turf-cutting (private turbary). Rehabilitation and restoration actions (e.g. drain blocking) within marginal land zones will be considered where appropriate.

**Rehabilitation:** Rehabilitation is defined in general by Bord na Móna as environmental stabilisation of the former cutaway. This is generally achieved via re-wetting, where possible, and natural colonisation of the former cutaway, with or without intervention. It is not possible to restore raised bog habitats on BnM cutaway in general in the short-term. In general, most of the peat mass has been removed from many BnM cutaway sites and the environmental characteristics of these areas have therefore changed radically (peat depths, hydrology, water chemistry, substrate type, nutrient status. This means there will therefore be different habitat outcomes (wetlands, fen, heathland, grassland and Birch woodland). Other after-use development may also serve to act as rehabilitation.

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**Restoration:** Ecological restoration to defined as the process of re-establishing to the extent possible the structure, function and integrity of indigenous ecosystems and the sustaining habitats they provide" (SER 2004). Defined in this way, restoration encompasses the repair of ecosystems (Whisenant 1999) and the **improvement of ecological conditions in damaged wildlands** through the **reinstatement of ecological processes**. In general, Bord na Móna cutaway peatlands cannot be restored back to raised bog in a reasonable timeframe as their environmental conditions has changed so radically (with the removal of the acrotelem – the living layer and much of the peat mass). However, they can be returned to a **trajectory** towards a naturally functioning peatland system (Renou-Wilson 2012). **Raised bog restoration** is an objective of some BnM sites where there is residual natural raised bog vegetation and where the majority of the peat is still intact.

**Standard rehabilitation:** This is defined as rehabilitation that is designed to meet the conditions of the EPA IPC Licence. The key objective of rehabilitation is environmental stabilisation. This is achieved by a combination of re-wetting, where possible, and natural colonisation of the former cutaway, with or without intervention**.** Other after-use development may also serve to act as rehabilitation.

**Standard decommissioning:** This is defined as decommissioning that is designed to meet the conditions of the EPA IPC Licence. This is defined as to render safe or remove for disposal/recovery, any soil, subsoils, buildings, plant or equipment, or any waste, materials or substances or other matter contained therein or thereon, that may result in environmental pollution.

**Wetland cutaway bog.** Wetland cutaway bog is defined as former raised bogs that have been in industrial peat production, where production has ceased and the majority of peat has been cutaway, and where this cutaway has the potential to be re-wetted. A significant number of Bord na Móna sites have pumped drainage and these sites are likely to develop a mosaic of wetland habitats when pumping in reduced or stopped. The water chemistry of wetland cutaway frequently is strongly influenced by the more alkaline sub-soils that have been exposed during peat production. This means that pioneer vegetation is more typical of fen and wetland, rather than raised bog. Wetland cutaway will have a broad range of hydrological conditions depending on the local topography. In some cases, these wetlands may form deep water (> 0.5 m) whilst other areas may have the water table at or just below the surface of the ground.

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# APPENDIX VIII. EXTRACTIVE WASTE MANAGEMENT PLAN

## (Minimisation, treatment, recovery and disposal)

**Objective:**
The objective of this generic plan is to comply with the requirements of regulation 5 of the Waste Management (Management of Waste from Extractive Industries) Regulations, and to prevent or reduce waste production and its harmfulness.

**Scope:**
This plan covers IPPC Licence's Ref P0501-01, Derrygreenagh-Ballivor Group of Bogs in Counties Meath and Mestmeath.

**1.0 Extractive Waste:**
Waste classified as extractive waste from peat extraction operations arise from three operations associated with this activity.

**1.1 Silt Pond excavations and maintenance.**
All peat extraction activities are serviced by a silt lagoons/ponds. During the excavation of these silt ponds, pre IPPC Licensing in 1999 and since licensing, the excavated material is stored adjacent to the silt pond, where it either remains in situ ores levelled out. As required by condition 6.6, these silt lagoons are cleaned twice per annum or more often if inspections dictate. These silt cleanings are also deposited on the same location, adjacent to the silt pond, where they may be levelled periodically to allow room for subsequent cleanings. These mounds of silt pond excavation material and cleanings are generally no higher that 2-3 metres.

**1.2 Power Station screenings:**
Lough Ree Power Ltd screens the peat from the bogs prior to processing. This screening removes oversized peat, stones and bogs timbers. Schedule 3 (ii) of the IPPC licence permits disposal of these peat screenings back to the bog, where it is levelled and graded into the surrounding peat landscape. These locations have been agreed with the Agency as per condition 7.4 of the IPPC Licence, and as per the attached locations.

**1.3 Bog Timbers:**
During peat extraction operations, bog timbers often arise in the bog surface and are required to be cleared. These timbers consist of bog pine, oak and some yew. Some of these timbers, such as the oak and yew are removed for use in the wood craft industry, with the remaining bog pine stockpiled in locations at the opposite end of each bog, where it generally becomes a habitat for flora and fauna. These piles of timber are generally no higher than 1-2 metres.

**2.0 P0501-01 IPPC Licence Extractive Waste Conditions**

**2.1 Condition 7.5 Extractive Waste Management**
The licensee shall draw up a Waste Management Plan (to be known as an Extractive Waste Management Plan) for the minimisation, treatment, recovery and disposal of extractive waste. This Plan shall meet the requirements of regulation 5 of the Waste Management (Management of Waste from the Extractive Industries) Regulations,2009. The Plan shall be submitted for agreement by the Agency by the 31' December2012. The Plan shall be reviewed at least once every five years thereafter in a manner agreeable to the Agency and amended in the event of substantial changes to the operation of a waste facility or to the waste deposited. Any amendments shall be notified to the Agency.
All extractive waste shall be managed in accordance with the Extractive Waste Management Plan. A report on the implementation of the Extractive Waste Management Plan shall be provided in the AER.

**2.2 Condition 7.6 Waste Facility**
(i) No new waste facility may be developed or an existing waste facility modified unless agreed by the Agency.
(ii) The licensee shall ensure that all existing waste facilities are managed and maintained to ensure their physical stability and to prevent pollution or contamination of soil, air, surface water or groundwater.
(iii) The licensee shall ensure that all new waste facilities are constructed, managed and maintained to ensure their physical stability and to prevent pollution or contamination of soil, air, surface water or groundwater.
(iv) Operational measures shall be continuously employed to prevent damage to waste facilities from personnel, plant or equipment.
(v) The licensee shall establish and maintain a system for regular monitoring and inspection of waste facilities.
(vi) All records of monitoring and inspection of waste facilities, as required under the licence, shall be maintained on-site in order to ensure the appropriate handover of information in the event of a change of operator or relevant personnel.

**2.3 Condition 7.7 Excavation Voids**
7.7.1 Unless otherwise agreed by the Agency, only extractive waste shall be placed in excavation voids.
7.7.2 When placing extractive waste into excavation voids for rehabilitation and construction purposes, the licensee shall, in accordance with regulation 10 of the Waste Management (Management of Waste from the Extractive Industries) Regulations, 2009, and the Extractive Waste Management Plan:

- Secure the stability of the waste
- Put in place measures to prevent pollution of soil, surface water and ground water.
- Carry out monitoring of the extractive waste and excavation void.

**Condition 7.5. Extractive Waste Management Plan. 5 (1)**

**3.0 Minimisation.**
**3.1 Silt pond excavation material and cleanings.**
IPPC Licence conditions require all production areas to be serviced by an appropriately designed silt pond based on storage volume and retention time. Condition 6.6 requires all ponds to be cleaned bi-annually and more often if inspections dictate, so the only opportunity for minimisation of same is through Standard Operating Procedures. These are required under condition 2.2.2 (i) regarding minimisation of suspended solids, and are in-place to minimise the generation of silt, which in-turn will minimise the generation of silt pond waste.

**3.2 Power Station Screenings.**
These screenings cannot be minimised as they are a consequence of peat production, stones, timbers and oversize peat materials are naturally occurring on the bog, and are required to be removed prior to processing.

**3.3 Bog Timbers.**
Bog timbers are also naturally occurring materials within a bog and are required to be removed prior for production. The volume of these bog timbers varies from bog to bog and as such their minimisation is not controllable or quantifiable.

**4.0 Treatment**
**4.1 Silt pond excavation material and cleanings.**
The silt pond excavation material and silt cleanings do not require any treatment for its end use which will be either backfilling these silt pond voids as per condition 7.7.1 above as part of the Bog Rehabilitation Plan, or reincorporated into the surrounding peatlands.

**4.2 Power Station Screenings.**
The factory screenings are permitted to be returned to the bog as they were naturally occurring materials from the bog, and as such do not require any treatment to serve this purpose.

**4.3 Bog Timbers**
As per 1.3 above, these timbers are stockpiled at two locations in each bog, as per the attached list of sites and become habitats for various flora and fauna.

**5.0 Recovery**
**5.1 Silt pond excavation material and cleanings.**
Condition 2.2.2 (vi) requires the reuse of silt pond waste to be examined. This was undertaken in 2006, the outcome of which was that this waste peat silt material, as a fuel, was contaminated with sub-soils, rendering it unsuitable for combustion. In addition, volumes are small compared to overall peat production volumes.

**5.2 Power Station Screenings.**
Given the nature of these screenings as outlined in 1.2 above, there is no further use identified and they are permitted to be disposed of back to the bog.

**5.3 Bog Timbers**
Investigations into processing these materials into smaller fractions for potential heating purposes did not yield any viable results. In addition, these older stockpiles are now classified as habitats and as such would not be considered for reuse as a fuel.

**6.0 Disposal**
**6.1 Silt pond excavation material and cleanings.**
Schedule 3 (ii) permits the disposal of silt pond cleanings (Lagoon Sediments) to the bog and these locations, adjacent to the silt pond site, are presented in the attached spreadsheet, with associated grid coordinates.

**6.2 Power Station Screenings.**
Schedule 3 (ii) permits the disposal of screenings (Peat Screenings) to the bog at designated locations agreed under Condition 7.4, and these locations, are presented in the attached spreadsheet, with associated grid coordinates.

**6.3 Bog Timbers**
These naturally occurring bog timbers are stockpiled at locations in each bog, grid coordinates attached.

**7.0 Extractive Waste Management Plan**

**5 (2a)(i)**
The vast majority of peat extraction bogs were all designed and drained for production prior to the 1960's and as such the production fields layout cannot' be altered. Under our Cleaner Reduction Procedures, various design changes have been implemented to the production machines and process to reduce lost peat which eventually is captured in the silt ponds and requires removal as waste peat silt. This along with training and ongoing research and development will continuously reduce waste peat and subsequently waste silt pond cleanings. Bog timbers are present naturally in various volumes and quantities in different bogs and as peat production involves stripping peat in layers, the exposure, generation and removal of these timbers is unavoidable. Work has been undertaken recently into project looking at grinding of these bog timbers in situ using a timber miller, and if this project becomes viable it will contribute to the reduction of bog timbers.

**5 (2a)(ii)**
Given the nature and expanse of peat bogs, the stockpiling and storage of these waste materials do not present a visual, storage or stability problem. As required under Condition 10 of the IPPC Licence, the silt pond excavations and screenings will be utilised to backfill the silt pond voids once the bogs have finished and stabilised in accordance with out Bog Rehabilitation Plan. Storage of these wastes in the interim, open to the elements does not present a change on the nature of these wastes that will threaten the environment or prevent their reuse during the bog rehabilitation process.

**5 (2a)(iii)**
Under Condition 10 of the IPPC Licence, all silt ponds will be decommissioned once the bog surface has stabilised, in agreement with the Agency. This will involve the removal of weirs and flow controls, returning the silt pond back to its original drain or removing the silt pond from the drainage system. Both of these activities will involve placing the silt pond extraction and cleaning material back into the excavation void.

**5 (2a)(iv)**

The peat bogs do not contain any topsoil, so this is not required.

**5 (2a)(v)**
Peat mineral resources do not undergo any treatment.

**5 (2b)**
These three extractive waste are all being reused and recovered back to their original extraction points and have not undergone any physical, chemical, or biological change.

**5 (2c)(i, ii & iii)**
These three extractive wastes, stored on the bog for reuse or recovery during the bog rehabilitation phase, do not require any management or monitoring during the operation of these bogs. Silt pond excavations and cleanings are stored adjacent to the silt pond and quickly revegetated and stabilise, the screenings are graded back into the bog at the agreed locations upon disposal and the bog timbers do not prevent any water or airborne danger to the environment.

**5 (3)**
The three extractive wastes arising from peat extraction operations at this site are classified wastes from mineral non-metalliferous excavation, with an EWC code of 0101 02. The materials are not classified as hazardous under Directive 91/689/EEC20, and do not contain substances or preparations classified as dangerous under Directives 67/548/EEC5 or 1999/45/EC6 above a certain threshold.
The peat excavations and cleanings are stored in locations and in a manner that they could not collapse, and are remote in their nature. The stockpiles are located adjacent to silt ponds that are cleaned regularly and as such these stockpiles are managed and levelled to facilitate further cleanings.
Therefore the material stored at these waste facilities would not be considered to be a Category A waste facility.

**Classification in accordance Annex II.**

| **Waste Material** | Description | **C**lassification | Chemical Process treatment | Deposition description | Transport System |
|---|---|---|---|---|---|
| Silt Pond Excavations and cleanings | Peat and mineral soils associated with peatlands. Stored for reuse during bog rehabilitation, with no displacement of overburden | 01 01 02 | None | Excavated from silt ponds by excavator and deposited adjacent to the silt pond. | Excavator |
| Peat Screenings | Stones, timbers and oversized peat particles, reincorporated into low areas, agreed with the Agency, and stabilized under normal natural bog conditions | 01 01 02 | None | Removed by screen at the factory and transported by tractor and trailer to the designated and agreed locations | Tractor and trailer. |
| Bog Timbers | Pine, Oak and Yew species, stored at locations in each bog. Not subject to any stability issues due to exposure to atmospheric/meteorological conditions. | 01 01 02 | None | Removed from the bog surface by excavator and transported by tractor and trailer to the agreed locations | Tractor and Trailer |

**Description of operations.**
Silt pond excavations arise from the requirement to have silt ponds treating all peat extraction sites. Silt pond cleanings arise from the removal of peat silt from silt ponds as required under IPPC Licence. Bog timbers arise from preparation of the bogs surface for peat production. Estimated quantities of materials are below:

**Closure plan. (Bog Rehabilitation Plan).**
Condition 10.1 – 10.3 of the IPPC Licence requires the following:

- 10.1 Following termination of use or involvement of all or part of the site in the licensed activity, the licensee shall:
- 10.1.1 Decommission, render safe or remove for disposal/recovery, any soil, subsoils, buildings, plant or equipment, or any waste, materials or substances or other matter contained therein or thereon, that may result in environmental pollution.
- 10.1.2 Implement the agreed cutaway bog rehabilitation plan (refer Condition 10.2).

10.2 Cutaway Bog Rehabilitation Plan:

- 10.2.1 The licensee shall prepare, to the satisfaction of the Agency, a fully detailed and costed plan for permanent rehabilitation of the cutaway boglands within the licensed area. This plan shall be submitted to the Agency for agreement within eighteen months of the date of grant of this licence.
- 10.2.2 The plan shall be reviewed every two years and proposed amendments thereto notified to the Agency for agreement as part of the AER. No amendments may be implemented without the written agreement of the Agency.

10.3 The Rehabilitation Plan shall include as a minimum, the following:

- 10.3.1 A scope statement for the plan; to include outcome of consultations with relevant Agencies, Authorities and affected parties (to be identified by the licensee).
- 10.3.2 The criteria which define the successful rehabilitation of the activity or part thereof, which ensures minimum impact to the environment.
- 10.3.3 A programme to achieve the stated criteria.
- 10.3.4 Where relevant, a test programme to demonstrate the successful implementation of the rehabilitation plan.
- 10.3.5 A programme for aftercare and maintenance.

10.4 A final validation report to include a certificate of completion for the Rehabilitation Plan, for all or part of the site as necessary, shall be submitted to the Agency within six months of execution of the plan. The licensee shall carry out such tests, investigations or submit certification, as requested by the Agency, to confirm that there is no continuing risk to the environment. This plan including maps and ecological classifications are available on file at the Ballivor IPPC Licence Coordinators office.
The location in relation to the silt pond excavations and cleanings are adjacent to the silt ponds, which are considered under the Shannon River Basin Management Plan in accordance with the requirements of Directive 2000/60/EC.
Screenings and bog timbers are all naturally occurring elements of peatland and there placement back to the bog in smaller concentrated designated waste facilities does not constitute a risk to the prevention of water compliance.
The lands under where these materials are deposited are peatlands and are un-effected by the placing of this material.

**Review.**
This plan will be reviewed every five years, the first review to take place in September 2017. This review will entail an inspection of these waste facilities to ensure their placing, management, maintenance and stability comply with the requirements of the Extractive Waste Management requirements and condition 7.5, 7.6 and 7.7 of the Ballivor IPPC Licence P0501-01.

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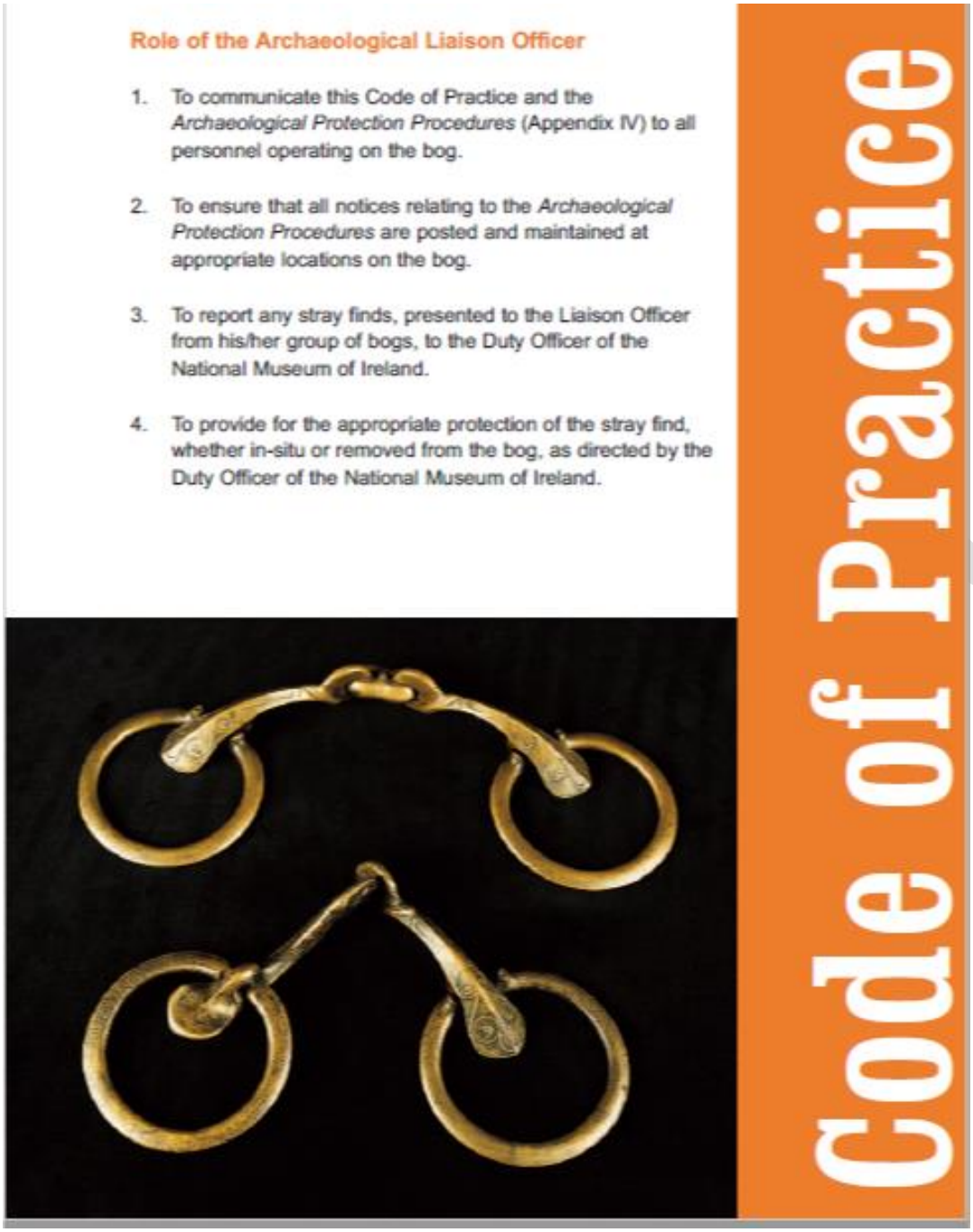
## APPENDIX IX. MITIGATION MEASURES FOR THE APPLICATION OF FERTILISER

- Any fertiliser used will be Rock Phosphate and will not be applied in the following conditions:
    1. The land is waterlogged;
    2. The land is flooded, or it is likely to flood;
    3. The land is frozen, or covered with snow;
    4. Heavy rain is forecast within 48 hours (forecasts will be checked from Met Éireann).
    5. The ground slopes steeply and there is a risk of water pollution, when factors such as surface run-off pathways, the presence of land drains, the absence of hedgerows to mitigate surface flow, soil condition and ground cover are taken into account.
- No fertiliser will be spread on land within 2 metres of a surface watercourse.
- Buffer zones in respect of waterbodies, as specified on https://www.epa.ie/about/faq/name,57156,en.html, will be adhered with at all times with regard to fertiliser application. Reproduced as follows:

| Water body / Feature | Buffer zone |
|---|---|
| Any water supply source providing 100m$^3$ or more of water per day, or serving 500 or more people | 200 metres (or as little as 30 metres where a local authority allows) |
| Any water supply source providing 10m$^3$ or more of water per day, or serving 50 or more people | 100 metres (or as little as 30 metres where a local authority allows) |
| Any other water supply for human consumption | 25 metres (or as little as 30 metres where a local authority allows) |
| Lake shoreline | 20 metres |
| Exposed cavernous or karstified limestone features (such as swallow holes or collapse features) | 15 metres |
| Any surface watercourse where the slope towards the watercourse exceeds 10% | 10 metres |
| Any other surface waters | 5 metres* |

## APPENDIX XI. ARCHAEOLOGY



22

Code of Practice

5. To arrange for the delivery or collection of the stray find, as directed by the Duty Officer of the National Museum of Ireland.

6. To complete the Report of Discovery of Archaeological Object(s) in Bogs (Appendix V), as directed by the Duty Officer of the National Museum of Ireland.

7. To maintain a file of all stray finds and associated documentation and provide copies to the Project Archaeologist.

8. To provide assistance, where required, to the Department during archaeological surveys.

9. To provide assistance, where required, to Bord na Móna's Consultant Archaeologists, during investigation and mitigation of monuments.

10. To report to the Bord na Móna members on the Archaeology Management Liaison Committee any planned developments or new activities on cutaway peatland areas within his/her group of bogs.



| Bord na Móna | **Procedure: ENV017** | **Rev: 1** |
|---|---|---|
| **Title: Archaeological Findings** | **Approved: EM** | **Date:** |

**1) Purpose**

The purpose of this procedure is to describe the arrangements in Bord na Móna for findings of Archaeological material (Stray Finds).

**All objects, sites or monuments, no matter how fragmentary, are important elements of our heritage.**

**2) Procedure**

1. Check whether there are any known archaeological monuments in your area.
2. Be vigilant at all times - objects or traces of structures can be found on the field surfaces, in the drain faces, on the bog margins or caught within the mechanics of machinery.
3. If an object is found leave it in place, if it is safe to do so, note its position and immediately contact your Archaeological Liaison Officer who will assess the situation and contact the Duty Officer of the National Museum of Ireland.
4. Resist the temptation to investigate the find spot as this may disturb fragile archaeological deposits.
5. If the object is already dislodged or is in imminent danger, remove it carefully, mark its find spot and report it immediately to your Archaeological Liaison Officer.
6. Objects made of wood, leather or textile, which are removed from peat should be kept in conditions similar to those in which they are found. This can be done by packing them in peat or, if waterlogged, placing them in a clean basin of water and sealing the container. Resist the temptation to clean or remove peat from the object.
7. If timbers or other materials, such as gravel or stones, which could be part of a man-made structure are noted on the bog, mark the location and report it immediately to your Archaeological Liaison Officer. If you suspect the find is of archaeological importance, resist the temptation to expose it any further as this could result in damage to the structure.
8. Report anything that looks unnatural in the bog – your Archaeological Liaison Officer will decide whether it should be referred to the appropriate authorities.

**NOTE:** Our archaeological heritage is a finite, non-renewable resource. Once a site is destroyed its information is lost forever and we have lost the chance to understand a little more about our past, where we have come from and perhaps the opportunity to learn for the future.

Your Archaeological Liaison Officer is ……

**3) Records**

| Revision Index | | | |
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| Revision | Date | Description of change | Approved |
| 1 | | | |
| 2 | | | |

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Bord na Móna

# Ballivor Bog
# Rehab Plan
# GIS Map Book
# 2022

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# Bog Site Information Maps

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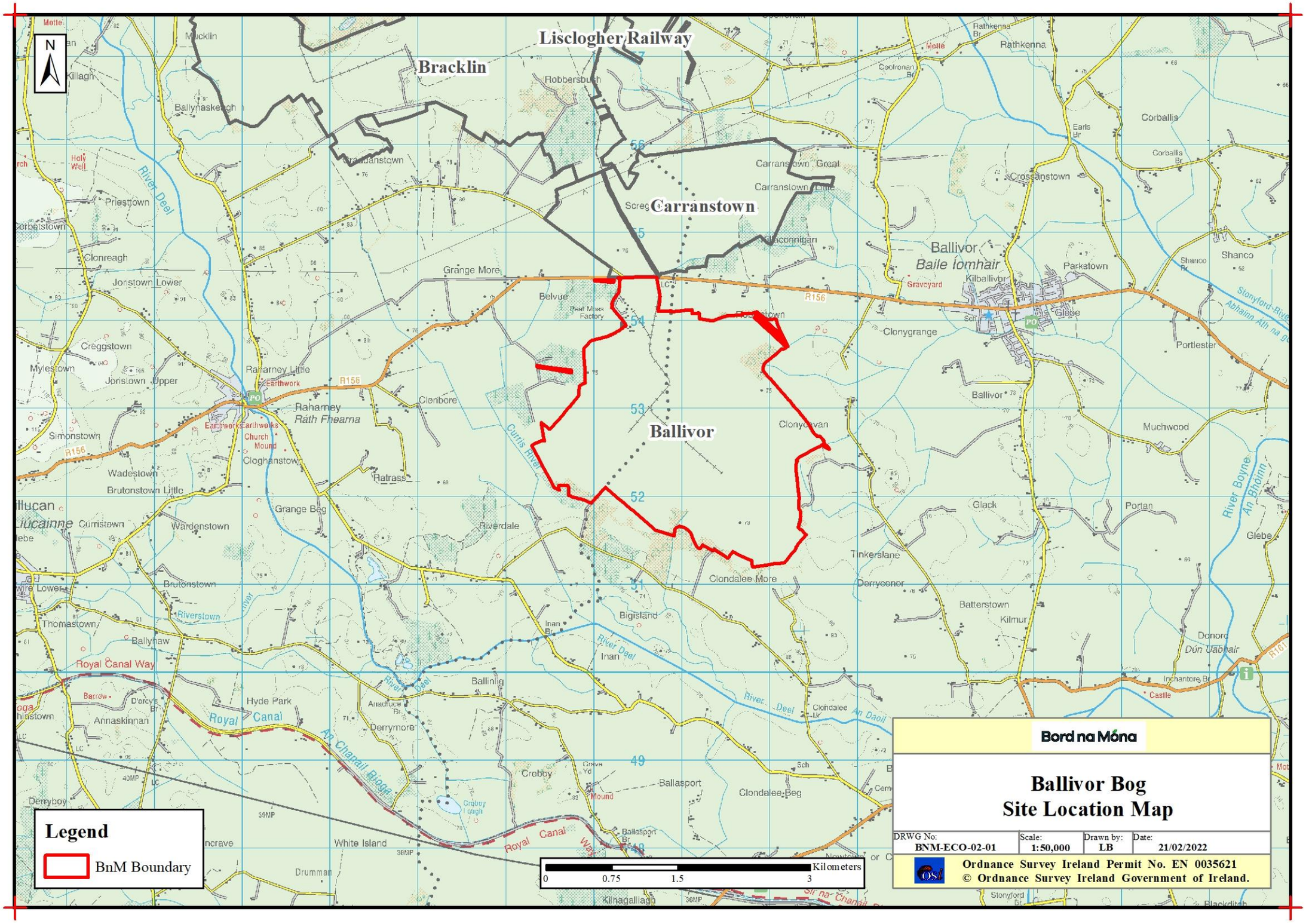

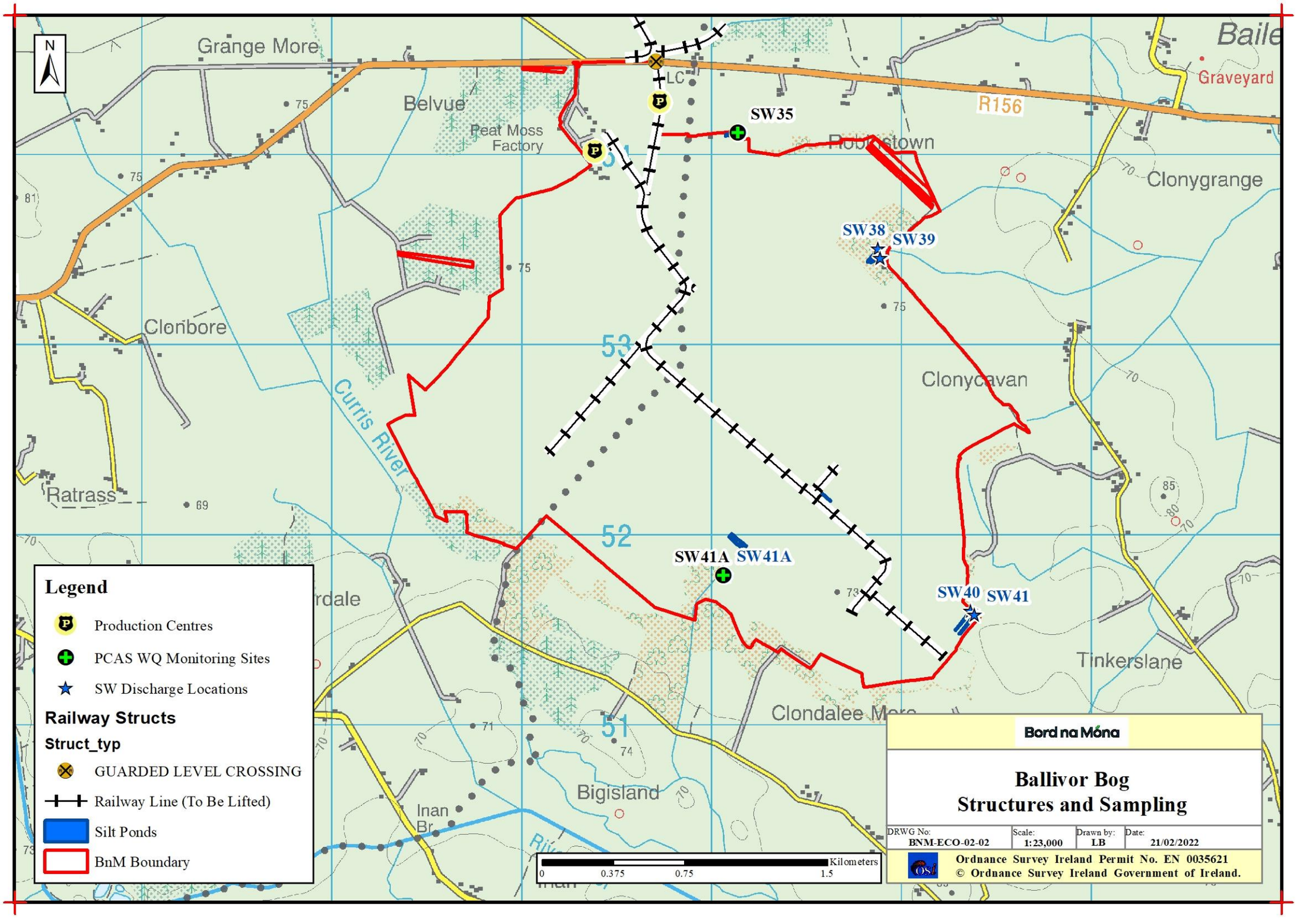
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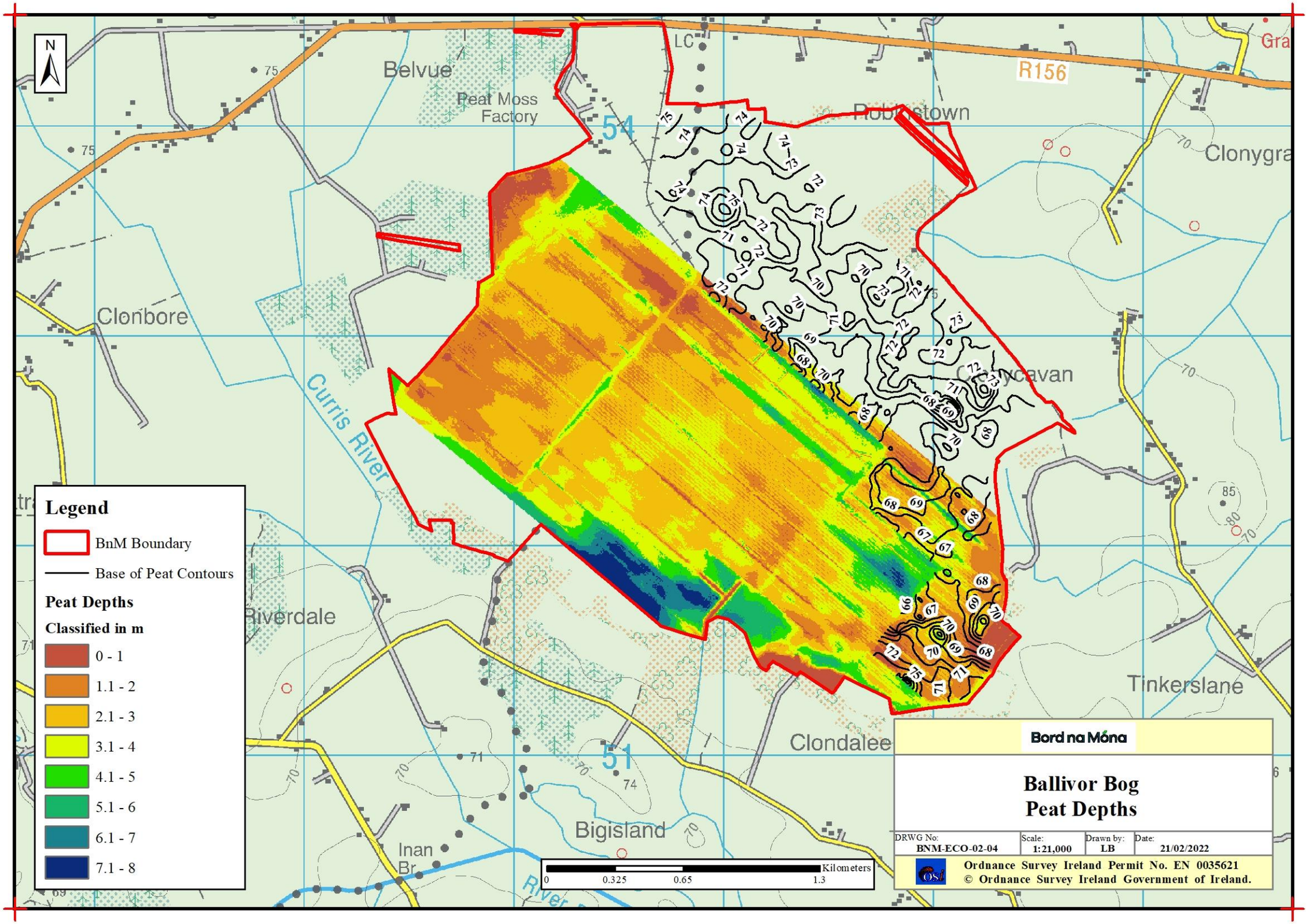
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**BNM-ECO-02-17: Current Habitat Map**

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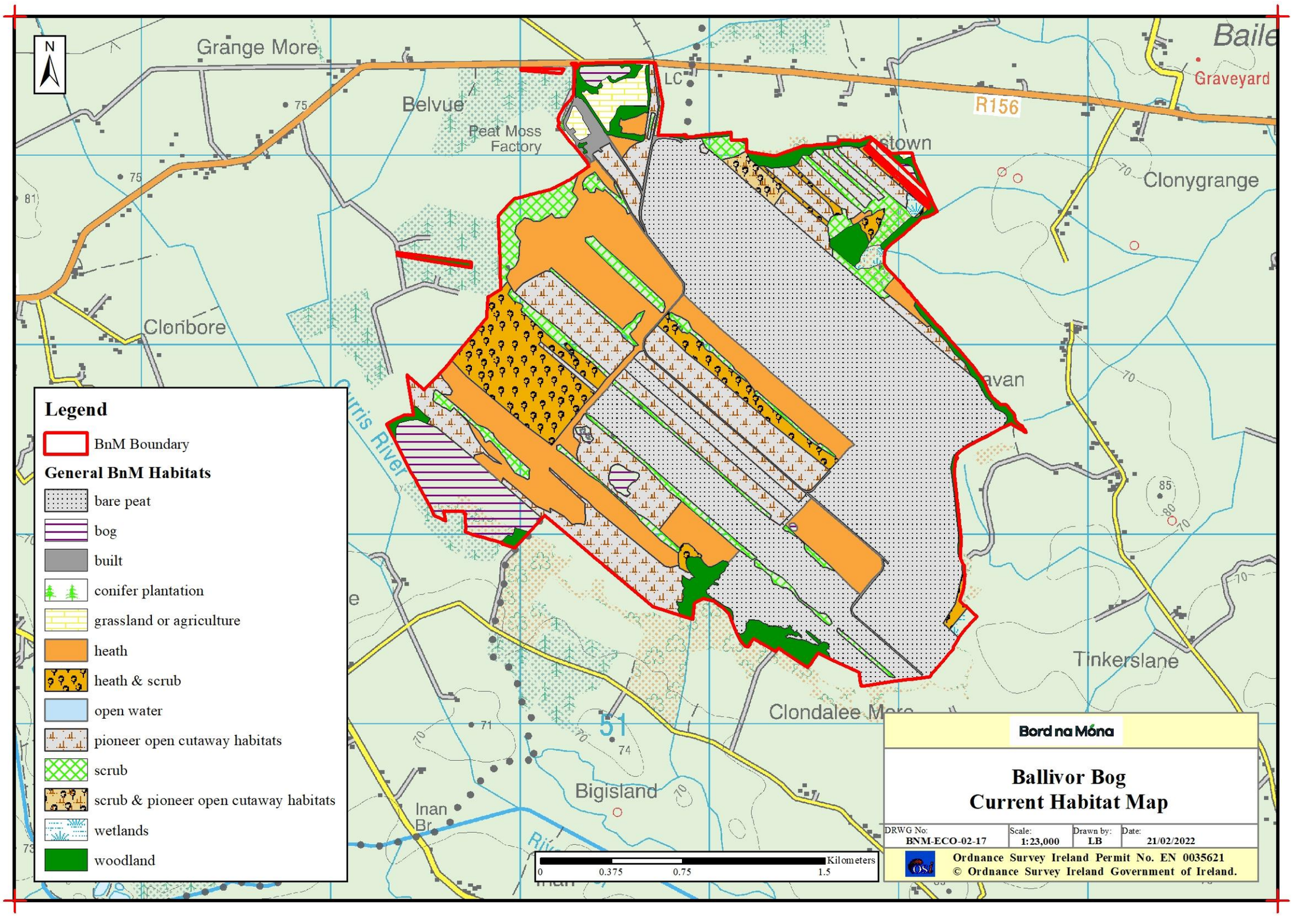

**BNM-ECO-02-18: Potential Future Habitats**

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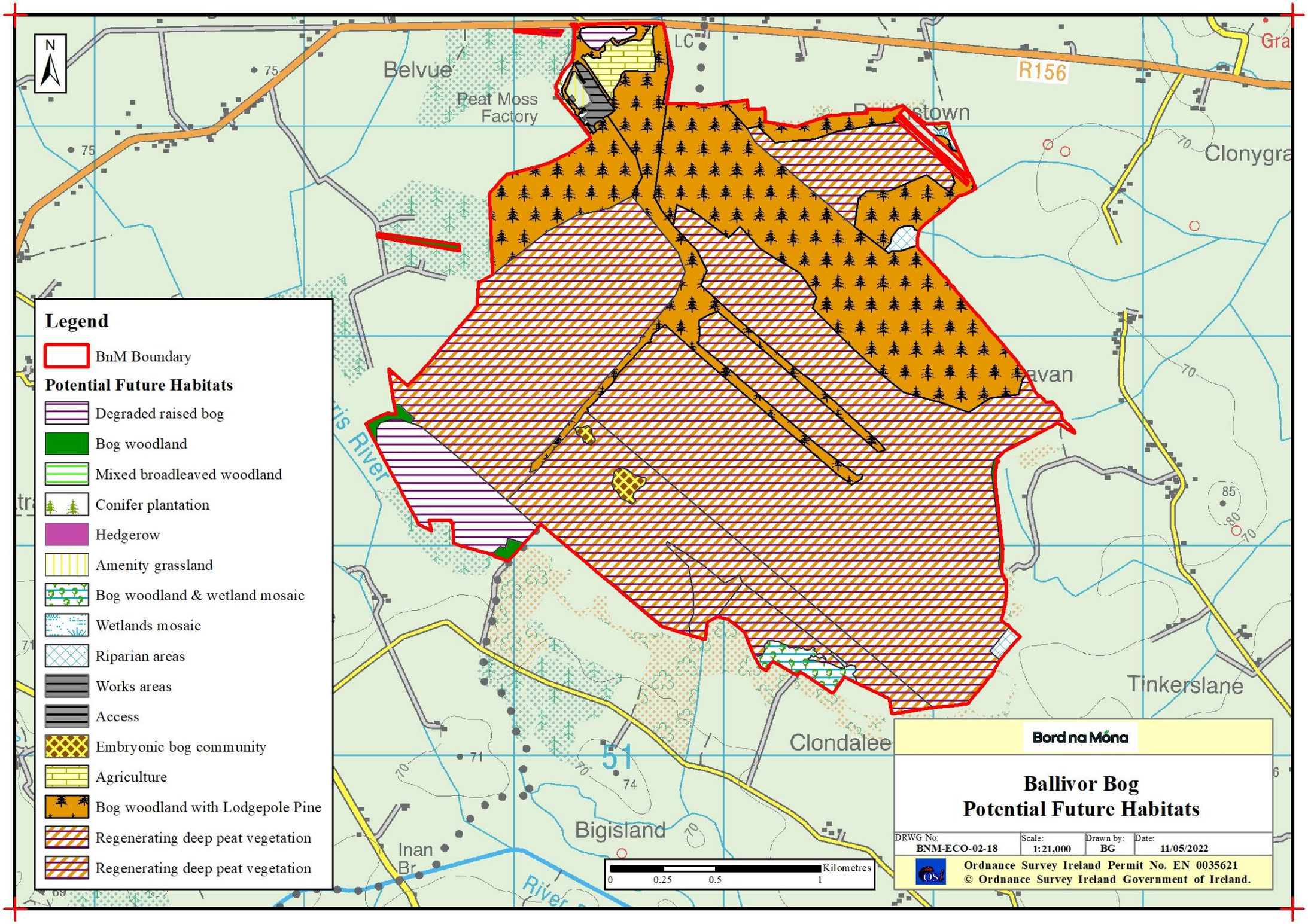

**BNM-ECO-02-21: Aerial Imagery 2000**

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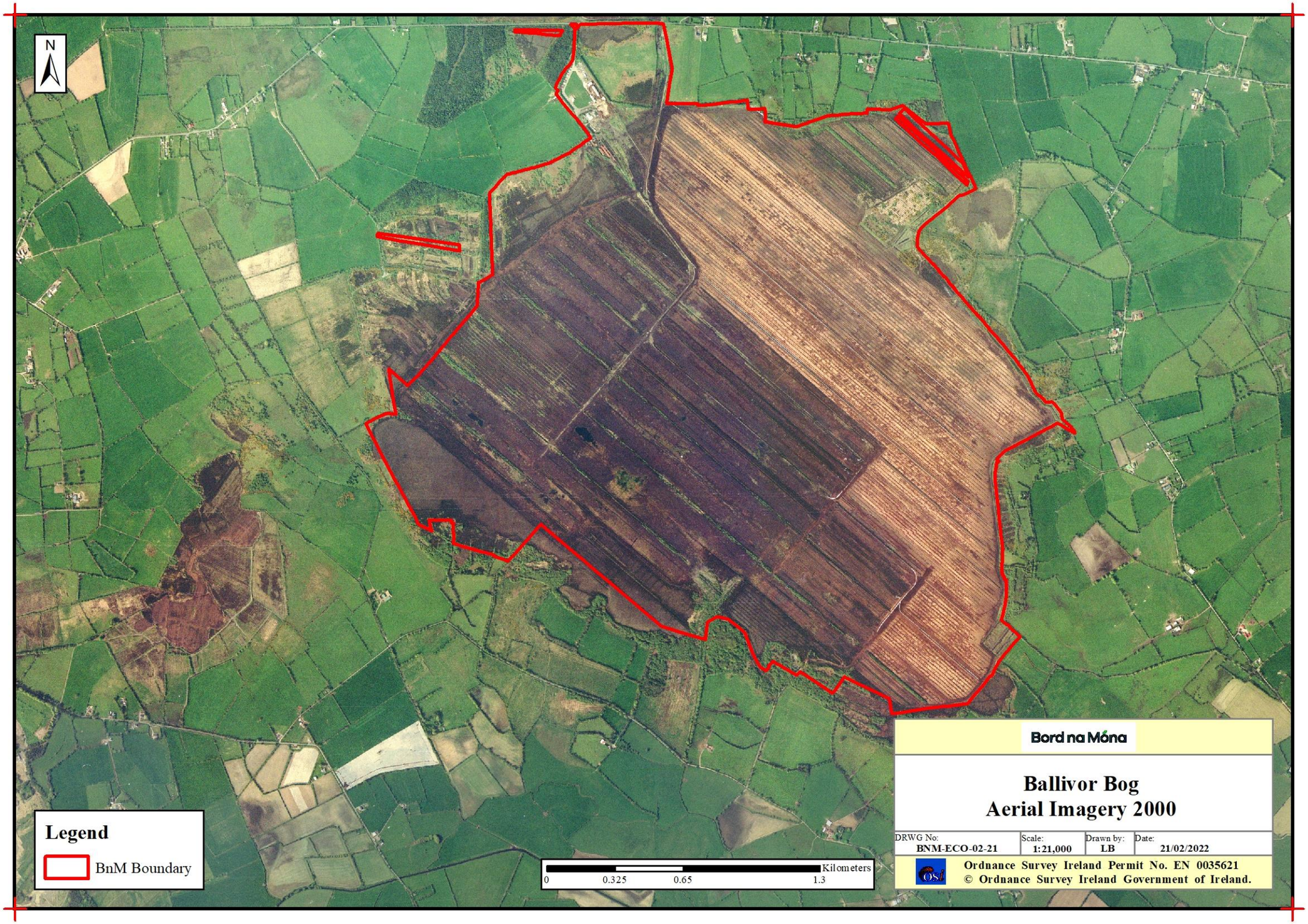

**BNM-ECO-02-22: Aerial Imagery 2020**

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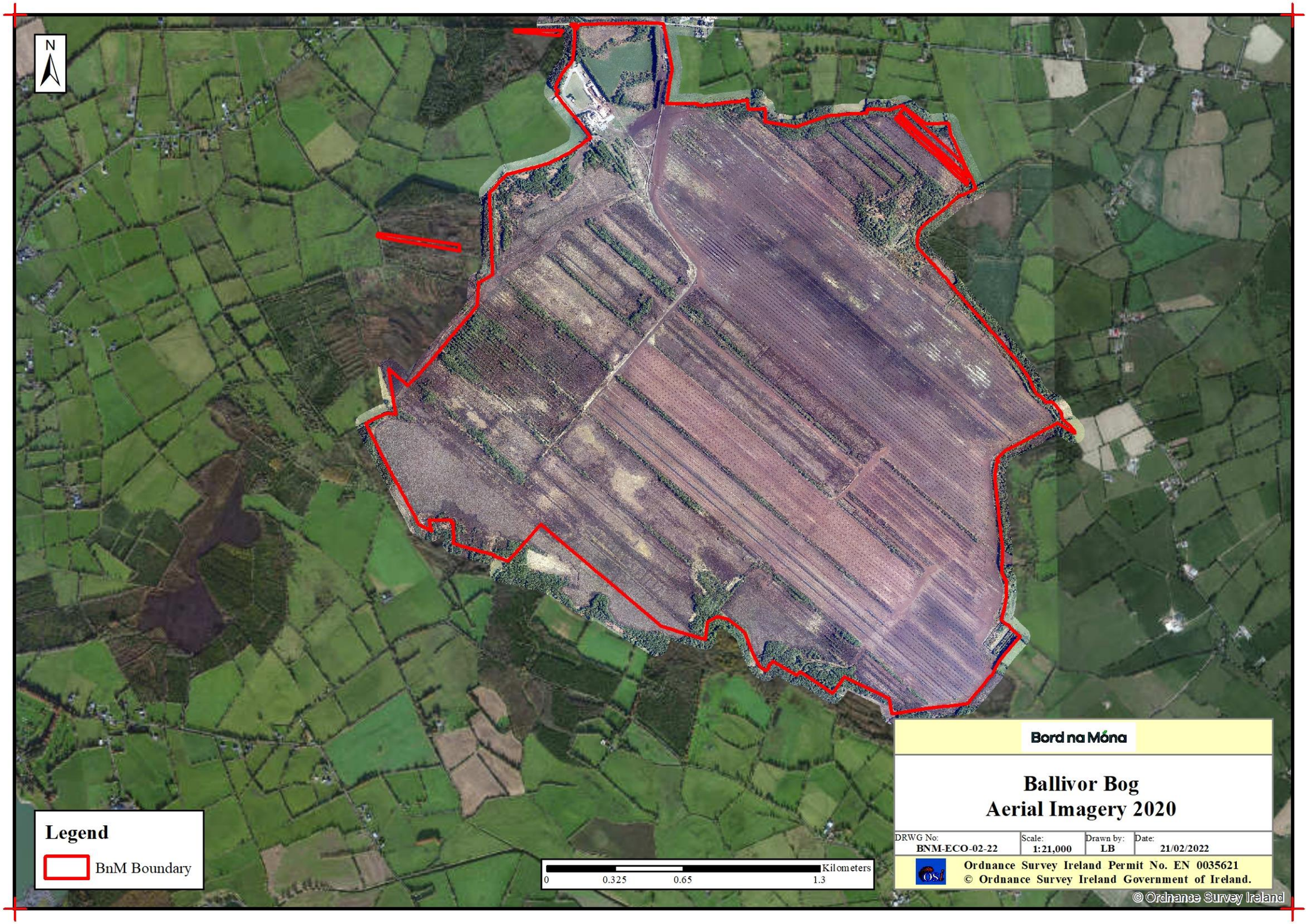

**BNM-ECO-02-23: Proximity Designated Sites**

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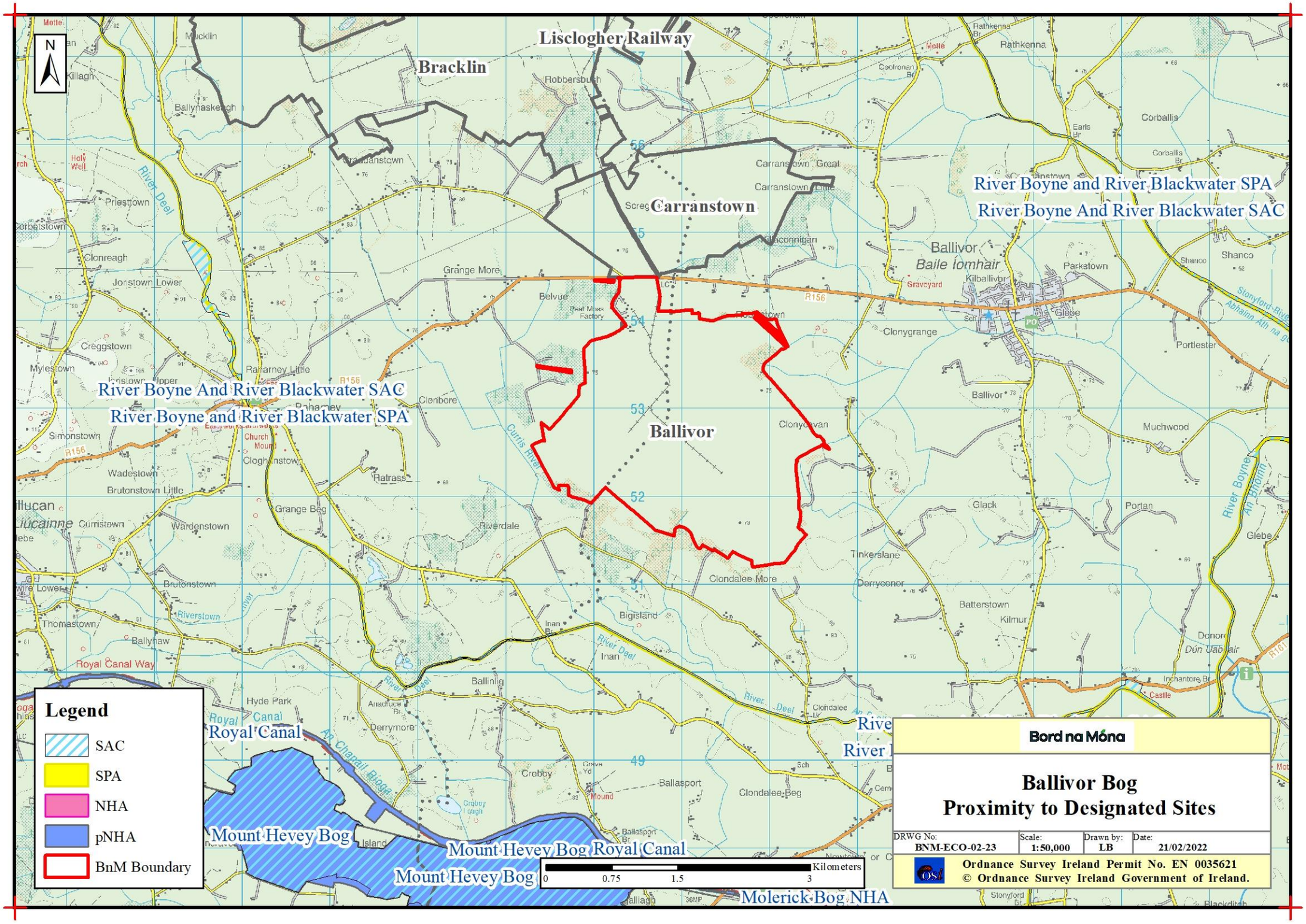

**BNM-ECO-02-24: Bog Group Map**

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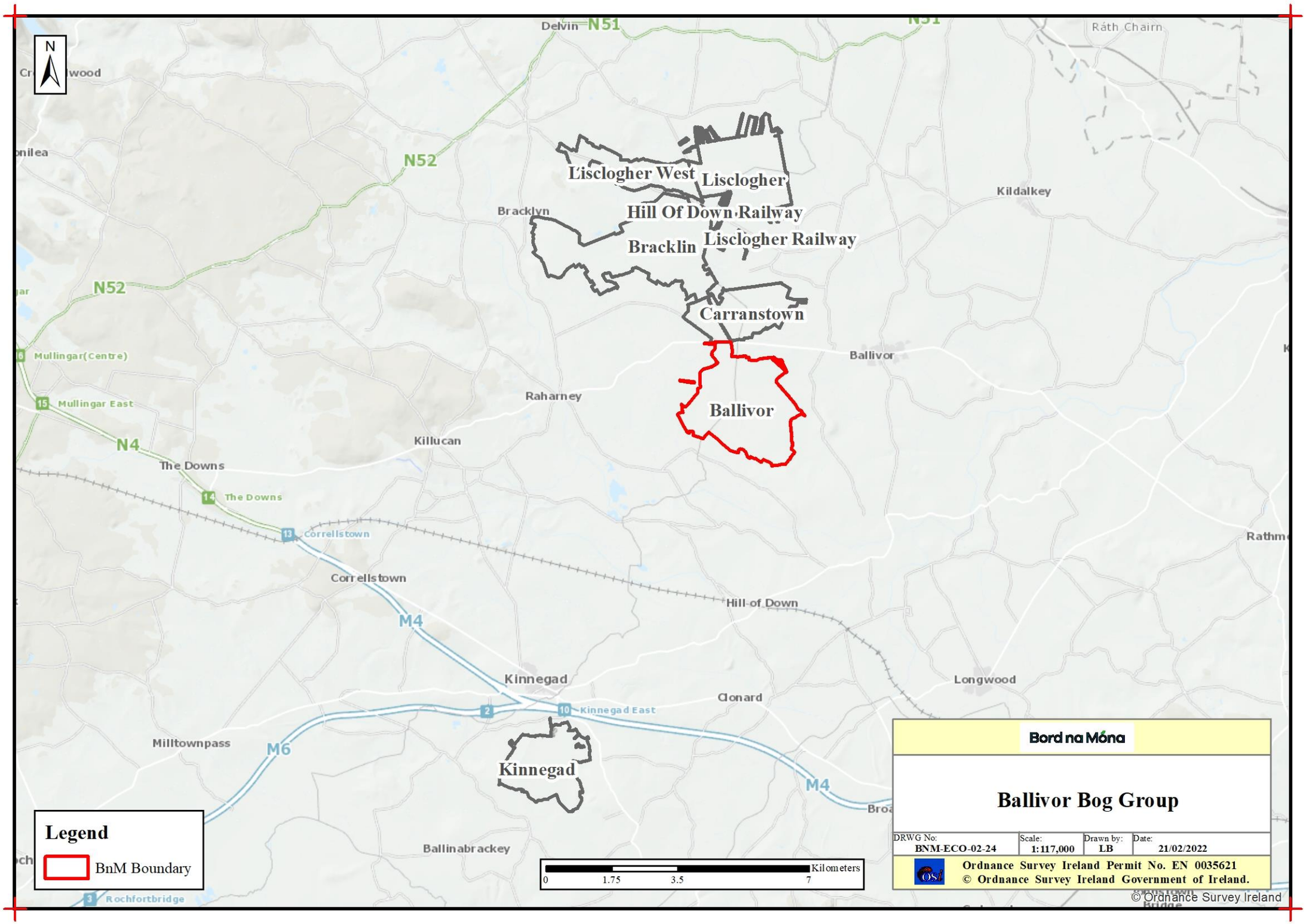

# Hydrology / Topography Maps

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**BNM-ECO-02-WQ01: Water Quality Map**

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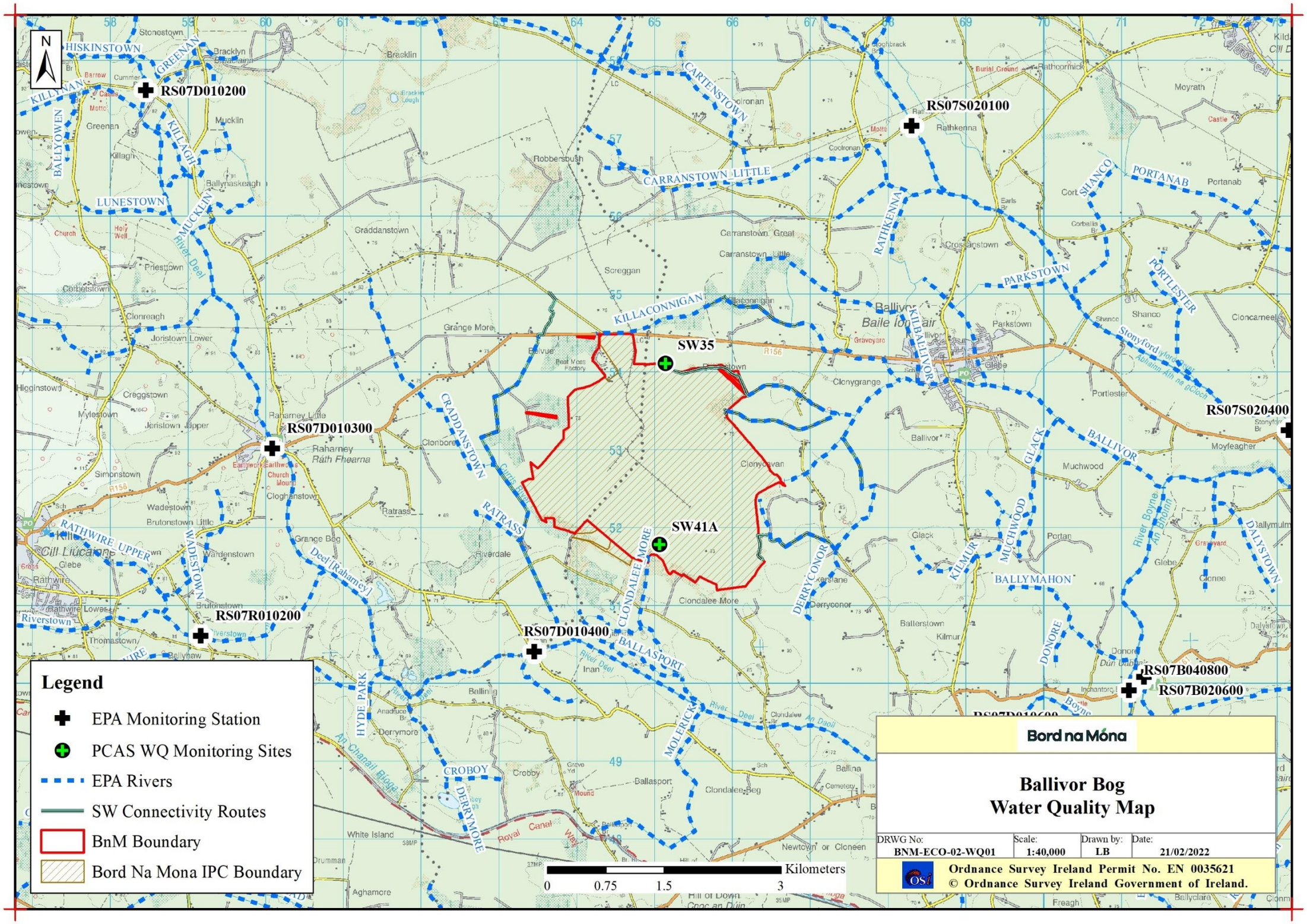

**BNM-ECO-02-SP01: Sampling Points**

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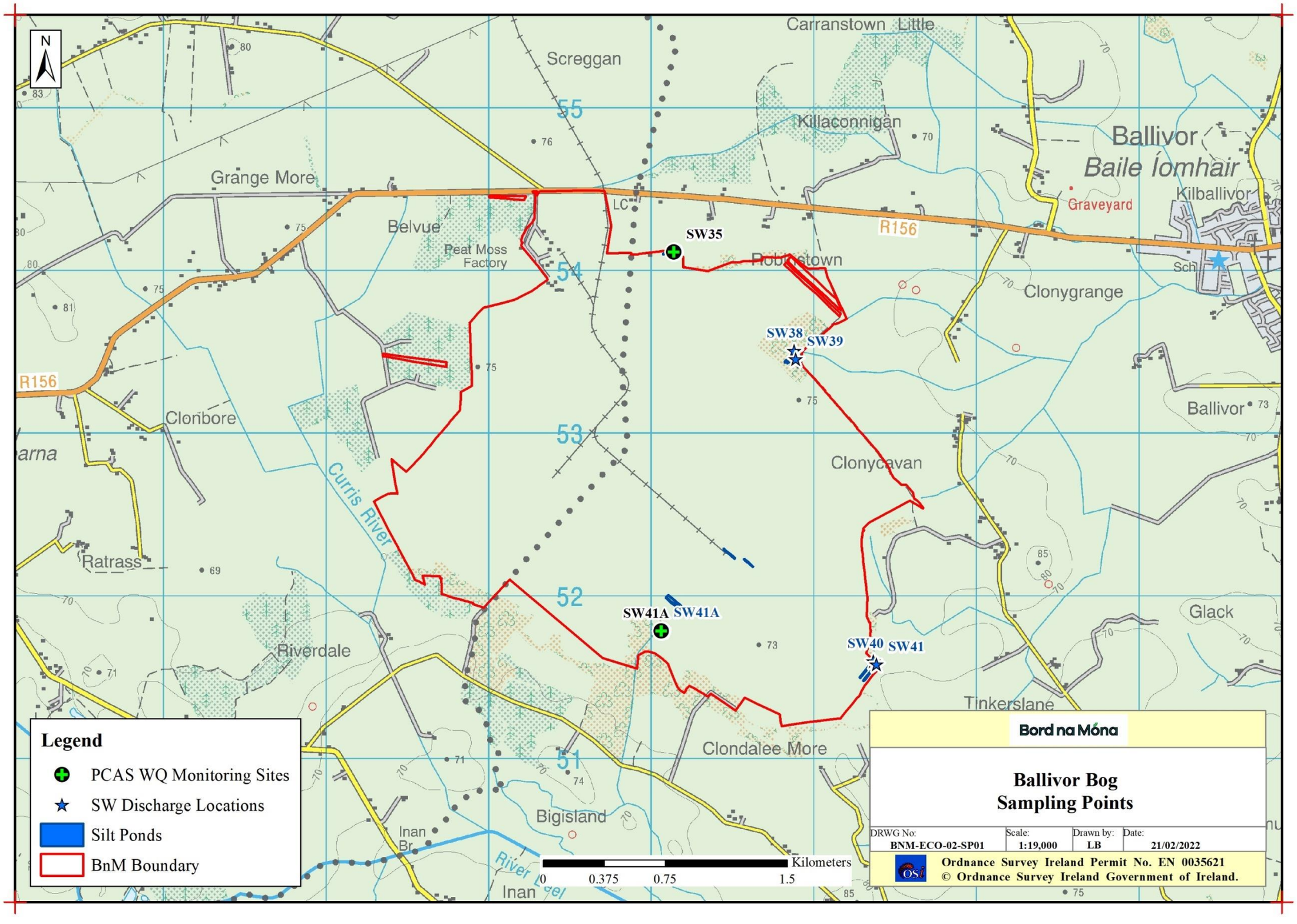

**BNM-ECO-02-03: LiDAR Map**

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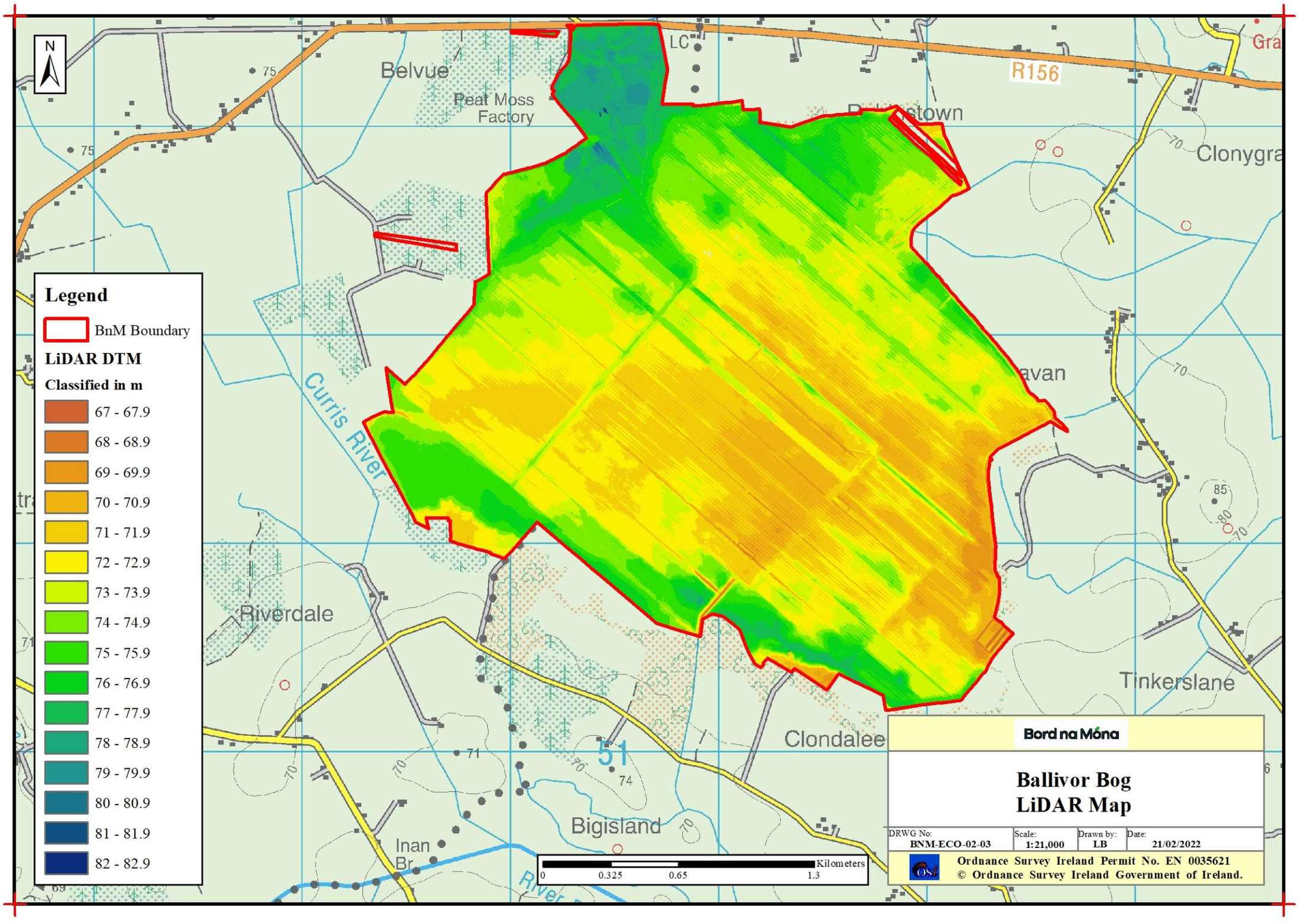

# Rehabilitation Maps

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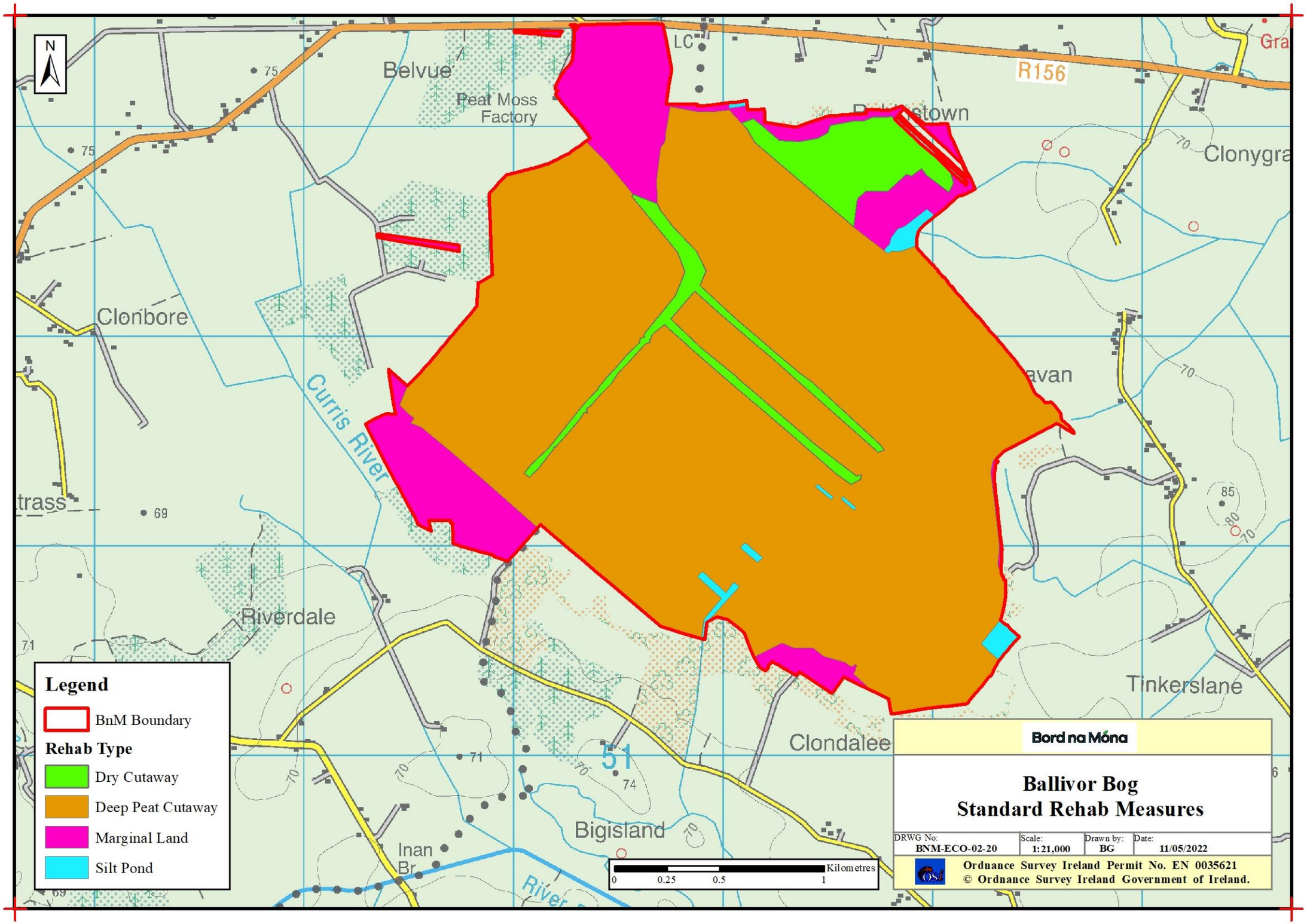
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Bigisland
Inan
Br
River
Legend
BnM Boundary
Rehab Type
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Deep Peat Cutaway
Marginal Land
Silt Pond
Kilometres
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Bord na Móna
Ballivor Bog
Standard Rehab Measures
DRWG No: BNM-ECO-02-20
Scale: 1:21,000
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Bord na Móna

# Bracklin Bog

# Draft Cutaway Bog Decommissioning and Rehabilitation Plan 2024

Draft

This document seeks to address the requirements of Condition 10.2 of IPC License Ref. P0501-01:

> "*The licensee shall prepare, to the satisfaction of the Agency, a fully detailed and costed plan for permanent rehabilitation of the cutaway boglands within the licensed area.*"

*This licence condition requires Bord na Móna agree with the EPA the measures that will provide for rehabilitation, i.e. stabilisation of Bracklin Bog upon cessation of peat production and compliments the licence requirement to decommission the site.*

***Rehabilitation** generally comprises site stabilisation with natural colonisation with or without targeted management.*

*Industrial peat production has now fully ceased at Bracklin Bog.*

*Bord na Móna have defined the key rehabilitation outcome at Bracklin Bog as environmental stabilisation.*

*Any consideration of any other future after-uses for Bracklin Bog, such as renewable energy, will be conducted in adherence to the relevant planning guidelines and consultation with relevant authorities and will be considered within the framework of this rehabilitation plan.*

*For the avoidance of doubt, Bracklin Bog refers the main bog area at Bracklin with the exclusion of Bracklin West Bog. This report addresses rehabilitation on Bracklin Bog only. For reference, the rehabilitation plan for Bracklin West Bog is provided in Appendix I.*

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| Document Control Sheet | |
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## NON-TECHNICAL SUMMARY

- Bord na Móna is updating the draft rehabilitation plan for Bracklin Bog, located in Co. Westmeath.
- This rehabilitation plan excludes Bracklin West Bog which is being rehabilitated separately, under the Peatland Climate Action Scheme in 2023(see Appendix I).
- Bracklin Bog is part of the Ballivor-Derrygreenagh Bog Group with Lisclogher East Bog and Lisclogher West Bog located to the north and Carranstown Bog and Ballivor Bog located to the south of the site.
- Bracklin Bog formerly supplied a range of commercial functions including the supply of horticultural peat, sod peat and latterly; fuel peat for Lough Ree Power.
- Industrial peat production commenced at Bracklin in the 1940s and ceased in majority of the eastern section of bog between 1995-2000. This section of Bracklin was formerly a sod peat production bog and was never converted to milled peat production. This area has revegetated as mature cutaway habitats and the bog still has relatively deep residual peat.
- Peat harvesting is now finished at Bracklin Bog.
- This rehabilitation plan has been prepared by Bord na Móna as part of obligations to carry out peatland rehabilitation via an IPC License issued by the Environmental Protection Agency.
- The key objective of peatland rehabilitation is environmental stabilisation. This means developing vegetation and promoting re-establishment of more typical cutaway peatland communities such as Birch woodland, fen habitat and *Sphagnum*-rich embryonic bog communities.
- Rehab measures will include drain-blocking and other measures to raise water levels to the surface of the bog, thus encouraging the development of naturally functioning cutaway peatland habitats.
- Many Bord na Móna bogs cannot be restored back to raised bog, as so much peat has been removed and the environmental conditions have been modified. However other natural habitats will develop like poor fen and *Sphagnum* (embryonic bog communities) (on deeper peat); and wetlands with Reedbeds and Birch woodland on shallower peat. In time a naturalised peatland can be developed.
- The development of a range of habitats at Bracklin Bog will support biodiversity including plants, insects, birds and mammals. This includes some species that are rare and protected in the wider landscape. It will increase the national area of native woodland. Many wetland habitats in the wider landscape have been reclaimed for agriculture and other uses and peatland rehabilitation is an opportunity to create new wetland habitats.
- Measures proposed for Bracklin Bog include internal drain blocking and other measures required to raise water levels to the surface of the peat.
- These rehabilitation measures will be planned by a team consisting of expert ecologists and engineers. It is a guiding principle of Bord na Móna rehabilitation planning that no actions or activities will be undertaken that would negatively impact on adjacent land. No boundary drains will be blocked. Water will still leave the bog via the existing outlets.
- It will take some time for vegetation and habitats to fully develop at Bracklin, and a peatland ecosystem to be restored. However, it is expected that most of the remaining bare peat will be developing pioneer habitats after 5-10 years.
- Bord na Móna have submitted a planning application to An Bord Pleanála for a renewable energy project called Ballivor Wind Farm (Ref. PA25M.316212; https://www.ballivorwindfarmplanning.ie/). This proposed development has been submitted for planning permission, and the proposed layout design has

informed the rehabilitation and constraints on Bracklin bog. It is expected that peatland rehabilitation for Bracklin Bog will be carried out alongside or after the proposed Wind Farm construction.

- Any other proposed development will be planned in adherence to relevant planning guidelines and will consider the rehabilitation and the condition of the site.
- Peatland rehabilitation of this bog will bring a range of benefits to the local community via improvements to the local landscape and is also important for supporting national policies and strategies in relation to reduction of carbon emissions from these peatlands, supporting biodiversity and improvements to water quality.

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# 1. INTRODUCTION

Bord na Móna operates under IPC Licence issued and administered by the EPA to extract peat within the Ballivor-Derrygreenagh bog group (Ref. P0501-01). As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. Bracklin Bog is part of the Ballivor-Derrygreenagh bog group (see Appendix II for details of the bog areas within the Ballivor-Derrygreenagh bog group). Bracklin Bog is located in Co. Westmeath, and borders Co. Meath along its eastern boundary.

This plan is a specific rehabilitation plan for the bog and outlines:

- Description of site management and status.
- Main issues and approaches to rehabilitation.
- Consultation to date with interested parties.
- Interaction with other policy and legislative frameworks (Appendix VI).
- The planned rehabilitation goals and outcomes.
- The scope of the rehabilitation plan.
- Criteria which define the successful rehabilitation and key targets to validate rehabilitation.
- Proposed rehabilitation actions.
- Proposed timeframe to implement these measures.
- Budget and Costings.
- Associated aftercare, maintenance, and monitoring.

*Note: This plan should be read in conjunction with the accompanying Map book*.

Bord na Móna have announced the complete cessation of industrial peat production across its estate (January 2021).

This draft rehabilitation plan outlines the proposed approach to be taken for IPC compliance in respect of Bracklin Bog and how the site will be rehabilitated. Bord na Móna is fully committed to meeting its obligations relating to rehabilitation and decommissioning under the Integrated Pollution Control Licence.

In April 2023, Bord na Móna Powergen Ltd lodged a planning application to An Bord Pleanála (Ref. PA25M.316212) for a development consisting of 26 no. wind turbines and associated works at the Ballivor Bog Group, known as Ballivor Wind Farm (https://www.ballivorWind Farm.ie/). The proposed wind farm is located on Ballivor bog, Carranstown bog, Bracklin bog, Lisclogher bog and agricultural land adjacent to Bracklin bog. This application was made directly to An Bord Pleanála as 'Strategic Infrastructure Development' (SID) under the provisions of Section 37E of the Planning and Development Act 2000, as amended (the Act). This position was confirmed by An Bord Pleanála in correspondence to the Applicant dated 5th April 2022 following pre-application consultations with the Board under Section 37B of the Act (ABP-307471-20). A separate EIAR and accompanying NIS was undertaken for the proposed wind farm development. At the time of writing, a decision had not yet been made by An Bord Pleanála with regards this application.

Bord na Móna has developed a number of onshore wind developments on lands which were previously subject to peat extraction, such as Mount Lucas Wind Farm and Cloncreen Wind Farm. These developments, among others, have demonstrated that peatland rehabilitation and wind farm development can co-exist successfully. The rehabilitation plan outlines how the site will be rehabilitated along with the construction and operation of the proposed Wind Farm. Further details of this proposed Wind Farm development can be obtained at the project website (Bord na Móna Wind Farm | Ballivor Wind Farm).

This rehabilitation plan has been specifically developed to integrate the proposed Ballivor Wind Farm development. It assumes that planning permission for the project will be granted in the future. If planning permission is not granted for this project, then Bord na Móna will revise the rehabilitation plan. Bord na Móna is fully committed to meeting its obligations relating to rehabilitation and decommissioning under the Integrated Pollution Control Licence.It has been proposed by the Government that Bord na Móna carry out a Peatlands Enhanced Decommissioning, Rehabilitation and Restoration Scheme on its peatlands. This proposal is also known colloquially as the 'Peatlands Climate Action Scheme' (PCAS). The additional costs of the scheme will be supported by the Government through the Climate Action Fund and Ireland's National Recovery and Resilience Plan, administered by the Department of Environment, Climate and Communications (DECC), while the National Parks and Wildlife Service (NPWS) will act as the scheme regulator. The Peatlands Climate Action Scheme is expected to operate between 2021-2025. Over 13,000 ha of cutaway peatlands have been rehabilitated as part of this scheme to date, across multiple Bord na Móna peatlands. Enhanced rehabilitation measures that have been proposed as part of PCAS are **NOT** proposed as part of this draft Bracklin rehabilitation plan at this stage. The potential implementation of enhanced rehabilitation measures at Bracklin Bog will be dependent on the selection of Bracklin Bog as a site to be included in PCAS.

## 1.1 Constraints and Limitations

This document seeks to address the requirements of Condition 10.2 of IPC License Ref. P0501-01:

> "*The licensee shall prepare, to the satisfaction of the Agency, a fully detailed and costed plan for permanent rehabilitation of the cutaway boglands within the licensed area.*"

This document covers the area of **Bracklin Bog, excluding Bracklin Bog west**.

Industrial peat extraction at Bracklin Bog permanently ceased in 2021 (having commenced bog development in around 1940). The bog came out of industrial peat production in 1995-2000 and has largely revegetated since then.

It is anticipated that the combination of rehabilitation measures and natural colonisation will result in environmental stabilisation. Nevertheless, it will still take some time (30-50 years) for naturally functioning wetland and peatland ecosystems to fully re-establish across bare peat.

Parts of Bracklin Bog (within and outside the areas owned and under the control of Bord na Móna) are currently being used by domestic turf cutters for intensive private sod peat production. These areas are ecologically and hydrologically linked to the area owned by Bord na Móna where rehabilitation is planned. It is beyond the scope of this rehabilitation plan to address turf cutting issues on Bracklin Bog that are outside of the control of Bord na Móna. Nevertheless, Bord na Móna are aware of such issues which may constrain the proposed rehabilitation actions, and this rehabilitation plan considered potential impacts of these on the delivery of the stated objectives.

Rehabilitation in other areas of the bog may also be constrained due to other property issues or issues such as rights of way. Several rights of way exist at or around the margin of Bracklin Bog, most of which lead to known turbary areas.

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# 2. METHODOLOGY

This rehabilitation plan was developed with a combination of desktop and field surveys, consultations with internal and external stakeholders. The development of this rehabilitation plan considered **recently published** guidance issued by the EPA in 2020 – **Guidance on the process of preparing and implementing a bog rehabilitation plan**.

The ecological information and site information collected during the Bord na Móna ecological baseline surveys, additional confirmatory site visits (covering the period 2012 to 2023 inclusive) and monitoring and desktop analysis, forms the basis for the development of this rehabilitation plan for the bog along with:

- Experience of 40 years of research on the after-use development and rehabilitation of the Bord na Móna cutaway bogs (Clarke, 2010; Bord na Móna, 2016);
- Significant international engagement during this period with other counties in relation to best-practice regarding peatland rehabilitation and after-use through the International Peat Society and the Society for Ecological Restoration (Joosten & Clarke, 2002; Clarke & Rieley, 2010; Gann *et al*., 2019);
- Consultation and engagement with internal and external stakeholders;
- GIS Mapping;
- BNM drainage surveys;
- Bog topography and peat depth data;
- Hydrological modelling;

## 2.1 Desk Study

The desk study involved collecting all relevant environmental and ecological data for the study area. The development of the rehabilitation plan also takes account of research, experience and engagement with other peatland restoration and rehabilitation projects and peatland research including Irish, UK, European and International best practice guidance (full citations are in the References Section):

- Anderson *et al*. (2017). An overview of the progress and challenges of peatland restoration in Western Europe.
- Barry, T.A. et al (1973). A survey of cutover peats and underlying mineral soils. Soil Survey Bulletin No. 30. Dublin, Bord na Móna and An Foras Taluntais.
- Bonn *et al*. (2017). Peatland restoration and ecosystem services- science, policy and practice.
- Carroll *et al*. (2009). *Sphagnum* in the Peak District. Current Status and Potential for Restoration. Moors for the Future Report No 16.
- Clark & Rieley (2010). Strategy for responsible peatland management.
- Eades *et al*. (2003). The Wetland Restoration Manual.
- Farrell & Doyle (2003). Rehabilitation of Industrial Cutaway Atlantic Blanket Bog, NW Mayo, Ireland.
- Feehan, J. (2004). A long-lived wilderness. The future of the north midlands peatland network. Department of Environmental Resource Management, UCD.
- Foss, P.J., Crushell, P. & Gallagher, M.C. (2017) Title: Counties Longford &Roscommon Wetland Study. Report prepared for Longford and Roscommon County Councils.
- Gann *et al*. (2019). International Principles and Standards for the practice of Ecological Restoration.
- Hinde *et al*. (2010). *Sphagnum* re-introduction project: A report on research into the re-introduction of *Sphagnum* mosses to degraded moorland. Moors for the Future Research Report 18.

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- Joosten & Clarke (2002). Wise Use of mires and peatlands – Background and Principles including a framework for Decision-making.
- Lindsay (2010). Peatbogs and Carbon: A Critical Synthesis to Inform Policy Development in Oceanic Peat Bog Conservation and Restoration in the Context of Climate Change.
- Mackin *et al*. (2017). Best practice in raised bog restoration in Ireland. Irish Wildlife Manuals, No. 99. National Parks and Wildlife Service,
- McBride *et al*. (2011). The Fen Management Handbook (2011), Scottish Natural Heritage.
- McDonagh (1996). Drain blocking by machines on Raised Bogs. Unpublished report for National Parks and Wildlife Service.
- NPWS (2017a). National Raised Bog Special Areas of Conservation management plan. Department of Arts, Heritage and the Gaeltacht.
- Pschenyckyj et al., 2021, Optimising Water Quality Returns from Peatland Management while Delivering Co-Benefits for Climate and Biodiversity. An Fóram Uisce.
- Quinty & Rochefort (2003). Peatland Restoration Guide, second edition. Canadian *Sphagnum* Peat Moss Association and New Brunswick Department of Natural Resources and Energy.
- Regan*, et. al.* (2020). Ecohydrology, Greenhouse Gas Dynamics and Restoration Guidelines for Degraded Raised Bogs. EPA Research Report. Prepared for the Environmental Protection Agency by Trinity College Dublin.
- Renou-Wilson *et al*. (2011). BOGLAND - Sustainable Management of Peatlands in Ireland. STRIVE Report No 75 prepared for the Environmental Protection Agency.
- Schouten (2002). Conservation and Restoration of Raised Bogs: Geological, Hydrological and Ecological Studies. Dúchas - The Heritage Service of the Department of the Environment and Local Government, Ireland;
- Thom (2019). Conserving Bogs – Management Handbook.
- Wheeler & Shaw (1995). Restoration of Damaged Peatlands – with Particular Reference to Lowland Raised Bogs Affected by Peat Extraction.
- Wittram *et al*. (2015). A Practitioners Guide to Sphagnum Reintroduction. Moors for the Future Partnership.


Additional on-line resources were also incorporated into the desk study, including:

- Ballivor-Derrygreenagh bog group Integrated Pollution Control Licence;
- Ballivor-Derrygreenagh bog group Annual Environmental Reports;
- Review of the National Biodiversity Data Centre (NBDC) webmapper;
- Inland Fisheries Ireland (IFI) Reports;
- Environmental Protection Agency database (www.epa.ie);
- EPA Guidance on Requests for Alterations to a Licensed Industrial or Waste Activity;
- BirdWatch Ireland online data (including I-WeBS and CBS datasets; www.birdwatchireland.ie);
- Geological Survey of Ireland - National Draft Bedrock Aquifer map;
- Geological Survey of Ireland - Groundwater Database (www.gsi.ie);
- Historic Environment Viewer at https://webgis.archaeology.ie/historicenvironment/
- National Parks & Wildlife Services Public Map Viewer (www.npws.ie);
- Water Framework Directive catchments.ie/maps/ Map Viewer (www.catchments.ie);
- OPW Indicative Flood Maps (www.floodmaps.ie);
- CFRAM Preliminary Flood Risk Assessment (PFRA) maps (www.cfram.ie);

- River Basin Management Plan for Ireland 2018 – 2021;
- Bord na Móna Annual Report 2023.
- Spatial data in respect of Article 17 reporting, available online at https://www.npws.ie/maps-and-data/habitat-and-species-data/article-17.

## 2.2 Consultation

A number of stakeholders have been identified during the course of Bord na Móna's rehabilitation and Biodiversity Action Plan activities and are contacted during the rehabilitation planning process for their views. See Section 4.

## 2.3 Field Surveys

Bord na Móna carried out a baseline ecological survey of all of its properties in 2009-2012 and developed habitat maps. As part of this exercise, Bracklin Bog was surveyed in July of 2012. Additional ecological walk-over surveys and visits have taken place at Bracklin Bog between 2015-2017. Habitat maps have been updated, where required. This rehabilitation plan is informed by the original baseline survey as well as subsequent confirmatory site walk-over surveys and visits, and updates to baseline data.

Habitat mapping followed best practice guidance from Smith *et al.* (2011). Map outputs including all habitat maps and target notes were produced using GIS software application packages (ArcGIS). General marginal habitats and other habitats that had not been modified significantly by industrial peat extraction were classified using Fossitt *et al*. (2000). Plant nomenclature for vascular plants follows Stace (2010), while mosses and liverworts nomenclature follows identification keys published by the British Bryological Society (2010). A more detailed Bord na Móna classification system was previously developed for classifying pioneer cutaway habitats as Fossitt categories were deemed not to be detailed enough for cutaway bog (much of cutaway bog could be classified as Cutover Bog - PB4).

A detailed ecological survey report for Bracklin Bog is contained in Appendix III.

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# 3. SITE DESCRIPTION

Bracklin Bog is located in Co. Westmeath, approximately 14km east of Mullingar (Grid reference: N 62310 57200). Bracklin Bog is located close to the villages of Raharney and Ballivor and is adjacent to the Co. Meath/Westmeath border along its eastern boundary. This bog is part of the Ballivor-Derrygreenagh group of bogs, with Lisclogher East and Lisclogher West located to the north and Carranstown Bog and Ballivor Bog located to the south of the site.

Bracklin bog is an older production bog with Industrial peat production having commenced in the 1940s and ceased between 1995-2000. Bracklin is considered a deep peat cutaway bog with large areas of deep peat remaining. Bracklin Bog was formerly a sod peat production bog and was never converted to milled peat production. This area has revegetated and stabilised, and there is extensive development of mature cutaway vegetation communities and minor areas of bare peat across the majority of the former production area.

Bracklin Bog has a gravity drainage regime.

See Drawing number BNM-ECO-03-01 titled **Bracklin Bog: Bog Site Location**, included in the accompanying Mapbook[1] , which illustrates the location of Bracklin Bog in context to the surrounding area.

## 3.1 Status and Situation

### *3.1.1 Site history*

Industrial peat production commenced at Bracklin in the 1940s and ceased between 1995-2000. Bracklin Bog formerly supplied a range of commercial functions including the supply of horticultural peat, sod peat and latterly; fuel peat for Lough Ree Power.

Bracklin Bog was never re-developed for milled peat production. This area has revegetated as mature cutaway habitats and the bog still retains deep peat reserves in this part.

An area of marginal raised bog remnant (19 ha) was restored at Bracklin Bog in 2016, as part of the Bord na Móna Raised Bog Restoration Programme. An extensive drain blocking programme was carried out to raise water levels and help re-wet the bog area, encouraging the development of embryonic *Sphagnum*-rich 'active' peat-forming raised bog. This area is of significant biodiversity and interest to the Meath-Westmeath Bog Group.

### *3.1.2 Current land-use*

Industrial peat production has now permanently ceased at Bracklin Bog. The majority of the site has colonised with mature vegetation since cessation of industrial peat production.

There are some areas of active turbary around the margins of the site. These are mapped in the accompanying Mapbook.

[1] Cutaway Bog Decommissioning and Rehabilitation Plan – Bracklin Bog Map Book

### *3.1.3. Socio-Economic conditions*

Bord na Móna has historically been a vital employer for the rural community of the Midlands of Ireland. Bord na Móna compiled a report on the role of peat extraction in the midlands historically in which they report that in 1986, by the end of Bord na Móna's Third Development Programme, a total of twenty-three work locations had been established around the country. The company had an average employment of approximately 4,688 in the mid 1980's, with a peak employment of 6,100 during the production season, which placed it among the country's largest commercial employers. The importance of such levels of employment were largely due to its regional concentration in the Midlands and the lack of alternative employment opportunities at the time.

According to the Energy Crop Socio-Economic Study undertaken by Fitzpatrick Associates in 2011, there were an estimated 1,443 jobs supported by the peat-to-power industry in Ireland at the time, some 81% of which were located in the catchment areas of the three peat-fired generating stations (Lough Ree, West Offaly, and Edenderry Power Stations). These constituted jobs in the plants and in peat extraction, jobs indirectly supported in upstream supply industries and jobs induced through the trickle-down effects of the wages and salaries of those supported directly or indirectly.

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In respect of Bracklin Bog, jobs included in the above study would have included those to facilitate peat extraction for the supply of horticultural peat, sod peat and latterly; fuel peat for Lough Ree Power.

As the primary employer in many Midland counties, Bord na Móna played a central role in building communities through several initiatives, including Education bursaries, support of local sporting clubs, the provision of community gain funds, charity programmes and the provision and building of amenity areas." These job numbers have now declined with the cessation of peat extraction at this bog.

## 3.2 Geology and Peat Depths

### *3.2.1 Sub-soil geology*

The underlying geology[2] of the main eastern section of Bracklin Bog comprises Waulsortian limestone and Lucan Formation; divided by a narrow band of Tober Colleen Formation. Mixed gravel till is exposed at several places through the bog on the surfaces of mounds.

### 3.2.2 *Peat type and depths*

Bracklin Bog contains reserves of deep peat across the main section that was never re-developed to milled peat. The bog still retains deep peat reserves.

[2] https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=de7012a99d2748ea9106e7ee1b6ab8d5&scale=0

## 3.3 Key Biodiversity Features of Interest

Bracklin Bog was formerly an old sod peat production bog and the majority of the site has had no milled peat production. Part of this cutaway area and remnant bog was initially developed for milled peat and regular field drains were dug through some of the bog, particularly some of the marginal remnant areas. However, this development was abandoned. The majority of the bog is now heavily vegetated with cutaway habitats. A detailed ecological report is provided in Appendix III.

### *3.3.1 Current habitats*

The most common vegetation communities present include (Categories in brackets refer to the current BnM classification system for vegetation communities, along with an equivalent Heritage Council habitat classification or Fossitt Code):

- Birch-dominated scrub and woodland (community '*Emergent Betula-dominated community (A)' and 'Betula-Salix woodland')* (Fossitt WS1, WN7);
- Pioneer Heather-dominated vegetation (in mosaic with scrub and poor fen) (community 'Dry *Calluna* community' or dHeath) (Fossitt PB4),
- Pioneer Bog Cotton -dominated poor fen ('*pioneer Eriophorum angustifolium*' community) (Fossitt PF1),
- Bare peat(community 'Bare peat (0-50% cover)'or BP) (Fossitt PB4);
- Pioneer dry Cocksfoot-False Oatgrass -dominated grassland ('*Dactylis-Arrhenatherum'* community*)* (Fossitt GS2);
- Pioneer dry Purple Moorgrass-dominated grassland ('*Molinia caerula-dominated*' community) (Fossitt GS3/4);
- Embryonic bog vegetation (PB1);
- Pioneer Bottle Sedge – dominated poor fen and open water ('*pioneer Eriophorum angustifolium community (poor fen)')* (Fossitt PF1),
- Pioneer Sweet Vernal grass-dominated grassland (*'Anthoxanhthum-Holcus-Equisetum' community*) (Fossitt GS2);
- Pioneer dry calcareous grassland (Fossitt GS1);
- Silt ponds with Gorse/Birch scrub and Purple Moorgrass-dominated grassland (Fossitt FL8/WS1);
- Riparian zones (with drains and associated habitats such as scrub) (Fossitt FW2, WS1).

The most common habitats[3] found around the margins of the site include:

- Birch woodland (WN7)
- Raised bog (PB1) and Poor flush (PF2)
- Cutover Bog (PB4)
- Secondary cutover bog mosaics (PB4), with developing dry heath/facebank (PB1), poor fen and scrub
- Scrub (WS1)
- Dry meadow (GS2) (around old famine house)
- Oak-Ash-Hazel woodland (WN2) (around old famine house)
- Hedgerows (WL1)
- Improved grassland (GA1) around the boundary where the GIS boundary extends into adjacent fields
- Wet grassland (GS4) (old cutover)

[3] Codes refer to Heritage Council habitat classification, Fossitt 2000

The large former sod peat production area is now heavily vegetated with overall vegetation cover generally about 90%. Deep wide trench drains were dug at intervals separating the former production bays across the bog in a north-east to south-west direction. These riparian zones are now generally heavily vegetated with dense Birch scrub and woodland, forming long bands of woodland through the site. Some contain running water and have developed riparian characteristics while some have silted up. The majority of the site is dry and there is little open water or wetland development.

There are several narrow strips of high bog running through the middle of each bay and are generally dominated by dry Heather-dominated vegetation as the remnant bog has dried out. They have also been colonised by Gorse and Birch scrub in places. The older sections that came out of production have much denser vegetation cover and much more scrub cover. The majority of the cutaway vegetation is a mosaic of pioneer Heather-dominated vegetation, Bog Cotton-dominated poor fen and Birch scrub. The older sections tend to have 100% vegetation cover.

Towards the centre of the site there is some development of an embryonic *Sphagnum* community associated with a small wetland area. This is **not** a remnant raised bog area but *Sphagnum* regenerating on cutaway. The wetland has formed in a local small basin with impeded drainage that has developed along one of the old remnant bands of high bog that was left after sod-peat cutting.

There are several mounds and ridges towards the centre of the site where the underlying glacial till has been exposed or where there is a thin layer of remnant peat. The areas with the exposed gravel tend to have small patches of pioneer calcareous grassland. This grassland community tends to be rich in orchids with frequent Common Spotted Orchid and some Marsh Helleborine. One area towards the centre of the site and adjacent to the railway has a relatively extensive area of this grassland community with limited scrub cover, which is somewhat unusual on the cutaway. A small pocket of dry calcareous grassland contains a significant Marsh Helleborine population (> 500 individuals).

A small raised bog remnant is located to southern end of the site (19 ha). This marginal raised bog was restored at Bracklin Bog in 2016, as part of the Bord na Móna Raised Bog Restoration Programme. An extensive drain blocking programme was carried out to raise water levels and help re-wet the bog area, encouraging the development of embryonic *Sphagnum*-rich 'active' peat-forming raised bog.

See Drawing number BNM-ECO-03-17 titled **Bracklin Bog: Current Habitat Map**, included in the accompanying Mapbook, which illustrates the habitats at Bracklin Bog.

### *3.3.2 Species of conservation interest*

A number of species of conservation concern have been recorded at Bracklin Bog. The following is a summary of the records of these species available within both BnM records and those of the National Biodiversity Data Centre (NBDC).

Multiple mammal species have been recorded on or within 1Km of the bog; Irish Hare (*Lepus timidus subsp. Hibernicus)*, Eurasian Badger (*Meles meles)* and European Otter (*Lutra lutra*).

Regarding lepidopteran species, records exist for Marsh Fritillary (*Euphydryas aurinia)*, Meadow Brown (*Maniola jurtinal)*, Small Heath (*Coenonympha pamphilus*), Ringlet (*Aphantopus hyperantus*) and Wood White (*Leptidea* sp.).

Numerous bird species are known to use the cutover bogs in Ireland's midlands as breeding grounds, wintering grounds or both. Kestrel *(Falco tinnunculus)*, Meadow Pipit (*Anthus pratensis*), as well as other common bird species including Blackcap (*Sylvia atricapilla*), Song Thrush *(Turdus philomelos),* Wood Pigeon (*Columba palumbus*), Whitethroat (*Sylvia communis*), Blue Tit (*Cyanistes caeruleus*), Blackbird (*Turdus merula*), Redpoll (*Carduelis flammea cabaret*), Rook (*Corvus frugilegus*), Hooded Crow (*Corvus cornix*) and Wren (*Troglodytes troglodytes*) have all been recorded during BNM ecology surveys.

NBDC records for red-listed[4] bird species of conservation concern recorded in the 10km square (N65) which Bracklin intersects include the species Grey Wagtail (*Motacilla cinerea*), Curlew (*Numenius arquata)*, Red Grouse (*Lagopus lagopus),* Golden Plover (*Pluvialis apricaria),* Woodcock (*Scolopax rusticola),* Redwing (*Turdus iliacus)* and Lapwing (*Vanellus vanellus).* There is potential (habitat availability) for these bird species to utilise Bracklin Bog.

### *3.3.3 Invasive species*

NBDC holds records for the high impact invasive species Japanese Knotweed (*Fallopia japonica*), and Rhododendron (*Rhododendron ponticum*), recorded in marginal scrub habitat along the northern boundary.

A broad range of common garden escapes are also occasionally present around the margins of Bord na Móna bogs. Although spatial overlap with the rehabilitation work is expected to be limited, these are, where necessary, to be treated in line with best practice during rehabilitation (Appendix V).

## 3.4 Statutory Nature Conservation Designations

There are a number of European Sites (SAC's or SPA's) in close proximity (i.e. within a 5km radius at minimum) to Bracklin Bog. Bracklin Bog has no overlapping designated sites. The nearest EU Designated sites to Bracklin Bog are as follows:

- River Boyne And River Blackwater SAC (site code: 002299) located approx. 2km west
- River Boyne And River Blackwater SPA (site code: 004232) located approx. 2km west
- Mount Hevey Bog SAC (site code: 002342) (also a pNHA) located approx. 6.7km south

The nearest nationally designated sites to Bracklin Bog are the Royal Canal pNHA (site code: 002103) located approximately 6.4km south of the site and Mount Hevey Bog pNHA (site code: 001584) located 6.7km south.

See Figure *BNM-ECO-03-23: Bracklin Bog Proximity to Designated Sites* in the accompanying map book.

### *3.4.1 Other Nature Conservation Designations*

The Ramsar Convention entered into force in Ireland on 15th March 1985. Ireland currently has 45 sites/wetlands designated as Wetlands of International Importance (Ramsar Sites). These cover a surface area of 66,994ha. There

[4] Gilbert G, Stanbury A and Lewis L (2021), "Birds of Conservation Concern in Ireland 2020 –2026". Irish Birds 9: 523—544

are no Ramsar site in close proximity to Bracklin Bog. The closest Ramsar Sites to Bracklin Bog are Lough Owel and Lough Iron, located 18.4km west and 25.5km northwest respectively.

## 3.5 Hydrology and Hydrogeology

Bracklin bog forms part of the Boyne Catchment (Catchment ID: 07) as defined by the EPA under the Water Framework Directive (WFD). The bog lies within two sub-catchments; the Boyne_SC_050 and Boyne_SC_40 sub catchments.

There are several streams around the margins that drain the site. The Carranstown Little (EPA code: 07C87) watercourse arises just outside the south-eastern boundary of the site and flows in an easterly direction, eventually flowing into the Cartenstown River. Two un-named watercourses flow from the northern boundary into Bolandstown Stream (07B45) which flows in a south-easterly direction and into Cartenstown River. These watercourses are tributaries of the Stonyford River which later merges with the River Boyne.

GSI data indicates that the majority of Bracklin Bog lies within a locally important aquifer - bedrock which is moderately productive only in local zones. A narrow strip of the site in the north-eastern section lies within a poor aquifer - bedrock which is generally unproductive except for local zones. An aquifer is an underground body of water-bearing rock or unconsolidated materials (gravel or sand) from which groundwater can be extracted in useful amounts. GSIs Aquifer classes are divided into three main groups based on their resource potential, and further subdivided based on the type of openings through which groundwater flows. There are nine aquifer categories in total. Locally important aquifers are capable of supplying locally important abstractions (e.g. smaller public water supplies, group schemes), or good yields (100-400 m3/d). This data gives an indication of sub-surface deposits (bedrock and unconsolidated materials) in terms of their groundwater resource potential and dominant groundwater flow type.

Regionally important aquifers are those in which the network of fractures, fissures and joints, through which groundwater flows, is well connected and widely dispersed, resulting in a relatively even distribution of highly permeable zones. There is good aquifer storage and groundwater flow paths can be up to several kilometres in length. There is likely to be substantial groundwater discharge to surface waters ('baseflow') and large (>2,000 m3/d), dependable springs may be associated with these aquifers.

The western section of Bracklin Bog is located in an area mapped by GSI as of low groundwater vulnerability, with the eastern section of the site lying in an area of moderate groundwater vulnerability (GSI Mapviewer). Groundwater Vulnerability is a term used to represent the intrinsic geological and hydrogeological characteristics that determine the ease with which groundwater may be contaminated by human activities. Groundwater vulnerability maps are based on the type and thicknesses of subsoils (sands, gravels, glacial tills (or boulder clays), peat, lake and alluvial silts and clays), and the presence of karst features. Groundwater is most at risk where the subsoils are absent or thin and, in areas of karstic limestone, where surface streams sink underground at swallow holes. These data indicate there is generally low risk of any groundwater contamination occurring at this site.

Quaternary sediment maps show that Bracklin is generally underlain by peat. Small pockets of esker, comprised of gravels of basic reaction, occurs in the eastern part of the site. In a wider context, the bog is surrounded by till derived from limestones, with lacustrine sediments and alluvium also present. A small area to the south of the bog is underlain by gravels derived from limestones.

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## 3.6 Emissions to surface-water and watercourses

Drainage is an important feature of industrial peat production and there were extensive field drains maintained throughout bog areas to facilitate industrial peat production annually, each of which eventually drains into a terminal silt pond that allows for settlement of suspended solids before entering the main river systems. In accordance with the existing Integrated Pollution Control licence, all drainage water from boglands in a licensed area is discharged via an appropriately designed silt pond treatment arrangement as required in Condition 6.6. of the licence. Industrial peat production has now permanently ceased at Bracklin Bog. There are no silt ponds associated with this bog.

There are several streams around the margins that drain the site. The Carranstown Little (EPA code: 07C87) watercourse arises just outside the south-eastern boundary of the site and flows in an easterly direction, eventually flowing into the Cartenstown River. Two un-named watercourses flow from the northern boundary into Bolandstown Stream (07B45) which flows in a south-easterly direction and into Cartenstown River. These watercourses are tributaries of the Stonyford River (IE_EA_07S020400 STONYFORD_040) which later merges with the River Boyne. The latest EPA Q-Value for Stonyford River (Station code: RS07S020400) is Q3-4 'Moderate' (2020). All surface waters associated with Bracklin Bog are located within the River Boyne Catchment.

The Boyne and Stonyford rivers were listed as being under pressure from peat extraction in the 2nd cycle of the River Basin Management Plan for Ireland, but are not indicated as remaining so in the third cycle which is currently out for consultation. Peat extraction was not identified as a pressure in the second cycle of the river basin management plan and is not indicated as being so in the third cycle.

Details of silt ponds, associated surface water emission points and monitoring and sampling locations are detailed in Drawing numbers BNM-ECO-03-02 titled **Bracklin Bog: Structures and Sampling**, along with Drawing number BNM-ECO-03-03-WQ01 titled **Bracklin Bog: Water Quality Map** included in the accompanying Mapbook, which illustrate the various drainage and water quality infrastructure present at Bracklin Bog.

There is a robust monitoring program to track and verify any changes in baseline water quality conditions pre and post decommissioning and rehabilitation so that the success or otherwise can be tracked and verified for the Environmental Protection Agency.

Rehabilitation of cutaway peatland is closely linked with control of emissions. One of the criteria for successful rehabilitation is stabilisation through re-vegetation, which will stabilise all substrates and in turn remove the need for further silt control measures. This site is already largely vegetated. Re-wetted peat also aids the primary objective of stabilizing peat, as when peat is re-wetted it is not vulnerable to wind erosion. Re-wetted peat and the development of wet peatland habitats can also act as sinks for silt and mobile peat, and increases additional retention time for solids, and the peatland vegetation can quickly stabilise this material within blocked drains on site (by acting like constructed wetlands).

Water quality of water discharges from restored peatlands normally improves as a result of bog restoration measures and the restoration of natural peatland processes (Bonn *et al.*, 20017). Bog restoration is also expected to improve water attenuation of the site as the drains are blocked, slowing water movement and water release from the site. Restored peatlands help slow the release of water and aid the natural regulation of floods downstream (Minayeva *et al.*, 2017). The National River Basin Management Plan (NRBMP) 2018-2021 (DHPCLG, 2017) is the key national plan for Ireland to achieve the objectives of the Water Framework Directive (WFD). The NRBMP outlines how key actions such as the Bord na Móna peatland rehabilitation is expected to have a positive impact on water quality and help the NWBMP deliver its objectives in relation to the WFD.

Water will still discharge from designated emission points when rehabilitation at Bracklin has been completed. This discharge will have improved water quality and there will be increased wetland attenuation, meaning slower release of water. This is expected to have a positive impact on status of the key waterbody receptor, the Stonyford River (IE_EA_07S020400 STONYFORD_040), and will support the future status of the waterbodies achieving Good Status.

**Decommissioning and Rehabilitation Programme Water Quality Monitoring.**

Water quality monitoring will be established. There will be initial quarterly monitoring assessments of the site to determine the general status of the site, the condition of the silt-ponds, assess the condition of the rehabilitation work, asses the progress of natural colonisation, monitoring of any potential impacts on neighbouring land and general land security. The number of site visits will reduce after 2 years to bi-annually. These site visits will assess the need to additional rehabilitation.

Monitoring results will be maintained, trended and reported on each year as part of the requirement to report on Condition 10.1 of the IPC Licence on Bog Rehabilitation in the Annual Environmental Report, which will be available in April each year at www.epa.ie.

The parameters to be included (as per condition 6.2 of the IPC Licence) include monthly monitoring for pH, Flow, Suspended Solids, Total Solids, Total Phosphorus, Total Ammonia, Colour, and COD.

This sampling regime on a selected number of silt ponds will be carried out over a two-year cycle. The original (licence) requirement was for a quarterly sampling regime.

## 3.7 Fugitive Emissions to air

Rehabilitation of the drained peatland will seek to re-wet the dry peat where possible. Collectively re-wetting and re-vegetating will minimise any risk of emission to air from dust.

## 3.8 Carbon emissions

The bog is likely to be a carbon source as it is a drained (degraded) peatland with some active drainage, which facilitates the oxidation of peat. Peat extraction generally transforms a natural peatland which acts as a modest carbon sink into a cutaway ecosystem which is a large source of carbon dioxide (2–5 t C/ha/year) (Waddington & McNeil, 2002; Alm *et al*., 2007; Wilson *et al*., 2007, Wilson *et al*., 2015). Furthermore, they are also a significant source of methane (Huttunen *et al*., 2003; Laine *et al*., 2007a) as a consequence of the conditions within the peat body that provide a suitable environment for the microbial breakdown of plant litter and root exudates. Degraded peatlands also release carbon/GHG emissions via the fluvial/aquatic pathway (Dissolved Organic Carbon – DOC, Suspended Solids/Particulate Matter, degassing of GHGs from water).

The EPA-funded CarbonRestore Project (Renou-Wilson et. al. 2012) found that rewetting of drained peatlands can lead to restoration of functional peatland, such as the return of typical plant and animal species, which in turn may lead to the restoration of peat-formation and the C-sink function. The EPA NEROS project carried out GHG flux research at Moyarwood Bog and found that Moyarwood Bog was overall a Carbon sink (sink for $CO_2$ and a source for Methane) 6 years after bog restoration was carried out (Renou-Wilson et al. 2018).

It is expected that Bracklin Bog will become a reduced Carbon source/part carbon sink following rehabilitation. The potential of any cutaway site to develop as a carbon sink in the longer-term depends on the success of the

rehabilitation measures, the extent of development of *Sphagnum*-rich or other peat-forming habitats, the balance of carbon fluxes from different cutaway habitats and future climatic conditions. Much of this site is expected to develop *Sphagnum*-rich habitats, poor fen, heath and Birch woodland along with some wetland habitats with open water, Reed Swamp and fen habitats. Birch woodland is expected to develop on the drier mounds and peripheral headlands.

## 3.9 Current ecological rating

(Following NRA (2009) Evaluation Criteria)

The majority of Bracklin Bog can be rated as **Local Importance; lower value to Local Importance; higher value.**

The revegetated formed production area in the east of the site and marginal habitats and including woodland, scrub, pioneer cutaway habitats, fen, calcareous grassland, remnant raised bog, and wetlands may act as a refuge and as ecological corridors for wildlife and are therefore deemed to be **locally important (higher value)**.

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# 4. CONSULTATION

## 4.1 Consultation to date

Consultation seeks to engage an audience of relevant stakeholders at both a national and local level. National stakeholders have been identified from varied bog restoration and rehabilitation efforts undertaken by Bord na Móna over the past 40 years, with particular emphasis on engagement with stakeholders during their Biodiversity Action Plan programme, since 2010. National Stakeholders includes relevant government departments and agencies, relevant semi-state bodies, NGOs and other environmentally focused groups with a national remit.

There has been ongoing consultation about rehabilitation, biodiversity, and other general issues over the years about Ballivor-Derrygreenagh bog group, including Bracklin Bog, with various stakeholders in relation to:

- General consultation with range of stakeholders at annual Bord na Mona Biodiversity Action Plan review days 2010-2018,
- Meetings and site visit with local community group - Meath-Westmeath Bog Group regarding rehabilitation of Bracklin Bog between 2013 - 2016.
- Meeting with Westmeath County Council regarding general rehabilitation plans for BnM bogs and BnM BAP (2016)
- Midlands & East Regional WFD Operational Committee (River Basin Management Plans),
- Archaeological Liaison Committee (National Museum of Ireland & Dept of Culture Heritage and the Gaeltacht).

There has been ongoing consultation about the planning and construction of Balivor Wind Farm (Bord na Móna Wind Farm | Ballivor Wind Farm) as part of planning for that particular proposed development. This website describes the project and has up to date project newsletters.

To inform the current Plan, both national and local stakeholders, including neighbours whose land adjoins Bracklin Bog and local representatives of national bodies (such as Regional National Parks and Wildlife Service staff) and relevant offices in County Councils (such as the Heritage or Environmental Offices) will be contacted. Any identified local interest groups will be sought and informed of the opportunity to engage with this rehabilitation plan, and when identified invited to submit their comments or observations in relation to the proposed rehabilitation at Bracklin Bog.

All correspondence received will be acknowledged and evaluated against the rehabilitation work proposed here, and the final draft of the Bracklin Bog Rehabilitation Plan will contain a review of the consultation.

## 4.2 Issues raised by Consultees

N/A Yet as consultation has not commenced.

## 4.3 Bord na Móna response to issues raised during consultation

N/A Yet as consultation has not commenced.

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# 5. REHABILITATION GOALS AND OUTCOMES

The rehabilitation goals and outcomes outline what Bord na Móna want to achieve by implementing the rehabilitation. These include:

- Meeting conditions of IPC Licence.
- Environmental stabilisation of the former peat production areas and mitigation of potential silt run-off.
- Stabilisation or reduction in water quality parameters of water discharging from the site (e.g. suspended solids).
- Reducing pressure on receiving waterbodies that have been classified as At Risk from peatlands and from peat extraction, via stabilization or improving water-quality from this bog, and therefore, reducing pressures.
- Integrating peatland rehabilitation with future planned renewable energy infrastructure on site. It is proposed to re-wet areas in the surrounding cutaway peatland, where possible.
- Optimising hydrological conditions for the protection of exposed archaeological structures, their retention in situ and preservation into the future.
- The main goal and outcome of this plan is the successful rehabilitation (environmental stabilisation and restoration) of a peatland originally drained for industrial peat production, but not brought into production, in a manner that is acceptable to both external stakeholders and to Bord na Móna.

The rehabilitation goals and outcomes take account of the following issues.

- Natural colonisation will form the basis for the environmental stabilisation of the bare peat areas. Re-wetting of the cutaway, where possible, is a general rehabilitation strategy. The main target will be to maintain water-levels close to the peat surface, and to avoid the creation of large-water bodies. Re-wetting and water levels close to the peat surface accelerates the re-vegetation processes, the development of vegetation cover and therefore environmental stabilisation. There already has been significant natural colonisation at this bog. There is already significant potential for the creation of wet cutaway habitats at Bracklin Bog due to the local topography (localised basins).
- It will take some time for stable naturally functioning habitats to fully develop at Bracklin Bog. This will happen over a longer timeframe than the implementation of this rehabilitation plan.
- Re-wetting residual peat will initially maintain and enhance the carbon storage capacity of the bog. There is scientific consensus that restoration of hydrology in damaged bog can improve carbon storage, water storage and attenuation and help support biodiversity both on the site and in the catchment (See Section 3.8). This will reduce Carbon emissions from the site from a larger carbon source to a smaller Carbon source. In time, the site has the capacity to develop in part as a Carbon sink.
- It is not expected that the site has the potential to develop active raised bog (ARB) analogous to the priority EU Habitats Directive Annex I habitat within the foreseeable future (c.50 years). Furthermore, only a small proportion of the bog has potential to develop *Sphagnum*-rich habitats in this timeframe. Nevertheless, re-wetting across the entire bog, will improve habitat conditions of the whole bog. Other peatland habitats will develop in a wider mosaic that reflects underlying conditions.
- Rehabilitating former industrial peat production bog will also in the longer-term support other ecosystem services such as such the development of new habitat to support biodiversity and local attenuation of water flows from the bog.

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- WFD status in receiving water bodies can be affected by peatlands and peat extraction but is also affected by other sources such as agriculture. In addition, receiving water bodies that are assessed as At Risk from peatlands and from peat extraction are likely to have several contributary sources of impacts (private peat extraction and Bord na Móna). Reducing pressures due to former peat extraction activities at Bracklin Bog will contribute to stabilising or improving water quality status of receiving water bodies in general. Ultimately, improving the WFD status of the receiving waterbody will depend on reducing pressure from a range of different sources, including peatlands in general (private and Bord na Móna).
- Re-wetting in general will benefit the future preservation of most known and unknown archaeological features.

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# 6. SCOPE OF REHABILITATION

The principal scope of this rehabilitation plan is the environmental stabilisation of the bog. This is defined by:

- The area of Bracklin Bog.
- EPA IPC Licence - Ref. P0501-01. As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. Bracklin Bog is part of the Ballivor-Derrygreenagh bog group.
- The local environmental conditions of Bracklin Bog mean that intensive drain blocking is the most suitable rehabilitation approach for this site. Bracklin Bog still retains deep peat reserves in the eastern section having not been fully developed for milled peat extraction.
- The key goals and outcomes of rehabilitation set by Bord na Móna. Bord na Móna have defined the key goal and outcome of rehabilitation at Bracklin Bog as **environmental stabilisation**, **optimising residual peat re-wetting,** to enhance the development of compatible habitats.
- The cutaway is already developing a mosaic of woodland, grassland, wetland and cutaway peatland habitats. Much of this cutaway has largely stabilised. Rehabilitation is proposed to enhance residual peat re-wetting in these areas while taking account of future infrastructure and land-uses.
- Proposed land-use. Bord na Móna are currently developing a renewable energy project called Ballivor Wind Farm. This proposed project has been submitted for planning permission. The proposed renewable energy project will have a footprint on Bracklin Bog and has been mapped as a constraint in the rehabilitation plan.
- Rehabilitation of Bracklin Bog will support multiple national strategies of climate action, biodiversity action and other key environmental strategies such was the Water Framework Directive.
- The time frame for the delivery of the planned rehabilitation will be undertaken according to available resources and appropriate constraints.
- It is not proposed to carry out rehabilitation on all marginal or peripheral cutover bog zones. Generally, these bog remnants are narrow, or are subject to turbary, and do not have positive bog restoration prospects.

## 6.1 Key constraints

- **Bog conditions.** Rehabilitation outcomes of sites are constrained by the environmental characteristics of these particular areas. Drain blocking can be widespread in scale with each field drain being blocked (e.g. Kellysgrove) or more localised with targeted drain-blocking (e.g. Mountlucas Wind Farm) and both can be very effective. This can be used in conjunction with local topographical features like natural hollows to manage water levels or with other typical features of cutaway peatlands like high peat fields, which act as berms to hold water to some extent. Active management to create low berms to manage water-levels and create shallow wetland habitats dominated by emergent vegetation has also been successfully developed (e.g. Mountlucas Wind Farm, Bruckana Wind Farm, Oweninny, Lough Boora Discovery Park, Ballycon). In conjunction with the wind farm development and associated roads and embankments there will be further opportunities to manage water-levels using the new construction as a partial embankment, where possible. Material (peat and sub-soil) side-casted from the road construction can be used to develop low berms that would then prevent the adjacent cutaway from draining directly into the drains along the roads. This technique has been used at Mountlucas and Bruckana Wind Farm. Overflow pipes will be used to maintain maximum water levels across the cutaway and allow excess

surface water to flow into the drainage channels beside the roads and other infrastructure. Managing the cutaway in this way means that the cutaway can stay wet, while excess surface water can drain away through the drainage infrastructure.

- **Future land-use.** Planned renewable energy development. It is expected that the site will be part of the proposed Ballivor Wind Farm. This project has been submitted for planning permission. Any proposed rehabilitation measures will be integrated to enable any future renewable energy development. It is expected that the proposed development footprint associated with the renewable energy will be < 4% of the overall site. The potential impact of this infrastructure on the rehabilitated area is expected to be relatively minor and it does not change the overall goals and outcomes of the proposed rehabilitation (re-wetting residual peat) for the overall site. The key objective will be environmental stabilisation and re-wetting of the cutaway areas between the proposed Wind Farm infrastructure.
- The EIAR for the proposed Ballivor Wind Farm development details issues related to peat management during construction. In summary, during construction for access tracks, hardstands and other areas, peat is excavated from the cutaway, moved to the side, graded into berms not more than 1 m and allowed to natural re-vegetate This has proven successful during construction of Mountlucas Wind Farm. In the event that natural re-vegetation was unsuccessful, then other measures such as re-seeding would be considered.
- **Surrounding landscape and neighbours.** Another key constraint is the interaction between the Bord na Móna sites and the surrounding landscape. Care has to be taken that no active rehabilitation management is carried out that could negatively and knowingly impact on surrounding land. This includes any hydrological management on neighbouring farmland. It is anticipated that the work proposed here (blocking drains and re-wetting cutaway peatlands) will not have any flooding impacts on adjacent land.
- **Turbary.** There are a number of small, isolated areas (constraint), along the north-eastern and eastern margins that are subject to active turbary.
- **Archaeology**. An Archaeological Impact Assessment (Appendix XI) will be carried out to mitigate against any impact on found archaeology at Bracklin Bog. Should any previously unknown archaeological material be uncovered during the rehabilitation works, it will be avoided and reported to Bord na Móna Archaeological Liaison Officer and the National Museum of Ireland.
- There are no known archaeological features present at Bracklin Bog. The discovery of monuments or archaeological objects during peatland rehabilitation may potentially constrain the rehabilitation measures proposed for a particular area. The rehabilitation will optimise hydrological conditions for the protection of exposed archaeological structures, their retention in situ and preservation into the future. Any newly discovered archaeology may require rehabilitation measures to be reviewed and adapted. An Archaeological Impact Assessment (see Appendix X) will be carried out to mitigate against any impact on archaeology that may be found at Bracklin Bog. In the worst-case scenario works affecting the surface and sub-surface of the bog might disturb previously unknown archaeological deposits or artefacts without preservation by record taking place. Should any previously unknown archaeological material be uncovered during the rehabilitation works, it will be avoided and reported to the Bord na Móna Archaeological Liaison Officer and the National Museum of Ireland.
- **Public Rights of Way**. Where a public right of way or similar burden exists on Bord na Móna property, consideration will be given to ensuring that this remains intact where possible. In some instances, depending upon previous land uses and management, alternative solutions may be required. These will be explored in consultation with local communities and statutory bodies during the consultation work

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associated with the decommissioning and rehabilitation work described here. Several Rights of Way exist at or around the margin of Bracklin Bog, most of which lead to known turbary areas.

## 6.2 Key Assumptions

- It is assumed that Bord na Móna will have all resources required to deliver this project.
- It is expected that weather conditions will be within normal limits over the rehabilitation plan timeframe. Long periods of wet weather have the capacity to significantly affect ground conditions and constrain drain blocking and other ground activities.

## 6.3 Key Exclusions

The scope of this rehabilitation plan does not cover:

- The longer-term development of stable naturally functioning habitats to fully develop at Bracklin Bog. The plan covers the short-term rehabilitation **actions** and **an additional monitoring and after-care programme** to monitor the rehabilitation and to respond to any needs.
- This plan is not intended to be an after-use or future land-use plan for Bracklin Bog.
- The longer-term management of this site, potentially as a nature conservation site, or for amenity, or for other uses in the future.

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# 7. CRITERIA FOR SUCCESSFUL REHABILITATION

This section outlines what criteria will be used to indicate successful rehabilitation and what critical success factors are needed to achieve successful rehabilitation. All criteria used to indicate successful rehabilitation will be measured to validate the achievement of the rehabilitation goals and outcomes and validate the completion of the rehabilitation.

The key objective of this rehabilitation plan is **environmental stabilisation** and the stabilisation of any emissions from the site that related to the former industrial drainage activities.

Rehabilitation is generally defined by Bord na Móna as:

- stabilisation of bare peat areas via targeted active management (e.g. drain-blocking/re-wetting) slowing movement of water across the site and encouraging a naturally functioning raised bog ecosystem; and
- mitigation of key emissions (e.g. potential suspended solids run-off).

## 7.1. Criteria for successful rehabilitation to meet EPA IPC licence conditions:

- Rewetting of residual peat in the area originally drained for industrial peat production (but never redeveloped to milled peat) to offset potential run off of suspended solids and to encourage and accelerate development of vegetation cover via natural colonisation, and increase in the area of potentially peat forming habitats. See Table 7.1 for a summary of the criteria for successful rehabilitation and associated monitoring. The target will be the delivery of measures and this will be measured by an aerial survey after rehabilitation is completed.
- That there is a stabilizing/improving concentration of suspended solids and ammonia in discharges from Bord na Móna sites, associated with the measures undertaken to stabilize the peat surface by the blocking of the internal drainage system and the maximized rewetting of the peat surface. This will be demonstrated by developing a stable or downward trajectory of water quality indicators (suspended solids and ammonia) towards what would be typical of a re-wetted cutaway bog. This will be measured via water quality monitoring (suspended solids and ammonia) for at least 2 years after the rehabilitation has been completed.
- Receiving water bodies have been classified under the River Basin Management Plan and this classification includes waters that are At-Risk from peatlands and peat extraction. The success criteria will be that the At-Risk classification will see improvements in the associated pressures from this peatland or if remaining At-Risk, that there is an improving trajectory in the pressure from this peatland.

With regard to predicting and estimating likely trends that might materialize or could be considered as a target, monitoring of surface water ammonia emissions from Longfordpass bog in Littleton over 3 yrs., post cessation of peat extraction with ongoing rehabilitation, were considered. These are indicating a downward trend in Ammonia concentrations (Figure 7.1).

Similarly monitoring of surface water ammonia emissions from a Corlea bog in Mountdillon over the past 3 yrs. post cessation of peat extraction with ongoing rehabilitation, indicate downward trends.

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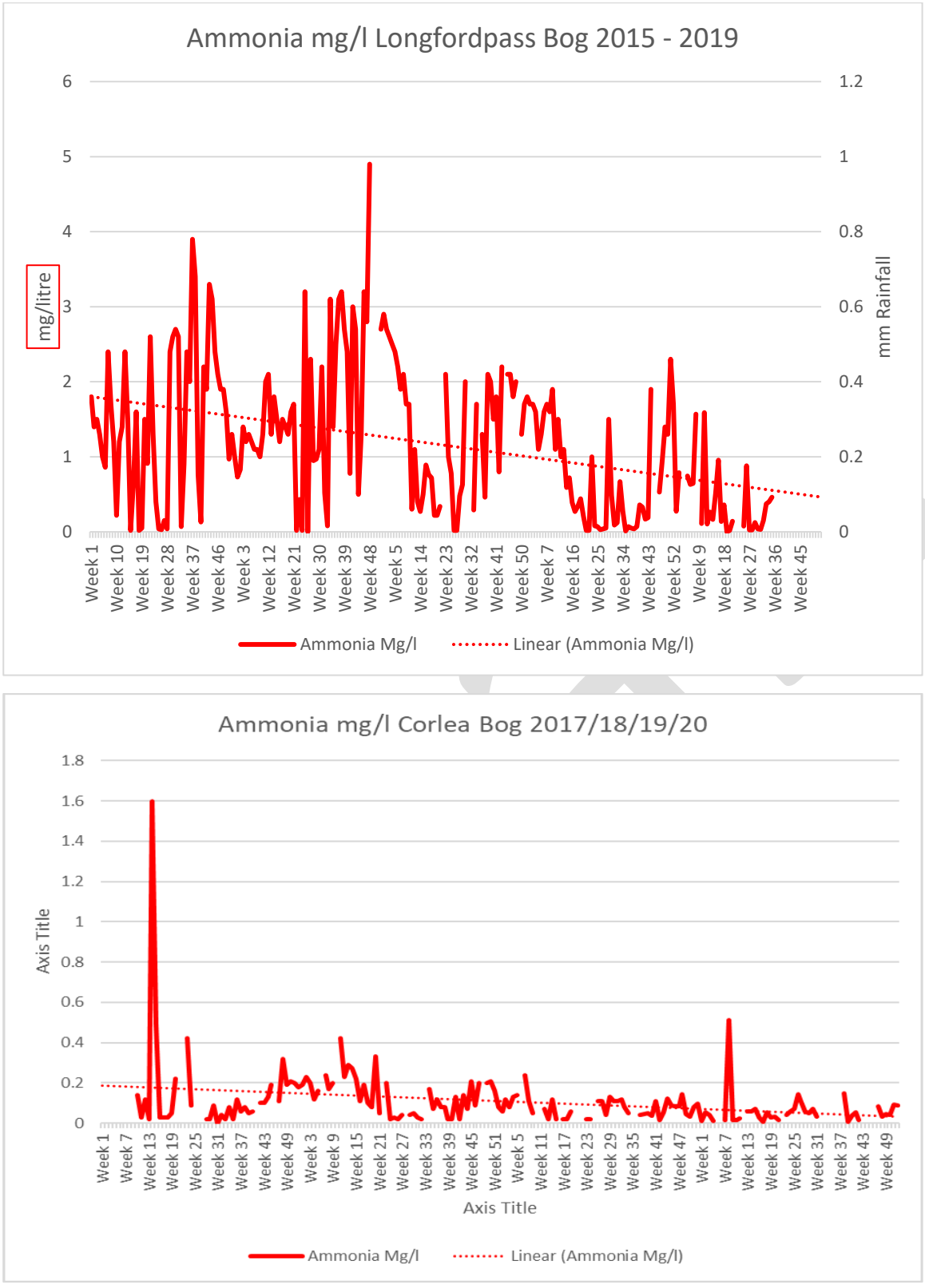


**Figure 7.1.** Ammonia levels over the period 2015-2019/2020 at Longfordpass and Corlea.

**Table 7.1. Summary of Success criteria, targets, how various success criteria will be measured and expected time-frames.**

| Criteria type | Criteria | Target | Measured by | Expected Time-frame |
|---|---|---|---|---|
| IPC validation | Rewetting in the former area of industrial drainage. | Delivery of rehabilitation measures<br>Restoration of hydrological regime. | Aerial photography after rehabilitation has been completed – to demonstrate measures (drain-blocking)<br>Establishment of a baseline for future monitoring of bare peat, vegetation establishment and habitat condition. | 3 years |
| IPC validation | Key water quality parameters<br>Ammonia, Phosphorous, Suspended solids, pH and conductivity | Reduction or stabilisation of key water quality parameters associated with this bog | Water quality monitoring for a period after rehabilitation has been completed | 2 years |
| IPC validation | Reducing pressure from drainage on the local water body catchment (WFD) | Where this section of the water body (that this bog drains to) has not been identified as under pressure from peat extraction, that the intervening EPA monitoring programme associated with its Programme of Measures for this water body, confirms that its classification remains at not being at risk from peat extraction associated with activities at this bog. | EPA WFD monitoring programme | WFD schedule |

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## 7.2. Critical success factors needed to achieve successful rehabilitation as outlined in the plan

The achievement of successful rehabilitation as outlined in the plan requires:

- **Funding to pay for resources required to deliver the planned rehabilitation (Bord na Móna).** Bord na Móna maintains a Provision on its balance sheet to pay for these future costs when industrial peat extraction ceases. Bord na Móna is fully committed to meeting its obligations relating to rehabilitation and decommissioning under the Integrated Pollution Control Licence.
- **Bord na Móna to have sufficient resources (staff and training) to deliver the planned rehabilitation with required associated skills and competencies.**
- **Bord na Móna to have sufficient resources (suitable machinery) and staff to maintain this machinery.**
- **Weather conditions to be within normal limits over the rehabilitation plan timeframe.** Long periods of wet weather have the capacity to significantly affect ground conditions and constrain the delivery of rehabilitation. The potential impact of wet weather on ground conditions can be reduced by appropriate planning and management. Bord na Móna have significant experience of managing these issues through 70 years of working in these peatland environments.
- **Rehabilitation measures to be effective.** The rehabilitation measures proposed in this plan are based on 40 years of Bord na Móna experience of peatland management and best practice applied internationally in peatland management. Measures proposed in this plan have already been shown to be affective at other sites. Bord na Móna will apply a flexible and adaptable approach to the more innovative rehabilitation measures proposed in this plan. If measures are not initially effective, Bord na Móna will review any requirement for additional practical rehabilitation.
- **Natural colonisation of vegetation to develop semi-natural habitats at a rate within the normal limits.** The development of naturally functioning semi-natural habitats on cutaway peatland takes time. Pioneer vegetation can develop relatively quickly (3-10 years) and wetland habitats can develop relatively quickly. Birch woodland make take 20-30 years to develop. However, it may take 50 years for active raised bog vegetation to re-develop on ground that was previously cutaway. Different environmental conditions will have a significant impact on the rate of natural colonisation, and as a result of the combination of different environmental conditions and the application of different rehabilitation measures, there will be a variety of habitat outcomes.
- Rehabilitation measures have been designed to accelerate and work with natural colonisation and other natural processes. Bord na Móna experience of rehabilitation and restoration has shown that re-wetting improves conditions for natural colonisation and that natural colonisation is accelerated where the environmental conditions are most suitable. Rehabilitation measures have been designed to modify the conditions of areas within sites where conditions are less suitable for natural colonisation (modifying hydrology, topography, nutrient status or availability of potential seed sources).
- **Monitoring to be robust and effective.** Rehabilitation Monitoring will be established to validate the success of rehabilitation as required by Condition 10 of the IPC Licence. This will focus on a collecting a range of scientific data that can then quickly be adapted and into metrics that can be used to measure changes in various ecosystem services.

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# 8. REHABILITATION ACTIONS AND TIME FRAME

Peatland restoration and rehabilitation requires detailed planning and the use of data from desktop surveys and field surveys. This data in association with topographical and hydrological modelling will be important in planning the future peatland landscapes and planning the use of the most appropriate rehabilitation methodologies based on environmental characteristic. Hydrological modelling indicates those areas that are likely to re-wet when drains are blocked, based on the current topography. This planning is essential for matching the most sustainable rehabilitation methodology to the most suitable cutaway environment to maximise the benefits of the resource outlay (maximising cost/benefit).

A number of illustrative figures have been produced to inform Rehab Planning and Design, including Aerial Photography, Peat Depths and LiDAR Surface Maps; these are included in the accompanying Mapbook as the drawings referenced below:

BNM-ECO-03-21titled **Bracklin Bog: Aerial Imagery2000**

BNM-ECO-03-22 titled **Bracklin Bog: Aerial Imagery 2020**

BNM-ECO-03-04 titled **Bracklin Bog: Peat Depths**

BNM-ECO-03-03 **Bracklin Bog: LiDAR Map**

The restoration and rehabilitation measures are provisionally outlined in drawing titled **BNM-ECO-03-20** ***Bracklin Bog Standard Rehab Measures*** in the accompanying Mapbook.

These rehabilitation measures for Bracklin bog will include (see Table 8.1):

- A widespread drain-blocking programme will implemented across the cutaway, where possible. This will have to be planned in association with the wind farm infrastructure. In general, field drains will be blocked where possible to re-wet cutaway and re-wet to the optimum water-level. More intensive measures will be targeted towards the bare peat.
- Less intensive measures (targeted drain-blocking) will be used in areas where habitats have already established.
- Measures will include drain blocking (3/100 m), modifying outfalls and managing water levels with overflow pipes.

*Table 8.1: Types of and areas for rehabilitation measures at Bracklin Bog.* Note that the types of rehab and areas of rehab may change in response to stakeholder consultation and refinement of the rehabilitation measures.

| Type | Code | Description | Area (Ha) |
|---|---|---|---|
| Deep peat cutover bog | DPT1 | Regular drain blocking (3/100 m) + modifying outfalls and managing water levels with overflow pipes | 223 |
| Dry cutaway | DCT1 | Modifying outfalls and managing water levels with overflow pipes | 116 |
| Wetland cutaway | WLT1 | Modifying outfalls and managing water levels with overflow pipes | 5 |
| Marginal land | MLT1 | No work required | 171 |

## 8.1 Completed and Ongoing.

- A significant part of the site has already re-vegetated, with pioneer vegetation maturing and developing a mosaic of typical cutaway peatland habitats with Birch woodland predominating. Bare peat areas within

the older cutaway areas are reducing. Natural re-colonisation of the cutaway so far has been quite effective. Natural re-colonisation of the cutaway so far has been quite effective.

- An area of marginal raised bog remnant (19 ha) was restored at Bracklin Bog in 2016, as part of the Bord na Móna Raised Bog Restoration Programme.

## 8.2 Short-term planning actions (0-1 years)

- Seek formal approval of the rehabilitation plan from the EPA.
- Develop a detailed site plan outlining how the various rehabilitation methods will be applied to Bracklin Bog. This will take account of peat depths, topography, drainage and hydrological modelling (see rehabilitation map for an indicative view of the application of different rehabilitation methodologies).
- A drainage management assessment of the proposed rehabilitation measures will be carried out and any issues identified resolved and the rehabilitation plan adapted.
- A review of known archaeology and an archaeological impact appraisal of the proposed rehabilitation will be carried out. The results of this assessment will be incorporated into the rehabilitation plan to minimise known archaeological disturbance, where possible.
- A review of issues that may constrain rehabilitation such as known rights of way, turbary and existing land agreements is to be carried out.
- An ecological appraisal of the potential impacts of the planned rehabilitation on the presence of sensitive ground-nesting bird breeding species (e.g. breeding waders) is to be carried out. The scheduling of rehabilitation operations will be adapted, where required.
- Ensure all activities comply with the environmental protection requirements of the IPC Licence.
- Carry out Appropriate Assessment (AA) of the Rehabilitation Plan. Incorporate any required mitigation measures from the AA in the plan for the delivery of rehabilitation and decommissioning across the site.
- Track implementation and enforcement of the relevant IPC Licence conditions, the mitigation measures (AA) and other environmental control measures during the implantation of the rehabilitation plan.

## 8.3 Short-term practical actions during/post the proposed Wind Farm construction (0-2 years)

- There will be ongoing monitoring of the site and appropriate rehabilitation planning during the proposed Wind Farm construction phase.
- Side-casted material from the wind farm road and drainage construction will be used to create low berms to help manage water levels and prevent surface water draining directly into the new drains. Pipes to be inserted, where required, to manage water-levels flowing off the cutaway and into the wind farm drainage.
- Carry out proposed measures as per the detailed site plan. This will include intensive drain blocking and targeted hydrological management prescriptions in the cutaway around and between the Wind Farm infrastructure. All rehabilitation will be carried out with regard to best practice environmental control measures (Appendix IV).
- Monitor the success of rehabilitation measures in relation to developing suitable hydrological conditions.
- Carry out the proposed monitoring, as outlined in section 9.

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- Silt ponds will be monitored during this period and there will be continued maintenance and cleaning to prevent potential suspended solids run-off from the site during the rehabilitation phase.

## 8.4 Long-term (Post Wind Farm construction) (>3 years)

- Site conditions and drainage are likely to change somewhat after the construction of the wind farm, so continued assessment could be made of further rehabilitation and maintenance works such as localised drain blocking and berm creation in association with the wind farm infrastructure. Similar rehabilitation works have already been carried out successfully at Mountlucas Wind Farm in County Offaly.
- Evaluate success of short-term rehabilitation measures outlined above and remediate where necessary.
- Delivery of a monitoring, aftercare and maintenance programme (See section 9 below).
- Decommissioning of silt-ponds will be assessed and carried out, where required.
- Reporting to the EPA will continue until the IPC License is surrendered.

## 8.5 Long-term (Post Wind Farm decommissioning)

- At this stage it is expected that the site will have no bare peat cover and that the entire site will be developing a suite of maturing cutaway habitats that reflect the mosaic of environmental conditions. The wind farm infrastructure will have been integrated into the landscape and there are likely to be other land-uses across the site including amenity.

## 8.6 Timeframe (when finalised)

- **Year 1**: Short-term planning actions.
- **Year 1**: Short-term practical actions (subject to successful planning or the proposed Balivor Wind Farm project.
- **> Year 3**: Long term practical actions. Evaluate success of short-term rehabilitation measures outlined above and remediate where necessary.
- **> Year 3**: Decommission silt-ponds, if necessary.

## 8.7 Budget and costing

Bord na Móna maintains a provision on its balance sheet to pay for the future costs of standard rehabilitation and decommissioning when industrial peat extraction ceases. This is updated every year - for more information see the Bord na Móna Annual Report (Bord na Móna 2023). Bord na Móna is fully committed to meeting its obligations relating to rehabilitation and decommissioning under the Integrated Pollution Control Licence.

At this time, a ‘standard’ rehabilitation provision (sufficient to discharge the requirement of Condition 10 in the licence) has been allocated to the site based on the area of different cutaway types across the site (See Appendix I).

Specific peatland rehabilitation measures that may be conditioned as part of the planning conditions for the proposed Ballivor Wind Farm will be funded via the Wind Farm construction programme.

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# 9. AFTERCARE AND MAINTENANCE

## 9.1 Programme for monitoring, aftercare and maintenance

This programme for monitoring, aftercare and maintenance has been designed to meet the Conditions of the IPC Licence. This is defined as:

- There will be **initial quarterly monitoring assessments** of the site to determine the general status of the site, the condition of the silt ponds, assess the condition of the rehabilitation work, monitoring of any potential impacts on neighbours land, general land security, boundary management, dumping and littering.
- The number of these site visits will reduce after 2 years to bi-annually.
- These monitoring visits will also consider any requirements for further practical rehabilitation measures.
- The **baseline condition of the site will be established** post-rehabilitation implementation by using an aerial survey to take an up to date aerial photo, when rehabilitation is completed. This will be used to verify completion of rehabilitation measures. The extent of bare peat will be assessed using this baseline data, and habitat maps will be updated, if needed. It is proposed that sites can be monitored against this baseline in the future.
- **Water quality monitoring** at the bog will be established. The main objective of this water quality monitoring will be to establish a baseline and then monitor the impact of peatland rehabilitation on water quality from the bog.
- Monitoring results will be maintained, trended and reported on each year and as required, as part of the requirement to report on Condition 10.1 of the IPC Licence on Bog Rehabilitation in the Annual Environmental Report, and will be provided to LAWPRO and the EPA as required to inform progress and national monitoring requirements under the WFD. These results will also be available in April each year as a requirement of the Annual Environmental Report at www.epa.ie.
- The parameters to be included (as per condition 6.2 of the IPC Licence) include monthly monitoring for pH, Flow, Suspended Solids, Total Solids, Total Phosphorus, Total Ammonia, Colour, and COD.
- This monthly sampling regime on a selected number of silt ponds will be carried out over a two-year cycle.
- If, after two years, key criteria for successful rehabilitation are being achieved and key targets are being met, then the water quality monitoring will be reviewed, with consideration of potential ongoing research on site. The water quality data, the aerial surveys and the habitat mapping will be collated and will be submitted to the EPA as part of the final validation report.
- If, after two years, key criteria for successful rehabilitation have **not** been achieved and key targets have **not** been met, then the rehabilitation measures and status of the site will be evaluated and enhanced, where required. This evaluation may indicate no requirement for additional enhancement of rehabilitation measures but may demonstrate that more time is required before key criteria for rehabilitation has been achieved. Monitoring of water quality will then also continue for another period to be defined.
- Where other uses are proposed for the site that are compatible the provision of biodiversity and ecosystem services, these will be assessed by Bord na Móna in consultation with interested parties. Other after-uses can be proposed for licensed areas and must go through the required assessment process and planning procedures.

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## 9.2 Rehabilitation plan validation and licence surrender – report as required under condition 10.4

***IPC License Condition 10.4.*** *A final validation report to include a certificate of completion for the Rehabilitation Plan, for all or part of the site as necessary, shall be submitted to the Agency within six months of execution of the plan. The licensee shall carry out such tests, investigations or submit certification, as requested by the Agency, to confirm that there is no continuing risk to the environment.*

Reporting to the EPA will continue until the IPC License is surrendered. The bog will be included in the full licence surrender process as per the Guidance to Licensees on Surrender, Cessation and Closure of Licensed Sites EPA, 2012, when:

- The planned rehabilitation has been completed;
- The key criteria for successful rehabilitation has been achieved and key targets have been met;
- Water quality monitoring demonstrates that water quality of discharge is stabilising or improving; and
- The site has been environmentally stabilised.

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## APPENDIX I: BRACKLIN WEST BOG REHABILITATION PLAN

See Separate document.

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## APPENDIX II: BOG GROUP CONTEXT

The Ballivor-Derrygreenagh Bog Group comprises 11 discrete and defined bog units within Co's. Offaly, Westmeath and Meath (and one site used for transport – Hill of Down Railway). There are two main sub-groups; Ballivor (7 sites) and Derrygreenagh (5 sites). Nearly all of the Derrygreenagh sub-group and all of the Ballivor sub-group is located within the River Boyne catchment. A small portion of the western side of Toar Bog is located in the River Shannon catchment. Each bog area further comprises a range of habitats from bare milled former peat extraction areas to re-colonising cutaway to workshops areas and transport infrastructure.

Industrial peat extraction in the Ballivor-Derrygreenagh Bog Group ceased in 2020.

The Ballivor Bogs sub-group is located close to Ballivor Town in Co. Meath and most of the bogs extend across the Meath and Westmeath border. The Bord na Móna Ballivor Peat Moss factory is located 4 km from Ballivor Village on the margin of Ballivor Bog. An industrial railway links Ballivor to Carrenstown, Bracklin and Lisclogher East. Milled peat was supplied from Ballivor, Carrenstown, and part of Bracklin to Ballivor peat moss factory for horticultural products, with milled fuel peat being transported via road to Lough Ree Power (Lanesborough Co. Longford).

Intensive decommissioning and rehabilitation for the Ballivor-Derrygreenagh Bog Group started in 2021 at a number of individual bogs.

Industrial peat extraction in the Ballivor-Derrygreenagh Bog Group ceased in 2020. Decommissioning for the Ballivor-Derrygreenagh Bog Group started in 2021 at a number of individual bogs. Enhanced rehabilitation as part of the Peatland Climate Action Scheme (PCAS) has been carried out at Carranstown Bog and Lisclogher West Bog. There is still some historical energy peat stock remaining on some bogs and these peat stock will be transferred via the BnM rail network to Edenderry Power Station up to 2024 when the power station is expected to have ceased using peat.

Bord na Móna is currently developing a wind energy project called Ballivor Wind Farm. This proposed project has been submitted for planning permission. Bord na Móna are also continuing to review its landbank for future potential renewable energy projects.

A breakdown of the component bog areas for the Ballivor-Derrygreenagh Bog Group IPC License Ref. PO-501-01 is outlined in Table Ap-2.

*Table Ap-2: Ballivor-Derrygreenagh Bog Group names, area and indicative status (Derrygreenagh Energy Peat sub-group)*

| Bog Name | Area (ha) | Stage of development | Land-Use and History | Peat Production Cessation | Rehab Plan Status |
|---|---|---|---|---|---|
| Ballivor | 654 | Industrial peat production commenced at Ballivor in the 1940s.<br>Some sections have been cutaway. Some sections still have relatively deep residual peat. | Ballivor Bog formerly supplied a range of commercial functions including the supply of horticultural peat, sod peat and latterly; fuel peat for Lough Ree Power.<br>Some sections were never re-developed to milled peat and have revegetated as cutaway..<br>Some areas of cutaway are developing pioneer cutaway vegetation communities. | 2020 | Draft updated 2024 |

| Bog Name | Area (ha) | Stage of development | Land-Use and History | Peat Production Cessation | Rehab Plan Status |
|---|---|---|---|---|---|
| | | | Expected to be part of the proposed Ballivor Wind Farm. Submitted for planning. | | |
| Bracklin | 680 | Industrial peat production commenced at Bracklin in the 1940s.<br>Some sections have been cutaway. Some sections still have relatively deep residual peat. | Bracklin Bog formerly supplied a range of commercial functions including the supply of horticultural peat, sod peat and latterly; fuel peat for Lough Ree Power.<br>The main section was never re-developed to milled peat and has revegetated as mature cutaway habitats<br>Bare peat is prevalent in the western section, which was in milled peat extraction. A separate specific rehabilitation plan for Bracklin West has been finalised and approved by EPA and rehab in this area is ongoing.<br>Bracklin expected to be part of the proposed Ballivor Wind Farm. Submitted for planning. | 2020 | Bracklin West rehab plan finalised 2023<br>Bracklin Drat rehab plan updated 2024 |
| Carrenstown | 306 | Industrial peat production commenced at Carrenstown in the 1980s.<br>The majority of the site has relatively deep peat. | Carrenstown Bog formerly supplied a range of commercial functions including the supply of horticultural peat and latterly; fuel peat for Lough Ree Power.<br>The majority of the site is bare peat. There are cutaway habitats developing on the eastern side.<br>Expected to be part of the proposed Ballivor Wind Farm. Submitted for planning. . | 2020 | Finalised in 2022<br>Rehabilitation ongoing |
| Lisclogher East | 486 | Industrial peat production commenced at Lisclogher East in the 1950s.<br>Part of the site is cutaway while there is a mosaic of residual peat depths. | Lisclogher East formerly supplied sod turf both for fuel and horticulture. This bog was never re-developed to supply milled peat.<br>The majority of the bog is developing cutaway habitats and there is a mosaic of bare peat areas where there has been recent sod peat extraction. | 2020 | Draft updated 2024 |
| Lisclogher West | 239 | Lisclogher West was drained in 1980s.<br>The bog is drained and still has residual vegetation in places. | Lisclogher West was drained but never fully developed for industrial peat extraction. | N/A | Finalised in 2023.<br>Rehabilitation ongoing |
| Kinnegad | 352 | Industrial peat production commenced at Kinnegad in the 1980s.<br>The majority of the site still has relatively deep peat. | Kinnegad Bog formerly supplied a range of commercial functions -mainly the supply of horticultural peat and latterly; fuel peat for Lough Ree Power.<br>The majority of the site is bare peat. | 2020 | Draft 2017 |
| Hill of Down Railway | 22 | | Rail link – not used for peat extraction | N/A | |
| Ballybeg | 847 | Industrial peat production commenced at Ballybeg in the 1950s.<br>Most of the site is cutaway | Ballybeg Bog formerly supplied a range of commercial functions including the supply of horticultural peat and fuel peat for Edenderry Power.<br>Much of the site is bare peat. The northern half has been cutaway and is establishing cutaway habitats.<br>Expected to be part of the proposed Derrygreenagh Energy Project, which is currently in pre-planning. | 2020 | Draft 2023 |

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| Bog Name | Area (ha) | Stage of development | Land-Use and History | Peat Production Cessation | Rehab Plan Status |
|---|---|---|---|---|---|
| Derryarkin | 710 | Industrial peat production commenced at Derryarkin in the 1950s.<br>Most of the site is cutaway | Derryarkin Bog formerly supplied a range of commercial functions including the supply of fuel peat for Rhode Power Station, Croghan Brickette Factory and Edenderry Power.<br>Most of the site is developing cutaway habitats. Some re-wetting was carried out in the past.<br>Part used for gravel extraction.<br>Expected to be part of the proposed Derrygreenagh Energy Project, which is currently in pre-planning. | 2015 | Draft 2023 |
| Derryhinch | 337 | Industrial peat production commenced at Derryhinch in the 1950s.<br>There is a mosaic of residual peat depths left | Derryhinch Bog formerly supplied a range of commercial functions including the supply of fuel peat for Rhode Power Station, Croghan Brickette Factory and Edenderry Power.<br>Most of the site is bare peat with emerging cutaway habitats.<br>Part of the site was used to trial herb production | 2020 | Draft 2023 |
| Drumman | 1,122 | Industrial peat production commenced at Drumman in the 1950s.<br>Most of the site is cutaway | Drumman Bog formerly supplied a range of commercial functions including the supply of fuel peat for Rhode Power Station, Croghan Brickette Factory and Edenderry Power.<br>Most of the site is developing cutaway habitats. Some re-wetting was carried out in the past.<br>Part used for gravel extraction.<br>Part of the site was used to trial herb production.<br>Part of the site is used for log storage (biomass).<br>Expected to be part of the proposed Derrygreenagh Energy Project, which is currently in pre-planning. | 2020 | Draft 2023 |
| Toar | 445 | Industrial peat production commenced at Toar in the 1980s.<br>Most of the site has deep residual peat. | Toar Bog formerly supplied a range of commercial functions including the supply of horticultural peat and fuel peat for Edenderry Power.<br>Most of the site is bare peat.<br>Part of the site is used for log storage (biomass) | 2020 | Draft 2021 |

See Drawing number BNM-ECO-03-01 titled Ballivor-Derrygreenagh Bog Group, included in the accompanying Mapbook which illustrates the location of Bracklin Bog and the Ballivor-Derrygreenagh Bog Group in context to the surrounding area.

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## APPENDIX III: ECOLOGICAL SURVEY REPORT

**Ecological Survey Report**

*Note: This report outlines an ecological survey of the bog. This report should not be taken as a management plan for the site as other land-uses may still be considered. Information within this report may inform the development of other land-uses and identify areas with particular biodiversity value. The report outlines potential options for biodiversity management after industrial peat production has ceased, (if this is the proposed main land-use for the site).*

| | | | |
|---|---|---|---|
| **Bog Name:** | **Bracklin** | **Area (ha):** | 680 ha (1680 acres) |
| **Works Name:** | Ballivor | **County:** | Westmeath |
| **Recorder(s):** | MMC & DF | **Survey Date(s):** | 9 & 11/07/2012, 2016 |

**Habitats present (in order of dominance)**

The most common habitats present at this site include:

- Birch-dominated scrub and woodland (eBir, oBir, cBir) (Codes refer BnM classification of pioneer habitats of production bog.).
- Pioneer Heather-dominated dry heath (dHeath) (in mosaic with scrub and pEang)
- Pioneer Bog Cotton -dominated poor fen (pEang,)
- Bare peat (mainly along travel paths)
- Pioneer dry Cocksfoot-False Oatgrass -dominated grassland (gDa-Arr)
- Pioneer dry Purple Moorgrass-dominated grassland (gMol)
- Embryonic bog vegetation (Em)
- Pioneer Bottle Sedge –dominated poor fen and open water (pRos/Ow)
- Pioneer Sweet Vernalgrass-dominated grassland (gAn-Ho-Eq)
- Pioneer dry calcareous grassland (gCal)
- Silt ponds (Silt) with Gorse/Birch scrub and Purple Moorgrass-dominated grassland (gMol)
- Riparian zones (Rip) (with drains and associated habitats such as scrub)

The most common habitats found around the margins of the site include:

- Birch woodland (WN7) (Codes refer to Heritage Council habitat classification, Fossitt 2000), See.)
- Raised bog (PB1) and Poor flush (PF2)
- Cutover Bog (PB4)
- Secondary cutover bog mosaics with developing dry heath/facebank PB1, poor fen and scrub.
- Scrub (WS1)

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- Dry meadow (GS2) (around old famine house)
- Oak-Ash-Hazel woodland (WN2) (around old famine house)
- Hedgerows (WL1)
- Improved grassland (GA1) around the boundary where the GIS boundary extends into adjacent fields
- Wet grassland (GS4) (old cutover)

**Description of site**

Bracklin Bog is located close to Raharney and Ballivor in eastern Co. Westmeath, adjacent to the Co. Meath border. It is part of the Ballivor Bog group with Lisclogher Bog East and West located to the north and Carranstown Bog located to the south of the site. A railway links the milled production bog to Carranstown and the rest of the Ballivor bog group and there are old abandoned railway link to Lisclogher to the north.

Bracklin Bog was formerly an old sod peat production bog and the majority of the bog was abandoned in the 1970-1980's. This area is now heavily vegetated with cutaway habitats. The majority of the site has had no milled peat production. Part of this cutaway area and remnant bog was initially developed for milled peat and regular field drains were dug through some of the bog, particularly some of the marginal remnant areas. However, this development was abandoned.

The large former sod peat production area is now heavily vegetated with overall vegetation cover generally about 90%. This area has similar characteristics to other old sod peat bogs like Timahoe North and South. Deep wide trench drains were dug at intervals separating the production bays across the bog in a north-east to south-west direction. These riparian zones are now generally heavily vegetated with dense Birch scrub and woodland, forming long bands of woodland through the site. Some contain running water and have developed riparian characteristics while some have silted up. The majority of the site is dry and there is little open water or wetland development. There are several narrow strips of high bog running through the middle of each bay that are the remaining banks left after sod peat production. These narrow strips are generally dominated by dry Heath (dHeath)-like vegetation as the remnant bog has dried out. They have also been colonised by Gorse and Birch scrub in places.

The cutaway areas have generally similar habitat development through the site that varies relative to the time since the various sections came out of production. Some bays obviously came out of production at a much later stage and have more frequent bare peat in mosaic with the pioneer habitats. The older sections have much denser vegetation cover and much more scrub cover. The majority of the cutaway vegetation is a mosaic of pioneer Heather-dominated dry heath (dHeath), Bog Cotton-dominated poor fen (pEang) and Birch scrub (e/oBir). The older sections tend to have 100% vegetation cover. One feature of this site is the excellent Birch colonisation and many of the younger areas have frequent small Birch saplings (eBir) (< 0.5 m high) that will develop to form thicker Birch scrub in the next 10 years. Another feature of this site is the relatively higher abundance of Hare's-tail Bog Cotton in the Bog Cotton-dominated cutaway vegetation. This species tended to be more frequent in some of the former production bays around the northern margin (where peat was deeper or closer to high bog that provides a seed source). It also appears in some of the embryonic bog communities. Other more typical raised bog species such as Bog Asphodel, Deergrass and White Beak Sedge, which are not usually found in pioneer cutaway vegetation on BnM cutaway, are found amongst the other cutaway vegetation at this site but are generally rare. Hummocks of various *Sphagnum* species can also be found throughout the

site and are generally associated with Bog Cotton-dominated vegetation (where it is wetter), but their overall cover is rare. However, there are several areas where the *Sphagnum* cover becomes a lot more frequent.

Some of the former production bay that runs along the northern margin of the former production area has significant *Sphagnum* regeneration in places (north-east corner). There are occasional large hummocks of S. *papillosum*, *S. subnitens*, *S. capillifolium* developing in association with Hare's-tail Bog Cotton, Common Bog Cotton and Heather. Hare's-tail Bog Cotton is particularly frequent. Production has not significantly lowered the surface of the bog so there is probably deep peat in this area.

Further south-west along this bay, the *Sphagnum* cover becomes frequent and the vegetation is a typical raised bog community (mapped as an embryonic bog community). This may be an area where peat production was limited, or there was no production at all, so some of the *Sphagnum* cover may be remnant *Sphagnum* cover. This area seems to have initially been developed for milled peat production and perhaps was only screw-levelled. The level of the bog is relatively high and there is a significant fall to adjacent production bays. The bog surface was quite firm and the relatively shallow drains were active. The vegetation cover was dominated by Heather and by the two Bog Cotton species. There was also occasionally frequent Bog Asphodel, Deergrass and White Beak Sedge, so the vegetation cover was quite similar to high bog vegetation. Soft Rush and Purple Moorgrass were present, indicating the previous disturbance, but were rare and absent in places.

The bog is underlain with some ridges and mounds and the peat topography is variable in places. The mounds tend to have more bare peat cover and are dominated by pioneer dry heath with Birch scrub. The basins tend to be dominated by pioneer poor fen Bog Cotton-dominated vegetation. Some of the former production bays are sloped and there are natural shallow drainage channels cut through the peat in places. These slopes have probably led to some erosion along these natural drainage channels.

Towards the centre of the site there is some development of an embryonic *Sphagnum* community associated with a small wetland area. This is **not** a remnant raised bog area but *Sphagnum* regenerating on cutaway. The wetland has formed in a local small basin with impeded drainage that has developed along one of the old remnant bands of high bog that was left after sod-peat cutting. The vegetation is somewhat similar to the *Sphagnum*-rich poor fen vegetation that is developing at Oweninny. There is an abundant carpet of *S. cuspidatum* cover associated with Soft Rush and/or Common Bog Cotton that was sitting on water. Other species present include Jointed Rush, Marsh Pennywort, Marsh Cinquefoil, Marsh Bedstraw, Reedmace, Horsetail, indicating poor fen influence. Hummocks of *S. palustre* and *S. subnitens* are also present in some of the denser areas and around the margins where it was somewhat drier. This basin formerly contained an open water area (see aerial photos), but this has now vegetated and infilled with pioneer Bottle Sedge-dominated vegetation (pRos). When examining LiDAR data, it is interesting to note that this basin has not developed on the lowest part of the site and there is lower ground that contains more typical drier communities dominated by scrub. This basin seems to be localised and has developed with a mound/ridge on one side and the band of high bog on another side.

There are several mounds and ridges towards the centre of the site where the underlying glacial till has been exposed or where there is a thin layer of remnant peat. The areas with the exposed gravel tend to have small patches of pioneer calcareous grassland (gCal). This grassland community tends to be rich in orchids with frequent Common Spotted Orchid and some Marsh Helleborine. Much of this grassland has become rank and dominated by False Oatgrass (gDa-Arr) forming a meadow-type community. Species present include Silverweed, Red Clover, Sweet Vernalgrass, Yorkshire Fog, Long-leaved Plantain, Marsh Thistle, Nettle, Meadowsweet, Sorrell, Knapweed, Hogweed, Brambles, and Bindweed, One area towards the centre of the site and adjacent to

the railway has a relatively extensive area of this grassland community with limited scrub cover, which is somewhat unusual on the cutaway. This habitat attracted a lot of butterflies. Associated with these mounds there is also some development of a more acidic grassland community dominated by Sweet Vernal-grass (gAn-Ho-Eq). This grassland type also contains other acidic grassland indicators such as Heath Bedstraw and Tormentil. Other species such as Hawthorn and Elder are also associated with the scrub on and around these mounds.

A small pocket of dry calcareous grassland contains a significant Marsh Helleborine population (> 500 individuals). This was a small gravelly area and was quite disturbed. The Marsh Hellaborine were associated with Catsear, Coltsfoot, Ox-eye Daisy, Sweet Vernal-grass, Yorkshire Fog, Glaucous Sedge, Eared Willow, Cocksfoot, Red Clover, Knapweed, Wild Strawberry, Creeping Thistle, Hawthorn, Purple Moorgrass, Wild Carrot, Long-leaved Plantain, Mouse-ear Chickweed, Yarrow, Black Medick, Self Heal, Red Fescue, Rosebay Willowherb, False Oatgrass, Slender St John's Wort, Tormentil, Bramble, Groundsel, Fragrant Orchid, Common Spotted Orchid.

**Large high bog remnant**

There is a relatively large bog remnant (15.7 ha within BnM GIS property boundary) located along the southern margin that is of conservation interest to the local community There are several parallel drains in the high bog close to the northern margin and adjacent to the production bog, which did not have *Sphagnum* cover. However, the majority of the high bog has not been drained extensively. There are natural transitions to Birch woodland to the east, south and west, which increase the conservation value of this high bog remnant somewhat. There are also relatively natural transitions/slopes to old regenerating cutover bog/dry heath to the south (outside the BnM property boundary). There are slopes from the west and east, creating a basin towards the eastern side, which may be as a result of subsidence. The high bog contains typical raised bog features and has a hummocky micro-topography. The bog surface was generally firm-spongy underfoot. It has been unburnt for some time and has a high *Cladonia portentosa* cover. It has a typical species assemblage and there are some algal hollows with White Beak-sedge. Deergrass was a prominent feature of the vegetation towards the margin. Small hummocks of S. *papillosum* and *S. capillifolium* and *S. subnitens* were present, although the *Sphagnum* cover was low. Bog Rosemary was present. *Sphagnum cuspidatum* was also present in some hollows but its cover was overall very low. The majority of the bog could be classified as sub-marginal in ecotope quality, although it was noticeable that further south towards the bog margin, the quality of the high bog deteriorated and *Sphagnum* was absent and there was more bare peat cover (marginal ecotope). Further into the bog there are some larger hollows or former pools. These generally do not retain any pool features and have re-vegetated, although some were algal and remained open.

A depression has developed towards the eastern side and is visible on the aerial photos. This section has some surface water and also has frequent to abundant *Sphagnum* cover. There are indications of flushing around the margins and within this section, where the Heather is more vigorous. The vegetation is dominated by Heather and Hare's-tail Bog Cotton, with S. *papillosum* and *S. capillifolium* hummocks and *S. cuspidatum* hollows. While the surface was squelchy and soft, there was no indication of quaking to the bog, indicating that this area was likely to be secondary *Sphagnum* development due to subsidence. This area could be considered sub-central in quality due to the abundant *Sphagnum* cover. There were also no indications of relic active bog features such as former pool complexes or large *S. imbricatum* hummocks. *Sphagnum imbricatum* was not recorded on the high bog, (which is unusual for a remnant this size). The depression with frequent *Sphagnum* cover continues further north towards the production bog boundary where the drains are infilled with *S. cuspidatum.*

The high bog transitioned to Birch woodland to the east, which has developed on old cutover bog. An old face-bank is still present within the woodland, although the Birch has spread onto the high bog in places. The woodland is dominated by numerous narrow-stemmed Birch trees with a low canopy of < 8 m. The ground cover is typical and is dominated by Brambles, Purple Moor-grass and Bracken, with some Bilberry cover. There are Deer tracks through the woodland and onto the high bog.

Further east there is a low mound where the peat is thin and the underlying gravel has a significant influence on the vegetation. This area was managed as a small farm in the past and was known as Robbersbush. It is now mostly vegetated with scrub and woodland with some open, now rank grassland and Bracken. Some mature Ash and Oak trees are visible. There used to be a path through this site, but this is now overgrown. The high bog area to the east of this old farm has been burnt in the recent past, although is recovering. The high bog (PB1) is poor in quality with a firm surface, significant bare peat cover and no *Sphagnum* cover. A small depression does have some regenerating *Sphagnum* cover. There is also a small flush (PF2) through this high bog area, which is vegetated by Purple Moorgrass. There are indications of the fire damage in the surrounding scrub and woodland on the high bog with standing dead Birch around the margins of the woodland regenerating from their bases and Bracken becoming prominent where there was former scrub.

**Old famine House area (Tonduff)**

This area is located towards the south-east part of Bracklin bog, between the railway along the eastern margin and the main travel path further west. It has developed around a low mineral island and this area was also farmed in the past. Old field enclosures are visible on the OSI 2nd edition 6 inch map. The area now contains dry meadow grassland, which is quite rank and ungrazed. This is surrounded by Birch woodland that has developed on cutover bog, with old face-banks still present. The woodland is dominated by Birch and contains Rowan and Bilberry. Pine is present on the high bog margin of the woodland. Some Alder are also present around the meadow margins. The remains of an old house are still present on a small mound in the area and this has now developed into a woodland copse with elements of WN2 Oak-Ash-Hazel woodland. There are several mature Sycamore trees around the house forming the woodland copse and associated with these there are also some Hazel, Elder, Holly, Hawthorn and Ash. The ground cover contains Wood Avens, Herb Robert, Wood Sedge, Ivy, Hogweed, and Bluebell. There are also some exotic plants and over-grown shrubs that were once part of the old garden associated with the house.

Birch-dominated woodland dominates the area to the south and west of Tonduff and the travel path. This Birch woodland has developed on old cutover bog with frequent old face-banks and drains present. The woodland contains Bilberry.

**Designated areas on site (cSAC, NHA, pNHA, SPA other)**

None

The western end of Brackin Bog is located within 2km of the River Boyne and Blackwater cSAC and SPA (River Deel) (Site codes 002299 & 4232)

**Adjacent habitats and land-use**

Adjacent habitats include wet grassland (GS4), improved agricultural grassland (GA1), conifer plantation (WD4), Birch woodland (WD7), remnant high bog (PB1) and cutover bog (PB4).

**Watercourses (major water features on/off site)**

- Bracklin Bog is located within the River Boyne catchment.
- The bog drains via the old drainage network to a variety of streams around the margins. There is no silt-pond treatment for the cutaway area. Old trench drains associated with sod peat bogs were cut through the bog. Some of these are still flowing and developing typical riparian features.
- There are several small wetlands with some open water on the site where drainage is impeded or where there is a localised basin.

**Peat type and sub-soils**

The main peat type left on the cutaway area is a more acidic red peat. This is indicated by the typical cutaway re-vegetation being dominated by Heather and Bog Cotton and is typical of old sod peat production bogs where deeper remnant peat was left on the bog.

Mixed gravel till is exposed at several places through the bog on the surfaces of mounds.

**Fauna biodiversity**

**Birds**

Several bird species were noted on the site during the survey.

- Peacock
- Kestrel
- Meadow Pipit were noted on the large high bog remnant
- More common bird species recorded around the bog included Blackcap, Song Thrush, Wood Pigeon, Whitethroat, Blue Tit, Blackbird, Redpoll, Rook, Grey Crow and Wren.
- Blackbird, Blackcap, Wood Pigeon and Song Thrush were noted around Tonduff.

**Mammals**

Signs of several mammal species were noted on the site during the survey.

- Several Hares were sighted at various locations around the bog. Signs of Hares were also quite frequent around the bog.
- Signs of Fox (droppings and prints) and Badger (prints) were also noted around the bog.
- Deer tracks though Birch woodland and onto high bog remnant at the southern bog margin.

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**Other species**

- Ringlet and Meadow Brown butterflies were frequently flushed from grassy areas on the site. Small Heath was recorded several times around the cutaway and on some of the high bog remnants. Common Blue was also recorded on the site associated with gravelly habitats with calcareous grassland.

Meadow Brown, Ringlet and Wood White were recorded around the meadow at Tonduff.

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## APPENDIX IV. ENVIRONMENTAL CONTROL MEASURES TO BE APPLIED TO BOG REHABILITATION

- Bog restoration/rehabilitation measures will be restricted to within the footprint of the proposed rehabilitation area.
- The proposed rehabilitation will have due regard to noise limits and hours of operation (i.e. dusk and dawn) to minimise any potential disturbance on resident and local fauna that utilise the site and immediate environs.
- All plant and equipment for use will comply with the Construction Plant and Equipment Permissible Noise Levels Regulations (SI 359/1996).
- The proposed activities will be restricted to daylight hours and there will be no requirement for artificial lighting.
- Silt ponds will be inspected and maintained as per the IPC Licence.
- During periods of heavy precipitation and run-off, activities will be halted.
- Measures will be carried out using a suitably sized machine and, in all circumstances,, excavation depths and volumes will be minimised where possible.
- All machines will be regularly checked and maintained prior to arrival at the site to prevent hydrocarbon leakage.
- Hoses and valves will be checked regularly for signs of wear and will be closed and securely locked when not in use.
- Fuelling and lubrication of equipment shall only be carried out in designated areas away from surface water drainage features and ecologically sensitive areas.
- Waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the site for disposal or re-cycling.
- Vehicles will never be left unattended during refuelling.
- No direct discharges to waters will be made. No washings from vehicles, plant or equipment will be carried out on site.
- All plant refuelling will take place using mobile fuel bowsers. Only dedicated trained and competent personnel will carry out refuelling operations.
- Mobile storage such as fuel bowsers will be bunded to 110% capacity to prevent spills. Tanks for bowsers and generators shall be double skinned. When not in use, all valves and fuel trigger guns from fuel storage containers will be locked. All pumps using fuel or containing oil will be locally and securely bunded where there is the possibility of discharge to waters.
- Potential impacts caused by spillages etc. during rehabilitation will be reduced by keeping spill kits and other appropriate equipment on-site.
- Site activities will be carried out in accordance with 'best practice'. In order to ensure compliance and implementation of 'best practice', these measures will be communicated to relevant Bord na Móna staff and updated as required.

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# APPENDIX V. BIOSECURITY

The potential for importation or introduction of non-native plant species (such as Japanese Knotweed, Himalayan Balsam, etc.) during future rehabilitation management, such as drain-blocking using excavators, has the potential to result in the establishment of invasive species within the site. Section 49 of the European Communities (Birds and Natural Habitats) Regulations 2011 prohibits the introduction and dispersal of invasive alien species (particularly plant species) listed on Part 1 (third column) of the 'Third Schedule'.

This section aims to reduce the risk from, and impacts of, invasive species and protecting biodiversity on lands under Bord na Móna ownership. Rehabilitation and decommissioning in the bog will have due regard to the relevant biosecurity measures outlined below:

- Records of problematic invasive species within the various bog units will be marked out with signs to highlight areas of infestation to personnel.
- All plant machinery will be restricted from disturbing known colonies of invasive species.
- All plant machinery will avoid unnecessary crossings to adjoining lands.
- Good site hygiene will be employed to prevent the introduction and spread of problematic invasive alien plant species (i.e. Japanese Knotweed (*Fallopia japonica*), Himalayan Balsam (*Impatiens glandulifera*), Himalayan Knotweed (*Persicaria wallichii*), etc.) by thoroughly washing vehicles prior to entering the area.

The biosecurity measures outlined above are in line with best practice guidelines issued by the National Roads Authority (NRA, 2010) – The Management of Noxious Weeds and Non-native Invasive Plant Species on National Roads and broadly based on the Environment Agency's (2013) – The Knotweed Code of Practice: Managing Japanese Knotweed on Development Sites (Version 3, amended in 2013, accessed on the Environment Agency's website on the 11th of July 2016).

In addition to the above, Best Practice measures around the prevention and spread of Crayfish plague[5] will be adhered with throughout all rehabilitation measures and activities.

[5] https://www.biodiversityireland.ie/projects/invasive-species/crayfish-plague/

# APPENDIX VI. POLICY AND REGULATORY FRAMEWORK

Bord na Móna Plc is a publicly owned company, originally established in 1934 to develop some of Ireland's extensive peat resources for the purposes of economic development and to support energy security, In the decades since its establishment the company has employed tens of thousands of people in its fuel, energy, and horticultural growing media businesses. For much of its history the company's support of important national policy aims has been enabled and encouraged in a variety of ways by Government.

Today, Bord na Móna is undertaking a number of highly significant actions in support of climate policy. These actions involve a radical transformation and decarbonisation of nearly the entire Bord na Móna business. This transformation will be driven by unlocking the full potential of our land and creating significant value for Ireland and the Midlands in particular.

Bord na Móna is an integral part of the economic, social, and environmental fabric of Ireland and Irish life. As a key employer in the Midlands, the company is conscious that its obligations go beyond purely commercial and environmental – there is also a social responsibility to employees and the communities served by Bord na Móna. It is the company's role and absolute priority to ensure that its long-term strategy delivers on all of these important areas in a robust and balanced way.

There are a wide range of policies, plans, legislation and land designations that inform the development of this Bord na Móna peatland rehabilitation plan. Bord na Móna have also developed and operate various policies and strategies that also inform the development of this rehabilitation plan.

## 1 EPA IPC Licence

Bord na Móna operates under IPC Licence issued and administered by the EPA to extract peat within the Ballivor-Derrygreenagh Bog Group (Ref. P0-501-01). As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. The bog is part of the Ballivor-Derrygreenagh group. This regulatory requirement is the main driver of the development of this rehabilitation plan.

## 2 National Climate Policy

The National Policy Position establishes the fundamental national objective of achieving a transition to a competitive, low carbon, climate-resilient and environmentally sustainable economy by 2050. It sets out:

- the context for the objective;
- clarifies the level of GHG mitigation ambition envisaged; and
- establishes the process to pursue and achieve the overall objective.

The evolution of climate policy in Ireland will be an iterative process based on the adoption by government of a series of national plans over the period to 2050. GHG mitigation and adaptation to the impacts of climate change are to be addressed in parallel national plans – respectively through the National Climate Action Plan. The plans will be continually updated, as well as being reviewed on a structured basis at appropriate intervals and, at a minimum, every five years. This will include early identification and ongoing updating of possible transition pathways to 2050 to inform sectoral strategic choices.

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Bord na Móna is following a decarbonisation programme aimed at reducing the carbon emissions from its activities. Industrial peat production has now ceased and several other decarbonisation measures are being implemented. The company aims to further develop renewable energy and resource recovery markets with a key objective of reducing the carbon intensity of all products. In addition, the carbon emission mitigation benefits associated with the post-peat extraction rehabilitated peatland following re-wetting, revegetation and colonisation of significant areas with native woodland will make a significant contribution to achieving the State's carbon emission reduction targets.

## 3 National Peatlands Strategy

The National Peatlands Strategy (2015) contains a comprehensive list of actions, necessary to ensure that Ireland's peatlands are preserved, nurtured and become living assets within the communities that live beside them. It sets out a cross-governmental approach to managing issues that relate to peatlands, including compliance with EU environmental law, climate change, forestry, flood control, energy, nature conservation, planning, and agriculture. The Strategy has been developed in partnership between relevant Government Departments/State bodies and key stakeholders through the Peatlands Council.

The strategy recognises that Ireland's peatlands will continue to contribute to a wide variety of human needs and to be put to many uses. It aims to ensure that Ireland's peatlands are sustainably managed so that their benefits can be enjoyed responsibly. It aims to inform appropriate regulatory systems to facilitate good decision making in support of responsible use. It also aims to inform the provision of appropriate incentives, financial supports and disincentives where required. The strategy attempts to strike an appropriate balance between different needs, including local stakeholders like turf-cutters and semi-state bodies such as Bord na Móna.

In line with a National Peatlands Strategy recommendation, a Peatlands Strategy Implementation Group (PSIG), was established, assisted in the finalisation of the Strategy, is overseeing subsequent implementation and will report to Government on an annual basis on the implementation of the actions and principles contained within the Strategy.

Bord na Móna is a key stakeholder in the National Peatlands Strategy and the Peatlands Strategy Implementation Group. The strategy recognises the potential for some Bord na Móna sites to be restored and to contribute to the national SAC and NHA network of protected raised bog sites. The strategy (agreed in 2015) also recognises the various different values of cutaway bog and developed six key principles (with Bord na Móna) for the after-use of cutaway bog.

- Bord na Móna will continue to assess and evaluate the potential of the company's land bank, using a land use review system. The assessment will help prepare a set of evidence-based management plans for the various areas of peatland. These plans will also inform its cutaway bog rehabilitation.
- The policy of Bord na Móna is not to open up any undrained new bogs for peat production.
- Lands identified by Bord na Móna as having high biodiversity value and/or priority habitats will be reserved for these purposes as the proposed future land use.
- Generally, Bord na Móna cutaway bogs that flood naturally will be permitted to flood unless there is a clear environmental and/or economic case to maintain pumped drainage.
- In deciding on the most appropriate afteruse of cutaway peatlands, consideration shall be given to encouraging, where possible, the return to a natural functioning peatland ecosystem.
- This will require re-wetting of the cutaway peatlands which may lead in time to the restoration of the peatland ecosystem.

- Environmentally, socially and economically viable options should be analysed to plan the future use of industrial cutaway peatlands, in conjunction with limiting factors as outlined in Bord na Móna's Strategic Framework for the Future Use of Peatlands.

The National Peatlands Strategy highlights the importance and value of developing peatland rehabilitation plans for Bord na Móna cutaway sites and implementing this peatland rehabilitation. Some of these principles have now been superseded by the company's decision to cease industrial peat extraction. The National Peatlands Strategy is currently being reviewed by Government.

## 4 Draft National River Basin Management Plan 2022-2027 (Water Framework Directive)

The National River Basin Management Plan (Department of Housing, Planning, Community and Local Government 2017) is the key national plan for Ireland to achieve the objectives of the Water Framework Directive (WFD). In broad terms, the objectives of the WFD are (1) to prevent the deterioration of water bodies and to protect, enhance and restore them with the aim of achieving at least good status and (2) to achieve compliance with the requirements for designated protected areas.

The NRBMP 2018-2021 outlined how peat extraction can be a potentially significant pressure on various water quality parameters. Peatland rehabilitation of Bord na Móna cutaway (in addition to other measures) was part of the WFD (2018-2021) programme of measures. The NRBMP 2018-2021 takes account of the fact that Bord na Móna was in the process of phasing out the extraction of peat for energy production, that it set a target to rehabilitate 9,000 ha of cutaway bogs (covering 25 peatlands) by 2021 (in 2018) and will look to implement best-available mitigation measures to further reduce water quality impacts caused by peat extraction while the phasing-out process is taking place. This NRBMP 2018-2021 rehabilitation target was superseded by the acceleration of the Bord na Móna de-carbonisation programme and the Peatland Climate Action Scheme (PCAS).

The development of site rehabilitation plans and the delivery of peatland rehabilitation by Bord na Móna was expected to have a positive impact on water quality and will help the NRBMP 2018-2021 deliver its objectives in relation to the Water Framework Directive and is one of the five key principle actions.

The draft NWBMP 2022-2027 describes how the number of waterbodies impacted by peat, industry and forestry have decreased by 10, 10 and 5 waterbodies, respectively since the second cycle. Impacts on water quality and river habitat arising from peat and peat extraction and associated drainage include the release of ammonium and fine-grained suspended sediments, and physical alteration of aquatic habitats. Drainage of peatlands also results in changes to the hydromorphological condition of rivers.

The draft NWBMP 2022-2027 outlines how maintaining and restoring Irish bogs will lead to a decrease in waterborne carbon leaching to levels comparable with intact bogs as well as reducing losses of peat silt and ammonia. Vegetation on the surface of the peat can also slow the flow of water over the land surface. Based on the EPA's most recent reports, peat extraction and drainage are impacting on 106 water bodies across the country, with peat the single pressure on 28 of these water bodies. However, compared to the data in the second-cycle plan, the number of water bodies impacted by peat has decreased.

The cessation of industrial peat extraction by Bord na Móna in 2021 was expected to have a significant positive impact on water quality of receiving water courses by reducing the impact of peat extraction as a key pressure on particular water courses. This is now being supported by the results and conclusions of the draft NWBMP 2022-2027.

## 5 National Biodiversity Action Plan 2016-2021

The National Biodiversity Action Plan 2016-2022 has a vision that biodiversity and ecosystems in Ireland are conserved and restored, delivering benefits essential for all sectors of society and that Ireland contributes to efforts to halt the loss of biodiversity and the degradation of ecosystems in the EU and globally. Ireland's 2nd National Biodiversity Action Plan outlines the main policies, strategies, actions and targets in relation to biodiversity. This plan has several Bord na Móna specific objectives and actions including implementing the BnM Biodiversity Action Plan 2016-2021 and overlaps with both the National Peatlands Strategy and the National Raised Bog Special Areas of Conservation Management Plan 2017-2022.

Rehabilitation of Bracklin Bog is expected to significantly contribute in the future to actions and targets of the National Biodiversity Action Plan 2016-2021, particularly in relation to peatland restoration and creation of new habitats such as wetlands and woodlands.

## 6 National conservation designations

Bord na Móna operates in a wider landscape that also includes a network of European and National nature conservation sites (Special Areas of Conservation (SACs), Special Protection Areas (SPAs), National Heritage Areas (NHAs, cNHAs) and National Nature Reserves). Bord na Móna will take account of this network of conservation objectives and their conservation objectives when developing these rehabilitation plans. It is expected that peatland rehabilitation will, in general, benefit the conservation objectives of this network of nature conservation sites.

## 7 National Raised Bog Special Area of Conservation Management Plan 2017-2022

The National Raised Bog Special Area of Conservation Management Plan 2017-2022 sets out a roadmap for the long-term management, restoration and conservation of protected raised bogs in Ireland. The Plan strikes an appropriate balance between the need to conserve and restore Ireland's raised bog network as part of Ireland's commitments towards the EU Habitats Directive, and the needs of stakeholders and gives recognition to the important role that communities have to play in the conservation and restoration of raised bogs. The National Raised Bog Special Areas of Conservation (SACs) Management Plan 2017-2022 is part of the measures being implemented in response to the on-going infringement action against Ireland in relation to the implementation of the EU Habitats Directive, with regard to the regulation of turf cutting on the Special Areas of Conservation (SACs). The then Minister for Arts, Heritage and the Gaeltacht, also published a **Review of Raised Bog Natural Heritage Area Network** in 2014.

Bord na Móna has played a key role in the development of the National Raised Bog Special Area of Conservation Management Plan 2017-2022 and the Review of the Raised Bog Natural Heritage Area Network. Several Bord na Móna sites were assessed by the National Parks and Wildlife Service as part of the above Plan and Review and there is an expectation that several Bord na Móna sites will be designated as SACs and NHAs in the future. This will reinforce the network of protected raised bog sites and replace in part sites that will be de-designated as they have been deemed to be significantly damaged and are deemed to have no raised bog restoration prospects. The Peatland Climate action scheme (PCAS), which includes enhanced rehabilitation measures, is expected to restore several sites that will contribute to The National Raised Bog Special Areas of Conservation (SACs) Management Plan 2017-2022 targets in relation to the restoration of raised bog habitat.

Bord na Móna has also responded to the needs of the NRBMP and provided several sites to the government for the relocation of turf-cutters from SACs. This is part of a suite of ongoing bog conservation measures in the NRBMP to manage turf-cutting in protected sites. Bord na Móna and the National Parks and Wildlife Service continues to engage regarding the ongoing relocation of turf-cutters from protected raised bog sites.

## 8 All-Ireland Pollinator Plan 2021-2025

The All-Ireland Pollinator Plan 2021-2025 outlines key objectives and actions to protect and support pollinating insects and the habitats they rely on. A Bord na Móna specific action in this plan includes the adoption of pollinator-friendly management within the Bord na Móna network of sites. One action to help achieve this objective is habitat rehabilitation and restoration, where possible, of pollinator-friendly habitats, including peatland habitats.

## 9 Land-use planning policies

As Bord na Móna operates in many counties across Ireland, it is important to note the respective development plans in these counties. Many of the existing development plans recognise the potential that exists in the after-use of cutover/cutaway peatlands. Bord na Móna seeks to work with all of the relevant local authorities to ensure that the most appropriate after-uses are reflected in local planning policy. The following areas of consistent importance are of both direct and indirect relevance to Bord na Móna: heritage, tourism, biodiversity/conservation, landscape, renewable energy, and economy/enterprise.

## 10 National Archaeology Code of Practice

Bord na Móna operates under an agreed Code of Practice regarding archaeology with the Department of Arts, Heritage and the Gaeltacht and the National Museum of Ireland which provides a framework to enable the Company to progress peat extraction whilst carrying out archaeological mitigation. (https://www.archaeology.ie/sites/default/files/media/publications/cop-bord-na-mona-en.pdf

The Code replaced a set of Principles agreed with the Department of Arts, Heritage and the Gaeltacht in the 1990s. Under the Code Bord na Móna, the Minister and Director work together to ensure that appropriate archaeological mitigation is carried out in advance of peat extraction.

- BNM must ensure that any monuments or archaeological objects discovered during peat extraction are protected in an appropriate manner by following the Archaeological Protection Procedures.
- BNM must ensure that any newly discovered monuments on Bord na Móna lands are reported in a timely manner to the National Monuments Service of the Department of Arts, Heritage and the Gaeltacht.
- BNM must ensure that any archaeological objects discovered on Bord na Móna lands are reported immediately to the Duty Officer of the National Museum of Ireland.
- Bord na Móna will adhere to the Archaeology Code of Practice relating to management of any archaeological finds that may arise during cutaway peatland rehabilitation and decommissioning.

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## 11 Bord na Móna Biodiversity Action Plan 2016-2021

Rehabilitation of industrial peatlands is a key objective of the Bord na Móna Biodiversity Action Plan 2016-2021. This action plan outlines the main objectives and actions around biodiversity on Bord na Móna lands. The Bord na Móna Biodiversity Action Plan also outlines key International and European policy in relation to biodiversity. This includes the **United Nations Convention on Biodiversity 2011-2020 (CBD)** and **European Biodiversity Strategy to 2020**. Further details of these policies and Bord na Mónas responses can be found in the Bord na Móna Biodiversity Action Plan (Bord na Móna 2016). Both policy documents highlight targets such as reducing pressure on biodiversity, promoting sustainability, habitat restoration and benefits of ecosystem services.

One example of a key CBD target is:

- *"Restore at least 15% of degraded areas through conservation and restoration activities."*

The EUs headline target for progress by 2020 is to:

- *"halt the loss of biodiversity and the degradation of ecosystems in the EU by 2020, restore them as far as feasible, while stepping up the EU contribution to averting global biodiversity loss."*

This rehabilitation plan is aligned to the CBD target and the EU Biodiversity Strategy target and will help Ireland meet its commitment to these international Biodiversity polices.

## 12 Bord na Móna commitments

Bord na Móna made the commitment in 2009 not to develop any new peatland sites for industrial peat production. The company has continued to work with different stakeholders.

The company announced that industrial peat production would be cut by over 50 percent in 2019 and would entirely cease over most of its lands by the mid-2020s. Rehabilitation measures would continue to be carried out with the focus on re-wetting and rehabilitation of cutover and cutaway areas in line with national policies (such as the National Peatland Strategy, the National Biodiversity Action Plan, the Climate Action Plan 2019, the Water Framework Directive, etc.) and rehabilitation guidelines set down by the Environmental Protection Agency. To date, 15,000 hectares of cutaway and cutover bog have been rehabilitated using this approach with 5,000 hectares in active rehabilitation.

In line with Bord na Móna's accelerated decarbonisation programme, the company made a further commitment to a significantly larger rehabilitation target. This was reflected in our plans to rehabilitate a further 20,000 hectares of cutaway and cutover bog to wetland and woodland mosaics by 2025. In addition, we planned to restore a further 1,000 hectares of raised bog habitat by 2025.

The above commitments have now been followed by the decision by the company to cease industrial peat extraction and rehabilitate a target of 33,000 ha between 2021-2025.

These commitments outline the importance of peatland rehabilitation to Bord na Móna. The company will continue to demonstrate environmental responsibility and continue to deliver on these commitments in relation to peatland rehabilitation and in relation to the future management of these lands to maximise their benefits, particularly their ecosystem service benefits, along with the sustainable development of a portion of the land bank for other uses, such as renewable energy.

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## 13 Bord na Móna Strategic Framework for the future use of cutaway peatlands 2020 (Draft)

The general after-use strategy of Bord na Móna is outlined in the Bord na Móna Strategic Framework for Future-Use of Cutaway Bogs 2020 (draft document). This document outlines how Bord na Móna's cutover peatland estate is complex in nature with great variability in terms of peat depths, peat types, drainage, subsoil condition and environmental value. Thus, future options require consideration on a site-specific basis, also bearing in mind the considerable internal variation within bogs. The development of the land-bank will also take account of national needs, while also taking account of the various national legislation, policies and plans related to the management of peatlands. In general, Bord na Móna will seek to balance and optimise commercial, social, and environmental value of these sites, and develop integrated land-uses, while taking account of the need for sustainability and their biodiversity value.

Any consideration of other future after-uses for Bord na Móna land such as development or other mixed uses will be conducted following the relevant planning guidelines and consultation with relevant authorities and will be considered within the framework of this peatland rehabilitation plan.

Draft

# APPENDIX VII. DECOMMISSIONING

## 1. Condition 10 Decommissioning

This is a requirement of the applicable Integrated Pollution Control Licence issued by the Environmental Protection Agency. This condition 10.1 requires the following:

*10.1 Following termination of use or involvement of all or part of the site in the licensed activity, the licensee shall:*

*10.1.1 Decommission, render safe or remove for disposal/recovery, any soil, subsoils, buildings, plant or equipment, or any waste, materials or substances or other matter contained therein or thereon, that may result in environmental pollution.*

The main success criteria pertaining to successfully complying with this condition is ensuring that no environmental liability remains from this infrastructure and material and that the bog can be deemed suitable for surrender of the license under section 95 of the EPA Acts. This is achieved by Bord na Móna identifying and quantifying any mechanical and infrastructural resources that were installed in the bog to enable the development and production operation at the site. This list is then refined to identify any items that would be deemed as possibly resulting in environmental pollution, should they not be removed.

Typically, these items/infrastructures would be any remaining, unconsolidated plant, equipment and attachments, waste materials, unused raw materials such as land drainage pipes, remaining peat stockpiles, stock pile covering, pumps, septic tanks and fuel tanks.

In relation to this bog, the list and tasks would be as follows:

| Item | Description | Bracklin Decommissioning Plan |
|---|---|---|
| 1 | Clean-up of remaining or unconsolidated waste or materials located in Bogs, Yards, Buildings and Offices | Where relevant |
| 2 | Cleaning Silt Ponds | Cleaning Silt Ponds |
| 3 | Decommissioning Peat Stockpiles | Where relevant |
| 4 | Decommissioning or Removal of Buildings and Compounds | Where relevant |
| 5 | Decommissioning Fuel Tanks and associated facilities | Where relevant |
| 6 | Decommissioning and Removal of Bog Pump Sites | Not relevant |
| 7 | Decommissioning or Removal of Septic Tanks | Where required |

In addition, condition 7 of the licence requires these now defined waste items to be disposed of or recovered as follows:

7.1 Disposal or recovery of waste shall take place only as specified in *Schedule 2(i) Hazardous Wastes for Disposal/Recovery* and *Schedule 2(ii) Other Wastes for Disposal/Recovery* of this licence and in accordance with the appropriate National and European legislation and protocols. No other waste shall be disposed of/recovered either on-site or off-site without prior notice to, and prior written agreement of, the Agency.

7.2 Waste sent off-site for recovery or disposal shall only be conveyed to a waste contractor, as agreed by the Agency, and only transported from the site of the activity to the site of recovery/disposal in a manner which will not adversely affect the environment.

7.3 A full record, which shall be open to inspection by authorized persons of the Agency at all times, shall be kept by the licensee on matters relating to the waste management operations and practices at this site. This record shall as a minimum contain details of the following:

7.3.1 The names of the agent and transporter of the waste.

7.3.2 The name of the persons responsible for the ultimate disposal/recovery of the waste.

7.3.3 The ultimate destination of the waste.

7.3.4 Written confirmation of the acceptance and disposal/recovery of any hazardous waste consignments sent off-site.

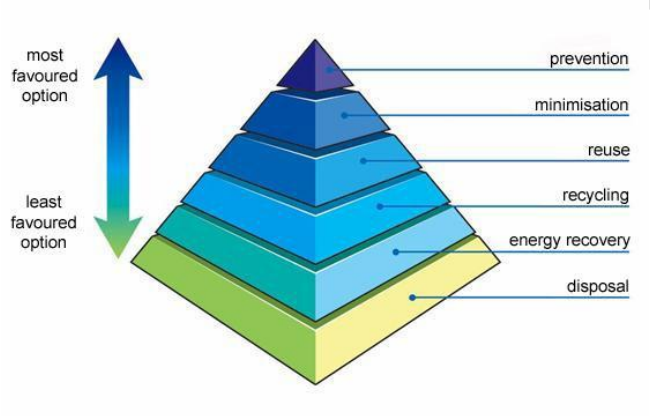
7.3.5 The tonnages and EWC Code for the waste materials listed in *Schedule 2(i) Hazardous Wastes for Disposal/Recovery* and *Schedule 2(ii) Other Wastes for Disposal/Recovery* sent off-site for disposal/recovery.

7.3.6 Details of any rejected consignments.

A copy of this Waste Management record shall be submitted to the Agency as part of the AER for the site.

As required by the licence, these waste items will be removed for recycling or disposal, using external contractors with the required waste collection permits, approved under 7.2, with waste records maintained as required under 7.3.

Where possible, Bord na Móna will utilize the appropriate waste hierarchy to identify waste that can reused or recycled ahead of disposal.




The validation of the success of condition 10.1 is carried out through an Independent Closure Audit (ICA), followed by and EPA Exit Audit (EA) and the eventual partial or full surrender of the licence.

## APPENDIX VIII. GLOSSARY

**Cutaway Bog:** A Bord na Móna site generally becomes cutaway when it is economically unviable to continue industrial peat extraction or when the majority of peat has been removed.

**Deep peat cutover bog.** Deep peat cutaway bog is defined as former raised bogs that have been in industrial peat production, where production has ceased but the residual peat depth is typically in excess of 2m. *Sphagnum* mosses are key species of raised bogs and the majority of the peat mass is formed from these mosses. *Sphagnum* species and other raised bog species are a key part of raised bog habitat function and prefer more acidic, nutrient poor, water-logged conditions. Typical raised bog *Sphagnum* mosses and other bog species do not thrive with the more typical alkaline water chemistry of cutaway bog but do grow well in these more acidic conditions where peat has been re-wetted. There is potential to re-develop embryonic *Sphagnum*-rich plant communities in these conditions if the peat can be re-wetted. This brings the opportunity of re-developing embryonic *Sphagnum*-rich vegetation communities that are considered Carbon sinks or peat-forming habitats and restoring the carbon sequestration function of these sites.

**Dry cutaway bog:** Cutaway bog is categorised as dry cutaway where it is not practical or feasible to re-wet these areas completely. It is inevitable that some areas of cutaway will remain relatively dry due to the heterogenous topography of the cutaway, as well as requirements for continued drainage on site for identified after-uses, or off site in relation to neighbouring lands or other infrastructure. Ridges and mounds of glacial deposits can become exposed during peat extraction and form a heterogenous topographical mosaic separated by basins. Dry cutaway may have very thin or no residual peat where ridges and mounds have been exposed. The exposed sub-soils are a mix of glacial gravels, muds and tills that can be quite free-draining. Dry cutaway may also have deeper residual peat but in a location (i.e. at the margin) where the peat cannot be re-wetted due to boundary constraints. Dry cutaway may also develop in situations where there a relatively steep slope that inhibits re-wetting. The majority of dry cutaway will develop towards grassland, heath, scrub and dry woodland habitats.

**Environmental stabilisation:** The key objective of peatland rehabilitation is environmental stabilisation. This means developing habitats and vegetation back onto the bare peat, slowing water movement across the bog, minimising effects to downstream waterbodies and meeting the conditions of the IPC Licence. This is achieved by a combination of re-wetting, where possible, and natural colonisation of the former cutaway, with or without intervention**.** Habitats will develop that reflect the underlying environmental conditions. Other after-use development may also serve to act as environmental stabilisation.

**Marginal land.** Marginal land is defined as land around the margin of the industrial peat production area. This margin generally contains a range of habitats including scrub, Birch woodland, cutover bog and raised bog remnants. It has a variety of land-uses including turf-cutting (private turbary).

**Rehabilitation:** Rehabilitation is defined in general by Bord na Móna as environmental stabilisation of the former cutaway. This is generally achieved via re-wetting, where possible, and natural colonisation of the former cutaway, with or without intervention. It is not possible to restore raised bog habitats on BnM cutaway in general in the short-term. In general, most of the peat mass has been removed from many BnM cutaway sites and the environmental characteristics of these areas have therefore changed radically (peat depths, hydrology, water chemistry, substrate type, nutrient status. This means there will therefore be different habitat outcomes (wetlands, fen, heathland, grassland and Birch woodland). Other after-use development may also serve to act as rehabilitation.

**Restoration:** Ecological restoration to defined as the process of re-establishing to the extent possible the structure, function and integrity of indigenous ecosystems and the sustaining habitats they provide" (SER 2004).

Defined in this way, restoration encompasses the repair of ecosystems (Whisenant 1999) and the **improvement of ecological conditions in damaged wildlands** through the **reinstatement of ecological processes**. In general, Bord na Móna cutaway peatlands cannot be restored back to raised bog in a reasonable timeframe as their environmental conditions has changed so radically (with the removal of the acrotelem – the living layer and much of the peat mass). However, they can be returned to a **trajectory** towards a naturally functioning peatland system (Renou-Wilson 2012). **Raised bog restoration** is an objective of some BnM sites where there is residual natural raised bog vegetation and where the majority of the peat is still intact.

**Standard rehabilitation:** This is defined as rehabilitation that is designed to meet the conditions of the EPA IPC Licence. The key objective of rehabilitation is environmental stabilisation. This is achieved by a combination of re-wetting, where possible, and natural colonisation of the former cutaway, with or without intervention**.** Other after-use development may also serve to act as rehabilitation.

**Standard decommissioning:** This is defined as decommissioning that is designed to meet the conditions of the EPA IPC Licence. This is defined as to render safe or remove for disposal/recovery, any soil, subsoils, buildings, plant or equipment, or any waste, materials or substances or other matter contained therein or thereon, that may result in environmental pollution.

**Wetland cutaway bog.** Wetland cutaway bog is defined as former raised bogs that have been in industrial peat production, where production has ceased and the majority of peat has been cutaway, and where this cutaway has the potential to be re-wetted. A significant number of Bord na Móna sites have pumped drainage and these sites are likely to develop a mosaic of wetland habitats when pumping in reduced or stopped. The water chemistry of wetland cutaway frequently is strongly influenced by the more alkaline sub-soils that have been exposed during peat production. This means that pioneer vegetation is more typical of fen and wetland, rather than raised bog. Wetland cutaway will have a broad range of hydrological conditions depending on the local topography. In some cases, these wetlands may form deep water (> 0.5 m) whilst other areas may have the water table at or just below the surface of the ground.

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# APPENDIX IX. EXTRACTIVE WASTE MANAGEMENT PLAN

**(Minimisation, treatment, recovery and disposal)**

**Objective:**
The objective of this generic plan is to comply with the requirements of regulation 5 of the Waste Management (Management of Waste from Extractive Industries) Regulations, and to prevent or reduce waste production and its harmfulness.

**Scope:**
This plan covers IPPC Licence's Ref P0501-01, Ballivor- Derrygreenagh Group of Bogs in Counties Meath and Westmeath.

**1.0 Extractive Waste:**
Waste classified as extractive waste from peat extraction operations arise from three operations associated with this activity.

**1.1 Silt Pond excavations and maintenance.**
All peat extraction activities are serviced by a silt lagoons/ponds. During the excavation of these silt ponds, pre IPPC Licensing in 1999 and since licensing, the excavated material is stored adjacent to the silt pond, where it either remains in situ ores levelled out. As required by condition 6.6, these silt lagoons are cleaned twice per annum or more often if inspections dictate. These silt cleanings are also deposited on the same location, adjacent to the silt pond, where they may be levelled periodically to allow room for subsequent cleanings. These mounds of silt pond excavation material and cleanings are generally no higher that 2-3 metres.

**1.2 Power Station screenings:**
Lough Ree Power Ltd screens the peat from the bogs prior to processing. This screening removes oversized peat, stones and bogs timbers. Schedule 3 (ii) of the IPPC licence permits disposal of these peat screenings back to the bog, where it is levelled and graded into the surrounding peat landscape. These locations have been agreed with the Agency as per condition 7.4 of the IPPC Licence, and as per the attached locations.

**1.3 Bog Timbers:**
During peat extraction operations, bog timbers often arise in the bog surface and are required to be cleared. These timbers consist of bog pine, oak and some yew. Some of these timbers, such as the oak and yew are removed for use in the wood craft industry, with the remaining bog pine stockpiled in locations at the opposite end of each bog, where it generally becomes a habitat for flora and fauna. These piles of timber are generally no higher than 1-2 metres.

**2.0 P0501-01 IPPC Licence Extractive Waste Conditions**

**2.1 Condition 7.5 Extractive Waste Management**
The licensee shall draw up a Waste Management Plan (to be known as an Extractive Waste Management Plan) for the minimisation, treatment, recovery and disposal of extractive waste. This Plan shall meet the requirements of regulation 5 of the Waste Management (Management of Waste from the Extractive Industries) Regulations,2009. The Plan shall be submitted for agreement by the Agency by the 31' December2012. The Plan

shall be reviewed at least once every five years thereafter in a manner agreeable to the Agency and amended in the event of substantial changes to the operation of a waste facility or to the waste deposited. Any amendments shall be notified to the Agency.

All extractive waste shall be managed in accordance with the Extractive Waste Management Plan. A report on the implementation of the Extractive Waste Management Plan shall be provided in the AER.

**2.2 Condition 7.6 Waste Facility**

(i) No new waste facility may be developed or an existing waste facility modified unless agreed by the Agency.
(ii) The licensee shall ensure that all existing waste facilities are managed and maintained to ensure their physical stability and to prevent pollution or contamination of soil, air, surface water or groundwater.
(iii) The licensee shall ensure that all new waste facilities are constructed, managed and maintained to ensure their physical stability and to prevent pollution or contamination of soil, air, surface water or groundwater.
(iv) Operational measures shall be continuously employed to prevent damage to waste facilities from personnel, plant or equipment.
(v) The licensee shall establish and maintain a system for regular monitoring and inspection of waste facilities.
(vi) All records of monitoring and inspection of waste facilities, as required under the licence, shall be maintained on-site in order to ensure the appropriate handover of information in the event of a change of operator or relevant personnel.

**2.3 Condition 7.7 Excavation Voids**

7.7.1 Unless otherwise agreed by the Agency, only extractive waste shall be placed in excavation voids.
7.7.2 When placing extractive waste into excavation voids for rehabilitation and construction purposes, the licensee shall, in accordance with regulation 10 of the Waste Management (Management of Waste from the Extractive Industries) Regulations, 2009, and the Extractive Waste Management Plan:

- Secure the stability of the waste
- Put in place measures to prevent pollution of soil, surface water and ground water.
- Carry out monitoring of the extractive waste and excavation void.

**Condition 7.5. Extractive Waste Management Plan. 5 (1)**

**3.0 Minimisation.**

**3.1 Silt pond excavation material and cleanings.**

IPPC Licence conditions require all production areas to be serviced by an appropriately designed silt pond based on storage volume and retention time. Condition 6.6 requires all ponds to be cleaned bi-annually and more often if inspections dictate, so the only opportunity for minimisation of same is through Standard Operating Procedures. These are required under condition 2.2.2 (i) regarding minimisation of suspended solids, and are in-place to minimise the generation of silt, which in-turn will minimise the generation of silt pond waste.

**3.2 Power Station Screenings.**

These screenings cannot be minimised as they are a consequence of peat production, stones, timbers and oversize peat materials are naturally occurring on the bog, and are required to be removed prior to processing.

**3.3 Bog Timbers.**

Bog timbers are also naturally occurring materials within a bog and are required to be removed prior for production. The volume of these bog timbers varies from bog to bog and as such their minimisation is not controllable or quantifiable.

**4.0 Treatment**

**4.1 Silt pond excavation material and cleanings.**

The silt pond excavation material and silt cleanings do not require any treatment for its end use which will be either backfilling these silt pond voids as per condition 7.7.1 above as part of the Bog Rehabilitation Plan, or reincorporated into the surrounding peatlands.

**4.2 Power Station Screenings.**

The factory screenings are permitted to be returned to the bog as they were naturally occurring materials from the bog, and as such do not require any treatment to serve this purpose.

**4.3 Bog Timbers**

As per 1.3 above, these timbers are stockpiled at two locations in each bog, as per the attached list of sites and become habitats for various flora and fauna.

**5.0 Recovery**

**5.1 Silt pond excavation material and cleanings.**

Condition 2.2.2 (vi) requires the reuse of silt pond waste to be examined. This was undertaken in 2006, the outcome of which was that this waste peat silt material, as a fuel, was contaminated with sub-soils, rendering it unsuitable for combustion. In addition, volumes are small compared to overall peat production volumes.

**5.2 Power Station Screenings.**

Given the nature of these screenings as outlined in 1.2 above, there is no further use identified and they are permitted to be disposed of back to the bog.

**5.3 Bog Timbers**

Investigations into processing these materials into smaller fractions for potential heating purposes did not yield any viable results. In addition, these older stockpiles are now classified as habitats and as such would not be considered for reuse as a fuel.

**6.0 Disposal**

**6.1 Silt pond excavation material and cleanings.**

Schedule 3 (ii) permits the disposal of silt pond cleanings (Lagoon Sediments) to the bog and these locations, adjacent to the silt pond site, are presented in the attached spreadsheet, with associated grid coordinates.

**6.2 Power Station Screenings.**

Schedule 3 (ii) permits the disposal of screenings (Peat Screenings) to the bog at designated locations agreed under Condition 7.4, and these locations, are presented in the attached spreadsheet, with associated grid coordinates.

**6.3 Bog Timbers**

These naturally occurring bog timbers are stockpiled at locations in each bog, grid coordinates attached.

**7.0 Extractive Waste Management Plan**

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**5 (2a) (i)**
The vast majority of peat extraction bogs were all designed and drained for production prior to the 1960's and as such the production fields layout cannot' be altered. Under our Cleaner Reduction Procedures, various design changes have been implemented to the production machines and process to reduce lost peat which eventually is captured in the silt ponds and requires removal as waste peat silt. This along with training and ongoing research and development will continuously reduce waste peat and subsequently waste silt pond cleanings. Bog timbers are present naturally in various volumes and quantities in different bogs and as peat production involves stripping peat in layers, the exposure, generation and removal of these timbers is unavoidable. Work has been undertaken recently into project looking at grinding of these bog timbers in situ using a timber miller, and if this project becomes viable it will contribute to the reduction of bog timbers.

**5 (2a) (ii)**
Given the nature and expanse of peat bogs, the stockpiling and storage of these waste materials do not present a visual, storage or stability problem. As required under Condition 10 of the IPPC Licence, the silt pond excavations and screenings will be utilised to backfill the silt pond voids once the bogs have finished and stabilised in accordance with out Bog Rehabilitation Plan. Storage of these wastes in the interim, open to the elements does not present a change on the nature of these wastes that will threaten the environment or prevent their reuse during the bog rehabilitation process.

**5 (2a) (iii)**
Under Condition 10 of the IPPC Licence, all silt ponds will be decommissioned once the bog surface has stabilised, in agreement with the Agency. This will involve the removal of weirs and flow controls, returning the silt pond back to its original drain or removing the silt pond from the drainage system. Both of these activities will involve placing the silt pond extraction and cleaning material back into the excavation void.

**5 (2a) (iv)**
The peat bogs do not contain any topsoil, so this is not required.

**5 (2a) (v)**
Peat mineral resources do not undergo any treatment.

**5 (2b)**
These three extractive waste are all being reused and recovered back to their original extraction points and have not undergone any physical, chemical, or biological change.

**5 (2c) (i, ii & iii)**
These three extractive wastes, stored on the bog for reuse or recovery during the bog rehabilitation phase, do not require any management or monitoring during the operation of these bogs. Silt pond excavations and cleanings are stored adjacent to the silt pond and quickly revegetated and stabilise, the screenings are graded back into the bog at the agreed locations upon disposal and the bog timbers do not prevent any water or airborne danger to the environment.

**5 (3)**
The three extractive wastes arising from peat extraction operations at this site are classified wastes from mineral non-metalliferous excavation, with an EWC code of 0101 02. The materials are not classified as hazardous under

Directive 91/689/EEC20, and do not contain substances or preparations classified as dangerous under Directives 67/548/EEC5 or 1999/45/EC6 above a certain threshold.

The peat excavations and cleanings are stored in locations and in a manner that they could not collapse and are remote in their nature. The stockpiles are located adjacent to silt ponds that are cleaned regularly and as such these stockpiles are managed and levelled to facilitate further cleanings.

Therefore, the material stored at these waste facilities would not be considered to be a Category A waste facility.

**Classification in accordance Annex II.**

| **Waste Material** | Description | **C**lassification | Chemical Process treatment | Deposition description | Transport System |
|---|---|---|---|---|---|
| Silt Pond Excavations and cleanings | Peat and mineral soils associated with peatlands. Stored for reuse during bog rehabilitation, with no displacement of overburden | 01 01 02 | None | Excavated from silt ponds by excavator and deposited adjacent to the silt pond. | Excavator |
| Peat Screenings | Stones, timbers and oversized peat particles, reincorporated into low areas, agreed with the Agency, and stabilized under normal natural bog conditions | 01 01 02 | None | Removed by screen at the factory and transported by tractor and trailer to the designated and agreed locations | Tractor and trailer. |
| Bog Timbers | Pine, Oak and Yew species, stored at locations in each bog. Not subject to any stability issues due to exposure to atmospheric/meteorological conditions. | 01 01 02 | None | Removed from the bog surface by excavator and transported by tractor and trailer to the agreed locations | Tractor and Trailer |

**Description of operations.**
Silt pond excavations arise from the requirement to have silt ponds treating all peat extraction sites. Silt pond cleanings arise from the removal of peat silt from silt ponds as required under IPPC Licence. Bog timbers arise from preparation of the bogs surface for peat production. Estimated quantities of materials are below:

**Closure plan. (Bog Rehabilitation Plan).**
Condition 10.1 – 10.3 of the IPPC Licence requires the following:

- 10.1 Following termination of use or involvement of all or part of the site in the licensed activity, the licensee shall:
- 10.1.1 Decommission, render safe or remove for disposal/recovery, any soil, subsoils, buildings, plant or equipment, or any waste, materials or substances or other matter contained therein or thereon, that may result in environmental pollution.
- 10.1.2 Implement the agreed cutaway bog rehabilitation plan (refer Condition 10.2).

10.2 Cutaway Bog Rehabilitation Plan:

- 10.2.1 The licensee shall prepare, to the satisfaction of the Agency, a fully detailed and costed plan for permanent rehabilitation of the cutaway boglands within the licensed area. This plan shall be submitted to the Agency for agreement within eighteen months of the date of grant of this licence.
- 10.2.2 The plan shall be reviewed every two years and proposed amendments thereto notified to the Agency for agreement as part of the AER. No amendments may be implemented without the written agreement of the Agency.

10.3 The Rehabilitation Plan shall include as a minimum, the following:

- 10.3.1 A scope statement for the plan; to include outcome of consultations with relevant Agencies, Authorities and affected parties (to be identified by the licensee).
- 10.3.2 The criteria which define the successful rehabilitation of the activity or part thereof, which ensures minimum impact to the environment.
- 10.3.3 A programme to achieve the stated criteria.
- 10.3.4 Where relevant, a test programme to demonstrate the successful implementation of the rehabilitation plan.
- 10.3.5 A programme for aftercare and maintenance.

10.4 A final validation report to include a certificate of completion for the Rehabilitation Plan, for all or part of the site as necessary, shall be submitted to the Agency within six months of execution of the plan. The licensee shall carry out such tests, investigations or submit certification, as requested by the Agency, to confirm that there is no continuing risk to the environment. This plan including maps and ecological classifications are available on file at the Ballivor-Derrygreenagh IPPC Licence Coordinators office. The location in relation to the silt pond excavations and cleanings are adjacent to the silt ponds, which are considered under the Shannon River Basin Management Plan in accordance with the requirements of Directive 2000/60/EC. Screenings and bog timbers are all naturally occurring elements of peatland and there placement back to the bog in smaller concentrated designated waste facilities does not constitute a risk to the prevention of water compliance. The lands under where these materials are deposited are peatlands and are un-effected by the placing of this material.

**Review.**

This plan will be reviewed every five years, the first review to take place in September 2017. This review will entail an inspection of these waste facilities to ensure their placing, management, maintenance and stability comply with the requirements of the Extractive Waste Management requirements and condition 7.5, 7.6 and 7.7 of the Ballivor-Derrygreenagh IPPC Licence P0501-01.

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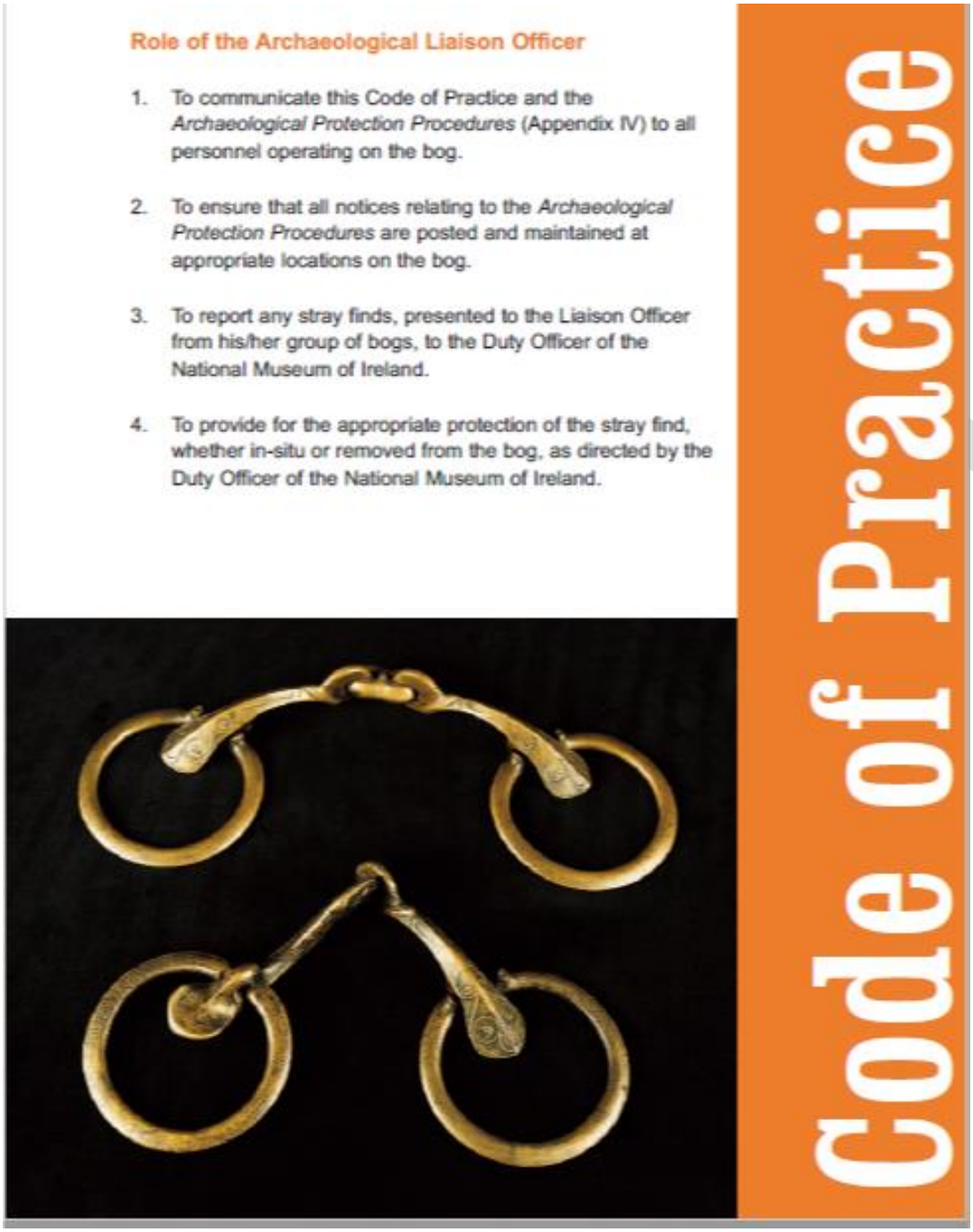
## APPENDIX X. MITIGATION MEASURES FOR THE APPLICATION OF FERTILISER

- Any fertiliser used will be Rock Phosphate and will not be applied in the following conditions:
    1. The land is waterlogged;
    2. The land is flooded, or it is likely to flood;
    3. The land is frozen, or covered with snow;
    4. Heavy rain is forecast within 48 hours (forecasts will be checked from Met Éireann).
    5. The ground slopes steeply and there is a risk of water pollution, when factors such as surface run-off pathways, the presence of land drains, the absence of hedgerows to mitigate surface flow, soil condition and ground cover are taken into account.
- No fertiliser will be spread on land within 2 metres of a surface watercourse.
- Buffer zones in respect of waterbodies, as specified on https://www.epa.ie/about/faq/name,57156,en.html, will be adhered with at all times with regard to fertiliser application. Reproduced as follows:

| Water body / Feature | Buffer zone |
|---|---|
| Any water supply source providing 100m$^3$ or more of water per day, or serving 500 or more people | 200 metres (or as little as 30 metres where a local authority allows) |
| Any water supply source providing 10m$^3$ or more of water per day, or serving 50 or more people | 100 metres (or as little as 30 metres where a local authority allows) |
| Any other water supply for human consumption | 25 metres (or as little as 30 metres where a local authority allows) |
| Lake shoreline | 20 metres |
| Exposed cavernous or karstified limestone features (such as swallow holes or collapse features) | 15 metres |
| Any surface watercourse where the slope towards the watercourse exceeds 10% | 10 metres |
| Any other surface waters | 5 metres* |

## APPENDIX XI. ARCHAEOLOGY



5. To arrange for the delivery or collection of the stray find, as directed by the Duty Officer of the National Museum of Ireland.

6. To complete the Report of Discovery of Archaeological Object(s) in Bogs (Appendix V), as directed by the Duty Officer of the National Museum of Ireland.

7. To maintain a file of all stray finds and associated documentation and provide copies to the Project Archaeologist.

8. To provide assistance, where required, to the Department during archaeological surveys.

9. To provide assistance, where required, to Bord na Móna's Consultant Archaeologists, during investigation and mitigation of monuments.

10. To report to the Bord na Móna members on the Archaeology Management Liaison Committee any planned developments or new activities on cutaway peatland areas within his/her group of bogs.



| Bord na Móna | **Procedure: ENV017** | **Rev: 1** |
|---|---|---|
| **Title: Archaeological Findings** | **Approved: EM** | **Date:** |

**1) Purpose**

The purpose of this procedure is to describe the arrangements in Bord na Móna for findings of Archaeological material (Stray Finds).

**All objects, sites or monuments, no matter how fragmentary, are important elements of our heritage.**

**2) Procedure**

1. Check whether there are any known archaeological monuments in your area.
2. Be vigilant at all times - objects or traces of structures can be found on the field surfaces, in the drain faces, on the bog margins or caught within the mechanics of machinery.
3. If an object is found leave it in place, if it is safe to do so, note its position and immediately contact your Archaeological Liaison Officer who will assess the situation and contact the Duty Officer of the National Museum of Ireland.
4. Resist the temptation to investigate the find spot as this may disturb fragile archaeological deposits.
5. If the object is already dislodged or is in imminent danger, remove it carefully, mark its find spot and report it immediately to your Archaeological Liaison Officer.
6. Objects made of wood, leather or textile, which are removed from peat should be kept in conditions similar to those in which they are found. This can be done by packing them in peat or, if waterlogged, placing them in a clean basin of water and sealing the container. Resist the temptation to clean or remove peat from the object.
7. If timbers or other materials, such as gravel or stones, which could be part of a man-made structure are noted on the bog, mark the location and report it immediately to your Archaeological Liaison Officer. If you suspect the find is of archaeological importance, resist the temptation to expose it any further as this could result in damage to the structure.
8. Report anything that looks unnatural in the bog – your Archaeological Liaison Officer will decide whether it should be referred to the appropriate authorities.

**NOTE:** Our archaeological heritage is a finite, non-renewable resource. Once a site is destroyed its information is lost forever and we have lost the chance to understand a little more about our past, where we have come from and perhaps the opportunity to learn for the future.

Your Archaeological Liaison Officer is ……

**3) Records**

| Revision Index | | | |
|---|---|---|---|
| Revision | Date | Description of change | Approved |
| 1 | | | |
| 2 | | | |

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Bord na Móna

# Bracklin Bog
# Rehab Plan
# GIS Map Book
# 2023

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| Date: | 11/05/2022 | | |

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| Date: | 22/02/2023 | 22/02/2023 | 22/02/2023 |

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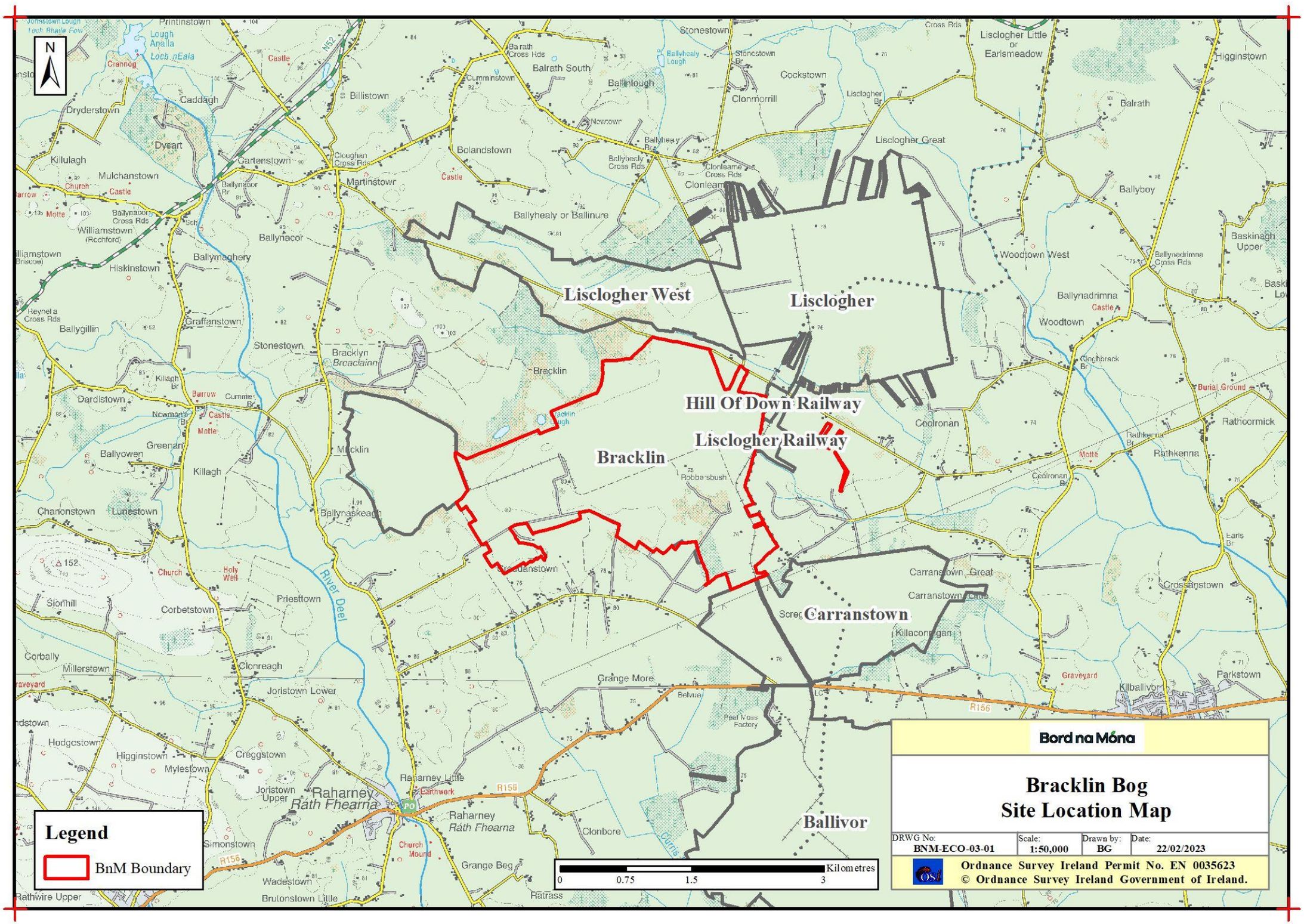

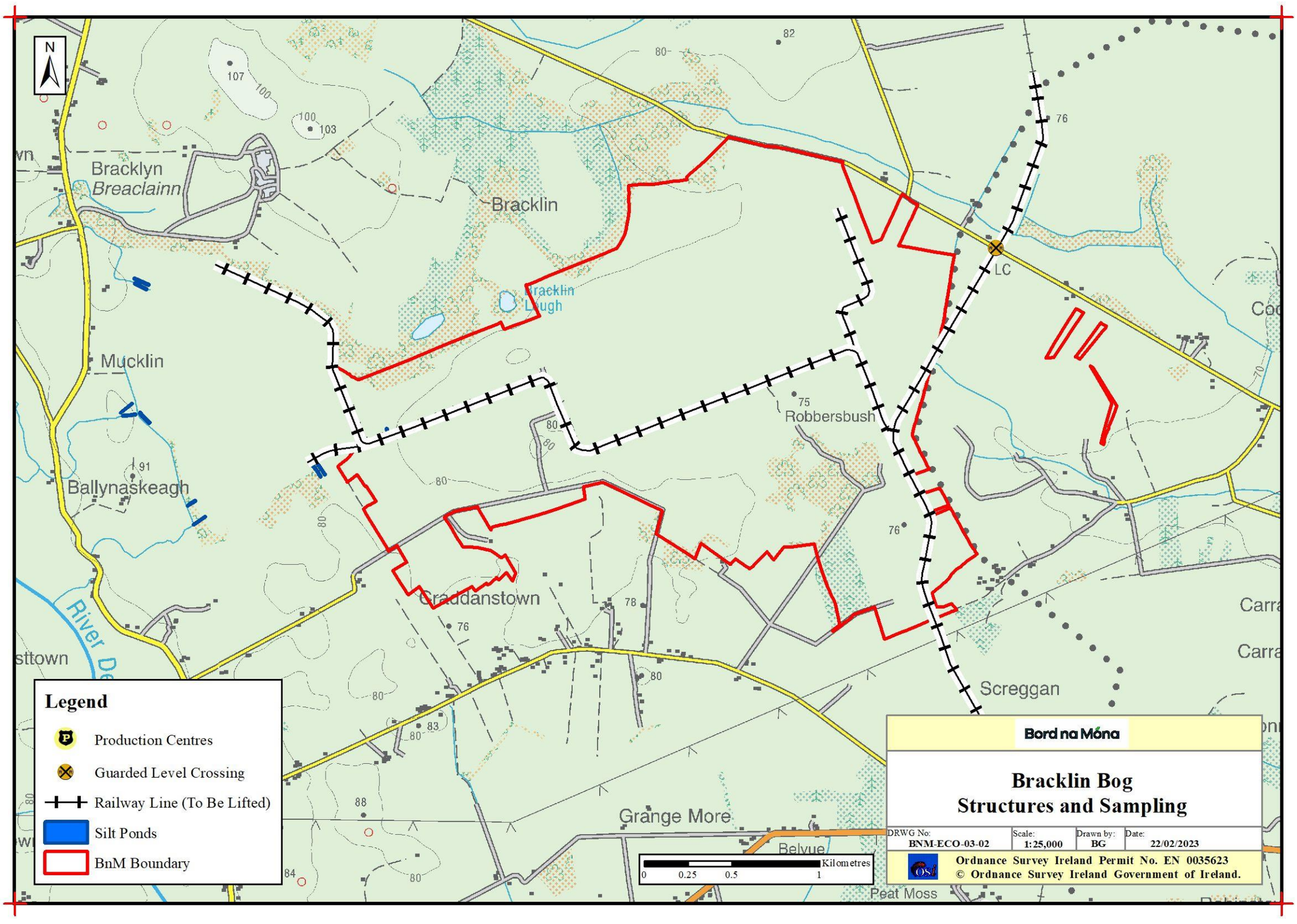
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Screggan
LC
River De
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Carra
Carra
Legend
Production Centres
Guarded Level Crossing
Railway Line (To Be Lifted)
Silt Ponds
BnM Boundary
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Bracklin Bog
Structures and Sampling
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**BNM-ECO-03-04: Peat Depths**

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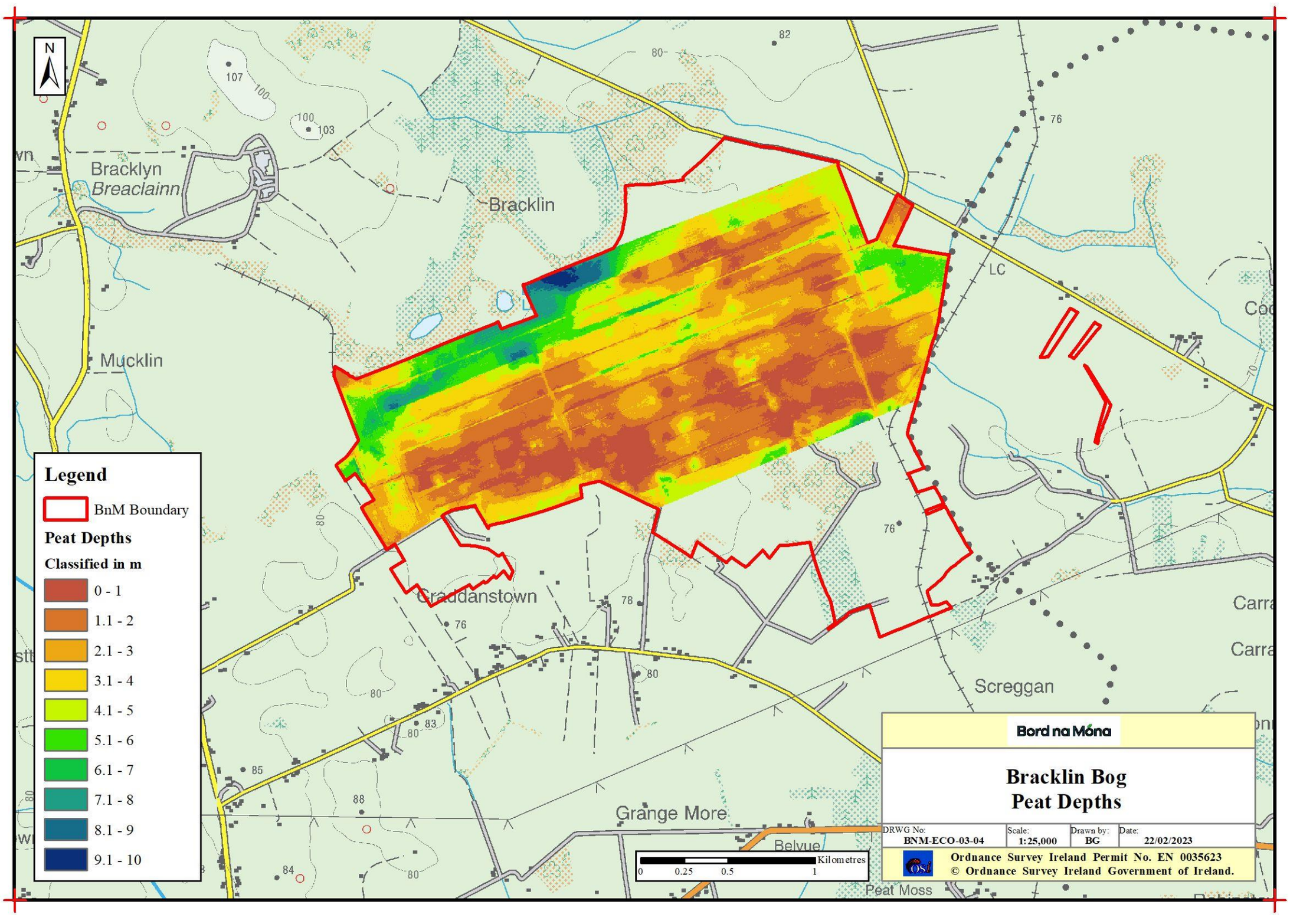

**BNM-ECO-03-17: Current Habitat Map**

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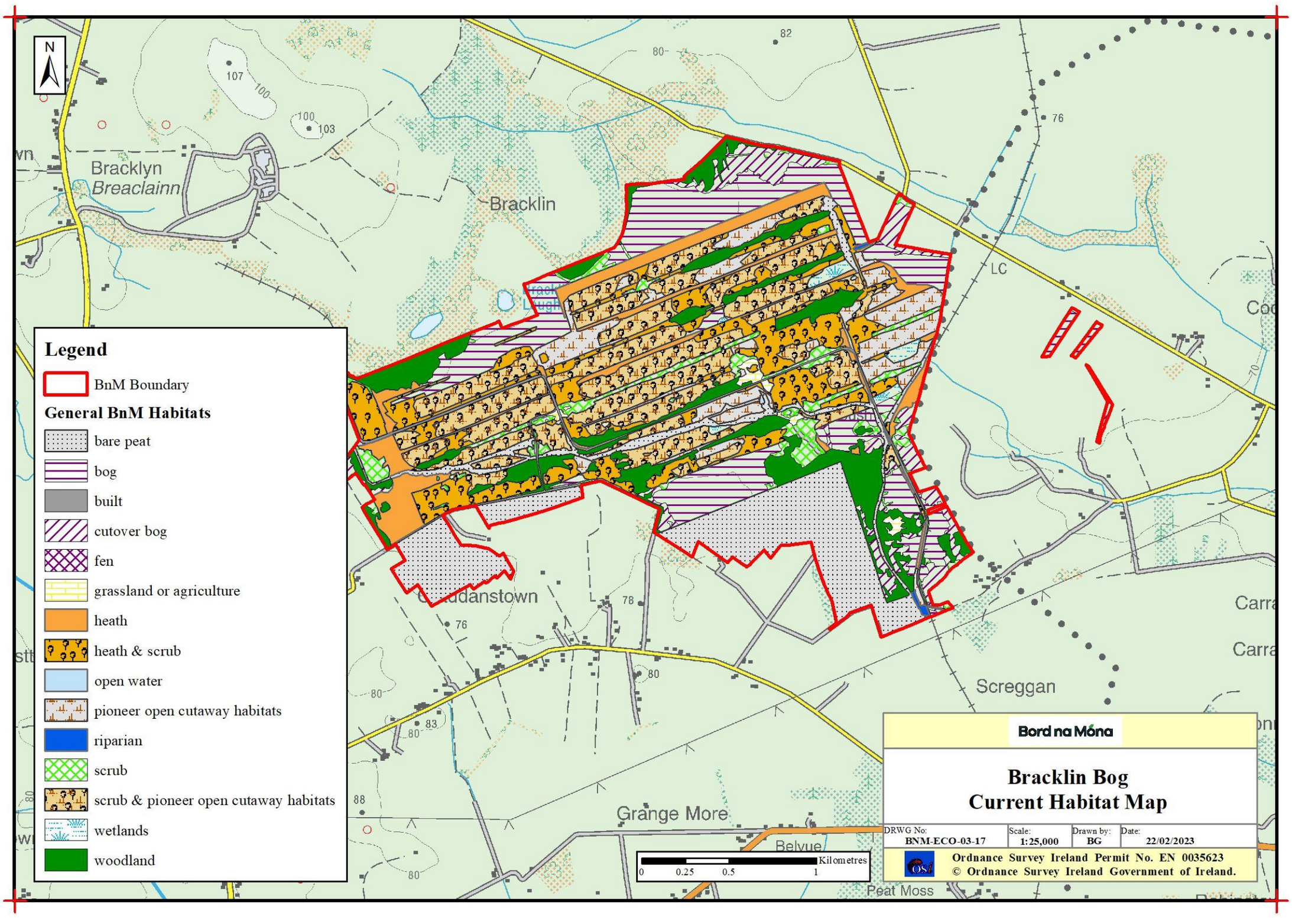

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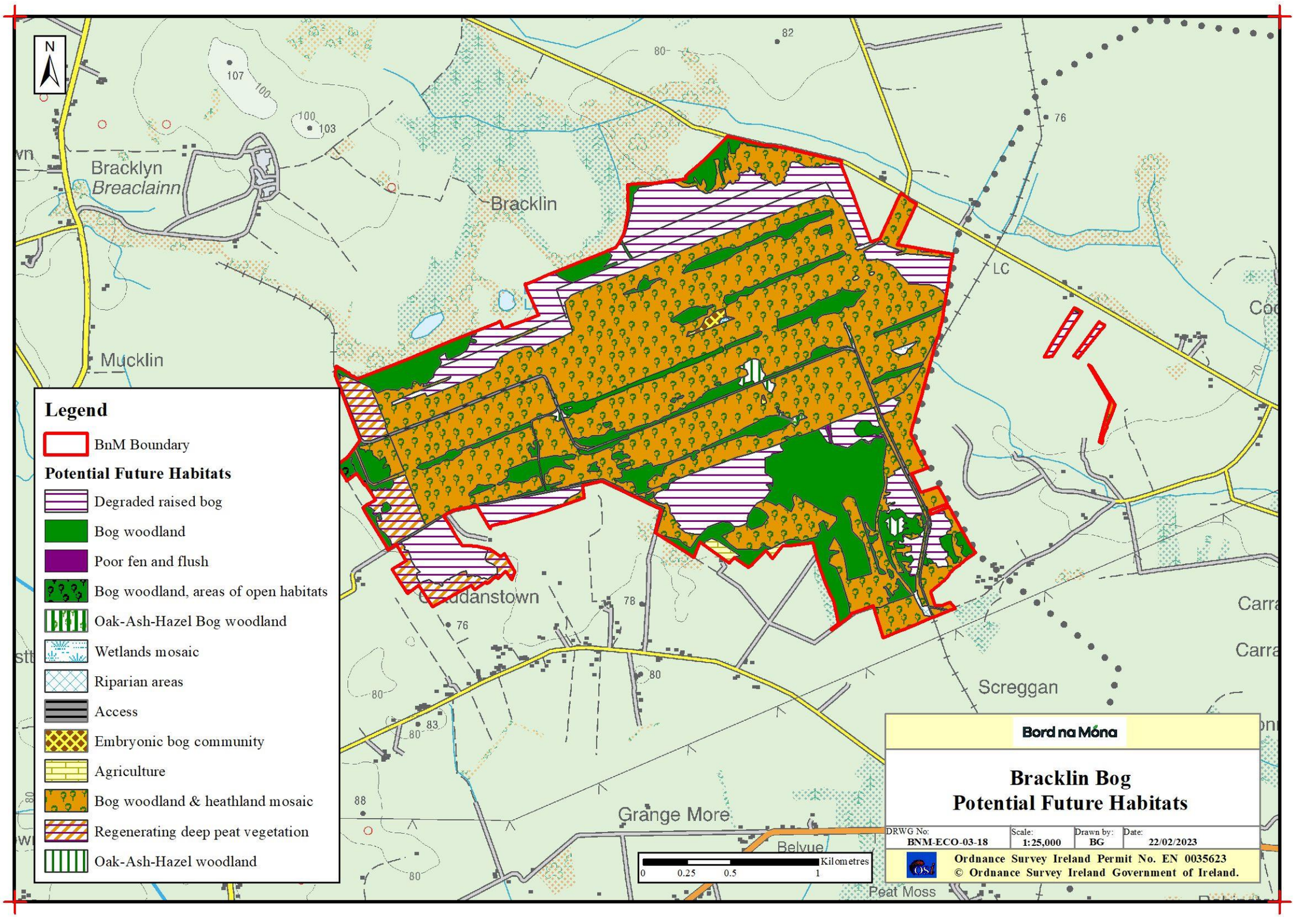

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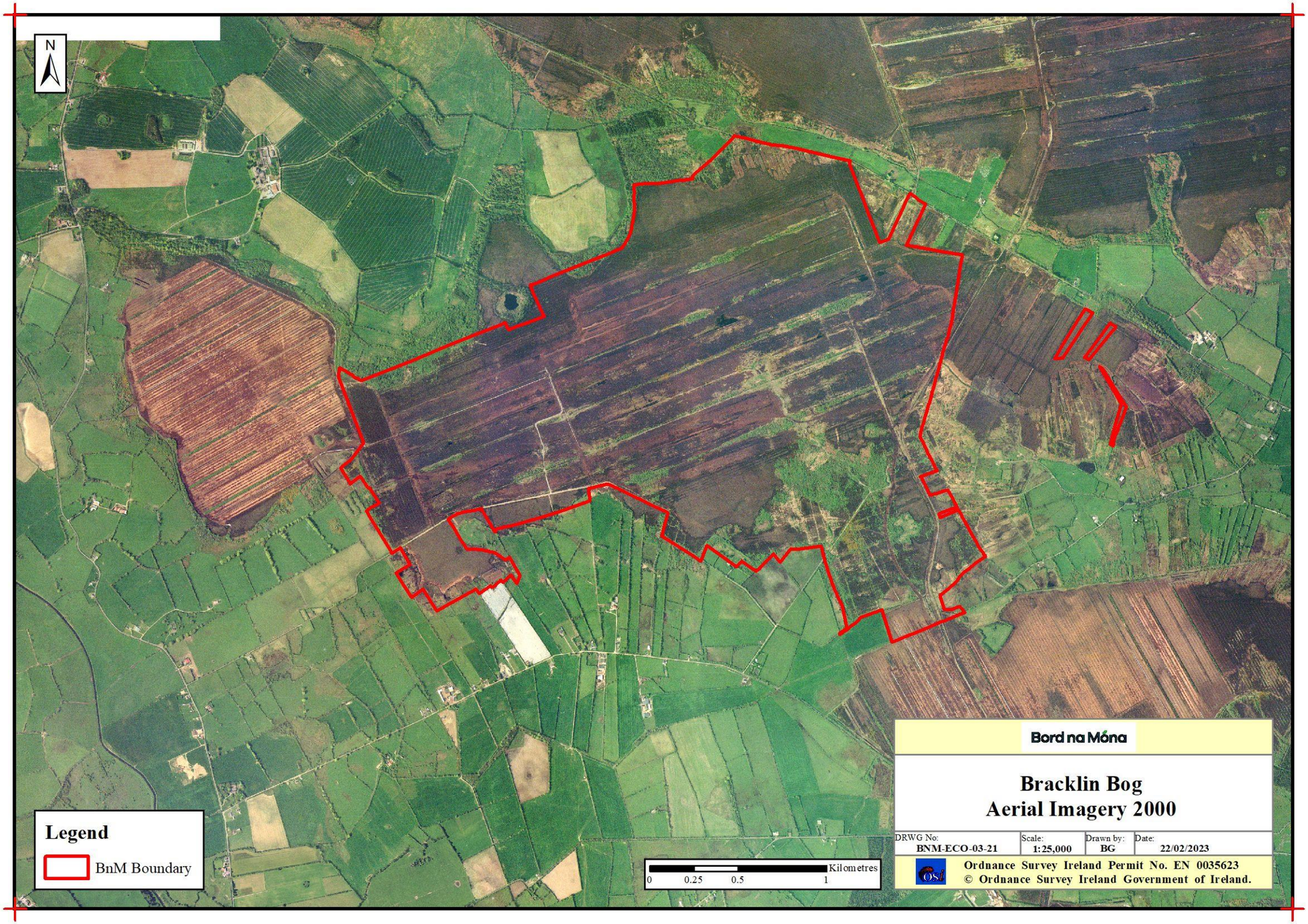

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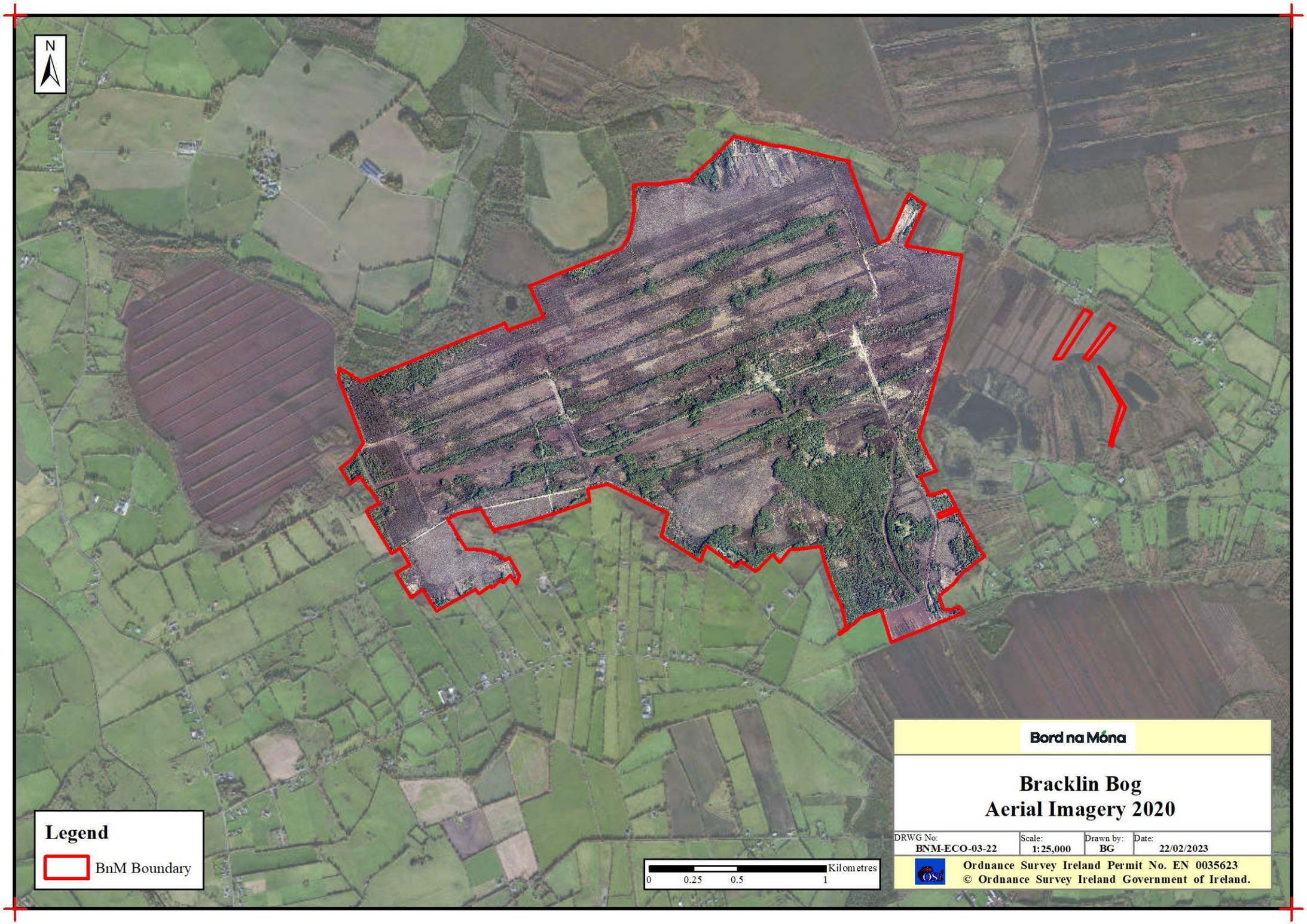

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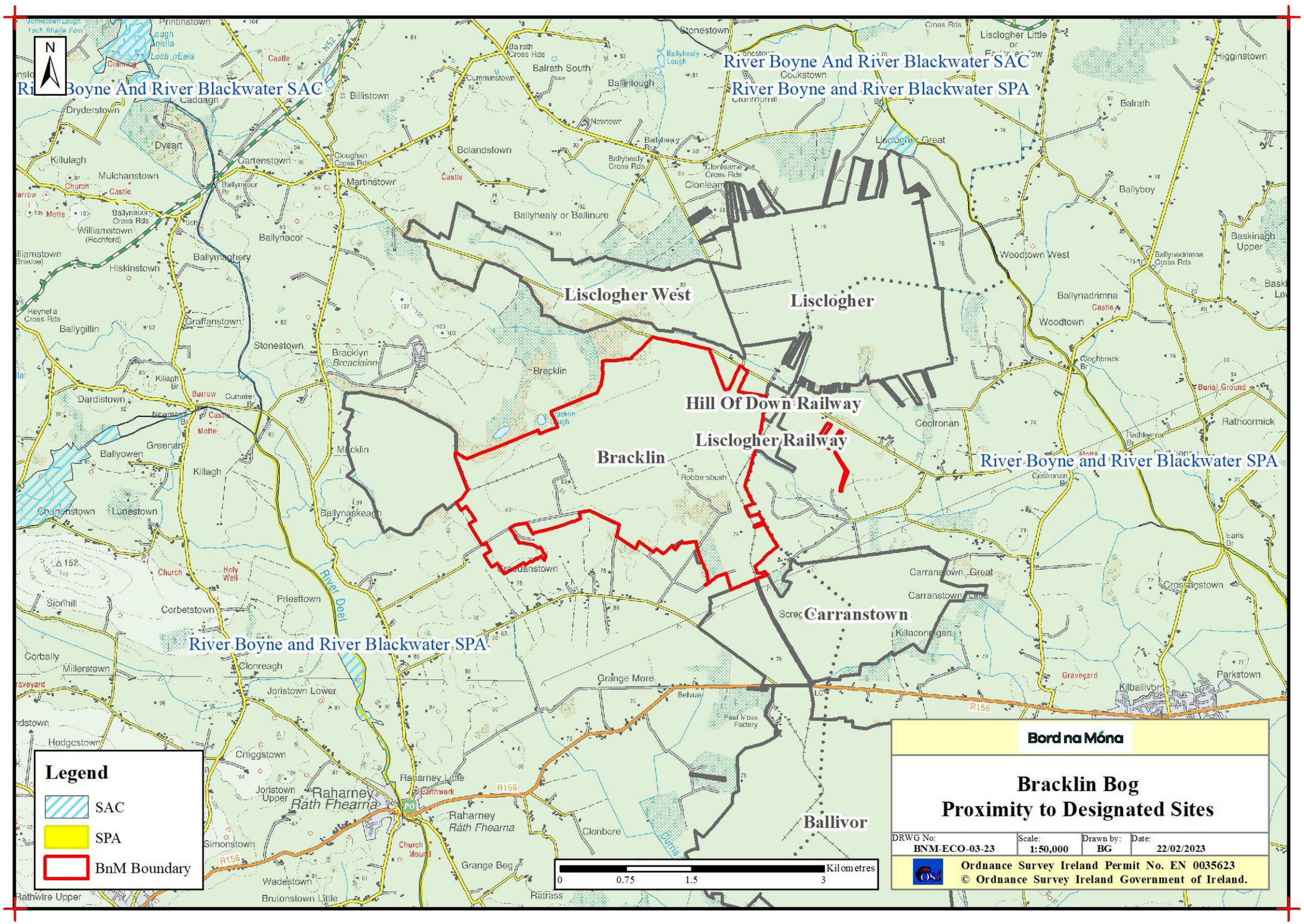

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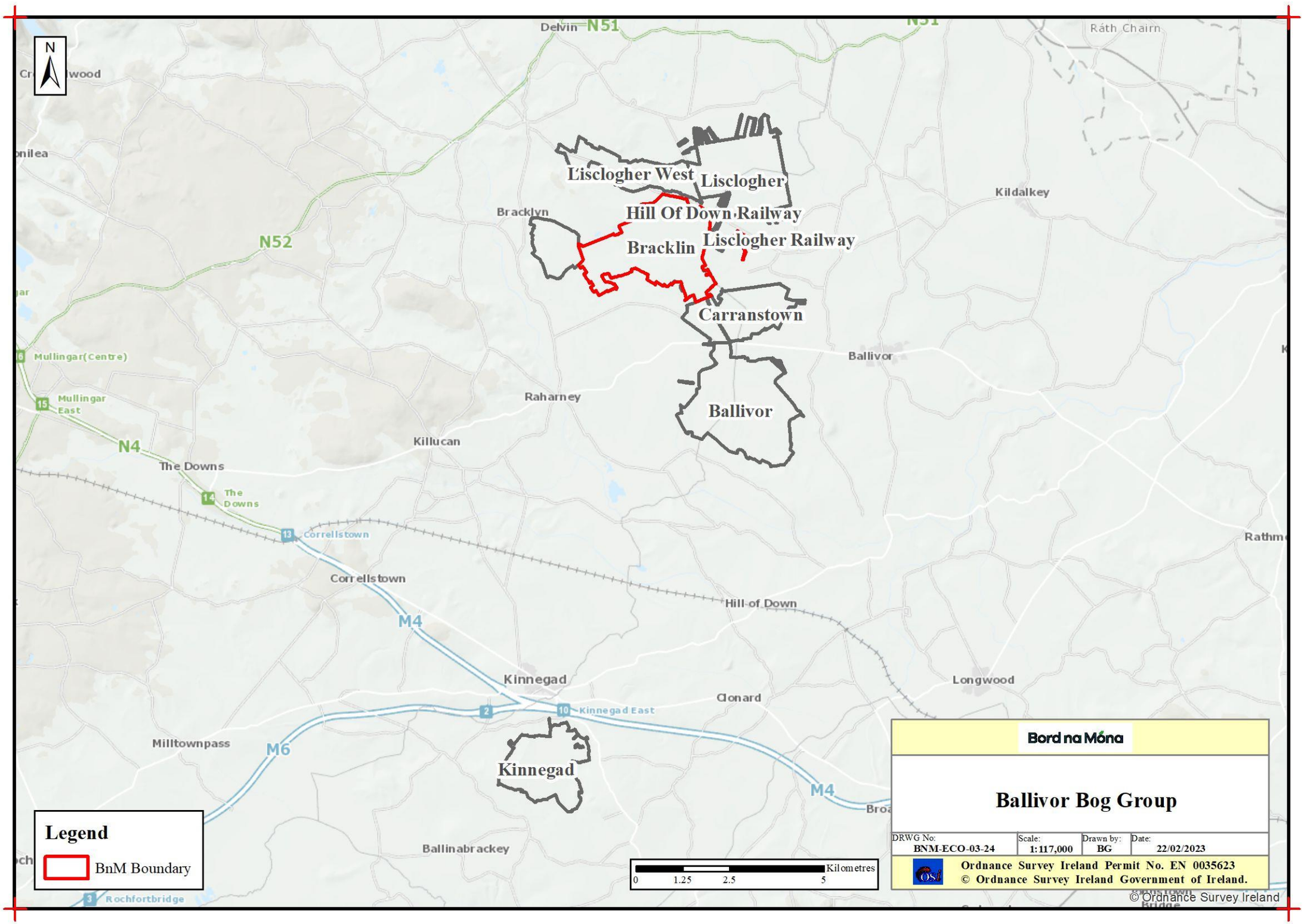

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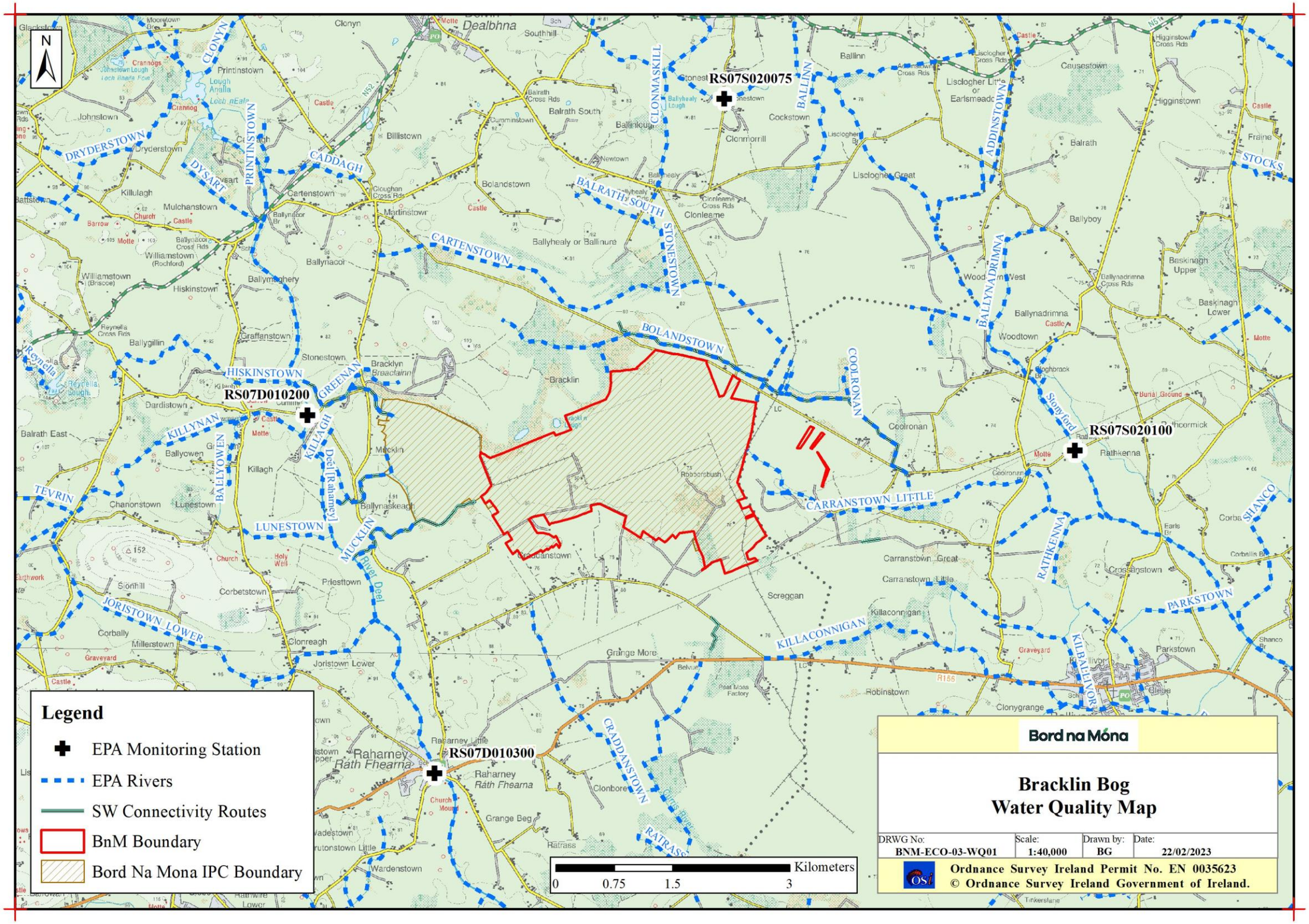

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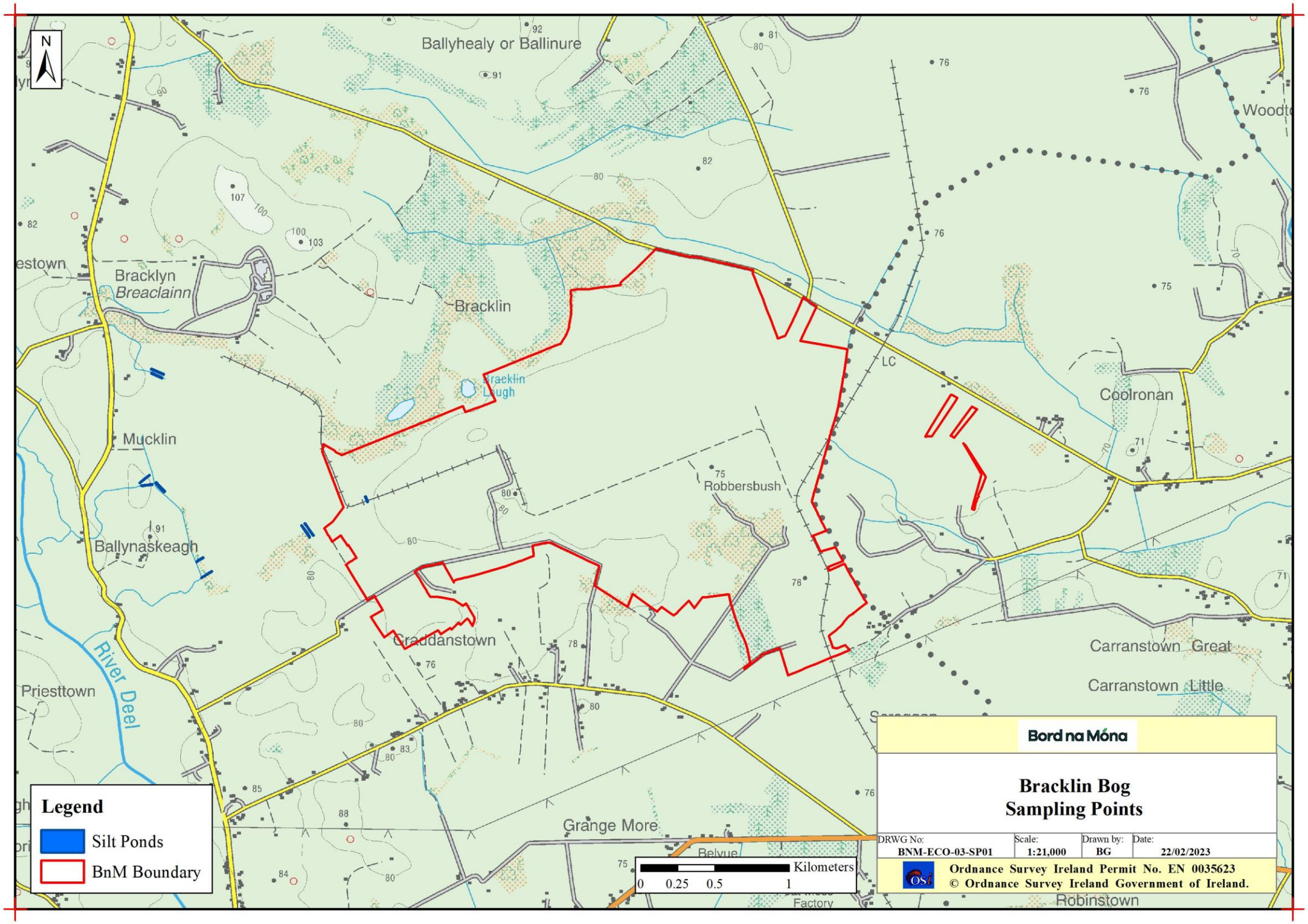

**BNM-ECO-03-03: LiDAR Map**

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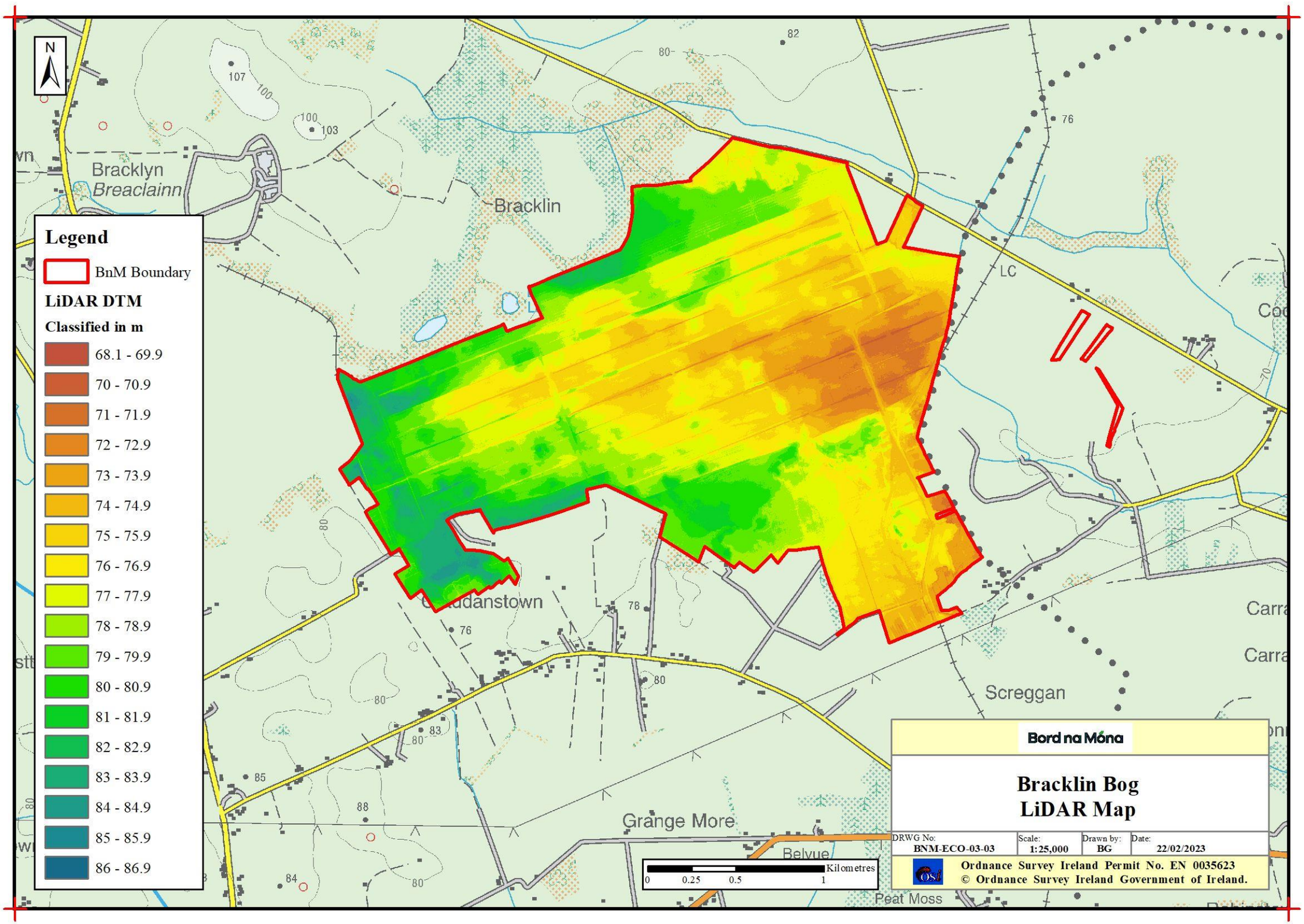

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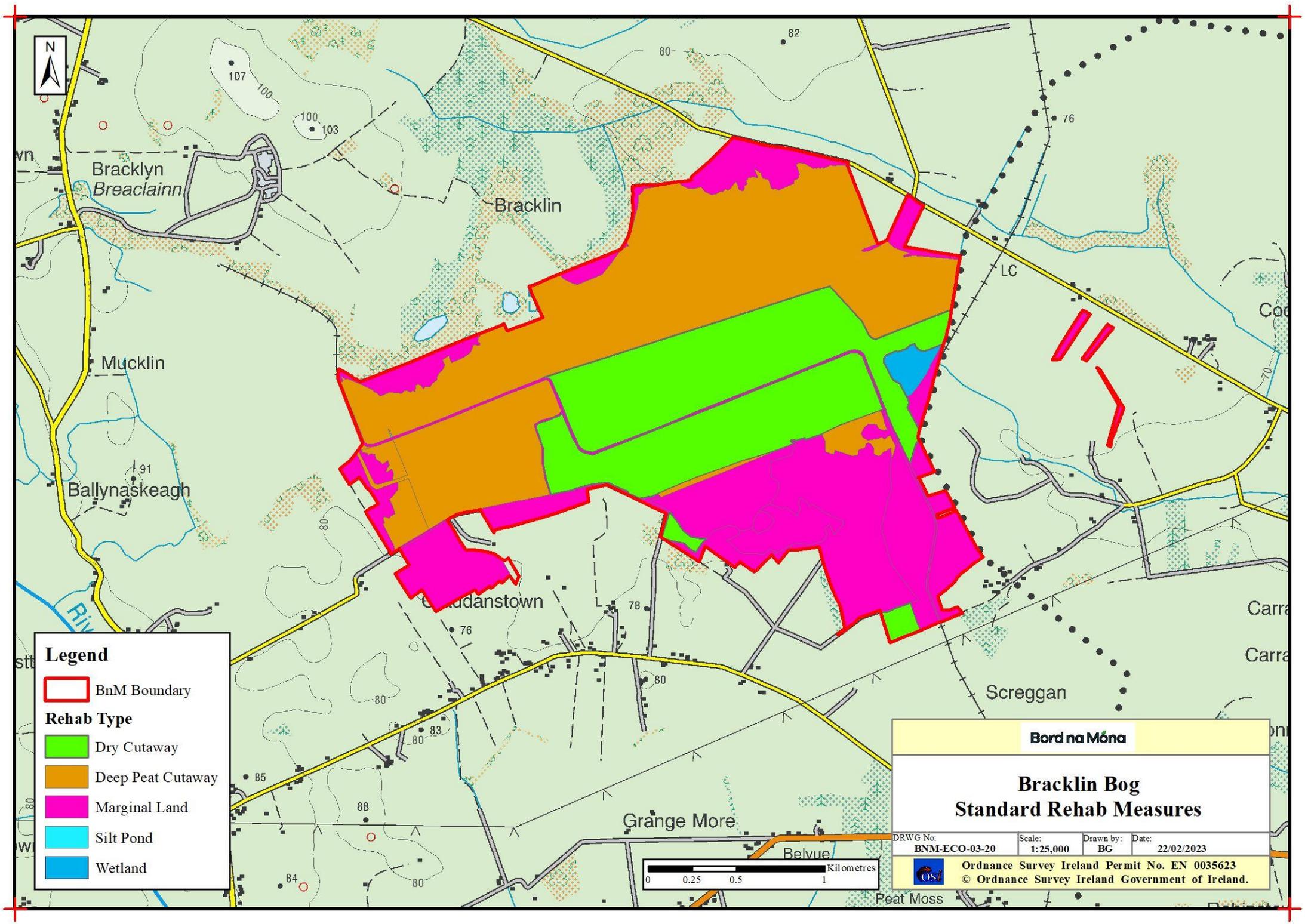
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Bracklin
Mucklin
Ballynaskeagh
Grange More
Belvue
Peat Moss
Screggan
Legend
BnM Boundary
Rehab Type
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Deep Peat Cutaway
Marginal Land
Silt Pond
Wetland
Kilometres
0 0.25 0.5 1
Bord na Móna
Bracklin Bog
Standard Rehab Measures
DRWG No: BNM-ECO-03-20
Scale: 1:25,000
Drawn by: BG
Date: 22/02/2023
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Bord na Móna

# Bracklin West Bog

# Cutaway Bog Decommissioning and Rehabilitation Plan

# 2023

This document seeks to address the requirements of Condition 10.2 of IPC License Ref. P0501-01:

> "*The licensee shall prepare, to the satisfaction of the Agency, a fully detailed and costed plan for permanent rehabilitation of the cutaway boglands within the licensed area.*"

*This licence condition requires Bord na Móna agree with the EPA the measures that will provide for rehabilitation, i.e. stabilisation of Bracklin West bog upon cessation of peat production and compliments the licence requirement to decommission the site.*

***Rehabilitation*** *generally comprises site stabilisation with natural colonisation with or without targeted management.*

*Industrial peat production has now fully ceased at Bracklin West bog.*

*In addition, to preparing this document to comply with Condition 10 of IPC Licence Ref. P0501-01, due regard was also given to the Peatlands Climate Action Scheme (PCAS) announced by the Minster. This Scheme will see the Minister support, via the Climate Action Fund* and Ireland's National Recovery and Resilience Plan*, Bord na Móna in developing a package of measures, 'the Scheme', for enhanced decommissioning, rehabilitation and restoration of cutaway peatlands referred to as, the Peatlands Climate Action Scheme'. However, only the additional costs associated with the additional and enhanced rehabilitation, i.e., measures which go beyond the existing standard mandatory decommissioning and rehabilitation requirements arising from Condition 10 will be eligible for support. The additional costs of the Scheme will be supported by Government, administered by the Department of Environment, Climate and Communications (DECC), while the National Parks and Wildlife Service (NPWS) will act as the Scheme regulator.*

*While this document outlines the enhanced rehabilitation measures planned for Bracklin West bog, activities which goes beyond that required by Condition 10 in the Licence, rehabilitation necessary to comply with the 'standard' requirement of Condition 10 (in the absence of the Scheme) is also included, to estimate costs. The inclusion of the 'standard' rehabilitation together with the enhanced rehabilitation in this document allows the Scheme Regulator to distinguish and objectively determine the specific activities (and their associated costs) eligible for support under the Scheme.*

*Bord na Móna have defined the key rehabilitation outcome at Bracklin West bog as environmental stabilisation, re-wetting and setting the bog on a trajectory towards development of naturally functioning peatland and wetland habitats.*

*Any consideration of any other future after-uses for Bracklin West bog will be conducted in adherence to the relevant planning guidelines and consultation with relevant authorities and will be considered within the framework of this rehabilitation plan.*

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| Name(s): | LC | JOS | CC |
| Date: | 07/03/2023 | 12/04/2023 | 28/04/23 |

Note: This finalised version of the Rehabilitation Plan has been updated to take account that several planning actions listed in Section 8.1 have been completed and have been incorporated into the plan. This includes an Appropriate Assessment of the rehabilitation plan. See Bracklin West Decommissioning and Rehabilitation Plan – Addendum 1 for more details.

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## NON-TECHNICAL SUMMARY

- Industrial peat harvesting is now finished at Bracklin West Bog.
- Bord na Móna is planning to rehabilitate Bracklin West Bog, located in Co. Westmeath in 2023.
- This is happening as Bord na Móna are obliged to carry out peatland rehabilitation via an IPC License issued by the Environmental Protection Agency. In addition, the Government has agreed to support peatland rehabilitation via the establishment of the Peatland Climate Action Scheme (PCAS). This is funded via the Government and by Bord na Móna.
- The key objective of peatland rehabilitation is environmental stabilisation. This means developing habitats and vegetation back onto the bare peat (putting a "skin" back onto the peat), and minimising effects to downstream waterbodies. Bracklin West was drained in the past to allow peat production. Better results for water quality improvements, climate action, the reduction of carbon emissions and biodiversity are achieved when the remaining peat is re-wetted. This means drain-blocking and other measures to raise water levels to the surface of the bog and to encourage the natural colonisation of vegetation.
- In general, soggy ground conditions are preferred. This means the remaining peat is wet and that plants that prefer wetter conditions, like Bog Cotton will thrive.
- Some sections with deeper residual peat have the capacity to regrow *Sphagnum* moss again, where there are suitable hydrological conditions. *Sphagnum* is a key species for restoring naturally functioning raised bog conditions.
- Many parts of Bord na Móna bogs cannot be restored back to raised bog in the short-term, as so much peat has been removed and the environmental conditions have been modified. However other peatland habitats with Heather, Bog Cotton, Rushes, Purple Moor-grass, Bog-mosses and scattered trees will develop, and in time a naturalised peatland can be restored.
- The development of a range of habitats in Bracklin West Bog will support biodiversity including plants, insects, birds and mammals. This includes some species that are rare and protected in the wider landscape. It will increase the national area of native woodland. Many wetland habitats in the wider landscape have been reclaimed for agriculture and other uses and peatland rehabilitation is an opportunity to create new peatland and wetland habitats.
- Bracklin West Bog was utilised for industrial peat production from the 1970's until 2020. Much of the former cutaway area currently comprises bare peat.
- Measures proposed for Bracklin West Bog include drain blocking and additional measures required to raise water levels to the surface of the peat (cell bunding for example). Some fertiliser will be spread on headlands and other areas (a small part of the overall area) to encourage vegetation growth.
- These rehabilitation measures will be planned by a team consisting of expert ecologists, hydrologists and engineers. It is a guiding principle of Bord na Móna rehabilitation planning that no actions or activities will be undertaken that would negatively impact on adjacent land. No boundary drains will be blocked. Water will still leave the bog via the existing outlets.
- It will take some time for vegetation and habitats to fully develop at Bracklin West Bog, and a peatland ecosystem to be restored. However, it is expected that most of the bog will be developing pioneer habitats after 5-10 years.
- This is a peatland rehabilitation plan. This plan does not consider future after-use or development. Bord na Móna continually reviews its land-bank to consider future commercial or industrial developments,

such as renewable energy. Any other proposed development will be planned in adherence to relevant planning guidelines and will consider the rehabilitation and the condition of the bog.

- Peatland rehabilitation of this bog will bring a range of benefits to the local community via improvements to the local landscape and is also important for supporting national policies and strategies in relation to reduction of carbon emissions from these peatlands, supporting biodiversity and improvements to water quality.

# 1. INTRODUCTION

Bord na Móna operates under IPC Licence issued and administered by the EPA to extract peat within the Ballivor-Derrygreenagh bog group (Ref. P0501-01). As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. Bracklin West bog is part of the Ballivor-Derrygreenagh bog group (see Appendix I for details of the bog areas within the Ballivor-Derrygreenagh bog group). Bracklin West bog is located in Co. Westmeath.

This plan is a specific rehabilitation plan for the bog and outlines:

- Description of site management and status.
- Main issues and approaches to rehabilitation.
- Consultation to date with interested parties.
- Interaction with other policy and legislative frameworks (Appendix VI).
- The planned rehabilitation goals and outcomes.
- The scope of the rehabilitation plan.
- Criteria which define the successful rehabilitation and key targets to validate rehabilitation.
- Proposed rehabilitation actions.
- Proposed timeframe to implement these measures.
- Budget and Costings.
- Associated aftercare, maintenance and monitoring.

Note: This plan should be read in conjunction with the accompanying Map book.

It is proposed by Government that Bord na Móna carry out a Peatlands Enhanced Decommissioning, Rehabilitation and Restoration Scheme on its peatlands. Note this proposal is also known colloquially as the 'Peatlands Climate Action Scheme' (PCAS). The additional costs of the Scheme will be supported by Government through the Climate Action Fund, and Ireland's National Recovery and Resilience Plan administered by the Department of Environment, Climate and Communications (DECC), while the National Parks and Wildlife Service (NPWS) will act as the Scheme regulator. Bord na Móna have previously identified a footprint of 33,000 ha as peatlands suitable for this scheme. This Scheme will significantly go beyond what is required to meet rehabilitation and decommissioning obligations (Appendix VII & IX) under existing EPA IPC licence conditions. Improvements supported by the Scheme will ensure that environmental stabilisation is achieved (meaning IPC obligations are met), and importantly, significant additional benefits, particularly relating to climate action and other ecosystem services, will also be delivered. The Scheme commenced in 2021.

Only the costs associated with the additional, enhanced, and accelerated rehabilitation, i.e. those measures which go beyond the existing decommissioning and rehabilitation requirements arising from Condition 10, will be eligible for support under the Scheme. Bord na Móna have now announced the complete cessation of industrial peat production across its estate (January 2021).

It is expected that the Scheme (PCAS) will have benefits accruing from biodiversity provision, water quality and storage attenuation as well as increased carbon storage, reduced carbon emissions and acceleration towards carbon sequestration. The Scheme will also facilitate monitoring of carbon fluxes (Greenhouse Gases and fluvial carbon) in selected areas (in addition to other established Research programmes), to monitor changes in where the interventions will accelerate the trajectory towards a naturally functioning peatland ecosystem.

It is envisaged that the Rehabilitation Scheme will support activities, interventions, or measures across the Bord na Móna cutaway peatlands which accelerate the original timelines. Selected rehabilitation measures will take account of site environmental conditions, which can vary significantly. These measures potentially include:

- more intensive management of water levels through pump management, drain-blocking and cell bunding,
- re-profiling that will deliver suitable conditions for development of wetlands, fens and bog habitats,
- targeted fertiliser applications,
- seeding of targeted vegetation, and
- proactive inoculation of suitable peatland areas with *Sphagnum.*

These are collectively designed to optimise hydrological conditions (ideally and where possible water-levels <10 cm) for climate action benefits and to accelerate the trajectory of the site towards a naturally functioning ecosystem, and eventually a reduced carbon source/carbon sink again. (In some areas of dry cutaway this trajectory will be significantly longer, and it is not feasible in the short-term to re-wet some areas. These areas will develop other habitats. The key to optimising climate action benefits is the restoration of suitable hydrological conditions and more intensive intervention means that the extent of suitable hydrological conditions can be optimised.

These measures are designed to encourage the development of peat-forming habitats, where possible. They are also designed to further slow the movement of water across the site (with the site acting similarly to a constructed wetland), slowing the release of water (improving local water attenuation) and water quality is also expected to improve as the site returns to a naturally functioning peatland ecosystem. The measures will also accelerate the development of new habitats for a range of species under pressure in the wider landscape and will have the potential to develop habitats (e.g. Annex I raised bog, wetlands that support wader water birds of conservation interest) that will contribute towards the delivery of national biodiversity objectives.

Bracklin West bog is proposed to be part of this Scheme (PCAS), which commenced in 2021 and this rehabilitation plan outlines the approach to be taken.

## 1.1 Constraints and Limitations

This document covers the area of **Bracklin West bog**.

Industrial peat extraction at Bracklin West bog permanently ceased in 2020 (having commenced in the 1970's). Currently the cutaway area comprises largely bare peat along with some small areas of pioneering cutaway habitats to the south east and north west, in addition to marginal[1] habitats.

Bord na Móna are currently developing a renewable energy project called Ballivor Wind Farm. Bracklin West is outside the development boundary of the proposed Ballivor Wind Farm and no turbines or wind farm infrastructure overlaps the currently proposed PCAS extent at Bracklin West (nearest is ca.600m to the east). This project is currently at the pre-planning stage. The potential impact of this infrastructure on the rehabilitated area is expected to be negligible and it does not change the overall goals and outcomes of the proposed rehabilitation (re-wetting residual peat) for Bracklin West.

[1] Marginal land is defined as land around the margin of the industrial peat production area. This margin generally contains a range of habitats including scrub, Birch woodland, cutover bog and raised bog remnants.

# 2. METHODOLOGY

This rehabilitation plan was developed with a combination of desktop and field surveys, consultations with internal and external stakeholders. The development of this rehabilitation plan considered **recently published** guidance issued by the EPA in 2020 – **Guidance on the process of preparing and implementing a bog rehabilitation plan**.

The ecological information and site information collected during the Bord na Móna ecological baseline surveys, additional confirmatory site visits (covering the period 2012 to 2023 inclusive) and monitoring and desktop analysis, forms the basis for the development of this rehabilitation plan for the bog along with:

- Experience of 40 years of research on the after-use development and rehabilitation of the Bord na Móna cutaway bogs (Clarke, 2010; Bord na Móna, 2016);
- Significant international engagement during this period with other counties in relation to best-practice regarding peatland rehabilitation and after-use through the International Peat Society and the Society for Ecological Restoration (Joosten & Clarke, 2002; Clarke & Rieley, 2010; Gann *et al*., 2019);
- Consultation and engagement with internal and external stakeholders;
- GIS Mapping;
- BNM drainage surveys;
- Bog topography and peat depth data;
- Hydrological modelling;
- The development of a Methodology Paper outlining the Scheme (PCAS). This rehabilitation includes enhanced measures defined in the Methodology Paper which are designed to exceed the standard stabilisation requirements as defined by the IPC Licence and to enhance the ecosystem services of Bracklin West bog, in particular, optimising climate action benefits.

## 2.1 Desk Study

The desk study involved collecting all relevant environmental and ecological data for the study area. The development of the rehabilitation plan also takes account of research, experience and engagement with other peatland restoration and rehabilitation projects and peatland research including Irish, UK, European and International best practice guidance (full citations are in the References Section):

- Anderson *et al*. (2017). An overview of the progress and challenges of peatland restoration in Western Europe.
- Barry, T.A. et al (1973). A survey of cutover peats and underlying mineral soils. Soil Survey Bulletin No. 30. Dublin, Bord na Móna and An Foras Taluntais.
- Bonn *et al*. (2017). Peatland restoration and ecosystem services- science, policy and practice.
- Carroll *et al*. (2009). *Sphagnum* in the Peak District. Current Status and Potential for Restoration. Moors for the Future Report No 16.
- Clark & Rieley (2010). Strategy for responsible peatland management.
- Eades *et al*. (2003). The Wetland Restoration Manual.
- Farrell & Doyle (2003). Rehabilitation of Industrial Cutaway Atlantic Blanket Bog, NW Mayo, Ireland.
- Gann *et al*. (2019). International Principles and Standards for the practice of Ecological Restoration.
- Hinde *et al*. (2010). *Sphagnum* re-introduction project: A report on research into the re-introduction of *Sphagnum* mosses to degraded moorland. Moors for the Future Research Report 18.

- Joosten & Clarke (2002). Wise Use of mires and peatlands – Background and Principles including a framework for Decision-making.
- Lindsay (2010). Peatbogs and Carbon: a Critical Synthesis to Inform Policy Development in Oceanic Peat Bog Conservation and Restoration in the Context of Climate Change.
- Mackin *et al*. (2017). Best practice in raised bog restoration in Ireland. Irish Wildlife Manuals, No. 99. National Parks and Wildlife Service,
- McBride *et al*. (2011). The Fen Management Handbook (2011), Scottish Natural Heritage.
- McDonagh (1996). Drain blocking by machines on Raised Bogs. Unpublished report for National Parks and Wildlife Service.
- NPWS (2017a). National Raised Bog Special Areas of Conservation management plan. Department of Arts, Heritage and the Gaeltacht.
- Pschenyckyj et al., 2021, Optimising Water Quality Returns from Peatland Management while Delivering Co-Benefits for Climate and Biodiversity. An Fóram Uisce.
- Quinty & Rochefort (2003). Peatland Restoration Guide, second edition. Canadian *Sphagnum* Peat Moss Association and New Brunswick Department of Natural Resources and Energy.
- Regan*, et. al.* (2020). Ecohydrology, Greenhouse Gas Dynamics and Restoration Guidelines for Degraded Raised Bogs. EPA Research Report. Prepared for the Environmental Protection Agency by Trinity College Dublin.
- Renou-Wilson *et al*. (2011). BOGLAND - Sustainable Management of Peatlands in Ireland. STRIVE Report No 75 prepared for the Environmental Protection Agency.
- Schouten (2002). Conservation and Restoration of Raised Bogs: Geological, Hydrological and Ecological Studies. Dúchas - The Heritage Service of the Department of the Environment and Local Government, Ireland;
- Thom (2019). Conserving Bogs – Management Handbook.
- Wheeler & Shaw (1995). Restoration of Damaged Peatlands – with Particular Reference to Lowland Raised Bogs Affected by Peat Extraction.
- Wittram *et al*. (2015). A Practitioners Guide to Sphagnum Reintroduction. Moors for the Future Partnership.


Additional on-line resources were also incorporated into the desk study, including:

- Ballivor-Derrygreenagh Integrated Pollution Control Licence;
- Ballivor-Derrygreenagh Annual Environmental Reports;
- Review of the National Biodiversity Data Centre (NBDC) webmapper;
- Inland Fisheries Ireland (IFI) Reports;
- Environmental Protection Agency database (www.epa.ie);
- EPA Guidance on Requests for Alterations to a Licensed Industrial or Waste Activity;
- BirdWatch Ireland online data (including I-WeBS and CBS datasets; www.birdwatchireland.ie);
- Geological Survey of Ireland - National Draft Bedrock Aquifer map;
- Geological Survey of Ireland - Groundwater Database (www.gsi.ie);
- Historic Environment Viewer at https://webgis.archaeology.ie/historicenvironment/
- National Parks & Wildlife Services Public Map Viewer (www.npws.ie);
- Water Framework Directive catchments.ie/maps/ Map Viewer (www.catchments.ie);
- OPW Indicative Flood Maps (www.floodmaps.ie);

- CFRAM Preliminary Flood Risk Assessment (PFRA) maps (www.cfram.ie);
- River Basin Management Plan for Ireland 2022-2027
- Bord na Móna Annual Report 2020.
- Spatial data in respect of Article 17 reporting, available online at https://www.npws.ie/maps-and-data/habitat-and-species-data/article-17.

## 2.2 Consultation

A number of stakeholders have been identified during the course of Bord na Móna's rehabilitation and Biodiversity Action Plan activities and are contacted during the rehabilitation planning process for their views. See Section 4.

## 2.3 Field Surveys

Bord na Móna carried out a baseline ecological survey of all of its properties in 2009-2012 and developed habitat maps. As part of this exercise, Bracklin West bog was surveyed in July of 2012. Additional ecological walk-over surveys and visits have taken place at Bracklin West Bog between 2015-2023. Habitat maps have been updated, where required. This rehabilitation plan is informed by the original baseline survey as well as subsequent confirmatory site walk-over surveys and visits, and updates to baseline data.

Habitat mapping followed best practice guidance from Smith *et al.* (2011). Map outputs including all habitat maps and target notes were produced using GIS software application packages (ArcGIS). General marginal habitats and other habitats that had not been modified significantly by industrial peat extraction were classified using Fossitt *et al*. (2000). Plant nomenclature for vascular plants follows Stace (2010), while mosses and liverworts nomenclature follows identification keys published by the British Bryological Society (2010). A more detailed Bord na Móna classification system was previously developed for classifying pioneer cutaway habitats as Fossitt categories were deemed not to be detailed enough for cutaway bog (much of cutaway bog could be classified as Cutover Bog - PB4).

A detailed ecological survey report for Bracklin Bog is contained in Appendix II. This report includes a larger area referred to as Bracklin Bog that was surveyed in 2012 and 2016. The current Bracklin West Bog extent is included within the larger bog area described in the ecological report provided in Appendix II.

# 3. SITE DESCRIPTION

Bracklin West Bog is located in Co. Westmeath, approximately 16km east of Mullingar (Grid reference: N 62310 57200). Bracklin Bog West is located close to the villages of Raharney and Ballivor. This bog is part of the Ballivor-Derrygreenagh group of bogs, with Lisclogher East and Lisclogher West located to the north and Carranstown Bog located to the south of the site.

Bracklin West Bog was a relatively young production bog with Industrial peat production having commenced in the late 1970s and ceased in 2020. Bracklin West Bog is considered a deep peat cutaway bog with large areas of deep peat remaining. The wider Bracklin Bog area to the east comprises a large area that was formerly a sod peat production bog and was never converted to milled peat production. This area has revegetated and stabilised, and there is extensive development of mature cutaway vegetation communities across the majority of the former production area.

Bracklin West Bog had been developed into milled peat production and the former production area now comprises bare peat. This remained in production up until 2020. Bracklin West Bog has a gravity drainage regime.

See Drawing number BNM-DR-24-15-01 titled ***Bracklin West Bog: Bog Site Location***, included in the accompanying Mapbook[2] , which illustrates the location of Bracklin West Bog in context to the surrounding area.

## 3.1 Status and Situation

### *3.1.1 Site history*

Industrial peat production commenced at Bracklin West in the 1970s and ceased in 2020. Bracklin West Bog formerly supplied a range of commercial functions including the supply of horticultural peat.

Bracklin West Bog had been developed into milled peat production and is now predominantly bare peat. Peat harvesting is now finished at Bracklin West Bog, having ceased in 2020.

### *3.1.2 Current land-use*

Industrial peat production has now permanently ceased at Bracklin West Bog which comprises predominantly bare peat.

Various different habitats including Birch woodland (WN7) and agricultural grassland (GA1) and scrub (WS1) are located along the margins of the site.

### *3.1.3. Socio-Economic conditions*

Bord na Móna has historically been a vital employer for the rural community of the Midlands of Ireland. Bord na Móna compiled a report on the role of peat extraction in the midlands historically in which they report that in 1986, by the end of Bord na Móna's Third Development Programme, a total of twenty-three work locations had been established around the country. The company had an average employment of approximately 4,688 in the mid 1980's, with a peak employment of 6,100 during the production season, which placed it among the country's

[2] Cutaway Bog Decommissioning and Rehabilitation Plan – Bracklin Bog Map Book

largest commercial employers. The importance of such levels of employment were largely due to its regional concentration in the Midlands and the lack of alternative employment opportunities at the time.

According to the Energy Crop Socio-Economic Study undertaken by Fitzpatrick Associates in 2011, there were an estimated 1,443 jobs supported by the peat-to-power industry in Ireland at the time, some 81% of which were located in the catchment areas of the three peat-fired generating stations (Lough Ree, West Offaly, and Edenderry Power Stations). These constituted jobs in the plants and in peat extraction, jobs indirectly supported in upstream supply industries and jobs induced through the trickle-down effects of the wages and salaries of those supported directly or indirectly.

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In respect of Bracklin West Bog, jobs included in the above study would have included those to facilitate peat extraction for the supply of horticultural peat.

As the primary employer in many Midland counties, Bord na Móna played a central role in building communities through several initiatives, including Education bursaries, support of local sporting clubs, the provision of community gain funds, charity programmes and the provision and building of amenity areas.

These job numbers have now declined with the cessation of peat extraction at this bog. It is anticipated that the scheme (PCAS) will provide some employment for a team of workers at this site for a period of time (> 1 year). There are approximately 1400 people working in Bord na Móna at present. There are approximately 255 roles directly involved in PCAS.

## 3.2 Geology and Peat Depths

### *3.2.1 Sub-soil geology*

The underlying geology[3] of Bracklin West bog is Ballysteen Formation.

### 3.2.2 *Peat type and depths*

Bracklin West bog has been developed into milled peat production and is now predominantly bare peat. Peat depths vary between 1 – 5+ metres, with some pockets of shallower peats also present.

[3] https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=de7012a99d2748ea9106e7ee1b6ab8d5&scale=0

## 3.3 Key Biodiversity Features of Interest

A detailed ecological report in relation to the wider area known as Bracklin Bog is provided in Appendix II. The current Bracklin West Bog proposed PCAS extent is included within the larger bog area described.

Due to the recent cessation of peat production, there has been little opportunity for post-production habitats to develop, and habitats of biodiversity interest are therefore largely confined to the marginal habitats fringing the cutaway.

### *3.3.1 Current habitats*

The most common vegetation communities present include (Categories in brackets refer to the current BnM classification system for vegetation communities, along with an equivalent Heritage Council habitat classification or Fossitt Code):

- Bare peat (community 'Bare peat (0-50% cover)'or BP) (Fossitt ED2);
- Birch woodland (community '*Betula*/*Salix*-dominated woodland' (Fossitt WN7);
- Remnant bog (community 'Embryonic bog') (Fossitt PB1)
- Mosaic of pioneer Heather-dominated vegetation (community 'Dry *Calluna* community' or dHeath) (Fossitt HH1) and Purple Moorgrass-dominated grassland (community '*Molinia caerulea*-dominated community' or gMol).
- Pioneer poor fen communities dominated by pioneer *Juncus effusus* community and pioneer *Eriophorum angustifolium* community (poor fen).
- Silt ponds (community 'Silt') (Fossitt Code FL8) with Gorse/Birch scrub (community '*Ulex*-dominated community') (Fossitt Code WS1) and Birch scrub (eBir or oBir as above) (Fossitt Code WS1).
- Riparian zones (community 'Riparian areas -stream or drain with associated edge habitats' or Rip) (Fossitt Code FW2/4);
- Access routes (rail lines and tracks including gravel embankments and associated habitats such as dry grassland communities (GS2) and scrub)

The most common habitats (Codes refer to Fossitt 2000) found around the margins of Bracklin West bog include:

- Birch woodland (WN7)
- Scrub (WS1)
- Cutover Bog (PB4)
- Improved grassland (GA1) around the boundary where the GIS boundary extends into adjacent fields
- Wet grassland (GS4)
- Riparian/drainage ditches (FW4)
- Silt ponds
- Access tracks (bare peat)

The former sod peat production area of Bracklin West is dominated by bare peat. The margins of the site are dominated by Birch woodland. An area of remnant bog is located to the south, south east and north with the additional habitats of scrub and pioneer heath and grassland in the south eastern corner of the site. Bracklin West Bog is predominantly bordered by woodland with the exception of the south-eastern boundary which is bordered by heath. .

See Drawing number BNM-DR-24-15-17 titled ***Bracklin West Bog: Current Habitat Map***, included in the accompanying Mapbook, which illustrates the habitats at Bracklin West Bog. Note: this is an aggregated general habitat map based on the detailed BnM habitat survey of Bracklin West. Similar vegetation communities have been aggregated.









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*Table 1: Photos of Habitats at Bracklin West Bog (2023).*

### *3.3.2 Species of conservation interest*

A number of species of conservation concern have been recorded at Bracklin West Bog. The following is a summary of the records of these species available within both BnM records and those of the National Biodiversity Data Centre (NBDC).

Multiple mammal species have been recorded on or within 1 Km of the bog; Irish Hare (*Lepus timidus subsp. Hibernicus)*, Eurasian Badger (*Meles meles)* and European Otter (*Lutra lutra*).

Regarding lepidopteran species, records exist for Marsh Fritillary (*Euphydryas aurinia)*, Meadow Brown (*Maniola jurtinal)*, Small Heath (*Coenonympha pamphilus*), Ringlet (*Aphantopus hyperantus*) and Wood White (*Leptidea* sp.).

Numerous bird species are known to use the cutover bogs in Ireland's midlands as breeding grounds, wintering grounds or both. Kestrel (*Falco tinnunculus*), Meadow Pipit *(Anthus pratensis*, as well as other common bird species including included Blackcap (*Sylvia atricapilla),* Song Thrush *(Turdus philomelos),* Wood Pigeon (*Columba palumbus*), Whitethroat (*Sylvia communis),* Blue Tit (*Cyanistes caeruleus*), Blackbird (*Turdus merula*), Redpoll *Carduelis flammea cabaret*), Rook (*Corvus frugilegus*) (, Hooded Crow (*Corvus cornix*) and Wren (*Troglodytes troglodytes*) have all been recorded during BNM ecology surveys.

NBDC records for red-listed[4] bird species of conservation concern recorded in the 10km squares (N55 and N65) which Bracklin West bog intersects include the species Kestrel (*Falco tinnunculus*), Grey Wagtail (*Motacilla cinerea*), Corncrake (*Crex crex*), Curlew (*Numenius arquata)*, Red Grouse (*Lagopus lagopus),* Golden Plover (*Pluvialis apricaria),* Woodcock (*Scolopax rusticola),* Redwing (*Turdus iliacus),* Lapwing (*Vanellus vanellus),* Meadow Pipit *(Anthus pratensis)* and Black-headed Gull *(Larus ridibundus).* There is potential (habitat availability) for some of these bird species to utilise Bracklin West Bog with the exception of Corncrake which is associated with hay meadows; breeding opportunities for Curlew are also limited.

### *3.3.3 Invasive species*

A single Third Schedule invasive plant species , Rhododendron *Rhododendron ponticum* has been recorded in Bracklin West bog. A broad range of common garden escapes are occasionally present around the margins of Bord na Móna bogs. Although spatial overlap with the rehabilitation work is expected to be limited, these are, where necessary, to be treated in line with best practice during rehabilitation.

## 3.4 Statutory Nature Conservation Designations

There are a number of European Sites (SAC's or SPA's) in close proximity (i.e. within a 5km radius at minimum) to Bracklin West Bog. Bracklin West Bog has no overlapping designated sites. The nearest EU Designated sites to Bracklin Bog are as follows:

- River Boyne And River Blackwater SAC (site code: 002299) located approx. 760 m west
- River Boyne And River Blackwater SPA (site code: 004232) located approx. 770 m west
- Mount Hevey Bog SAC (site code: 002342) (also a pNHA) located approx. 7km south

[4] Gilbert G, Stanbury A and Lewis L (2021), "Birds of Conservation Concern in Ireland 2020 –2026". Irish Birds 9: 523—544

The nearest nationally designated sites to Bracklin West Bog are the Royal Canal pNHA (site code: 002103) located approximately 6.5km south of the site and Mount Hevey Bog pNHA (site code: 001584) located 7km south.

See drawing *BNM-DR-24-15-23:* ***Bracklin West Bog: Proximity to Designated Sites*** in the accompanying map book.

### *3.4.1 Other Nature Conservation Designations*

The Ramsar Convention entered into force in Ireland on 15th March 1985. Ireland currently has 45 sites/wetlands designated as Wetlands of International Importance (Ramsar Sites). These cover a surface area of 66,994ha. There are no Ramsar site in close proximity to Bracklin West bog. The closest Ramsar Sites to Bracklin West bog are Lough Owel and Lough Iron, located 17km west and 12km northwest respectively.

## 3.5 Hydrology and Hydrogeology

Bracklin West forms part of the Boyne Catchment (Catchment ID : 07) as defined by the EPA under the Water Framework Directive (WFD) and is primarily situated within the Deel [Raharney]_SC_010 and Boyne_SC_040 sub-catchments. The bog is located approximately 16km East of Mullingar, in County Westmeath. The bog contains several drainage pathways and discharge locations, with the majority of the bog discharging to the Deel (Raharney) River to the West of the bog.

GSI data indicates that Bracklin West Bog is underlain by the Ballysteen Formation, which is a dark muddy limestone with shale. This unit is classified as locally important aquifer as they are moderately productive in local zones only. Geological Survey of Ireland (GSI) mapping does not identify any karst feature in close proximity to the bog, with the nearest feature (a spring) located >2.5km to the north-west of the bog. No data exists concerning depth to bedrock and there are no mapped features of exposed bedrock in close proximity to the bog.

Locally important aquifers that are Moderately Productive only in Local Zones are defined as having a limited and relatively poor connected network of fractures, fissures and joints, giving a *low* fissure permeability which tends to decrease further with depth. A shallow zone of higher permeability may exist within the top few metres of more fractured/weathered rock, and higher permeability may also occur along fault zones. These zones may be able to provide larger 'locally important' supplies of water. In general, the lack of connection between the limited fissures results in relatively poor aquifer storage and flow paths that may only extend a few hundred metres.

Bracklin West Bog is located in an area mapped by GSI as of low groundwater vulnerability, with the area of bog to the east of the site lying in an area of moderate groundwater vulnerability (GSI Map viewer). Groundwater Vulnerability is a term used to represent the intrinsic geological and hydrogeological characteristics that determine the ease with which groundwater may be contaminated by human activities. Groundwater vulnerability maps are based on the type and thicknesses of subsoils (sands, gravels, glacial tills (or boulder clays), peat, lake and alluvial silts and clays), and the presence of karst features. Groundwater is most at risk where the subsoils are absent or thin and, in areas of karstic limestone, where surface streams sink underground at swallow holes. These data indicate there is generally low risk of any groundwater contamination occurring at this site.

Quaternary Sediment maps show Bracklin West to be underlain by peat, yet surrounded by inorganic deposits, predominately till derived from limestone, with a pocket of alluvium mapped north of the bog. Groundwater Vulnerability is typically used to indicate the susceptibility to groundwater pollution; however, it can provide a useful proxy indication of likely groundwater flow rates in the surrounding area. Groundwater vulnerability for

the surrounding areas is generally low to moderate, with some areas of higher vulnerability mapped in areas where till sequences are suspected to be thinner.

## 3.6 Emissions to surface-water and watercourses

Drainage is an important feature of industrial peat production and there were extensive field drains maintained throughout bog areas to facilitate industrial peat production annually, each of which eventually drains into a terminal silt pond that allows for settlement of suspended solids before entering the main river systems. In accordance with the existing Integrated Pollution Control licence, all drainage water from boglands in a licensed area is discharged via an appropriately designed silt pond treatment arrangement as required in Condition 6.6. of the licence. Industrial peat production has now permanently ceased at Bracklin West Bog.

Silt ponds are the key silt control infrastructure to control potential emissions from industrial peat production sites. As required under licence, BNM have a number of procedures for how it manages and maintains its silt pond network. The silt that builds up in silt ponds is excavated on a regular basis by Bord na Móna to facilitate an efficient level of silt control. Silt ponds will continue to be maintained during the rehabilitation and decommissioning. Silt pond decommissioning will be considered when sites are deemed to be on a trajectory of environmental stability and peatland rehabilitation has been completed.

Bracklin West bog has 3 treated surface water outlets from previously active peat extraction catchments. Two of the treated outlets discharge to the River Deel (IE_EA_07D010200 DEEL (RAHARNEY)_030) & (IE_EA_07D010300 DEEL (RAHARNEY)_040) with the remaining one discharging to the Craddanstown River (IE_EA_07D010600 DEEL (RAHARNEY)_060).

Details of silt ponds, associated surface water emission points and those being monitored and sampled as part of the PCAS scheme are detailed on the accompanying structures map along with water quality map. See Drawing number BNM-DR-24-15-SP01 titled Peatlands and Climate Action Scheme Bracklin West: Sampling Points, along with Drawing number BNM-DR-24-15-WQ01 titled Peatlands and Climate Action Scheme Bracklin West Bog: Water Quality Map.

There is a robust monitoring program to track and verify any changes in baseline water quality conditions pre and post decommissioning and rehabilitation so that the success or otherwise can be tracked and verified for the National Parks & Wildlife Service, Environmental Protection Agency and Local Authority Water Program, amongst a range of stakeholders.

The Deel or Craddanstown Rivers were not listed as being under pressure from peat extraction in the 2nd cycle of the River Basin Management Plan for Ireland and is indicated as remaining so in the third cycle, which is currently in preparation.

The main emission limit value associated with this bog is 35mg/l suspended solids, with trigger levels for ammonia of 2.78 mg/l and COD 100mg/l.

From an analysis of any results over previous five years of the IPC licence environmental monitoring of some of the discharges from this bog, these indicate that results were under the Emission Limit Value for Suspended Solids and Ammonia and broadly under the trigger level for COD.

Ammonia averaged 1.17mg/l and ranged from 0.022 to 2.6 mg/l with Suspended Solids ranging from 2 to 14 mg/l and averaging 5.13 mg/l.

| Bog | SW | Monitoring | pH | SS | TS | Ammonia | TP | COD | Colour |
|---|---|---|---|---|---|---|---|---|---|
| Bracklin | SW-29 | Q3 22 | NO FLOW | | | | | | |
| Bracklin | SW-30 | Q3 22 | 6.6 | 11 | 211 | 0.025 | 0.12 | 117 | 680 |
| Bracklin | SW-26 | Q3 21 | 7.1 | 5 | 235 | 0.968 | 0.05 | 61 | 394 |
| Bracklin | SW-27 | Q3 21 | 7.6 | 3 | 249 | 0.022 | 0.05 | 56 | 396 |
| Bracklin | SW-29 | Q 2 21 | 7.2 | 10 | 386 | 1.51 | 0.06 | 69 | 257 |
| Bracklin | SW-30 | Q 2 21 | 7.1 | 10 | 366 | 1.22 | 0.07 | 65 | 246 |
| Bracklin | SW-29 | Q3 20 | 6.7 | 3 | 178 | 0.14 | 0.05 | 91 | 440 |
| Bracklin | SW-30 | Q3 20 | 7.1 | 3 | 221 | 0.163 | 0.05 | 76 | 326 |
| Bracklin | SW-29 | Q 2 19 | 7.4 | 5 | 305 | 1.4 | 0.05 | 60 | 166 |
| Bracklin | SW-30 | Q 2 19 | 7.5 | 6 | 328 | 1.6 | 0.05 | 60 | 177 |
| Bracklin | SW-26 | Q3 19 | 6.6 | 2 | 211 | 1.38 | 0.05 | 82 | 307 |
| Bracklin | SW-27 | Q3 19 | 7.4 | 2 | 306 | 1.9 | 0.05 | 76 | 247 |
| Bracklin | SW-29 | Q4 18 | 7 | 5 | 164 | 2.6 | 0.28 | 91 | 345 |
| Bracklin | SW-30 | Q4 18 | 6.6 | 5 | 136 | 2.4 | 0.05 | 95 | 90 |
| Bracklin | SW-26 | Q1 18 | 6.4 | 5 | 96 | 0.71 | 0.06 | 57 | 191 |
| Bracklin | SW-27 | Q1 18 | 7.1 | 5 | 224 | 1.6 | 0.05 | 72 | 326 |

### Decommissioning and Rehabilitation Programme Water Quality Monitoring

The licence obligation of quarterly sampling regime on a selected number of ponds to be sampled over a 3 year cycle would not be sufficient to be able to appropriately track the changing water chemistry that will occur as part of this enhanced rehabilitation programme, so this sampling regime will occur on a monthly basis.

To assist in monitoring surface water quality from this bog, it was agreed to increase the existing licence monitoring requirements of the IPC Licence, to sampling for the same parameters every month.

This new sampling programme commenced in November 2020 and is enabling a baseline to be established, with sampling to progress during the scheduled works, and for a period of up to 2 years post rehabilitation. Depending on the period required to confirm that the main two parameters, suspended solids and ammonia as remaining compliant with the licence emission and trigger limit values and there is an improving trajectory in these two parameters i.e. reduction in concentration, the monitoring programme and intensity will be periodically reviewed and amended.

Initial monthly results are included in Appendix XIII for Bracklin West. These results cover the period from November 2020 to November 2022 and are from 2 the main surface water outlets from the sections of bog to be rehabilitated in 2023. Peat extraction ceased in these bogs in 2020 and as expected some of the key water quality parameters that can impact water quality from peat extraction activities, remain on a relatively static trajectory, with suspended solids indicating a flat trend. During this period, ammonia did indicate an increase in trend during the 24 months of sampling, with all other parameters fluctuated slightly, most likely influenced by normal weather patterns, especially rainfall.

Monthly ammonia concentrations from both bogs from November 202 to November 2022 had a range of 0.019 to 2.24 mg/l with an average of 0.750 mg/l.

Results for suspended solids for the same period indicate a range of 2 to 11 mg/l with an average of 3.06 mg/l.

In the preparation of this monitoring programme, Bord na Mona have been providing the Local Authority Water Programme (LAWPRO) with details of the surface water emissions points associated with this bog and will be amending some of the proposed monitoring locations on foot of this engagement. LAWPRO have in turn provided details of their 2021 monitoring programme and these are included in the Water Quality Map.

This is necessary to ensure that there is alignment with the WFD monitoring programme and that where possible, the monitoring programme will enable any improvements in water quality or establishing trends to be quantified against any available WFD monitoring data. It will also enable the periodic sharing of data which will inform the monitoring reports, success criteria and enable LAWPRO under the Water Framework Directive to track any changes in pressures and be aware of changes in water chemistry.

Monitoring results will be maintained, trended every six months and reported on each year and as required, as part of the requirement to report on Condition 10.1 of the IPC Licence on Bog Rehabilitation in the Annual Environmental Report, and will be provided to LAWPRO and the EPA as required to inform progress and national monitoring requirements under the WFD.

These results will also be available in April each year as a requirement of the Annual Environmental Report at www.epa.ie.

The parameters to include as per condition 6.2 of the IPC Licence include monthly monitoring for pH, Flow, Suspended Solids, Total Solids, Total Phosphorus, Total Ammonia, Colour & COD. In addition, DOC has been included as a parameter to try and identify any changes in carbon in the surface water, and where required by LAWPRO, to assist in investigating other changes in water chemistry, the series of parameters can be reviewed and amended.

Rehabilitation of cutaway peatland is closely linked with control of emissions. One of the criteria for successful rehabilitation is stabilisation through re-vegetation, which will stabilise all substrates and in turn remove the need for further silt control measures. This site is already largely vegetated. Re-wetted peat also aids the primary objective of stabilizing peat, as when peat is re-wetted it is not vulnerable to wind erosion. Re-wetted peat and the development of wet peatland habitats can also act as sinks for silt and mobile peat, and increases additional retention time for solids, and the peatland vegetation can quickly stabilise this material within blocked drains on site (by acting like constructed wetlands).

Water quality of water discharges from restored peatlands normally improves as a result of bog restoration measures and the restoration of natural peatland processes (Bonn *et al*., 20017). Bog restoration is also expected to improve water attenuation of the site as the drains are blocked, slowing water movement and water release from the site. Restored peatlands help slow the release of water and aid the natural regulation of floods downstream (Minayeva *et al*., 2017). The National River Basin Management Plan (NRBMP) 2018-2021 (DHPCLG, 2017) is the key national plan for Ireland to achieve the objectives of the Water Framework Directive (WFD). The NRBMP outlines how key actions such as the Bord na Móna peatland rehabilitation is expected to have a positive impact on water quality and help the NWBMP deliver its objectives in relation to the WFD.

Water will still discharge from designated emission points when rehabilitation at Bracklin West has been completed. This discharge will have improved water quality and there will be increased wetland attenuation, meaning slower release of water. This is expected to have a positive impact on status of the key waterbody receptors: River Deel (IE_EA_07D010200 DEEL (RAHARNEY)_030) & (IE_EA_07D010300 DEEL (RAHARNEY)_040) and Craddanstown River (IE_EA_07D010600 DEEL (RAHARNEY)_060),and will support the future status of the waterbodies achieving Good Status.

## 3.7 Fugitive Emissions to air

None.

The bog is no longer in industrial peat production. Rehabilitation of the peatland will seek to re-wet the dry peat where possible and re-vegetate all areas (whether wet or dry). Collectively, ceasing industrial peat production, re-wetting and re-vegetating will minimise any risk of emission to air from dust.

## 3.8 Carbon emissions

Irish peatlands are a huge carbon store, containing more than 75% of the national soil organic carbon (Renou-Wilson et al. 2012). Peatland drainage and extraction transforms a natural peatland which acts as a modest carbon sink into a carbon source (Waddington & McNeil, 2002; Alm *et al*., 2007; Wilson *et al*., 2007, Wilson *et al*., 2015). A natural peatland can take in 0.1 to 1.1 t of carbon as CO2-C /ha/yr while drainage and extraction can create large source of carbon dioxide releasing 1.3 to 2.2 t of carbon as CO2-C /ha/yr (based on Tier 1 Emission factors, Evans et al. 2017). Renou-Wilson et al. (2018) reported losses of between 0.81 – 1.51 CO2-C /ha/yr from drained peatlands located in Ireland.

Re-wetting of dry peatlands will increase methane emissions (Gunther et al. 2020) as a consequence of the anoxic conditions within the peat body that provide a suitable environment for the microbial breakdown of plant litter and root exudates. Tanneberger et al. (2021) describes how peatland management has to choose between CO2 emissions from drained peatlands or increased methane (CH4) emissions from rewetted industrial peatlands. However, when radiative effects and atmospheric lifetimes of both GHG gases are considered and modelled, postponing rewetting increases the longterm warming effect of continued CO2 emissions (Gunther et al. 2020). This means the increase in methane due to rewetting of dry peatlands is still negated by the CO2 emissions reductions. Further, Wilson et al. (2022) confirmed the benefit of rapid rewetting to achieve strong carbon reductions and potentially altering the warming dynamics from warming to cooling depending upon the climate scenario.

It is expected that Bracklin West Bog will become a reduced carbon source following rehabilitation. The potential of any cutaway site to develop as a carbon sink in the longer-term depends on the success of the rehabilitation measures, the extent of development of *Sphagnum*-rich or other peat-forming habitats, the balance of carbon fluxes from different cutaway habitats and future climatic conditions. Much of this bog is expected to develop embryonic bog on deep peat areas, and wetland habitats on shallow peat with open water, reed swamp and fen habitats with alkaline emission factors. Birch woodland is expected to develop on the drier mounds and peripheral headlands.

## 3.9 Current ecological rating

(Following NRA (2009) Evaluation Criteria)

The habitats of Bracklin West Bog can be rated as **Local Importance; lower value to Local Importance; higher value.** Bare peat and in the former production area of Bracklin West Bog are assessed as **local importance (lower value)**. The remaining habitats recorded; woodland, scrub, dry heath, remnant bog, wetland and riparian habitats may act as a refuge and as ecological corridors for wildlife and are therefore deemed to be **locally important (higher value)**.

# 4. CONSULTATION

## 4.1 Consultation to date

Consultation seeks to engage an audience of relevant stakeholders at both a national and local level. National stakeholders have been identified from varied bog restoration and rehabilitation efforts undertaken by Bord na Móna over the past 40 years, with particular emphasis on engagement with stakeholders during their Biodiversity Action Plan programme, since 2010. National Stakeholders includes relevant government departments and agencies, relevant semi-state bodies, NGOs and other environmentally focused groups with a national remit.

There has been ongoing consultation about rehabilitation, biodiversity, and other general issues over the years about Ballivor-Derrygreenagh bog group, including Bracklin West Bog, with various stakeholders in relation to:

- General consultation with range of stakeholders at annual Bord na Mona Biodiversity Action Plan review days 2010-2018,
- Meetings and site visit with local community group - Meath-Westmeath Bog Group regarding rehabilitation of Bracklin Bog between 2013 - 2016.
- Meeting with Westmeath County Council regarding general rehabilitation plans for BnM bogs and BnM BAP (2016)
- Midlands & East Regional WFD Operational Committee (River Basin Management Plans),
- The proposed development of the nearby Ballivor wind farm,
- Archaeological Liaison Committee (National Museum of Ireland & Dept of Culture Heritage and the Gaeltacht).

There has been ongoing consultation about the planning and construction of Ballivor Wind Farm (Bord na Móna Wind Farm | Ballivor Wind Farm) as part of planning for that particular proposed development. This website describes the project and has up to date project newsletters.

To inform the current Plan, both national and local stakeholders, including neighbours whose land adjoins Bracklin West Bog and local representatives of national bodies (such as Regional National Parks and Wildlife Service staff) and relevant offices in County Councils (such as the Heritage or Environmental Offices) will be contacted. Any identified local interest groups will be sought and informed of the opportunity to engage with this rehabilitation plan, and when identified invited to submit their comments or observations in relation to the proposed rehabilitation at Bracklin West Bog.

All correspondence received has been acknowledged and evaluated against the rehabilitation work proposed here.

## 4.2 Issues raised by Consultees

To date, a number of issues have been raised by consultees during the consultation process for both the current and previous drafts of the rehabilitation plan for Bracklin West Bogs – these are summarised below.

### *4.2.1 Assessments of rehabilitation*

During the initial commencement of PCAS, a number of consultees including: the Irish Farmers Association (IFA), the Irish Creamery Milk Suppliers Association (ICMSA) and Trinity College Dublin have raised concerns regarding the duration and scope of consultation period. Stakeholders suggested that the consultation period should be extended to allow all potential stakeholders to make submissions where required.

Queries on pre-rehabilitation assessments were raised by NPWS and the National Museum of Ireland relating to the finalisation of several bog rehab plans in 2021 in relation to Appropriate Assessment, Environmental Impact Assessment and Strategic Environmental Assessment.

#### *4.2.2 Restoration scope*

Restoration/rehabilitation of marginal habitats was raised by the Irish Peatland Conservation Council (IPCC) and Butterfly Conservation Ireland (BCI) relating to the finalisation of several bog rehab plans in 2021 as worthy of consideration within the rehabilitation measures to support carbon sequestration and biodiversity objectives.

#### *4.2.3 Monitoring*

Further details on monitoring of ecological metrics, and how and where reporting on this monitoring would take place, was raised by the IPCC, University College Dublin and Trinity College researchers in their respective submissions relating to the finalisation of several bog rehab plans in 2021. Uisce Éireann (formerly Irish Water)reiterated the requirement of a strong monitoring program with respect to water quality during and post rehabilitation.

#### *4.2.4 Flooding and drainage*

The IFA, The Department of Agriculture Food and the Marine, individual local residents and ICMSA queried likely impacts relating to the finalisation of several bog rehab plans in 2021 arising from the proposed re-wetting associated with the rehabilitation in relation to flooding on adjoining lands and, specifically, with regards to the maintenance of drains. The IFA also raised the issue of Health and Safety in relation to raising water levels as well as possible impacts on land and property prices.

#### *4.2.*5 Future management

The IFA expressed concerns regarding the future ownership of the BnM bogs subject to rehabilitation. They expressed a desire for contingency planning for potential future ownership of designated bogs so as to ensure no negative impacts arise on adjacent properties from any new ownership.

#### *4.2.6 Other issues*

Other issues (raised by IPCC) during the finalisation of several bog rehab plans in 2021 and in 2023 for Bracklin West Bogs included after use of the bog and turf cutting on the margins of the bog (outside of the area owned by Bord na Móna).

Archaeological end of life survey of all the bogs were requested by National Museum of Ireland and National Monuments Unit.

For a complete summary of submissions received and replies, see Appendix XI.

## 4.3 Bord na Móna response to issues raised during consultation

*4.3.1. Consultation*

BnM are carrying out ongoing consultation has part of the process of developing the rehabilitation plan for Bracklin West Bog. This is ongoing with a dedicated Community Liaison Officer communicating to affected and interested parties. A website has been developed to make information available. This will be continually updated. Some PCAS Bogs have been used as demonstration sites so that interested stakeholders can come to visit and observe the measures on the ground.

*4.3.2 Assessments of rehabilitation*

Appropriate Assessment screening will be undertaken on all the bogs as part of PCAS and this is currently being undertaken by external consultants for Bracklin West Bogs. Where required, Natura Impact Statements shall be completed and submitted to the Minister in accordance with 42(9) and 42(10) of the Habitats Regulation, noting that Bord na Móna is prescribed as a 'public authority' under this legislation. In relation to the SEA Directive and EIAR Directive, this has been considered and the legal advice to date is that the scheme does not come under these Directives.

An Archaeological Impact Assessment (AIA) has been undertaken on all the bogs in PCAS (Appendix XII). The aim for known archaeology on these bogs is to accomplish preservation in situ and we are taking steps to identify and avoid all known archaeology. It is anticipated that any archaeology will benefit from the ultimate remit of the rehabilitation, in that water tables will be raised thereby preserving in-situ. There is also an identified procedure for managing reports of stray finds that may arise during rehabilitation works.

*4.3.3 Restoration scope*

As part of the PCAS, all restoration/rehabilitation options have been developed to support climate action and biodiversity objectives. Other issues such as existing amenity, social impacts, industrial history, archaeology were not part of the direct scope of PCAS but were considered when developing the rehabilitation plan. After use of the bog is outside the scope of PCAS. Rehabilitation will lead to the development of a stable diverse re-wetted cutaway landscape that will have added benefits for amenity in the future.

*4.3.4 Monitoring*

As part of the PCAS, a monitoring and verification plan has been developed to support climate action and biodiversity objectives. This will include stratified monitoring of bog condition, habitats and biodiversity at several different scales. It is proposed to monitor the improvement of some biodiversity ecosystem services. The appearance of key species such as *Sphagnum* moss will be monitored during walk-over surveys and general monitoring visits. It is not proposed to carry out any additional monitoring of biodiversity ecosystem services at this site. This site is not expected to attract significant numbers of wetland birds as it is a relatively deep peat bog. Biodiversity monitoring for PCAS planned for a stratified approach with different targeted monitoring at different sites based on the site characteristics.

*4.3.5 Flooding, drainage or other impacts on adjacent land.*

It is the intention of Bord na Móna that the re-wetting of the bogs will be carried out in such a manner that does not impact on third party lands. Where it is deemed that blocking of a shared drain would cause any adjoining lands to be adversely affected, this will be avoided, and alterations made to the rehabilitation plan. In general, drains around the margins of the bog will not be blocked.

External consultants have been appointed to carry a hydrological assessment to identify any potential impacts to neighbouring lands and to mitigate against any such impacts. No issues were identified. There is no potential for direct impacts on arterial drainage downstream.

The rehabilitation measures proposed at Bracklin West Bogs will generally result in reduced runoff and drainage from the existing peat fields through a mixture of techniques including drain blocking, cell bunding and re-profiling. It is intended that these measures will not significantly alter the existing topographical catchments and that the spine of the drainage networks, those which the upstream catchments drain through, will be retained by Bord na Móna. Based on evidence from other bogs, rehabilitation measures will reduce the run-off from the bog by returning the peatlands towards its natural water retention function.

*4.3.6 Amenity*

Creating amenity such as walking tracks is not part of the direct scope of PCAS. There is no current amenity planned for Bracklin West under this scheme. However, PCAS will enable and support any future amenity development. There can be further opportunities to develop amenity at this site. Any future amenity can be positively aligned and integrated to after-use plans following the completion of the proposed rehabilitation at Bracklin West Bog. Rehabilitation measures proposed for Bracklin West Bog do not need to be amended to integrate any future amenity projects positioned along the margin of the former production bog or along the former bog railways.

*4.3.7* Water quality

It is the expectation of BnM that rehabilitation measures should positively impact the water quality in receiving water bodies through enhancing the water attenuation across rehabilitated sites. The robust water monitoring programme implemented as part of PCAS will be used to assess water quality leaving rehabilitated sites at designated points.

*4.3.8 Future management*

Bord na Móna will continue to manage their land bank into the future. As peat production has now ceased on Bord na Móna lands and rehabilitation measures will be carried out, a regular drainage maintenance programme will not be required or carried out as would have been the case in the past. However, if issues arise with the Bord na Móna internal drainage system that affects upstream or downstream landowners, then these issues will be addressed by Bord na Móna.

Bord na Móna considers issues regarding estate security, fire risk, invasive species and water pollution of utmost importance. BnM intends to maintain security and manage fire risk over the entirety of the estate. In this regard, PCAS activities, should have no detrimental impact on these issues. Regarding water pollution, BnM is regulated by the EPA and as such adheres to the strict water pollution measures laid out by the same.

*4.3.9 Other issues*

Other issues, including after-use and management issues outside the boundary of Bracklin West Bogs, are acknowledged but are specifically outside the scope of this rehabilitation plan.

Security: It is the intention of Bord na Móna to keep secure the estate and ensure that any anti-social behaviour that occurs within the estate is reported and dealt with by the appropriate authorities.

*4.3.10 Concluding statement.*

- Some parts of Bracklin West Bog includes large areas of bare peat following the cessation of peat production, with some areas that were out of peat production earlier beginning to develop a mosaic of habitats already. This will not be radically changed.
- No specific issues were raised during consultation that required significant changes to the substance of the rehabilitation plan.
- Several marginal drains will not be blocked to avoid impacts on adjacent lands, rights of way or turf-banks. This does not change the overall rehabilitation goals and outcomes and can be integrated with the other rehabilitation measures to allow cutaway re-wetting.
- No changes were required to the rehabilitation plan to enable any future potential amenity.

# 5. REHABILITATION GOALS AND OUTCOMES

The rehabilitation goals and outcomes outline what Bord na Móna want to achieve by implementing the rehabilitation. These include:

- Meeting conditions of IPC Licence.
- Stabilisation or reduction in water quality parameters of water discharging from the site (e.g. suspended solids).
- Reducing pressure on receiving waterbodies that have been classified as At Risk from peatlands and from peat extraction, via stabilization or improving water-quality from this bog, and therefore, reducing pressures.
- Optimising hydrological conditions for **climate action benefits as part of PCAS**.
- Optimising hydrological conditions for the development of embryonic *Sphagnum*-rich vegetation communities on deep peat, or reed swamp and fen on shallow more alkaline peat and other subsoils, where present.
- Optimising hydrological conditions for the development of active raised bog on extant high bog.
- Optimising hydrological conditions for the protection of exposed archaeological structures, their retention in situ and preservation into the future.
- Supporting expected future land-uses.
- The main goal and outcome of this plan is the successful rehabilitation (environmental stabilisation) of peatlands used for industrial peat production at the bog in a manner that is acceptable to both external stakeholders and to Bord na Móna and which optimise climate action and other ecosystem service benefits.

The rehabilitation goals and outcomes take account of the following issues.

- It will take some time for stable naturally functioning habitats to fully develop at Bracklin West Bog. This will happen over a longer timeframe than the implementation of this rehabilitation plan.
- Re-wetting residual peat will initially maintain and enhance the carbon storage capacity of the bog. There is scientific consensus that restoration of hydrology in damaged bog can improve carbon storage, water storage and attenuation and help support biodiversity both on the site and in the catchment (See Section 3.8). This will reduce carbon emissions from the site from a larger carbon source to a smaller carbon source. In time, the site has the capacity to develop in part as a carbon sink. PCAS is expected to deliver significant contributions to Ireland's climate action.
- It is not expected that the site has the potential to develop active raised bog (ARB) analogous to the priority EU Habitats Directive Annex I habitat within the foreseeable future (c.50 years). Furthermore, only a proportion of the bog has potential to develop *Sphagnum*-rich habitats in this timeframe. Nevertheless, re-wetting across the entire bog, as part of the scheme, will improve habitat conditions of the whole bog. Other peatland habitats will develop in a wider mosaic that reflects underlying conditions.
- Rehabilitating former industrial peat production bog will also in the longer-term support other ecosystem services such as such the development of new habitat to support biodiversity and local attenuation of water flows from the bog.
- WFD status in receiving water bodies can be affected by peatlands and peat extraction but is also affected by other sources such as agriculture. In addition, receiving water bodies that are assessed as At Risk from peatlands and from peat extraction are likely to have several contributary sources of impacts (private peat extraction and Bord na Mona). Reducing pressures due to former peat extraction activities at

Bracklin West bog will contribute to stabilising or improving water quality status of receiving water bodies in general. Ultimately, improving the WFD status of the receiving water body will depend on reducing pressure from a range of different sources, including peatlands in general (private and Bord na Móna).

- The proposed development of the nearby Ballivor wind farm.
- Re-wetting in general will benefit the future preservation of most known and unknown archaeological features. An Archaeological Impact Assessment (AIA) is to be carried out under the PCAS scheme.

# 6. SCOPE OF REHABILITATION

The principal scope of this enhanced rehabilitation plan is to rehabilitate the bog. This is defined by:

- The area of Bracklin West bog.
- EPA IPC Licence - Ref. P0501-01. As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. Bracklin West bog is part of the Ballivor-Derrygreenagh bog group.
- The Scheme is designed to exceed the stabilisation requirements as defined by the IPC Licence. This scheme is designed to enhance the ecosystem services of Bracklin West bog, in particular, optimising **climate action benefits**. The proposed interventions will mean that environmental stabilization is achieved (meaning IPC obligations are met) and, in addition, significant other ecosystem service benefits particularly for climate action will be accrued.
- The local environmental conditions of Bracklin West Bog mean that intensive drain blocking and cell creation are the most suitable rehabilitation approach for this site.
- Bracklin West Bog has a gravity drainage regime.
- Proposed land-use. Bord na Móna are currently developing a renewable energy project called Ballivor Wind Farm. Bracklin West is outside the development boundary of the proposed Ballivor Wind Farm and no turbines or wind farm infrastructure overlaps the currently proposed PCAS extent at Bracklin West (nearest is ca.600m to the east).
- Bord na Móna have defined the key goal and outcome of rehabilitation at Bracklin West Bog as **environmental stabilisation** of the site via **optimising climate action benefits, where possible**. The re-wetting of residual peat in the area recently out of peat extraction will be optimised, **setting the site on a trajectory towards the development of peat-forming communities on residual deep peat, and the development of wetlands/Reed Swamp and fen on shallow more alkaline peat and other subsoils.**
- Rehabilitation of Bracklin West bogs will support multiple national strategies of climate action, biodiversity action and other key environmental strategies such as the Water Framework Directive.
- The time frame for the delivery of the planned rehabilitation will be undertaken according to available resources and appropriate constraints.
- It is not proposed to carry out rehabilitation on all marginal or peripheral cutover bog zones. Generally, these bog remnants are narrow, or are subject to turbary, and do not have positive bog restoration prospects.

## 6.1 Key constraints

- **Bog conditions.** Rehabilitation outcomes of sites are constrained by the environmental characteristics of these particular areas. Drain blocking can be widespread in scale with each field drain being blocked (e.g. Kellysgrove) or more localised with targeted drain-blocking (e.g. Mountlucas Wind Farm) and both can be very effective. This can be used in conjunction with local topographical features like natural hollows to manage water levels or with other typical features of cutaway peatlands like high peat fields, which act as berms to hold water to some extent. Active management to create low berms to manage water-levels and create shallow wetland habitats dominated by emergent vegetation has also been successfully developed (e.g. Mountlucas Wind Farm, Bruckana Wind Farm, Oweninny, Lough Boora Discovery Park, Ballycon). Overflow pipes will be used to maintain maximum water levels across the cutaway and allow excess surface water to flow into the drainage channels beside the roads and other infrastructure.

Managing the cutaway in this way means that the cutaway can stay wet, while excess surface water can drain away through the drainage infrastructure.

- **Future land-use.** Planned renewable energy development. Bracklin West is outside the development boundary of the proposed Ballivor Wind Farm and no turbines or wind farm infrastructure overlaps the currently proposed PCAS extent at Bracklin West (nearest is ca.600m to the east). The wind farm project is currently at the pre-planning stage. The potential impact of the wind farm infrastructure on the rehabilitated area is expected to be negligible and it does not change the overall goals and outcomes of the proposed rehabilitation (re-wetting residual peat) for Bracklin West. The key objective of this rehabilitation plan will be environmental stabilisation and re-wetting of the cutaway areas in the selected extent, which are removed and separated from the proposed Ballivor Wind Farm infrastructure.
- **Surrounding landscape and neighbours.** Another key constraint is the interaction between the Bord na Móna sites and the surrounding landscape. Care has to be taken that no active rehabilitation management is carried out that could negatively and knowingly impact on surrounding land. This includes any hydrological management on neighbouring farmland. It is anticipated that the work proposed here (blocking drains and re-wetting cutaway peatlands) will not have any flooding impacts on adjacent land.
- **Archaeology**. Should any previously unknown archaeological material be uncovered during the rehabilitation works, it will be avoided and reported to Bord na Móna Archaeological Liaison Officer and the National Museum of Ireland.
- **Public Rights of Way**. Where a public right of way or similar burden exists on Bord na Móna property, consideration will be given to ensuring that this remain intact where possible. In some instances, depending upon previous land uses and management, alternative solutions may be required. These will be explored in consultation with local communities and statutory bodies during the consultation work associated with the decommissioning and rehabilitation work described here. No known Rights of Way exist at or around the margin of Bracklin West Bog, most of which lead to known turbary areas.

## 6.2 Key Assumptions

- It is assumed that Bord na Móna will have all resources required to deliver this project.
- It is expected that weather conditions will be within normal limits over the rehabilitation plan timeframe. Long periods of wet weather have the capacity to significantly affect ground conditions and constrain drain blocking and other ground activities.

## 6.3 Key Exclusions

The scope of this rehabilitation plan does not cover:

- The longer-term development of stable naturally functioning habitats to fully develop at Bracklin West Bog. The plan covers the short-term rehabilitation **actions** and **an additional monitoring and after-care programme** to monitor the rehabilitation and to respond to any needs.
- The currently proposed Ballivor Wind Farm footprint.
- This plan is not intended to be an after-use or future land-use plan for Bracklin West Bog.
- The longer-term management of this site, potentially as a nature conservation site, or for amenity, or for other uses in the future.

# 7. CRITERIA FOR SUCCESSFUL REHABILITATION

This section outlines what criteria will be used to indicate successful rehabilitation and what critical success factors are needed to achieve successful rehabilitation. All criteria used to indicate successful rehabilitation will be measured to validate the achievement of the rehabilitation goals and outcomes and validate the completion of the rehabilitation.

The key objective of this enhanced rehabilitation plan is **environmental stabilisation** and the stabilisation of any emissions from the site that related to the former industrial peat extraction activities.

Rehabilitation is generally defined by Bord na Móna as:

- stabilisation of bare peat areas via targeted active management (e.g. drain-blocking/re-wetting) slowing movement of water across the site and encouraging natural colonisation; and
- mitigation of key emissions (e.g. potential run-off of suspended solids).

In addition, Bord na Móna wish to optimise climate action and other ecosystem service benefits via enhanced rehabilitation measures.

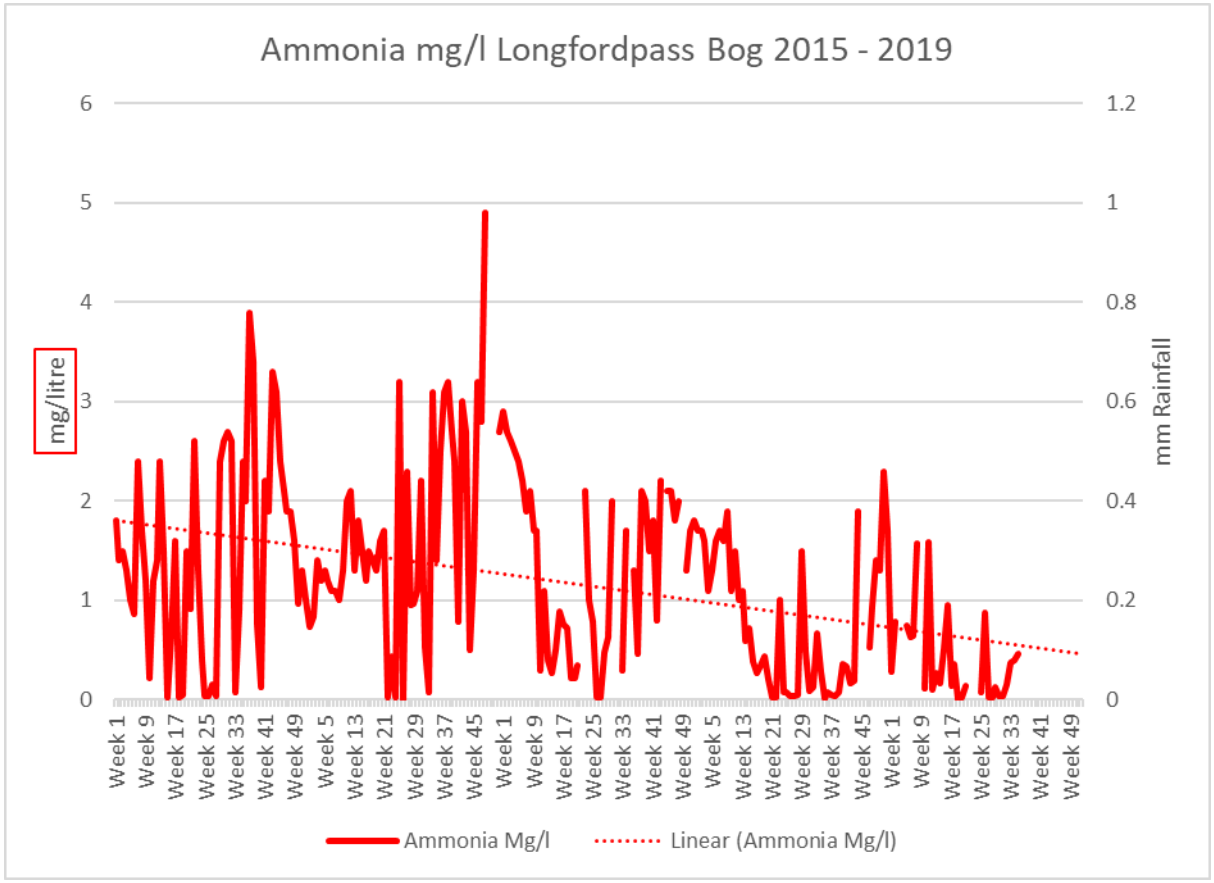
## 7.1. Criteria for successful rehabilitation to meet EPA IPC licence conditions:

- Rewetting of residual peat in the area originally drained for industrial peat production to offset potential run off of suspended solids and to encourage and accelerate development of vegetation cover via natural colonisation, and increase in the area of potentially peat forming habitats. See Table 7.1 for a summary of the criteria for successful rehabilitation and associated monitoring. The target will be the delivery of measures and this will be measured by an aerial survey after rehabilitation is completed.
- That there is a stabilizing/improving concentration of suspended solids and ammonia in discharges from Bord na Móna sites, associated with the measures undertaken to stabilize the peat surface by the blocking of the internal drainage system and the maximized rewetting of the peat surface. This will be demonstrated by developing a stable or downward trajectory of water quality indicators (suspended solids and ammonia) towards what would be typical of a re-wetted cutaway bog. This will be measured via water quality monitoring (suspended solids and ammonia) for at least 2 years after the rehabilitation has been completed.
- Receiving water bodies have been classified under the River Basin Management Plan and this classification includes waters that are At-Risk from peatlands and peat extraction. The success criteria will be that the At-Risk classification will see improvements in the associated pressures from this peatland or if remaining At-Risk, that there is an improving trajectory in the pressure from this peatland.

With regard to predicting and estimating likely trends that might materialize or could be considered as a target, monitoring of surface water ammonia emissions from Longfordpass bog in Littleton over 3 yrs., post cessation of peat extraction with ongoing rehabilitation, were considered. These are indicating a downward trend in Ammonia concentrations (Figure 7.1).

Similarly monitoring of surface water ammonia emissions from a Corlea bog in Mountdillon over the past 4 yrs. post cessation of peat extraction with ongoing rehabilitation, indicate downward trends.

As the monthly monitoring program at Bracklin West Bog continues in 2022/2023 during the rehabilitation works planned for 2023, and data from the 2022 monitoring program is compiled, further trending will be produced to verify any ongoing trends.



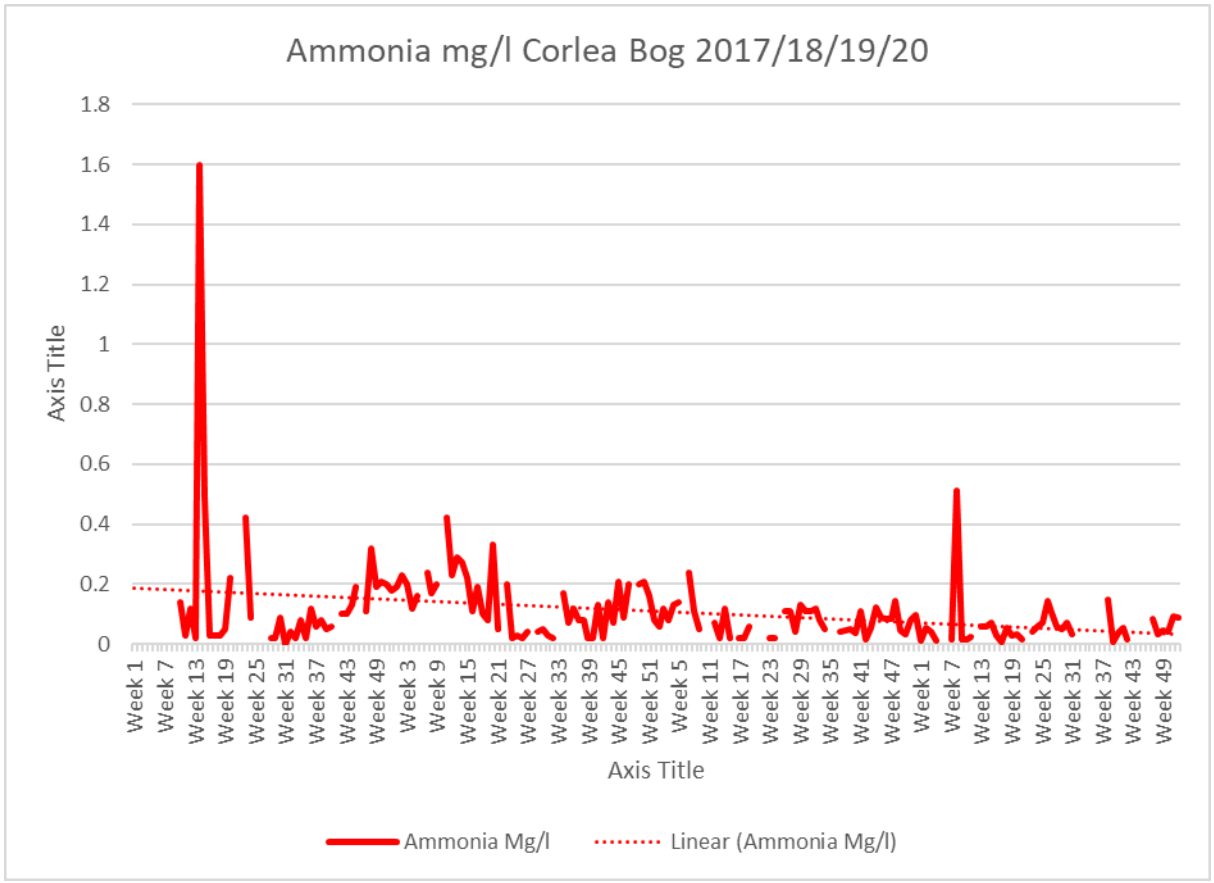




**Figure 7.1.** Ammonia levels over the period 2015-2019 at Longfordpass and the period 2017-2020 at Corlea.

**Additional criteria for successful rehabilitation to optimise climate action and other ecosystem service benefits:**

- Optimising the extent of suitable hydrological conditions to optimise climate action and other ecosystem service benefits (optimising and maximising residual peat re-wetting). This will be measured by an aerial survey after rehabilitation has been completed.
- Accelerating the trajectory of the bog towards becoming a reduced carbon source/carbon sink. This will be measured through habitat mapping and the development of cutaway bog condition assessment. This cutaway bog condition assessment will include assessment of environmental and ecological indicators such as vegetation cover, vegetation communities, presence of key species, *Sphagnum* cover, bare peat cover and water levels (similar to ecotope mapping). Baseline monitoring will be carried out after rehabilitation is completed (during the scheme). It is proposed that sites can be monitored against this baseline in the future.
- Reduction in carbon emissions. This will be estimated via a combination of habitat condition assessment and application of appropriate carbon emission factors derived from other sites. Baseline monitoring (habitat condition) will be carried out after rehabilitation is completed (during the scheme). It is proposed that sites can be monitored against this baseline in the future.
- Setting the site on a trajectory towards establishment of a mosaic of compatible habitats including embryonic *Sphagnum*-rich peatland communities, wetland, fen, Reed swamp, heath, scrub, poor fen, and Birch woodland, where conditions are suitable. It will take some time for stable naturally functioning habitats to fully develop at Bracklin West Bog. This will be demonstrated and measured via aerial photography, habitat mapping and cutaway/habitat condition assessment. Baseline monitoring will be carried out after rehabilitation is completed (during the scheme). It is proposed that sites can be monitored against this baseline in the future.
- Improvement in biodiversity and ecosystem services. This will be demonstrated by metrics outlined in Section 9.1 that can be used to measure changes in ecosystem services (e.g. water quality parameters, development of pioneer habitats, breeding bird monitoring). This will be measured by collecting a range of scientific data that can then quickly be adapted and into metrics that can be used to measure changes in various ecosystem services. Baseline monitoring will be carried out after rehabilitation is completed (during the scheme). It is proposed that sites can be monitored against this baseline in the future.

**Table 7.1. Summary of Success criteria, targets, how various success criteria will be measured and expected timeframes.**

| Criteria type | Criteria | Target | Measured by | Expected Timeframe |
|---|---|---|---|---|
| IPC validation | Rewetting in the former area of industrial peat production | Delivery of rehabilitation measures<br>Reduction in bare peat. | Aerial photography after rehabilitation has been completed – to demonstrate measures (drain-blocking)<br>Establishment of a baseline for future monitoring of bare peat, vegetation establishment and habitat condition. | 2023-2025 |
| IPC validation | Key water quality parameters<br>Ammonia, Phosphorous, Suspended solids, pH and conductivity | Reduction or stabilisation of key water quality parameters associated with this bog | Water quality monitoring for a period after rehabilitation has been completed | 2022-2024 |
| IPC validation | Reducing pressure from peat production on the local water body catchment (WFD) | Where this section of the water body, that this bog drains to, has not been identified as under pressure from peat extraction, that the intervening EPA monitoring programme associated with its Programme of Measures for this water body, confirms that its classification remains at not being at risk from peat extraction associated with activities at this bog. | EPA WFD monitoring programme | WFD schedule |
| Climate action verification | Optimising the extent of suitable hydrological conditions to optimise climate action | Optimal extent of suitable hydrological conditions | Aerial photography and Habitat mapping to map extent of suitable hydrological conditions.<br>Baseline monitoring to be carried out during the scheme when rehabilitation is complete. Sites can be re- | 2023-2025 |

| Criteria type | Criteria | Target | Measured by | Expected Timeframe |
|---|---|---|---|---|
| | | | monitored in the future and compared against this baseline. | |
| Climate action verification | Reduction in carbon emissions. | Reduction in carbon emissions | Carbon emissions – estimated using a bog condition assessment and appropriate carbon emission factors. | 2023-2025 |
| Climate action verification | Setting the site on a trajectory towards establishment of a mosaic of compatible habitats | Establishment of compatible cutaway habitats | Habitat map, Cutaway bog condition map<br>Baseline monitoring to be carried out during the scheme when rehabilitation is complete. Sites can be re-monitored in the future and compared against this baseline. | 2023-2025 |

Meeting climate action verification criteria and monitoring of these criteria after the scheme has been completed is dependent on support from the Climate Action Fund or other sources of funding. Note that monitoring and verification of the overall scheme will be stratified – not all these criteria will be measured at each individual site. Baseline monitoring to be carried out during the scheme when rehabilitation is complete. Sites can be re-monitored in the future and compared against this baseline.

## 7.2. Critical success factors needed to achieve successful rehabilitation as outlined in the plan

The achievement of successful rehabilitation as outlined in the plan requires:

- **Funding to pay for resources required to deliver the planned rehabilitation (Bord na Móna and external).** Bord na Móna maintains a provision on its balance sheet to pay for these future costs when industrial peat extraction ceases. Bord na Móna is fully committed to meeting its obligations relating to rehabilitation and decommissioning under the Integrated Pollution Control Licence. It is expected that additional costs of enhanced rehabilitation will be supported by Government through the Climate Action Fund and Ireland's National Recovery and Resilience Plan.
- **Bord na Móna to have sufficient resources (staff and training) to deliver the planned rehabilitation with required associated skills and competencies.**
- **Bord na Móna to have sufficient resources (suitable machinery) and staff to maintain this machinery.**
- **Weather conditions to be within normal limits over the rehabilitation plan timeframe.** Long periods of wet weather have the capacity to significantly affect ground conditions and constrain the delivery of rehabilitation. The potential impact of wet weather on ground conditions can be reduced by appropriate planning and management. Bord na Móna have significant experience of managing these issues through 70 years of working in these peatland environments.

- **Rehabilitation measures to be effective.** The rehabilitation measures proposed in this plan are based on 40 years of Bord na Móna experience of peatland management and best practice applied internationally in peatland management. Measures proposed in this plan have already been shown to be affective at other sites. Bord na Móna will apply a flexible and adaptable approach to the more innovative rehabilitation measures proposed in this plan**.** If measures are not initially effective, Bord na Móna will review any requirement for additional practical rehabilitation.
- **Natural colonisation of vegetation to develop semi-natural habitats at a rate within the normal limits.** The development of naturally functioning semi-natural habitats on degraded bog takes time. It may take 30-50 years for active raised bog vegetation to re-develop on suitable cutaway that was previously bare peat. However, Bord na Móna experience has demonstrated the effectiveness of these type of measures for re-wetting bog and creating carbon sinks (Renou-Wilson et al. 2018).
- Rehabilitation measures have been designed to accelerate and work with natural colonisation and other natural processes. Bord na Móna experience of rehabilitation has shown that re-wetting improves conditions for natural colonisation and that natural colonisation is accelerated where the environmental conditions are most suitable. Rehabilitation measures have been designed to modify the conditions of areas within sites where conditions are less suitable for natural colonisation (modifying hydrology, topography, nutrient status or availability of potential seed sources).
- **Monitoring to be robust and effective.** Rehabilitation Monitoring will be established to validate the success of rehabilitation as required by Condition 10 of the IPC Licence and to verify the benefits of the proposed enhanced measures to optimise climate action. This will focus on collecting a range of scientific data that can then quickly be adapted into metrics that can be used to measure changes in various ecosystem services.

# 8. REHABILITATION ACTIONS AND TIME FRAME

Peatland rehabilitation requires detailed planning and the use of data from desktop surveys and field surveys. This data in association with topographical and hydrological modelling will be important in planning the future peatland landscapes and planning the use of the most appropriate rehabilitation methodologies to maximise climate action benefits. Hydrological modelling indicates those areas that are likely to re-wet when drains are blocked, based on the current topography, and areas where water levels may have to be modified, where needed. Enhanced rehabilitation measures will look to optimise hydrological conditions for re-wetting peat in other areas. This planning is also essential for matching the most sustainable rehabilitation methodology to the most suitable cutaway environment to maximise the benefits of the resource outlay (maximising cost/benefit).

A number of illustrative figures have been produced to inform Rehab Planning and Design, including Aerial Photography, Peat Depths, LiDar Surface Maps, and Depression Analysis modelling; these are included in the accompanying Mapbook as the drawings referenced below:

BNM-DR-15-22 titled ***Bracklin West Bog: Aerial Imagery2020***

BNM-DR-15-04 titled ***Bracklin West Bog: Peat Depths***

BNM-DR-15-03 titled ***Bracklin West Bog: LiDAR Map***

The rehabilitation actions themselves will be a combination of PCAS measures to re-wet peat. The distribution of these measures is provisionally outlined in drawing titled BNM-DR-15-20 ***Bracklin West Bog: Standard Rehabilitation Measures*** in the accompanying Mapbook (note that the actual distribution of these measures may be subject to change in response to stakeholder consultation and refinement of the enhanced rehabilitation measures.)

These enhanced measures for Bracklin West bog will include (see Table 8.1):

- A widespread drain-blocking programme will be implemented across the cutaway bog, where possible. In general, field drains will be blocked where possible to re-wet cutaway and re-wet to the optimum water-level. More intensive measures will be targeted towards the bare peat.
- In areas of deeper peat, berms and field reprofiling will be carried out to create 45m x 60m cells. These will be carried out in deep peat areas where water has potential to be retained within the cell. Measures will also entail blocking outfalls, managing overflows, creating drainage channels for excess water and carrying out *Sphagnum* inoculation.
- Less intensive measures (targeted drain-blocking) will be used in areas where habitats have already established.
- Measures will include drain blocking (3/100 m), modifying outfalls and managing water levels with overflow pipes;
- Wetland measures including drain blocking, blocking outfalls and managing water levels with overflow pipes.

*Table 8.1: Types of and areas for enhanced rehabilitation measures at Bracklin West bog.* Note that the types of rehab and areas of rehab may change in response to stakeholder consultation and refinement of the enhanced rehabilitation measures.

| Type | Code | Description | Extent (Ha) |
|---|---|---|---|
| Deep Peat | DPT 2 | More intensive drain blocking (max 7/100m) + blocking outfalls and managing water levels with overflow pipes | 41.27 |
| | DPT 3 | More intensive drain blocking (max 7/100m) + field reprofiling + blocking outfalls and managing overflows | 3.14 |
| | DPT 4 | Berms and field reprofiling (45m x 60m cell) + blocking outfalls and managing overflows + drainage channels for excess water + *Sphagnum* innoculation | 50.57 |
| Dry Cutaway | DCT2 | Regular drain blocking (3/100m) + blocking outfalls and managing water levels with overflow pipes + targeted fertiliser treatment | 30.74 |
| Wetland Cutaway | WLT4 | More intensive drain blocking (max 7/100m) + blocking outfalls and managing overflows + transplanting reeds and other rhizomes | 3.62 |
| Additional Works | AW2 | Targeted drain blocking | 5.4 |
| Marginal land | MLT1 | No work required | 15.8 |
| Constrained Area | Constraint | Constraint – agricultural field to west and railway line. | 1.77 |
| Silt Ponds | Silt Pond | | 0.33 |
| **Total Area** | | | **152.6** |

## 8.1 Short-term planning actions (0-1 years)

- Seek formal approval of the rehabilitation plan from the EPA.
- Develop a detailed site plan outlining how the various rehabilitation methods will be applied to Bracklin West Bog. This will take account of peat depths, topography, drainage and hydrological modelling (see rehabilitation map for an indicative view of the application of different rehabilitation methodologies).
- A drainage management assessment of the proposed rehabilitation measures will be carried out and any issues identified resolved and the rehabilitation plan adapted.
- A review of issues that may constrain rehabilitation such as known rights of way, turbary and existing land agreements is to be carried out

- An ecological appraisal of the potential impacts of the planned rehabilitation on the presence of sensitive ground-nesting bird breeding species (e.g. breeding waders) is to be carried out. The scheduling of rehabilitation operations will be adapted, where required.
- Ensure all activities comply with the environmental protection requirements of the IPC Licence.
- Carry out Appropriate Assessment (AA) of the Rehabilitation Plan. Incorporate any required mitigation measures from the AA in the plan for the delivery of rehabilitation and decommissioning across the site.
- Track implementation and enforcement of the relevant IPC Licence conditions, the mitigation measures (AA) and other environmental control measures during the implantation of the rehabilitation plan.

## 8.2 Short-term practical actions (0-2 years)

- Carry out proposed measures as per the detailed site plan. This will include a combination of drain blocking, and fertiliser applications targeting bare peat areas of headlands, high fields and other areas (where required) in addition to wetland creation and management prescriptions. All rehabilitation will be carried out with regard to best practice environmental control measures (Appendix III).
- Monitor the success of rehabilitation measures in relation to developing suitable hydrological conditions.
- Carry out the proposed monitoring, as outlined in section 9.
- Silt ponds will be monitored during this period and there will be continued maintenance and cleaning to prevent potential suspended solids run-off from the site during the rehabilitation phase.

## 8.3 Long-term (>3 years)

- Evaluate success of short-term rehabilitation measures outlined above and remediate where necessary.
- Delivery of a monitoring, aftercare and maintenance programme (See section 10.2 below).
- Decommissioning of silt-ponds will be assessed and carried out, where required.
- Reporting to the EPA will continue until the IPC License is surrendered.

## 8.4 Timeframe

- **2022-2023**: Short-term planning actions.
- **2023-2024**: Short-term practical actions.
- **2024-2025**: Long term practical actions. Evaluate success of short-term rehabilitation measures outlined above and remediate where necessary.
- **2025**: Decommission silt-ponds, if necessary.

## 8.5 Budget and costing

Bord na Móna (BnM) appreciates the Minister's intention to support Bord na Móna in developing a package of measures, 'the Scheme', for enhanced decommissioning, rehabilitation and restoration of cutaway peatlands referred to as, the Peatlands Climate Action Scheme'. *However, only the additional costs associated with the additional and enhanced rehabilitation, i.e., measures which go beyond the existing standard mandatory decommissioning and rehabilitation requirements arising from Condition 10 will be eligible for support.*

The enhanced decommissioning, rehabilitation and restoration of the peatlands funded by the Scheme will deliver benefits across climate action (GHG mitigation through reduced carbon emissions and acceleration towards carbon sequestration), enrich the State's natural capital, increase eco-system services, strengthen biodiversity, improve water quality and storage attenuation as well as developing the amenity potential of the peatlands.

Bord na Móna maintains a provision on its balance sheet to pay for the future costs of **standard** rehabilitation and decommissioning when industrial peat extraction ceases. This is updated every year - for more information see the Bord na Móna Annual Report (Bord na Móna, 2022). Bord na Móna is fully committed to meeting its obligations relating to rehabilitation and decommissioning under the Integrated Pollution Control Licence.

At this time, a 'standard' rehabilitation provision (sufficient to discharge the requirement of Condition 10 in the licence) has been allocated to the site based on the area of different cutaway types across the site (See Appendix I).

# 9. AFTERCARE AND MAINTENANCE

## 9.1 Programme for monitoring, aftercare and maintenance

This programme for monitoring, aftercare and maintenance has been designed to meet the Conditions of the IPC Licence. This is defined as:

- There will be **initial quarterly monitoring assessments** of the site to determine the general status of the site, the condition of the silt ponds, assess the condition of the rehabilitation work, monitoring of any potential impacts on neighbours land, general land security, boundary management, dumping and littering.
- The number of these site visits will reduce after 2 years to bi-annually and then after 5 years to annual visits.
- These monitoring visits will also consider any requirements for further practical rehabilitation measures.
- The **baseline condition of the site will be established** post-rehabilitation implementation by using an aerial survey to take an up to date aerial photo, when rehabilitation is completed. This will be used to verify completion of rehabilitation measures. The extent of bare peat will be assessed using this baseline data, and habitat maps will be updated, if needed. It is proposed that sites can be monitored against this baseline in the future.
- **Water quality monitoring** at the bog will be established. The main objective of this water quality monitoring will be to establish a baseline and then monitor the impact of peatland rehabilitation on water quality from the bog.
- In order to assist in monitoring surface water quality from this bog, it is planned to increase the existing licence monitoring requirements to sampling for the same parameters to every month during the scheduled activities and for a period up to two years post rehabilitation, depending on the period required to confirm that the main two parameters, suspended solids and ammonia are remaining compliant with the licence emission and trigger limit values and there is an improving trajectory in these two parameters i.e. reduction in concentration.
- Enhanced water quality monitoring will aim to include up to 70% of a bogs drainage catchments.
- Monitoring results will be maintained, trended and reported on each year as part of the requirement to report on Condition 10.1 of the IPC Licence on Bog Rehabilitation in the Annual Environmental Report, which will be available in April each year at www.epa.ie.
- The parameters to be included (as per condition 6.2 of the IPC Licence) include monthly monitoring for pH, Suspended Solids, Total Solids, Total Phosphorus, Total Ammonia, Colour, and COD and DOC.
- This monthly sampling regime on a selected number of silt ponds will be carried out over a two-year cycle. The original (licence) requirement was for a quarterly sampling regime, but this has been increased to a monthly regime to appropriately track the changing water chemistry that will occur as part of this enhanced rehabilitation. In addition, DOC will be included as a parameter to try and identify any changes in carbon in the surface water.
- If, after two years, key criteria for successful rehabilitation are being achieved and key targets are being met, then the water quality monitoring will be reviewed, with consideration of potential ongoing research on site. The water quality data, the aerial surveys and the habitat mapping will be collated and will be submitted to the EPA as part of the final validation report.
- If, after two years, key criteria for successful rehabilitation have **not** been achieved and key targets have **not** been met, then the rehabilitation measures and status of the site will be evaluated and enhanced, where required. This evaluation may indicate no requirement for additional enhancement of

rehabilitation measures, but may demonstrate that more time is required before key criteria for rehabilitation has been achieved. Monitoring of water quality will then also continue for another period to be defined.

- Where other uses are proposed for the site that are compatible the provision of biodiversity and ecosystem services, these will be assessed by Bord na Móna in consultation with interested parties. Other after-uses can be proposed for licensed areas and must go through the required assessment process and planning procedures.

Additional monitoring measures are also proposed to monitor ecosystem service benefits that have been derived by enhanced rehabilitation. These proposed monitoring measures will be funded by the proposed Climate Action Fund Scheme or additional other funding. Monitoring of climate action and other ecosystem service benefits will be designed to take account of the requirements of monitoring benefits of the overall Scheme and will be stratified; that is not all monitoring will be carried out in each site. These are defined as:

- Vegetation and habitat monitoring after rehabilitation is completed using a cutaway bog condition assessment (Similar to ecotope mapping). This assessment will include assessment of on environmental and ecological indicators such as vegetation cover, vegetation communities, presence of key species, *Sphagnum* cover, bare peat cover and water levels. It is proposed that sites can be monitored against this baseline in the future.
- The condition of the bog can be assessed using the condition assessment and suitable Greenhouse Gas (GHG) emission factors can be assigned to different habitats. GHG emission factors have been determined for various peatland habitats in Ireland (Wilson *et al*., 2015) and are constantly being refined with more and more research. BnM is actively supporting research into GHG fluxes in different rehabilitated peatland habitats. This means that potential GHG emissions can be estimated from the site, as the site continues along its trajectory towards a naturally functioning peatland ecosystem.

## 9.2 Rehabilitation plan validation and licence surrender – report as required under condition 10.4

***IPC License Condition 10.4.*** *A final validation report to include a certificate of completion for the Rehabilitation Plan, for all or part of the site as necessary, shall be submitted to the Agency within six months of execution of the plan. The licensee shall carry out such tests, investigations or submit certification, as requested by the Agency, to confirm that there is no continuing risk to the environment.*

Reporting to the EPA will continue until the IPC License is surrendered. The bog will be included in the full licence surrender process as per the Guidance to Licensees on Surrender, Cessation and Closure of Licensed Sites EPA, 2012, when:

- The planned rehabilitation has been completed.
- The key criteria for successful rehabilitation has been achieved and key targets have been met;
- Water quality monitoring demonstrates that water quality of discharge is stabilising or improving; and
- The site has been environmentally stabilised.

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# BRACKLIN WEST DECOMMISSIONING AND REHABILITATION PLAN - ADDENDUM 1

Bord na Móna operates under IPC Licence issued and administered by the EPA to extract peat within the Ballivor Derrygreenagh Bog group (Ref. P0501-01). As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. Bracklin West Bog is located in Co. Westmeath.

This addendum outlines the findings of the Appropriate Assessment reporting carried out in respect of proposed PCAS activities at Bracklin West Bog.

### Appropriate Assessment Reporting Findings

An Appropriate Assessment Report[5] was commissioned by Bord na Móna to inform whether the proposed PCAS activities at Bracklin West Bog had the potential to result in Likely Significant Effects on European Sites.

The concluding statement of this report reads as follows:

> '*It is concluded beyond reasonable scientific doubt, in view of best scientific knowledge, on the basis of objective information and in light of the conservation objectives of the relevant European Sites, that the proposed Decommissioning and Rehabilitation, individually or in combination with other plans and projects, will not have a significant effect on any European Site'*.

Therefore following screening, Appropriate Assessment is not required for the project as it is not directly connected with or necessary to the management of any European Site(s) and as it can be concluded, on the basis of objective information, that the project, individually or in combination with other plans or projects is not likely to have a significant effect on any European Site(s).

[5] MKO (2023). Article 6 (3) Appropriate Assessment Screening Report. Bracklin West Bog, Co. Westmeath, Decommissioning and Rehabilitation Plan 2023

## APPENDIX I: A STANDARD PEATLAND REHABILITATION PLAN TO MEET CONDITIONS OF THE IPC LICENCE

In the event that the Scheme (PCAS) is not supported by additional funding, Bord na Móna is still obligated to carry out peatland rehabilitation to meet the conditions of the IPC Licence. Under its EPA licences and following cessation of peat extraction, BnM is mandated to 'decommission' its operations by removing materials 'that may result in environmental pollution' and establish that 'rehabilitation' measures have environmentally stabilised peat production areas.

This proposed standard peatland rehabilitation plan is outlined here to **estimate potential costs**. Bord na Móna will still be expected to cover the costs that would have accrued from standard decommissioning and rehabilitation activities, as part of its original obligations. The existing costs associated with both the removal of potentially polluting materials and the environmental stabilisation of the peatlands resides with Bord na Móna. However, the expenditure necessary to deliver the additional and enhanced decommissioning, rehabilitation and restoration and the benefits that flow from these measures and interventions/improvements will be eligible for funding by government through the Climate Action Fund and Ireland's National Recovery and Resilience Plan.

The same process as outlined in Section 2 will be followed.

### Scope of rehabilitation

The principal scope of this rehabilitation plan is to rehabilitate the bog. This is defined by:

- The area of Bracklin West bog.
- EPA IPC Licence - Ref. P0501-01. As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. Bracklin West bog is part of the Ballivor-Derrygreenagh bog group.
- The current condition of Bracklin West Bog. This site has a gravity drainage system.
- The key objective of rehabilitation, as defined by this licence, is **environmental stabilisation** of the bog.
- To minimise potential impacts on neighbouring land. Boundary drains around Bracklin West Bog will be left unblocked as blocking boundary drains could affect adjacent land.
- Land-use. Bord na Móna are currently planning to build a wind farm on cutaway bog in the Ballivor area. This project is known as Ballivor Wind Farm and is in the pre-planning stage, but the planning application layout design does not include any wind farm infrastructure within or near Bracklin West bog. Rehabilitation of Bracklin West bog will not be affected by this proposed renewable energy project.

### Rehabilitation goals and outcomes

The key rehabilitation goal and outcome for Bracklin West Bog is environmental stabilisation of the site via wetland creation. This is defined as:

- Carrying out drain blocking to re-wet peat and slow runoff.
- Stabilising potential emissions from the site (e.g. suspended solids).
- Environmental stabilisation.

The outcome is setting the site on a trajectory towards establishment of natural habitats.

**Criteria for successful rehabilitation:**

- Rewetting of residual peat and shallow cutaway in the former area of industrial peat production to offset potential silt run off and to encourage development of vegetation cover via natural colonisation, and reducing the area of bare exposed peat.
- That there is a stabilising/improving concentration of suspended solids and ammonia associated with the measures undertaken to stabilise the peat surface by the blocking of the internal drainage system and the maximised rewetting of the peat surface. This will be demonstrated by developing a stable or downward trajectory of water quality indicators (suspended solids and ammonia) towards what would be typical of a re-wetted cutaway bog. This will be measured via water quality monitoring (suspended solids and ammonia).
- Receiving water bodies have been classified under the River Basin Management Plan and this classification includes waters that are At Risk from peatlands and peat extraction. The success criteria will be that the At Risk classification will see improvements in the associated pressures from this peatland or if remaining At Risk, that there is an improving trajectory in the pressure from this peatland.

**Rehabilitation targets**

- Demonstrating the delivery of the rehabilitation through site visits and through updated aerial photography (indicating presence of peat blockages and re-wetting). This will be demonstrated by a post rehab aerial survey.
- Stabilising potential emissions from the site (e.g. suspended solids). The key target will be developing a stable or downward trajectory of water quality indicators (suspended solids and ammonia) towards what would be typical of a re-wetted cutaway bog. This will be demonstrated by water quality monitoring results.

**Rehabilitation measures:**

- Blocking field drains in drier sections of the former industrial production area using a dozer to create regular peat blockages (seven blockages per 100 m) along each field drain, field re-profiling, blocking outfalls and managing overflows.
- Berms and field reprofiling (45m x 60m cell), blocking outfalls, managing overflows and drainage channels for excess water and *Sphagnum* inoculation.
- Re-alignment of piped drainage; and management of water levels to create/enhance existing wetlands.
- No measures are planned for the majority of surrounding marginal woodland habitats to the north and west.
- Silt ponds will continue to be maintained during the rehabilitation and decommissioning phase.
- Evaluate success of short-term rehabilitation measures and enhance where necessary.
- Decommissioning of silt-ponds will be assessed and carried out, where required.

**Timeframe:**

- 2023-2024. 1st phase of rehabilitation. Field drain blocking and cell creation.
- 2025. 2nd phase. Further realignment of piped drainage and other re-wetting measures dependent on success of 1st phase re-wetting, as determined by ongoing monitoring of water levels and re-vegetation.

- Other enhancement measures such as fertiliser treatment will be carried out, if needed. These will be determined by ongoing monitoring.
- 2025-2026. Evaluate success of short-term rehabilitation measures outlined above and remediate where necessary.
- 2025-2026. Decommission silt-ponds, if necessary.

**Table AP-1. Rehabilitation measures and target area.**

| Type | Code | Description | Area (Ha) |
|---|---|---|---|
| Deep peat cutover bog | DPT1 | Regular drain blocking (3/100 m) + modifying outfalls and managing water levels with overflow pipes | 95 |
| Dry cutaway | DCT1 | Modifying outfalls and managing water levels with overflow pipes | 30.7 |
| Wetland cutaway | WLT1 | Modifying outfalls and managing water levels with overflow pipes | 3.9 |
| Marginal land | MLT1 | No work required | 15.78 |
| Constrained area | Constraint | Constraint – Agricultural field to the west, railway line. | 1.77 |
| Additional | AW2 | Targeted drain blocking | 5.4 |
| **Total Area** | | | **152.6** |

See Drawing number BNM-DR-24-15-20 titled **Bracklin West Bog: Standard Rehab Measures** included in the accompanying Mapbook which illustrates the standard rehab measures to be applied.

**Monitoring, after-care and maintenance**

- There will be initial quarterly monitoring assessments of the site to determine the general status of the site, the condition of the silt-ponds, assess the condition of the rehabilitation work, assess the progress of natural colonisation, monitoring of any potential impacts on neighbouring land and general land security. The number of site visits will reduce after 2 years to bi-annually. These site visits will assess the need to additional rehabilitation.
- Water quality monitoring will be established.
- Monitoring results will be maintained, trended and reported on each year as part of the requirement to report on Condition 10.1 of the IPC Licence on Bog Rehabilitation in the Annual Environmental Report, which will be available in April each year at www.epa.ie.
- The parameters to be included (as per condition 6.2 of the IPC Licence) include monthly monitoring for pH, Flow, Suspended Solids, Total Solids, Total Phosphorus, Total Ammonia, Colour, and COD.
- This sampling regime on a selected number of silt ponds will be carried out over a two-year cycle. The original (licence) requirement was for a quarterly sampling regime.

- Where other uses are proposed for the site, these will be assessed by Bord na Móna in consultation with interested parties. Other after-uses can be proposed for licensed areas and must go through the required assessment and planning procedures.

**Validation and IPC Licence surrender**

Reporting to the EPA will continue until the IPC License is surrendered. The bog will be included in the full licence surrender process as per the Guidance to Licensees on Surrender, Cessation and Closure of Licensed Sites (EPA, 2012) when:

- The planned rehabilitation has been completed;
- Water quality monitoring demonstrates that water quality of discharge is stabilising or improving; and
- The site has been environmentally stabilised.

## APPENDIX II: BOG GROUP CONTEXT

The Ballivor-Derrygreenagh Bog Group comprises 11 discrete and defined bog units within Co's. Offaly, Westmeath and Meath (and one site used for transport – Hill of Down Railway). There are two main sub-groups; Ballivor (7 sites) and Derrygreenagh (5 sites). Nearly all of the Derrygreenagh sub-group and all of the Ballivor sub-group is located within the River Boyne catchment. A small portion of the western side of Toar Bog is located in the River Shannon catchment. Each bog area further comprises a range of habitats from bare milled former peat extraction areas to re-colonising cutaway to workshops areas and transport infrastructure.

Industrial peat extraction in the Ballivor-Derrygreenagh Bog Group ceased in 2020.

The Ballivor Bogs sub-group is located close to Ballivor Town in Co. Meath and most of the bogs extend across the Meath and Westmeath border. The Bord na Móna Ballivor Peat Moss factory is located 4 km from Ballivor Village on the margin of Ballivor Bog. An industrial railway links Ballivor to Carrenstown, Bracklin and Lisclogher East. Milled peat was supplied from Ballivor, Carrenstown, and part of Bracklin to Ballivor peat moss factory for horticultural products, with milled fuel peat being transported via road to Lough Ree Power (Lanesborough Co. Longford).

Intensive decommissioning and rehabilitation for the Ballivor-Derrygreenagh Bog Group started in 2021 at a number of individual bogs.

Industrial peat extraction in the Ballivor-Derrygreenagh Bog Group ceased in 2020. Decommissioning for the Ballivor-Derrygreenagh Bog Group started in 2021 at a number of individual bogs. Enhanced rehabilitation as part of the Peatland Climate Action Scheme (PCAS) will be carried out at Carranstown Bog and is expected to start in 2022. There is still some historical energy peat stock remaining on some bogs and these peat stock will be transferred via the BnM rail network to Edenderry Power Station up to 2024 when the power station is expected to have ceased using peat.

Bord na Móna is currently developing a wind energy project called Ballivor Wind Farm. This proposed project is in the pre-planning stage. It is expected to be submitted to planning in 2023. Bord na Móna are also continuing to review its landbank for future potential renewable energy projects.

A breakdown of the component bog areas for the Ballivor-Derrygreenagh Bog Group IPC License Ref. PO-501-01 is outlined in Table Ap-2.

*Table Ap-2: Ballivor-Derrygreenagh Bog Group names, area and indicative status (Derrygreenagh Energy Peat sub-group)*

| Bog Name | Area (ha) | Stage of development | Land-Use and History | Peat Production Cessation | Rehab Plan Status |
|---|---|---|---|---|---|
| Ballivor | 654 | Industrial peat production commenced at Ballivor in the 1940s.<br>Some sections have been cutaway. Some sections still have relatively deep residual peat. | Ballivor Bog formerly supplied a range of commercial functions including the supply of horticultural peat, sod peat and latterly; fuel peat for Lough Ree Power.<br>Some sections were never re-developed to milled peat and have revegetated as cutaway. | 2020 | Draft updated 2022 |

| Bog Name | Area (ha) | Stage of development | Land-Use and History | Peat Production Cessation | Rehab Plan Status |
|---|---|---|---|---|---|
| | | | Some areas of cutaway are developing pioneer cutaway vegetation communities.<br>Expected to be part of the proposed Ballivor Wind Farm, which is currently in pre-planning. | | |
| Bracklin (excluding Bracklin West) | 680 | Industrial peat production commenced at Bracklin in the 1940s.<br>Some sections have been cutaway. Some sections still have relatively deep residual peat. | Bracklin Bog formerly supplied a range of commercial functions including the supply of horticultural peat, sod peat and latterly; fuel peat for Lough Ree Power.<br>The main section was never re-developed to milled peat and has revegetated as mature cutaway habitats<br>Bare peat is prevalent in the western section, which was in milled peat extraction.<br>Expected to be part of the proposed Ballivor Wind Farm, which is currently in pre-planning. | 2020 | Draft updated 2022 |
| Carranstown | 306 | Industrial peat production commenced at Carrenstown in the 1980s.<br>The majority of the site has relatively deep peat. | Carrenstown Bog formerly supplied a range of commercial functions including the supply of horticultural peat and latterly; fuel peat for Lough Ree Power.<br>The majority of the site is rehabilitated.<br>A constrained area is part of the proposed Ballivor Wind Farm, which is currently in pre-planning. | 2020 | Rehabilitated 2022 |
| Lisclogher East | 486 | Industrial peat production commenced at Lisclogher East in the 1950s.<br>Part of the site is cutaway while there is a mosaic of residual peat depths. | Lisclogher East formerly supplied sod turf both for fuel and horticulture. This bog was never re-developed to supply milled peat.<br>The majority of the bog is developing cutaway habitats and there is a mosaic of bare peat areas where there has been recent sod peat extraction. | 2020 | Draft updated 2022 |
| Lisclogher West | 239 | Lisclogher West was drained in 1980s.<br>The bog is drained and still has residual vegetation in places. | Lisclogher West was drained but never fully developed for industrial peat extraction. | N/A | Draft updated 2023 |
| Kinnegad | 352 | Industrial peat production commenced at Kinnegad in the 1980s.<br>The majority of the site still has relatively deep peat. | Kinnegad Bog formerly supplied a range of commercial functions -mainly the supply of horticultural peat and latterly; fuel peat for Lough Ree Power.<br>The majority of the site is bare peat. | 2020 | Draft 2017 |
| Hill of Down Railway | 22 | | Rail link – not used for peat extraction | N/A | |
| Ballybeg | 847 | Industrial peat production commenced at Ballybeg in the 1950s. | Ballybeg Bog formerly supplied a range of commercial functions including the | 2020 | Draft 2017 |

| Bog Name | Area (ha) | Stage of development | Land-Use and History | Peat Production Cessation | Rehab Plan Status |
|---|---|---|---|---|---|
| | | Most of the site is cutaway | supply of horticultural peat and fuel peat for Edenderry Power.<br>Much of the site is bare peat. The northern half has been cutaway and is establishing cutaway habitats. | | |
| Derryarkin | 710 | Industrial peat production commenced at Derryarkin in the 1950s.<br>Most of the site is cutaway | Derryarkin Bog formerly supplied a range of commercial functions including the supply of fuel peat for Rhode Power Station, Croghan Brickette Factory and Edenderry Power.<br>Most of the site is developing cutaway habitats. Some re-wetting was carried out in the past.<br>Part used for gravel extraction. | 2015 | Draft 2017 |
| Derryhinch | 337 | Industrial peat production commenced at Derryhinch in the 1950s.<br>There is a mosaic of residual peat depths left | Derryhinch Bog formerly supplied a range of commercial functions including the supply of fuel peat for Rhode Power Station, Croghan Brickette Factory and Edenderry Power.<br>Most of the site is bare peat with emerging cutaway habitats.<br>Part of the site was used to trial herb production | 2020 | Draft 2017 |
| Drumman | 1,122 | Industrial peat production commenced at Drumman in the 1950s.<br>Most of the site is cutaway | Drumman Bog formerly supplied a range of commercial functions including the supply of fuel peat for Rhode Power Station, Croghan Brickette Factory and Edenderry Power.<br>Most of the site is developing cutaway habitats. Some re-wetting was carried out in the past.<br>Part used for gravel extraction.<br>Part of the site was used to trial herb production.<br>Part of the site is used for log storage (biomass) | 2020 | Draft 2017 |
| Toar | 445 | Industrial peat production commenced at Toar in the 1980s.<br>Most of the site has deep residual peat. | Toar Bog formerly supplied a range of commercial functions including the supply of horticultural peat and fuel peat for Edenderry Power.<br>Most of the site is bare peat.<br>Part of the site is used for log storage (biomass) | 2020 | To be updated 2023 |

## APPENDIX III: ECOLOGICAL SURVEY REPORT

**Ecological Survey Report**

*Note: This Ecological Survey Report has been appended to provide a background to the current Bracklin West Rehabilitation Plan. The Ecological Survey Report is not restricted to the current extent of Bracklin West Bog but describes the wider Brackiln Bog area as a whole. This report outlines an ecological survey of Bracklin Bog in its entirely. This report should not be taken as a management plan for the site as other land-uses may still be considered. Information within this report may inform the development of other land-uses and identify areas with particular biodiversity value. The report outlines potential options for biodiversity management after industrial peat production has ceased, (if this is the proposed main land-use for the site).*

| | | | |
|---|---|---|---|
| **Bog Name:** | **Bracklin** | **Area (ha):** | 680 ha (1680 acres) |
| **Works Name:** | Ballivor | **County:** | Westmeath |
| **Recorder(s):** | MMC & DF | **Survey Date(s):** | 9 & 11/07/2012, 2016 |

**Habitats present (in order of dominance)**

The most common habitats present at this site include:

- Birch-dominated scrub and woodland (eBir, oBir, cBir) (Codes refer BnM classification of pioneer habitats of production bog).
- Pioneer Heather-dominated dry heath (dHeath) (in mosaic with scrub and pEang)
- Pioneer Bog Cotton -dominated poor fen (pEang,)
- Bare peat (mainly along travel paths)
- Pioneer dry Cocksfoot-False Oatgrass -dominated grassland (gDa-Arr)
- Pioneer dry Purple Moorgrass-dominated grassland (gMol)
- Embryonic bog vegetation (Em)
- Pioneer Bottle Sedge –dominated poor fen and open water (pRos/Ow)
- Pioneer Sweet Vernalgrass-dominated grassland (gAn-Ho-Eq)
- Pioneer dry calcareous grassland (gCal)
- Silt ponds (Silt) with Gorse/Birch scrub and Purple Moorgrass-dominated grassland (gMol)
- Riparian zones (Rip) (with drains and associated habitats such as scrub)

The most common habitats found around the margins of the site include:

- Birch woodland (WN7) (Codes refer to Heritage Council habitat classification, Fossitt 2000),
- Raised bog (PB1) and Poor flush (PF2)
- Cutover Bog (PB4)
- Secondary cutover bog mosaics with developing dry heath/facebank PB1, poor fen and scrub.
- Scrub (WS1)

- Dry meadow (GS2) (around old famine house)
- Oak-Ash-Hazel woodland (WN2) (around old famine house)
- Hedgerows (WL1)
- Improved grassland (GA1) around the boundary where the GIS boundary extends into adjacent fields
- Wet grassland (GS4) (old cutover)

**Description of site**

Bracklin Bog is located close to Raharney and Ballivor in eastern Co. Westmeath, adjacent to the Co. Meath border. It is part of the Ballivor Bog group with Lisclogher Bog East and West located to the north and Carranstown Bog located to the south of the site. A railway links the milled production bog to Carranstown and the rest of the Ballivor bog group and there are old abandoned railway link to Lisclogher to the north.

Bracklin Bog was formerly an old sod peat production bog and the majority of the bog was abandoned in the 1970-1980's. This area is now heavily vegetated with cutaway habitats. The majority of the site has had no milled peat production. Part of this cutaway area and remnant bog was initially developed for milled peat and regular field drains were dug through some of the bog, particularly some of the marginal remnant areas. However, this development was abandoned. A small section to the west has been developed into milled peat production and is now dominated by bare peat.

The large former sod peat production area is now heavily vegetated with overall vegetation cover generally about 90%. This area has similar characteristics to other old sod peat bogs like Timahoe North and South. Deep wide trench drains were dug at intervals separating the production bays across the bog in a north-east to south-west direction. These riparian zones are now generally heavily vegetated with dense Birch scrub and woodland, forming long bands of woodland through the site. Some contain running water and have developed riparian characteristics while some have silted up. The majority of the site is dry and there is little open water or wetland development. There are several narrow strips of high bog running through the middle of each bay that are the remaining banks left after sod peat production. These narrow strips are generally dominated by dry Heath (dHeath)-like vegetation as the remnant bog has dried out. They have also been colonised by Gorse and Birch scrub in places.

The cutaway areas have generally similar habitat development through the site that varies relative to the time since the various sections came out of production. Some bays obviously came out of production at a much later stage and have more frequent bare peat in mosaic with the pioneer habitats. The older sections have much denser vegetation cover and much more scrub cover. The majority of the cutaway vegetation is a mosaic of pioneer Heather-dominated dry heath (dHeath), Bog Cotton-dominated poor fen (pEang) and Birch scrub (e/oBir). The older sections tend to have 100% vegetation cover. One feature of this site is the excellent Birch colonisation and many of the younger areas have frequent small Birch saplings (eBir) (< 0.5 m high) that will develop to form thicker Birch scrub in the next 10 years. Another feature of this site is the relatively higher abundance of Hare's-tail Bog Cotton in the Bog Cotton-dominated cutaway vegetation. This species tended to be more frequent in some of the former production bays around the northern margin (where peat was deeper or closer to high bog that provides a seed source). It also appears in some of the embryonic bog communities. Other more typical raised bog species such as Bog Asphodel, Deergrass and White Beak Sedge, which are not usually found in pioneer cutaway vegetation on BnM cutaway, are found amongst the other cutaway vegetation

at this site but are generally rare. Hummocks of various *Sphagnum* species can also be found throughout the site and are generally associated with Bog Cotton-dominated vegetation (where it is wetter), but their overall cover is rare. However, there are several areas where the *Sphagnum* cover becomes a lot more frequent.

Some of the former production bay that runs along the northern margin of the former production area has significant *Sphagnum* regeneration in places (north-east corner). There are occasional large hummocks of *S. papillosum*, *S. subnitens*, *S. capillifolium* developing in association with Hare's-tail Bog Cotton, Common Bog Cotton and Heather. Hare's-tail Bog Cotton is particularly frequent. Production has not significantly lowered the surface of the bog so there is probably deep peat in this area.

Further south-west along this bay, the *Sphagnum* cover becomes frequent and the vegetation is a typical raised bog community (mapped as an embryonic bog community). This may be an area where peat production was limited, or there was no production at all, so some of the *Sphagnum* cover may be remnant *Sphagnum* cover. This area seems to have initially been developed for milled peat production and perhaps was only screw-levelled. The level of the bog is relatively high and there is a significant fall to adjacent production bays. The bog surface was quite firm and the relatively shallow drains were active. The vegetation cover was dominated by Heather and by the two Bog Cotton species. There was also occasionally frequent Bog Asphodel, Deergrass and White Beak Sedge, so the vegetation cover was quite similar to high bog vegetation. Soft Rush and Purple Moorgrass were present, indicating the previous disturbance, but were rare and absent in places.

The bog is underlain with some ridges and mounds and the peat topography is variable in places. The mounds tend to have more bare peat cover and are dominated by pioneer dry heath with Birch scrub. The basins tend to be dominated by pioneer poor fen Bog Cotton-dominated vegetation. Some of the former production bays are sloped and there are natural shallow drainage channels cut through the peat in places. These slopes have probably led to some erosion along these natural drainage channels.

Towards the centre of the site there is some development of an embryonic *Sphagnum* community associated with a small wetland area. This is **not** a remnant raised bog area but *Sphagnum* regenerating on cutaway. The wetland has formed in a local small basin with impeded drainage that has developed along one of the old remnant bands of high bog that was left after sod-peat cutting. The vegetation is somewhat similar to the *Sphagnum*-rich poor fen vegetation that is developing at Oweninny. There is an abundant carpet of *S. cuspidatum* cover associated with Soft Rush and/or Common Bog Cotton that was sitting on water. Other species present include Jointed Rush, Marsh Pennywort, Marsh Cinquefoil, Marsh Bedstraw, Reedmace, Horsetail, indicating poor fen influence. Hummocks of *S. palustre* and *S. subnitens* are also present in some of the denser areas and around the margins where it was somewhat drier. This basin formerly contained an open water area (see aerial photos), but this has now vegetated and infilled with pioneer Bottle Sedge-dominated vegetation (pRos). When examining LiDAR data, it is interesting to note that this basin has not developed on the lowest part of the site and there is lower ground that contains more typical drier communities dominated by scrub. This basin seems to be localised and has developed with a mound/ridge on one side and the band of high bog on another side.

There are several mounds and ridges towards the centre of the site where the underlying glacial till has been exposed or where there is a thin layer of remnant peat. The areas with the exposed gravel tend to have small patches of pioneer calcareous grassland (gCal). This grassland community tends to be rich in orchids with frequent Common Spotted Orchid and some Marsh Helleborine. Much of this grassland has become rank and dominated by False Oatgrass (gDa-Arr) forming a meadow-type community. Species present include Silverweed, Red Clover, Sweet Vernal grass, Yorkshire Fog, Long-leaved Plantain, Marsh Thistle, Nettle, Meadowsweet,

Sorrell, Knapweed, Hogweed, Brambles, and Bindweed. One area towards the centre of the site and adjacent to the railway has a relatively extensive area of this grassland community with limited scrub cover, which is somewhat unusual on the cutaway. This habitat attracted a lot of butterflies. Associated with these mounds there is also some development of a more acidic grassland community dominated by Sweet Vernal-grass (gAn-Ho-Eq). This grassland type also contains other acidic grassland indicators such as Heath Bedstraw and Tormentil. Other species such as Hawthorn and Elder are also associated with the scrub on and around these mounds.

A small pocket of dry calcareous grassland contains a significant Marsh Helleborine population (> 500 individuals). This was a small gravelly area and was quite disturbed. The Marsh Hellaborine were associated with Catsear, Coltsfoot, Ox-eye Daisy, Sweet Vernal-grass, Yorkshire Fog, Glaucous Sedge, Eared Willow, Cocksfoot, Red Clover, Knapweed, Wild Strawberry, Creeping Thistle, Hawthorn, Purple Moorgrass, Wild Carrot, Long-leaved Plantain, Mouse-ear Chickweed, Yarrow, Black Medick, Self Heal, Red Fescue, Rosebay Willowherb, False Oatgrass, Slender St John's Wort, Tormentil, Bramble, Groundsel, Fragrant Orchid, Common Spotted Orchid.

**Large high bog remnant**

There is a relatively large bog remnant (15.7 ha within BnM GIS property boundary) located along the southern margin that is of conservation interest to the local community. There are several parallel drains in the high bog close to the northern margin and adjacent to the production bog, which did not have *Sphagnum* cover. However, the majority of the high bog has not been drained extensively. There are natural transitions to Birch woodland to the east, south and west, which increase the conservation value of this high bog remnant somewhat. There are also relatively natural transitions/slopes to old regenerating cutover bog/dry heath to the south (outside the BnM property boundary). There are slopes from the west and east, creating a basin towards the eastern side, which may be as a result of subsidence. The high bog contains typical raised bog features and has a hummocky micro-topography. The bog surface was generally firm-spongy underfoot. It has been unburnt for some time and has a high *Cladonia portentosa* cover. It has a typical species assemblage and there are some algal hollows with White Beak-sedge. Deergrass was a prominent feature of the vegetation towards the margin. Small hummocks of S. *papillosum* and *S. capillifolium* and *S. subnitens* were present, although the *Sphagnum* cover was low. Bog Rosemary was present. *Sphagnum cuspidatum* was also present in some hollows but its cover was overall very low. The majority of the bog could be classified as sub-marginal in ecotope quality, although it was noticeable that further south towards the bog margin, the quality of the high bog deteriorated and *Sphagnum* was absent and there was more bare peat cover (marginal ecotope). Further into the bog there are some larger hollows or former pools. These generally do not retain any pool features and have re-vegetated, although some were algal and remained open.

A depression has developed towards the eastern side and is visible on the aerial photos. This section has some surface water and also has frequent to abundant *Sphagnum* cover. There are indications of flushing around the margins and within this section, where the Heather is more vigorous. The vegetation is dominated by Heather and Hare's-tail Bog Cotton, with S. *papillosum* and *S. capillifolium* hummocks and *S. cuspidatum* hollows. While the surface was squelchy and soft, there was no indication of quaking to the bog, indicating that this area was likely to be secondary *Sphagnum* development due to subsidence. This area could be considered sub-central in quality due to the abundant *Sphagnum* cover. There were also no indications of relic active bog features such as former pool complexes or large *S. imbricatum* hummocks. *Sphagnum imbricatum* was not recorded on the

high bog, (which is unusual for a remnant this size). The depression with frequent *Sphagnum* cover continues further north towards the production bog boundary where the drains are infilled with *S. cuspidatum.*

The high bog transitioned to Birch woodland to the east, which has developed on old cutover bog. An old face-bank is still present within the woodland, although the Birch has spread onto the high bog in places. The woodland is dominated by numerous narrow-stemmed Birch trees with a low canopy of < 8 m. The ground cover is typical and is dominated by Brambles, Purple Moor-grass and Bracken, with some Bilberry cover. There are Deer tracks through the woodland and onto the high bog.

Further east there is a low mound where the peat is thin and the underlying gravel has a significant influence on the vegetation. This area was managed as a small farm in the past and was known as Robbersbush. It is now mostly vegetated with scrub and woodland with some open, now rank grassland and Bracken. Some mature Ash and Oak trees are visible. There used to be a path through this site, but this is now overgrown. The high bog area to the east of this old farm has been burnt in the recent past, although is recovering. The high bog (PB1) is poor in quality with a firm surface, significant bare peat cover and no *Sphagnum* cover. A small depression does have some regenerating *Sphagnum* cover. There is also a small flush (PF2) through this high bog area, which is vegetated by Purple Moorgrass. There are indications of the fire damage in the surrounding scrub and woodland on the high bog with standing dead Birch around the margins of the woodland regenerating from their bases and Bracken becoming prominent where there was former scrub.

**Old famine House area (Tonduff)**

This area is located towards the south-east part of Bracklin bog, between the railway along the eastern margin and the main travel path further west. It has developed around a low mineral island and this area was also farmed in the past. Old field enclosures are visible on the OSI 2nd edition 6 inch map. The area now contains dry meadow grassland, which is quite rank and ungrazed. This is surrounded by Birch woodland that has developed on cutover bog, with old face-banks still present. The woodland is dominated by Birch and contains Rowan and Bilberry. Pine is present on the high bog margin of the woodland. Some Alder are also present around the meadow margins. The remains of an old house are still present on a small mound in the area and this has now developed into a woodland copse with elements of WN2 Oak-Ash-Hazel woodland. There are several mature Sycamore trees around the house forming the woodland copse and associated with these there are also some Hazel, Elder, Holly, Hawthorn and Ash. The ground cover contains Wood Avens, Herb Robert, Wood Sedge, Ivy, Hogweed, and Bluebell. There are also some exotic plants and over-grown shrubs that were once part of the old garden associated with the house.

Birch-dominated woodland dominates the area to the south and west of Tonduff and the travel path. This Birch woodland has developed on old cutover bog with frequent old face-banks and drains present. The woodland contains Bilberry.

**Designated areas on site (cSAC, NHA, pNHA, SPA other)**

None

The western end of Brackin Bog is located within 1 km of the River Boyne and Blackwater cSAC and SPA (River Deel) (Site codes 002299 & 4232)

**Adjacent habitats and land-use**

Adjacent habitats include wet grassland (GS4), improved agricultural grassland (GA1), conifer plantation (WD4), Birch woodland (WD7), remnant high bog (PB1) and cutover bog (PB4).

**Watercourses (major water features on/off site)**

- Bracklin Bog is located within the River Boyne catchment.
- The milled peat production bog drains via gravity to several silt-ponds around the margins and on to the River Deel.
- The remaining bog drains via the old drainage network to a variety of streams around the margins. There is no silt-pond treatment for the cutaway area. Old trench drains associated with sod peat bogs were cut through the bog. Some of these are still flowing and developing typical riparian features.
- There are several small wetlands with some open water on the site where drainage is impeded or where there is a localised basin.

**Peat type and sub-soils**

The main peat type left on the cutaway area is a more acidic red peat. This is indicated by the typical cutaway re-vegetation being dominated by Heather and Bog Cotton and is typical of old sod peat production bogs where deeper remnant peat was left on the bog.

Mixed gravel till is exposed at several places through the bog on the surfaces of mounds.

**Fauna biodiversity**

**Birds**

Several bird species were noted on the site during the survey.

- Peacock
- Kestrel
- Meadow Pipit were noted on the large high bog remnant
- More common bird species recorded around the bog included Blackcap, Song Thrush, Wood Pigeon, Whitethroat, Blue Tit, Blackbird, Redpoll, Rook, Grey Crow and Wren.
- Blackbird, Blackcap, Wood Pigeon and Song Thrush were noted around Tonduff.

**Mammals**

Signs of several mammal species were noted on the site during the survey.

- Several Hares were sighted at various locations around the bog. Signs of Hares were also quite frequent around the bog.
- Signs of Fox (droppings and prints) and Badger (prints) were also noted around the bog.
- Deer tracks though Birch woodland and onto high bog remnant at the southern bog margin.

**Other species**

- Ringlet and Meadow Brown butterflies were frequently flushed from grassy areas on the site. Small Heath was recorded several times around the cutaway and on some of the high bog remnants. Common Blue was also recorded on the site associated with gravelly habitats with calcareous grassland.

Meadow Brown, Ringlet and Wood White were recorded around the meadow at Tonduff.

## APPENDIX IV. ENVIRONMENTAL CONTROL MEASURES TO BE APPLIED TO BOG REHABILITATION

- Bog restoration/rehabilitation measures will be restricted to within the footprint of the proposed rehabilitation area.
- The proposed rehabilitation will have due regard to noise limits and hours of operation (i.e. dusk and dawn) to minimise any potential disturbance on resident and local fauna that utilise the site and immediate environs.
- All plant and equipment for use will comply with the Construction Plant and Equipment Permissible Noise Levels Regulations (SI 359/1996).
- The proposed activities will be restricted to daylight hours and there will be no requirement for artificial lighting.
- Silt ponds will be inspected and maintained as per the IPC Licence.
- During periods of heavy precipitation and run-off, activities will be halted.
- Measures will be carried out using a suitably sized machine and in all circumstances, excavation depths and volumes will be minimised where possible.
- All machines will be regularly checked and maintained prior to arrival at the site to prevent hydrocarbon leakage.
- Hoses and valves will be checked regularly for signs of wear and will be closed and securely locked when not in use.
- Fuelling and lubrication of equipment shall only be carried out in designated areas away from surface water drainage features and ecologically sensitive areas.
- Waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the site for disposal or re-cycling.
- Vehicles will never be left unattended during refuelling.
- No direct discharges to waters will be made. No washings from vehicles, plant or equipment will be carried out on site.
- All plant refuelling will take place using mobile fuel bowsers. Only dedicated trained and competent personnel will carry out refuelling operations.
- Mobile storage such as fuel bowsers will be bunded to 110% capacity to prevent spills. Tanks for bowsers and generators shall be double skinned. When not in use, all valves and fuel trigger guns from fuel storage containers will be locked. All pumps using fuel or containing oil will be locally and securely bunded where there is the possibility of discharge to waters.
- Potential impacts caused by spillages etc. during rehabilitation will be reduced by keeping spill kits and other appropriate equipment on-site.
- Site activities will be carried out in accordance with 'best practice'. In order to ensure compliance and implementation of 'best practice', these measures will be communicated to relevant Bord na Móna staff and updated as required.

## APPENDIX V. BIOSECURITY

The potential for importation or introduction of non-native plant species (such as Japanese Knotweed, Himalayan Balsam, etc.) during future rehabilitation management, such as drain-blocking using excavators, has the potential to result in the establishment of invasive species within the site. Section 49 of the European Communities (Birds and Natural Habitats) Regulations 2011 prohibits the introduction and dispersal of invasive alien species (particularly plant species) listed on Part 1 (third column) of the 'Third Schedule'.

This section aims to reduce the risk from, and impacts of, invasive species and protecting biodiversity on lands under Bord na Móna ownership. Rehabilitation and decommissioning in the bog will have due regard to the relevant biosecurity measures outlined below:

- Records of problematic invasive species within the various bog units will be marked out with signs to highlight areas of infestation to personnel.
- All plant machinery will be restricted from disturbing known colonies of invasive species.
- All plant machinery will avoid unnecessary crossings to adjoining lands.
- Good site hygiene will be employed to prevent the introduction and spread of problematic invasive alien plant species (i.e. Japanese Knotweed (*Fallopia japonica*), Himalayan Balsam (*Impatiens glandulifera*), Himalayan Knotweed (*Persicaria wallichii*), etc.) by thoroughly washing vehicles prior to entering the area.

The biosecurity measures outlined above are in line with best practice guidelines issued by the National Roads Authority (NRA, 2010) – The Management of Noxious Weeds and Non-native Invasive Plant Species on National Roads and broadly based on the Environment Agency's (2013) – The Knotweed Code of Practice: Managing Japanese Knotweed on Development Sites (Version 3, amended in 2013).

In respect of Bracklin West Best Practice measures will be adhered with regarding the presence of Rododendron.

In addition to the above, Best Practice measures around the prevention and spread of Crayfish plague[6] will be adhered with throughout all rehabilitation measures and activities.

[6] https://www.biodiversityireland.ie/projects/invasive-species/crayfish-plague/

# APPENDIX VI. POLICY AND REGULATORY FRAMEWORK

Bord na Móna Plc is a publicly owned company, originally established in 1934 to develop some of Ireland's extensive peat resources for the purposes of economic development and to support energy security. In the decades since its establishment the company has employed tens of thousands of people in its fuel, energy, and horticultural growing media businesses. For much of its history the company's support of important national policy aims has been enabled and encouraged in a variety of ways by Government.

Today, Bord na Móna is undertaking a number of highly significant actions in support of climate policy. These actions involve a radical transformation and decarbonisation of nearly the entire Bord na Móna business. This transformation will be driven by unlocking the full potential of our land and creating significant value for Ireland and the Midlands in particular.

Bord na Móna is an integral part of the economic, social, and environmental fabric of Ireland and Irish life. As a key employer in the Midlands, the company is conscious that its obligations go beyond purely commercial and environmental – there is also a social responsibility to employees and the communities served by Bord na Móna. It is the company's role and absolute priority to ensure that its long-term strategy delivers on all of these important areas in a robust and balanced way.

There are a wide range of policies, plans, legislation and land designations that inform the development of this Bord na Móna peatland rehabilitation plan. Bord na Móna have also developed and operate various policies and strategies that also inform the development of this rehabilitation plan.

## 1 EPA IPC Licence

Bord na Móna operates under IPC Licence issued and administered by the EPA to extract peat within the Ballivor-Derrygreenagh Bog Group (Ref. P0-501-01). As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. The bog is part of the Ballivor-Derrygreenagh group. This regulatory requirement is the main driver of the development of this rehabilitation plan.

## 2 The Peatlands Climate Action Scheme (PCAS)

Bord na Móna (BnM) understand that it is the Minister's (DECC) intention to impose an obligation on Bord na Móna to develop a programme of measures, 'the Scheme', for the enhanced decommissioning, rehabilitation and restoration of boglands previously used to supply peat for electricity generation within the State. The enhanced decommissioning, rehabilitation and restoration of the peatlands funded by the Scheme (PCAS) will deliver benefits across climate action (GHG mitigation through reduced carbon emissions and acceleration towards carbon sequestration), enrich the State's natural capital, increase eco-system services, strengthen biodiversity, improve water quality and storage attenuation as well as developing the amenity potential of the peatlands.

It is envisaged that Bord na Móna carry out an enhanced decommissioning, rehabilitation and restoration, under the Scheme (PCAS), and supported by the Climate Action Fund and Ireland's National Recovery and Resilience Plan across a footprint of 33,000 ha. This scheme will significantly go beyond what is required to meet rehabilitation and decommissioning obligations under existing EPA IPC licence conditions. Interventions and measures supported by the Scheme will ensure that environmental stabilisation is achieved (meaning IPC obligations are met), and importantly, significant additional benefits, particularly relating to climate action and

other ecosystem services, will also be delivered. However, only the additional costs associated with the additional and enhanced rehabilitation, i.e., those activities which go beyond the existing decommissioning and rehabilitation requirements arising from Condition 10 will be eligible for support under the Scheme.

The proposed enhanced rehabilitation detailed in this document, are predicated on the understanding that the element of the activities, over and above the 'standard' rehabilitation necessary to comply with pre-existing Condition 10 IPC Licence requirements, will be deemed eligible costs by the Scheme regulator and funded by the Climate Action Fund and Ireland's National Recovery and Resilience Plan.

For the avoidance of doubt, should the Scheme and the associated statutory obligation on Bord na Móna not materialise, Bord na Móna will not carry out the enhanced decommissioning, rehabilitation and restoration measures described in this plan. Bord na Móna will instead plan to complete an adapted standard decommissioning and rehabilitation measures required under Condition 10 and outlined in Appendix I.

## 3 National and EU Climate and Biodiversity Policy

The National Policy Position establishes the fundamental national objective of achieving a transition to a competitive, low carbon, climate-resilient and environmentally sustainable economy by 2050. It sets out:

- the context for the objective;
- clarifies the level of GHG mitigation ambition envisaged; and
- establishes the process to pursue and achieve the overall objective.

The evolution of climate policy in Ireland will be an iterative process based on the adoption by government of a series of national plans over the period to 2050. GHG mitigation and adaptation to the impacts of climate change are to be addressed in parallel national plans – respectively through the National Climate Action Plan. The plans will be continually updated, as well as being reviewed on a structured basis at appropriate intervals and, at a minimum, every five years. This will include early identification and ongoing updating of possible transition pathways to 2050 to inform sectoral strategic choices.

Bord na Móna is following a decarbonisation programme aimed at reducing the carbon emissions from its activities. Industrial peat production has now ceased, and several other decarbonisation measures are being implemented. The company aims to further develop renewable energy and resource recovery markets with a key objective of reducing the carbon intensity of all products. In addition, the carbon emission mitigation benefits associated with the post-peat extraction rehabilitated peatland following re-wetting, revegetation and colonisation of significant areas with native woodland will make a significant contribution to achieving the State's carbon emission reduction targets.

Peatlands rehabilitation and restoration is referenced in Section 17.3.3 of the Land Use, Land Use Change, Forestry and Marine Chapter of the National Climate Action Plan 2021 as follows:

"The rehabilitation of degraded peatlands to a condition in which they regain their ability to deliver specific ecosystem services has considerable potential for initial mitigation gains, and future carbon sequestration. Additional benefits of peatland restoration include positive socio-economic outcomes for the Midlands, increased natural capital, enriched biodiversity, improved water quality, and flood attenuation."

The scheme is included as Action 33 in the Climate Action Plan 2021 Annex of Actions - Deliver the Enhanced Decommissioning, Rehabilitation and Restoration (EDRR) Scheme for Bord na Mona Peatlands.

EDRRS is also referenced in the Climate Action Plan 2021 as a measure to deliver a Just Transition in the Midlands.

International research and scientific understanding of peatlands is now reflected in key Irish national policy and strategy documents such as the National Raised Bog Special Areas of Conservation (SACs) Management Plan 2017 - 2022 (Department of Arts, Heritage and the Gaeltacht 2017), The National Peatland Strategy (Department of Arts, Heritage and the Gaeltacht 2015), The National Biodiversity Action Plan (National Parks and Wildlife Service 2017), The River Basin Management Plan for Ireland 2018-2021 (Department of Housing, Planning and Local Government 2018), and the Biodiversity – Climate Change Sectoral Action Plan (Department of Arts, Heritage and the Gaeltacht 2019). Each of the national plans, which are also complemented with the recently published EU Green Deal communication on Biodiversity Strategy for 2030 (COM 2020) have overlapping objectives and actions that focus on the restoration of peatlands damaged by turf-cutting, drainage and other impacts, as well as the re-wetting of Bord na Móna industrial peat extraction bogs.

While not specifically identified as a restoration implementor, EDRRS objectives are in line with those of the United Nations Decade on Ecosystem Restoration 2021-2030 of Preventing, Halting and Reversing the Degradation of Ecosystems worldwide.

EDRRS is also in line with the EU Commission proposal for a Nature Restoration Law which will apply legally binding targets for nature restoration in different eco-systems to every Member State. The aim is to cover at least 20% of the EU's land and sea areas by 2030 with nature restoration measures and eventually extend these to all ecosystems in need of restoration by 2050.

## 4 National Peatlands Strategy

The National Peatlands Strategy (2015) contains a comprehensive list of actions, necessary to ensure that Ireland's peatlands are preserved, nurtured and become living assets within the communities that live beside them. It sets out a cross-governmental approach to managing issues that relate to peatlands, including compliance with EU environmental law, climate change, forestry, flood control, energy, nature conservation, planning, and agriculture. The Strategy has been developed in partnership between relevant Government Departments/State bodies and key stakeholders through the Peatlands Council.

The strategy recognises that Ireland's peatlands will continue to contribute to a wide variety of human needs and to be put to many uses. It aims to ensure that Ireland's peatlands are sustainably managed so that their benefits can be enjoyed responsibly. It aims to inform appropriate regulatory systems to facilitate good decision making in support of responsible use. It also aims to inform the provision of appropriate incentives, financial supports and disincentives where required. The strategy attempts to strike an appropriate balance between different needs, including local stakeholders like turf-cutters and semi-state bodies such as Bord na Móna.

In line with a National Peatlands Strategy recommendation, a Peatlands Strategy Implementation Group (PSIG), was established, assisted in the finalisation of the Strategy, is overseeing subsequent implementation and will report to Government on an annual basis on the implementation of the actions and principles contained within the Strategy.

Bord na Móna is a key stakeholder in the National Peatlands Strategy and the Peatlands Strategy Implementation Group. The strategy recognises the potential for some Bord na Móna sites to be restored and to contribute to the national SAC and NHA network of protected raised bog sites. The strategy (agreed in 2015) also recognises the various different values of cutaway bog and developed six key principles (with Bord na Móna) for the after-use of cutaway bog.

- Bord na Móna will continue to assess and evaluate the potential of the company's land bank, using a land use review system. The assessment will help prepare a set of evidence-based management plans for the various areas of peatland. These plans will also inform its cutaway bog rehabilitation.
- The policy of Bord na Móna is not to open up any undrained new bogs for peat production.
- Lands identified by Bord na Móna as having high biodiversity value and/or priority habitats will be reserved for these purposes as the principal future land use.
- Generally, Bord na Móna cutaway bogs that flood naturally will be permitted to flood unless there is a clear environmental and/or economic case to maintain pumped drainage.
- In deciding on the most appropriate afteruse of cutaway peatlands, consideration shall be given to encouraging, where possible, the return to a natural functioning peatland ecosystem.
- This will require re-wetting of the cutaway peatlands which may lead in time to the restoration of the peatland ecosystem.
- Environmentally, socially and economically viable options should be analysed to plan the future use of industrial cutaway peatlands, in conjunction with limiting factors as outlined in Bord na Móna's Strategic Framework for the Future Use of Peatlands.

The National Peatlands Strategy highlights the importance and value of developing peatland rehabilitation plans for Bord na Móna cutaway sites and implementing this peatland rehabilitation. Some of these principles have now been superseded by the company's decision to cease industrial peat extraction. The National Peatlands Strategy is currently being reviewed by Government.

## 5 Draft National River Basin Management Plan 2022-2027 (Water Framework Directive)

The National River Basin Management Plan (Department of Housing, Planning, Community and Local Government 2017) is the key national plan for Ireland to achieve the objectives of the Water Framework Directive (WFD). In broad terms, the objectives of the WFD are (1) to prevent the deterioration of water bodies and to protect, enhance and restore them with the aim of achieving at least good status and (2) to achieve compliance with the requirements for designated protected areas.

The NRBMP 2018-2021 outlined how peat extraction can be a potentially significant pressure on various water quality parameters. Peatland rehabilitation of Bord na Móna cutaway (in addition to other measures) was part of the WFD (2018-2021) programme of measures. The NRBMP 2018-2021 takes account of the fact that Bord na Móna was in the process of phasing out the extraction of peat for energy production, that it set a target to rehabilitate 9,000 ha of cutaway bogs (covering 25 peatlands) by 2021 (in 2018) and will look to implement best-available mitigation measures to further reduce water quality impacts caused by peat extraction while the phasing-out process is taking place. This NRBMP 2018-2021 rehabilitation target was superseded by the acceleration of the Bord na Móna de-carbonisation programme and the Scheme **(PCAS)**.

The development of site rehabilitation plans and the delivery of peatland rehabilitation by Bord na Móna was expected to have a positive impact on water quality and will help the NRBMP 2018-2021 deliver its objectives in relation to the Water Framework Directive and is one of the five key principle actions.

The draft NWBMP 2022-2027 describes how the number of waterbodies impacted by peat, industry and forestry have decreased by 10, 10 and 5 waterbodies, respectively since the second cycle. Impacts on water quality and river habitat arising from peat and peat extraction and associated drainage include the release of ammonium and

fine-grained suspended sediments, and physical alteration of aquatic habitats. Drainage of peatlands also results in changes to the hydromorphological condition of rivers.

The draft NWBMP 2022-2027 outlines how maintaining and restoring Irish bogs will lead to a decrease in waterborne carbon leaching to levels comparable with intact bogs as well as reducing losses of peat silt and ammonia. Vegetation on the surface of the peat can also slow the flow of water over the land surface. Based on the EPA's most recent reports, peat extraction and drainage is impacting on 106 water bodies across the country, with peat the single pressure on 28 of these water bodies. However, compared to the data in the second-cycle plan, the number of water bodies impacted by peat has decreased.

The cessation of industrial peat extraction by Bord na Móna in 2021 was expected to have a significant positive impact on water quality of receiving water courses by reducing the impact of peat extraction as a key pressure on particular water courses. This is now being supported by the results and conclusions of the draft NWBMP 2022-2027.

## 6 National Biodiversity Action Plan 2016-2021

The National Biodiversity Action Plan 2016-2022 has a vision that biodiversity and ecosystems in Ireland are conserved and restored, delivering benefits essential for all sectors of society and that Ireland contributes to efforts to halt the loss of biodiversity and the degradation of ecosystems in the EU and globally. Ireland's 2nd National Biodiversity Action Plan outlines the main policies, strategies, actions and targets in relation to biodiversity. This plan has several Bord na Móna specific objectives and actions including implementing the BnM Biodiversity Action Plan 2016-2021 and overlaps with both the National Peatlands Strategy and the National Raised Bog Special Areas of Conservation Management Plan 2017-2022.

The delivery of rehabilitation via PCAS is expected to significantly contribute in the future to actions and targets of the National Biodiversity Action Plan 2016-2021, particularly in relation to peatland restoration and creation of new habitats such as wetlands and woodlands.

A new National Biodiversity Action Plan is currently being developed.

## 7 National Conservation Designations

Bord na Móna operates in a wider landscape that also includes a network of European and National nature conservation sites (Special Areas of Conservation (SACs), Special Protection Areas (SPAs), National Heritage Areas (NHAs, cNHAs) and National Nature Reserves). Bord na Móna will take account of this network of conservation objectives and their conservation objectives when developing these rehabilitation plans. It is expected that peatland rehabilitation will, in general, benefit the conservation objectives of this network of nature conservation sites.

## 8 National Raised Bog Special Area of Conservation Management Plan 2017-2022.

The National Raised Bog Special Area of Conservation Management Plan 2017-2022 sets out a roadmap for the long-term management, restoration and conservation of protected raised bogs in Ireland. The Plan strikes an appropriate balance between the need to conserve and restore Ireland's raised bog network as part of Ireland's commitments towards the EU Habitats Directive, and the needs of stakeholders and gives recognition to the

important role that communities have to play in the conservation and restoration of raised bogs. The National Raised Bog Special Areas of Conservation (SACs) Management Plan 2017-2022 is part of the measures being implemented in response to the on-going infringement action against Ireland in relation to the implementation of the EU Habitats Directive, with regard to the regulation of turf cutting on the Special Areas of Conservation (SACs). The then Minister for Arts, Heritage and the Gaeltacht, also published a **Review of Raised Bog Natural Heritage Area Network** in 2014.

Bord na Móna has played a key role in the development of the National Raised Bog Special Area of Conservation Management Plan 2017-2022 and the Review of the Raised Bog Natural Heritage Area Network. Several Bord na Móna sites were assessed by the National Parks and Wildlife Service as part of the above Plan and Review and there is an expectation that several Bord na Móna sites will be designated as SACs and NHAs in the future. This will reinforce the network of protected raised bog sites and replace in part sites that will be de-designated as they have been deemed to be significantly damaged and are deemed to have no raised bog restoration prospects. PCAS is expected to restore several sites that will contribute to The National Raised Bog Special Areas of Conservation (SACs) Management Plan 2017-2022 targets in relation to the restoration of raised bog habitat.

Bord na Móna has also responded to the needs of the NRBMP and provided several sites to the government for the relocation of turf-cutters from SACs. This is part of a suite of ongoing bog conservation measures in the NRBMP to manage turf-cutting in protected sites. Bord na Móna and the National Parks and Wildlife Service continues to engage regarding the ongoing relocation of turf-cutters from protected raised bog sites.

## 9 All-Ireland Pollinator Plan 2021-2025

The All-Ireland Pollinator Plan 2021-2025 outlines key objectives and actions to protect and support pollinating insects and the habitats they rely on. A Bord na Móna specific action in this plan includes the adoption of pollinator-friendly management within the Bord na Móna network of sites. One action to help achieve this objective is habitat rehabilitation and restoration, where possible, of pollinator-friendly habitats, including peatland habitats.

## 10 Land-use Planning Policies

As Bord na Móna operates in many counties across Ireland, it is important to note the respective development plans in these counties. Many of the existing development plans recognise the potential that exists in the after-use of cutover/cutaway peatlands. Bord na Móna seeks to work with all of the relevant local authorities to ensure that the most appropriate after-uses are reflected in local planning policy. The following areas of consistent importance are of both direct and indirect relevance to Bord na Móna: heritage, tourism, biodiversity/conservation, landscape, renewable energy, and economy/enterprise.

## 11 National Archaeology Code of Practice

Bord na Móna operates under an agreed Code of Practice regarding archaeology with the Department of Arts, Heritage and the Gaeltacht and the National Museum of Ireland which provides a framework to enable the Company to progress peat extraction whilst carrying out archaeological mitigation. (https://www.archaeology.ie/sites/default/files/media/publications/cop-bord-na-mona-en.pdf

The Code replaced a set of Principles agreed with the Department of Arts, Heritage and the Gaeltacht in the 1990s. Under the Code Bord na Móna, the Minister and Director work together to ensure that appropriate archaeological mitigation is carried out in advance of peat extraction.

- BNM must ensure that any monuments or archaeological objects discovered during peat extraction are protected in an appropriate manner by following the Archaeological Protection Procedures.
- BNM must ensure that any newly discovered monuments on Bord na Móna lands are reported in a timely manner to the National Monuments Service of the Department of Arts, Heritage and the Gaeltacht.
- BNM must ensure that any archaeological objects discovered on Bord na Móna lands are reported immediately to the Duty Officer of the National Museum of Ireland.
- Bord na Móna will adhere to the Archaeology Code of Practice relating to management of any archaeological finds that may arise during cutaway peatland rehabilitation and decommissioning.

## 12 Bord na Móna Biodiversity Action Plan 2016-2021

Rehabilitation of industrial peatlands is a key objective of the Bord na Móna Biodiversity Action Plan 2016-2021. This action plan outlines the main objectives and actions around biodiversity on Bord na Móna lands. The Bord na Móna Biodiversity Action Plan also outlines key International and European policy in relation to biodiversity. This includes the **United Nations Convention on Biodiversity 2011-2020 (CBD)** and **European Biodiversity Strategy to 2020**. Further details of these policies and Bord na Móna s responses can be found in the Bord na Móna Biodiversity Action Plan (Bord na Móna, 2016). Both policy documents highlight targets such as reducing pressure on biodiversity, promoting sustainability, habitat restoration and benefits of ecosystem services.

One example of a key CBD target is:

- *"Restore at least 15% of degraded areas through conservation and restoration activities."*

The EUs headline target for progress by 2020 is to:

- *"halt the loss of biodiversity and the degradation of ecosystems in the EU by 2020, restore them as far as feasible, while stepping up the EU contribution to averting global biodiversity loss."*

This rehabilitation plan is aligned to the CBD target and the EU Biodiversity Strategy target and will help Ireland meet its commitment to these international Biodiversity polices.

## 13 Bord na Móna Commitments

Bord na Móna made the commitment in 2009 not to develop any new peatland sites for industrial peat production. The company has continued to work with different stakeholders.

The company announced that industrial peat production would be cut by over 50 percent in 2019 and would entirely cease over most of its lands by the mid-2020s. Rehabilitation measures would continue to be carried out with the focus on re-wetting and rehabilitation of cutover and cutaway areas in line with national policies (such as the National Peatland Strategy, the National Biodiversity Action Plan, the Climate Action Plan 2019, the Water Framework Directive, etc.) and rehabilitation guidelines set down by the Environmental Protection Agency. To date, 15,000 hectares of cutaway and cutover bog have been rehabilitated using this approach with 5,000 hectares in active rehabilitation.

In line with Bord na Móna's accelerated decarbonisation programme, the company made a further commitment to a significantly larger rehabilitation target. This was reflected in our plans to rehabilitate a further 20,000 hectares of cutaway and cutover bog to wetland and woodland mosaics by 2025. In addition, we planned to restore a further 1,000 hectares of raised bog habitat by 2025.

The above commitments have now been followed by the decision by the company to cease industrial peat extraction and rehabilitate a target of 33,000 ha between 2021-2025.

These commitments outline the importance of peatland rehabilitation to Bord na Móna. The company will continue to demonstrate environmental responsibility and continue to deliver on these commitments in relation to peatland rehabilitation and in relation to the future management of these lands to maximise their benefits, particularly their ecosystem service benefits, along with the sustainable development of a portion of the land bank for other uses, such as renewable energy.

## 14 Bord na Móna Strategic Framework for the future use of cutaway peatlands 2020 (Draft)

The general after-use strategy of Bord na Móna is outlined in the Bord na Móna Strategic Framework for Future-Use of Cutaway Bogs 2020 (draft document). This document outlines how Bord na Móna's cutover peatland estate is complex in nature with great variability in terms of peat depths, peat types, drainage, subsoil condition and environmental value. Thus, future options require consideration on a site-specific basis, also bearing in mind the considerable internal variation within bogs. The development of the land-bank will also take account of national needs, while also taking account of the various national legislation, policies and plans related to the management of peatlands. In general, Bord na Móna will seek to balance and optimise commercial, social, and environmental value of these sites, and develop integrated land-uses, while taking account of the need for sustainability and their biodiversity value.

Any consideration of other future after-uses for Bord na Móna land such as development or other mixed uses will be conducted following the relevant planning guidelines and consultation with relevant authorities and will be considered within the framework of this peatland rehabilitation plan.

# APPENDIX VII. DECOMMISSIONING

## 1. Condition 10 Decommissioning

This is a requirement of the applicable Integrated Pollution Control Licence issued by the Environmental Protection Agency. This condition 10.1 requires the following:

*10.1 Following termination of use or involvement of all or part of the site in the licensed activity, the licensee shall:*

*10.1.1 Decommission, render safe or remove for disposal/recovery, any soil, subsoils, buildings, plant or equipment, or any waste, materials or substances or other matter contained therein or thereon, that may result in environmental pollution.*

The main success criteria pertaining to successfully complying with this condition is ensuring that no environmental liability remains from this infrastructure and material and that the bog can be deemed suitable for surrender of the licence under section 95 of the EPA Acts. This is achieved by Bord na Móna identifying and quantifying any mechanical and infrastructural resources that were installed in the bog to enable the development and production operation at the site. This list is then refined to identify any items that would be deemed as possibly resulting in environmental pollution, should they not be removed.

Typically, these items/infrastructures would be any remaining, unconsolidated plant, equipment and attachments, waste materials, unused raw materials such as land drainage pipes, remaining peat stockpiles, stock pile covering, pumps, septic tanks and fuel tanks.

In relation to this bog, the list and tasks would be as follows:

| Item | Description | Bracklin West Decommissioning Plan |
|---|---|---|
| 1 | Clean-up of remaining or unconsolidated waste or materials located in Bogs, Yards, Buildings and Offices | Where relevant |
| 2 | Cleaning Silt Ponds | Cleaning Silt Ponds |
| 3 | Decommissioning Peat Stockpiles | Where relevant |
| 4 | Decommissioning or Removal of Buildings and Compounds | Where relevant |
| 5 | Decommissioning Fuel Tanks and associated facilities | Where relevant |
| 6 | Decommissioning and Removal of Bog Pump Sites | Not relevant |
| 7 | Decommissioning or Removal of Septic Tanks | Where required |

In addition, condition 7 of the licence requires these now defined waste items to be disposed of or recovered as follows:

7.1 Disposal or recovery of waste shall take place only as specified in *Schedule 2(i) Hazardous Wastes for Disposal/Recovery* and *Schedule 2(ii) Other Wastes for Disposal/Recovery* of this licence and in accordance with the appropriate National and European legislation and protocols. No other waste shall be disposed of/recovered either on-site or off-site without prior notice to, and prior written agreement of, the Agency.

7.2 Waste sent off-site for recovery or disposal shall only be conveyed to a waste contractor, as agreed by the Agency, and only transported from the site of the activity to the site of recovery/disposal in a manner which will not adversely affect the environment.

7.3 A full record, which shall be open to inspection by authorized persons of the Agency at all times, shall be kept by the licensee on matters relating to the waste management operations and practices at this site. This record shall as a minimum contain details of the following:

7.3.1 The names of the agent and transporter of the waste.

7.3.2 The name of the persons responsible for the ultimate disposal/recovery of the

waste.

7.3.3 The ultimate destination of the waste.

7.3.4 Written confirmation of the acceptance and disposal/recovery of any hazardous waste consignments sent off-site.

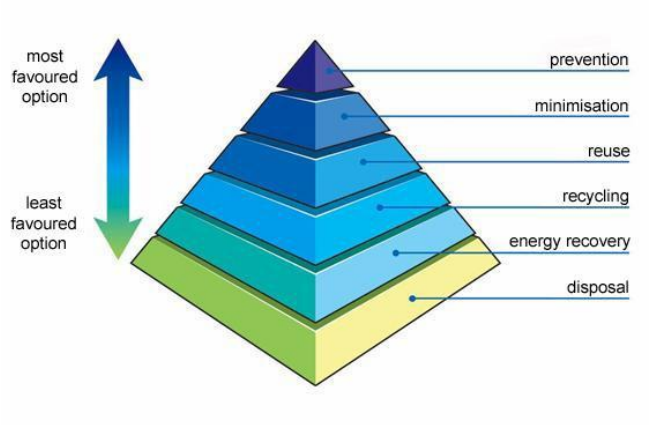
7.3.5 The tonnages and EWC Code for the waste materials listed in *Schedule 2(i) Hazardous Wastes for Disposal/Recovery* and *Schedule 2(ii) Other Wastes for Disposal/Recovery* sent off-site for disposal/recovery.

7.3.6 Details of any rejected consignments.

A copy of this Waste Management record shall be submitted to the Agency as part of the AER for the site.

As required by the licence, these waste items will be removed for recycling or disposal, using external contractors with the required waste collection permits, approved under 7.2, with waste records maintained as required under 7.3.

Where possible, Bord na Móna will utilize the appropriate waste hierarchy to identify waste that can reused or recycled ahead of disposal.




The validation of the success of condition 10.1 is carried out through an Independent Closure Audit (ICA), followed by and EPA Exit Audit (EA) and the eventual partial or full surrender of the licence.

**2. Enhanced Decommissioning.**

The remaining infrastructure does not constitute a risk to the environment and would not be a requirement of condition 10 of the licence. The removal of these are deemed as enhanced measures. These may enhance the future afteruse of the bog for amenity value, security against access for illegal and unsocial activities and general State and community benefit. In relation to this bog, this would include the infrastructure defined below:

| Item | Enhanced Decommissioning Type | Bracklin West Decommissioning Plan |
|---|---|---|
| 1 | Removal of Railway Lines | Removal of Railway Lines |
| 2 | Decommissioning Bridges and Underpasses | Where Applicable |
| 3 | Decommissioning Railway Level Crossing | Where Applicable |
| 4 | Restricting Access (bogs and silt ponds) | Restricting Access to Bog |
| 5 | Removal of High Voltage Power Lines | Where Applicable |

## APPENDIX VIII. GLOSSARY

**Cutaway Bog:** A Bord na Móna site generally becomes cutaway when it is economically unviable to continue industrial peat extraction or when the majority of peat has been removed.

**Deep peat cutover bog.** Deep peat cutaway bog is defined as former raised bogs that have been in industrial peat production, where production has ceased but the residual peat depth is typically in excess of 2m. *Sphagnum* mosses are key species of raised bogs and the majority of the peat mass is formed from these mosses. *Sphagnum* species and other raised bog species are a key part of raised bog habitat function and prefer more acidic, nutrient poor, water-logged conditions. Typical raised bog *Sphagnum* mosses and other bog species do not thrive with the more typical alkaline water chemistry of cutaway bog but do grow well in these more acidic conditions where peat has been re-wetted. There is potential to re-develop *Sphagnum*-rich plant communities in these conditions if the peat can be re-wetted. This brings the opportunity of re-developing *Sphagnum*-rich vegetation communities that are considered Carbon sinks or peat-forming habitats and restoring the carbon sequestration function of these sites.

**Dry cutaway bog:** Cutaway bog is categorised as dry cutaway where it is not practical or feasible to re-wet these areas completely. It is inevitable that some areas of cutaway will remain relatively dry due to the heterogenous topography of the cutaway, as well as requirements for continued drainage on site for identified after-uses, or off site in relation to neighbouring lands or other infrastructure. Ridges and mounds of glacial deposits can become exposed during peat extraction and form a heterogenous topographical mosaic separated by basins. Dry cutaway may have very thin or no residual peat where ridges and mounds have been exposed. The exposed sub-soils are a mix of glacial gravels, muds and tills that can be quite free-draining. Dry cutaway may also have deeper residual peat, but in a location (i.e. at the margin) where the peat cannot be re-wetted due to boundary constraints. Dry cutaway may also develop in situations where there a relatively steep slope that inhibits re-wetting. The majority of dry cutaway will develop towards grassland, heath, scrub and dry woodland habitats.

**Enhanced decommissioning:** This is defined as decommissioning carried out under the Scheme, which is proposed to be externally funded.

**Enhanced rehabilitation:** This is defined as rehabilitation carried out under Scheme, which is proposed to be externally funded. It is proposed by Government that Bord na Móna be obligated to carry out enhanced decommissioning, rehabilitation and restoration on peatlands. This Scheme will significantly go beyond what is required to meet rehabilitation and decommissioning obligations under existing EPA IPC licence conditions. Interventions and activities supported by the Scheme will ensure that environmental stabilisation is achieved (meaning IPC obligations are met), and importantly, significant additional benefits, particularly relating to climate action and other ecosystem services, will also be delivered. However, only the costs associated with the additional, enhanced and accelerated measures, i.e., those interventions which go beyond the existing decommissioning and rehabilitation requirements arising from Condition 10 will be eligible for support under the Scheme.

**Environmental stabilisation:** The key objective of peatland rehabilitation is environmental stabilisation. This means developing habitats and vegetation back onto the bare peat, slowing water movement across the bog, minimising effects to downstream waterbodies and meeting the conditions of the IPC Licence. This is achieved by a combination of re-wetting, where possible, and natural colonisation of the former cutaway, with or without intervention**.** Habitats will develop that reflect the underlying environmental conditions. Other after-use development may also serve to act as environmental stabilisation.

**Marginal land.** Marginal land is defined as land around the margin of the industrial peat production area. This margin generally contains a range of habitats including scrub, birch woodland, cutover bog and raised bog remnants. It has a variety of land-uses including turf-cutting (private turbary). The Scheme will consider potential rehabilitation and restoration actions (e.g. drain blocking) within marginal land zones, where appropriate.

**Rehabilitation:** Rehabilitation is defined in general by Bord na Móna as environmental stabilisation of the former cutaway. This is generally achieved via re-wetting, where possible, and natural colonisation of the former cutaway, with or without intervention. It is not possible to restore raised bog habitats on BnM cutaway in general in the short-term. In general, most of the peat mass has been removed from many BnM cutaway sites and the environmental characteristics of these areas have therefore changed radically (peat depths, hydrology, water chemistry, substrate type, nutrient status. This means there will therefore be different habitat outcomes (wetlands, fen, heathland, grassland and Birch woodland). Other after-use development may also serve to act as rehabilitation.

**Restoration:** Ecological restoration to defined as the process of re-establishing to the extent possible the structure, function and integrity of indigenous ecosystems and the sustaining habitats they provide" (SER, 2004). Defined in this way, restoration encompasses the repair of ecosystems (Whisenant, 1999) and the **improvement of ecological conditions in damaged wildlands** through the **reinstatement of ecological processes**. In general, Bord na Móna cutaway peatlands cannot be restored back to raised bog in a reasonable timeframe as their environmental conditions has changed so radically (with the removal of the acrotelem – the living layer and much of the peat mass). However, they can be returned to a **trajectory** towards a naturally functioning peatland system (Renou-Wilson, 2012). **Raised bog restoration** is an objective of some BnM sites where there is residual natural raised bog vegetation and where the majority of the peat is still intact.

**Standard rehabilitation:** This is defined as rehabilitation that is designed to meet the conditions of the EPA IPC Licence. The key objective of rehabilitation is environmental stabilisation. This is achieved by a combination of re-wetting, where possible, and natural colonisation of the former cutaway, with or without intervention**.** Other after-use development may also serve to act as rehabilitation.

**Standard decommissioning:** This is defined as decommissioning that is designed to meet the conditions of the EPA IPC Licence. This is defined as to render safe or remove for disposal/recovery, any soil, subsoils, buildings, plant or equipment, or any waste, materials or substances or other matter contained therein or thereon, that may result in environmental pollution.

**Wetland cutaway bog.** Wetland cutaway bog is defined as former raised bogs that have been in industrial peat production, where production has ceased and the majority of peat has been cutaway, and where this cutaway has the potential to be re-wetted. A significant number of Bord na Móna sites have pumped drainage and these sites are likely to develop a mosaic of wetland habitats when pumping in reduced or stopped. The water chemistry of wetland cutaway frequently is strongly influenced by the more alkaline sub-soils that have been exposed during peat production. This means that pioneer vegetation is more typical of fen and wetland, rather than raised bog. Wetland cutaway will have a broad range of hydrological conditions depending on the local topography. In some cases, these wetlands may form deep water (> 0.5 m) whilst other areas may have the water table at or just below the surface of the ground.

# APPENDIX IX. EXTRACTIVE WASTE MANAGEMENT PLAN

## (Minimisation, treatment, recovery and disposal)

**Objective:**
The objective of this generic plan is to comply with the requirements of regulation 5 of the Waste Management (Management of Waste from Extractive Industries) Regulations, and to prevent or reduce waste production and its harmfulness.

**Scope:**
This plan covers IPPC Licence's Ref P0501-01, Ballivor- Derrygreenagh Group of Bogs in Counties Meath and Westmeath.

**1.0 Extractive Waste:**
Waste classified as extractive waste from peat extraction operations arise from three operations associated with this activity.

**1.1 Silt Pond excavations and maintenance.**
All peat extraction activities in the Mount Dillon bog group are serviced by silt lagoons/ponds. During the excavation of these silt ponds, pre IPPC Licensing in 1999 and since licensing, the excavated material is stored adjacent to the silt pond, where it either remains in situ ores levelled out. As required by condition 6.6, these silt lagoons are cleaned twice per annum or more often if inspections dictate. These silt cleanings are also deposited on the same location, adjacent to the silt pond, where they may be levelled periodically to allow room for subsequent cleanings. These mounds of silt pond excavation material and cleanings are generally no higher that 2-3 metres.

**1.2 Power Station screenings:**
Edenderry Power Station screens the peat from the bogs prior to processing. This screening removes oversized peat, stones and bogs timbers. Schedule 3 (ii) of the IPPC licence permits disposal of these peat screenings back to the bog, where it is levelled and graded into the surrounding peat landscape. These locations have been agreed with the Agency as per condition 7.4 of the IPPC Licence, and as per the attached locations.

**1.3 Bog Timbers:**
During peat extraction operations, bog timbers often arise in the bog surface and are required to be cleared. These timbers consist of bog pine, oak and some yew. Some of these timbers, such as the oak and yew are removed for use in the wood craft industry, with the remaining bog pine stockpiled in locations at the opposite end of each bog, where it generally becomes a habitat for flora and fauna. These piles of timber are generally no higher than 1-2 metres.

**2.0 P0501-01 IPPC Licence Extractive Waste Conditions**

**2.1 Condition 7.5 Extractive Waste Management**
The licensee shall draw up a Waste Management Plan (to be known as an Extractive Waste Management Plan) for the minimisation, treatment, recovery and disposal of extractive waste. This Plan shall meet the requirements of regulation 5 of the Waste Management (Management of Waste from the Extractive Industries) Regulations,2009. The Plan shall be submitted for agreement by the Agency by the 31' December 2012. The Plan shall be reviewed at least once every five years thereafter in a manner agreeable to the Agency and amended in the event of substantial changes to the operation of a waste facility or to the waste deposited. Any amendments shall be notified to the Agency.
All extractive waste shall be managed in accordance with the Extractive Waste Management Plan. A report on the implementation of the Extractive Waste Management Plan shall be provided in the AER.

**2.2 Condition 7.6 Waste Facility**
(i) No new waste facility may be developed or an existing waste facility modified unless agreed by the Agency.
(ii) The licensee shall ensure that all existing waste facilities are managed and maintained to ensure their physical stability and to prevent pollution or contamination of soil, air, surface water or groundwater.
(iii) The licensee shall ensure that all new waste facilities are constructed, managed and maintained to ensure their physical stability and to prevent pollution or contamination of soil, air, surface water or groundwater.
(iv) Operational measures shall be continuously employed to prevent damage to waste facilities from personnel, plant or equipment.
(v) The licensee shall establish and maintain a system for regular monitoring and inspection of waste facilities.
(vi) All records of monitoring and inspection of waste facilities, as required under the licence, shall be maintained on-site in order to ensure the appropriate handover of information in the event of a change of operator or relevant personnel.

**2.3 Condition 7.7 Excavation Voids**
7.7.1 Unless otherwise agreed by the Agency, only extractive waste shall be placed in excavation voids.
7.7.2 When placing extractive waste into excavation voids for rehabilitation and construction purposes, the licensee shall, in accordance with regulation 10 of the Waste Management (Management of Waste from the Extractive Industries) Regulations, 2009, and the Extractive Waste Management Plan:

- Secure the stability of the waste
- Put in place measures to prevent pollution of soil, surface water and ground water.
- Carry out monitoring of the extractive waste and excavation void.

**Condition 7.5. Extractive Waste Management Plan. 5 (1)**

**3.0 Minimisation.**
**3.1 Silt pond excavation material and cleanings.**

IPPC Licence conditions require all production areas to be serviced by an appropriately designed silt pond based on storage volume and retention time. Condition 6.6 requires all ponds to be cleaned bi-annually and more often if inspections dictate, so the only opportunity for minimisation of same is through Standard Operating Procedures. These are required under condition 2.2.2 (i) regarding minimisation of suspended solids, and are in-place to minimise the generation of silt, which in-turn will minimise the generation of silt pond waste.

**3.2 Power Station Screenings.**
These screenings cannot be minimised as they are a consequence of peat production, stones, timbers and oversize peat materials are naturally occurring on the bog, and are required to be removed prior to processing.

**3.3 Bog Timbers.**
Bog timbers are also naturally occurring materials within a bog and are required to be removed prior for production. The volume of these bog timbers varies from bog to bog and as such their minimisation is not controllable or quantifiable.

**4.0 Treatment**
**4.1 Silt pond excavation material and cleanings.**
The silt pond excavation material and silt cleanings do not require any treatment for its end use which will be either backfilling these silt pond voids as per condition 7.7.1 above as part of the Bog Rehabilitation Plan, or reincorporated into the surrounding peatlands.

**4.2 Power Station Screenings.**
The factory screenings are permitted to be returned to the bog as they were naturally occurring materials from the bog, and as such do not require any treatment to serve this purpose.

**4.3 Bog Timbers**
As per 1.3 above, these timbers are stockpiled at two locations in each bog, as per the attached list of sites and become habitats for various flora and fauna.

**5.0 Recovery**
**5.1 Silt pond excavation material and cleanings.**
Condition 2.2.2 (vi) requires the reuse of silt pond waste to be examined. This was undertaken in 2006, the outcome of which was that this waste peat silt material, as a fuel, was contaminated with sub-soils, rendering it unsuitable for combustion. In addition, volumes are small compared to overall peat production volumes.

**5.2 Power Station Screenings.**
Given the nature of these screenings as outlined in 1.2 above, there is no further use identified and they are permitted to be disposed of back to the bog.

**5.3 Bog Timbers**
Investigations into processing these materials into smaller fractions for potential heating purposes did not yield any viable results. In addition, these older stockpiles are now classified as habitats and as such would not be considered for reuse as a fuel.

**6.0 Disposal**
**6.1 Silt pond excavation material and cleanings.**
Schedule 3 (ii) permits the disposal of silt pond cleanings (Lagoon Sediments) to the bog and these locations, adjacent to the silt pond site, are presented in the attached spreadsheet, with associated grid coordinates.

**6.2 Power Station Screenings.**
Schedule 3 (ii) permits the disposal of screenings (Peat Screenings) to the bog at designated locations agreed under Condition 7.4, and these locations, are presented in the attached spreadsheet, with associated grid coordinates.

**6.3 Bog Timbers**
These naturally occurring bog timbers are stockpiled at locations in each bog, grid coordinates attached.

**7.0 Extractive Waste Management Plan**

**5 (2a)(i)**
The vast majority of peat extraction bogs were all designed and drained for production prior to the 1960's and as such the production fields layout cannot' be altered. Under our Cleaner Reduction Procedures, various design changes have been implemented to the production machines and process to reduce lost peat which eventually is captured in the silt ponds and requires removal as waste peat silt. This along with training and ongoing research and development will continuously reduce waste peat and subsequently waste silt pond cleanings. Bog timbers are present naturally in various volumes and quantities in different bogs and as peat production involves stripping peat in layers, the exposure, generation and removal of these timbers is unavoidable. Work has been undertaken recently into project looking at grinding of these bog timbers in situ using a timber miller, and if this project becomes viable it will contribute to the reduction of bog timbers.

**5 (2a)(ii)**
Given the nature and expanse of peat bogs, the stockpiling and storage of these waste materials do not present a visual, storage or stability problem. As required under Condition 10 of the IPPC Licence, the silt pond excavations and screenings will be utilised to backfill the silt pond voids once the bogs have finished and stabilised in accordance with out Bog Rehabilitation Plan. Storage of these wastes in the interim, open to the elements does not present a change on the nature of these wastes that will threaten the environment or prevent their reuse during the bog rehabilitation process.

**5 (2a)(iii)**

Under Condition 10 of the IPPC Licence, all silt ponds will be decommissioned once the bog surface has stabilised, in agreement with the Agency. This will involve the removal of weirs and flow controls, returning the silt pond back to its original drain or removing the silt pond from the drainage system. Both of these activities will involve placing the silt pond extraction and cleaning material back into the excavation void.

**5 (2a)(iv)**
The peat bogs do not contain any topsoil, so this is not required.

**5 (2a)(v)**
Peat mineral resources do not undergo any treatment.

**5 (2b)**
These three extractive waste are all being reused and recovered back to their original extraction points and have not undergone any physical, chemical, or biological change.

**5 (2c)(i, ii & iii)**
These three extractive wastes, stored on the bog for reuse or recovery during the bog rehabilitation phase, do not require any management or monitoring during the operation of these bogs. Silt pond excavations and cleanings are stored adjacent to the silt pond and quickly revegetated and stabilise, the screenings are graded back into the bog at the agreed locations upon disposal and the bog timbers do not prevent any water or airborne danger to the environment.

**5 (3)**
The three extractive wastes arising from peat extraction operations at this site are classified wastes from mineral non-metalliferous excavation, with an EWC code of 0101 02. The materials are not classified as hazardous under Directive 91/689/EEC20, and do not contain substances or preparations classified as dangerous under Directives 67/548/EEC5 or 1999/45/EC6 above a certain threshold.
The peat excavations and cleanings are stored in locations and in a manner that they could not collapse, and are remote in their nature. The stockpiles are located adjacent to silt ponds that are cleaned regularly and as such these stockpiles are managed and levelled to facilitate further cleanings.
Therefore the material stored at these waste facilities would not be considered to be a Category A waste facility.

**Classification in accordance Annex II.**

| **Waste Material** | Description | **C**lassification | Chemical Process treatment | Deposition description | Transport System |
|---|---|---|---|---|---|
| Silt Pond Excavations and cleanings | Peat and mineral soils associated with peatlands. Stored for reuse during bog rehabilitation, with no displacement of overburden | 01 01 02 | None | Excavated from silt ponds by excavator and deposited adjacent to the silt pond. | Excavator |
| Peat Screenings | Stones, timbers and oversized peat particles, reincorporated into low areas, agreed with the Agency, and stabilized under normal natural bog conditions | 01 01 02 | None | Removed by screen at the factory and transported by tractor and trailer to the designated and agreed locations | Tractor and trailer. |
| Bog Timbers | Pine, Oak and Yew species, stored at locations in each bog. Not subject to any stability issues due to exposure to atmospheric/meteorological conditions. | 01 01 02 | None | Removed from the bog surface by excavator and transported by tractor and trailer to the agreed locations | Tractor and Trailer |

**Description of operations.**
Silt pond excavations arise from the requirement to have silt ponds treating all peat extraction sites. Silt pond cleanings arise from the removal of peat silt from silt ponds as required under IPPC Licence. Bog timbers arise from preparation of the bogs surface for peat production. Estimated quantities of materials are below:

**Closure plan. (Bog Rehabilitation Plan).**
Condition 10.1 – 10.3 of the IPPC Licence requires the following:

- 10.1 Following termination of use or involvement of all or part of the site in the licensed activity, the licensee shall:
- 10.1.1 Decommission, render safe or remove for disposal/recovery, any soil, subsoils, buildings, plant or equipment, or any waste, materials or substances or other matter contained therein or thereon, that may result in environmental pollution.
- 10.1.2 Implement the agreed cutaway bog rehabilitation plan (refer Condition 10.2).

10.2 Cutaway Bog Rehabilitation Plan:

- 10.2.1 The licensee shall prepare, to the satisfaction of the Agency, a fully detailed and costed plan for permanent rehabilitation of the cutaway boglands within the licensed area. This plan shall be submitted to the Agency for agreement within eighteen months of the date of grant of this licence.
- 10.2.2 The plan shall be reviewed every two years and proposed amendments thereto notified to the Agency for agreement as part of the AER. No amendments may be implemented without the written agreement of the Agency.

10.3 The Rehabilitation Plan shall include as a minimum, the following:

- 10.3.1 A scope statement for the plan; to include outcome of consultations with relevant Agencies, Authorities and affected parties (to be identified by the licensee).
- 10.3.2 The criteria which define the successful rehabilitation of the activity or part thereof, which ensures minimum impact to the environment.
- 10.3.3 A programme to achieve the stated criteria.
- 10.3.4 Where relevant, a test programme to demonstrate the successful implementation of the rehabilitation plan.
- 10.3.5 A programme for aftercare and maintenance.

10.4 A final validation report to include a certificate of completion for the Rehabilitation Plan, for all or part of the site as necessary, shall be submitted to the Agency within six months of execution of the plan. The licensee shall carry out such tests, investigations or submit certification, as requested by the Agency, to confirm that there is no continuing risk to the environment. This plan including maps and ecological classifications are available on file at the Mount Dillon IPPC Licence Coordinators office.
The location in relation to the silt pond excavations and cleanings are adjacent to the silt ponds, which are considered under the Shannon River Basin Management Plan in accordance with the requirements of Directive 2000/60/EC.
Screenings and bog timbers are all naturally occurring elements of peatland and there placement back to the bog in smaller concentrated designated waste facilities does not constitute a risk to the prevention of water compliance.
The lands under where these materials are deposited are peatlands and are un-effected by the placing of this material.

**Review.**
This plan will be reviewed every five years, the first review to take place in September 2017. This review will entail an inspection of these waste facilities to ensure their placing, management, maintenance and stability comply with the requirements of the Extractive Waste Management requirements and condition 7.5, 7.6 and 7.7 of the Mount Dillon IPPC Licence P0504-01.

## APPENDIX X. MITIGATION MEASURES FOR THE APPLICATION OF FERTILISER

- Any fertiliser used will be Rock Phosphate and will not be applied in the following conditions:
    1. The land is waterlogged;
    2. The land is flooded, or it is likely to flood;
    3. The land is frozen, or covered with snow;
    4. Heavy rain is forecast within 48 hours (forecasts will be checked from Met Éireann).
    5. The ground slopes steeply and there is a risk of water pollution, when factors such as surface run-off pathways, the presence of land drains, the absence of hedgerows to mitigate surface flow, soil condition and ground cover are taken into account.

6. Buffer zones in respect of waterbodies, as specified on https://www.epa.ie/about/faq/name,57156,en.html, will be adhered with at all times with regard to fertiliser application.
7. No fertiliser will be spread within or in proximity to European Sites. Fertiliser will not be spread within 25m of a hydraulic break (where slope indicates runoff potential); 25m of an area subject to annual winter inundation, 25m of a natural watercourse, or 25m of any drains where conveyance is to be retained through the proposed rehabilitation extent.
8. Fertiliser will be applied to headlands and bare fields where the surface slope indicates runoff is directed away from the above areas, and to within 2m of internal drainage channels within the cutover high field areas. These drainage channels will be blocked in advance of fertiliser application, restricting potential run-off to downstream drainage channels.

| Water body / Feature | Buffer zone |
|---|---|
| Any water supply source providing 100m$^3$ or more of water per day, or serving 500 or more people | 200 metres (or as little as 30 metres where a local authority allows) |
| Any water supply source providing 10m$^3$ or more of water per day, or serving 50 or more people | 100 metres (or as little as 30 metres where a local authority allows) |
| Any other water supply for human consumption | 25 metres (or as little as 30 metres where a local authority allows) |
| Lake shoreline | 20 metres |
| Exposed cavernous or karstified limestone features (such as swallow holes or collapse features) | 15 metres |
| Any surface watercourse where the slope towards the watercourse exceeds 10% | 10 metres |
| Any other surface waters | 5 metres* |

# APPENDIX XI. CONSULTATION SUMMARIES

**Table APXI -1 Consultees contacted**

| Bog Name | Contact Organisation | Contact Name | Date of Issue | Format | Date Response Received | Response Format |
|---|---|---|---|---|---|---|
| Bracklin West | Department of Housing, Local Government and Heritage NPWS | Multiple Staff Members | 22/02/2023 | Email | | |
| Bracklin West | National Museum of Ireland | Multiple Staff Members | 22/02/2023 | Email | | |
| Bracklin West | Department of Housing, Local Government and Heritage | General Email Contact | 22/02/2023 | Email | | |
| Bracklin West | Dept of Agriculture Food & the Marine | General Email Contact | 22/02/2023 | Email | | |
| Bracklin West | Department of Environment, Climate and Communications | Multiple Staff Members | 22/02/2023 | Email | | |
| Bracklin West | Dept of Rural and Community Development | General Email Contact | 22/02/2023 | Email | | |
| Bracklin West | Department of the Housing Local Government and Heritage | General Email Contact | 22/02/2023 | Email | | |
| Bracklin West | Minister for Environment, Climate and Communications | Minister - Eamon Ryan | 22/02/2023 | Email | | |
| Bracklin West | Minister of state for Agriculture with responsibility for Land use and Biodiversity | Pippa Hackett Minister of State for Land Use and Biodiversity | 22/02/2023 | Email | | |
| Bracklin West | Oireachtas | Minister Malcolm Noonan | 22/02/2023 | Email | 23/02/2023 | Email |
| Bracklin West | An Taisce | General Email Contact | 22/02/2023 | Email | | |
| Bracklin West | Environmental Protection Agency | Multiple Staff Members | 22/02/2023 | Email | | |
| Bracklin West | Inland Fisheries Ireland | General Email Contact | 22/02/2023 | Email | | |
| Bracklin West | Local Authority Waters Programme | Multiple Staff Members | 22/02/2023 | Email | | |

| Bog Name | Contact Organisation | Contact Name | Date of Issue | Format | Date Response Received | Response Format |
|---|---|---|---|---|---|---|
| Bracklin West | Teagasc | General Email Contact | 22/02/2023 | Email | | |
| Bracklin West | The Heritage Council | General Email Contact | 22/02/2023 | Email | | |
| Bracklin West | Waterways Ireland | General Email Contact | 22/02/2023 | Email | | |
| Bracklin West | An Forum Uisce (The Water Forum) | General Email Contact | 22/02/2023 | Email | | |
| Bracklin West | Coillte | Multiple Staff Members | 22/02/2023 | Email | | |
| Bracklin West | Irish Water | General Email Contact | 22/02/2023 | Email | | |
| Bracklin West | Irish Water- Water Supply Project Eastern and Midlands Region | General Email Contact | 22/02/2023 | Email | | |
| Bracklin West | Office of Public Works (OPW) | Multiple Staff Members | 22/02/2023 | Email | 21/03/2023 | Email |
| Bracklin West | CARO (Climate Action Regional Office) Eastern and Midlands | General Email Contact | 22/02/2023 | Email | | |
| Bracklin West | Bat Conservation Ireland | General Email Contact | 22/02/2023 | Email | | |
| Bracklin West | Birdwatch Ireland | General Email Contact | 22/02/2023 | Email | | |
| Bracklin West | Butterfly Conservation Ireland | General Email Contact | 22/02/2023 | Email | | |
| Bracklin West | Eastern and Midland Regional Assembly | General Email Contact | 22/02/2023 | Email | | |
| Bracklin West | Fisheries Ireland | General Email Contact | 22/02/2023 | Email | | |
| Bracklin West | Friends of the Earth | General Email Contact | 22/02/2023 | Email | | |
| Bracklin West | Irish Environmental Network (IEN) | General Email Contact | 22/02/2023 | Email | | |
| Bracklin West | Friends of the Irish Environment | General Email Contact | 22/02/2023 | Email | | |

| Bog Name | Contact Organisation | Contact Name | Date of Issue | Format | Date Response Received | Response Format |
|---|---|---|---|---|---|---|
| Bracklin West | ICMSA (Irish Creamery Milk Suppliers Association) | General Email Contact | 22/02/2023 | Email | | |
| Bracklin West | ICSA (Irish Cattle and Sheep Farmers Association | General Email Contact | 22/02/2023 | Email | | |
| Bracklin West | Irish Farmers Association | General Email Contact | 22/02/2023 | Email | | |
| Bracklin West | Irish Peatlands Conservation Council | General Email Contact | 22/02/2023 | Email | | |
| Bracklin West | Irish Raptor Study Group | General Email Contact | 22/02/2023 | Email | | |
| Bracklin West | Irish Rural Link (Community Wetlands Forum) | General Email Contact | 22/02/2023 | Email | | |
| Bracklin West | Irish Rural Link | General Email Contact | 22/02/2023 | Email | | |
| Bracklin West | Irish Wildlife Trust | General Email Contact | 22/02/2023 | Email | | |
| Bracklin West | Inland Waterways Association of Ireland (IWAI) | General Email Contact | 22/02/2023 | Email | | |
| Bracklin West | National Association of Regional Game Councils | General Email Contact | 22/02/2023 | Email | | |
| Bracklin West | NPWS Rangers North Midlands | General Email Contact | 22/02/2023 | Email | | |
| Bracklin West | University of Galway (Peatlands and People) | General Email Contact | 22/02/2023 | Email | | |
| Bracklin West | PPN Offaly Public Participation Network | General Email Contact | 22/02/2023 | Email | | |
| Bracklin West | Ranger Association Committee | General Email Contact | 22/02/2023 | Email | | |
| Bracklin West | Shannon Flood Risk State Agency Co-ordination Working Group | General Email Contact | 22/02/2023 | Email | | |
| Bracklin West | Sustainable Water Action Network (SWAN) | General Email Contact | 22/02/2023 | Email | | |

| Bog Name | Contact Organisation | Contact Name | Date of Issue | Format | Date Response Received | Response Format |
|---|---|---|---|---|---|---|
| Bracklin West | Trinity College Dublin | General Email Contact | 22/02/2023 | Email | | |
| Bracklin West | Turf Cutters and Contractors Association | General Email Contact | 22/02/2023 | Email | | |
| Bracklin West | UCD / Irish Rural Link | General Email Contact | 22/02/2023 | Email | | |
| Bracklin West | University College Dublin | General Email Contact | 22/02/2023 | Email | | |
| Bracklin West | Waterways Ireland | General Email Contact | 22/02/2023 | Email | | |
| Bracklin West | Woodlands of Ireland | General Email Contact | 22/02/2023 | Email | | |
| Bracklin West | Westmeath County Councillors - Chief Exec | General Email Contact | 22/02/2023 | Email | | |
| Bracklin West | Westmeath County Councillors - Director of Service | General Email Contact | 22/02/2023 | Email | | |
| Bracklin West | Westmeath County Councillors - Director of Service | General Email Contact | 22/02/2023 | Email | | |
| Bracklin West | Westmeath County Council Executive Directors | Listed for all Director of Services | 22/02/2023 | Email | | |
| Bracklin West | Westmeath County Councillor | Deirdre Reilly | 22/02/2023 | Email | | |
| Bracklin West | Westmeath County Councillor - Mullingar-Kinnegad | John Shaw | 22/02/2023 | Email | | |
| Bracklin West | Westmeath County Councillor - Mullingar-Kinnegad | Emily Wallace | 22/02/2023 | Email | | |
| Bracklin West | Westmeath County Councillor - Mullingar-Kinnegad | Andrew Duncan | 22/02/2023 | Email | | |
| Bracklin West | Westmeath County Councillor - Mullingar-Kinnegad | Michael Dollard | 22/02/2023 | Email | | |

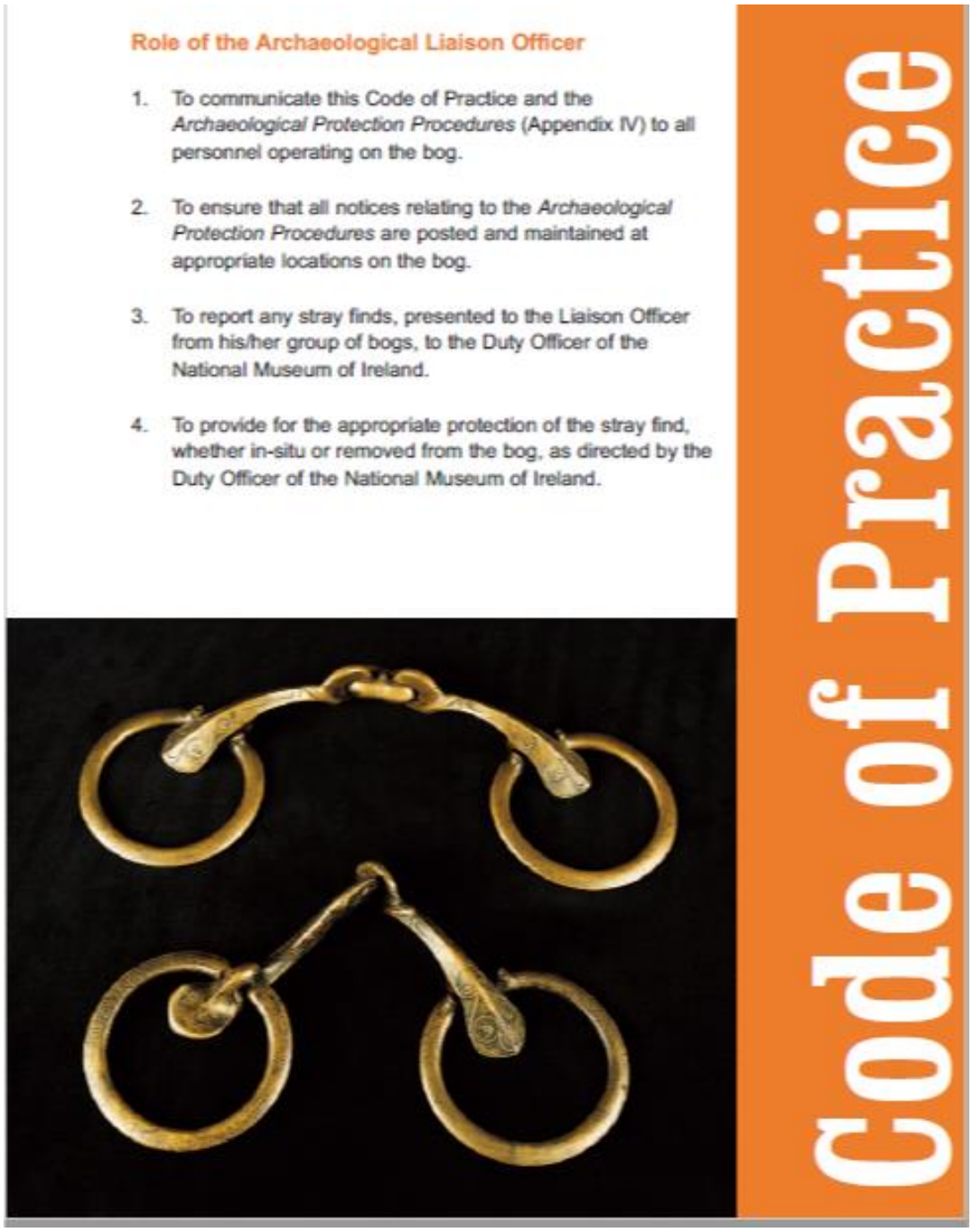
| Bog Name | Contact Organisation | Contact Name | Date of Issue | Format | Date Response Received | Response Format |
|---|---|---|---|---|---|---|
| Bracklin West | Westmeath County Councillor - Mullingar-Kinnegad | Aoife Davitt | 22/02/2023 | Email | | |
| Bracklin West | Westmeath County Councillor - Mullingar-Kinnegad | Denis Leonard | 22/02/2023 | Email | | |
| Bracklin West | Westmeath County Councillor - Mullingar-Kinnegad | Ken Glynn | 22/02/2023 | Email | | |
| Bracklin West | Westmeath County Councillor - Mullingar-Kinnegad | Hazel Smyth | 22/02/2023 | Email | 27/02/2023 | Email |
| Bracklin West | Westmeath County Councillor - Mullingar-Kinnegad | Billy Collentine | 22/02/2023 | Email | | |
| Bracklin West | Westmeath County Councillor - Mullingar-Kinnegad | Frank McDermott | 22/02/2023 | Email | | |
| Bracklin West | Westmeath County Councillor - Mullingar-Kinnegad | Paddy Hill | 22/02/2023 | Email | | |
| Bracklin West | All Land- owners in vicinity of bog | | 02/03/2023 | Letter drop | | |

**Table APXI -2 Response summary from Consultees contacted**

| Organisation | Summary of Response by Stakeholder | BnM Response |
|---|---|---|
| OPW | **Submission from The OPW on the BnM Decommissioning & Rehabilitation Plan for Bracklin West Bog**<br><br>The Bracklin West Bog in within the benefiting boglands of the OPW Boyne Arterial Drainage Scheme. The Boyne ADS channels extend up to the western and south eastern boundaries of Bracklin West Bog and provide drainage outfalls for the bogland. However, there are no measures in the draft rehabilitation plan for modification of these channels or impacts on OPW drainage maintenance activities. However as part of this consultation process it is recommended that OPW seek clarification from Bord na Móna on the following:<br>1. Does BnM envisage any impacts or constraints on OPW carrying out normal Arterial Drainage Maintenance activities on the OPW Boyne scheme channels C1/37/4/7, C1/37/14 and C1/37/16/1. Any impacts on OPW Arterial Drainage Schemes needs to be assessed in the decommissioning and rehabilitation plan.<br>2. Bracklin West Bog is within the "Benefited Boglands" of the Boyne Arterial Drainage Scheme, therefore the OPW is seeking clarification from Bord na Móna with regard to future drainage maintenance liabilities for the OPW on this bogland that will be rewetted during the decommissioning and rehabilitation of this bog.<br>In general, the OPW supports the BnM bog rehabilitation and rewetting as a Nature Based Catchment Management measure in managing flood flows in the Boyne River Catchment and the many other environmental co-benefits from developing this project. | BnM responded acknowledging the submission and confirmed that they do not envisage any impacts that would constrain ADM activities or any future requirements for OPW drain maintenance activities on this bogland. |
| Cllr. Hazel Smyth<br>Green Party<br>Representative, Westmeath County Council (WCC) | Less than 3% of the world's land surface is made up of bogs but they contain twice as much carbon as the world's forests. They are a vital defence in helping us fight the drastic effects of climate change. As well as playing a hugely important role in capturing carbon from the atmosphere and absorbing rainfall to prevent flooding. They are vital habitats for many very special forms of plants, birds and insects. They also offer a magical getaway for people to come to relax, unwind and explore which is more important than ever for our mental health and well-being. I hope that this project will further contribute to Westmeath being a sustainability and wellness hub | BnM responded acknowledging the submission and made reference to the proposed adjacent Ballivor Windfarm. |

| Organisation | Summary of Response by Stakeholder | BnM Response |
|---|---|---|
| | for all of Ireland. I would call for this bog to be considered for renewable energy projects, to the extent that this is possible while maintaining the integrity and environment of the bog. It is important that the local community be engaged with respect to the rehabilitation of this bog and that any amenity area supports the local community needs. The need for education and awareness regarding the importance of this bogland is also essential. The problems with burning turf in terms of our health, biodiversity and our environment need to be communicated clearly to all. The need for enforcement to protect this bogland is critical and I ask that this be considered as part of the development of this bogland. | |

## APPENDIX XII. ARCHAEOLOGY



22

# Code of Practice

5. To arrange for the delivery or collection of the stray find, as directed by the Duty Officer of the National Museum of Ireland.

6. To complete the Report of Discovery of Archaeological Object(s) in Bogs (Appendix V), as directed by the Duty Officer of the National Museum of Ireland.

7. To maintain a file of all stray finds and associated documentation and provide copies to the Project Archaeologist.

8. To provide assistance, where required, to the Department during archaeological surveys.

9. To provide assistance, where required, to Bord na Móna's Consultant Archaeologists, during investigation and mitigation of monuments.

10. To report to the Bord na Móna members on the Archaeology Management Liaison Committee any planned developments or new activities on cutaway peatland areas within his/her group of bogs.



| Bord na Móna | **Procedure: ENV017** | **Rev: 1** |
|---|---|---|
| **Title: Archaeological Findings** | **Approved: EM** | **Date: 13/10/2020** |

**1) Purpose**

The purpose of this procedure is to describe the arrangements in Bord na Móna for findings of Archaeological material (Stray Finds).

**All objects, sites or monuments, no matter how fragmentary, are important elements of our heritage.**

**2) Procedure**

1. Check whether there are any known archaeological monuments in your area.
2. Be vigilant at all times - objects or traces of structures can be found on the field surfaces, in the drain faces, on the bog margins or caught within the mechanics of machinery.
3. If an object is found leave it in place, if it is safe to do so, note its position and immediately contact your Archaeological Liaison Officer who will assess the situation and contact the Duty Officer of the National Museum of Ireland.
4. Resist the temptation to investigate the find spot as this may disturb fragile archaeological deposits.
5. If the object is already dislodged or is in imminent danger, remove it carefully, mark its find spot and report it immediately to your Archaeological Liaison Officer.
6. Objects made of wood, leather or textile, which are removed from peat should be kept in conditions similar to those in which they are found. This can be done by packing them in peat or, if waterlogged, placing them in a clean basin of water and sealing the container. Resist the temptation to clean or remove peat from the object.
7. If timbers or other materials, such as gravel or stones, which could be part of a man-made structure are noted on the bog, mark the location and report it immediately to your Archaeological Liaison Officer. If you suspect the find is of archaeological importance, resist the temptation to expose it any further as this could result in damage to the structure.
8. Report anything that looks unnatural in the bog – your Archaeological Liaison Officer will decide whether it should be referred to the appropriate authorities.

**NOTE:** Our archaeological heritage is a finite, non-renewable resource. Once a site is destroyed its information is lost forever and we have lost the chance to understand a little more about our past, where we have come from and perhaps the opportunity to learn for the future.

Your Archaeological Liaison Officer is ……

**3) Records**

| Revision Index | | | |
|---|---|---|---|
| Revision | Date | Description of change | Approved |
| 1 | 13/09/2020 | First release | EMcD |
| 2 | | | |

# Archaeological Impact Assessment of Proposed Bog Decommissioning and Rehabilitation at Bracklin West Bog, Co. Westmeath

## Report For

## Bord Na Móna Energy Ltd.

## Author

## Dr. Charles Mount

## Bord Na Móna Project Archaeologist

## Introduction

The EPA (2002) *Guidance on the process of preparing and implementing a bog rehabilitation plan* notes that the licensee should characterise the bog prior to embarking on detailed planning and implementation. This characterisation should detail how the land is classified in terms of statutory protections, e.g. as European sites, world heritage sites, RAMSAR sites, National Heritage Areas, national monuments, archaeological heritage, etc. This archaeological impact assessment report was prepared by Dr. Charles Mount for Bord na Móna Energy Ltd to fulfil this characterisation in relation to archaeological heritage. It represents the results of a desk-based assessment of the impact of proposed bog rehabilitation on c.750 hectares at Bracklin West Bog, Co. Westmeath on the known archaeological heritage of the bog. The proposed rehabilitation actions will be a combination of measures to create wetlands and re-wet deep peat as outlined in the draft Methodology Paper for the proposed Bord na Móna Decommissioning, Rehabilitation and Restoration Scheme. These enhanced measures for Bracklin West Bog will include:

- A widespread drain-blocking programme will be implemented across the cutaway, where possible. This will have to be planned in association with the wind farm infrastructure. In general, field drains will be blocked where possible to re-wet cutaway and re-wet to the optimum water-level. More intensive measures will be targeted towards the bare peat.
- In areas of deeper peat, berms and field reprofiling will be carried out to create 45m x 60m cells. These will be carried out in deep peat areas where water has potential to be retained within the cell. Measures will also entail blocking outfalls, managing overflows, creating drainage channels for excess water and carrying out Sphagnum inoculation.
- Less intensive measures (targeted drain-blocking) will be used in areas where habitats have already established.
- Measures will include drain blocking (3/100 m), modifying outfalls and managing water levels with overflow pipes;
- Wetland measures including blocking outfalls and managing water levels with overflow pipes.

Bracklin West Bog is located c.2.9km north of Raharney and east of the L1504 road. The bog rehabilitation area occupies the townlands of Ballynaskeagh, Bracklin, Craddanstown, Killagh, and Mucklin on OS 6 inch sheets Westmeath Nos. 13, 14, 20 and 21.

## Methodology

This is a desk-based archaeological assessment that includes a collation of existing written and graphic information to identify the likely archaeological potential of Bracklin West Bog. The extent of the rehabilitation area is indicated in Fig. 1. This area was examined using information from:

- The IAWU Peatland Survey
- The 2005 Bord na Móna Survey
- The Record of Monuments and Places
- The Sites and Monuments Record (SMR) that is maintained by the Dept of Housing, Local Government and Heritage
- The Excavations database
- Previous assessments

An impact assessment has been prepared and recommendations have been made.

## Desktop assessment

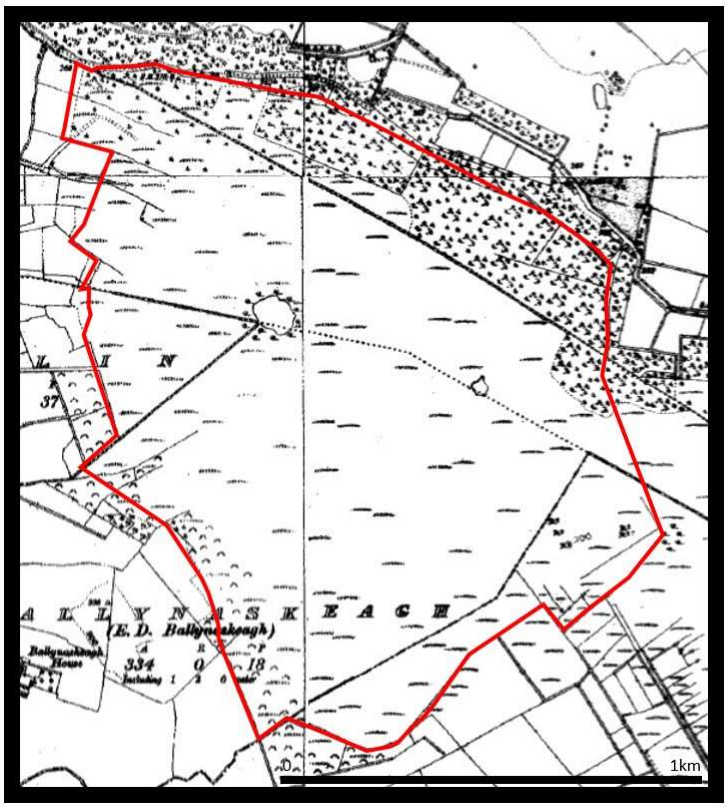



Fig. 1. Bracklin West Bog, Co. Westmeath, detail of the Record of Monuments and Places map sheets Westmeath Nos. 13, 14, 20 and 21. The proposed rehabilitation area is outlined with the red line.

**Peatland survey**
Bracklin West Bog was not surveyed by the Irish Archaeological Wetland Unit (IAWU).

**Recorded Monuments**
The Record of Monuments and Places (RMP) for Co. Westmeath which was established under Section 12 of the National Monuments (Amendment) Act, 1994 was examined as part of the assessment (DAHGI 1997). This record was published by the Minister in 1997 and includes sites and monuments that were known in Bracklin West Bog before that date. This review established that there are no RMPs located in the proposed rehabilitation area (see Fig. 1).

**2005 Archaeological Survey of Ireland Peatland Survey**
Bracklin West Bog was surveyed by ADS Ltd in 2005 as part of the Archaeological Survey of Ireland Peatland Survey (Licence No. 05E0793). No sightings of archaeological material were recorded during the fieldwalking survey (Whitaker 2006, 11-12).

**Archaeological Excavations**
The Excavations Bulletin at excavations.ie was checked for reports of licenced excavations carried out in the rehabilitation area. This indicate that there have been no licenced excavations carried out in the rehabilitation area.

**Sites and Monuments Record**

The Sites and Monuments Record (SMR) which is maintained by the Department of Housing, Local Government and Heritage was examined as part of the assessment on the 1st of February 2023. This review established that there are no SMRs located in the proposed rehabilitation area (see Fig. 2).




Fig. 2. Bracklin West Bog, Co. Westmeath, detail of the Sites and Monuments Record. The proposed rehabilitation area is outlined with the red line.

**Previous assessments**

Bracklin West Bog has been the subject of an Environmental Impact Assessment Report (EIAR) carried out by Irish Archaeological Consultancy LTD in 2018 for Bord na Móna Energy Limited in relation to IPC Licence P0500-03. This assessment included a review of the topographical files and finds registers of the National Museum of Ireland intended to identify all finds from the bog reported to the Museum by that date and these are included below in Table 1 (Pers Comm. Jane Whitaker). The assessment noted that there was a high potential for archaeological features to be uncovered during the course of any future development works in Bracklin West Bog.

**Reported finds**

As noted above the EIAR carried out by Irish Archaeological Consultancy LTD in in relation to IPC Licence P0500-03 contains a complete list of known finds from Bracklin West Bog reported to the National Museum of Ireland up to 2018 (see Table 1).

| Townland | Museum No./ catalogue N0. | Description |
|---|---|---|
| Bracklin | 1964:83 | Wooden lid |

| | | |
|---|---|---|
| Bracklin | 1959:31 | Bronze sword blade |
| Bracklin | 1959:09 | Neolithic pottery vessel |
| Bracklin | 1962:243 | Polished stone axehead |

Table 1. List of archaeological finds from Bracklin Bog reported to the National Museum of Ireland.

## Impact assessment

There are no known sightings of archaeological material in the rehabilitation area. There are some finds known from the bog (see Table 1).

## Recommendations

There are no known sightings of archaeological material in the rehabilitation area. There are some finds known from the bog (see Table 1). Should any previously unknown archaeological material be uncovered during the rehabilitation works, it should also be avoided and reported to the Bord na Móna Archaeological Liaison Officer and the National Museum of Ireland.

## Conclusion

This is a desk-based archaeological assessment and includes a collation of existing written and graphic information to identify the likely archaeological potential of the proposed rehabilitation area. Bracklin West Bog was surveyed by ADS Ltd in 2005 as part of the Archaeological Survey of Ireland Peatland Survey and no sightings of archaeological material were recorded. There are no known sightings of archaeological material in the rehabilitation area. There are some finds known from the bog (see Table 1). Should any previously unknown archaeological material be uncovered during the rehabilitation works, it should also be avoided and reported to the Bord na Móna Archaeological Liaison Officer and the National Museum of Ireland.

## References

DAHGI 1997. Recorded Monuments Protected under Section 12 of the National Monuments (Amendment) Act, 1994. County Westmeath.

EPA 2020. Guidance on the process of preparing and implementing a bog rehabilitation plan.

Mackin *et al.* 2017. Best practice in raised bog restoration in Ireland. Irish Wildlife Manuals, No. 99. National Parks and Wildlife Service.

Whitaker, J. 2006. Peatland Survey 2005 Allen, Kilberry & Coolnamóna Bogs Counties Kildare, Laois, Meath, Offaly, & Westmeath. Unpublished report for Department of the Environment, Heritage and Local Government.

Dr. Charles Mount
1 February 2023

# APPENDIX XIII. WATER QUALITY MONITORING RESULTS FOR BRACKLIN WEST BOG

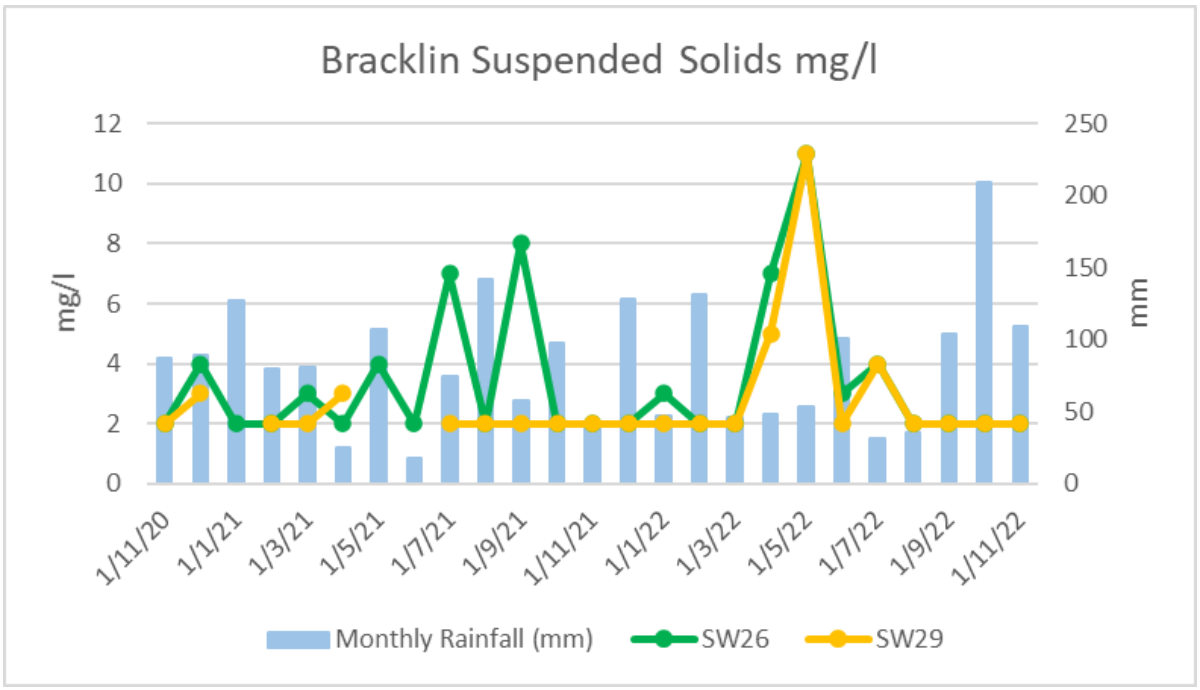



Figure AP13.1 Suspended solids in water sampling at Bracklin West from different discharge points.

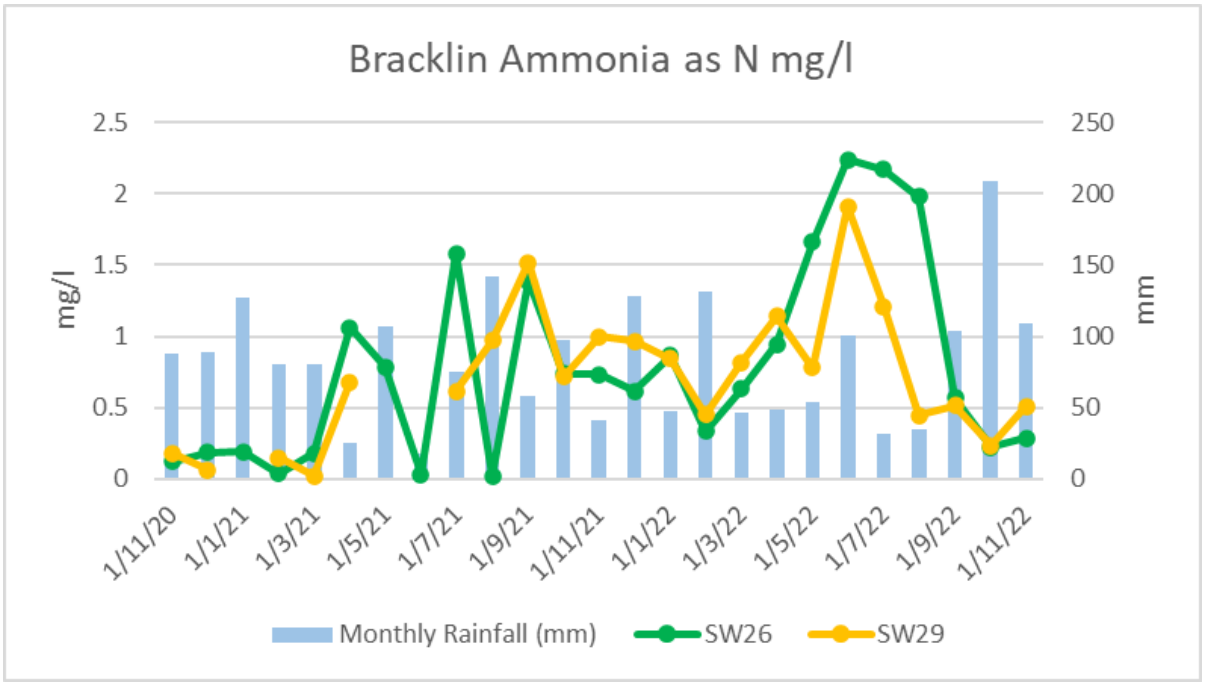



Figure AP13.2 Ammonia concentrations in water sampling from Bracklin West from different discharge points.

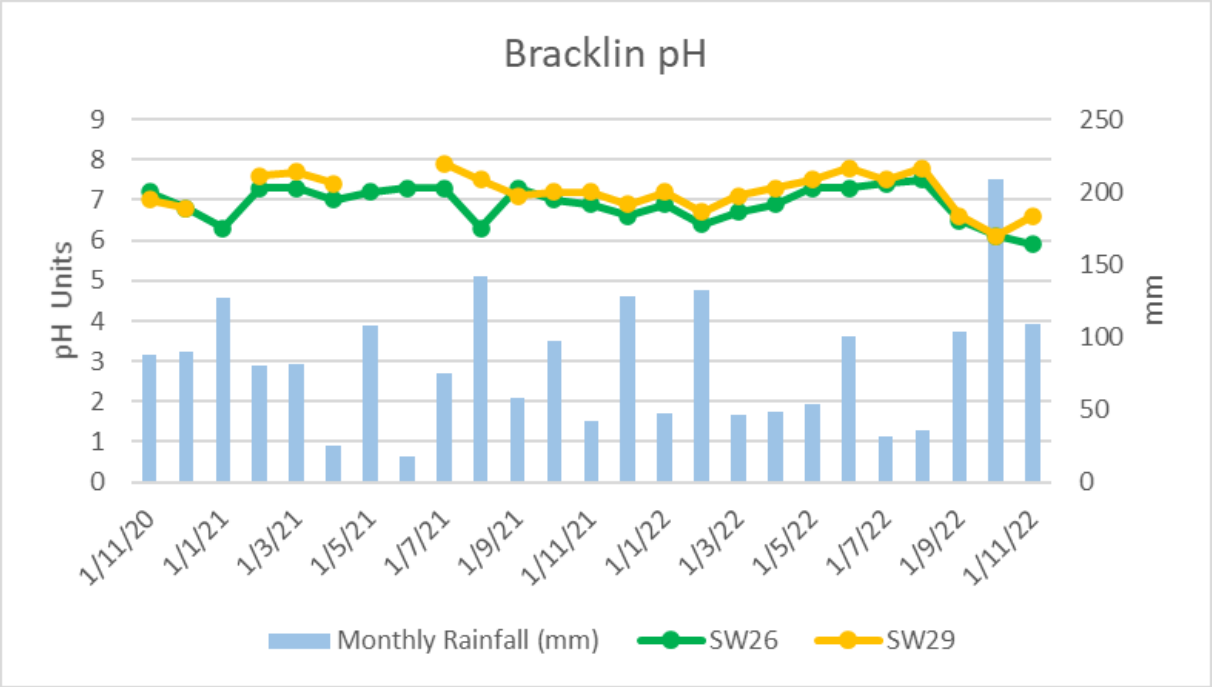



Figure AP13.3 PH concentrations in water sampling from Bracklin West from different discharge points.

| PCAS SW Sampling Scheme | | | | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bog Group | Licence No | Bog Name | SW Code -GIS | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l |
| | | | | 1/11/20 | 1/12/20 | 1/1/21 | 1/2/21 | 1/3/21 | 1/4/21 | 1/5/21 | 1/6/21 | 1/7/21 | 1/8/21 | 1/9/21 | 1/10/21 | 1/11/21 | 1/12/21 | 1/1/22 | 1/2/22 | 1/3/22 | 1/4/22 | 1/5/22 | 1/6/22 | 1/7/22 | 1/8/22 | 1/9/22 | 1/10/22 | 1/11/22 |
| Derrygreenagh | P0501-01 | Bracklin | SW26 | 2 | 4 | 2 | 2 | 3 | 2 | 4 | 2 | 7 | 2 | 8 | 2 | 2 | 2 | 3 | 2 | 2 | 7 | 11 | 3 | 4 | 2 | 2 | 2 | 2 |
| Derrygreenagh | P0501-01 | Bracklin | SW29 | 2 | 3 | NF | 2 | 2 | 3 | NF | NF | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 5 | 11 | 2 | 4 | 2 | 2 | 2 | 2 |
| | | | Monthly Rainfall (mm) | 87.7 | 89.3 | 126.9 | 80.3 | 80.9 | 25.5 | 107.4 | 17.4 | 74.9 | 142.1 | 58.1 | 97.7 | 41.6 | 128 | 47.6 | 131.8 | 46.2 | 48.7 | 53.4 | 100.6 | 31.6 | 35.2 | 104.1 | 208.8 | 109.3 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PCAS SW Sampling Scheme | | | | Colour | Colour | Colour | Colour | Colour | Colour | Colour | Colour | Colour | Colour | Colour | Colour | Colour | Colour | Colour | Colour | Colour | Colour | Colour | Colour | Colour | Colour | Colour | Colour | Colour | Colour | Colour |
| Bog Group | Licence No | Bog Name | SW Code -GIS | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co |
| | | | | 1/11/20 | 1/12/20 | 1/1/21 | 1/2/21 | 1/3/21 | 1/4/21 | 1/5/21 | 1/6/21 | 1/7/21 | 1/8/21 | 1/9/21 | 1/10/21 | 1/11/21 | 1/12/21 | 1/1/22 | 1/2/22 | 1/3/22 | 1/4/22 | 1/5/22 | 1/6/22 | 1/7/22 | 1/8/22 | 1/9/22 | 1/10/22 | 1/11/22 |
| Derrygreenagh | P0501-01 | Bracklin | SW26 | 222 | 371 | 255 | 199 | 343 | 257 | 386 | 269 | 319 | 384 | 246 | 352 | 286 | 213 | 243 | 175 | 205 | 343 | 246 | 170 | 171 | 155 | 372 | 223 | 241 |
| Derrygreenagh | P0501-01 | Bracklin | SW29 | 422 | 313 | NF | 199 | 87.5 | 318 | NF | NF | 196 | 252 | 149 | 304 | 268 | 181 | 224 | 164 | 170 | 285 | 193 | 109 | 159 | 125 | 313 | 196 | 251 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PCAS SW Sampling Scheme | | | | COD | COD | COD | COD | COD | COD | COD | COD | COD | COD | COD | COD | COD | COD | COD | COD | COD | COD | COD | COD | COD | COD | COD | COD | COD | COD | COD |
| Bog Group | Licence No | Bog Name | SW Code -GIS | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l |
| | | | | 1/11/20 | 1/12/20 | 1/1/21 | 1/2/21 | 1/3/21 | 1/4/21 | 1/5/21 | 1/6/21 | 1/7/21 | 1/8/21 | 1/9/21 | 1/10/21 | 1/11/21 | 1/12/21 | 1/1/22 | 1/2/22 | 1/3/22 | 1/4/22 | 1/5/22 | 1/6/22 | 1/7/22 | 1/8/22 | 1/9/22 | 1/10/22 | 1/11/22 |
| Derrygreenagh | P0501-01 | Bracklin | SW26 | 53 | 61 | 43 | 42 | 67 | 52 | 76 | 81 | 72 | 92 | 32 | 77 | 53 | 51 | 55 | 40 | 35 | 60 | 64 | 55 | 57 | 55 | 102 | 59 | 59 |
| Derrygreenagh | P0501-01 | Bracklin | SW29 | 79 | 52 | NF | 48 | 31 | 74 | NF | NF | 55 | 63 | 10 | 63 | 48 | 37 | 49 | 34 | 29 | 54 | 50 | 37 | 44 | 45 | 87 | 51 | 51 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PCAS SW Sampling Scheme | | | | pH | pH | pH | pH | pH | pH | pH | pH | pH | pH | pH | pH | Ph | Ph | pH | pH | pH | pH | pH | pH | Ph | Ph | Ph | Ph | Ph | Ph | Ph |
| Bog Group | Licence No | Bog Name | SW Code -GIS | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units |
| | | | | 1/11/20 | 1/12/20 | 1/1/21 | 1/2/21 | 1/3/21 | 1/4/21 | 1/5/21 | 1/6/21 | 1/7/21 | 1/8/21 | 1/9/21 | 1/10/21 | 1/11/21 | 1/12/21 | 1/1/22 | 1/2/22 | 1/3/22 | 1/4/22 | 1/5/22 | 1/6/22 | 1/7/22 | 1/8/22 | 1/9/22 | 1/10/22 | 1/11/22 |
| Derrygreenagh | P0501-01 | Bracklin | SW26 | 7.2 | 6.8 | 6.3 | 7.3 | 7.3 | 7 | 7.2 | 7.3 | 7.3 | 6.3 | 7.3 | 7 | 6.9 | 6.6 | 6.9 | 6.4 | 6.7 | 6.9 | 7.3 | 7.3 | 7.4 | 7.5 | 6.5 | 6.1 | 5.9 |
| Derrygreenagh | P0501-01 | Bracklin | SW29 | 7 | 6.8 | NF | 7.6 | 7.7 | 7.4 | NF | NF | 7.9 | 7.5 | 7.1 | 7.2 | 7.2 | 6.9 | 7.2 | 6.7 | 7.1 | 7.3 | 7.5 | 7.8 | 7.5 | 7.8 | 6.6 | 6.1 | 6.6 |
| | | | Monthly Rainfall (mm) | 87.7 | 89.3 | 126.9 | 80.3 | 80.9 | 25.5 | 107.4 | 17.4 | 74.9 | 142.1 | 58.1 | 97.7 | 41.6 | 128 | 47.6 | 131.8 | 46.2 | 48.7 | 53.4 | 100.6 | 31.6 | 35.2 | 104.1 | 208.8 | 109.3 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PCAS SW Sampling Scheme | | | | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P |
| Bog Group | Licence No | Bog Name | SW Code -GIS | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l |
| | | | | 1/11/20 | 1/12/20 | 1/1/21 | 1/2/21 | 1/3/21 | 1/4/21 | 1/5/21 | 1/6/21 | 1/7/21 | 1/8/21 | 1/9/21 | 1/10/21 | 1/11/22 | 1/12/21 | 1/1/22 | 1/2/22 | 1/3/22 | 1/4/22 | 1/5/22 | 1/6/22 | 1/7/22 | 1/8/22 | 1/9/22 | 1/10/22 | 1/11/22 |
| Derrygreenagh | P0501-01 | Bracklin | SW26 | 0.05 | 0.06 | 0.05 | 0.05 | 0.15 | 0.05 | 0.05 | 0.06 | 0.08 | 0.05 | 0.08 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.06 | 0.08 | 0.07 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |
| Derrygreenagh | P0501-01 | Bracklin | SW29 | 0.05 | 0.05 | NF | 0.05 | 0.05 | 0.05 | NF | NF | 0.07 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.07 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PCAS SW Sampling Scheme | | | | TS | TS | TS | TS | TS | TS | TS | TS | TS | TS | TS | TS | TS | TS | TS | TS | TS | TS | TS | TS | TS | TS | TS | TS | TS | TS | TS |
| Bog Group | Licence No | Bog Name | SW Code -GIS | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l |
| | | | | 1/11/20 | 1/12/20 | 1/1/21 | 1/2/21 | 1/3/21 | 1/4/21 | 1/5/21 | 1/6/21 | 1/7/21 | 1/8/21 | 1/9/21 | 1/10/21 | 1/11/21 | 1/12/21 | 1/1/22 | 1/2/22 | 1/3/22 | 1/4/22 | 1/5/22 | 1/6/22 | 1/7/22 | 1/8/22 | 1/9/22 | 1/10/22 | 1/11/22 |
| Derrygreenagh | P0501-01 | Bracklin | SW26 | 212 | 97 | 61 | 193 | 193 | 92 | 207 | 238 | 373 | 128 | 365 | 146 | 109 | 87 | 139 | 80 | 93 | 164 | 324 | 412 | 385 | 430 | 253 | 86 | 15 |
| Derrygreenagh | P0501-01 | Bracklin | SW29 | 132 | 126 | NF | 335 | 423 | 266 | NF | NF | 309 | 254 | 321 | 141 | 158 | 145 | 346 | 131 | 111 | 246 | 379 | 321 | 333 | 321 | 253 | 129 | 73 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PCAS SW Sampling Scheme | | | | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N |
| Bog Group | Licence No | Bog Name | SW Code -GIS | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l |
| | | | | 1/11/20 | 1/12/20 | 1/1/21 | 1/2/21 | 1/3/21 | 1/4/21 | 1/5/21 | 1/6/21 | 1/7/21 | 1/8/21 | 1/9/21 | 1/10/21 | 1/11/21 | 1/12/21 | 1/1/22 | 1/2/22 | 1/3/22 | 1/4/22 | 1/5/22 | 1/6/22 | 1/7/22 | 1/8/22 | 1/9/22 | 1/10/22 | 1/11/22 |
| Derrygreenagh | P0501-01 | Bracklin | SW26 | 0.124 | 0.184 | 0.192 | 0.038 | 0.18 | 1.06 | 0.788 | 0.033 | 1.58 | 0.019 | 1.39 | 0.739 | 0.734 | 0.617 | 0.867 | 0.337 | 0.634 | 0.943 | 1.66 | 2.24 | 2.17 | 1.98 | 0.569 | 0.224 | 0.285 |
| Derrygreenagh | P0501-01 | Bracklin | SW29 | 0.181 | 0.064 | NF | 0.147 | 0.024 | 0.68 | NF | NF | 0.615 | 0.969 | 1.52 | 0.715 | 0.998 | 0.968 | 0.846 | 0.453 | 0.816 | 1.14 | 0.778 | 1.91 | 1.21 | 0.448 | 0.517 | 0.236 | 0.511 |
| | | | Monthly Rainfall (mm) | 87.7 | 89.3 | 126.9 | 80.3 | 80.9 | 25.5 | 107.4 | 17.4 | 74.9 | 142.1 | 58.1 | 97.7 | 41.6 | 128 | 47.6 | 131.8 | 46.2 | 48.7 | 53.4 | 100.6 | 31.6 | 35.2 | 104.1 | 208.8 | 109.3 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PCAS SW Sampling Scheme | | | | DOC | DOC | DOC | DOC | DOC | DOC | DOC | DOC | DOC | DOC | DOC | DOC | DOC | DOC | DOC | DOC | DOC | DOC | DOC | DOC | DOC | DOC | DOC | DOC | DOC | DOC | DOC |
| Bog Group | Licence No | Bog Name | SW Code -GIS | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l |
| | | | | 1/11/20 | 1/12/20 | 1/1/21 | 1/2/21 | 1/3/21 | 1/4/21 | 1/5/21 | 1/6/21 | 1/7/21 | 1/8/21 | 1/9/21 | 1/10/21 | 1/11/21 | 1/12/21 | 1/1/22 | 1/2/22 | 1/3/22 | 1/4/22 | 1/5/22 | 1/6/22 | 1/7/22 | 1/8/22 | 1/9/22 | 1/10/22 | 1/11/22 |
| Derrygreenagh | P0501-01 | Bracklin | SW26 | 23.7 | 27.4 | 14.8 | 19.3 | 24.58 | 16.9 | 26.8 | 29.3 | 22.2 | 36.1 | 20.5 | 24.4 | 23.4 | 19.8 | 19.5 | 14.4 | 16.2 | 21.2 | 20.9 | 19.4 | 21.5 | 21.3 | 38.2 | 23.5 | 20.9 |
| Derrygreenagh | P0501-01 | Bracklin | SW29 | 33.9 | 35.5 | NF | 20.3 | 12.5 | 26.3 | NF | NF | 18.5 | 55 | 15.1 | 20.7 | 19.5 | 14.9 | 17.8 | 11.2 | 12 | 19.3 | 17.2 | 14.9 | 17.3 | 17.7 | 32.8 | 18.9 | 17.3 |

Table AP13.1. Water quality data for 12 months from Nov 2020 to November 2022 at Bracklin West bog.

Bord na Móna

# Bracklin West Bog
# Rehab Plan
# GIS Map Book
# 2023

MAKING COMPLEX EASY

| Document Control Sheet | |
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| **Document File Path:** | |
| **Document Status:** | **Draft v0.1** |

| This document comprises: | DCS | TOC | Text (Body) | References | Maps | No. of Appendices |
|---|---|---|---|---|---|---|
| | 1 | 1 | 0 | 0 | 15 | 0 |

| Rev. 0.1 | Author(s): | Checked By: | Approved By: |
|---|---|---|---|
| Name(s): | BG | ML | MMcC |
| Date: | 01/02/2023 | 01/02/2023 | 01/02/2023 |

*Bord na Móna would like to thank and acknowledge RPS Consultants for their input into this document and the provision of data for inclusion in these maps.*

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# Bog Site Information Maps

**BNM-DR-23-15-01: Site Location Map**

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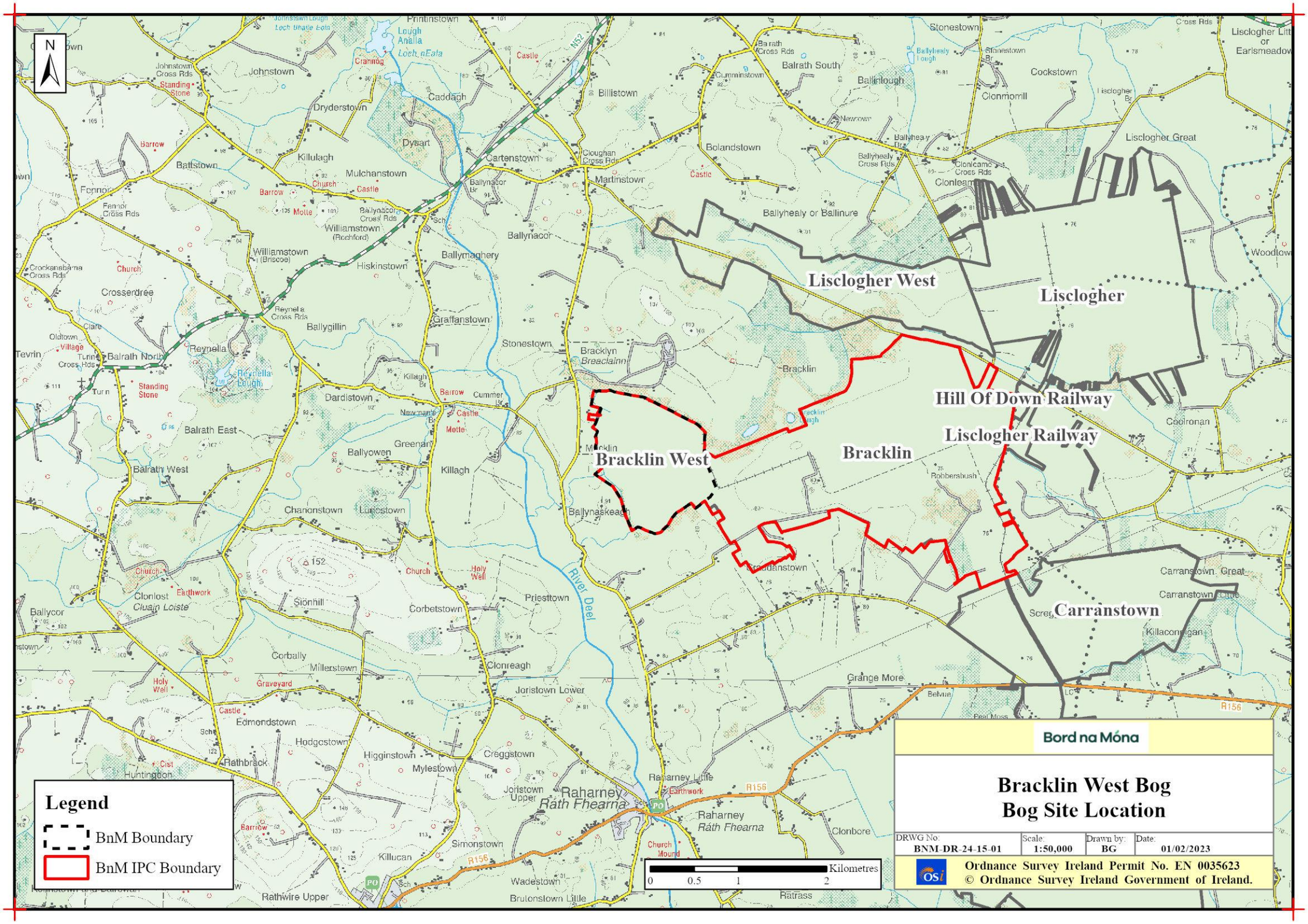

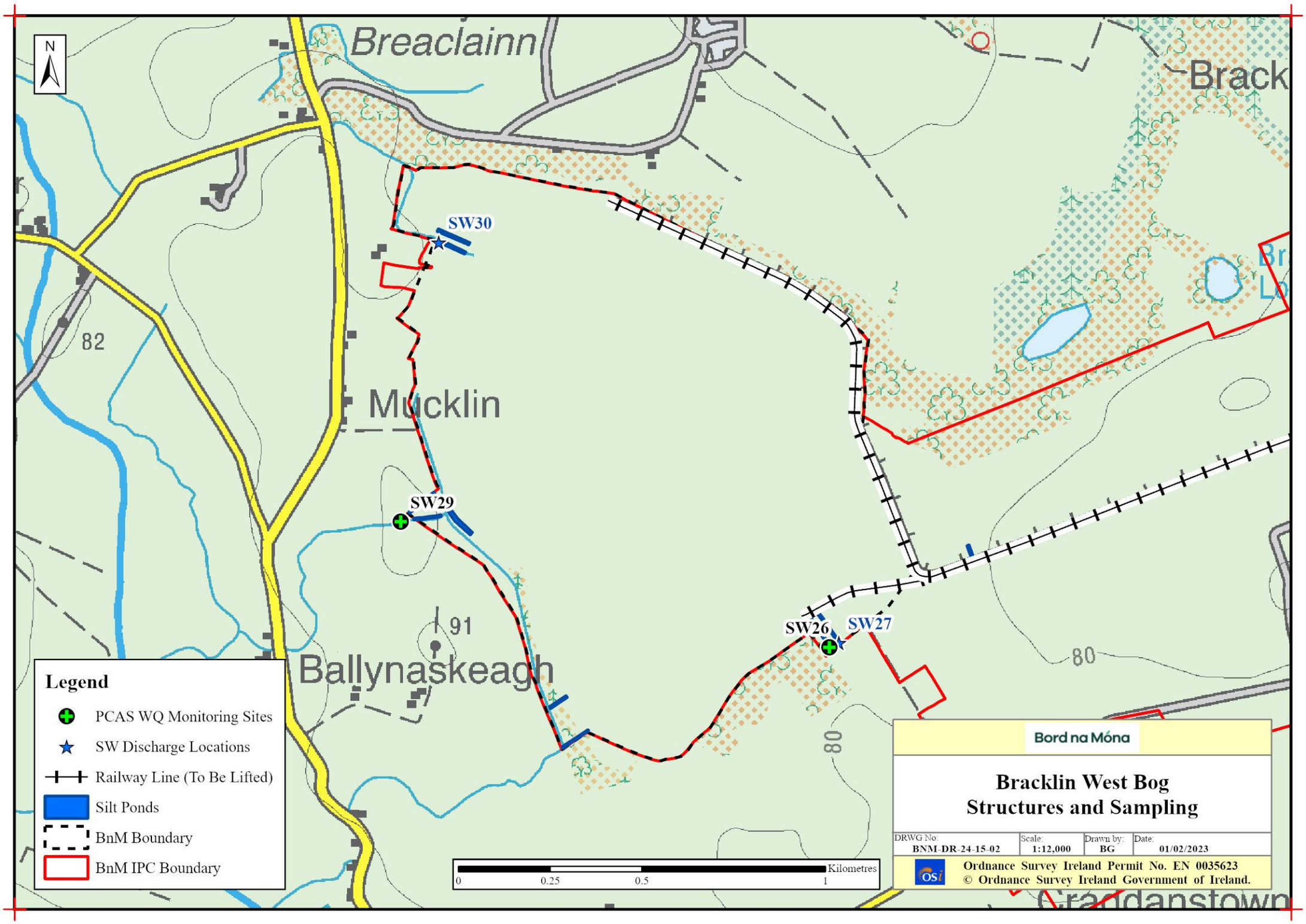
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SW Discharge Locations
Railway Line (To Be Lifted)
Silt Ponds
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BnM IPC Boundary
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0.25
0.5
1
Kilometres
Bord na Móna
Bracklin West Bog
Structures and Sampling
DRWG No: BNM-DR-24-15-02
Scale: 1:12,000
Drawn by: BG
Date: 01/02/2023
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Craddanstown

**BNM-DR-23-15-04: Peat Depths**

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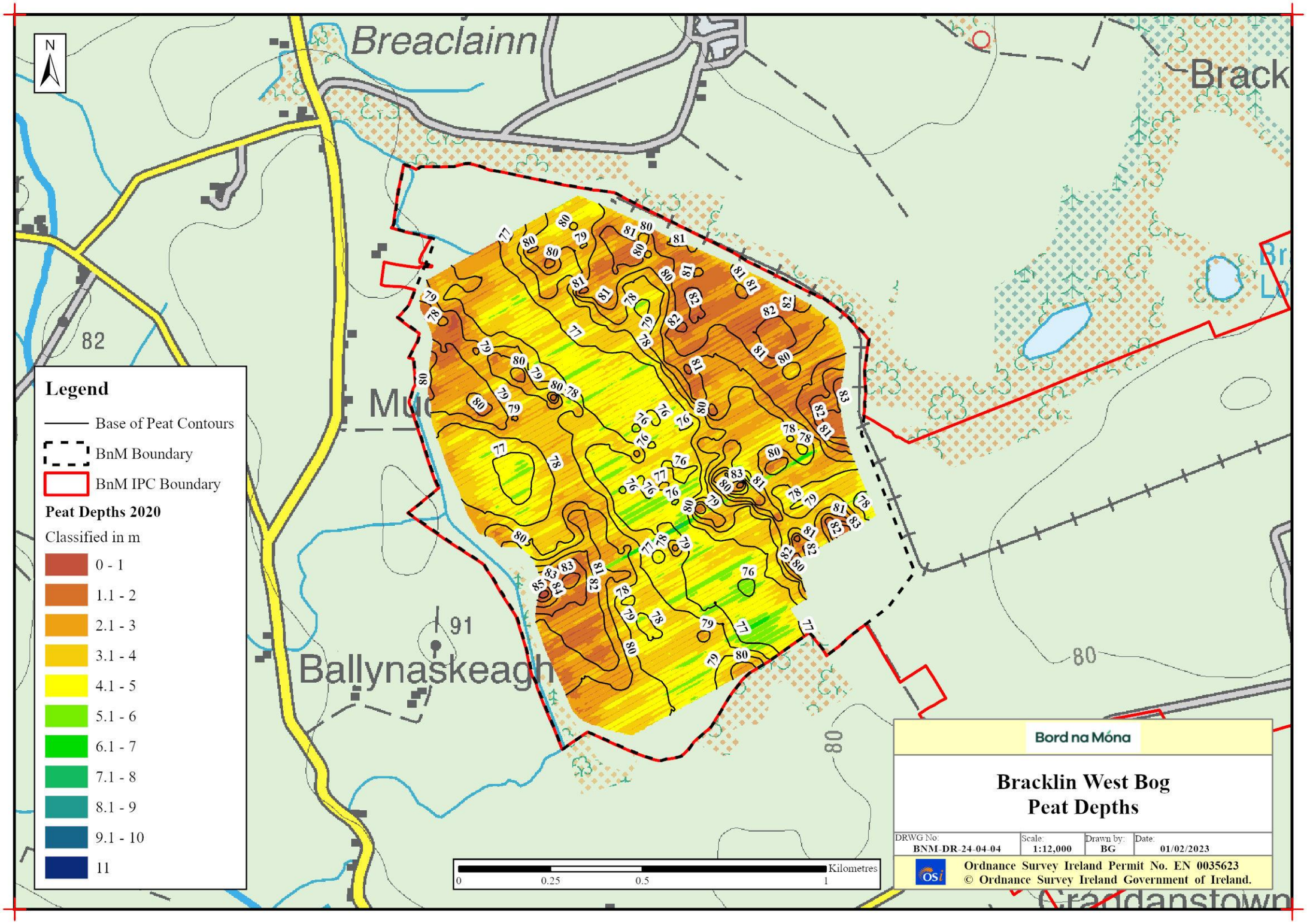

**BNM-DR-23-15-17: Current Habitat Map**

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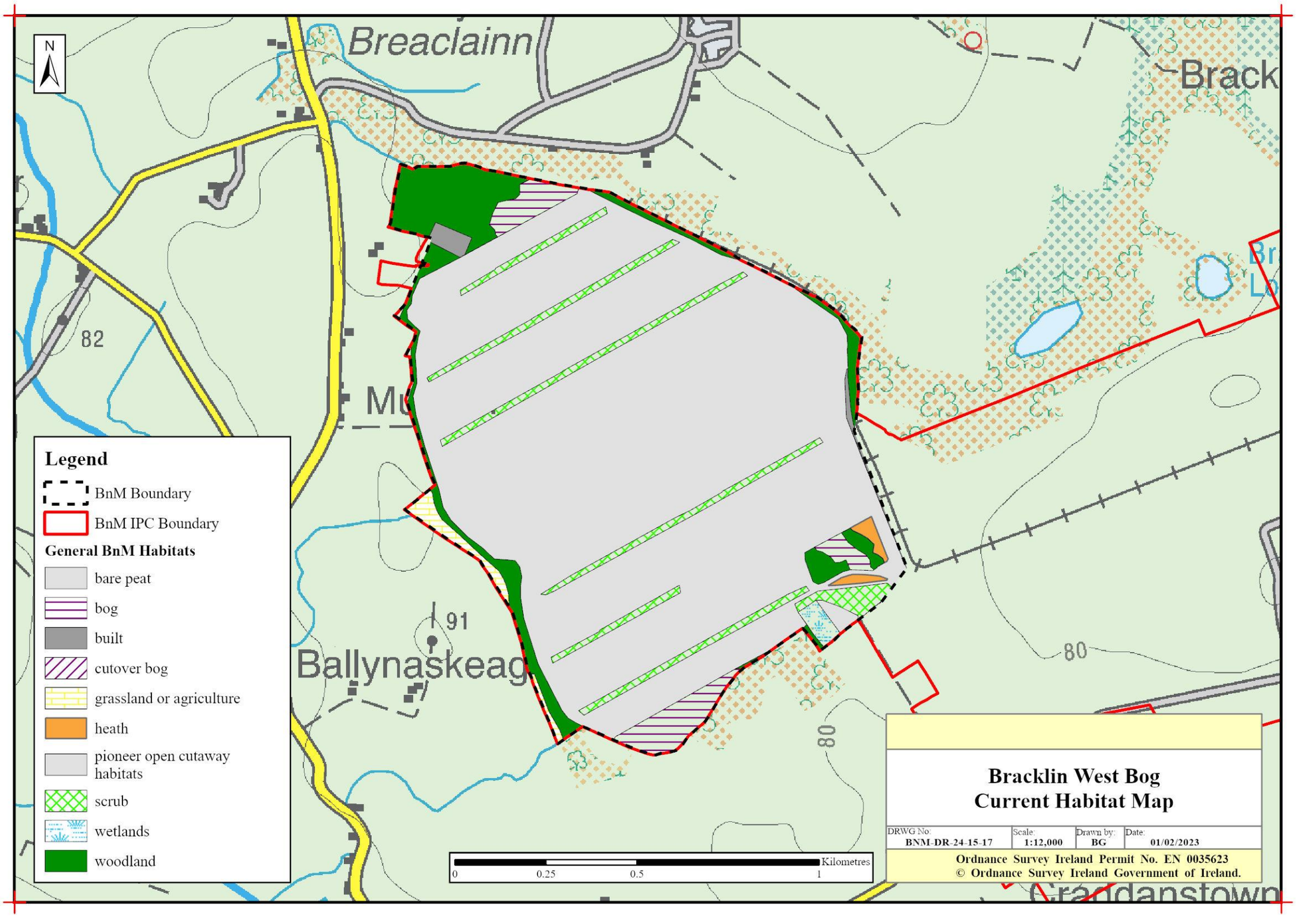

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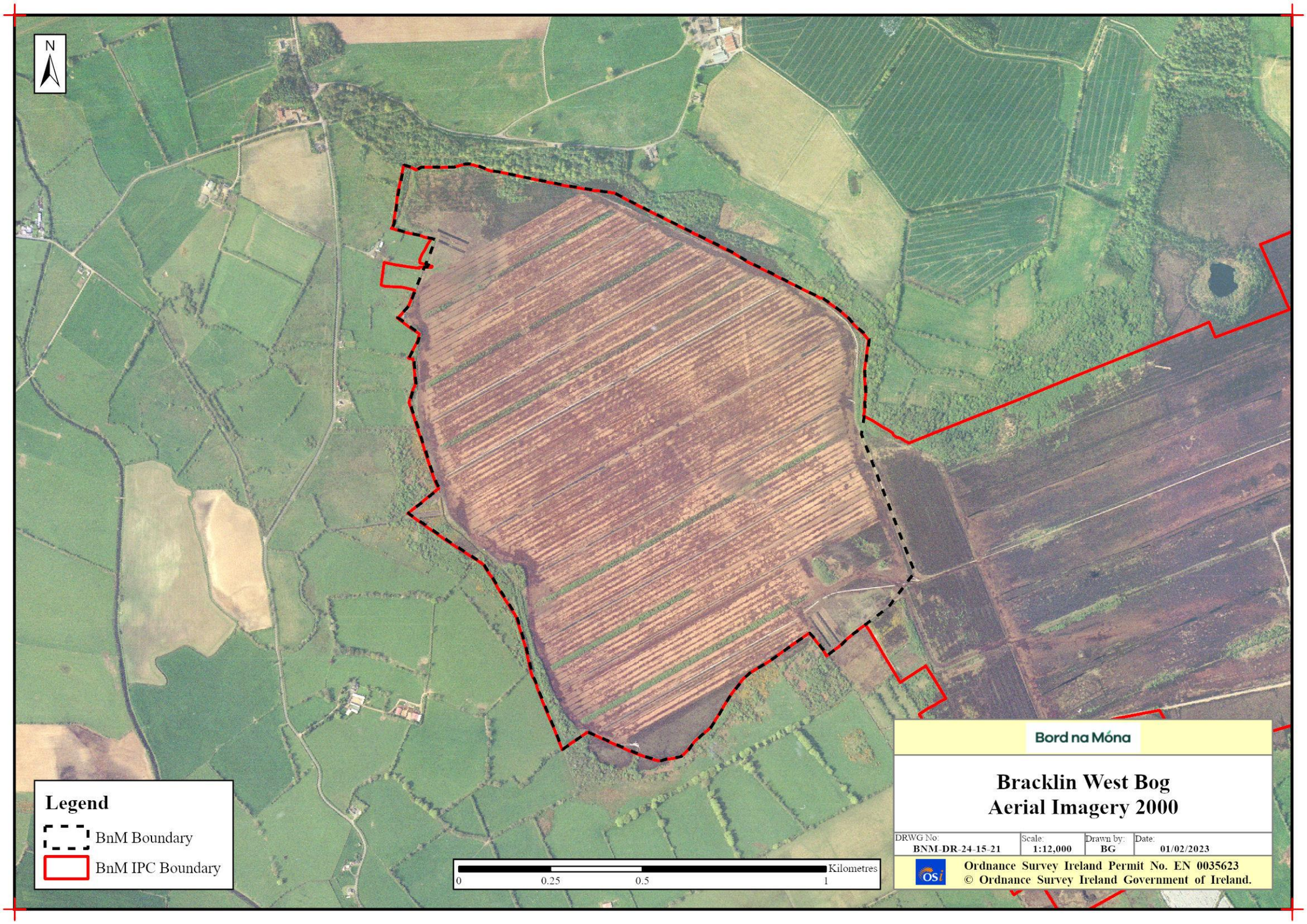

**BNM-DR-23-15-22: Aerial Imagery 2020**

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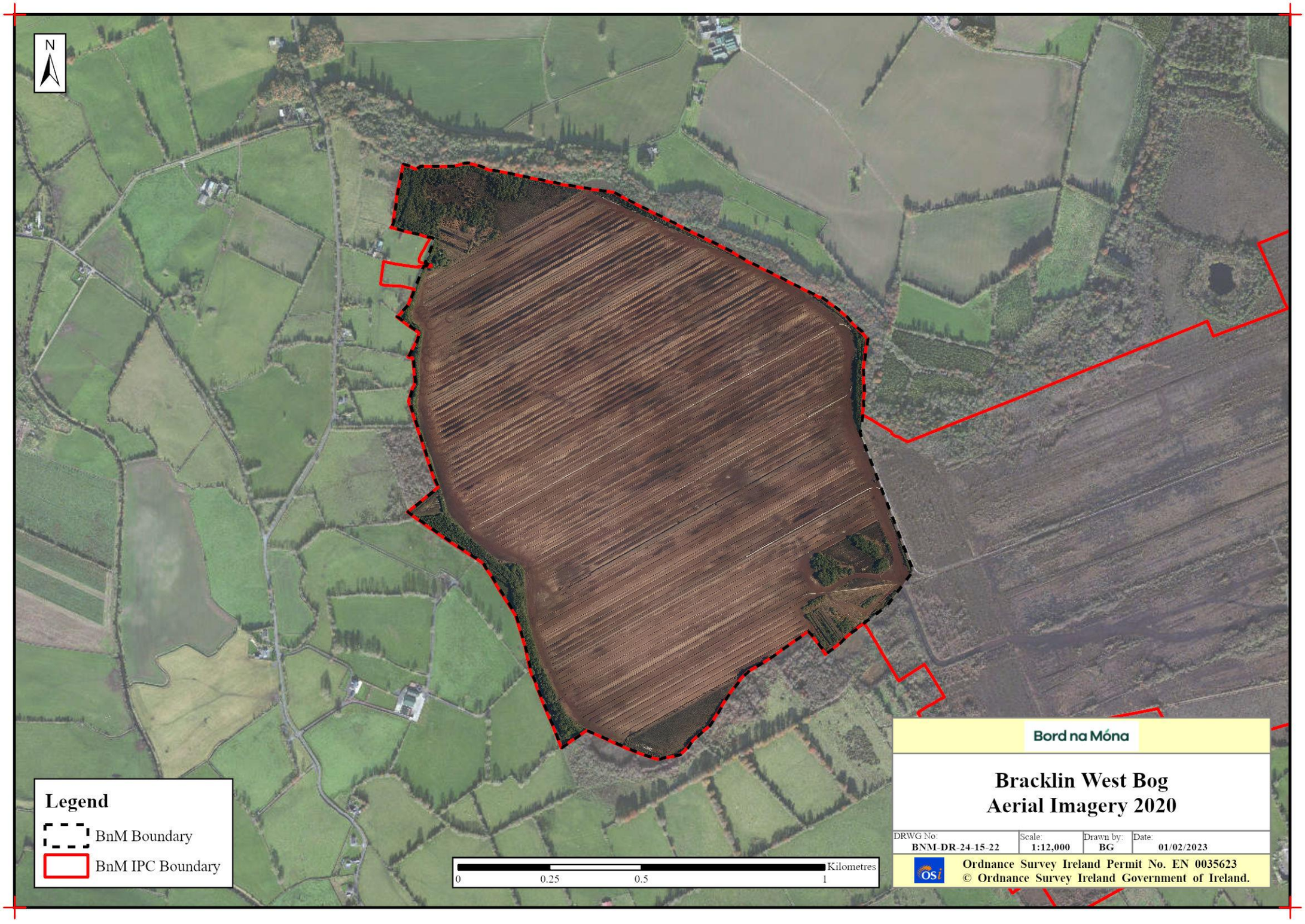

**BNM-DR-23-15-23: Proximity Designated Sites**

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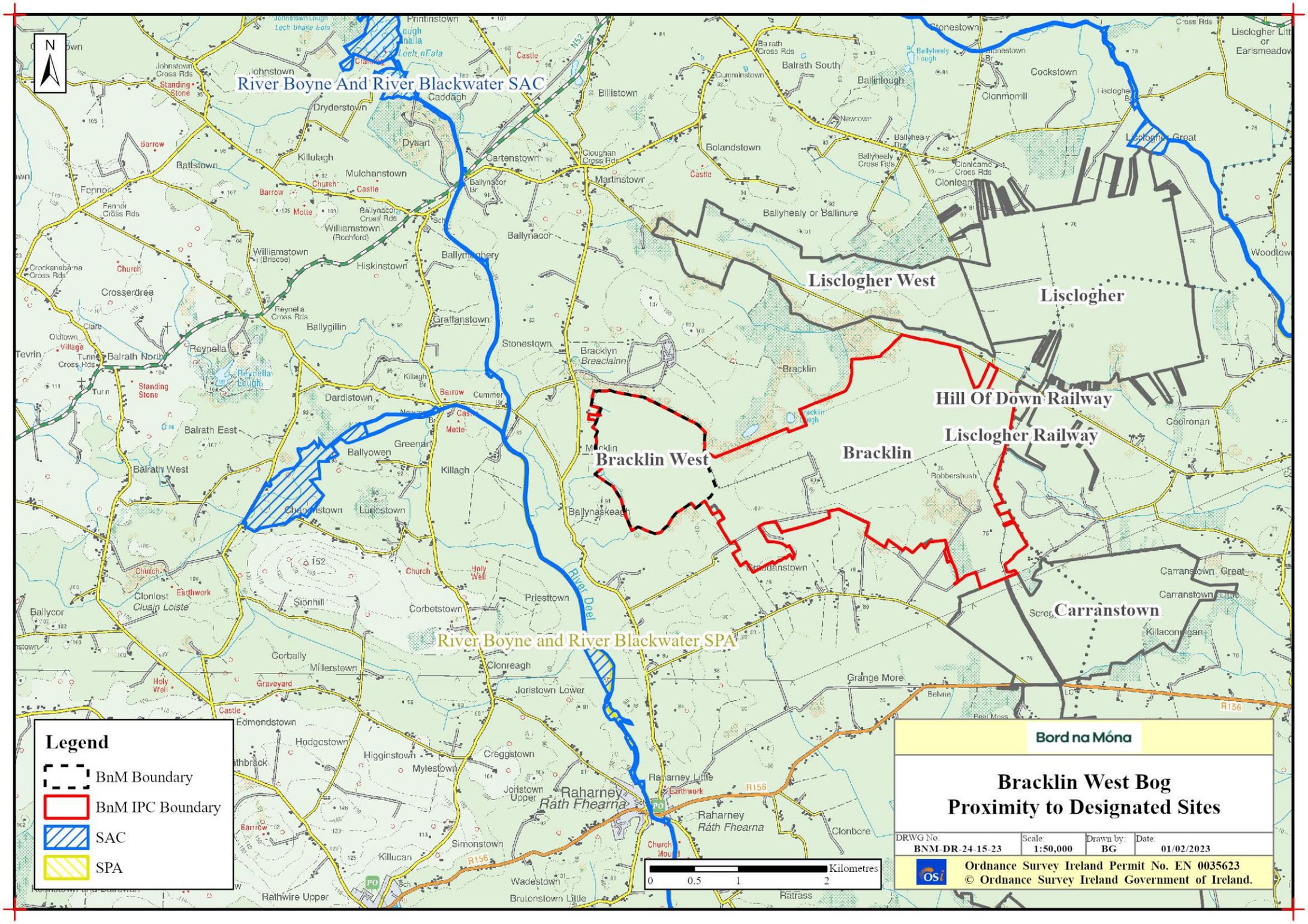

**BNM-DR-23-15-24: Bog Group Map**

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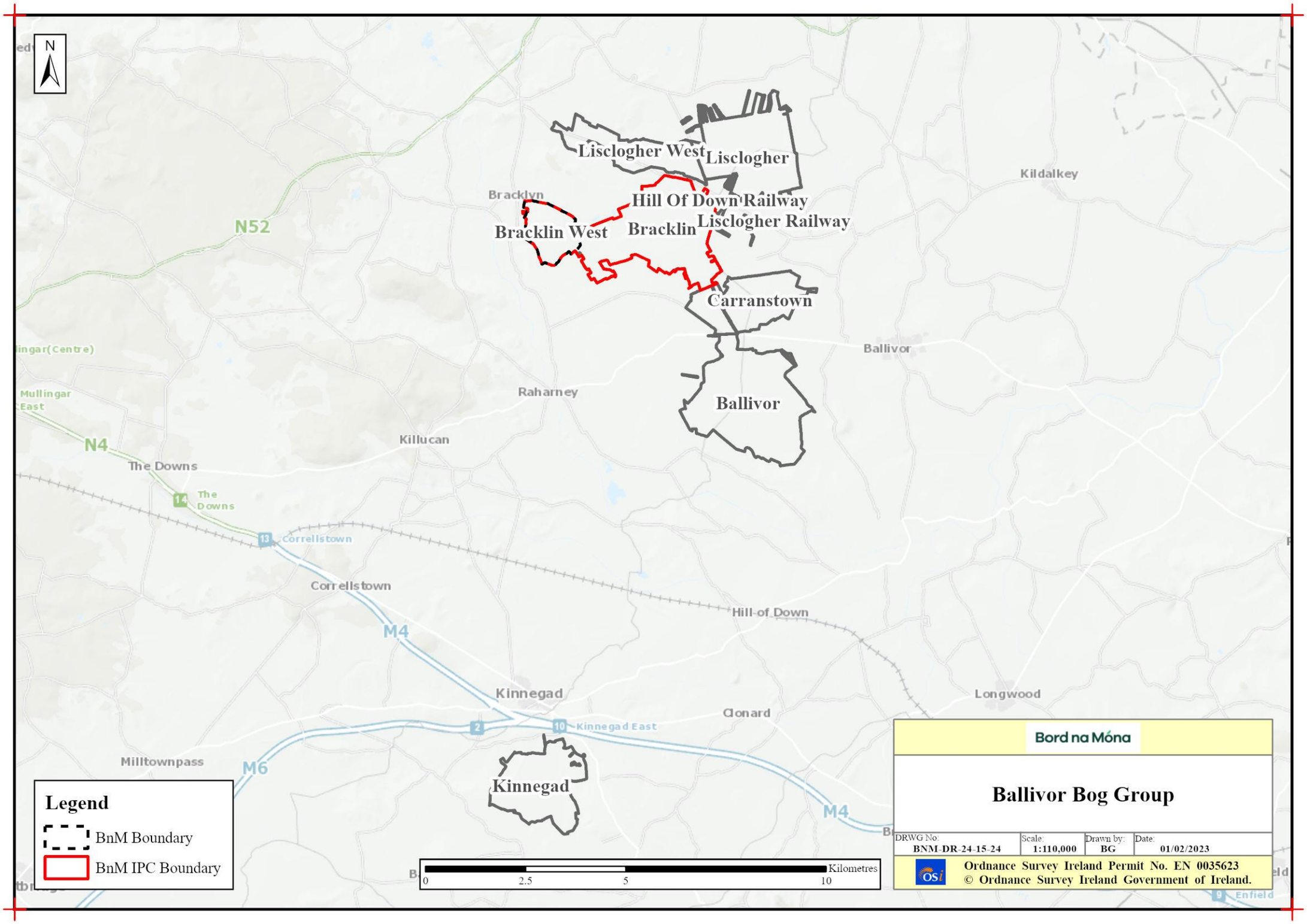

# Hydrology / Topography Maps

**BNM-DR-23-15-WQ01: Water Quality Map**

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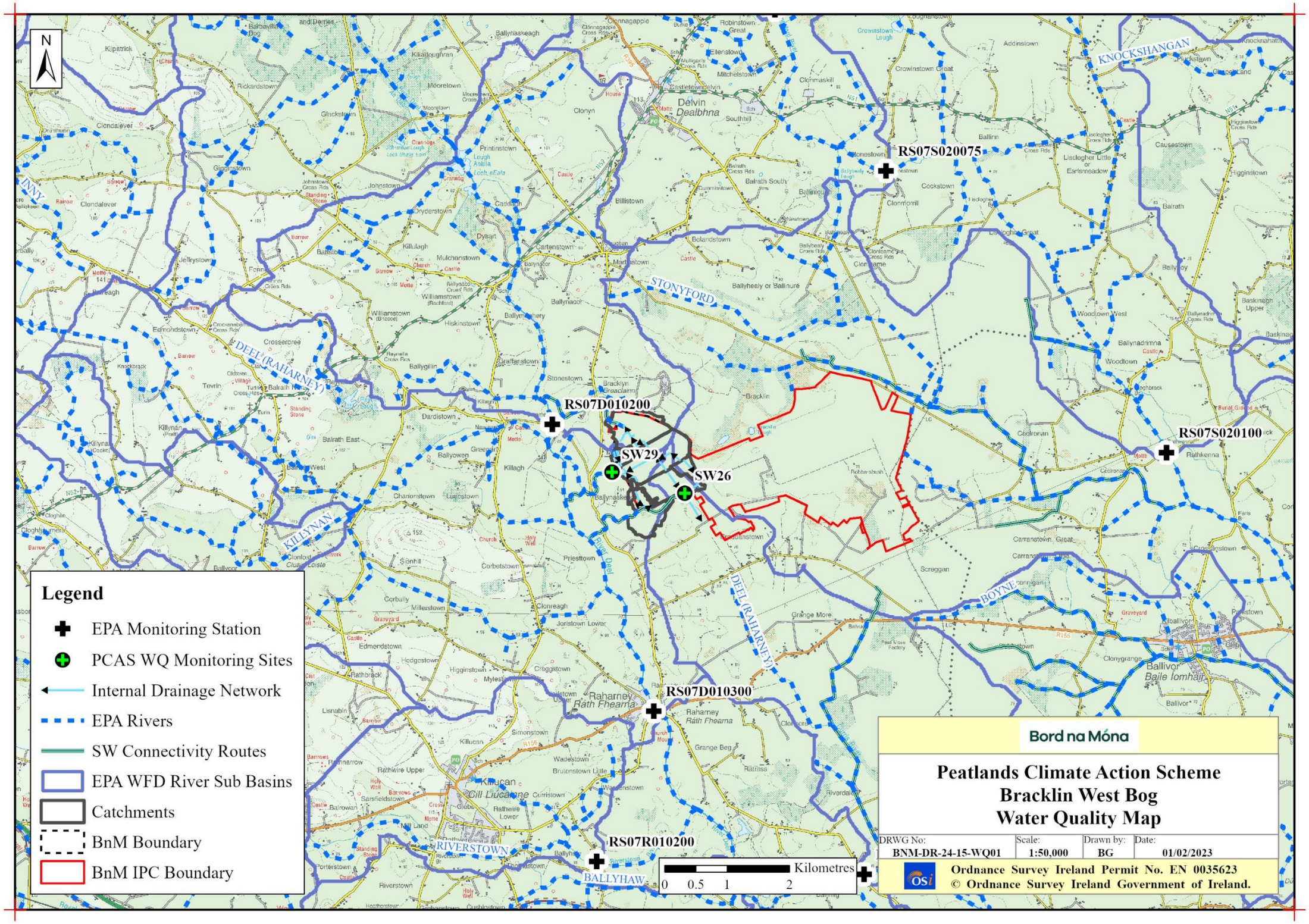

**BNM-DR-23-15-SP01: Sampling Points**

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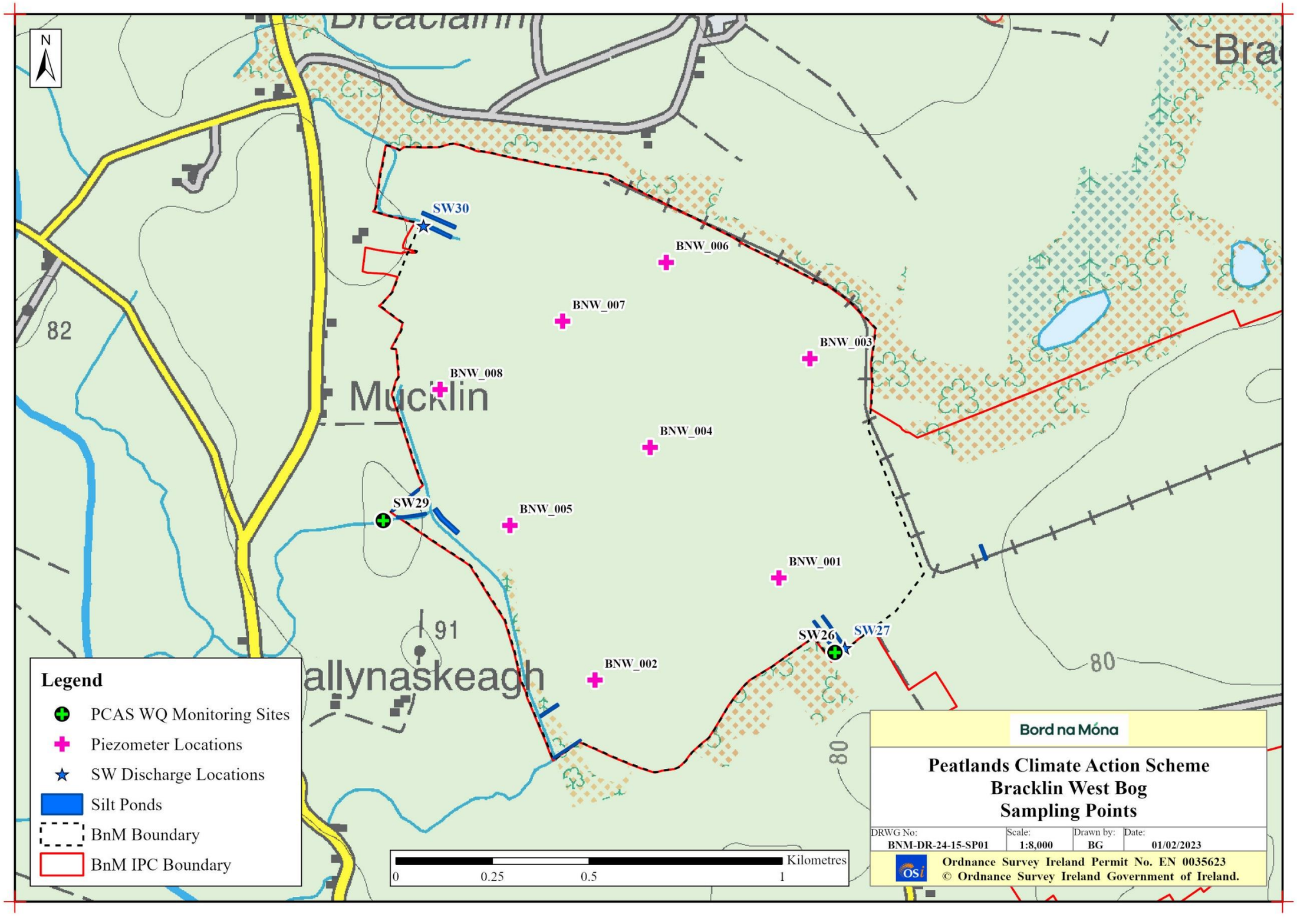

**BNM-DR-23-15-03: LiDAR Map**

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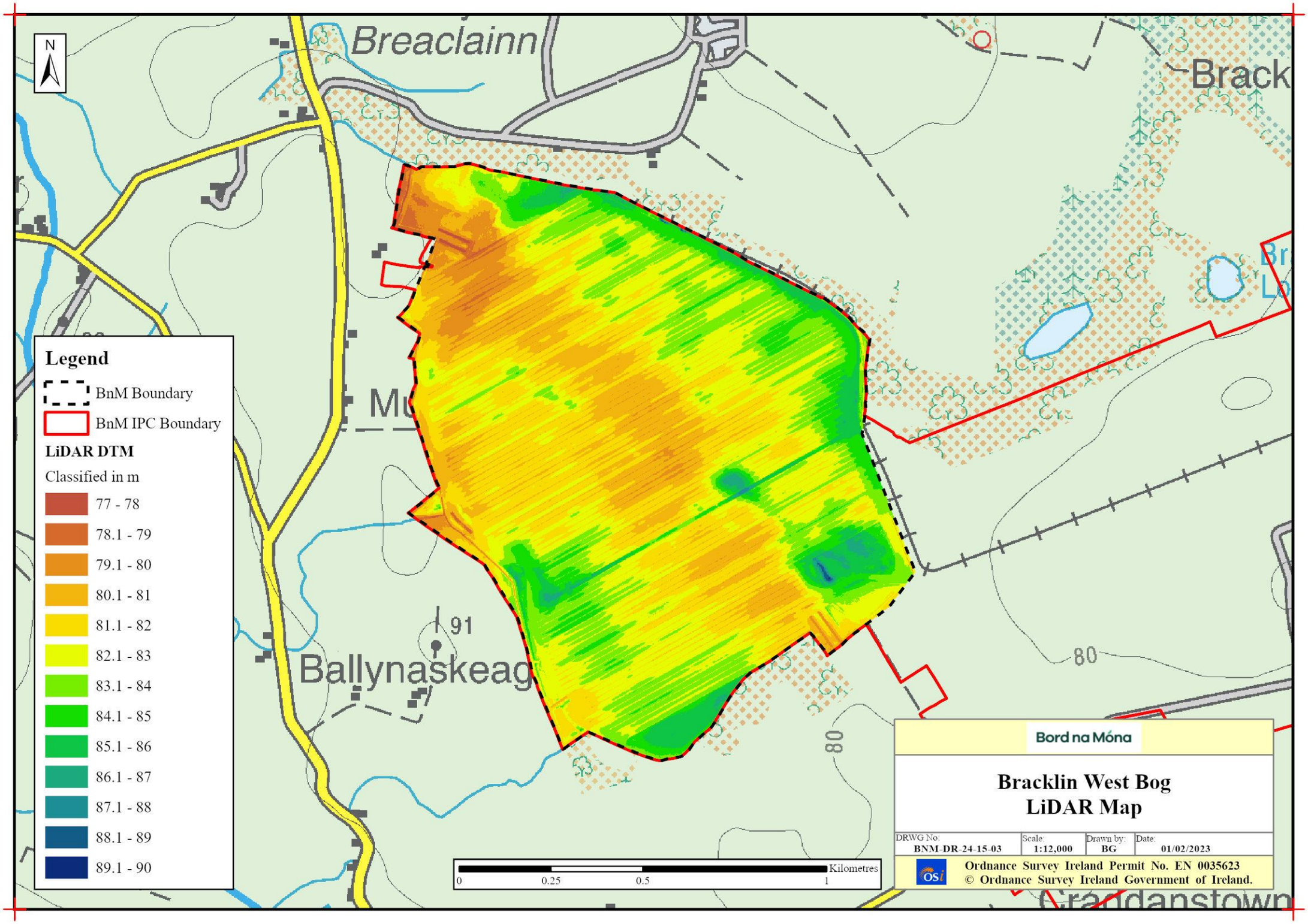

**BNM-DR-23-15-09: Depression Analysis**

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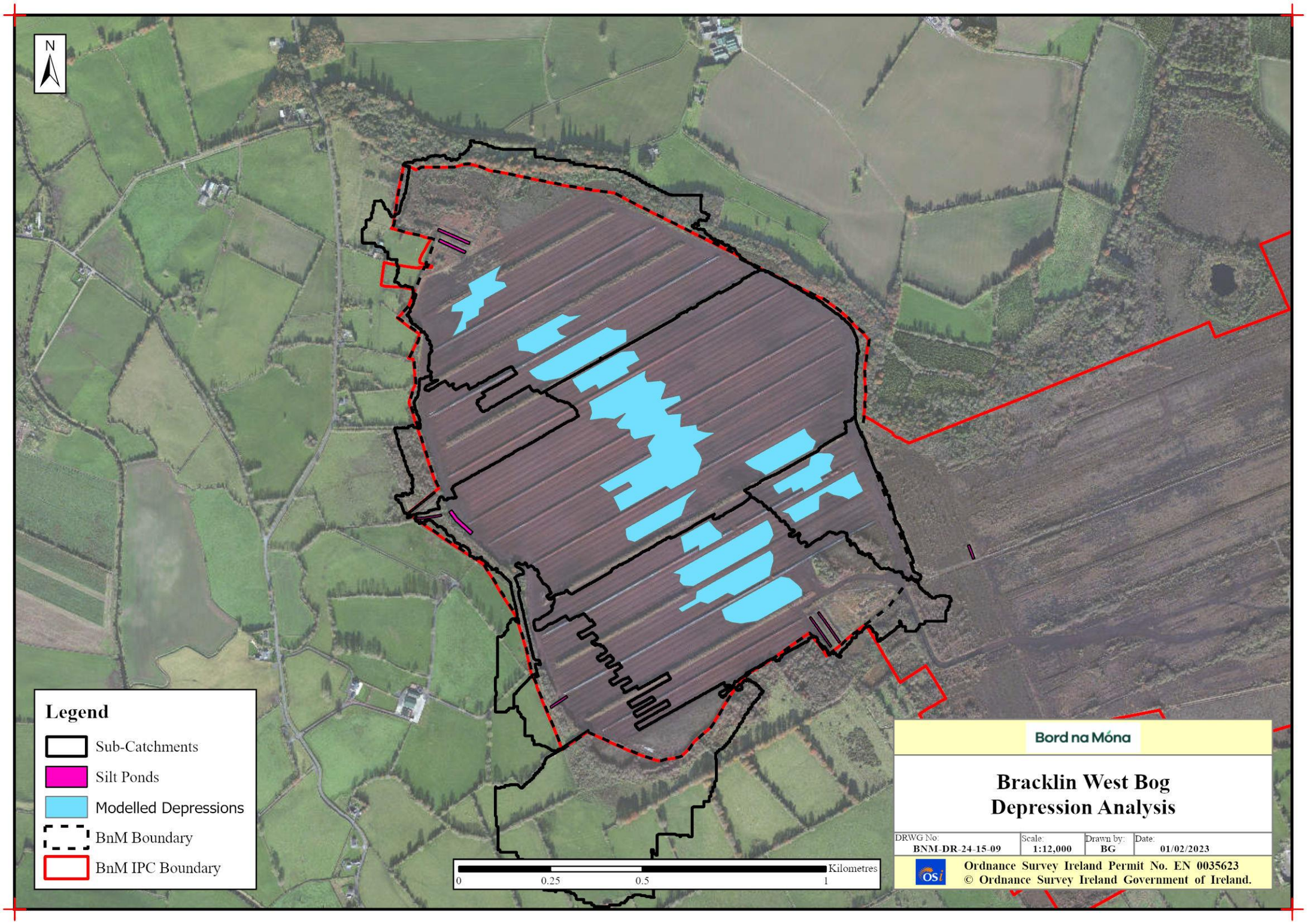

**BNM-DR-23-15-13: General Drainage Map**

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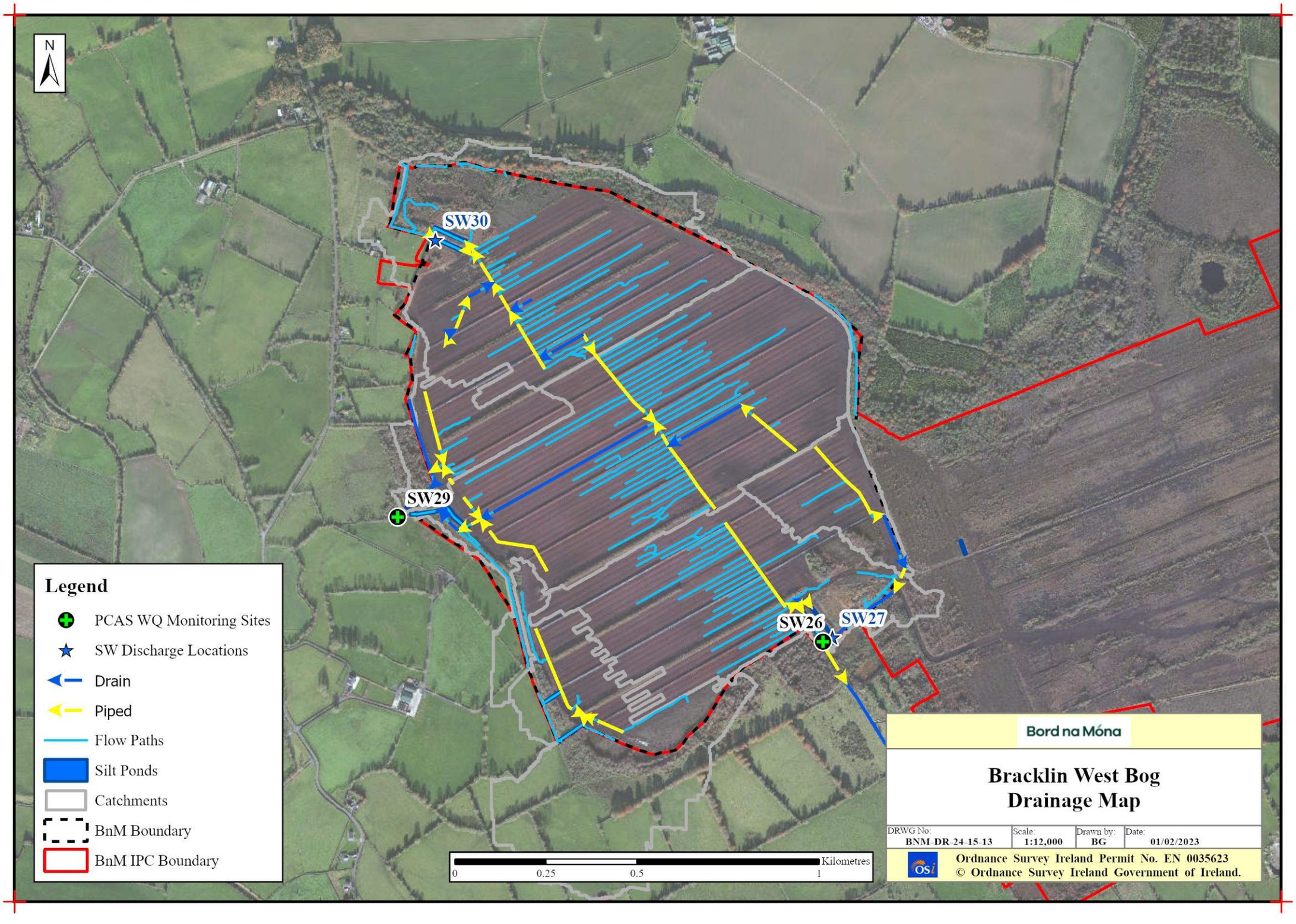

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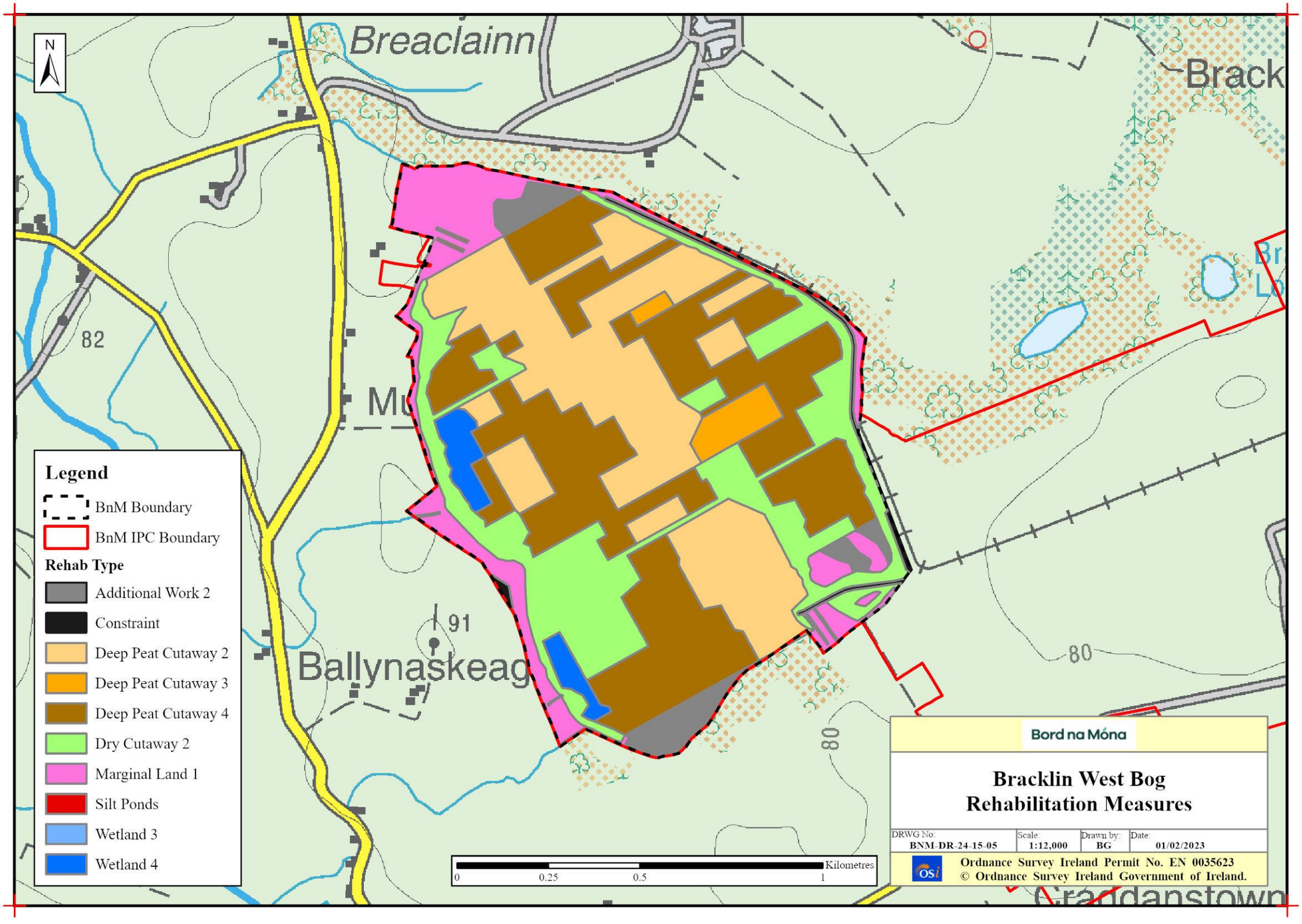
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Bracklin West Bog
Rehabilitation Measures
DRWG No: BNM-DR-24-15-05
Scale: 1:12,000
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Date: 01/02/2023
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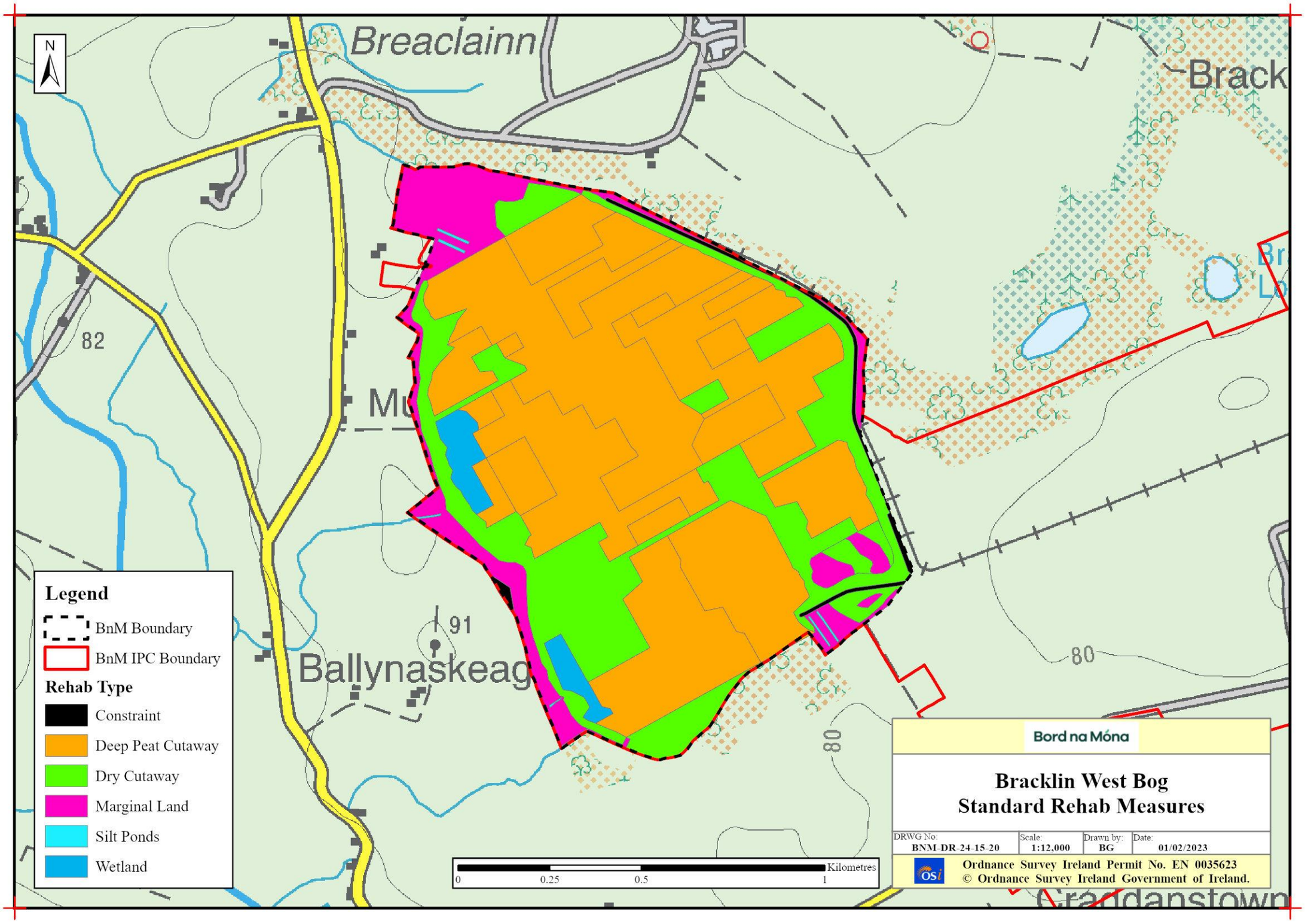
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DRWG No: BNM-DR-24-15-20
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Bord na Móna

# Carranstown Bog

# Cutaway Bog Decommissioning and Rehabilitation Plan 2022

This document seeks to address the requirements of Condition 10.2 of IPC License Ref. P0501-01:

> "*The licensee shall prepare, to the satisfaction of the Agency, a fully detailed and costed plan for permanent rehabilitation of the cutaway boglands within the licensed area.*"

*This licence condition requires Bord na Móna agree with the EPA the measures that will provide for rehabilitation, i.e. stabilisation of Carranstown Bog upon cessation of peat production and compliments the licence requirement to decommission the site.*

***Rehabilitation*** *generally comprises site stabilisation with natural colonisation with or without targeted management.*

*Industrial peat production has now fully ceased at Carranstown Bog.*

*In addition, to preparing this document to comply with Condition 10 of IPC Licence Ref. P0501-01, due regard was also given to the Peatlands Climate Action Scheme (PCAS) announced by the Minster. This Scheme will see the Minister support, via the Climate Action Fund* and Ireland's National Recovery and Resilience Plan*, Bord na Móna in developing a package of measures, 'the Scheme', for enhanced decommissioning, rehabilitation and restoration of cutaway peatlands referred to as, the Peatlands Climate Action Scheme'. However, only the additional costs associated with the additional and enhanced rehabilitation, i.e, measures which go beyond the existing standard mandatory decommissioning and rehabilitation requirements arising from Condition 10 will be eligible for support. The additional costs of the Scheme will be supported by Government, administered by the Department of Environment, Climate and Communications (DECC), while the National Parks and Wildlife Service (NPWS) will act as the Scheme regulator.*

*While this document outlines the enhanced rehabilitation measures planned for Carranstown bog, activities which goes beyond that required by Condition 10 in the Licence, rehabilitation necessary to comply with the 'standard' requirement of Condition 10 (in the absence of the Scheme) is also included, to estimate costs. The inclusion of the 'standard' rehabilitation together with the enhanced rehabilitation in this document allows the Scheme Regulator to distinguish and objectively determine the specific activities (and their associated costs) eligible for support under the Scheme.*

*Bord na Móna have defined the key rehabilitation outcome at Carranstown Bog as environmental stabilisation, re-wetting and setting the bog on a trajectory towards development of naturally functioning peatland and wetland habitats.*

*Any consideration of any other future after-uses for Carranstown Bog, such as amenity, will be conducted in adherence to the relevant planning guidelines and consultation with relevant authorities and will be considered within the framework of this rehabilitation plan.*

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Note: This finalised version of the Rehabilitation Plan has been updated to take account that several planning actions listed in Section 8.1 have been completed and have been incorporated into the plan. This includes an Appropriate Assessment of the rehabilitation plan. See Carranstown Decommissioning and Rehabilitation Plan – Addendum 1 for more details.

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## NON-TECHNICAL SUMMARY

- Bord na Móna is planning to rehabilitate Carranstown Bog, west of Ballivor, in Co. Meath/Westmeath.
- Peat harvesting is now finished at Carranstown Bog.
- This is happening as Bord na Móna are obliged to carry out peatland rehabilitation via an IPC License issued by the Environmental protection Agency. In addition, the Government has agreed to support peatland rehabilitation via the establishment of the Peatland Climate Action Scheme (PCAS). This is funded via the Government and by Bord na Móna.
- The key objective of peatland rehabilitation is environmental stabilisation. This means developing habitats and vegetation back onto the bare peat (putting a "skin" back onto the peat), and minimising effects to downstream waterbodies. Carranstown was drained in the past to allow peat production. Better results for water quality improvements, climate action, the reduction of carbon emissions and biodiversity are achieved when the remaining peat is re-wetted. This means drain-blocking and other measures to raise water levels to the surface of the bog and to encourage the natural colonisation of vegetation.
- In general, soggy ground conditions are preferred. This means the remaining peat is wet and that plants that prefer wetter conditions, like Bog Cotton and Reeds will thrive.
- Many Bord na Móna bogs cannot be restored back to raised bog, as so much peat has been removed and the environmental conditions have been modified. However other natural habitats will develop like shallow wetlands with Reedbeds and Birch woodland, and in time a naturalised peatland can be restored.
- The development of a range of habitats in Carranstown Bog will support biodiversity including plants, insects, birds and mammals. This includes some species that are rare and protected in the wider landscape. It will increase the national area of native woodland. Many wetland habitats in the wider landscape have been reclaimed for agriculture and other uses and peatland rehabilitation is an opportunity to create new wetland habitats.
- While Carranstown Bog was utilised for industrial peat production from 1950 until 2020, the bog still has relatively deep residual peat. Much of the former production area currently comprises of bare peat. Within the former production area there are some already established pioneer peatland habitats.
- Measures proposed for Carranstown Bog include internal drain blocking and other measures required to raise water levels to the surface of the peat (changing levels of pipes for example). Some fertiliser will be spread on headlands and other areas (a small part of the overall area) to encourage vegetation growth.
- Bord na Mona plan to carry out this work in 2022.
- These rehabilitation measures will be planned by a team consisting of expert ecologists, hydrologists and engineers. It is a guiding principle of Bord na Móna rehabilitation planning that no actions or activities will be undertaken that would negatively impact on adjacent land. No boundary drains will be blocked. Water will still leave the bog via the existing outlets.
- It will take some time for vegetation and habitats to fully develop at Carranstown, and a peatland ecosystem to be restored. However, it is expected that most of the bog will be developing pioneer habitats after 10 years.
- This is a peatland rehabilitation plan. This plan does not consider future after-use or development. Bord na Móna continually reviews its land-bank to consider future commercial or industrial developments, such as renewable energy. Bord na Móna are currently developing a renewable energy project called Ballivor Windfarm. This proposed project is in the pre-planning stage, but the planning application layout design has informed the constraints (see drawing number BNM-DR-23-20-05: Enhanced Rehab Measures

and BNM-DR-23-20-20: Standard Rehab Measures). The proposed renewable energy project is expected to have a small footprint on Carranstown Bog. In advance of this proposed planning submission, it is planned to rehabilitate **part** of Carranstown Bog in 2023 (eastern part). The remaining area will be rehabilitated after the renewable energy construction is complete, or at a later date.

- Any other proposed development will be planned in adherence to relevant planning guidelines and will consider the rehabilitation and the condition of the site.
- Peatland rehabilitation of these bogs will bring a range of benefits to the local community via improvements to the local landscape and is also important for supporting national policies and strategies in relation to reduction of carbon emissions from these peatlands, supporting biodiversity and improvements to water quality.

## SUMMARY

**Name of bog:** Carranstown Bog **Area:** 306 ha

**Site description:**

- Industrial peat production at Carranstown bog commenced in 1950 and ceased in 2020. The peat was formerly used as horticultural and fuel peat;
- Carranstown Bog has a gravity-based drainage system;
- Active drainage channels are still present;
- The majority of the site is bare peat;
- Residual peat depths at Carranstown are deep (>2.6m) for the most part but some small areas have shallow peat <1m and some <0.5m.

**Rehabilitation goals and outcomes**

Bord na Móna is committed to discharging the obligations arising from Condition 10 of the IPC licence.

This is defined as:

- Meeting conditions of the IPC licence;
- Stabilisation or improvement in water quality parameters (e.g. suspended solids);
- Environmental stabilisation;
- Optimising hydrological conditions for the further development of embryonic *Sphagnum*-rich peat forming communities, wetland, Reed swamp, wet woodland and fen habitats on shallow cutaway peats, along with management of existing habitats;
- Optimising hydrological conditions for the protection of exposed archaeological structures, their retention in situ and preservation into the future;
- Rehabilitation will support the National Policies on Climate Action Fund and Ireland's National Recovery and Resilience Plan and GHG mitigation by maintaining and enhancing the current residual peat storage capacity of the bog (locking the carbon into the ground). It is expected that the bog will have reduced emissions (reduced source) as it develops naturally functioning wetland and peatland habitats. It will also support Ireland's commitments towards Water Framework Directive and the National River Basin Management Plan 2018-2021.

**Scope of rehabilitation**

The principal scope of this rehabilitation plan is defined by:

- The area of Carranstown Bog.
- EPA IPC Licence - Ref. P0501-01. As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. The key objective of 'rehabilitation', as required by this licence, is achieved by the **environmental stabilisation** of the bog.
- **The Scheme (PCAS)** includes enhanced measures which are designed to exceed/meet the standard stabilisation requirements as defined by the IPC Licence and to enhance the ecosystem services of Carranstown Bog, principally optimising **climate action benefits**.
- The key goals and outcomes of rehabilitation at this bog outlined above.
- To minimise potential impacts on neighbouring land, some boundary drains around Carranstown Bog will be left unblocked, as blocking boundary drains could affect adjacent land.
- Other constraints include access routes and Turbary rights.

- Proposed land-use. Bord na Móna are currently developing a renewable energy project called Ballivor Windfarm. This proposed project is in the pre-planning stage. The proposed renewable energy project will have a small footprint on Carranstown Bog. In advance of this proposed planning submission, it is planned to rehabilitate **part** of Carranstown Bog in 2023 (eastern part). The remaining area will be rehabilitated after the renewable energy construction is complete, or at a later date. Bord na Móna remain committed to rehabilitating all of Carranstown Bog and meeting conditions of the IPC Lisence for this bog.

**Criteria for successful rehabilitation:**

The Criteria for successful rehabilitation to meet Condition 10 of the IPC Licence have been defined as:

- Rewetting of residual peat in the former area of industrial peat production to slow water movement across the site to retain silt, encouraging development of vegetation cover via natural colonisation, and reducing the area of bare exposed peat through management of existing wetlands, and the creation of further wetland or fen habitat (IPC Licence validation) along with embryonic *Sphagnum*-rich peat forming communities. The target will be the delivery of measures and this will be measured by an aerial survey after rehabilitation is completed. (IPC Licence validation).
- Stabilising/improving potential emissions to water (e.g. suspended solids). This will be measured via water quality monitoring (suspended solids and ammonia) for at least 2 years after the rehabilitation has been completed. (IPC Licence validation).
- Reducing pressure from peat production on the local river catchment (WFD) (IPC Licence validation). This will be measured by the EPA WFD monitoring programme.
- Optimising the extent of suitable hydrological conditions for climate action (Climate action verification). This will be measured by an aerial survey after rehabilitation has been completed.
- Reduction in carbon emissions (Climate action verification). Baseline monitoring will be carried after rehabilitation is completed (during the scheme). It is proposed that sites can be monitored against this baseline in the future.
- Setting the site on a trajectory towards establishment of a mosaic of compatible habitats including embryonic *Sphagnum*-rich peat forming communities, fen, Reed swamp, wet woodland, heath, scrub and Birch woodland, where conditions are suitable, and eventually towards a reduced Carbon source/part Carbon sink. Some areas will naturally be dry and develop Birch woodland and other drier habitats. It will take some time for stable naturally functioning habitats to fully develop at Carranstown Bog.
- Improvement in biodiversity and ecosystem services (Climate action verification).

**Summary of measures:**

The below section is a summary of measures proposed for rehabilitation.

- Planning actions, including developing a detailed site plan and carrying out a hydrology and drainage appraisal.
- Carry out an ecological appraisal of the potential impacts of the planned rehabilitation.
- Carry out proposed measures, which will be a combination of hydrological management, drain blocking, peat field re-profiling, wetland creation and fertiliser applications targeting bare peat sections of headlands, high fields and other areas.
- Silt ponds will continue to be maintained during the rehabilitation and decommissioning phase.
- Evaluate success of short-term rehabilitation measures outlined above and remediate, where necessary.
- Decommissioning of silt-ponds will be assessed and carried out, where required.

**Timeframe:**

- 2021-2022: Short-term planning actions.
- 2022: Short-term practical actions.

- 2022-2025: Any long-term practical actions; Evaluate success of short-term rehabilitation measures outlined above and remediate, where necessary.
- 2025: Decommission silt-ponds, if necessary.

**Budget and Costing**

- The rehabilitation plan outlined in this document is predicated on the understanding that it is the Minister's intention to support, via the Climate Action Fund and Ireland's National Recovery and Resilience Plan, Bord na Móna in developing a package of measures, 'the Scheme', for enhanced decommissioning, rehabilitation and restoration of cutaway peatlands referred to as, the Peatlands Climate Action Scheme'. *However, only the additional costs associated with the additional and enhanced rehabilitation, i.e., measures which go beyond the existing standard mandatory decommissioning and rehabilitation requirements arising from Condition 10 will be eligible for support.*
- In relation to the pre-existing Condition 10 IPC Licence requirement to carry out what can be termed the 'standard' decommissioning and rehabilitation, Bord na Móna maintains a Provision on its balance sheet to pay for these future costs when industrial peat extraction ceases. This is updated every year. For more information see the Bord na Móna Annual Report (Bord na Móna 2021). Bord na Móna is fully committed to meeting its obligations relating to rehabilitation and decommissioning under the Integrated Pollution Control Licence.

**Monitoring, after-care and maintenance**

The monitoring, after-care and maintenance programme for Carranstown Bog, as required to meet Condition 10 of the IPC Licence, is defined as:

- Quarterly monitoring assessments of the site to determine the general status of the site, assess the condition of the rehabilitation work, asses the progress of natural colonisation, monitoring of any potential impacts on neighbouring land and general land security. The number of site visits will reduce after 2 years to bi-annually. These site visits will assess the need to additional rehabilitation, if needed.
- **Water quality monitoring** will be established. Monitoring of key water quality parameters for 2 years after rehabilitation will include: Ammonia, Phosphorous, Suspended solids (silt) & pH.
- Where other uses are proposed for the site, these will be assessed by Bord na Móna in consultation with interested parties. Other after-uses can be proposed for licensed areas and must go through the required assessment and planning procedures.

**Additional Monitoring:**

- The monitoring and validation of re-vegetation via natural colonisation and changes in bog condition will be carried out using an aerial survey, after rehabilitation measures are implemented. It is proposed that sites can be monitored against this baseline in the future.
- Biodiversity Ecosystem services will be monitored using specific indicators.
- Carbon emissions monitoring only be carried out on a small proportion of BnM sites to develop better understanding of carbon emissions and GHG emission factors from different types of BnM sites and will be developed on association with other established research programmes. Reduction in carbon emissions will be modelled by a combination of habitat condition assessment and application of appropriate carbon emission factors derived from other sites. Baseline monitoring (habitat condition) will be carried after rehabilitation is completed (during the Scheme). It is proposed that sites can be monitored against this baseline in the future.
- Monitoring as part of Climate Action Verification is dependent on support from the Climate Action Fund and Ireland's National Recovery and Resilience Plan or other external funding.

**Validation and IPC Licence surrender**

Reporting to the EPA will continue until the IPC License is surrendered. The bog will be included in the full licence surrender process as per the Guidance to Licensees on Surrender, Cessation and Closure of Licensed Sites EPA, 2012, when:

- The planned rehabilitation has been completed.
- Water quality monitoring demonstrates that water quality indicators are stabilising/improving.
- The site has been environmentally stabilised.

# 1. INTRODUCTION

Bord na Móna operates under IPC Licence issued and administered by the EPA to extract peat within the Ballivor-Derrygreenagh bog group (Ref. P0501-01). As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. Carranstown bog is part of the Ballivor-Derrygreenagh bog group (see Appendix II for details of the bog areas within the Ballivor-Derrygreenagh bog group). Carranstown Bog is located in Co. Meath/Westmeath.

This plan is a specific rehabilitation plan for the bog and outlines:

- Description of site management and status.
- Main issues and approaches to rehabilitation.
- Consultation to date with interested parties.
- Interaction with other policy and legislative frameworks (Appendix VI).
- The planned rehabilitation goals and outcomes.
- The scope of the rehabilitation plan.
- Criteria which define the successful rehabilitation and key targets to validate rehabilitation.
- Proposed rehabilitation actions.
- Proposed timeframe to implement these measures.
- Budget and Costings.
- Associated aftercare, maintenance and monitoring.

Note: This plan should be read in conjunction with the accompanying Map book.

It is proposed by Government that Bord na Móna carry out a Peatlands Enhanced Decommissioning, Rehabilitation and Restoration Scheme on its peatlands. Note this proposal is also known colloquially as the 'Peatlands Climate Action Scheme' (PCAS). The additional costs of the Scheme will be supported by Government through the *Climate Action Fund* and Ireland's National Recovery and Resilience Plan, and Ireland's National Recovery and Resilience Plan administered by the Department of Environment, Climate and Communications (DECC), while the National Parks and Wildlife Service (NPWS) will act as the Scheme regulator. Bord na Móna have previously identified a footprint of 33,000 ha as peatlands suitable for this scheme. This Scheme will significantly go beyond what is required to meet rehabilitation and decommissioning obligations (Appendix VII & IX) under existing EPA IPC licence conditions. Improvements supported by the Scheme will ensure that environmental stabilisation is achieved (meaning IPC obligations are met), and importantly, significant additional benefits, particularly relating to climate action and other ecosystem services, will also be delivered. The Scheme commenced in 2021.

Only the costs associated with the additional, enhanced and accelerated rehabilitation, i.e. those measures which go beyond the existing decommissioning and rehabilitation requirements arising from Condition 10, will be eligible for support under the Scheme. Bord na Móna have now announced the complete cessation of industrial peat production across its estate (January 2021).

It is expected that the Scheme (PCAS) will have benefits accruing from biodiversity provision, water quality and storage attenuation as well as increased carbon storage, reduced carbon emissions and acceleration towards carbon sequestration. The Scheme will also facilitate monitoring of carbon fluxes (Greenhouse Gases and fluvial carbon) in selected areas (in addition to other established Research programmes), to monitor changes in where the interventions will accelerate the trajectory towards a naturally functioning peatland ecosystem.

It is envisaged that the Rehabilitation Scheme will support activities, interventions, or measures across the Bord na Móna cutaway peatlands which accelerate the original timelines. Selected rehabilitation measures will take account of site environmental conditions, which can vary significantly. These measures potentially include:

- more intensive management of water levels through pump management, drain-blocking and cell bunding;
- re-profiling that will deliver suitable conditions for development of wetlands, fens and bog habitats;
- targeted fertiliser applications,
- seeding of targeted vegetation; and
- proactive inoculation of suitable peatland areas with *Sphagnum.*

These are collectively designed to optimise hydrological conditions (ideally and where possible water-levels <10 cm) for climate action benefits and to accelerate the trajectory of the site towards a naturally functioning ecosystem, and eventually a reduced carbon source/carbon sink again (In some areas of dry cutaway this trajectory will be significantly longer and it is not feasible in the short-term to re-wet some areas. These areas will develop other habitats. The key to optimising climate action benefits is the restoration of suitable hydrological conditions and more intensive intervention means that the extent of suitable hydrological conditions can be optimised.

These measures are designed to encourage the development of peat-forming habitats, where possible. They are also designed to further slow the movement of water across the site (with the site acting similarly to a constructed wetland), slowing the release of water (improving local water attenuation) and water quality is also expected to improve as the site returns to a naturally functioning peatland ecosystem. The measures will also accelerate the development of new habitats for a range of species under pressure in the wider landscape and will have the potential to develop habitats (e.g. Annex I raised bog, wetlands that support wader water birds of conservation interest) that will contribute towards the delivery of national biodiversity objectives.

Carranstown Bog is proposed to be part of this Scheme (PCAS), which commenced in 2021 and this rehabilitation plan outlines the approach to be taken.

## 1.1 Constraints and Limitations

This document seeks to address the requirements of Condition 10.2 of IPC License Ref. P0501-01:

> "*The licensee shall prepare, to the satisfaction of the Agency, a fully detailed and costed plan for permanent rehabilitation of the cutaway boglands within the licensed area.*"

It also seeks to outline measures to optimise climate action and other ecosystem services benefits, mainly through hydrological management.

This document covers the area of **Carranstown Bog**.

Industrial peat extraction at Carranstown Bog permanently ceased in 2020 (having commenced bog development in 1950). Currently the former peat production area comprises a mosaic of largely bare peat along with pioneering cutaway habitats, in addition to marginal[1] habitats. There are some small areas to the east and west of the site that were initially developed for milled peat production but have never been put fully into production and now

[1] Marginal land is defined as land around the margin of the industrial peat production area. This margin generally contains a range of habitats including scrub, Birch woodland, cutover bog and raised bog remnants.

have re-vegetated or have some remnant vegetation. These areas are rapidly developing Birch and Pine scrub and Heather is also a dominant vegetation type. The south east of the site also contains a relatively large area of Birch woodland. Other habitats in the eastern boundary of the site include a small section of remnant raised bog, Birch woodland and old domestic cutover bog. Two small mineral islands are located on the site; these areas contain woodland that is dominated by Hazel, Birch and Oak.

It is anticipated that the combination of active enhanced rehabilitation measures and natural colonisation will quickly accelerate environmental stabilisation. Nevertheless, it will still take some time (30-50 years) for naturally functioning wetland and peatland ecosystems to fully re-establish.

Parts of Carranstown Bog (within and outside the areas owned and under the control of Bord na Móna) are currently being used by domestic turf cutters for intensive private sod peat production. These areas are ecologically and hydrologically linked to the area owned by Bord na Móna where rehabilitation is planned. It is beyond the scope of this rehabilitation plan to address turf cutting issues on Carranstown Bog that are outside of the control of Bord na Móna. Nevertheless, Bord na Móna are aware of such issues which may constrain the proposed rehabilitation actions, and this rehabilitation plan considered potential impacts of these on the delivery of the stated objectives.

Rehabilitation in other areas of the bog may also be constrained due to other property issues or issues such as rights of way. Several Rights of Way exist at Carranstown, one of which leads to the known tubaries on the west side of the bog.

The rail line on site at Carranstown will be in operation in the short term until all peat stocks have been removed from the bog and adjacent bogs.

# 2. METHODOLOGY

This rehabilitation plan was developed with a combination of desktop and field surveys, consultations with internal and external stakeholders and cognisance of the Scheme (PCAS). The development of this rehabilitation plan considered **recently published** guidance issued by the EPA in 2020 – **Guidance on the process of preparing and implementing a bog rehabilitation plan**.

The ecological information and site information collected during the Bord na Móna ecological baseline survey, additional confirmatory site visits (covering the period 2012 to 2021 inclusive) and monitoring and desktop analysis forms the basis for the development of the rehabilitation plan for the bog, along with:

- Experience of 40 years of research on the after-use development and rehabilitation of the Bord na Móna cutaway bogs (Clarke, 2010; Bord na Móna, 2016);
- Significant international engagement during this period with other counties in relation to best-practise regarding peatland rehabilitation and after-use through the International Peat Society and the Society for Ecological Restoration (Joosten & Clarke, 2002; Clarke & Rieley, 2010; Gann *et al*., 2019);
- Consultation and engagement with internal and external stakeholders;
- GIS Mapping;
- BNM drainage surveys;
- Bog topography and LIDAR data;
- Previous research studies on site;
- Hydrological modelling; and
- The development of a Methodology Paper (draft) outlining the Scheme (PCAS). This rehabilitation includes enhanced measures defined in the Methodology Paper which are designed to exceed the standard stabilisation requirements as defined by the IPC Licence and to enhance the ecosystem services of Carranstown Bog, in particular, optimising climate action benefits.

## 2.1 Desk Study

The desk study involved collecting all relevant environmental and ecological data for the study area. The development of the rehabilitation plan also takes account of research, experience and engagement with other peatland restoration and rehabilitation projects and peatland research including Irish, UK, European and International best-practise guidance (full citations are in the References Section):

- Anderson *et al*. (2017). An overview of the progress and challenges of peatland restoration in Western Europe.
- Barry, T.A. et al (1973). A survey of cutover peats and underlying mineral soils. Soil Survey Bulletin No. 30. Dublin, Bord na Móna and An Foras Taluntais.
- Bonn *et al*. (2017). Peatland restoration and ecosystem services- science, policy and practice.
- Carroll *et al*. (2009). *Sphagnum* in the Peak District. Current Status and Potential for Restoration. Moors for the Future Report No 16.
- Clark & Rieley (2010). Strategy for responsible peatland management.
- Eades *et al*. (2003). The Wetland Restoration Manual.
- Farrell & Doyle (2003). Rehabilitation of Industrial Cutaway Atlantic Blanket Bog, NW Mayo, Ireland.
- Feehan, J. (2004). A long-lived wilderness. The future of the north midlands peatland network. Department of Environmental Resource Management, UCD.

- Foss, P.J., Crushell, P. & Gallagher, M.C. (2017) Title: Counties Longford &Roscommon Wetland Study. Report prepared for Longford and Roscommon County Councils.
- Gann *et al*. (2019). International Principles and Standards for the practice of Ecological Restoration.
- Hinde *et al*. (2010). *Sphagnum* re-introduction project: A report on research into the re-introduction of *Sphagnum* mosses to degraded moorland. Moors for the Future Research Report 18.
- Joosten & Clarke (2002). Wise Use of mires and peatlands – Background and Principles including a framework for Decision-making.
- Lindsay (2010). Peatbogs and Carbon: A Critical Synthesis to Inform Policy Development in Oceanic Peat Bog Conservation and Restoration in the Context of Climate Change.
- Mackin *et al*. (2017). Best practice in raised bog restoration in Ireland. Irish Wildlife Manuals, No. 99. National Parks and Wildlife Service,
- McBride *et al*. (2011). The Fen Management Handbook (2011), Scottish Natural Heritage.
- McDonagh (1996). Drain blocking by machines on Raised Bogs. Unpublished report for National Parks and Wildlife Service.
- NPWS (2017a). National Raised Bog Special Areas of Conservation management plan. Department of Arts, Heritage and the Gaeltacht.
- Pschenyckyj et al., 2021, Optimising Water Quality Returns from Peatland Management while Delivering Co-Benefits for Climate and Biodiversity. An Fóram Uisce.
- Quinty & Rochefort (2003). Peatland Restoration Guide, second edition. Canadian *Sphagnum* Peat Moss Association and New Brunswick Department of Natural Resources and Energy.
- Regan*, et. al.* (2020). Ecohydrology, Greenhouse Gas Dynamics and Restoration Guidelines for Degraded Raised Bogs. EPA Research Report. Prepared for the Environmental Protection Agency by Trinity College Dublin.
- Renou-Wilson *et al*. (2011). BOGLAND - Sustainable Management of Peatlands in Ireland. STRIVE Report No 75 prepared for the Environmental Protection Agency.
- Schouten (2002). Conservation and Restoration of Raised Bogs: Geological, Hydrological and Ecological Studies. Dúchas - The Heritage Service of the Department of the Environment and Local Government, Ireland;
- Thom (2019). Conserving Bogs – Management Handbook.
- Wheeler & Shaw (1995). Restoration of Damaged Peatlands – with Particular Reference to Lowland Raised Bogs Affected by Peat Extraction.
- Wittram *et al*. (2015). A Practitioners Guide to Sphagnum Reintroduction. Moors for the Future Partnership.


Additional on-line resources were also incorporated into the desk study, including:

- Ballivor Integrated Pollution Control Licence;
- Ballivor Annual Environmental Reports;
- Review of the National Biodiversity Data Centre (NBDC) webmapper;
- Inland Fisheries Ireland (IFI) Reports;
- Environmental Protection Agency database (www.epa.ie);
- EPA Guidance on Requests for Alterations to a Licensed Industrial or Waste Activity;
- BirdWatch Ireland online data (including I-WeBS and CBS datasets; www.birdwatchireland.ie);
- Geological Survey of Ireland - National Draft Bedrock Aquifer map;
- Geological Survey of Ireland - Groundwater Database (www.gsi.ie);

- Historic Environment Viewer at https://webgis.archaeology.ie/historicenvironment/
- National Parks & Wildlife Services Public Map Viewer (www.npws.ie);
- Water Framework Directive catchments.ie/maps/ Map Viewer (www.catchments.ie);
- OPW Indicative Flood Maps (www.floodmaps.ie);
- CFRAM Preliminary Flood Risk Assessment (PFRA) maps (www.cfram.ie);
- River Basin Management Plan for Ireland 2018 – 2021;
- Bord na Móna Annual Report 2020.
- Spatial data in respect of Article 17 reporting, available online at https://www.npws.ie/maps-and-data/habitat-and-species-data/article-17.

## 2.2 Consultation

A number of stakeholders have been identified during the course of Bord na Móna's rehabilitation and Biodiversity Action Plan activities and are contacted during the rehabilitation planning process for their views. See Section 4.

## 2.3 Field Surveys

Bord na Móna carried out a baseline ecological survey of all of its properties in 2009-2012 and developed habitat maps. As part of this exercise, Carranstown Bog was surveyed in July of 2012. Additional ecological walk-over surveys and visits have taken place at Carranstown Bog between 2012-2021 (visited during winter 2016/17, but also a final confirmatory survey took place in September of 2021). Habitat maps have been updated, where required. This rehabilitation plan is informed by the original baseline survey as well as subsequent confirmatory site walk-over surveys and visits, and updates to baseline data.

Habitat mapping followed best-practise guidance from Smith *et al.* (2011). Map outputs including all habitat maps and target notes were produced using GIS software application packages (ArcGIS). General marginal habitats and other habitats that had not been modified significantly by industrial peat extraction were classified using Fossitt *et al*. (2000). Plant nomenclature for vascular plants follows Stace (2010), while mosses and liverworts nomenclature follows identification keys published by the British Bryological Society (2010). A more detailed Bord na Móna classification system was previously developed for classifying pioneer cutaway habitats as Fossitt categories were deemed not to be detailed enough for cutaway bog (much of cutaway bog could be classified as Cutover Bog - PB4). Much of the pioneer cutaway vegetation is still at an early stage of its development and cannot be assigned to Fossitt Level 3 categories yet. A site visit was used to categorise any changes in habitat extent at Carranstown in September 2021.

A detailed ecological survey report for Carranstown Bog is contained in Appendix II.

# 3. SITE DESCRIPTION

Carranstown Bog is located approximately 5 km east of Raharney in Co Westmeath along the R156 Raharney to Ballivor Road. It is part of the Ballivor-Derrygreenagh Bog group and a BnM railway links the site to Ballivor Bog to the south, with the road marking the southern boundary. There are further rail links to Bracklin bog to the north. Carranstown Bog was used to produce sod peat in the past. However, the majority of the bog has been re-developed for milled peat production for some time. The bog still retains a dome through much of this section and the peat that remains is "red" or "Sphagnum" peat.

Approximately three quarters of the site was in active peat production until recently and is bare peat. There are some small areas to the east and west of the site that were initially developed for milled peat production but have never been put fully into production and now have re-vegetated or have some remnant vegetation. These areas are rapidly developing Birch and Pine scrub and Heather is also a dominant vegetation type.

The south east of the site also contains a relatively large area of Birch woodland. Other habitats in the eastern boundary of the site include a small section of remnant raised bog, Birch woodland and old domestic cutover bog. Two small mineral islands are located on the site; these areas contain woodland that is dominated by Hazel, Birch and Oak. A tributary of the River Boyne flows along the southern boundary of the site.

See Drawing number BNM-DR-23_20_01 titled **Carranstown Bog: Bog Site Location**, included in the accompanying Mapbook[2] , which illustrates the location of Carranstown Bog in context to the surrounding area.

## 3.1 Status and Situation

### *3.1.1 Site history*

Carranstown bog was in production from 1950 until 2020. The eastern boundary of the site includes a small section of remnant raised bog, Birch woodland and old domestic cutover bog.

### *3.1.2 Current land-use*

Industrial peat production has now permanently ceased at Carranstown Bog. The site has some remaining stock which is being removed. Approximately three quarters of the site is bare peat.

Site infrastructure and structures are mapped in the accompanying Mapbook. Some marginal areas to the east and west of the Bord na Móna boundary are used for private turbary.

### *3.1.3. Socio-Economic conditions*

Bord na Móna has historically been a vital employer for the rural community of the Midlands of Ireland. Bord na Móna compiled a report on the role of peat extraction in the midlands historically in which they report that in 1986, by the end of Bord na Móna's Third Development Programme, a total of twenty-three work locations had been established around the country. The company had an average employment of approximately 4,688 in the mid 1980's, with a peak employment of 6,100 during the production season, which placed it among the country's

[2] Cutaway Bog Decommissioning and Rehabilitation Plan - Carranstown Bog Map Book

largest commercial employers. The importance of such levels of employment were largely due to its regional concentration in the Midlands and the lack of alternative employment opportunities at the time.

According to the Energy Crop Socio-Economic Study undertaken by Fitzpatrick Associates in 2011, there were an estimated 1,443 jobs supported by the peat-to-power industry in Ireland at the time, some 81% of which were located in the catchment areas of the three peat-fired generating stations (Lough Ree, West Offaly, and Edenderry Power Stations). These constituted jobs in the plants and in peat extraction, jobs indirectly supported in upstream supply industries and jobs induced through the trickle-down effects of the wages and salaries of those supported directly or indirectly.

In respect of Carranstown Bog, jobs included in the above study would have included those to facilitate extraction of peat at this site, and associated processing and transfer to the relevant power station.

As the primary employer in many Midland counties, Bord na Móna played a central role in building communities through several initiatives, including Education bursaries, support of local sporting clubs, the provision of community gain funds, charity programmes and the provision and building of amenity areas."

These job numbers have now declined with the cessation of peat extraction at this bog. It is anticipated that the scheme (PCAS) will provide some employment for a team of workers at this site for a period of time (> 1 year).

## 3.2 Geology and Peat Depths

### *3.2.1 Sub-soil geology*

The underlying geology comprises Waulsortian limestone[3]. The site is underlain with both gravel and marl. Gravel sub-soil has been exposed in places within the production-related cutaway area, which was noted on the west side of the site when carrying out field surveys in September 2021.

### 3.2.2 *Peat type and depths*

Large sections of Carranstown still contain significant areas of "Sphagnum" peat. Peat depths range from less than half a meter to greater than 2.6m.

## 3.3 Key Biodiversity Features of Interest

There are some small areas to the east and west of the site that were initially developed for milled peat production but have never been put fully into production and now have re-vegetated or have some remnant vegetation. This section of the site is rapidly developing Birch and Pine scrub and Heather is also a dominant vegetation type. The drainage ditches have become blocked in many areas and contain *Sphagnum cuspidatum* and *Sphagnum papillosum*.

[3] https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=de7012a99d2748ea9106e7ee1b6ab8d5&scale=0

The south east of the site also contains a relatively large area of Birch woodland. The woodland is situated on an area of old domestic turf cutting. Birch and willow dominate with occasional Rowan and Oak, while Bramble, Bracken and Heather dominate the understory.

The margins of the BnM property include some remnant habitats including raised bog (PB1) and Birch woodland (WN7). The Birch woodland located along the south eastern margin is quite well-developed in places. Other habitats in the eastern boundary of the site include a small section of remnant raised bog, Birch woodland and old domestic cutover bog. The western boundary also contains an area of ditched raised bog that has never been in peat production. This area is dominated by Heather with Birch and Pine scrub encroaching.

Two small mineral islands are located on the site; these areas contain woodland that is dominated by Hazel, Birch and Oak.

The site is used occasionally by small groups of Golden Plover in the winter (Biosphere Environmental Services 2014).

### *3.3.1 Current habitats*

The most common habitats present at Carranstown include (in order of dominance):

- Bare peat (BP).
- Birch woodland (WN7) (on cutover bog dominated by Birch and/or Scot's Pine)
- Birch *Betula spp.* -dominated scrub (WS1) (on drier higher old cutover bog that is not flooded))
- Raised bog (PB1)
- Cutover Bog (PB4)
- Degraded raised bog habitat (PB1)
- Access routes (BL3) (rail lines and tracks including gravel embankments and associated habitats such as dry grassland communities (GS2) and scrub)
- Scrub (WS1)
- Pioneering vegetation on cutaway including Scrub and Soft Rush dominated Poor fen (mainly in mosaic with Birch scrub but also Gorse (*Ulex europaeus*)
- Oak Ash Hazel woodland (WN2)
- Wet grassland (GS4)
- Mosaics of Willow-dominated scrub (WS1) along with open communities dominated by Soft rush (PF2) on cutaway
- Silt ponds (FL8)
- Improved grassland (GA1) around the boundary where the official boundary extends into adjacent fields
- Dense bracken (HD1).

See Drawing number BNM-DR-23-20-17 titled **Carranstown Bog: Current Habitat Map**, included in the accompanying Mapbook, which illustrates the habitats at Carranstown Bog.

| | |
|---|---|
|  |  |
| *Pioneering vegetation on cutaway including Scrub and Soft Rush dominated Poor fen (Sept 2021)* | *Bare Peat at Carranstown (Sept 2021)* |
|  |  |
| *Sphagnum recolonization within Dry Heath at Carranstown (Sept 2021)* | *Birch woodland (WN7) (on cutover bog dominated by Birch and/or Scot's Pine) at Carranstown Bog (Sept 2021)* |

*Table 1: Photos of Habitats at Carranstown Bog*

### *3.3.2 Species of conservation interest*

A review of available Biodiversity records from the National Biodiversity Data Centre (hereafter NBDC) of flora and fauna recorded within a polygon including Carranstown Bog found 3 species of Butterfly , Green-veined White (*Pieris napi*), Marsh Fritillary (*Euphydryas aurinia*) and Small Tortoiseshell (*Aglais urticae*), and 4 species of terrestrial mammal (Eurasian Badger (*Meles meles*), Irish Hare (*Lepus timidus subsp. hibernicus*), Pine Marten (*Martes martes*), and Red Fox (*Vulpes vulpes*)).

Carranstown Bog is within a 10km square (N65) which has records of 78 species of birds (2007-2011 Bird Atlas period), 163 species of flowering plant, 2 species of Amphibian, 16 species of Butterfly, 43 species of Moth, 5 species of terrestrial mammal, 42 species of Mollusc, 51 species of Moss, and 16 species of Liverwort, along with records of Stoneworts (n=3), other insects (n=10).

On the most recent visit to Carranstown in September of 2021, species of bird were recorded utilising or associating with habitats onsite including Meadow pipit (*Anthus pratensis*) (Red-listed[4]), along with the Amber listed Common Kingfisher (*Alcedo atthis*). Additionally other species were noted such as Blue Tit (*Cyanistes caeruleus*), Sparrowhawk (*Accipiter nisus*), Goldfinch (*Carduelis carduelis*), Raven (*Corvus corax*), Lesser Redpol (*Acanthis cabaret*), Wren (*Troglodytes aedon*), Hooded Crow (*Corvus cornix*), Long tailed tit (*Aegithalos caudatus*), Great Tit (*Parus major*) and Wheatear (*Oenanthe oenanth*).

Golden Plover (*Pluvialis apricaria*) and Eurasian Curlew (*Numenius arquata*) (both Red-listed) have previously been recorded on or near Carranstown in the Autumn period (September 2012).

In September of 2021, 4 species of Butterfly and 2 species of Dragonfly were recorded. Butterflies included Small tortoiseshell, Ringlet (*Aphantopus hyperantus*), Speckled wood (*Maniola jurtina*) and Green Veined White (*Polyommatus icarus*), whilst Dragonfly species were Black Darter (*Sympetrum danae*).

### *3.3.3 Invasive species*

Invasive alien species known to occur at the subject bog (or desktop review suggests presence is likely), and for which reasonably foreseeable source impact pathways for dispersal may result from the proposed PCAS described here. A broad range of common garden escapes are occasionally present around the margins of Bord na Móna bogs and although spatial overlap with the PCAS is expected to be limited, these are, where necessary, to be treated in line with Best Practice during PCAS activities.

## 3.4 Statutory Nature Conservation Designations

Carranstown has no overlapping designated sites. Mount Hevey Bog SAC (Site Code 002342) (also a pNHA) is located to the south of Carranstown, whilst Molerick Bog NHA (Site Code 001582) is south east of Carranstown. Mount Hevey is designated for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes): Raised Bog (Active)* [7110], Degraded Raised Bog [7120] and Rhynchosporion Vegetation [7150]. Molerick Bog NHA is a site of conservation significance comprising as it does a raised bog, a rare habitat in the E.U. and one that is becoming increasingly scarce and under threat in Ireland. This site is located in Co. Meath at the eastern extreme of raised bogs in Ireland and is

[4] Gilbert G, Stanbury A and Lewis L (2021), "Birds of Conservation Concern in Ireland 2020 –2026". Irish Birds 9: 523—544

one of only four raised bogs in the county. Ireland has a high proportion of the total E.U. resource of this habitat type (over 50%) and so has a special responsibility for its conservation at an international level.

### *3.4.1 Other Nature Conservation Designations*

The Ramsar Convention entered into force in Ireland on 15th March 1985. Ireland currently has 45 sites/wetlands designated as Wetlands of International Importance (Ramsar Sites). These cover a surface area of 66,994ha. There are no Ramsar Sites in the local vicinity of Carranstown Bog (i.e. within 3km). The closest Ramsar Sites to Carranstown Bog are Lough Derravarragh, Lough Ennell and Lough Owel, all of which are ca.25km west of the site.

## 3.5 Hydrology and Hydrogeology

Carranstown bog forms part of the Boyne Catchment (Catchment ID : HA 07) as defined by the EPA under the Water Framework Directive (WFD) and is situated within the Boyne_SC_050 Sub-Catchment. The bog is located along the floodplain of the river Boyne east of the town of Mullingar. Carranstown bog contains several drainage pathways which primarily drain in a westerly direction towards the River Boyne. Carranstown Bog has a gravity-based drainage system.

Regional hydrological data suggest that Carranstown receives average precipitation of 891mm/yr (1981-2010), with an estimated evapotranspiration rate of c. 512mm/yr, leaving an average effective precipitation of 379 mm/yr. Assuming no recharge to groundwater and no groundwater contribution to discharge from the bog, the available precipitation that may become runoff (assuming no change in storage) is 379mm/yr, which equates to an annual runoff rate of c. 3,790m3/ha.

GSI data indicates that Waulsortian Limestones underlie Carranstown Bog. This unit is classified as a Locally Important Aquifer (Bedrock which is Moderately Productive only in Local Zones). A south-west to north-east trending fault line crosses close to the south-eastern margin of the bog . No data exists concerning depth to bedrock, whilst no mapped bedrock outcrop could be identified in close proximity to the bogs. There are also no mapped karst features within the surrounding area.

Quaternary Sediment maps show Carranstown underlain by peat, yet surrounded by inorganic deposits, including Till derived from limestones to the south, east and west and Till deriv in information on the buried ed from cherts to the north east. GSI Groundwater mapping indicates that there is generally moderate vulnerability in the surrounding area with some higher vulnerability areas to the north-east. While Groundwater Vulnerability is typically used to indicate the susceptibility to groundwater pollution, it can provide a useful proxy indication of likely groundwater flow rates in the surrounding area.

## 3.6 Emissions to surface-water and water-courses

Drainage is an important feature of industrial peat production and there were extensive field drains maintained throughout bog areas to facilitate industrial peat production annually, each of which eventually drains into a terminal silt pond that allows for settlement of suspended solids before entering the main river systems. In accordance with the existing Integrated Pollution Control licence, all drainage water from boglands in a licensed area is discharged via an appropriately designed silt pond treatment arrangement as required in Condition 6.6. of the licence. Industrial peat production has now permanently ceased at Carranstown Bog.

Silt ponds are the key silt control infrastructure to control potential emissions from industrial peat production sites. As required under licence, BNM have a number of procedures for how it manages and maintains its silt pond network. The silt that builds up in silt ponds is excavated on a regular basis by Bord na Móna to facilitate an efficient level of silt control. Silt ponds will continue to be maintained during the rehabilitation and decommissioning. Silt pond decommissioning will be considered when sites are deemed to be on a trajectory of environmental stability and peatland rehabilitation has been completed.

Carranstown bog has four treated surface water outlets to the River Boyne catchment. There are two direct to the River Boyne (IE_EA_07B040900 BOYNE_060), one to the River Deel (IE_EA_07D010600 DEEL (RAHARNEY)_060) and one to the Stonyford River (IE_EA_07S020400 STONYFORD_040)

The Boyne and Stonyford rivers were listed as being under pressure from peat extraction in the 2nd cycle of the River Basin Management Plan for Ireland, but are not indicated as remaining so in the third cycle which is currently out for consultation. Peat extraction was not identified as a pressure in the second cycle of the river basin management plan and is not indicated as being so in the third cycle.

Details of silt ponds, associated surface water emission points and those being monitored and sampled as part of the PCAS scheme are detailed on the accompanying structures map along with water quality map. See Drawing number BNM-DR-23-20-02 titled **Carranstown Bog: Structures and Sampling**, along with Drawing number BNM-DR-23-20-WQ01 titled **Carranstown Bog: Water Quality Map** included in the accompanying Mapbook, which illustrate the various drainage and water quality infrastructure present at Carranstown.

There is a robust monitoring program to track and verify any changes in baseline water quality conditions pre and post decommissioning and rehabilitation so that the success or otherwise can be tracked and verified for the National Parks & Wildlife Service, Environmental Protection Agency and Local Authority Water Program, amongst a range of stakeholders.

The main emission limit value associated with this bog is 35mg/l suspended solids, with trigger levels for ammonia of 2.78 mg/l and COD 100mg/l.

Initial monthly results are included in appendix XIII. These results are for 12 months from November 2020 to Dec 2021 and indicate the baseline water quality from a minimum of 70% of the bogs catchment. This was the first full summer season without any peat extraction and as expected some of the key water quality parameters, that can impact water quality from peat extraction activities, such as suspended solids, remained relatively static. During this period, ammonia indicating a slight upward trend, linked to a season where peat extraction did not take place. Carranstown bog was a source of horticultural peat prior to peat extraction ceasing and from analysis of ammonia across a range of peat types and uses, horticultural peat bogs tend to have higher ammonia. All other parameters fluctuated slightly, most likely influenced by normal weather patterns, especially rainfall.

Monthly ammonia concentrations from August 2020 to December 2021 had a range of 0.041 to 0.458 mg/l with an average of 0.243 mg/l.

Results for suspended solids for the same period indicate a range of 2 to 15mg/l with an average of 4.5 mg/l.

From an analysis of any monitoring over the previous 5 yrs, during such time where peat extraction was undertaken each Summer, the IPC licence environmental monitoring of some of the discharges from this bog, indicate that results were under the ELV for SS and broadly under the trigger level for Ammonia, with COD regularly exceeding the trigger level, due to naturally occurring peat and subsoil interactions. (Table 3.1).

| Bog | SW | Monitoring | pH | SS | TS | Ammonia | TP | COD | Colour |
|---|---|---|---|---|---|---|---|---|---|
| Carranstown | SW-31 | Q3 19 | 6.8 | 3 | 213 | 0.149 | 0.05 | 106 | 620 |
| Carranstown | SW-32 | Q4 19 | 8 | 2 | 371 | 0.249 | 0.05 | 49 | 163 |
| Carranstown | SW-33 | Q4 19 | 8 | 2 | 438 | 0.129 | 0.05 | 52 | 169 |
| Carranstown | SW-34 | Q4 19 | 7.7 | 2 | 195 | 0.086 | 0.05 | 47 | 140 |
| Carranstown | SW-31 | Q2 18 | 7.6 | 5 | 171 | 0.03 | 0.05 | 126 | 230 |
| Carranstown | SW-32 | Q2 18 | 7.6 | 5 | 394 | 0.54 | 0.1 | 140 | 176 |
| Carranstown | SW-33 | Q2 18 | 7.1 | 35 | 414 | 2.8 | 0.65 | 124 | 178 |
| Carranstown | SW-34 | Q2 18 | 7.4 | 12 | 432 | 0.99 | 0.12 | 142 | 272 |
| Carranstown | SW-33 | Q4 16 | 7.1 | 5 | 192 | 1.8 | 0.24 | 100 | 314 |
| Carranstown | SW-34 | Q4 16 | 6.7 | 5 | 122 | 0.04 | 0.05 | 101 | 343 |
| Carranstown | SW-31 | Q3 15 | 6.9 | 5 | 168 | 0.16 | 0.05 | 60 | 146 |
| Carranstown | SW-32 | Q3 15 | 7.4 | 5 | 350 | 0.35 | 0.05 | 89 | 224 |

**Decommissioning and Rehabilitation Programme Water Quality Monitoring.**

Rehabilitation of cutaway peatland is closely linked with control of emissions. One of the criteria for successful rehabilitation is stabilisation through re-vegetation, which will stabilise all substrates and in turn remove the need for further silt control measures. This site is already largely vegetated. Re-wetted peat also aids the primary objective of stabilizing peat, as when peat is re-wetted it is not vulnerable to wind erosion. Re-wetted peat and the development of wet peatland habitats can also act as sinks for silt and mobile peat, and increases additional retention time for solids, and the peatland vegetation can quickly stabilise this material within blocked drains on site (by acting like constructed wetlands).

Water quality of water discharges from restored peatlands normally improves as a result of bog restoration measures and the restoration of natural peatland processes (Bonn *et al*., 20017). Bog restoration is also expected to improve water attenuation of the site as the drains are blocked, slowing water movement and water release from the site. Restored peatlands help slow the release of water and aid the natural regulation of floods downstream (Minayeva *et al*., 2017). The National River Basin Management Plan (NRBMP) 2018-2021 (DHPCLG, 2017) is the key national plan for Ireland to achieve the objectives of the Water Framework Directive (WFD). The NRBMP outlines how key actions such as the Bord na Móna peatland rehabilitation is expected to have a positive impact on water quality and help the NWBMP deliver its objectives in relation to the WFD.

Water will still discharge from designated emission points when rehabilitation at Carranstown has been completed. This discharge will have improving water quality and there will be increased wetland attenuation, meaning slower release of water. This is expected to have a positive impact on status of the key water body receptor, the Shannon [Upper]_100, and is expected to support the future status of the waterbody as being of Good Status.

**Decommissioning and Rehabilitation Programme Water Quality Monitoring.**

The licence obligation of quarterly sampling regime on a selected number of ponds to be sampled over a 3 year cycle will not be sufficient to be able to appropriately track the changing water chemistry that will occur as part of this enhanced rehabilitation programme, so this sampling regime will occur on a monthly basis.

In order to assist in monitoring surface water quality from this bog, it was agreed to increase the existing licence monitoring requirements of the IPC Licence, to sampling for the same parameters every month.

This new sampling programme commenced in November 2020 and is enabling a baseline to be established, with sampling to progress during the scheduled works, and for a period of up to 2 years post rehabilitation. Depending on the period required to confirm that the main two parameters, suspended solids and ammonia as remaining compliant with the licence emission and trigger limit values and there is an improving trajectory in these two parameters i.e. reduction in concentration, the monitoring programme and intensity will be periodically reviewed and amended.

In the preparation of this monitoring programme, Bord na Mona have been providing the Local Authority Water Programme (LAWPRO) with details of the surface water emissions points associated with this bog and will be amending some of the proposed monitoring locations on foot of this engagement. LAWPRO have in turn provided details of their 2021 monitoring programme and these are included in the Water Quality Map.

This is necessary to ensure that there is alignment with the WFD monitoring programme and that where possible, the monitoring programme will enable any improvements in water quality or establishing trends to be quantified against any available WFD monitoring data. It will also enable the periodic sharing of data which will inform the monitoring reports, success criteria and enable LAWPRO under the Water Framework Directive to track any changes in pressures and be aware of changes in water chemistry.

This enhanced monitoring programme will aim to include a minimum of 70% of a bog's drainage catchments, whatever number of surface water outlets these include.

Monitoring results will be maintained, trended every six months and reported on each year and as required, as part of the requirement to report on Condition 10.1 of the IPC Licence on Bog Rehabilitation in the Annual Environmental Report, and will be provided to LAWPRO and the EPA as required to inform progress and national monitoring requirements under the WFD. These results will also be available in April each year as a requirement of the Annual Environmental Report at www.epa.ie.

The parameters to be included as per condition 6.2 of the IPC Licence include monthly monitoring for pH, Flow, Suspended Solids, Total Solids, Total Phosphorus, Total Ammonia, Colour & COD. In addition, DOC has been included as a parameter to try and identify any changes in carbon in the surface water, and where required by LAWPRO, to assist in investigating other changes in water chemistry, the series of parameters can be reviewed and amended.

## 3.7 Fugitive Emissions to air

The bog is no longer in industrial peat production. Rehabilitation of the cutaway peatland will seek to re-wet the dry peat where possible and re-vegetate all areas (whether wet or dry). Collectively, ceasing industrial peat production, re-wetting and re-vegetating will minimise any risk of emission to air from dust.

## 3.8 Carbon emissions

The bog is likely to be a carbon source as it is a drained (degraded) peatland with some active drainage, which facilitates the oxidation of peat. Peat extraction generally transforms a natural peatland which acts as a modest carbon sink into a cutaway ecosystem which is a large source of carbon dioxide (2–5 t C/ha/year) (Waddington & McNeil, 2002; Alm *et al*., 2007; Wilson *et al*., 2007, Wilson *et al*., 2015). Furthermore, they are also a significant source of methane (Huttunen *et al*., 2003; Laine *et al*., 2007a) as a consequence of the conditions within the peat body that provide a suitable environment for the microbial breakdown of plant litter and root exudates. Degraded

peatlands also release carbon/GHG emissions via the fluvial/aquatic pathway (Dissolved Organic Carbon – DOC, Suspended Solids/Particulate Matter, degassing of GHGs from water).

The EPA-funded CarbonRestore Project (Renou-Wilson et. al. 2012) found that rewetting of drained peatlands can lead to restoration of functional peatland, such as the return of typical plant and animal species, which in turn may lead to the restoration of peat-formation and the C-sink function. The EPA NEROS project carried out GHG flux research at Moyarwood Bog and found that Moyarwood Bog was overall a Carbon sink (sink for $CO_2$ and a source for Methane) 6 years after bog restoration was carried out (Renou-Wilson et al. 2018).

It is expected that Carranstown Bog will become a reduced Carbon source/part carbon sink following rehabilitation. The potential of any cutaway site to develop as a carbon sink in the longer-term depends on the success of the rehabilitation measures, the extent of development of *Sphagnum*-rich or other peat-forming habitats, the balance of carbon fluxes from different cutaway habitats and future climatic conditions. Much of this site is expected to develop *Sphagnum*-rich habitats, poor fen, heath and Birch woodland along with some wetland habitats with open water, Reed Swamp and fen habitats. Birch woodland is expected to develop on the drier mounds and peripheral headlands.

## 3.9 Current ecological rating

(Following NRA (2009) Evaluation Criteria)

This site can be rated as having a **low local ecological value (E)** as it is dominated milled production bog and bare peat. Some sections of the site including re-vegetating areas, marginal habitats and the woodland on the mineral island have a higher local ecological value **(D)**

# 4. CONSULTATION

## 4.1 Consultation to date

Consultation will seek to engage an audience of relevant stakeholders at both a national and local level. National stakeholders have been identified from varied bog restoration and rehabilitation efforts undertaken by Bord na Móna over the past 40 years, with particular emphasis on engagement with stakeholders during their Biodiversity Action Plan programme since 2010. National Stakeholders includes relevant government departments and agencies, relevant semi-state bodies, NGOs and other environmentally-focused groups with a national remit. Stakeholders have been emailed a copy of the draft plan when it has been finalised internally by Bord na Móna and invited to make submissions on the objectives and content of this plan in relation to Carranstown Bog.

There has been ongoing consultation about rehabilitation and other general issues over the years about Carranstown Bog with various stakeholders in relation to:

- General consultation with range of stakeholders at annual Bord na Mona Biodiversity Action Plan review days 2010-2018.
- Midlands & East Regional WFD Operational Committee (River Basin Management Plans).
- Archaeological Liaison Committee (National Museum of Ireland & Dept of Culture Heritage and the Gaeltacht).
- Consultation has taken place between BnM and the Meath/Westmeath Peatland Heritage Group since 2014 on various projects regarding BnM peatlands in Balivor bog group including a small area of bog restoration in Bracklin Bog.
- The proposed development of the nearby Balivor Windfarm in the Balivor Bog Group and potential further amenity linkage (walking and cycling tracks).
- Consultation between Bord na Móna and stakeholders as part of the proposed Balivor Windfarm is part of a different process and is not listed here.

To inform the current Plan, both national and local stakeholders, including neighbours whose land adjoins Carranstown Bog and local representatives of national bodies (such as Regional National Parks and Wildlife Service staff) and relevant offices in County Councils (such as the Heritage or Environmental Offices) have been contacted. Any identified local interest groups have been sought and informed of the opportunity to engage with this rehabilitation plan, and when identified have been invited to submit their comments or observations in relation to the proposed rehabilitation at Carranstown Bog (see Appendix XI).

Phone correspondence was undertaken as either follow up to submissions received, or to instigate consultation. All correspondence received has been acknowledged and evaluated against the rehabilitation work proposed here; these are also summarised in Appendix XI.

Further to the above, as a means of further notification for those based near to any proposed PCAS activities, a leaflet detailing PCAS plans for Carranstown Bog, contact details and the PCAS website address was delivered to each house within a 1Km radius of the bog.

## 4.2 Issues raised by Consultees

To date, a number of issues have been raised by consultees during the consultation process for both the current and previous drafts of the rehabilitation plan for Carranstown Bog – these are summarised below.

### *4.2.1 Consultation*

As part of general consultation in relation to PCAS plans in 2021, a number of consultees including: the IFA, the IMSCA and Trinity College Dublin have raised concerns regarding the duration and scope of consultation period. Stakeholders suggested that the consultation period should be extended to allow all potential stakeholders to make submissions where required.

### *4.2.2 Assessments of rehabilitation*

Queries on pre-rehabilitation assessments were raised by NPWS and the National Museum of Ireland relating to the finalisation of several bog rehab plans in 2021 in relation to Appropriate Assessment, Environmental Impact Assessment and Strategic Environmental Assessment.

### *4.2.3 Restoration scope*

Restoration/rehabilitation of marginal habitats was raised by IPCC and BCI relating to the finalisation of several bog rehab plans in 2021 as worthy of consideration within the rehabilitation measures to support carbon sequestration and biodiversity objectives.

### *4.2.4 Monitoring*

Further details on monitoring of ecological metrics, and how and where reporting on this monitoring would take place, was raised the IPCC, University College Dublin and Trinity College researchers in their respective submissions relating to the finalisation of several bog rehab plans in 2021. Butterfly Conservation Ireland also suggested that monitoring of Large Heath butterfly be considered to assess the success of the proposed rehabilitation actions. Irish Water reiterated the requirement of a strong monitoring program with respect to water quality during and post rehabilitation.

### *4.2.5 Flooding and drainage*

The IFA, The Department of Agriculture Food and the Marine, individual local residents and ICMSA queried likely impacts relating to the finalisation of several bog rehab plans in 2021 and the finalisation for this Carranstown Rehabilitation Plan arising from the proposed re-wetting associated with the rehabilitation in relation to flooding on adjoining lands and, specifically, with regards to the maintenance of drains. The IFA also raised the issue of Health and Safety in relation to raising water levels as well as possible impacts on land and property prices. The OPW expressed concerns regarding the potential impacts of rehabilitation of Carranstown Bog on OPW arterial drainage works.

### *4.2.6 Amenity*

A local resident raised several issues regarding potential amenity development at Carranstown Bog post rehabilitation. Among the person's concerns were the potential nuisance impact arising from the development an amenity and the increased foot traffic using the area as a result of any such development.

### *4.2.7 Water Quality*

Irish Water recognised potential for positive impacts arising from bog rehabilitation to drinking water quality in the local vicinity. IW expressed the desire that BnM clearly outline the potential benefits for water quality in the rehab plans.

### *4.2.8 Future management*

The IFA expressed concerns regarding the future ownership of the BnM bogs subject to rehabilitation. They expressed a desire for contingency planning for potential future ownership of designated bogs so as to ensure no negative impacts arise on adjacent properties from any new ownership.

### *4.2.9 Other issues*

Other issues (raised by IPCC) during the finalisation of several bog rehab plans in 2021 included after use of the bog and turf cutting on the margins of the bog (outside of the area owned by Bord na Móna).

Archaeological end of life survey of all the bogs were requested by National Museum of Ireland and National Monuments Unit, with due diligence be taken during works to protect any archaeologically significant findings or areas.

For a complete summary of submissions received and replies, see Appendix XI.

## 4.3 Bord na Móna response to issues raised during consultation

*4.3.1. Consultation*

BnM are carrying out ongoing consultation has part of the process of developing the rehabilitation plan for Carranstown Bog. This is ongoing with a dedicated Community Liaison Officer communicating to affected and interested parties. A website has been developed to make information available. This will be continually updated. It is expected that some PCAS Bogs will become demonstration sites so that interested stakeholders can come to visit and observe the measures on the ground.

*4.3.2 Assessments of rehabilitation*

AA screening will be undertaken on all the bogs as part of PCAS and this is currently being undertaken by external consultants for Carranstown Bog. Where required, Natura Impact Statements shall be completed and submitted to the Minister in accordance with 42(9) and 42(10) of the Habitats Regulation, noting that Bord na Móna is prescribed as a 'public authority' under this legislation. In relation to the SEA Directive and EIAR Directive, this has been considered and the legal advice to date is that the scheme does not come under these Directives.

*4.3.3 Archaeology*

An Archaeological Impact Assessment (AIA) has been undertaken on all the bogs in PCAS (Appendix XII). The aim for known archaeology on these bogs is to accomplish preservation in situ and we are taking steps to identify and avoid all known archaeology. Both archaeological sites RMP OF023-005--- Habitation Site and SMR OF023-026--- - Redundant Record should be avoided by the rehabilitation activities. Bord na Móna aim to achieve this through including all known archaeology in the planning process of rehabilitation works and implementing and exclusion or buffer zone around these features. These measures should sufficiently protect any archaeology in these areas, during any ground works in the final plan. It is anticipated that any archaeology will benefit from the ultimate remit of the rehabilitation, in that water tables will be raised thereby preserving in-situ. There is also an identified procedure for managing reports of stray finds that may arise during rehabilitation works (Appendix XII).

*4.3.4 Restoration scope*

As part of the PCAS, all restoration/rehabilitation options have been developed to support climate action and biodiversity objectives. Other issues such as existing amenity, social impacts, industrial history, archaeology were not part of the direct scope of PCAS but were considered when developing the rehabilitation plan. After use of the bog is outside the scope of PCAS. Rehabilitation will lead to the development of a stable diverse re-wetted cutaway landscape that will have added benefits for amenity in the future.

*4.3.5 Monitoring*

As part of the PCAS, a monitoring and verification plan has been developed to support climate action and biodiversity objectives. This will include stratified monitoring of bog condition, habitats and biodiversity at several different scales. Some fauna monitoring is proposed as part of the monitoring and verification at Carranstown Bog during the period of the scheme (2021-2025). However, note that fauna typically take longer to respond to

the changes in vegetation colonisation and habitats arising from the proposed rehabilitation measures identified for Carranstown Bog.

#### *4.3.6 Flooding, drainage or other impacts on adjacent land.*

It is the intention of Bord na Móna that the re-wetting of the bogs will be carried out in such a manner that does not impact on third party lands. Where it is deemed that blocking of a shared drain would cause any adjoining lands to be adversely affected, this will be avoided and alterations made to the rehabilitation plan. In general, drains around the margins of the bog will not be blocked.

External consultants have been appointed to carry a hydrological assessment to identify any potential impacts to neighbouring lands and to mitigate against any such impacts. No issues were identified. There is no potential for direct impacts on arterial drainage downstream.

The rehabilitation measures proposed at Carranstown Bog will generally result in reduced runoff and drainage from the existing peat fields through a mixture of techniques including drain blocking, cell bunding and re-profiling. It is intended that these measures will not significantly alter the existing topographical catchments and that the spine of the drainage networks, those which the upstream catchments drain through, will be retained by Bord na Móna. Based on evidence from other bogs, rehabilitation measures will reduce the run-off from the bog by returning the peatlands towards its natural water retention function.

#### *4.3.7 Amenity*

Creating amenity such as walking tracks is not part of the direct scope of PCAS. There is no current amenity planned for Carranstown by BnM. However, PCAS will enable and support any future amenity proposals by enhancing the landscape. There may be further opportunities to develop amenity at this site. Rehabilitation measures proposed for Carranstown Bog do not need to be amended to integrate any future amenity projects positioned along the margin of the former production bog or along the former bog railways.

#### *4.3.8 Water Quality*

Research on peatlands and ecosystem services (Pschenyckyj *et al*., 2021) indicates that restoration and rehabilitation of peatlands can have positive impacts on catchment water quality, with indirect benefits to drinking water quality. It is the expectation of BnM that rehabilitation measures should positively impact the water quality in receiving water bodies through enhancing the water attenuation across rehabilitated sites. The robust water monitoring programme implemented as part of PCAS will be used to assess water quality leaving rehabilitated sites at designated point and demonstrate positive impacts on water quality.

#### *4.3.9 Future management*

Bord na Móna will continue to manage their land bank into the future. As peat production has now ceased on Bord na Móna lands and rehabilitation measures will be carried out, a regular drainage maintenance programme will not be required or carried out as would have been the case in the past. However, if issues arise with the Bord na Móna internal drainage system that affects upstream or downstream landowners, then these issues will be addressed by Bord na Móna.

Bord na Móna considers issues regarding estate security, fire risk, invasive species and water pollution of utmost importance. BnM intends to maintain security and manage fire risk over the entirety of the estate. Re-wetting peatlands will reduce the risk and impact of potential future fires. In this regard, PCAS activities, should have no detrimental impact on these issues. Regarding water pollution, BnM is regulated by the EPA and as such adheres to the strict water pollution measures laid out by the same.

#### *4.3.10 Other issues*

Other issues, including after-use and management issues outside the boundary of Carranstown Bog, are acknowledged but are specifically outside the scope of this rehabilitation plan.

Security: It is the intention of Bord na Móna to keep secure the estate and ensure that any anti-social behaviour that occurs within the estate is reported and dealt with by the appropriate authorities.

#### *4.3.11 Concluding statement.*

- Some parts of Carranstown bog is largely stabilised and developing a mosaic of habitats already. This will not be radically changed.
- No specific issues were raised during consultation that required significant changes to the substance of the rehabilitation plan.
- Issues raised by several consultees in relation to potential impacts on adjacent land had already been accounted for during the hydrological analysis and assessment, and corresponding adaptations to incorporate Drainage Management Plan mitigation measures.
- Several marginal drains will not be blocked to avoid impacts on adjacent lands, Coillte forestry, rights of way or turf-banks. This does not change the overall rehabilitation goals and outcomes and can be integrated with the other rehabilitation measures to allow cutaway re-wetting.
- No changes were required to the rehabilitation plan to enable any future potential amenity.

# 5. REHABILITATION GOALS AND OUTCOMES

The rehabilitation goals and outcomes outline what Bord na Móna want to achieve by implementing the rehabilitation. These include:

- Meeting conditions of IPC Licence.
- Stabilisation or reduction in water quality parameters of water discharging from the site (e.g. suspended solids).
- Reducing pressure on receiving water-bodies that have been classified as At Risk from peatlands and from peat extraction, via stabilization or improving water-quality from this bog, and therefore, reducing pressures.
- Optimising hydrological conditions for **climate action benefits as part of PCAS**.
- Carrying out an intensive rehabilitation measures in the area that is recently out of peat extraction (including hydrological management, drain-blocking, re-profiling, wetland creation, fertiliser application, seeding of vegetation &, inoculation of *Sphagnum,* where appropriate).
- Optimising hydrological conditions for the development of embryonic *Sphagnum*-rich raised bog vegetation communities on deep residual peat, where possible.
- Optimising or enhancing hydrological conditions for the development of Reed Swamp and fen on shallow more alkaline peat and other subsoils.
- Integrating rehabilitation measures with current land-use (e.g. turf-cutting).
- Optimising hydrological conditions for the protection of any exposed archaeological structures, their retention in situ and preservation into the future, where possible.
- The main goal and outcome of this plan is the successful rehabilitation (environmental stabilisation) of peatlands used for industrial peat production at the bog in a manner that is acceptable to both external stakeholders and to Bord na Móna and which optimise climate action and other ecosystem service benefits.

The rehabilitation goals and outcomes take account of the following issues:

- It will take some time for stable naturally functioning habitats to fully develop across the entirety of Carranstown Bog. This will happen over a longer time-frame than the implementation of this rehabilitation plan.
- Re-wetting residual peat will initially maintain and enhance the carbon storage capacity of the bog. There is scientific consensus that restoration of hydrology in damaged bog can improve carbon storage, water storage and attenuation and help support biodiversity both on the site and in the catchment (See Section 3.8). This will reduce carbon emissions from the site from a larger carbon source to a smaller carbon source. In time, the site has the capacity to develop in part as a carbon sink. PCAS is expected to deliver significant contributions to Ireland's climate action.
- It is not expected that the site has the potential to develop active raised bog (ARB) analogous to the priority EU Habitats Directive Annex I habitat within the foreseeable future (c.50 years). Furthermore, only a proportion of the bog has potential to develop *Sphagnum*-rich habitats in this timeframe. Nevertheless, re-wetting across the entire bog, as part of the Scheme, will improve habitat conditions of the whole bog. Other peatland habitats will develop in a wider mosaic that reflects underlying conditions.

- Rehabilitating former industrial peat production bog will also in the longer-term support other ecosystem services such as such the development of new habitat to support biodiversity and local attenuation of water flows from the bog.
- WFD status in receiving water bodies can be affected by peatlands and peat extraction, but is also affected by other sources such as agriculture. In addition, receiving water bodies that are assessed as At Risk from peatlands and from peat extraction are likely to have several contributary sources of impacts (private peat extraction and Bord na Móna).
- Re-wetting in general will benefit the future preservation of most known and unknown archaeological features.

# 6. SCOPE OF REHABILITATION

The principal scope of this enhanced rehabilitation plan is to rehabilitate the bog. This is defined by:

- The area of Carranstown Bog.
- EPA IPC Licence - Ref. P0501-01. As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. Carranstown bog is part of the Ballivor-Derrygreenagh bog group.
- The Scheme is designed to exceed the stabilisation requirements as defined by the IPC Licence. This scheme is designed to enhance the ecosystem services of Carranstown Bog, in particular, optimising **climate action benefits**. The proposed interventions will mean that environmental stabilization is achieved (meaning IPC obligations are met) and, in addition, significant other ecosystem service benefits particularly for climate action will be accrued.
- The local environmental conditions of Carranstown Bog mean that deep peat measures along with wetland creation is the most suitable rehabilitation approach for this site. Carranstown Bog does have residual deep peat along with shallower areas.
- The key goals and outcomes of rehabilitation set by Bord na Móna. Bord na Móna have defined the key goal and outcome of rehabilitation at Carranstown Bog as **environmental stabilisation**, **optimising residual peat re-wetting, and the development of embryonic raised bog on deep peat along with wetlands/Reed Swamp and fen on shallow more alkaline peat and other subsoils.**
- Proposed land-use. Bord na Móna are currently developing a renewable energy project called Ballivor Windfarm. This proposed project is in the pre-planning stage. The proposed renewable energy project will have a small footprint on Carranstown Bog. It is planned to integrate rehabilitation with the future proposed development.
- Rehabilitation of Carranstown Bog will support multiple national strategies of climate action, biodiversity action and other key environmental strategies such was the Water Framework Directive.
- The time frame for the delivery of the planned rehabilitation will be undertaken according to available resources and appropriate constraints.
- It is not proposed to carry out rehabilitation on all marginal or peripheral cutover bog zones. Generally, these bog remnants are narrow, or are subject to turbary, and do not have positive bog restoration prospects.

## 6.1 Key constraints

- **Bog conditions.** Rehabilitation outcomes of sites are constrained by the environmental characteristics of these particular areas. For example, there is potential for raised bog restoration at some sites where there has not been significant industrial peat extraction and the peat body is largely intact (deep peat sites that are drained). At other sites, most of the peat mass has been removed, the environmental characteristics of these areas have therefore changed radically (peat depths, hydrology, water chemistry, substrate type, nutrient status, etc.) and there will therefore be different habitat outcomes (wetlands, fen, heathland, grassland and Birch woodland).
- Remaining **peat depths** are between 1m and 2.6m deep for the most part apart from a couple of small areas to the south and east where depths are less than 0.5m.
- **Current/future land-use.** Planned renewable energy development. It is expected that the site will be part of the proposed Ballivor Windfarm. This project is currently in pre-planning. Any proposed

rehabilitation measures will be integrated to enable any future renewable energy development and to facilitate any planned amenity. No turbines are planned for Carranstown. Infrastructure will include supporting access, cables and an electrical sub-station and works to the existing overhead transmission line. It is expected that the proposed development footprint associated with the renewable energy will be < 2% of the overall site. The potential impact of this infrastructure on the rehabilitated area is expected to be relatively minor and it does not change the overall goals and outcomes of the proposed rehabilitation (re-wetting residual peat) for the overall site, and where possible is a temporal constraint on the scope of rehabilitation. See Carranstown Bog: Mapbook, which outlines the proposed cutaway footprint to be rehabilitated with PCAS enhanced rehabilitation measures (drawing number BNM-DR-23-20-05: Enhanced Rehab Measures and BNM-DR-23-20-20: Standard Rehab Measures).

- It is planned to rehabilitate the area east of the railway in 2022. The remaining area (west of the railway) will be rehabilitated when the windfarm construction is complete. Phasing rehabilitation in way has the potential to support additional climate action measures (integrating renewable energy). At this stage, it is not anticipated that any future potential land-use in areas to the west of the railway will impact on the proposed rehabilitation in the eastern side of the site.
- **Surrounding landscape and neighbours.** Another key constraint is the interaction between the Bord na Móna sites and the surrounding landscape. Care has to be taken that no active rehabilitation management is carried out that could negatively and knowingly impact on surrounding land. This includes any hydrological management on neighbouring farmland. It is anticipated that the work proposed here (blocking drains and re-wetting cutaway peatlands) will not have any flooding impacts on adjacent land.
- **Turbary.** The small, isolated area (constraint) to the northeast of the main production bog. This area was never developed by BnM and is still being used for turf-cutting (turbary).
- **Archaeology**. The discovery of monuments or archaeological objects during peatland rehabilitation may potentially constrain the rehabilitation measures proposed for a particular area. While the rehabilitation will optimise hydrological conditions for the protection of exposed archaeological structures, their retention in situ and preservation into the future, any new archaeology may require rehabilitation measures will be reviewed and adapted. If this occurs, rehabilitation measures will be reviewed and adapted. An Archaeological Impact Assessment (Appendix XII) was carried out to mitigate against any impact on found archaeology at Carranstown Bog. It is noted that the Bord na Móna industrial railway is currently designated as a protected structure in the current Westmeath County Council County Development Plan. In the worst-case scenario works affecting the surface and sub-surface of the bog might disturb previously unknown archaeological deposits or artefacts without preservation by record taking place. Should any previously unknown archaeological material be uncovered during the rehabilitation works, it should be avoided and reported to Bord na Móna Archaeological Liaison Officer and the National Museum of Ireland.
- **Public Rights of Way**. Where a public right of way or similar burden exists on Bord na Móna property, consideration will be given to ensuring that this remain intact where possible. In some instances, depending upon previous land uses and management, alternative solutions may be required. These will be explored in consultation with local communities and statutory bodies during the consultation work associated with the decommissioning and rehabilitation work described here.

## 6.2 Key Assumptions

- It is assumed that Bord na Móna will have all resources required to deliver this project.

- It is expected that weather conditions will be within normal limits over the rehabilitation plan timeframe. Long periods of wet weather have the capacity to significantly affect ground conditions and constrain drain blocking and other ground activities.

## 6.3 Key Exclusions

The scope of this rehabilitation plan does not cover:

- The longer-term development of stable naturally functioning habitats to fully develop at Carranstown Bog. The plan covers the short-term rehabilitation **actions** and **an additional monitoring and after-care programme** to monitor the rehabilitation and to respond to any needs.
- This plan is not intended to be an after-use or future land-use plan for Carranstown Bog.
- The longer-term management of this site, potentially as a nature conservation site, or for amenity, or for other uses in the future.

# 7. CRITERIA FOR SUCCESSFUL REHABILITATION

This section outlines what criteria will be used to indicate successful rehabilitation and what critical success factors are needed to achieve successful rehabilitation. All criteria used to indicate successful rehabilitation will be measured to validate the achievement of the rehabilitation goals and outcomes and validate the completion of the rehabilitation.

The key objective of this enhanced rehabilitation plan is **environmental stabilisation** and the stabilisation of any emissions from the site that related to the former industrial peat extraction activities.

Rehabilitation is generally defined by Bord na Móna as

- stabilisation of bare peat areas via targeted active management (e.g. drain-blocking/re-wetting) slowing movement of water across the site and encouraging natural colonisation; and
- mitigation of key emissions (e.g. potential suspended solids run-off).

In addition, Bord na Móna wish to optimise climate action and other ecosystem service benefits via enhanced rehabilitation measures.

## 7.1. Criteria for successful rehabilitation to meet EPA IPC licence conditions:

- Rewetting of residual peat in the former area of industrial peat production to offset potential run off of suspended solids and to encourage and accelerate development of vegetation cover via natural colonisation, and reducing the area of bare exposed peat. See Table 7.1 for a summary of the criteria for successful rehabilitation and associated monitoring. The target will be the delivery of measures and this will be measured by an aerial survey after rehabilitation is completed.
- That there is a stabilizing/improving concentration of suspended solids and ammonia in discharges from Bord na Móna sites, associated with the measures undertaken to stabilize the peat surface by the blocking of the internal drainage system and the maximized rewetting of the peat surface. This will be demonstrated by developing a stable or downward trajectory of water quality indicators (suspended solids and ammonia) towards what would be typical of a re-wetted cutaway bog. This will be measured via water quality monitoring (suspended solids and ammonia) for at least 2 years after the rehabilitation has been completed.
- Receiving water bodies have been classified under the River Basin Management Plan and this classification includes waters that are At Risk from peatlands and peat extraction. The success criteria will be that the At Risk classification will see improvements in the associated pressures from this peatland or if remaining At Risk, that there is an improving trajectory in the pressure from this peatland.

With regard to predicting and estimating likely trends that might materialize or could be considered as a target, monitoring of surface water ammonia emissions from Longfordpass bog in Littleton over 3 yrs., post cessation of peat extraction with ongoing rehabilitation, were considered. These are indicating a downward trend in Ammonia concentrations (Figure 7.1).

Similarly monitoring of surface water ammonia emissions from a Corlea bog in Mountdillon over the past 3 yrs. post cessation of peat extraction with ongoing rehabilitation, indicate downward trends.

Following commencement, and as the monthly monitoring program at Carranstown continues in 2022 during the rehabilitation works and data from the 2021 monitoring program is compiled, further trending will be produced to verify any ongoing trends.

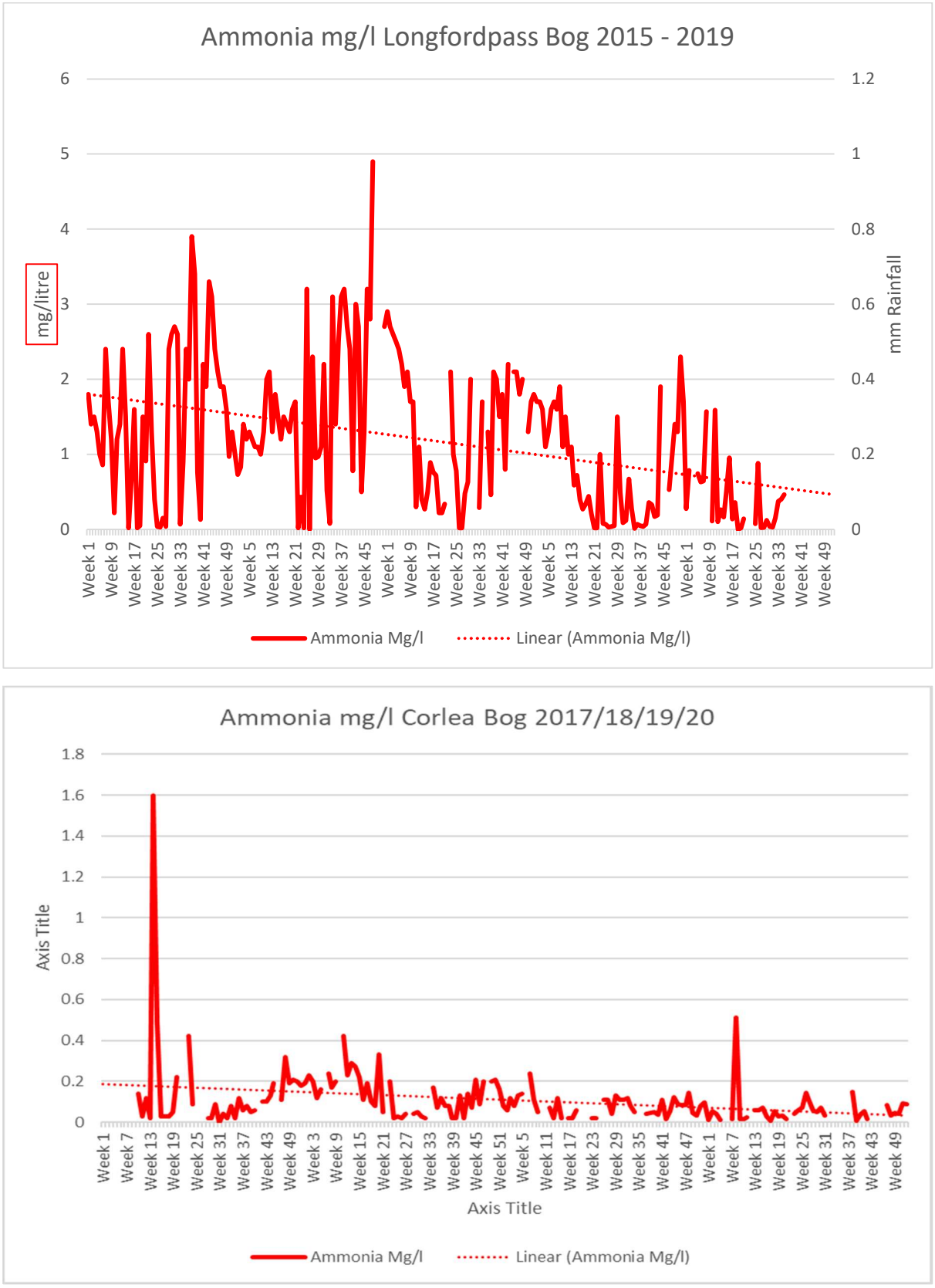


**Figure 7.1.** Ammonia levels over the period 2015-2019/2020 at Longfordpass and Corlea.

**Additional criteria for successful rehabilitation to optimise climate action and other ecosystem service benefits:**

- Optimising the extent of suitable hydrological conditions to optimise climate action and other ecosystem service benefits (optimising and maximising residual peat re-wetting). This will be measured by an aerial survey after rehabilitation has been completed.
- Accelerating the trajectory of the bog towards becoming a reduced carbon source/part carbon sink. This will be measured through habitat mapping and the development of cutaway bog condition assessment. This cutaway bog condition assessment will include assessment of environmental and ecological indicators such as vegetation cover, vegetation communities, presence of key species, *Sphagnum* cover, bare peat cover and water levels (similar to ecotope mapping). Baseline monitoring will be carried after rehabilitation is completed (during the scheme). It is proposed that sites can be monitored against this baseline in the future.
- Reduction in carbon emissions. This will be estimated via a combination of habitat condition assessment and application of appropriate carbon emission factors derived from other sites. Baseline monitoring (habitat condition) will be carried after rehabilitation is completed (during the scheme). It is proposed that sites can be monitored against this baseline in the future.
- Setting the site on a trajectory towards establishment of a mosaic of compatible habitats including embryonic *Sphagnum*-rich peat forming communities, fen, Reed swamp, wet woodland, heath, scrub and Birch woodland, where conditions are suitable. Some of these habitats have already in part established as pioneer vegetation/wetlands. It will take some time for stable naturally functioning habitats to fully develop at Carranstown Bog. This will be demonstrated and measured via aerial photography, habitat mapping and cutaway/habitat condition assessment. Baseline monitoring will be carried after rehabilitation is completed (during the scheme). It is proposed that sites can be monitored against this baseline in the future.
- Improvement in biodiversity and ecosystem services. This will be demonstrated by metrics outlined in Section 9.1 that can be used to measure changes in ecosystem services (e.g. water quality parameters, development of pioneer habitats, breeding bird monitoring). This will be measured by collecting a range of scientific data that can then quickly be adapted and into metrics that can be used to measure changes in various ecosystem services. Baseline monitoring will be carried after rehabilitation is completed (during the scheme). It is proposed that sites can be monitored against this baseline in the future.

**Table 7.1. Summary of Success criteria, targets, how various success criteria will be measured and expected time-frames.**

| Criteria type | Criteria | Target | Measured by | Expected Time-frame |
|---|---|---|---|---|
| IPC validation | Rewetting in the former area of industrial peat production | Delivery of rehabilitation measures<br>Reduction in bare peat. | Aerial photography after rehabilitation has been completed – to demonstrate measures (drain-blocking)<br>Establishment of a baseline for future monitoring of bare peat, vegetation establishment and habitat condition. | 2022-2025 |
| IPC validation | Key water quality parameters<br>Ammonia, Phosphorous, Suspended solids, pH and conductivity | Reduction or stabilisation of key water quality parameters associated with this bog | Water quality monitoring for a period after rehabilitation has been completed | 2021-2024 |
| IPC validation | Reducing pressure from peat production on the local water body catchment (WFD) | Where this section of the water body, that this bog drains to, has not been identified as under pressure from peat extraction, that the intervening EPA monitoring programme associated with its Programme of Measures for this water body, confirms that its classification remains at not being at risk from peat extraction associated with activities at this bog. | EPA WFD monitoring programme | WFD schedule |

| | | | | |
|---|---|---|---|---|
| Climate action verification | Optimising the extent of suitable hydrological conditions to optimise climate action | Optimal extent of suitable hydrological conditions | Aerial photography and Habitat mapping to map extent of suitable hydrological conditions.<br>Baseline monitoring to be carried out during the scheme when rehabilitation is complete. Sites can be re-monitored in the future and compared against this baseline. | 2022-2025 |
| Climate action verification | Reduction in carbon emissions. | Reduction in carbon emissions | Carbon emissions – estimated using a bog condition assessment and appropriate carbon emission factors. | 2022-2025 |
| Climate action verification | Setting the site on a trajectory towards establishment of a mosaic of compatible habitats | Establishment of compatible cutaway habitats | Habitat map, Cutaway bog condition map<br>Baseline monitoring to be carried out during the scheme when rehabilitation is complete. Sites can be re-monitored in the future and compared against this baseline. | 2022-2025 |
| Climate action verification | Biodiversity and ecosystem services.<br>Habitat establishment<br>Presence of key species – Sphagnum | Improvement in biodiversity and ecosystem services. | Metrics that relate to selected biodiversity and ecosystem services<br>Presence of key species – Sphagnum – Walkover survey | 2022-2025 |

Meeting climate action verification criteria and monitoring of these criteria after the scheme has been completed is dependent on support from the *Climate Action Fund* and Ireland's National Recovery and Resilience Plan or other sources of funding. Note that monitoring and verification of the overall scheme will be stratified – not all these criteria will be measured at each individual site. Baseline monitoring to be carried out during the scheme when rehabilitation is complete. Sites can be re-monitored in the future and compared against this baseline.

## 7.2. Critical success factors needed to achieve successful rehabilitation as outlined in the plan

The achievement of successful rehabilitation as outlined in the plan requires:

- **Funding to pay for resources required to deliver the planned rehabilitation (Bord na Móna and external).** Bord na Móna maintains a Provision on its balance sheet to pay for these future costs when industrial peat extraction ceases. Bord na Móna is fully committed to meeting its obligations relating to rehabilitation and decommissioning under the Integrated Pollution Control Licence. It is expected that additional costs of enhanced rehabilitation will be supported by Government through the Climate Action Fund and Ireland's National Recovery and Resilience Plan.
- **Bord na Móna to have sufficient resources (staff and training) to deliver the planned rehabilitation with required associated skills and competencies.**
- **Bord na Móna to have sufficient resources (suitable machinery) and staff to maintain this machinery.**
- **Weather conditions to be within normal limits over the rehabilitation plan timeframe.** Long periods of wet weather have the capacity to significantly affect ground conditions and constrain the delivery of rehabilitation. The potential impact of wet weather on ground conditions can be reduced by appropriate planning and management. Bord na Móna have significant experience of managing these issues through 70 years of working in these peatland environments.
- **Rehabilitation measures to be effective.** The rehabilitation measures proposed in this plan are based on 40 years of Bord na Móna experience of peatland management and best practise applied internationally in peatland management. Measures proposed in this plan have already been shown to be affective at other sites. Bord na Móna will apply a flexible and adaptable approach to the more innovative rehabilitation measures proposed in this plan**.** If measures are not initially effective, Bord na Móna will review any requirement for additional practical rehabilitation.
- **Natural colonisation of vegetation to develop semi-natural habitats at a rate within the normal limits.** The development of naturally functioning semi-natural habitats on degraded bog takes time. It may take 30-50 years for active raised bog vegetation to re-develop on suitable cutaway that was previously bare peat. However, Bord na Móna experience has demonstrated the effectiveness of these type of measures for re-wetting bog and creating carbon sinks (Renou-Wilson et al. 2018).
- Rehabilitation measures have been designed to accelerate and work with natural colonisation and other natural processes. Bord na Móna experience of rehabilitation has shown that re-wetting improves conditions for natural colonisation and that natural colonisation is accelerated where the environmental conditions are most suitable. Rehabilitation measures have been designed to modify the conditions of areas within sites where conditions are less suitable for natural colonisation (modifying hydrology, topography, nutrient status or availability of potential seed sources).
- **Monitoring to be robust and effective.** Rehabilitation Monitoring will be established to validate the success of rehabilitation as required by Condition 10 of the IPC Licence and to verify the benefits of the proposed enhanced measures to optimise climate action. This will focus on a collecting a range of scientific data that can then quickly be adapted and into metrics that can be used to measure changes in various ecosystem services.

# 8. REHABILITATION ACTIONS AND TIME FRAME

Peatland rehabilitation requires detailed planning and the use of data from desktop surveys and field surveys. This data in association with topographical and hydrological modelling will be important in planning the future peatland landscapes and planning the use of the most appropriate rehabilitation methodologies to maximise climate action benefits. Hydrological modelling indicates those areas that are likely to re-wet when drains are blocked, based on the current topography, and areas where water levels may have to be modified, where needed. Enhanced rehabilitation measures will look to optimise hydrological conditions for re-wetting peat in other areas. This planning is also essential for matching the most sustainable rehabilitation methodology to the most suitable cutaway environment to maximise the benefits of the resource outlay (maximising cost/benefit).

A number of illustrative figures have been produced to inform Rehab Planning and Design, including Aerial Photography, Peat Depths, LiDAR Surface Maps, and Depression Analysis modelling; these are included in the accompanying Mapbook as the drawings referenced below:

BNM-DR-23-20-22 titled **Carranstown Bog: Aerial Imagery2020**

BNM-DR-23-20-04 titled **Carranstown Bog: PeatDepths**

BNM-DR-23-20-03 titled **Carranstown Bog: LiDAR Map**

BNM-DR-23-20-09 titled **Carranstown Bog: Depression Analysis**

The rehabilitation actions themselves will be a combination of PCAS measures to re-wet peat. The distribution of these measures is provisionally outlined in drawing titled **BNM-DR-23-20-05 Carranstown Bog: Rehabilitation Measures** in the accompanying Mapbook (Note that the actual distribution of these measures may be subject to change in response to stakeholder consultation and refinement of the enhanced rehabilitation measures.)

These enhanced measures for Carranstown bog will include (see Table 8.1):

- Deep Peat measures including field re-profiling, bunding and drain-blocking, resulting in bunded wetlands suitable for *Sphagnum* inoculation, on deeper peat;
- Intensive drain blocking around shallow peat areas / modelled depressions on little or no peat to create/promote the spread of wetland habitats,
- Modifying outfalls, and management of water levels with overflow pipes and blocking of internal outfalls;
- Regular drain blocking (3/100) on dry cutaway along with the blocking of outfalls and management of water levels;
- Intensive drain blocking (7/100) in areas to develop wetlands in areas of shallow peat. Measures include the blocking of outfalls, management of water levels and transplanting reeds and other rhizomes;
- Berms and field re-profiling (45m x 60m cell) in deep peat areas, along with blocking outfalls and managing overflows with a controlled weir outfall, includes drainage channels for excess water and *Sphagnum* inoculation;
- Targeted fertiliser applications to accelerate vegetation establishment on areas of **bare peat** on headlands and high fields, and within certain areas of dry cutaway. Areas where vegetation has established do not need fertiliser application.
- Seeding of vegetation and inoculation of *Sphagnum* will be undertaken where required.

*Table 8.1: Types of and areas for enhanced rehabilitation measures at Carranstown Bog.* Note that the types of rehab and areas of rehab may change in response to stakeholder consultation and refinement of the enhanced rehabilitation measures.

| **Type** | | **Enhanced Rehabilitation Measure** | Extent (Ha) |
|---|---|---|---|
| Deep Peat | DPT 2 | More intensive drain blocking (max 7/100), blocking outfalls and Sphagnum inoculation | 38.18 |
| Deep Peat | DPT 4 | Berms and field re-profiling (45x60m cell), blocking outfalls and managing overflows & drainage channels for excess water & Sphagnum Inoculation | 121.54 |
| Wetland | WLT4 | More intensive drain blocking (max 7/100 m), + blocking outfalls and managing overflows + transplanting Reeds and other rhizomes | 4.28 |
| Marginal land | MLT1 | No work required | 34.55 |
| Silt ponds | Silt pond | Silt ponds | 0.6 |
| Dry Cutaway 2 | DCT2 | Regular drain blocking (3/100m) +blocking outfalls and managing water levels with overflow pipes + targeted fertiliser treatment | 17.57 |
| Constraint | Constraint | Other Constraints (ROW) | 89.52 |
| Total | | | 306.24 |

## 8.1 Short-term planning actions (0-1 years)

- Seek formal approval of the enhanced plan, noting the alternative standard plan should funding from the Scheme not materialise, from the EPA.
- Agree an *ex ante* budget of eligible costs (based on the approved enhanced plan) with the Scheme regulator.
- Develop a detailed site plan with engineering drawings outlining how the various rehabilitation methodologies (The Scheme PCAS) will be applied to Carranstown Bog. This will take account of peat depths, topography, drainage and hydrological modelling. (See map for an indicative view of the application of different rehabilitation methodologies).
- A drainage management assessment of the proposed enhanced rehabilitation measures has been carried out, any issues identified resolved and the rehabilitation plan adapted.
- A review of known archaeology and an archaeological impact appraisal of the proposed rehabilitation has been carried out. The results of this assessment has been incorporated into the rehabilitation plan to minimise known archaeological disturbance, where possible.
- A review of issues that may constrain rehabilitation such as known rights of way, turbary and existing land agreements has been carried out. There is some known turbary on this bog.
- A review of remaining milled peat stocks has been carried out. Remaining peat stocks on the bog will be removed prior to rehabilitation.
- An ecological appraisal of the potential impacts of the planned rehabilitation on the presence of sensitive ground-nesting bird breeding species (e.g. breeding waders) will be carried out. The scheduling of rehabilitation operations will be adapted, where required.
- Ensure all activities comply with the environmental protection requirements of the IPC Licence.

- An Appropriate Assessment of the Rehabilitation Plan has been carried out. (Note that the rehabilitation plan for Carranstown Bog screened out at the Stage I.) See Carranstown Decommissioning and Rehabilitation Plan – Addendum 1 for more details.
- Track implementation and enforcement of the relevant IPC Licence conditions, and other environmental control measures during the implantation of the rehabilitation plan.

## 8.2 Short-term practical actions (0-2 years)

- Carry out proposed measures as per the detailed site plan. This will include a combination of drain blocking, and fertiliser applications targeting bare peat areas of headlands, high fields and other areas (where required) in addition to wetland creation and management prescriptions. All rehabilitation will be carried out with regard to best practice environmental control measures (Appendix IV).
- Monitor the success of rehabilitation measures in relation to developing suitable hydrological conditions.
- Carry out the proposed monitoring, as outlined.
- While natural colonisation is expected to commence almost immediately once peat production ceases, Phase 2 actions will be carried out in targeted areas to accelerate re-vegetation and colonisation of target species. Phase 2 actions may include seeding of targeted vegetation and inoculation of *Sphagnum*.
- Silt ponds will be monitored during this period and there will be continued maintenance and cleaning to prevent potential suspended solids run-off from the site during the rehabilitation phase.
- Submit an *ex post* report to the Scheme regulator to verify the eligible measures to be carried out in year 1 of the Scheme, and an *ex ante* estimate for year 2 of the Scheme; and so on for each year of the Scheme.

## 8.3 Long-term (>3 years)

- Evaluate success of short-term rehabilitation measures outlined above and remediate where necessary.
- Delivery of a monitoring, aftercare and maintenance programme (See section 10.2 below).
- Decommissioning of silt-ponds will be assessed and carried out, where required.
- Reporting to the EPA will continue until the IPC License is surrendered.

## 8.4 Timeframe

- **2021-2022**: Short-term planning actions.
- **2022**: Short-term practical actions.
- **2022-2025**: Long term practical actions. Evaluate success of short-term rehabilitation measures outlined above and remediate where necessary.
- **2025**: Decommission silt-ponds, if necessary.

## 8.5 Budget and costing

Bord na Móna (BnM) appreciates the Minister's intention to support Bord na Móna in developing a package of measures, 'the Scheme', for enhanced decommissioning, rehabilitation and restoration of cutaway peatlands referred to as, the Peatlands Climate Action Scheme'. *However, only the additional costs associated with the additional and enhanced rehabilitation, i.e, measures which go beyond the existing standard mandatory decommissioning and rehabilitation requirements arising from Condition 10 will be eligible for support.*

The enhanced decommissioning, rehabilitation and restoration of the peatlands funded by the Scheme will deliver benefits across climate action (GHG mitigation through reduced carbon emissions and acceleration towards carbon sequestration), enrich the State's natural capital, increase eco-system services, strengthen biodiversity, improve water quality and storage attenuation as well as developing the amenity potential of the peatlands.

Bord na Móna maintains a provision on its balance sheet to pay for the future costs of **standard** rehabilitation and decommissioning when industrial peat extraction ceases. This is updated every year - for more information see the Bord na Móna Annual Report (Bord na Móna 2021). Bord na Móna is fully committed to meeting its obligations relating to rehabilitation and decommissioning under the Integrated Pollution Control Licence.

At this time, a 'standard' rehabilitation provision (sufficient to discharge the requirement of Condition 10 in the licence) has been be allocated to the site based on the area of different cutaway types across the site (See Appendix I).

# 9. AFTERCARE AND MAINTENANCE

## 9.1 Programme for monitoring, aftercare and maintenance

This programme for monitoring, aftercare and maintenance has been designed to meet the Conditions of the IPC Licence. This is defined as:

- There will be **initial quarterly monitoring assessments** of the site to determine the general status of the site, the condition of the silt ponds, assess the condition of the rehabilitation work, monitoring of any potential impacts on neighbours land, general land security, boundary management, dumping and littering.
- The number of these site visits will reduce after 2 years to bi-annually and then after 5 years to annual visits.
- These monitoring visits will also consider any requirements for further practical rehabilitation measures.
- The **baseline condition of the site will be established** post-rehabilitation implementation by using an aerial survey to take an up to date aerial photo, when rehabilitation is completed. This will be used to verify completion of rehabilitation measures. The extent of bare peat will be assessed using this baseline data, and habitat maps will be updated, if needed. It is proposed that sites can be monitored against this baseline in the future.
- **Water quality monitoring** at the bog will be established. The main objective of this water quality monitoring will be to establish a baseline and then monitor the impact of peatland rehabilitation on water quality from the bog.
- In order to assist in monitoring surface water quality from this bog, it is planned to increase the existing licence monitoring requirements to sampling for the same parameters to every month during the scheduled activities and for a period up to two years. post rehabilitation, depending on the period required to confirm that the main two parameters, suspended solids and ammonia are remaining compliant with the licence emission and trigger limit values and there is an improving trajectory in these two parameters i.e. reduction in concentration.
- Enhanced water quality monitoring will aim to include up to 70% of a bogs drainage catchments.
- Monitoring results will be maintained, trended and reported on each year as part of the requirement to report on Condition 10.1 of the IPC Licence on Bog Rehabilitation in the Annual Environmental Report, which will be available in April each year at www.epa.ie.
- The parameters to be included (as per condition 6.2 of the IPC Licence) include monthly monitoring for pH, Suspended Solids, Total Solids, Total Phosphorus, Total Ammonia, Colour, and COD and DOC.
- This monthly sampling regime on a selected number of silt ponds will be carried out over a two-year cycle. The original (licence) requirement was for a quarterly sampling regime but this has been increased to a monthly regime to appropriately track the changing water chemistry that will occur as part of this enhanced rehabilitation. In addition, DOC will be included as a parameter to try and identify any changes in carbon in the surface water.
- If, after two years, key criteria for successful rehabilitation are being achieved and key targets are being met, then the water quality monitoring will be reviewed, with consideration of potential ongoing research on site. The water quality data, the aerial surveys and the habitat mapping will be collated and will be submitted to the EPA as part of the final validation report.
- If, after two years, key criteria for successful rehabilitation have **not** been achieved and key targets have **not** been met, then the rehabilitation measures and status of the site will be evaluated and enhanced, where required. This evaluation may indicate no requirement for additional enhancement of

rehabilitation measures but may demonstrate that more time is required before key criteria for rehabilitation has been achieved. Monitoring of water quality will then also continue for another period to be defined.

- Where other uses are proposed for the site that are compatible the provision of biodiversity and ecosystem services, these will be assessed by Bord na Móna in consultation with interested parties. Other after-uses can be proposed for licensed areas and must go through the required assessment process and planning procedures.

Additional monitoring measures are also proposed to monitor ecosystem service benefits that have been derived by enhanced rehabilitation. These proposed monitoring measures will be funded by the proposed *Climate Action Fund* and Ireland's National Recovery and Resilience Plan or additional other funding. Monitoring of climate action and other ecosystem service benefits will be designed to take account of the requirements of monitoring benefits of the overall Scheme and will be stratified; that is not all monitoring will be carried out in each site. These are defined as:

- Vegetation and habitat monitoring after rehabilitation is completed using a cutaway bog condition assessment (Similar to ecotope mapping). This assessment will include assessment of on environmental and ecological indicators such as vegetation cover, vegetation communities, presence of key species, *Sphagnum* cover, bare peat cover and water levels. It is proposed that sites can be monitored against this baseline in the future.
- The condition of the bog can be assessed using the condition assessment and suitable Greenhouse Gas (GHG) emission factors can be assigned to different habitats. GHG emission factors have been determined for various peatland habitats in Ireland (Wilson *et al.*, 2015) and are constantly being refined with more and more research. BnM is actively supporting research into GHG fluxes in different rehabilitated peatland habitats. This means that potential GHG emissions can be estimated from the site, as the site continues along its trajectory towards a naturally functioning peatland ecosystem.

## 9.2 Rehabilitation plan validation and licence surrender – report as required under condition 10.4

***IPC License Condition 10.4.*** *A final validation report to include a certificate of completion for the Rehabilitation Plan, for all or part of the site as necessary, shall be submitted to the Agency within six months of execution of the plan. The licensee shall carry out such tests, investigations or submit certification, as requested by the Agency, to confirm that there is no continuing risk to the environment.*

Reporting to the EPA will continue until the IPC License is surrendered. The bog will be included in the full licence surrender process as per the Guidance to Licensees on Surrender, Cessation and Closure of Licensed Sites EPA, 2012, when:

- The planned rehabilitation has been completed;
- The key criteria for successful rehabilitation has been achieved and key targets have been met;
- Water quality monitoring demonstrates that water quality of discharge is stabilising or improving; and
- The site has been environmentally stabilised.

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## CARRANSTOWN DECOMMISSIONING AND REHABILITATION PLAN - ADDENDUM 1

Bord na Móna operates under IPC Licence issued and administered by the EPA to extract peat within the Ballivor-Derrygreenagh bog group (Ref. P0501-01). As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. Carranstown bog is part of the Ballivor-Derrygreenagh bog group (see Appendix II for details of the bog areas within the Ballivor-Derrygreenagh bog group). Carranstown Bog is located in Co. Meath/Westmeath.

This addendum outlines the findings of the Appropriate Assessment reporting carried out in respect of proposed PCAS activities at Carranstown Bog.

## APPROPRIATE ASSESSMENT REPORTING FINDINGS

An Appropriate Assessment Stage 1 Screening Report [5]was commissioned by Bord na Móna to inform whether the proposed PCAS activities at Carranstown Bog had the potential to result in Likely Significant Effects on European Sites. The concluding statement of this report reads as follows:

*"Following this initial screening of the proposed rehabilitation measures on Carranstown Bog it can be concluded that the possibility of any likely significant effects on the European Sites listed below, whether arising from the project itself or in combination with other plans and projects, can be excluded beyond a reasonable scientific doubt on the basis of the best scientific knowledge available.*

- *River Boyne and River Blackwater SPA [004232]*
- *River Boyne and River Blackwater SAC [002299]*

*If any changes occur in the design of these rehabilitation measures, a new Screening for Appropriate Assessment is required."*

Therefore following screening, Appropriate Assessment is not required for the Project as it is not directly connected with or necessary to the management of any Site(s) as European Site(s) and as it can be concluded, on the basis of objective information, that the project, individually or in combination with other plans or projects is not likely to have a significant effect on any European Site(s).

[5] JBA Consulting Engineers and Scientists Limited (2022). *Appropriate Assessment Screening Report Rehabilitation of Carranstown Bog, Co. Westmeath/Meath.*

## APPENDIX I: A STANDARD PEATLAND REHABILITATION PLAN TO MEET CONDITIONS OF THE IPC LICENCE

In the event that the Scheme (PCAS) is not supported by additional funding, Bord na Móna is still obligated to carry out peatland rehabilitation to meet the conditions of the IPC Licence. Under its EPA licences and following cessation of peat extraction, BnM is mandated to 'decommission' its operations by removing materials 'that may result in environmental pollution' and establish that 'rehabilitation' measures have environmentally stabilised peat production areas.

This proposed standard peatland rehabilitation plan is outlined here to **estimate potential costs**. Bord na Móna will still be expected to cover the costs that would have accrued from standard decommissioning and rehabilitation activities, as part of its original obligations. The existing costs associated with both the removal of potentially polluting materials and the environmental stabilisation of the peatlands resides with Bord na Móna. However, the expenditure necessary to deliver the additional and enhanced decommissioning, rehabilitation and restoration and the benefits that flow from these measures and interventions/improvements will be eligible for funding by government through the Climate Action Fund and Ireland's National Recovery and Resilience Plan.

The same process as outlined in Section 2 will be followed.

### Scope of rehabilitation

The principal scope of this rehabilitation plan is to rehabilitate the bog. This is defined by:

- The area of Carranstown Bog.
- EPA IPC Licence - Ref. P0501-01. As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. Carranstown bog is part of the Ballivor-Derrygreenagh bog group.
- The current condition of Carranstown Bog.
- The key objective of rehabilitation, as defined by this licence, is **environmental stabilisation** of the bog.
- To minimise potential impacts on neighbouring land. Some boundary drains around Carranstown Bog will be left unblocked as blocking boundary drains could affect adjacent land.
- Land-use: Bord na Móna are currently planning to build a windfarm on cutaway bog in the Ballivor area. This project is known as Ballivor Windfarm. Carranstown Bog will be part of this project. Rehabilitation will be integrated with this proposed renewable energy project.

### Rehabilitation goals and outcomes

The key rehabilitation goal and outcome for Carranstown Bog is environmental stabilisation of the site via wetland creation. This is defined as:

- Carrying out drain blocking to re-wet peat and slow runoff.
- Stabilising potential emissions from the site (e.g. suspended solids).
- Environmental stabilisation.

The outcome is setting the site on a trajectory towards establishment of natural habitats.

### Criteria for successful rehabilitation:

- Rewetting of residual peat and shallow cutaway in the former area of industrial peat production to offset potential run off of suspended solids and to encourage development of vegetation cover via natural colonisation and reducing the area of bare exposed peat.
- That there is a stabilising/improving concentration of suspended solids and ammonia associated with the measures undertaken to stabilise the peat surface by the blocking of the internal drainage system and the maximised rewetting of the peat surface. This will be demonstrated by developing a stable or downward trajectory of water quality indicators (suspended solids and ammonia) towards what would be typical of a re-wetted cutaway bog. This will be measured via water quality monitoring (suspended solids and ammonia).
- Receiving water bodies have been classified under the River Basin Management Plan and this classification includes waters that are At Risk from peatlands and peat extraction. The success criteria will be that the At Risk classification will see improvements in the associated pressures from this peatland or if remaining At Risk, that there is an improving trajectory in the pressure from this peatland.

**Rehabilitation targets**

- Demonstrating the delivery of the rehabilitation through site visits and through updated aerial photography (indicating presence of peat blockages and re-wetting). This will be demonstrated by a post rehab aerial survey.
- Stabilising potential emissions from the site (e.g. suspended solids). The key target will be developing a stable or downward trajectory of water quality indicators (suspended solids and ammonia) towards what would be typical of a re-wetted cutaway bog. This will be demonstrated by water quality monitoring results.

**Rehabilitation measures:**

- Blocking field drains in drier sections of the former industrial production area using a dozer to create regular peat blockages (three blockages per 100 m) along each field drain to re-wet peat.
- Re-alignment of piped drainage; and management of water levels to create/enhance existing wetlands and re-wet peat.
- No measures are planned for the other surrounding marginal peatland habitats.
- Silt ponds will continue to be maintained during the rehabilitation and decommissioning phase.
- Evaluate success of short-term rehabilitation measures and enhance where necessary.
- Decommissioning of silt-ponds will be assessed and carried out, where required.

**Timeframe:**

- 2022. 1st phase of rehabilitation. Field drain blocking.
- 2022. 2nd phase. Further realignment of piped drainage and other re-wetting measures dependent on success of 1st phase re-wetting, as determined by ongoing monitoring of water levels and re-vegetation.
- Other enhancement measures such as fertiliser treatment will be carried out, if needed. These will be determined by ongoing monitoring.
- 2024-2026. Evaluate success of short-term rehabilitation measures outlined above and remediate where necessary.

- 2024-2026. Decommission silt-ponds, if necessary.

Table AP-1. Rehabilitation measures and target area.

| Type | Code | Description | Area (Ha) |
|---|---|---|---|
| Deep Peat | DPT1 | Regular drain blocking (3/100 m) + blocking outfalls and managing water levels with overflow pipes | 159.7 |
| Dry Cutaway | DCT1 | Blocking outfalls and managing water levels with overflow pipes | 17.6 |
| Wetland | WLT1 | Turn off or reduce pumping to re-wet cutaway + blocking outfalls and managing water levels with overflow pipes | 4.28 |
| Marginal land | MLT1 | No work required | 34.5 |
| Silt ponds | Silt pond | Silt ponds | 0.6 |
| Constraint | Constraint | Other Constraints (ROW) | 89.5 |
| **Total** | | | **306.2** |

See Drawing number BNM-DR-23-20-20 titled **Carranstown Bog: Standard Rehab Measures** included in the accompanying Mapbook which illustrates the standard rehab measures to be applied.

**Monitoring, after-care and maintenance**

- There will be initial quarterly monitoring assessments of the site to determine the general status of the site, the condition of the silt-ponds, assess the condition of the rehabilitation work, asses the progress of natural colonisation, monitoring of any potential impacts on neighbouring land and general land security. The number of site visits will reduce after 2 years to bi-annually. These site visits will assess the need to additional rehabilitation.
- Water quality monitoring will be established.
- Monitoring results will be maintained, trended and reported on each year as part of the requirement to report on Condition 10.1 of the IPC Licence on Bog Rehabilitation in the Annual Environmental Report, which will be available in April each year at www.epa.ie.
- The parameters to be included (as per condition 6.2 of the IPC Licence) include monthly monitoring for pH, Flow, Suspended Solids, Total Solids, Total Phosphorus, Total Ammonia, Colour, and COD.
- This sampling regime on a selected number of silt ponds will be carried out over a two-year cycle. The original (licence) requirement was for a quarterly sampling regime.
- Where other uses are proposed for the site, these will be assessed by Bord na Móna in consultation with interested parties. Other after-uses can be proposed for licensed areas and must go through the required assessment and planning procedures.

**Validation and IPC Licence surrender**

Reporting to the EPA will continue until the IPC License is surrendered. The bog will be included in the full licence surrender process as per the Guidance to Licensees on Surrender, Cessation and Closure of Licensed Sites (EPA, 2012) when:

- The planned rehabilitation has been completed;
- Water quality monitoring demonstrates that water quality of discharge is stabilising or improving; and
- The site has been environmentally stabilised.

## APPENDIX II: BOG GROUP CONTEXT

The Ballivor-Derrygreenagh Bog Group comprises 11 discrete and defined bog units within Cos. Offaly, Westmeath and Meath (and one site used for transport – Hill of Down Railway). There are two main sub-groups; Ballivor (7 sites) and Derrygreenagh (5 sites). Nearly all of the Derrygreenagh sub-group and all of the Ballivor sub-group is located within the River Boyne catchment. A small portion of the western side of Toar Bog is located in the River Shannon catchment. Each bog area further comprises a range of habitats from bare milled former peat extraction areas to re-colonising cutaway to workshops areas and transport infrastructure.

Industrial peat extraction in the Ballivor-Derrygreenagh Bog Group ceased in 2020.

The Ballivor Bogs sub-group is located close to Ballivor Town in Co. Meath and most of the bogs extend across the Meath and Westmeath border. The Bord na Móna Ballivor Peat Moss factory is located 4 km from Ballivor Village on the margin of Ballivor Bog. An industrial railway links Ballivor to Carranstown, Bracklin and Lisclogher East. Milled peat was supplied from Ballivor, Carranstown, and part of Bracklin to Ballivor peat moss factory for horticultural products, with milled fuel peat being transported via road to Lough Ree Power (Lanesborough Co. Longford). Kinnegad Bog is an isolated bog unit with no industrial railway link to the other bogs. Kinnegad Bog is located to the south of Kinnegad in Co. Meath. This bog supplied mainly milled horticultural peat via road to various customers.

The Derrygreenagh Bogs sub-group is located to the south and east of Rochfortbridge (Co. Westmeath), along the borders of Co. Westmeath, Offaly and Meath. Four bogs (Ballybeg, Derryhinch, Drumman, Toar) supplied milled fuel peat via industrial railway to Edenderry Power.

Lisclogher East was never developed for milled peat production but there was still some sod peat production on this site. A large section of Bracklin was formerly a sod peat production bog and was never converted to milled peat production. This area is now considered cutaway. Lisclogher West was drained in the 1980's but has never been put into industrial peat production. This site is not now required for industrial peat production and will be restored in the future. Bogs that have been in industrial peat production for decades (such as Ballybeg and Drumman) have become cutaway as peat is extracted from the sites and the industrial peat production area is shrinking. A large section of cutaway in Derryarkin and Drumman has been developed since 2001 for sand and gravel extraction by a joint venture between Roadstone and Bord na Móna (Derryarkin Sand & Gravel Ltd). A large section of Derryarkin was also rehabilitated in 2001-2002 with wetland development via outfall blocking.

There has already been significant rehabilitation work carried out within the Ballivor-Derrygreenagh Bog Group. Bord na Móna originally established a grassland research unit and farm at Derryarkin. This farm has now been closed for some time but grassland established from cutaway has been sold to local farmers. Older rehabilitation includes the establishment of confer plantations in the 1980s and 1990s. Several rehabilitation trials (test programmes) have been developed more recently, where different techniques have been trailed and implemented.

One of the main outfalls of a large section of cutaway in Drumman (north) was blocked in 2005 creating a large wetland (~75 ha). Fertiliser and nursery crop trials were carried out on bare peat cutaway in Drumman (north) in 2010 over an area of 19 ha. Further applications of fertiliser were applied to an additional 22.6 ha of mostly bare peat cutaway in Drumman (north) in 2012. There have been further crop trials in Drumman in 2014 (grass-seed).

In Derryarkin, wetlands (143 ha) were created in 2001-2002 when main outfalls were blocked and cutaway was deliberately re-wetted.

A small area of cutaway at Derryarkin has been leased to DAMX Ltd for the development of an off-road moto-cross track at Derryarkin.

An area of cutaway (13 ha) with significant bare peat cover adjacent to the road in Derryarkin was treated with fertiliser to encourage natural colonisation in 2016.

During the 1980's/1990's about 176 ha of cutaway and marginal bog was developed for conifer forestry by Coillte at Drumman and Derryarkin in several different areas. There is ongoing management of these areas by Coillte.

Part of the cutaway at Ballybeg (76 ha) was planted with Alder (2008-2009) as a biomass trial (for fuel).

An area of marginal raised bog (19 ha) was restored at Bracklin Bog in 2016, as part of the Bord na Móna Raised Bog Restoration Programme. An extensive drain blocking programme was carried out to raise water levels and help re-wet the bog area, encouraging the development of embryonic *Sphagnum*-rich 'active' peat-forming raised bog. This area is of significant biodiversity and cultural interest to the Meath-Westmeath Bog Group and is likely to be part of a lease to this group in the future.

Some rehabilitation was carried out in a small area of cutaway in Balivor Bog (9 ha) in 2015. This involved drain-blocking to maintain and enhance re-wetting of an area of cutaway with *Sphagnum*-rich poor fen peat-forming vegetation.

Intensive decommissioning and rehabilitation for the Ballivor-Derrygreenagh Bog Group started in 2021 at a number of individual bogs.

Industrial peat extraction in the Ballivor-Derrygreenagh Bog Group ceased in 2020. Decommissioning for the Ballivor-Derrygreenagh Bog Group started in 2021 at a number of individual bogs and PCAS rehabilitation is expected to start in 2021. There is still some historical energy peat stock remaining on some bogs and these peat stock will be transferred via the BnM rail network to Edenderry Power Station up to 2024 when the power station is expected to have ceased using peat.

Bord na Móna is currently developing a wind energy project called Ballivor Windfarm. This proposed project is in the pre-planning stage. It is expected to be submitted to planning in 2022. Bord na Móna are also continuing to review its landbank for future potential renewable energy projects.

A breakdown of the component bog areas for the Ballivor-Derrygreenagh Bog Group IPC License Ref. PO-501-01 is outlined in Table Ap-2.

*Table Ap-2: Ballivor-Derrygreenagh Bog Group names, area and indicative status (Derrygreenagh Energy Peat sub-group)*

| Bog Name | Area (ha) | Stage of development | Land-Use and History | Peat Production Cessation | Rehab Plan Status |
|---|---|---|---|---|---|
| Ballivor | 654 | Industrial peat production commenced at Ballivor in the 1940s.<br>Some sections have been cutaway. Some sections still have relatively deep residual peat. | Ballivor Bog formerly supplied a range of commercial functions including the supply of horticultural peat, sod peat and latterly; fuel peat for Lough Ree Power.<br>Some sections were never re-developed to milled peat and have revegetated as cutaway..<br>Some areas of cutaway are developing pioneer cutaway vegetation communities. | 2020 | Draft 2017 |

| | | | | | |
|---|---|---|---|---|---|
| | | | Expected to be part of the proposed Ballivor Windfarm, which is currently in pre-planning. | | |
| Bracklin | 680 | Industrial peat production commenced at Bracklin in the 1940s.<br>Some sections have been cutaway. Some sections still have relatively deep residual peat. | Bracklin Bog formerly supplied a range of commercial functions including the supply of horticultural peat, sod peat and latterly; fuel peat for Lough Ree Power.<br>The main section was never re-developed to milled peat and has revegetated as mature cutaway habitats<br>Bare peat is prevalent in the western section, which was in milled peat extraction.<br>Expected to be part of the proposed Ballivor Windfarm, which is currently in pre-planning. | 2020 | Draft 2017 |
| Carranstown | 306 | Industrial peat production commenced at Carranstown in the 1980s.<br>The majority of the site has relatively deep peat. | Carranstown Bog formerly supplied a range of commercial functions including the supply of horticultural peat and latterly; fuel peat for Lough Ree Power.<br>The majority of the site is bare peat. There are cutaway habitats developing on the eastern side.<br>Expected to be part of the proposed Ballivor Windfarm, which is currently in pre-planning. | 2020 | Finalised 2022 |
| Lisclogher East | 486 | Industrial peat production commenced at Lisclogher East in the 1950s.<br>Part of the site is cutaway while there is a mosaic of residual peat depths. | Lisclogher East formerly supplied sod turf both for fuel and horticulture. This bog was never re-developed to supply milled peat.<br>The majority of the bog is developing cutaway habitats and there is a mosaic of bare peat areas where there has been recent sod peat extraction. | 2020 | Draft 2017 |
| Lisclogher West | 239 | Lisclogher West was drained in 1980s.<br>The bog is drained and still has residual vegetation in places. | Lisclogher West was drained but never fully developed for industrial peat extraction.<br>Expected to be part of the proposed Ballivor Windfarm, which is currently in pre-planning. | N/A | Draft 2017 |
| Kinnegad | 352 | Industrial peat production commenced at Kinnegad in the 1980s.<br>The majority of the site still has relatively deep peat. | Kinnegad Bog formerly supplied a range of commercial functions -mainly the supply of horticultural peat and latterly; fuel peat for Lough Ree Power.<br>The majority of the site is bare peat. | 2020 | Draft 2017 |
| Hill of Down Railway | 22 | | Rail link – not used for peat extraction | N/A | Draft 2017 |
| Ballybeg | 847 | Industrial peat production commenced at Ballybeg in the 1950s.<br>Most of the site is cutaway | Ballybeg Bog formerly supplied a range of commercial functions including the supply of horticultural peat and fuel peat for Edenderry Power.<br>Much of the site is bare peat. The northern half has been cutaway and is establishing cutaway habitats. | 2020 | Draft 2017 |
| Derryarkin | 710 | Industrial peat production commenced at Derryarkin in the 1950s.<br>Most of the site is cutaway | Derryarkin Bog formerly supplied a range of commercial functions including the supply of fuel peat for Rhode Power Station, Croghan Brickette Factory and Edenderry Power.<br>Most of the site is developing cutaway habitats. Some re-wetting was carried out in the past.<br>Part used for gravel extraction. | 2015 | Draft 2017 |
| Derryhinch | 337 | Industrial peat production commenced at Derryhinch in the 1950s. | Derryhinch Bog formerly supplied a range of commercial functions including the supply of fuel peat for Rhode Power Station, Croghan Brickette Factory and Edenderry Power. | 2020 | Draft 2017 |

| | | | | | |
|---|---|---|---|---|---|
| | | There is a mosaic of residual peat depths left | Most of the site is bare peat with emerging cutaway habitats.<br>Part of the site was used to trial herb production | | |
| Drumman | 1,122 | Industrial peat production commenced at Drumman in the 1950s.<br>Most of the site is cutaway | Drumman Bog formerly supplied a range of commercial functions including the supply of fuel peat for Rhode Power Station, Croghan Brickette Factory and Edenderry Power.<br>Most of the site is developing cutaway habitats. Some re-wetting was carried out in the past.<br>Part used for gravel extraction.<br>Part of the site was used to trial herb production.<br>Part of the site is used for log storage (biomass) | 2020 | Draft 2017 |
| Toar | 445 | Industrial peat production commenced at Toar in the 1980s. Most of the site has deep residual peat. | Toar Bog formerly supplied a range of commercial functions including the supply of horticultural peat and fuel peat for Edenderry Power.<br>Most of the site is bare peat.<br>Part of the site is used for log storage (biomass) | 2020 | Draft 2021 |

See Drawing number BNM-DR-23-20-24 titled Ballivor-Derrygreenagh Bog Group, included in the accompanying Mapbook which illustrates the location of Carranstown Bog and the Ballivor-Derrygreenagh Bog Group in context to the surrounding area.

# APPENDIX III: ECOLOGICAL SURVEY REPORT

**Ecological Survey Report**

*Note: This report outlines an ecological survey of the bog. This report should not be taken as a management plan for the site as other land-uses may still be considered. Information within this report may inform the development of other land-uses and identify areas with particular biodiversity value.*

| | | | |
|---|---|---|---|
| **Bog Name:** | **Carranstown** | **Area (ha):** | 306 ha |
| **Works Name:** | Ballivor | **County:** | Meath/Westmeath |
| **Recorder(s):** | SC, DMN, JOS, SD | **Survey Date(s):** | 15th September 2021 |

**Habitats present (in order of dominance)**

The most common habitats present at this site include:

- Bare peat (BP) (Codes refer BnM classification of pioneer habitats of production bog).
- Birch woodland (WN7) (on cutover bog dominated by Birch and/or Scot's Pine)
- Birch *Betula spp.* -dominated scrub (WS1) (on drier higher old cutover bog that is not flooded))
- Raised bog (PB1) (Codes refer to Heritage Council habitat classification, (Fossitt 2000),)
- Cutover Bog (PB4)
- Dry Heath (dheath) – A number of *Sphagnum* species were noted during the survey, including *Sphagnum* papillosum in drains, on the west side of the site in this habitat (see also images in Table 1).
- Access routes (BL3) (rail lines and tracks including gravel embankments and associated habitats such as dry grassland communities (GS2) and scrub)
- Scrub (WS1) (eBir, oBir and cBir)
- Pioneering vegetation on cutaway including Scrub and Soft Rush dominated Poor fen (mainly in mosaic with Birch scrub but also Gorse (*Ulex europaeus*)
- Oak Ash Hazel woodland
- Wet grassland (GS4)
- Mosaics of Willow-dominated scrub (WS1) along with open communities dominated by Soft rush (PF2) on cutaway
- Silt ponds (FL8)
- Improved grassland (GA1) around the boundary where the official boundary extends into adjacent fields
- Dense bracken (HD1)

The most common habitats found around the margins of the site include:

- Raised bog (PB1) (Codes refer to Heritage Council habitat classification, Fossitt 2000)
- Cutover Bog (PB4)
- Scrub (WS1)
- Improved grassland (GA1)
- Wet (callows-type) grassland (GS4)
- Conifer plantation (WD4)
- Birch woodland (WN7)

- Dense Bracken (HD1)

**Description of site**

Carranstown Bog is located approximately 5 km east of Raharney in Co Westmeath along the R156 Raharney to Ballivor Road. It is part of the Ballivor-Derrygreenagh Bog Group and a BnM railway links the site to Ballivor Bog to the south, with the road marking the southern boundary. There are further rail links to Bracklin bog to the north. Carranstown Bog was used to produce sod peat in the past. However, the majority of the bog has been re-developed for milled peat production for some time. The bog still retains a dome through much of this section and the peat that remains is "red" or "*Sphagnum*" peat. This site has been in industrial peat production since 1950 and there are still significant amounts (>2.6m) of "*Sphagnum*" peat remaining in the site.

Approximately three quarters of the site is currently in active peat production and is bare peat. There are some small areas to the east and west of the site that were initially developed for milled peat production but have never been put fully into production and now have re-vegetated or have some remnant vegetation. These areas are rapidly developing Birch and Pine scrub and Heather is also a dominant vegetation type. Some of these sections are currently being re-developed for milled peat production with vegetation clearance.

The south east of the site also contains a relatively large area of Birch woodland. Other habitats in the eastern boundary of the site include a small section of remnant raised bog, Birch woodland and old domestic cutover bog. Two small mineral islands are located on the site; these areas contain woodland that is dominated by Hazel, Birch and Oak.

**Designated areas on site (cSAC, NHA, pNHA, SPA other)**

None

**Adjacent habitats and land-use**

Adjacent habitats include lowland depositing river (FW2), wet grassland (GS4), improved agricultural grassland (GA1), cutaway bog (PB4), Conifer plantation and raised bog (PB1).

The surrounding landscape is dominated by farmland with improved grassland, with som of the improved grassland having been developed from peatland. Adjacent habitats include scrub (WS1), Birch woodland (WN7), improved grassland (GA1) and wet grassland (GS4). There are also some high bog (PB1) remnants and active cutover bog (PB4) around the margins that are not in ownership by BnM.

**Watercourses (major water features on/off site)**

- The Stonyfort River is located close to the north-eastern boundary of the bog.
- The Deel River is located to the west and south of the bog.
- The majority of the bog drains into streams that eventually feed into the Boyne River.

**Peat type and sub-soils**

Large sections of the site still contain significant areas of "Sphagnum" peat. The site is underlain with both gravel and marl. Gravel Sub-soil has been exposed in places within the production-related cutaway area.

**Fauna biodiversity**

**Birds**

Several bird species were noted on the site during the survey.

- Meadow pipit (*Anthus pratensis*) (Red-listed)
- Common Kingfisher (*Alcedo atthis*) (Amber listed)
- Additionally other species were noted such as Blue Tit (*Cyanistes caeruleus*), Sparrowhawk (*Accipiter nisus*), Goldfinch (*Carduelis carduelis*), Raven (*Corvus corax*), Lesser Redpol (*Acanthis cabaret*), Wren (*Troglodytes aedon*), Hooded Crow (*Corvus cornix*), Long tailed tit (*Aegithalos caudatus*), Great Tit (*Parus major*) and Wheatear (*Oenanthe oenanth*).Other species present included Blue Tit, Kingfisher (along the northern silt ponds), Sparrowhawk, Goldfinch, Raven, Lesser Redpol, Wren, Hooded Crow, Long tailed tit, Great Tit and Wheatear.
- Some of the younger cutaway vegetation surrounding the scrub in the production-related area may be suitable for breeding waders as there are unused bare peat fields and adjacent wet pools with emergent poor fen vegetation present.

**Mammals**

Signs of several mammal species were noted on the site during the survey.

- Badger
- Fox
- Hare

**Other species**

Butterflies: Small tortoiseshell, Ringlet (*Aphantopus hyperantus*), Speckled wood (*Maniola jurtina*) and Green Veined White (*Polyommatus icarus*)

Dragonfly species: Black Darter (*Sympetrum danae*)

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## APPENDIX IV. ENVIRONMENTAL CONTROL MEASURES TO BE APPLIED TO BOG REHABILITATION

- Bog restoration/rehabilitation measures will be restricted to within the footprint of the proposed rehabilitation area.
- The proposed rehabilitation will have due regard to noise limits and hours of operation (i.e. dusk and dawn) to minimise any potential disturbance on resident and local fauna that utilise the site and immediate environs.
- All plant and equipment for use will comply with the Construction Plant and Equipment Permissible Noise Levels Regulations (SI 359/1996).
- The proposed activities will be restricted to daylight hours and there will be no requirement for artificial lighting.
- Silt ponds will be inspected and maintained as per the IPC Licence.
- During periods of heavy precipitation and run-off, activities will be halted.
- Measures will be carried out using a suitably sized machine and, in all circumstances,, excavation depths and volumes will be minimised where possible.
- All machines will be regularly checked and maintained prior to arrival at the site to prevent hydrocarbon leakage.
- Hoses and valves will be checked regularly for signs of wear and will be closed and securely locked when not in use.
- Fuelling and lubrication of equipment shall only be carried out in designated areas away from surface water drainage features and ecologically sensitive areas.
- Waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the site for disposal or re-cycling.
- Vehicles will never be left unattended during refuelling.
- No direct discharges to waters will be made. No washings from vehicles, plant or equipment will be carried out on site.
- All plant refuelling will take place using mobile fuel bowsers. Only dedicated trained and competent personnel will carry out refuelling operations.
- Mobile storage such as fuel bowsers will be bunded to 110% capacity to prevent spills. Tanks for bowsers and generators shall be double skinned. When not in use, all valves and fuel trigger guns from fuel storage containers will be locked. All pumps using fuel or containing oil will be locally and securely bunded where there is the possibility of discharge to waters.
- Potential impacts caused by spillages etc. during rehabilitation will be reduced by keeping spill kits and other appropriate equipment on-site.
- Site activities will be carried out in accordance with 'best practice'. In order to ensure compliance and implementation of 'best practice', these measures will be communicated to relevant Bord na Móna staff and updated as required.

# APPENDIX V. BIOSECURITY

The potential for importation or introduction of non-native plant species (such as Japanese Knotweed, Himalayan Balsam, etc.) during future rehabilitation management, such as drain-blocking using excavators, has the potential to result in the establishment of invasive species within the site. Section 49 of the European Communities (Birds and Natural Habitats) Regulations 2011 prohibits the introduction and dispersal of invasive alien species (particularly plant species) listed on Part 1 (third column) of the 'Third Schedule'.

This section aims to reduce the risk from, and impacts of, invasive species and protecting biodiversity on lands under Bord na Móna ownership. Rehabilitation and decommissioning in the bog will have due regard to the relevant biosecurity measures outlined below:

- Records of problematic invasive species within the various bog units will be marked out with signs to highlight areas of infestation to personnel.
- All plant machinery will be restricted from disturbing known colonies of invasive species.
- All plant machinery will avoid unnecessary crossings to adjoining lands.
- Good site hygiene will be employed to prevent the introduction and spread of problematic invasive alien plant species (i.e. Japanese Knotweed (*Fallopia japonica*), Himalayan Balsam (*Impatiens glandulifera*), Himalayan Knotweed (*Persicaria wallichii*), etc.) by thoroughly washing vehicles prior to entering the area.

The biosecurity measures outlined above are in line with best practice guidelines issued by the National Roads Authority (NRA, 2010) – The Management of Noxious Weeds and Non-native Invasive Plant Species on National Roads and broadly based on the Environment Agency's (2013) – The Knotweed Code of Practice: Managing Japanese Knotweed on Development Sites (Version 3, amended in 2013, accessed on the Environment Agency's website on the 11th of July 2016).

In addition to the above, Best Practise measures around the prevention and spread of Crayfish plague[6] will be adhered with throughout all rehabilitation measures and activities.

[6] https://www.biodiversityireland.ie/projects/invasive-species/crayfish-plague/

## APPENDIX VI. POLICY AND REGULATORY FRAMEWORK

Bord na Móna Plc is a publicly owned company, originally established in 1934 to develop some of Ireland's extensive peat resources for the purposes of economic development and to support energy security, In the decades since its establishment the company has employed tens of thousands of people in its fuel, energy, and horticultural growing media businesses. For much of its history the company's support of important national policy aims has been enabled and encouraged in a variety of ways by Government.

Today, Bord na Móna is undertaking a number of highly significant actions in support of climate policy. These actions involve a radical transformation and decarbonisation of nearly the entire Bord na Móna business. This transformation will be driven by unlocking the full potential of our land and creating significant value for Ireland and the Midlands in particular.

Bord na Móna is an integral part of the economic, social, and environmental fabric of Ireland and Irish life. As a key employer in the Midlands, the company is conscious that its obligations go beyond purely commercial and environmental – there is also a social responsibility to employees and the communities served by Bord na Móna. It is the company's role and absolute priority to ensure that its long-term strategy delivers on all of these important areas in a robust and balanced way.

There are a wide range of policies, plans, legislation and land designations that inform the development of this Bord na Móna peatland rehabilitation plan. Bord na Móna have also developed and operate various policies and strategies that also inform the development of this rehabilitation plan.

### 1 EPA IPC Licence

Bord na Móna operates under IPC Licence issued and administered by the EPA to extract peat within the Ballivor-Derrygreenagh Bog Group (Ref. PO-501-01). As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. The bog is part of the Ballivor group. This regulatory requirement is the main driver of the development of this rehabilitation plan.

### 2 The Peatlands Climate Action Scheme (PCAS)

Bord na Móna (BnM) understand that it is the Minister's (DECC) intention to impose an obligation on Bord na Móna to develop a programme of measures, 'the Scheme', for the enhanced decommissioning, rehabilitation and restoration of boglands previously used to supply peat for electricity generation within the State. The enhanced decommissioning, rehabilitation and restoration of the peatlands funded by the Scheme (PCAS) will deliver benefits across climate action (GHG mitigation through reduced carbon emissions and acceleration towards carbon sequestration), enrich the State's natural capital, increase eco-system services, strengthen biodiversity, improve water quality and storage attenuation as well as developing the amenity potential of the peatlands.

It is envisaged that Bord na Móna carry out an enhanced decommissioning, rehabilitation and restoration, under the Scheme (PCAS), and supported by the Climate Action Fund and Ireland's National Recovery and Resilience Plan across a footprint of 33,000 ha. This scheme will significantly go beyond what is required to meet rehabilitation and decommissioning obligations under existing EPA IPC licence conditions. Interventions and measures supported by the Scheme will ensure that environmental stabilisation is achieved (meaning IPC obligations are met), and importantly, significant additional benefits, particularly relating to climate action and other ecosystem services, will also be delivered. However, only the additional costs associated with the additional

and enhanced rehabilitation, i.e., those activities which go beyond the existing decommissioning and rehabilitation requirements arising from Condition 10 will be eligible for support under the Scheme.

The proposed enhanced rehabilitation detailed in this document, are predicated on the understanding that the element of the activities, over and above the 'standard' rehabilitation necessary to comply with pre-existing Condition 10 IPC Licence requirements, will be deemed eligible costs by the Scheme regulator and funded by the Climate Action Fund and Ireland's National Recovery and Resilience Plan.

For the avoidance of doubt, should the Scheme and the associated statutory obligation on Bord na Móna not materialise, Bord na Móna will not carry out the enhanced decommissioning, rehabilitation and restoration measures described in this plan. Bord na Móna will instead plan to complete an adapted standard decommissioning and rehabilitation measures required under Condition 10 and outlined in Appendix I.

## 3 National Climate Policy

The National Policy Position establishes the fundamental national objective of achieving a transition to a competitive, low carbon, climate-resilient and environmentally sustainable economy by 2050. It sets out:

- the context for the objective;
- clarifies the level of GHG mitigation ambition envisaged; and
- establishes the process to pursue and achieve the overall objective.

The evolution of climate policy in Ireland will be an iterative process based on the adoption by government of a series of national plans over the period to 2050. GHG mitigation and adaptation to the impacts of climate change are to be addressed in parallel national plans – respectively through the National Climate Action Plan. The plans will be continually updated, as well as being reviewed on a structured basis at appropriate intervals and, at a minimum, every five years. This will include early identification and ongoing updating of possible transition pathways to 2050 to inform sectoral strategic choices.

Bord na Móna is following a decarbonisation programme aimed at reducing the carbon emissions from its activities. Industrial peat production has now ceased and several other decarbonisation measures are being implemented. The company aims to further develop renewable energy and resource recovery markets with a key objective of reducing the carbon intensity of all products. In addition, the carbon emission mitigation benefits associated with the post-peat extraction rehabilitated peatland following re-wetting, revegetation and colonisation of significant areas with native woodland will make a significant contribution to achieving the State's carbon emission reduction targets.

## 4 National Peatlands Strategy

The National Peatlands Strategy (2015) contains a comprehensive list of actions, necessary to ensure that Ireland's peatlands are preserved, nurtured and become living assets within the communities that live beside them. It sets out a cross-governmental approach to managing issues that relate to peatlands, including compliance with EU environmental law, climate change, forestry, flood control, energy, nature conservation, planning, and agriculture. The Strategy has been developed in partnership between relevant Government Departments/State bodies and key stakeholders through the Peatlands Council.

The strategy recognises that Ireland's peatlands will continue to contribute to a wide variety of human needs and to be put to many uses. It aims to ensure that Ireland's peatlands are sustainably managed so that their benefits

can be enjoyed responsibly. It aims to inform appropriate regulatory systems to facilitate good decision making in support of responsible use. It also aims to inform the provision of appropriate incentives, financial supports and disincentives where required. The strategy attempts to strike an appropriate balance between different needs, including local stakeholders like turf-cutters and semi-state bodies such as Bord na Móna.

In line with a National Peatlands Strategy recommendation, a Peatlands Strategy Implementation Group (PSIG), was established, assisted in the finalisation of the Strategy, is overseeing subsequent implementation and will report to Government on an annual basis on the implementation of the actions and principles contained within the Strategy.

Bord na Móna is a key stakeholder in the National Peatlands Strategy and the Peatlands Strategy Implementation Group. The strategy recognises the potential for some Bord na Móna sites to be restored and to contribute to the national SAC and NHA network of protected raised bog sites. The strategy (agreed in 2015) also recognises the various different values of cutaway bog and developed six key principles (with Bord na Móna) for the after-use of cutaway bog.

- Bord na Móna will continue to assess and evaluate the potential of the company's land bank, using a land use review system. The assessment will help prepare a set of evidence-based management plans for the various areas of peatland. These plans will also inform its cutaway bog rehabilitation.
- The policy of Bord na Móna is not to open up any undrained new bogs for peat production.
- Lands identified by Bord na Móna as having high biodiversity value and/or priority habitats will be reserved for these purposes as the proposed future land use.
- Generally, Bord na Móna cutaway bogs that flood naturally will be permitted to flood unless there is a clear environmental and/or economic case to maintain pumped drainage.
- In deciding on the most appropriate afteruse of cutaway peatlands, consideration shall be given to encouraging, where possible, the return to a natural functioning peatland ecosystem.
- This will require re-wetting of the cutaway peatlands which may lead in time to the restoration of the peatland ecosystem.
- Environmentally, socially and economically viable options should be analysed to plan the future use of industrial cutaway peatlands, in conjunction with limiting factors as outlined in Bord na Móna's Strategic Framework for the Future Use of Peatlands.

The National Peatlands Strategy highlights the importance and value of developing peatland rehabilitation plans for Bord na Móna cutaway sites and implementing this peatland rehabilitation. Some of these principles have now been superseded by the company's decision to cease industrial peat extraction. The National Peatlands Strategy is currently being reviewed by Government.

## 5 Draft National River Basin Management Plan 2022-2027 (Water Framework Directive)

The National River Basin Management Plan (Department of Housing, Planning, Community and Local Government 2017) is the key national plan for Ireland to achieve the objectives of the Water Framework Directive (WFD). In broad terms, the objectives of the WFD are (1) to prevent the deterioration of water bodies and to protect, enhance and restore them with the aim of achieving at least good status and (2) to achieve compliance with the requirements for designated protected areas.

The NRBMP 2018-2021 outlined how peat extraction can be a potentially significant pressure on various water quality parameters. Peatland rehabilitation of Bord na Móna cutaway (in addition to other measures) was part

of the WFD (2018-2021) programme of measures. The NRBMP 2018-2021 takes account of the fact that Bord na Móna was in the process of phasing out the extraction of peat for energy production, that it set a target to rehabilitate 9,000 ha of cutaway bogs (covering 25 peatlands) by 2021 (in 2018) and will look to implement best-available mitigation measures to further reduce water quality impacts caused by peat extraction while the phasing-out process is taking place. This NRBMP 2018-2021 rehabilitation target was superseded by the acceleration of the Bord na Móna de-carbonisation programme and the Scheme **(PCAS)**.

The development of site rehabilitation plans and the delivery of peatland rehabilitation by Bord na Móna was expected to have a positive impact on water quality and will help the NRBMP 2018-2021 deliver its objectives in relation to the Water Framework Directive and is one of the five key principle actions.

The draft NWBMP 2022-2027 describes how the number of waterbodies impacted by peat, industry and forestry have decreased by 10, 10 and 5 waterbodies, respectively since the second cycle. Impacts on water quality and river habitat arising from peat and peat extraction and associated drainage include the release of ammonium and fine-grained suspended sediments, and physical alteration of aquatic habitats. Drainage of peatlands also results in changes to the hydromorphological condition of rivers.

The draft NWBMP 2022-2027 outlines how maintaining and restoring Irish bogs will lead to a decrease in waterborne carbon leaching to levels comparable with intact bogs as well as reducing losses of peat silt and ammonia. Vegetation on the surface of the peat can also slow the flow of water over the land surface. Based on the EPA's most recent reports, peat extraction and drainage are impacting on 106 water bodies across the country, with peat the single pressure on 28 of these water bodies. However, compared to the data in the second-cycle plan, the number of water bodies impacted by peat has decreased.

The cessation of industrial peat extraction by Bord na Móna in 2021 was expected to have a significant positive impact on water quality of receiving water courses by reducing the impact of peat extraction as a key pressure on particular water courses. This is now being supported by the results and conclusions of the draft NWBMP 2022-2027.

## 6 National Biodiversity Action Plan 2016-2021

The National Biodiversity Action Plan 2016-2022 has a vision that biodiversity and ecosystems in Ireland are conserved and restored, delivering benefits essential for all sectors of society and that Ireland contributes to efforts to halt the loss of biodiversity and the degradation of ecosystems in the EU and globally. Ireland's 2nd National Biodiversity Action Plan outlines the main policies, strategies, actions and targets in relation to biodiversity. This plan has several Bord na Móna specific objectives and actions including implementing the BnM Biodiversity Action Plan 2016-2021 and overlaps with both the National Peatlands Strategy and the National Raised Bog Special Areas of Conservation Management Plan 2017-2022.

The delivery of rehabilitation via PCAS is expected to significantly contribute in the future to actions and targets of the National Biodiversity Action Plan 2016-2021, particularly in relation to peatland restoration and creation of new habitats such as wetlands and woodlands.

## 7 National conservation designations

Bord na Móna operates in a wider landscape that also includes a network of European and National nature conservation sites (Special Areas of Conservation (SACs), Special Protection Areas (SPAs), National Heritage Areas

(NHAs, cNHAs) and National Nature Reserves). Bord na Móna will take account of this network of conservation objectives and their conservation objectives when developing these rehabilitation plans. It is expected that peatland rehabilitation will, in general, benefit the conservation objectives of this network of nature conservation sites.

## 8 National Raised Bog Special Area of Conservation Management Plan 2017-2022.

The National Raised Bog Special Area of Conservation Management Plan 2017-2022 sets out a roadmap for the long-term management, restoration and conservation of protected raised bogs in Ireland. The Plan strikes an appropriate balance between the need to conserve and restore Ireland's raised bog network as part of Ireland's commitments towards the EU Habitats Directive, and the needs of stakeholders and gives recognition to the important role that communities have to play in the conservation and restoration of raised bogs. The National Raised Bog Special Areas of Conservation (SACs) Management Plan 2017-2022 is part of the measures being implemented in response to the on-going infringement action against Ireland in relation to the implementation of the EU Habitats Directive, with regard to the regulation of turf cutting on the Special Areas of Conservation (SACs). The then Minister for Arts, Heritage and the Gaeltacht, also published a **Review of Raised Bog Natural Heritage Area Network** in 2014.

Bord na Móna has played a key role in the development of the National Raised Bog Special Area of Conservation Management Plan 2017-2022 and the Review of the Raised Bog Natural Heritage Area Network. Several Bord na Móna sites were assessed by the National Parks and Wildlife Service as part of the above Plan and Review and there is an expectation that several Bord na Móna sites will be designated as SACs and NHAs in the future. This will reinforce the network of protected raised bog sites and replace in part sites that will be de-designated as they have been deemed to be significantly damaged and are deemed to have no raised bog restoration prospects. PCAS is expected to restore several sites that will contribute to The National Raised Bog Special Areas of Conservation (SACs) Management Plan 2017-2022 targets in relation to the restoration of raised bog habitat.

Bord na Móna has also responded to the needs of the NRBMP and provided several sites to the government for the relocation of turf-cutters from SACs. This is part of a suite of ongoing bog conservation measures in the NRBMP to manage turf-cutting in protected sites. Bord na Móna and the National Parks and Wildlife Service continues to engage regarding the ongoing relocation of turf-cutters from protected raised bog sites.

## 9 All-Ireland Pollinator Plan 2021-2025

The All-Ireland Pollinator Plan 2021-2025 outlines key objectives and actions to protect and support pollinating insects and the habitats they rely on. A Bord na Móna specific action in this plan includes the adoption of pollinator-friendly management within the Bord na Móna network of sites. One action to help achieve this objective is habitat rehabilitation and restoration, where possible, of pollinator-friendly habitats, including peatland habitats.

## 10 Land-use planning policies

As Bord na Móna operates in many counties across Ireland, it is important to note the respective development plans in these counties. Many of the existing development plans recognise the potential that exists in the after-use of cutover/cutaway peatlands. Bord na Móna seeks to work with all of the relevant local authorities to ensure

that the most appropriate after-uses are reflected in local planning policy. The following areas of consistent importance are of both direct and indirect relevance to Bord na Móna: heritage, tourism, biodiversity/conservation, landscape, renewable energy, and economy/enterprise.

## 11 National Archaeology Code of Practise

Bord na Móna operates under an agreed Code of Practice regarding archaeology with the Department of Arts, Heritage and the Gaeltacht and the National Museum of Ireland which provides a framework to enable the Company to progress peat extraction whilst carrying out archaeological mitigation. (https://www.archaeology.ie/sites/default/files/media/publications/cop-bord-na-mona-en.pdf

The Code replaced a set of Principles agreed with the Department of Arts, Heritage and the Gaeltacht in the 1990s. Under the Code Bord na Móna, the Minister and Director work together to ensure that appropriate archaeological mitigation is carried out in advance of peat extraction.

- BNM must ensure that any monuments or archaeological objects discovered during peat extraction are protected in an appropriate manner by following the Archaeological Protection Procedures.
- BNM must ensure that any newly discovered monuments on Bord na Móna lands are reported in a timely manner to the National Monuments Service of the Department of Arts, Heritage and the Gaeltacht.
- BNM must ensure that any archaeological objects discovered on Bord na Móna lands are reported immediately to the Duty Officer of the National Museum of Ireland.
- Bord na Móna will adhere to the Archaeology Code of Practise relating to management of any archaeological finds that may arise during cutaway peatland rehabilitation and decommissioning.

## 12 Bord na Móna Biodiversity Action Plan 2016-2021

Rehabilitation of industrial peatlands is a key objective of the Bord na Móna Biodiversity Action Plan 2016-2021. This action plan outlines the main objectives and actions around biodiversity on Bord na Móna lands. The Bord na Móna Biodiversity Action Plan also outlines key International and European policy in relation to biodiversity. This includes the **United Nations Convention on Biodiversity 2011-2020 (CBD)** and **European Biodiversity Strategy to 2020**. Further details of these policies and Bord na Móna s responses can be found in the Bord na Móna Biodiversity Action Plan (Bord na Móna 2016). Both policy documents highlight targets such as reducing pressure on biodiversity, promoting sustainability, habitat restoration and benefits of ecosystem services.

One example of a key CBD target is:

- *"Restore at least 15% of degraded areas through conservation and restoration activities."*

The EUs headline target for progress by 2020 is to:

- *"halt the loss of biodiversity and the degradation of ecosystems in the EU by 2020, restore them as far as feasible, while stepping up the EU contribution to averting global biodiversity loss."*

This rehabilitation plan is aligned to the CBD target and the EU Biodiversity Strategy target and will help Ireland meet its commitment to these international Biodiversity polices.

## 13 Bord na Móna commitments

Bord na Móna made the commitment in 2009 not to develop any new peatland sites for industrial peat production. The company has continued to work with different stakeholders.

The company announced that industrial peat production would be cut by over 50 percent in 2019 and would entirely cease over most of its lands by the mid-2020s. Rehabilitation measures would continue to be carried out with the focus on re-wetting and rehabilitation of cutover and cutaway areas in line with national policies (such as the National Peatland Strategy, the National Biodiversity Action Plan, the Climate Action Plan 2019, the Water Framework Directive, etc.) and rehabilitation guidelines set down by the Environmental Protection Agency. To date, 15,000 hectares of cutaway and cutover bog have been rehabilitated using this approach with 5,000 hectares in active rehabilitation.

In line with Bord na Móna's accelerated decarbonisation programme, the company made a further commitment to a significantly larger rehabilitation target. This was reflected in our plans to rehabilitate a further 20,000 hectares of cutaway and cutover bog to wetland and woodland mosaics by 2025. In addition, we planned to restore a further 1,000 hectares of raised bog habitat by 2025.

The above commitments have now been followed by the decision by the company to cease industrial peat extraction and rehabilitate a target of 33,000 ha between 2021-2025.

These commitments outline the importance of peatland rehabilitation to Bord na Móna. The company will continue to demonstrate environmental responsibility and continue to deliver on these commitments in relation to peatland rehabilitation and in relation to the future management of these lands to maximise their benefits, particularly their ecosystem service benefits, along with the sustainable development of a portion of the land bank for other uses, such as renewable energy.

## 14 Bord na Móna Strategic Framework for the future use of cutaway peatlands 2020 (Draft)

The general after-use strategy of Bord na Móna is outlined in the Bord na Móna Strategic Framework for Future-Use of Cutaway Bogs 2020 (draft document). This document outlines how Bord na Móna's cutover peatland estate is complex in nature with great variability in terms of peat depths, peat types, drainage, subsoil condition and environmental value. Thus, future options require consideration on a site-specific basis, also bearing in mind the considerable internal variation within bogs. The development of the land-bank will also take account of national needs, while also taking account of the various national legislation, policies and plans related to the management of peatlands. In general, Bord na Móna will seek to balance and optimise commercial, social, and environmental value of these sites, and develop integrated land-uses, while taking account of the need for sustainability and their biodiversity value.

Any consideration of other future after-uses for Bord na Móna land such as development or other mixed uses will be conducted following the relevant planning guidelines and consultation with relevant authorities and will be considered within the framework of this peatland rehabilitation plan.

# APPENDIX VII. DECOMMISSIONING

## 1. Condition 10 Decommissioning

This is a requirement of the applicable Integrated Pollution Control Licence issued by the Environmental Protection Agency. This condition 10.1 requires the following:

*10.1 Following termination of use or involvement of all or part of the site in the licensed activity, the licensee shall:*

*10.1.1 Decommission, render safe or remove for disposal/recovery, any soil, subsoils, buildings, plant or equipment, or any waste, materials or substances or other matter contained therein or thereon, that may result in environmental pollution.*

The main success criteria pertaining to successfully complying with this condition is ensuring that no environmental liability remains from this infrastructure and material and that the bog can be deemed suitable for surrender of the license under section 95 of the EPA Acts. This is achieved by Bord na Móna identifying and quantifying any mechanical and infrastructural resources that were installed in the bog to enable the development and production operation at the site. This list is then refined to identify any items that would be deemed as possibly resulting in environmental pollution, should they not be removed.

Typically, these items/infrastructures would be any remaining, unconsolidated plant, equipment and attachments, waste materials, unused raw materials such as land drainage pipes, remaining peat stockpiles, stock pile covering, pumps, septic tanks and fuel tanks.

In relation to this bog, the list and tasks would be as follows:

| Item | Description | Carranstown Decommissioning Plan |
|---|---|---|
| 1 | Clean-up of remaining or unconsolidated waste or materials located in Bogs, Yards, Buildings and Offices | Clean-up of Bog |
| 2 | Cleaning Silt Ponds | Cleaning Silt Ponds |
| 3 | Decommissioning Peat Stockpiles | Peat Stockpile Management |
| 4 | Decommissioning or Removal of Buildings and Compounds | Not relevant |
| 5 | Decommissioning Fuel Tanks and associated facilities | Not relevant |
| 6 | Decommissioning and Removal of Bog Pump Sites | Not relevant |
| 7 | Decommissioning or Removal of Septic Tanks | Where required |

In addition, condition 7 of the licence requires these now defined waste items to be disposed of or recovered as follows:

7.1 Disposal or recovery of waste shall take place only as specified in *Schedule 2(i) Hazardous Wastes for Disposal/Recovery* and *Schedule 2(ii) Other Wastes for Disposal/Recovery* of this licence and in accordance with the appropriate National and European legislation and protocols. No other waste shall be disposed of/recovered either on-site or off-site without prior notice to, and prior written agreement of, the Agency.

7.2 Waste sent off-site for recovery or disposal shall only be conveyed to a waste contractor, as agreed by the Agency, and only transported from the site of the activity to the site of recovery/disposal in a manner which will not adversely affect the environment.

7.3 A full record, which shall be open to inspection by authorized persons of the Agency at all times, shall be kept by the licensee on matters relating to the waste management operations and practices at this site. This record shall as a minimum contain details of the following:

7.3.1 The names of the agent and transporter of the waste.

7.3.2 The name of the persons responsible for the ultimate disposal/recovery of the

waste.

7.3.3 The ultimate destination of the waste.

7.3.4 Written confirmation of the acceptance and disposal/recovery of any hazardous waste consignments sent off-site.

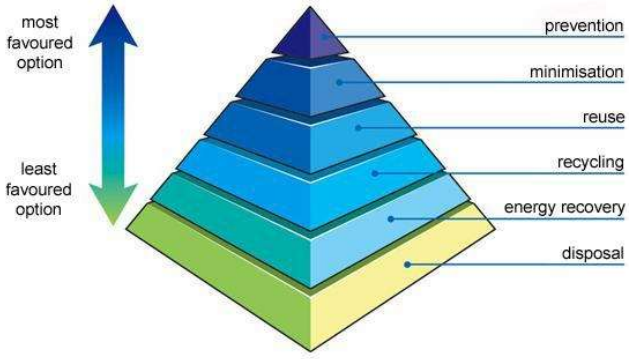
7.3.5 The tonnages and EWC Code for the waste materials listed in *Schedule 2(i) Hazardous Wastes for Disposal/Recovery* and *Schedule 2(ii) Other Wastes for Disposal/Recovery* sent off-site for disposal/recovery.

7.3.6 Details of any rejected consignments.

A copy of this Waste Management record shall be submitted to the Agency as part of the AER for the site.

As required by the licence, these waste items will be removed for recycling or disposal, using external contractors with the required waste collection permits, approved under 7.2, with waste records maintained as required under 7.3.

Where possible, Bord na Móna will utilize the appropriate waste hierarchy to identify waste that can reused or recycled ahead of disposal.




The validation of the success of condition 10.1 is carried out through an Independent Closure Audit (ICA), followed by and EPA Exit Audit (EA) and the eventual partial or full surrender of the licence.

## 2. Enhanced Decommissioning.

The remaining infrastructure does not constitute a risk to the environment and would not be a requirement of condition 10 of the licence. The removal of these are deemed as enhanced measures. These may enhance the future afteruse of the bog for amenity value, security against access for illegal and unsocial activities and general State and community benefit. In relation to this bog, this would include the infrastructure defined below:

| Item | Enhanced Decommissioning Type | Carranstown Decommissioning Plan |
|---|---|---|
| 1 | Removal of Railway Lines | To be defined* |
| 2 | Decommissioning Bridges and Underpasses | Not Applicable |
| 3 | Decommissioning Railway Level Crossing | Not Applicable |
| 4 | Restricting Access (bogs and silt ponds) | Restricting Access to Bog |
| 5 | Removal of High Voltage Power Lines | If feasible |

* It is noted that the Bord na Móna industrial railway is currently designated as a protected structure in the current Westmeath County Council County Development Plan. This is currently being assessed by archaeological consultants for Bord na Móna.

## APPENDIX VIII. GLOSSARY

**Cutaway Bog:** A Bord na Móna site generally becomes cutaway when it is economically unviable to continue industrial peat extraction or when the majority of peat has been removed.

**Deep peat cutover bog.** Deep peat cutaway bog is defined as former raised bogs that have been in industrial peat production, where production has ceased but the residual peat depth is typically in excess of 2m. *Sphagnum* mosses are key species of raised bogs and the majority of the peat mass is formed from these mosses. *Sphagnum* species and other raised bog species are a key part of raised bog habitat function and prefer more acidic, nutrient poor, water-logged conditions. Typical raised bog *Sphagnum* mosses and other bog species do not thrive with the more typical alkaline water chemistry of cutaway bog but do grow well in these more acidic conditions where peat has been re-wetted. There is potential to re-develop embryonic *Sphagnum*-rich plant communities in these conditions if the peat can be re-wetted. This brings the opportunity of re-developing embryonic *Sphagnum*-rich vegetation communities that are considered Carbon sinks or peat-forming habitats and restoring the carbon sequestration function of these sites.

**Dry cutaway bog:** Cutaway bog is categorised as dry cutaway where it is not practical or feasible to re-wet these areas completely. It is inevitable that some areas of cutaway will remain relatively dry due to the heterogenous topography of the cutaway, as well as requirements for continued drainage on site for identified after-uses, or off site in relation to neighbouring lands or other infrastructure. Ridges and mounds of glacial deposits can become exposed during peat extraction and form a heterogenous topographical mosaic separated by basins. Dry cutaway may have very thin or no residual peat where ridges and mounds have been exposed. The exposed sub-soils are a mix of glacial gravels, muds and tills that can be quite free-draining. Dry cutaway may also have deeper residual peat but in a location (ie. at the margin) where the peat cannot be re-wetted due to boundary constraints. Dry cutaway may also develop in situations where there a relatively steep slope that inhibits re-wetting. The majority of dry cutaway will develop towards grassland, heath, scrub and dry woodland habitats.

**Enhanced decommissioning:** This is defined as decommissioning carried out under Scheme, which is proposed to externally funded.

**Enhanced rehabilitation:** This is defined as rehabilitation carried out under Scheme, which is proposed to be externally funded. It is proposed by Government that Bord na Móna be obligated to carry out enhanced decommissioning, rehabilitation and restoration on peatlands. This Scheme will significantly go beyond what is required to meet rehabilitation and decommissioning obligations under existing EPA IPC licence conditions. Interventions and activities supported by the Scheme will ensure that environmental stabilisation is achieved (meaning IPC obligations are met), and importantly, significant additional benefits, particularly relating to climate action and other ecosystem services, will also be delivered. However, only the costs associated with the additional, enhanced and accelerated measures, i.e., those interventions which go beyond the existing decommissioning and rehabilitation requirements arising from Condition 10 will be eligible for support under the Scheme.

**Environmental stabilisiation:** The key objective of peatland rehabilitation is environmental stabilisation. This means developing habitats and vegetation back onto the bare peat, slowing water movement across the bog, minimising effects to downstream waterbodies and meeting the conditions of the IPC Lisence. This is achieved by a combination of re-wetting, where possible, and natural colonisation of the former cutaway, with or without intervention**.** Habitats will develop that reflect the underlying environmental conditions. Other after-use development may also serve to act as environmental stabilisiation.

**Marginal land.** Marginal land is defined as land around the margin of the industrial peat production area. This margin generally contains a range of habitats including scrub, Birch woodland, cutover bog and raised bog remnants. It has a variety of land-uses including turf-cutting (private turbary). The Scheme will consider potential rehabilitation and restoration actions (e.g. drain blocking) within marginal land zones, where appropriate.

**Rehabilitation:** Rehabilitation is defined in general by Bord na Móna as environmental stabilisation of the former cutaway. This is generally achieved via re-wetting, where possible, and natural colonisation of the former cutaway, with or without intervention. It is not possible to restore raised bog habitats on BnM cutaway in general in the short-term. In general, most of the peat mass has been removed from many BnM cutaway sites and the environmental characteristics of these areas have therefore changed radically (peat depths, hydrology, water chemistry, substrate type, nutrient status. This means there will therefore be different habitat outcomes (wetlands, fen, heathland, grassland and Birch woodland). Other after-use development may also serve to act as rehabilitation.

**Restoration:** Ecological restoration to defined as the process of re-establishing to the extent possible the structure, function and integrity of indigenous ecosystems and the sustaining habitats they provide" (SER 2004). Defined in this way, restoration encompasses the repair of ecosystems (Whisenant 1999) and the **improvement of ecological conditions in damaged wildlands** through the **reinstatement of ecological processes**. In general, Bord na Móna cutaway peatlands cannot be restored back to raised bog in a reasonable timeframe as their environmental conditions has changed so radically (with the removal of the acrotelem – the living layer and much of the peat mass). However, they can be returned to a **trajectory** towards a naturally functioning peatland system (Renou-Wilson 2012). **Raised bog restoration** is an objective of some BnM sites where there is residual natural raised bog vegetation and where the majority of the peat is still intact.

**Standard rehabilitation:** This is defined as rehabilitation that is designed to meet the conditions of the EPA IPC Licence. The key objective of rehabilitation is environmental stabilisation. This is achieved by a combination of re-wetting, where possible, and natural colonisation of the former cutaway, with or without intervention**.** Other after-use development may also serve to act as rehabilitation.

**Standard decommissioning:** This is defined as decommissioning that is designed to meet the conditions of the EPA IPC Licence. This is defined as to render safe or remove for disposal/recovery, any soil, subsoils, buildings, plant or equipment, or any waste, materials or substances or other matter contained therein or thereon, that may result in environmental pollution.

**Wetland cutaway bog.** Wetland cutaway bog is defined as former raised bogs that have been in industrial peat production, where production has ceased and the majority of peat has been cutaway, and where this cutaway has the potential to be re-wetted. A significant number of Bord na Móna sites have pumped drainage and these sites are likely to develop a mosaic of wetland habitats when pumping in reduced or stopped. The water chemistry of wetland cutaway frequently is strongly influenced by the more alkaline sub-soils that have been exposed during peat production. This means that pioneer vegetation is more typical of fen and wetland, rather than raised bog. Wetland cutaway will have a broad range of hydrological conditions depending on the local topography. In some cases, these wetlands may form deep water (> 0.5 m) whilst other areas may have the water table at or just below the surface of the ground.

# APPENDIX IX. EXTRACTIVE WASTE MANAGEMENT PLAN

## (Minimisation, treatment, recovery and disposal)

**Objective:**
The objective of this generic plan is to comply with the requirements of regulation 5 of the Waste Management (Management of Waste from Extractive Industries) Regulations, and to prevent or reduce waste production and its harmfulness.

**Scope:**
This plan covers IPPC Licence's Ref P0501-01, Derrygreenagh-Ballivor Group of Bogs in Counties Meath and Mestmeath.

**1.0 Extractive Waste:**
Waste classified as extractive waste from peat extraction operations arise from three operations associated with this activity.

**1.1 Silt Pond excavations and maintenance.**
All peat extraction activities are serviced by a silt lagoons/ponds. During the excavation of these silt ponds, pre IPPC Licensing in 1999 and since licensing, the excavated material is stored adjacent to the silt pond, where it either remains in situ ores levelled out. As required by condition 6.6, these silt lagoons are cleaned twice per annum or more often if inspections dictate. These silt cleanings are also deposited on the same location, adjacent to the silt pond, where they may be levelled periodically to allow room for subsequent cleanings. These mounds of silt pond excavation material and cleanings are generally no higher that 2-3 metres.

**1.2 Power Station screenings:**
Lough Ree Power Ltd screens the peat from the bogs prior to processing. This screening removes oversized peat, stones and bogs timbers. Schedule 3 (ii) of the IPPC licence permits disposal of these peat screenings back to the bog, where it is levelled and graded into the surrounding peat landscape. These locations have been agreed with the Agency as per condition 7.4 of the IPPC Licence, and as per the attached locations.

**1.3 Bog Timbers:**
During peat extraction operations, bog timbers often arise in the bog surface and are required to be cleared. These timbers consist of bog pine, oak and some yew. Some of these timbers, such as the oak and yew are removed for use in the wood craft industry, with the remaining bog pine stockpiled in locations at the opposite end of each bog, where it generally becomes a habitat for flora and fauna. These piles of timber are generally no higher than 1-2 metres.

**2.0 P0501-01 IPPC Licence Extractive Waste Conditions**

**2.1 Condition 7.5 Extractive Waste Management**
The licensee shall draw up a Waste Management Plan (to be known as an Extractive Waste Management Plan) for the minimisation, treatment, recovery and disposal of extractive waste. This Plan shall meet the requirements of regulation 5 of the Waste Management (Management of Waste from the Extractive Industries) Regulations,2009. The Plan shall be submitted for agreement by the Agency by the 31' December2012. The Plan shall be reviewed at least once every five years thereafter in a manner agreeable to the Agency and amended in the event of substantial changes to the operation of a waste facility or to the waste deposited. Any amendments shall be notified to the Agency.
All extractive waste shall be managed in accordance with the Extractive Waste Management Plan. A report on the implementation of the Extractive Waste Management Plan shall be provided in the AER.

**2.2 Condition 7.6 Waste Facility**
(i) No new waste facility may be developed or an existing waste facility modified unless agreed by the Agency.
(ii) The licensee shall ensure that all existing waste facilities are managed and maintained to ensure their physical stability and to prevent pollution or contamination of soil, air, surface water or groundwater.
(iii) The licensee shall ensure that all new waste facilities are constructed, managed and maintained to ensure their physical stability and to prevent pollution or contamination of soil, air, surface water or groundwater.
(iv) Operational measures shall be continuously employed to prevent damage to waste facilities from personnel, plant or equipment.
(v) The licensee shall establish and maintain a system for regular monitoring and inspection of waste facilities.
(vi) All records of monitoring and inspection of waste facilities, as required under the licence, shall be maintained on-site in order to ensure the appropriate handover of information in the event of a change of operator or relevant personnel.

**2.3 Condition 7.7 Excavation Voids**
7.7.1 Unless otherwise agreed by the Agency, only extractive waste shall be placed in excavation voids.
7.7.2 When placing extractive waste into excavation voids for rehabilitation and construction purposes, the licensee shall, in accordance with regulation 10 of the Waste Management (Management of Waste from the Extractive Industries) Regulations, 2009, and the Extractive Waste Management Plan:

- Secure the stability of the waste
- Put in place measures to prevent pollution of soil, surface water and ground water.
- Carry out monitoring of the extractive waste and excavation void.

**Condition 7.5. Extractive Waste Management Plan. 5 (1)**

**3.0 Minimisation.**
**3.1 Silt pond excavation material and cleanings.**
IPPC Licence conditions require all production areas to be serviced by an appropriately designed silt pond based on storage volume and retention time. Condition 6.6 requires all ponds to be cleaned bi-annually and more often if inspections dictate, so the only opportunity for minimisation of same is through Standard Operating Procedures. These are required under condition 2.2.2 (i) regarding minimisation of suspended solids, and are in-place to minimise the generation of silt, which in-turn will minimise the generation of silt pond waste.

**3.2 Power Station Screenings.**
These screenings cannot be minimised as they are a consequence of peat production, stones, timbers and oversize peat materials are naturally occurring on the bog, and are required to be removed prior to processing.

**3.3 Bog Timbers.**
Bog timbers are also naturally occurring materials within a bog and are required to be removed prior for production. The volume of these bog timbers varies from bog to bog and as such their minimisation is not controllable or quantifiable.

**4.0 Treatment**
**4.1 Silt pond excavation material and cleanings.**
The silt pond excavation material and silt cleanings do not require any treatment for its end use which will be either backfilling these silt pond voids as per condition 7.7.1 above as part of the Bog Rehabilitation Plan, or reincorporated into the surrounding peatlands.

**4.2 Power Station Screenings.**
The factory screenings are permitted to be returned to the bog as they were naturally occurring materials from the bog, and as such do not require any treatment to serve this purpose.

**4.3 Bog Timbers**
As per 1.3 above, these timbers are stockpiled at two locations in each bog, as per the attached list of sites and become habitats for various flora and fauna.

**5.0 Recovery**
**5.1 Silt pond excavation material and cleanings.**
Condition 2.2.2 (vi) requires the reuse of silt pond waste to be examined. This was undertaken in 2006, the outcome of which was that this waste peat silt material, as a fuel, was contaminated with sub-soils, rendering it unsuitable for combustion. In addition, volumes are small compared to overall peat production volumes.

**5.2 Power Station Screenings.**
Given the nature of these screenings as outlined in 1.2 above, there is no further use identified and they are permitted to be disposed of back to the bog.

**5.3 Bog Timbers**
Investigations into processing these materials into smaller fractions for potential heating purposes did not yield any viable results. In addition, these older stockpiles are now classified as habitats and as such would not be considered for reuse as a fuel.

**6.0 Disposal**
**6.1 Silt pond excavation material and cleanings.**
Schedule 3 (ii) permits the disposal of silt pond cleanings (Lagoon Sediments) to the bog and these locations, adjacent to the silt pond site, are presented in the attached spreadsheet, with associated grid coordinates.

**6.2 Power Station Screenings.**
Schedule 3 (ii) permits the disposal of screenings (Peat Screenings) to the bog at designated locations agreed under Condition 7.4, and these locations, are presented in the attached spreadsheet, with associated grid coordinates.

**6.3 Bog Timbers**
These naturally occurring bog timbers are stockpiled at locations in each bog, grid coordinates attached.

**7.0 Extractive Waste Management Plan**

**5 (2a)(i)**
The vast majority of peat extraction bogs were all designed and drained for production prior to the 1960's and as such the production fields layout cannot' be altered. Under our Cleaner Reduction Procedures, various design changes have been implemented to the production machines and process to reduce lost peat which eventually is captured in the silt ponds and requires removal as waste peat silt. This along with training and ongoing research and development will continuously reduce waste peat and subsequently waste silt pond cleanings. Bog timbers are present naturally in various volumes and quantities in different bogs and as peat production involves stripping peat in layers, the exposure, generation and removal of these timbers is unavoidable. Work has been undertaken recently into project looking at grinding of these bog timbers in situ using a timber miller, and if this project becomes viable it will contribute to the reduction of bog timbers.

**5 (2a)(ii)**
Given the nature and expanse of peat bogs, the stockpiling and storage of these waste materials do not present a visual, storage or stability problem. As required under Condition 10 of the IPPC Licence, the silt pond excavations and screenings will be utilised to backfill the silt pond voids once the bogs have finished and stabilised in accordance with out Bog Rehabilitation Plan. Storage of these wastes in the interim, open to the elements does not present a change on the nature of these wastes that will threaten the environment or prevent their reuse during the bog rehabilitation process.

**5 (2a)(iii)**
Under Condition 10 of the IPPC Licence, all silt ponds will be decommissioned once the bog surface has stabilised, in agreement with the Agency. This will involve the removal of weirs and flow controls, returning the silt pond back to its original drain or removing the silt pond from the drainage system. Both of these activities will involve placing the silt pond extraction and cleaning material back into the excavation void.

**5 (2a)(iv)**

The peat bogs do not contain any topsoil, so this is not required.

**5 (2a)(v)**
Peat mineral resources do not undergo any treatment.

**5 (2b)**
These three extractive waste are all being reused and recovered back to their original extraction points and have not undergone any physical, chemical, or biological change.

**5 (2c)(i, ii & iii)**
These three extractive wastes, stored on the bog for reuse or recovery during the bog rehabilitation phase, do not require any management or monitoring during the operation of these bogs. Silt pond excavations and cleanings are stored adjacent to the silt pond and quickly revegetated and stabilise, the screenings are graded back into the bog at the agreed locations upon disposal and the bog timbers do not prevent any water or airborne danger to the environment.

**5 (3)**
The three extractive wastes arising from peat extraction operations at this site are classified wastes from mineral non-metalliferous excavation, with an EWC code of 0101 02. The materials are not classified as hazardous under Directive 91/689/EEC20, and do not contain substances or preparations classified as dangerous under Directives 67/548/EEC5 or 1999/45/EC6 above a certain threshold.
The peat excavations and cleanings are stored in locations and in a manner that they could not collapse, and are remote in their nature. The stockpiles are located adjacent to silt ponds that are cleaned regularly and as such these stockpiles are managed and levelled to facilitate further cleanings.
Therefore the material stored at these waste facilities would not be considered to be a Category A waste facility.

**Classification in accordance Annex II.**

| **Waste Material** | Description | **C**lassification | Chemical Process treatment | Deposition description | Transport System |
|---|---|---|---|---|---|
| Silt Pond Excavations and cleanings | Peat and mineral soils associated with peatlands. Stored for reuse during bog rehabilitation, with no displacement of overburden | 01 01 02 | None | Excavated from silt ponds by excavator and deposited adjacent to the silt pond. | Excavator |
| Peat Screenings | Stones, timbers and oversized peat particles, reincorporated into low areas, agreed with the Agency, and stabilized under normal natural bog conditions | 01 01 02 | None | Removed by screen at the factory and transported by tractor and trailer to the designated and agreed locations | Tractor and trailer. |
| Bog Timbers | Pine, Oak and Yew species, stored at locations in each bog. Not subject to any stability issues due to exposure to atmospheric/meteorological conditions. | 01 01 02 | None | Removed from the bog surface by excavator and transported by tractor and trailer to the agreed locations | Tractor and Trailer |

**Description of operations.**
Silt pond excavations arise from the requirement to have silt ponds treating all peat extraction sites. Silt pond cleanings arise from the removal of peat silt from silt ponds as required under IPPC Licence. Bog timbers arise from preparation of the bogs surface for peat production. Estimated quantities of materials are below:

**Closure plan. (Bog Rehabilitation Plan).**
Condition 10.1 – 10.3 of the IPPC Licence requires the following:

- 10.1 Following termination of use or involvement of all or part of the site in the licensed activity, the licensee shall:
- 10.1.1 Decommission, render safe or remove for disposal/recovery, any soil, subsoils, buildings, plant or equipment, or any waste, materials or substances or other matter contained therein or thereon, that may result in environmental pollution.
- 10.1.2 Implement the agreed cutaway bog rehabilitation plan (refer Condition 10.2).

10.2 Cutaway Bog Rehabilitation Plan:

- 10.2.1 The licensee shall prepare, to the satisfaction of the Agency, a fully detailed and costed plan for permanent rehabilitation of the cutaway boglands within the licensed area. This plan shall be submitted to the Agency for agreement within eighteen months of the date of grant of this licence.
- 10.2.2 The plan shall be reviewed every two years and proposed amendments thereto notified to the Agency for agreement as part of the AER. No amendments may be implemented without the written agreement of the Agency.

10.3 The Rehabilitation Plan shall include as a minimum, the following:

- 10.3.1 A scope statement for the plan; to include outcome of consultations with relevant Agencies, Authorities and affected parties (to be identified by the licensee).
- 10.3.2 The criteria which define the successful rehabilitation of the activity or part thereof, which ensures minimum impact to the environment.
- 10.3.3 A programme to achieve the stated criteria.
- 10.3.4 Where relevant, a test programme to demonstrate the successful implementation of the rehabilitation plan.
- 10.3.5 A programme for aftercare and maintenance.

10.4 A final validation report to include a certificate of completion for the Rehabilitation Plan, for all or part of the site as necessary, shall be submitted to the Agency within six months of execution of the plan. The licensee shall carry out such tests, investigations or submit certification, as requested by the Agency, to confirm that there is no continuing risk to the environment. This plan including maps and ecological classifications are available on file at the Ballivor IPPC Licence Coordinators office.
The location in relation to the silt pond excavations and cleanings are adjacent to the silt ponds, which are considered under the Shannon River Basin Management Plan in accordance with the requirements of Directive 2000/60/EC.
Screenings and bog timbers are all naturally occurring elements of peatland and there placement back to the bog in smaller concentrated designated waste facilities does not constitute a risk to the prevention of water compliance.
The lands under where these materials are deposited are peatlands and are un-effected by the placing of this material.

**Review.**
This plan will be reviewed every five years, the first review to take place in September 2017. This review will entail an inspection of these waste facilities to ensure their placing, management, maintenance and stability comply with the requirements of the Extractive Waste Management requirements and condition 7.5, 7.6 and 7.7 of the Ballivor IPPC Licence P0501-01.

# APPENDIX X. MITIGATION MEASURES FOR THE APPLICATION OF FERTILISER

- Any fertiliser used will be Rock Phosphate and will not be applied in the following conditions:
    1. The land is waterlogged;
    2. The land is flooded, or it is likely to flood;
    3. The land is frozen, or covered with snow;
    4. Heavy rain is forecast within 48 hours (forecasts will be checked from Met Éireann).
    5. The ground slopes steeply and there is a risk of water pollution, when factors such as surface run-off pathways, the presence of land drains, the absence of hedgerows to mitigate surface flow, soil condition and ground cover are taken into account.
- No fertiliser will be spread on land within 2 metres of a surface watercourse.
- Buffer zones in respect of waterbodies, as specified on https://www.epa.ie/about/faq/name,57156,en.html, will be adhered with at all times with regard to fertiliser application. Reproduced as follows:

| Water body / Feature | Buffer zone |
|---|---|
| Any water supply source providing 100m$^3$ or more of water per day, or serving 500 or more people | 200 metres (or as little as 30 metres where a local authority allows) |
| Any water supply source providing 10m$^3$ or more of water per day, or serving 50 or more people | 100 metres (or as little as 30 metres where a local authority allows) |
| Any other water supply for human consumption | 25 metres (or as little as 30 metres where a local authority allows) |
| Lake shoreline | 20 metres |
| Exposed cavernous or karstified limestone features (such as swallow holes or collapse features) | 15 metres |
| Any surface watercourse where the slope towards the watercourse exceeds 10% | 10 metres |
| Any other surface waters | 5 metres* |

## APPENDIX XI. CONSULTATION SUMMARIES

**Table APXI -1 Consultees contacted**

| Bog Name | Contact Organisation | Contact Name | Date of Issue | Format | Date Response Received | Response Format |
|---|---|---|---|---|---|---|
| Carranstown | Department of Housing, Local Government and Heritage NPWS | Multiple Staff Members | 23/11/2021 | Email | 23/11/2021 | Email |
| Carranstown | National Museum of Ireland | Multiple Staff Members | 23/11/2021 | Email | 24/11/2021 | Email |
| Carranstown | Department of Housing, Local Government and Heritage | General Email Contact | 23/11/2021 | Email | | |
| Carranstown | Dept of Agriculture Food & the Marine | General Email Contact | 23/11/2021 | Email | | |
| Carranstown | Department of Environment, Climate and Communications | Multiple Staff Members | 23/11/2021 | Email | | |
| Carranstown | Dept of Rural and Community Development | General Email Contact | 23/11/2021 | Email | | |
| Carranstown | Department of the Housing Local Government and Heritage | General Email Contact | 23/11/2021 | | | |
| Carranstown | Minister for Environment, Climate and Communications | Minister - Eamon Ryan | 23/11/2021 | Email | | |
| Carranstown | Minister of state for Agriculture with responsibility for Land use and Biodiversity | Pippa Hackett Minister of State for Land Use and Biodiversity) | 23/11/2021 | Email | | |

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|---|---|---|---|---|---|---|
| Carranstown | Oireachtas | Danielle McDonnell (Minister Malcolm Noonan Secretary) | 23/11/2021 | Email | 24/11/2021 | Email |
| Carranstown | An Taisce | General Email Contact | 23/11/2021 | Email | | |
| Carranstown | Environmental Protection Agency | Multiple Staff Members | 23/11/2021 | Email | | |
| Carranstown | Inland Fisheries Ireland | General Email Contact | 23/11/2021 | Email | | |
| Carranstown | Local Authority Waters Programme | Multiple Staff Members | 23/11/2021 | Email | | |
| Carranstown | NWRA | General Email Contact | 23/11/2021 | Email | | |
| Carranstown | Teagasc | General Email Contact | 23/11/2021 | Email | | |
| Carranstown | The Heritage Council | General Email Contact | 23/11/2021 | Email | | |
| Carranstown | Waterways Ireland | General Email Contact | 23/11/2021 | Email | | |
| Carranstown | An Forum Uisce (The Water Forum) | General Email Contact | 23/11/2021 | Email | | |
| Carranstown | Coillte | Multiple Staff Members | 23/11/2021 | Email | | |
| Carranstown | Irish Water | General Email Contact | 23/11/2021 | Email | 21/12/2021 | Email |
| Carranstown | Office of Public Works | Multiple Staff Members | 23/11/2021 | Email | 23/11/2021, 29/11/2021 & 10/12/2021 | Email |
| Carranstown | NGOs | General Email Contact | 23/11/2021 | Email | | |
| Carranstown | CARO (Climate Action Regional Office) Eastern and Midlands | General Email Contact | 23/11/2021 | Email | | |
| Carranstown | Bat Conservation Ireland | General Email Contact | 23/11/2021 | Email | | |

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|---|---|---|---|---|---|---|
| Carranstown | Birdwatch Ireland | General Email Contact | 23/11/2021 | Email | | |
| Carranstown | Butterfly Conservation Ireland | General Email Contact | 23/11/2021 | Email | | |
| Carranstown | Eastern and Midland Regional Assembly | General Email Contact | 23/11/2021 | Email | | |
| Carranstown | Fisheries Ireland | General Email Contact | 23/11/2021 | Email | | |
| Carranstown | Friends of the Earth | General Email Contact | 23/11/2021 | Email | | |
| Carranstown | Friends of the Irish Environment | General Email Contact | 23/11/2021 | Email | | |
| Carranstown | ICMSA (Irish Creamery Milk Suppliers Association) | General Email Contact | 23/11/2021 | Email | | |
| Carranstown | ICSA (Irish Cattle and Sheep Farmers Association | General Email Contact | 23/11/2021 | Email | | |
| Carranstown | Irish Farmers Association | General Email Contact | 23/11/2021 | Email | 13/12/2021 | Email |
| Carranstown | Irish Peatlands Conservation Council | General Email Contact | 23/11/2021 | Email | | |
| Carranstown | Irish Raptor Study Group | General Email Contact | 23/11/2021 | Email | | |
| Carranstown | Irish Rural Link (Community Wetlands Forum) | General Email Contact | 23/11/2021 | Email | | |
| Carranstown | Irish Rural Link | General Email Contact | 23/11/2021 | Email | | |
| Carranstown | Irish Wildlife Trust | General Email Contact | 23/11/2021 | Email | | |
| Carranstown | National Association of Regional Game Councils | General Email Contact | 23/11/2021 | Email | | |
| Carranstown | NPWS Rangers North East | General Email Contact | 23/11/2021 | Email | | |
| Carranstown | NUIG Galway | General Email Contact | 23/11/2021 | Email | | |

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|---|---|---|---|---|---|---|
| Carranstown | PPN Westmeath Public Participation Network | General Email Contact | 23/11/2021 | Email | | |
| Carranstown | Ranger Association Committee | General Email Contact | 23/11/2021 | Email | | |
| Carranstown | Shannon Flood Risk State Agency Co-ordination Working Group | General Email Contact | 23/11/2021 | Email | | |
| Carranstown | Sustainable Water Action Network (SWAN) | General Email Contact | 23/11/2021 | Email | | |
| Carranstown | Trinity College Dublin | General Email Contact | 23/11/2021 | Email | 23/11/2021 | Email |
| Carranstown | Turf Cutters and Contractors Association | General Email Contact | 23/11/2021 | Email | | |
| Carranstown | UCD / Irish Rural Link | General Email Contact | 23/11/2021 | Email | | |
| Carranstown | University College Dublin | General Email Contact | 23/11/2021 | Email | | |
| Carranstown | Waterways Ireland | General Email Contact | 23/11/2021 | Email | | |
| Carranstown | Woodlands of Ireland | General Email Contact | 23/11/2021 | Email | | |
| Carranstown | Westmeath Tidy Towns | General Email Contact | 23/11/2021 | Email | | |
| Carranstown | TD/Longford | Peter Burke | 23/11/2021 | Email | | |
| Carranstown | TD/Longford | Sorca Clarke | 23/11/2021 | Email | | |
| Carranstown | TD/Longford | Joe Flaherty | 23/11/2021 | Email | | |
| Carranstown | TD/Longford | Robert Troy | 23/11/2021 | Email | | |
| Carranstown | Westmeath County Councillors - Chief Exec | Pat Gallagher | 23/11/2021 | Email | | |
| Carranstown | Westmeath County Councillors - Director of Service | Barry Kehoe | 23/11/2021 | Email | | |

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|---|---|---|---|---|---|---|
| Carranstown | Westmeath County Councillors - Director of Service | Mark Keaveney | 23/11/2021 | Email | | |
| Carranstown | Westmeath County Councillors - | Deirdre Reilly | 23/11/2021 | Email | | |
| Carranstown | Westmeath County Councillors - Mullingar-Kinnegad | John Shaw | 23/11/2021 | Email | | |
| Carranstown | Westmeath County Councillors - Mullingar-Kinnegad | Emily Wallace | 23/11/2021 | Email | | |
| Carranstown | Westmeath County Councillors - Mullingar-Kinnegad | Andrew Duncan | 23/11/2021 | Email | | |
| Carranstown | Westmeath County Councillors - Mullingar-Kinnegad | Michael Dollard | 23/11/2021 | Email | | |
| Carranstown | Westmeath County Councillors - Mullingar-Kinnegad | Aoife Davitt | 23/11/2021 | Email | | |
| Carranstown | Westmeath County Councillors - Mullingar-Kinnegad | Denis Leonard | 23/11/2021 | Email | | |
| Carranstown | Westmeath County Councillors - Mullingar-Kinnegad | Ken Glynn | 23/11/2021 | Email | | |
| Carranstown | Westmeath County Councillors - Mullingar-Kinnegad | Hazel Smyth | 23/11/2021 | Email | | |
| Carranstown | Westmeath County Councillors - Mullingar-Kinnegad | Billy Collentine | 23/11/2021 | Email | | |
| Carranstown | Westmeath County Councillors - Mullingar-Kinnegad | Frank McDermott | 23/11/2021 | Email | | |

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|---|---|---|---|---|---|---|
| Carranstown | Westmeath County Councillors - Mullingar-Kinnegad | Paddy Hill | 23/11/2021 | Email | | |
| Carranstown | Minister of State at the Department of Housing, Local Government and Heritage | Peter Burke (Longford-Westmeath) | 23/11/2021 | Email | | |
| Carranstown | TD Longford-Westmeath | Sorca Clarke | 23/11/2021 | Email | | |
| Carranstown | TD Longford-Westmeath | Joe Flaherty | 23/11/2021 | Email | | |
| Carranstown | Minister of State at the Department of Enterprise, Trade and Employment | Robert Troy (Longford-Westmeath) | 23/11/2021 | Email | | |
| Carranstown | TD Meath West | Damien English | 23/11/2021 | Email | | |
| Carranstown | TD Meath West | Johnny Guirke | 23/11/2021 | Email | | |
| Carranstown | TD Meath West | Peadar Toibin | 23/11/2021 | Email | | |
| Carranstown | Meath County Councillors - Trim | Joe Fox | 23/11/2021 | Email | | |
| Carranstown | Meath County Councillors - Trim | Niamh Souhan | 23/11/2021 | Email | | |
| Carranstown | Meath County Councillors - Trim | Aisling Dempsey | 23/11/2021 | Email | | |
| Carranstown | Meath County Councillors - Trim | Noel French | 23/11/2021 | Email | | |
| Carranstown | Meath County Councillors - Trim | Trevor Golden | 23/11/2021 | Email | | |
| Carranstown | Meath County Councillors - Trim | Ronan Moore | 23/11/2021 | Email | | |
| Carranstown | All Land- owners in vicinity of bog | Leaflet Drop | | Leaflet | | |
| Carranstown | All stakeholders with turbary rights | Leaflet Drop | | Leaflet | | |

**Table APXI -2 Response summary from Consultees contacted**

| Organisation | Summary of Response by Stakeholder | BnM Response |
|---|---|---|
| Irish Water | Irish Water made submissions on multiple PCAS bogs including Carranstown Bog, raising the following points:<br>1) IW wished to express support for PCAS<br>2) IW recognised the potential for beneficial impacts of bog rehabilitation on drinking water supplies<br>3) IW expressed the need to list the potential benefits of PCAS to regional drinking water supplies within the rehabilitation plans<br>4) IW expressed need for strong monitoring protocols initially and post restoration<br>5) IW advised protection of drinking water sources be afforded special consideration, welcomed the planned maintenance of silt-ponds and requested they be consulted if decommissioning of silt-ponds proves necessary | BnM acknowledged the submission from IW and responded to the queries raised within the same.<br>Dialogue is ongoing |
| Irish Farmers Association | The IFA made a submission on Carranstown Bog 13/12/2021 raising the following points:<br>1) Acknowledging need to protect the environment and manage national peatlands<br>2) Expressing concern about possible impact of peatland rehabilitation on surrounding farmlands, specifically around the following:<br>(a) Flooding/waterlogging of surrounding areas and development of new flood plains.<br>(b) Health and Safety risks if water levels in drains and depressions rise then these could become a hazard for livestock, machinery operation and farmer access.<br>(c) Negative impact on Property Values due to accumulation of risks outlined above.<br>(d) Contingency Planning for potential future ownership of designated bogs in ensuring no negative impacts on property from any new ownership. | BnM responded on 16/12/2021 to address the concerns of raised by the IFA.<br>Site visit to Pollagh Bog in July 2021 to demonstrate rehab measures and discuss PCAS.<br>Dialogue is ongoing between BnM and the IFA. |

| | | |
|---|---|---|
| | (e) Protection of existing Turf Cutting rights and resolution of any issues around same.<br><br>The IFA made a number of proposals to be considered as potential solutions to queries raised. | |
| Office of Public Works | Submission received from OPW on 10/12/2021 that was supportive of the measures being undertaken and the benefits arising but also requested clarification on the following:<br>1) Clarification on any potential impacts or constraints on the OPW carrying out normal Arterial Drainage maintenance activities on the OPW scheme channels, adjacent to the south, west and north boundary of Carranstown Bog as a result of PCAS activities.<br>2) The OPW reiterated that Carranstown Bog is within the "Benefited Bog lands" of the Boyne Arterial Drainage Scheme.<br>3) The OPW also wished to clarify if BnM envisaged that the OPW might be required to offer drainage maintenance support to Carranstown Bog and the associated drainage infrastructure post rehabilitation. | BnM responded on 15/12/2021 acknowledging the submission by OPW.<br>BnM advised that as part of Carranstown Bog rehabilitation, BnM do not envisage any impacts or constraints which would restrict OPW from carrying out its ADM activities.<br>BnM also advised that no requirement for OPW drain maintenance activities to support the hydrological requirements of Bord na Mona's lands at Carranstown Bog is envisaged. |
| Office of Public Works | Submission received 26/11/2021 providing locations of channels OPW are responsible for maintain and outlining statutory obligation to maintain.<br>The submission states that the OPW require an access route to be provided for maintenance work. They also advise that new culverts/bridges on any watercourse or changes to existing structures or drainage channels require Section 50 consent from the Office of Public Works. | Acknowledged via e-mail by BnM on 03/12/2021.<br>Dialogue is ongoing. |

| | | |
|---|---|---|
| National Museum of Ireland | Response received 24/11/2021 acknowledging receipt of email and thanking us for making the opportunity to respond.<br>Responded through e-mail throughout 2020/21 in relation to all PCAS bogs. Issues raised were;<br>1) The request that due diligence be taken during works to protect any archaeologically significant findings or areas<br>2) The NMI reiterated the importance of peatlands for the preservation of archaeology and requested they be consulted as part of any EIA undertaken | BnM acknowledged on 25/11/2021. Dialogue is ongoing. |
| Department of Housing, Local Government and Heritage | Acknowledgement e-mail from department received 24/11/2021 to inform BnM of receipt of consultation. | Dialogue is ongoing |
| Trinity College Dublin | TCD contacted BnM on 23/11/2021 thanking BnM for information on the PCAS scheme and expressing interest in examining the documents in more detail. TCD also requested further information on separate PCAS project bogs. | BnM responded on 23/11/2021 providing internet address resources and instructions on how to access the desired information. |
| Private Individual/Local resident A | Stakeholder expressed concerns regarding; potential impacts of rising water levels on nearby property, fire risk the impact of heavier footfall and traffic that might arise if the amenity development was considered on the bog post rehabilitation. | BnM responded by telephone on 31/12/2021 to address these concerns. Individual was happy with response but asked to be kept updated when works progress. |

| | | |
|---|---|---|
| Private Individual/Local resident B | Response received 23/11/2021 asking for clarification on location of proposed wind farm in Carranstown. | BnM responded on 24/11/2021 to provide website addresses to the wind turbine locations on the Ballivor Windfarm website along with contact details for the BnM Ballivor Community Liaison Officer. |

# APPENDIX XII. ARCHAEOLOGY

## Role of the Archaeological Liaison Officer

1. To communicate this Code of Practice and the *Archaeological Protection Procedures* (Appendix IV) to all personnel operating on the bog.

2. To ensure that all notices relating to the *Archaeological Protection Procedures* are posted and maintained at appropriate locations on the bog.

3. To report any stray finds, presented to the Liaison Officer from his/her group of bogs, to the Duty Officer of the National Museum of Ireland.

4. To provide for the appropriate protection of the stray find, whether in-situ or removed from the bog, as directed by the Duty Officer of the National Museum of Ireland.



Code of Practice

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Code of Practice

5. To arrange for the delivery or collection of the stray find, as directed by the Duty Officer of the National Museum of Ireland.

6. To complete the Report of Discovery of Archaeological Object(s) in Bogs (Appendix V), as directed by the Duty Officer of the National Museum of Ireland.

7. To maintain a file of all stray finds and associated documentation and provide copies to the Project Archaeologist.

8. To provide assistance, where required, to the Department during archaeological surveys.

9. To provide assistance, where required, to Bord na Móna's Consultant Archaeologists, during investigation and mitigation of monuments.

10. To report to the Bord na Móna members on the Archaeology Management Liaison Committee any planned developments or new activities on cutaway peatland areas within his/her group of bogs.



| Bord na Móna | **Procedure: ENV017** | **Rev: 1** |
|---|---|---|
| **Title: Archaeological Findings** | **Approved: EM** | **Date:** |

**1) Purpose**

The purpose of this procedure is to describe the arrangements in Bord na Móna for findings of Archaeological material (Stray Finds).

**All objects, sites or monuments, no matter how fragmentary, are important elements of our heritage.**

**2) Procedure**

1. Check whether there are any known archaeological monuments in your area.
2. Be vigilant at all times - objects or traces of structures can be found on the field surfaces, in the drain faces, on the bog margins or caught within the mechanics of machinery.
3. If an object is found leave it in place, if it is safe to do so, note its position and immediately contact your Archaeological Liaison Officer who will assess the situation and contact the Duty Officer of the National Museum of Ireland.
4. Resist the temptation to investigate the find spot as this may disturb fragile archaeological deposits.
5. If the object is already dislodged or is in imminent danger, remove it carefully, mark its find spot and report it immediately to your Archaeological Liaison Officer.
6. Objects made of wood, leather or textile, which are removed from peat should be kept in conditions similar to those in which they are found. This can be done by packing them in peat or, if waterlogged, placing them in a clean basin of water and sealing the container. Resist the temptation to clean or remove peat from the object.
7. If timbers or other materials, such as gravel or stones, which could be part of a man-made structure are noted on the bog, mark the location and report it immediately to your Archaeological Liaison Officer. If you suspect the find is of archaeological importance, resist the temptation to expose it any further as this could result in damage to the structure.
8. Report anything that looks unnatural in the bog – your Archaeological Liaison Officer will decide whether it should be referred to the appropriate authorities.

**NOTE:** Our archaeological heritage is a finite, non-renewable resource. Once a site is destroyed its information is lost forever and we have lost the chance to understand a little more about our past, where we have come from and perhaps the opportunity to learn for the future.

Your Archaeological Liaison Officer is ……

**3) Records**

| Revision Index | | | |
|---|---|---|---|
| Revision | Date | Description of change | Approved |
| 1 | | | |
| 2 | | | |

# Archaeological Impact Assessment of Proposed Bog Decommissioning and Rehabilitation at Carranstown Bog, Cos. Meath and Westmeath

**Draft**

**Report For**

**Bord Na Móna Energy Ltd.**

**Author**

**Dr. Charles Mount**

**Bord Na Móna Project Archaeologist**

## Introduction

The EPA (2020) *Guidance on the process of preparing and implementing a bog rehabilitation plan* notes that the licensee should characterise the bog prior to embarking on detailed planning and implementation. This characterisation should detail how the land is classified in terms of statutory protections, e.g. as European sites, world heritage sites, RAMSAR sites, National Heritage Areas, national monuments, archaeological heritage, etc. This archaeological impact assessment report was prepared by Dr. Charles Mount for Bord na Móna Energy Ltd to fulfil this characterisation in relation to archaeological heritage. It represents the results of a desk-based assessment of the impact of proposed bog rehabilitation of c.305 hectares at Carranstown Bog, Cos. Meath and Westmeath on the known archaeological heritage of the bog. The proposed rehabilitation actions will be a combination of measures to create wetlands and re-wet deep peat as outlined in the draft Methodology Paper for the proposed Bord na Móna Decommissioning, Rehabilitation and Restoration Scheme. These enhanced measures for Carranstown Bog will include:

- Deep Peat measures including field re-profiling, bunding and drain-blocking, resulting in bunded wetlands suitable for Sphagnum inoculation, on deeper peat;
- Intensive drain blocking around shallow peat areas / modelled depressions on little or no peat to create/promote the spread of wetland habitats,
- Modifying outfalls, and management of water levels with overflow pipes and blocking of internal outfalls;
- Regular drain blocking (3/100) on dry cutaway along with the blocking of outfalls and management of water levels;
- Intensive drain blocking (7/100) in areas to develop wetlands in areas of shallow peat. Measures include the blocking of outfalls, management of water levels and transplanting reeds and other rhizomes;
- Berms and field re-profiling (45m x 60m cell) in deep peat areas, along with blocking outfalls and managing overflows with a controlled weir outfall, includes drainage channels for excess water and Sphagnum inoculation;
- Targeted fertiliser applications to accelerate vegetation establishment on areas of bare peat on headlands and high fields, and within certain areas of dry cutaway. Areas where vegetation has established do not need fertiliser application.
- Seeding of vegetation and inoculation of Sphagnum will be undertaken where required.

Carranstown Bog is located c.1.7km northwest of Ballivor, Co. Meath, and north of the R156 road. The overall rehabilitation area occupies the townlands of Grangemore, Co. Westmeath and Carranstown Great and Little and Killaconnigan, Co. Meath on OS 6 inch sheets Meath No. 35 and Westmeath No. 21.

## Methodology

This is a desk-based archaeological assessment that includes a collation of existing written and graphic information to identify the likely archaeological potential of Carranstown Bog. The overall extent of the rehabilitation is indicated in Fig. 1. This area was examined using information from:

- Archaeological Survey of Ireland Peatland 2005
- The Sites and Monuments Record that is maintained by the Dept of Housing, Local Government and Heritage
- The topographical files of the National Museum of Ireland.
- The Excavations database
- Previous assessments

An impact assessment has been prepared and recommendations have been made.

## Desktop assessment

**Recorded Monuments**

The Record of Monuments and Places (RMP) for Cos. Meath and Westmeath which was established under Section 12 of the National Monuments (Amendment) Act, 1994 was examined as part of the assessment (DAHGI 1996 and 1997). These records were published by the Minister in 1996 and 1997 and includes sites and monuments that were known in Carranstown Bog before that date. This review established that there are no RMPs located in the proposed rehabilitation area (see Fig. 1).

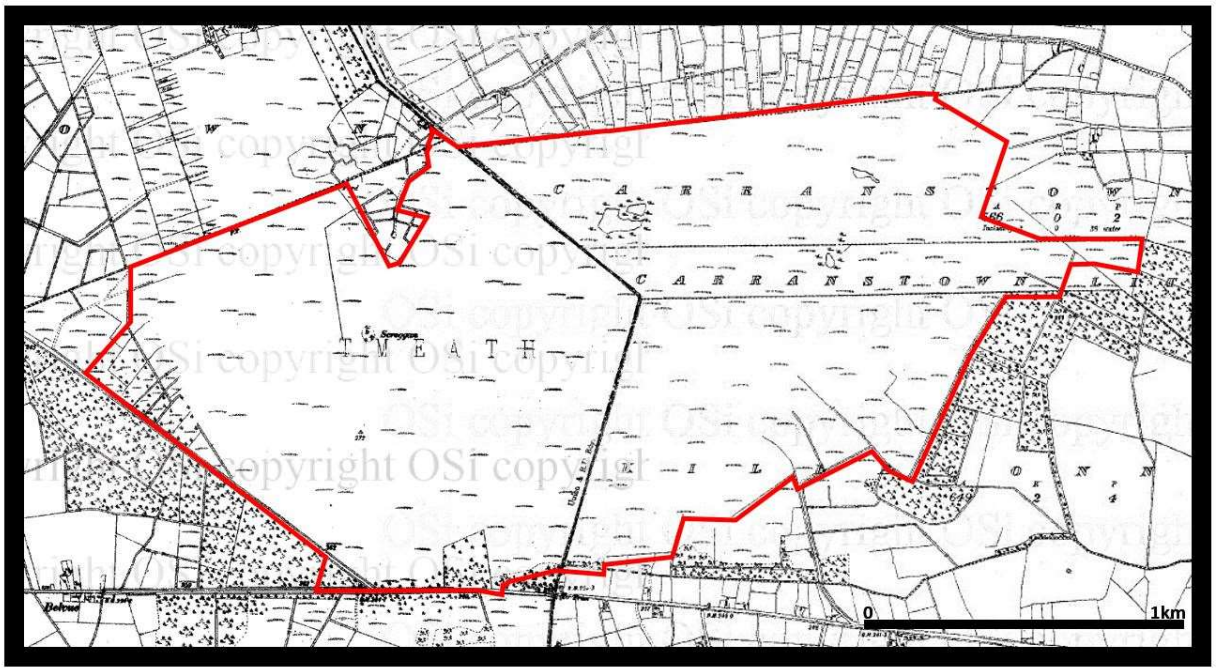


Fig. 1. Carranstown Bog, Co. Offaly, detail of the Record of Monuments and Places map sheets Meath No. 35 and Westmeath No. 21. The proposed rehabilitation area is outlined with the red line. There are no Recorded Monuments in the rehabilitation area.

**Archaeological Survey of Ireland Peatland 2005**

In 2005 Carranstown Bog was the subject of a peatland survey (Licence No. 05E0794). The bog was field walked by ADS Ltd at two drain intervals with the exception of the overgrown area which was walked at roughly 30m intervals. No archaeological material was recorded during this survey (Whitaker 2005, 12).

**Sites and Monuments Record**

The Sites and Monuments Record (SMR) which is maintained by the Department of Housing, Local Government and Heritage was examined as part of the assessment on the 16th of November 2021. The SMR consists of records included in the RMP and sites and monuments notified to the Dept. since the publication of the RMP. This review established that there are no entries in the SMR in the proposed rehabilitation area (see Fig. 2).

**Reported finds**

The topographical files of the National Museum of Ireland were searched for records of finds from the bog in x 2021. There have been no finds reported to the Museum from the rehabilitation area.




Fig. 2. Carranstown Bog, Cos Meath and Westmeath, detail of the Sites and Monuments Record. The proposed rehabilitation area is outlined with the red line. There are no SMRs in the rehabilitation area.

**Archaeological investigations**

Reports of archaeological excavations and licensed monitoring in the study area listed in the excavations database at excvations.ie were examined as part of the assessment. There are no additional reports of archaeological investigation carried out in the rehabilitation area.

**Previous assessments**

Carranstown Bog has been the subject of an Environmental Impact Assessment Report caried out by Irish Archaeological Consultancy LTD in 2018 for Bord na Móna Energy Limited in relation to IPC Licence P0500-01. The assessment noted that no archaeological material has been identified in Carranstown Bog and noted that there was a potential for archaeological features to be uncovered during the course of any future development works in the bog.

## Impact assessment

There is no known archaeological material in Carranstown Bog.

## Recommendations

There is no known archaeological material in Carranstown Bog. Should any previously unknown archaeological material be uncovered during the rehabilitation works, it should be avoided and reported to the Bord na Móna Archaeological Liaison Officer and the National Museum of Ireland.

## Conclusion

This is a desk-based archaeological assessment and includes a collation of existing written and graphic information to identify the likely archaeological potential of the proposed rehabilitation area. There is no known archaeological material in Carranstown Bog. Should any previously unknown archaeological material be uncovered during the rehabilitation works, it should be avoided and reported to the Bord na Móna Archaeological Liaison Officer and the National Museum of Ireland.

## References

DAHGI 1996. Recorded Monuments Protected under Section 12 of the National Monuments (Amendment) Act, 1994. County Meath.

DAHGI 1997. Recorded Monuments Protected under Section 12 of the National Monuments (Amendment) Act, 1994. County Westmeath.

EPA 2020. Guidance on the process of preparing and implementing a bog rehabilitation plan.

Whitaker, J. 2006. Peatland Survey 2005 Allen, Kilberry & Coolnamóna Bogs Counties Kildare, Laois, Meath, Offaly, & Westmeath. Unpublished report for the Department of the Environment, Heritage and Local Government.

Dr. Charles Mount
18 November 2021

# APPENDIX XIII. INITIAL WATER QUALITY DATA FROM CARRANSTOWN

Table AP13.1. Water quality data for 12 months from November 2020 to Dec 2021 at Carranstown.

| PCAS SW Sampling Scheme | | | | | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bog Group | Licence No | Bog Name | Unique I.D No. | SW Code - | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l |
| | | | | | 1/11/20 | 1/1/21 | 1/3/21 | 1/4/21 | 1/5/21 | 1/6/21 | 1/7/21 | 1/8/21 | 1/9/21 | 1/10/21 | 1/11/21 | 1/12/21 |
| Derrygreenagh | P0501-01 | Carranstown | 236 | SW32 | 3 | 15 | 2 | 2 | 2 | 4 | 5 | 2 | 2 | 2 | 13 | 2 |
| | | | | | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 |
| | | | | | | | | | | | | | | | | |
| | | | | | Colour | Colour | Colour | Colour | Colour | Colour | Colour | Colour | Colour | Colour | Colour | Colour |
| | Licence No | Bog Name | Unique I.D No. | SW Code - | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co |
| | | | | | 1/11/20 | 1/1/21 | 1/3/21 | 1/4/21 | 1/5/21 | 1/6/21 | 1/7/21 | 1/8/21 | 1/9/21 | 1/10/21 | 1/11/21 | 1/12/21 |
| | P0501-01 | Carranstown | 236 | SW32 | 312 | 433 | 131 | 352 | 469 | 396 | 301 | 329 | 185 | 318 | 364 | 312 |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | COD | COD | COD | COD | COD | COD | COD | COD | COD | COD | COD | COD |
| | Licence No | Bog Name | Unique I.D No. | SW Code - | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l |
| | | | | | 1/11/20 | 1/1/21 | 1/3/21 | 1/4/21 | 1/5/21 | 1/6/21 | 1/7/21 | 1/8/21 | 1/9/21 | 1/10/21 | 1/11/21 | 1/12/21 |
| | P0501-01 | Carranstown | 236 | SW32 | 56 | 74 | 35 | 90 | 95 | 90 | 84 | 99 | 46 | 88 | 83 | 82 |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | pH | pH | pH | pH | pH | pH | pH | pH | pH | pH | Ph | Ph |
| | Licence No | Bog Name | Unique I.D No. | SW Code - | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units |
| | | | | | 1/11/20 | 1/1/21 | 1/3/21 | 1/4/21 | 1/5/21 | 1/6/21 | 1/7/21 | 1/8/21 | 1/9/21 | 1/10/21 | 1/11/21 | 1/12/21 |
| | P0501-01 | Carranstown | 236 | SW32 | 6.5 | 6.6 | 7.6 | 7.6 | 7.2 | 6 | 7.6 | 7.5 | 7.6 | 7.5 | 7.3 | 7.3 |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P |
| | Licence No | Bog Name | Unique I.D No. | SW Code - | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l |
| | | | | | 1/11/20 | 1/1/21 | 1/3/21 | 1/4/21 | 1/5/21 | 1/6/21 | 1/7/21 | 1/8/21 | 1/9/21 | 1/10/21 | 1/11/21 | 1/12/21 |
| | P0501-01 | Carranstown | 236 | SW32 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.09 | 0.06 | 0.05 | 0.07 | 0.05 | 0.05 | 0.05 |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | TS | TS | TS | TS | TS | TS | TS | TS | TS | TS | TS | TS |
| | Licence No | Bog Name | Unique I.D No. | SW Code - | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l |
| | | | | | 1/11/20 | 1/1/21 | 1/3/21 | 1/4/21 | 1/5/21 | 1/6/21 | 1/7/21 | 1/8/21 | 1/9/21 | 1/10/21 | 1/11/21 | 1/12/21 |
| | P0501-01 | Carranstown | 236 | SW32 | 156 | 105 | 132 | 345 | 182 | 127 | 326 | 337 | 350 | 293 | 224 | 269 |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N |
| | Licence No | Bog Name | Unique I.D No. | SW Code - | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l |
| | | | | | 1/11/20 | 1/1/21 | 1/3/21 | 1/4/21 | 1/5/21 | 1/6/21 | 1/7/21 | 1/8/21 | 1/9/21 | 1/10/21 | 1/11/21 | 1/12/21 |
| | P0501-01 | Carranstown | 236 | SW32 | 0.041 | 0.396 | 0.064 | 0.375 | 0.458 | 0.051 | 0.182 | 0.166 | 0.137 | 0.258 | 0.324 | 0.468 |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | DOC | DOC | DOC | DOC | DOC | DOC | DOC | DOC | DOC | DOC | DOC | DOC |
| | Licence No | Bog Name | Unique I.D No. | SW Code - | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l |
| | | | | | 1/11/20 | 1/1/21 | 1/3/21 | 1/4/21 | 1/5/21 | 1/6/21 | 1/7/21 | 1/8/21 | 1/9/21 | 1/10/21 | 1/11/21 | 1/12/21 |
| | P0501-01 | Carranstown | 236 | SW32 | 28.2 | 23 | 14.2 | 33.4 | 34.3 | 29.9 | 31.2 | 66.9 | 31.1 | 30.3 | 33.5 | 32.8 |

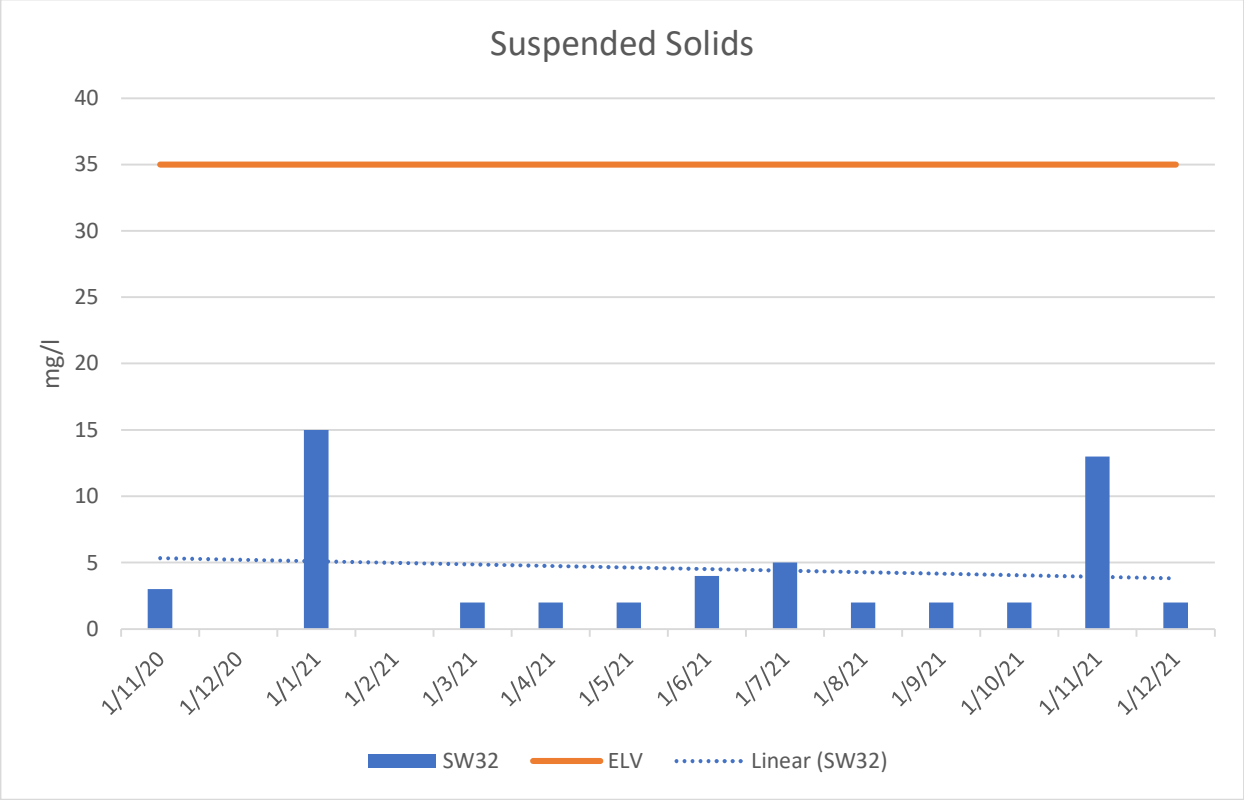


Figure AP13.1. Suspended solids in water sampling at Carranstown from different discharge points.35 mg/l is the emission limit value.

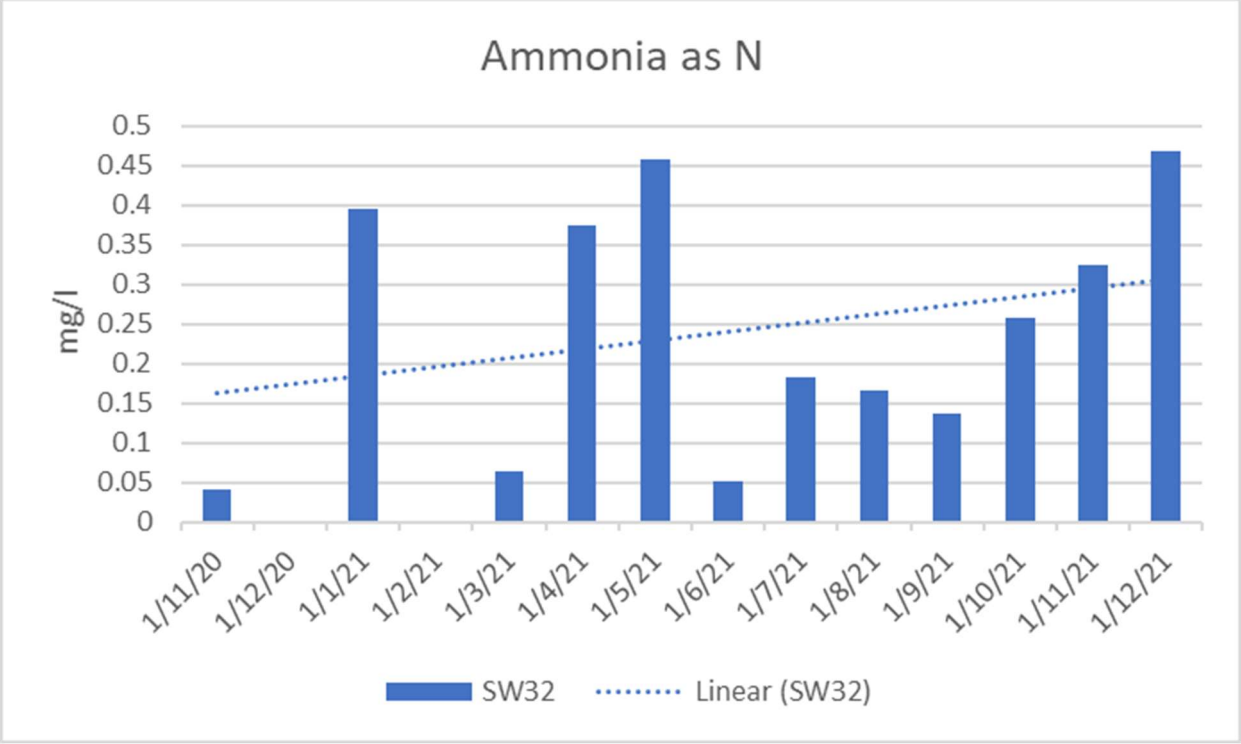


Figure AP13.2. Ammonia concentrations in water sampling from Carranstown from different discharge points. The main trigger level for ammonia is 1.42mg/l for reporting to EPA.

Bord na Móna

# Carranstown Bog
# Rehab Plan
# GIS Map Book
# 2022

MAKING COMPLEX EASY

| Document Control Sheet | |
|---|---|
| Document Name: | Carranstown Bog Rehab Plan GIS Map Book 2022 |
| Document File Path: | |
| Document Status: | Final v1.0 |

| This document comprises: | DCS | TOC | Text (Body) | References | Maps | No. of Appendices |
|---|---|---|---|---|---|---|
| | 1 | 1 | 0 | 0 | 15 | 0 |

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|---|---|---|---|
| Name(s): | LB | | |
| Date: | 26/10/2021 | | |

| Rev. 0.2 | Author(s): | Checked By: | Approved By: |
|---|---|---|---|
| Name(s): | LB | DK | DK |
| Date: | 19/11/2021 | 22/11/2021 | 22/11/2021 |
| **Rev. 0.1** | **Author(s):** | **Checked By:** | **Approved By:** |
| Name(s): | LB | ML | MMC |
| Date: | 23/02/2022 | 23/02/2022 | 23/02/2022 |

*Bord na Móna would like to thank and acknowledge RPS Consultants for their input into this document and the provision of data for inclusion in these maps.*

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# Bog Site Information Maps

**BNM-DR-23-20-01: Site Location Map**

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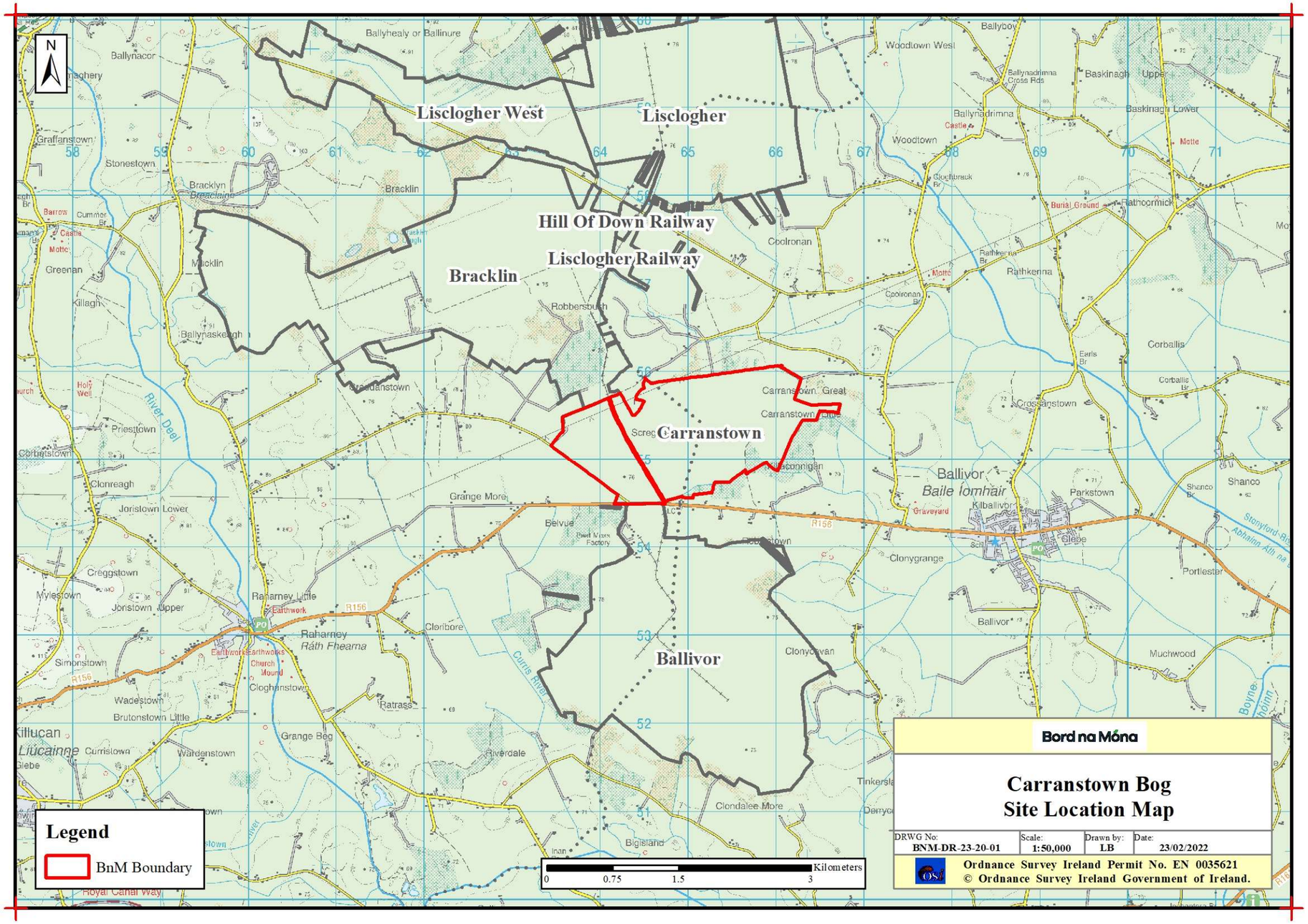

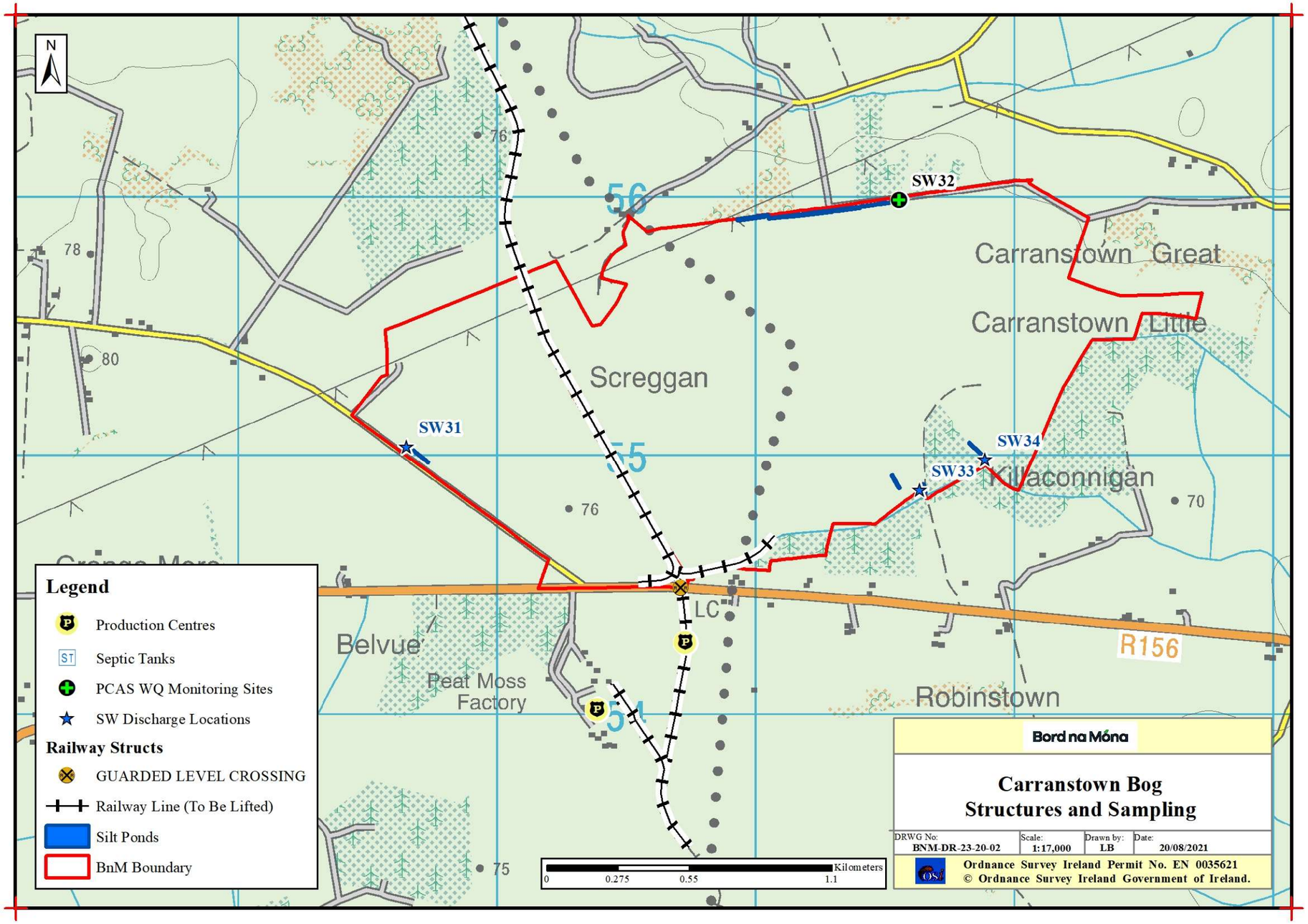
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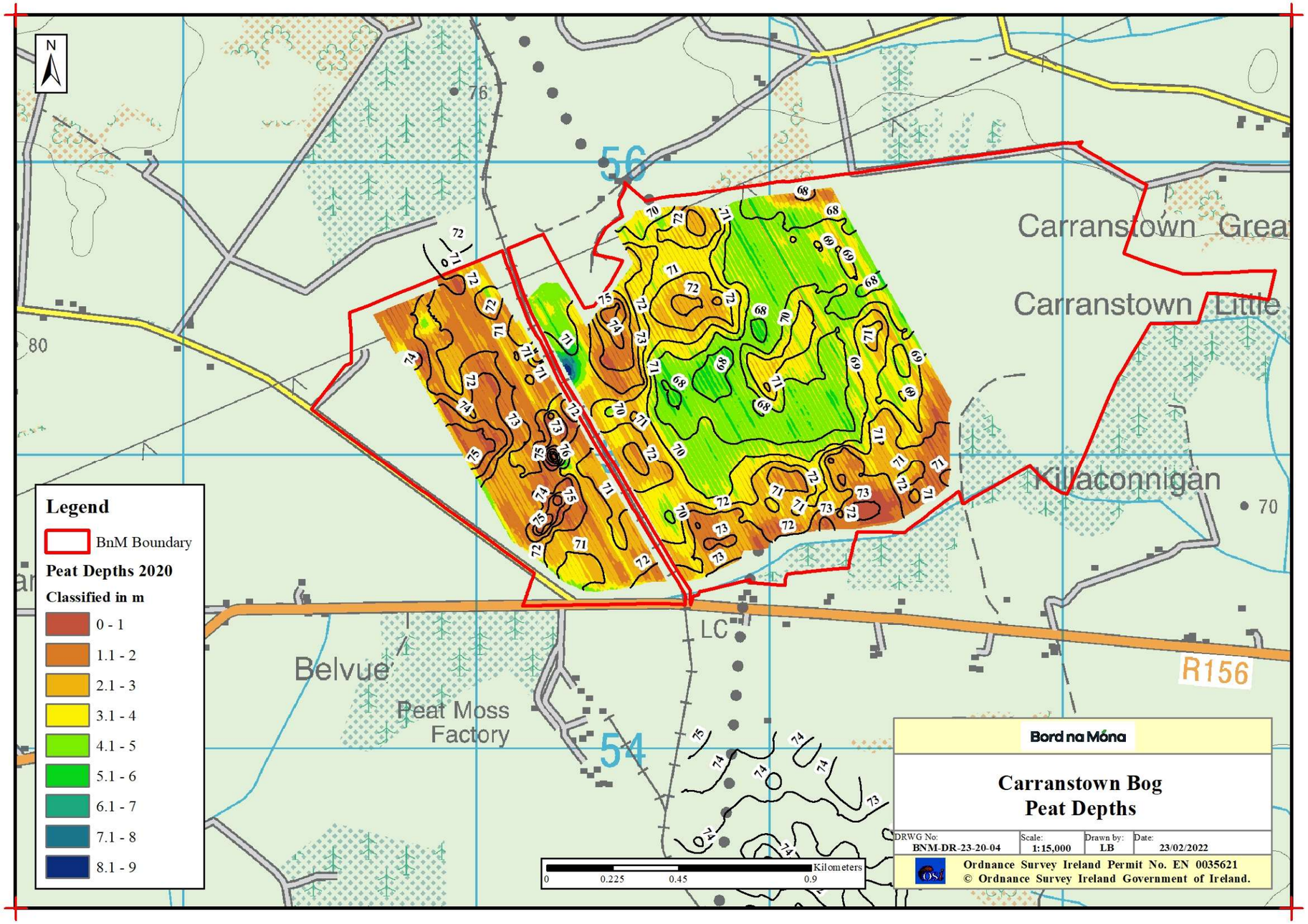

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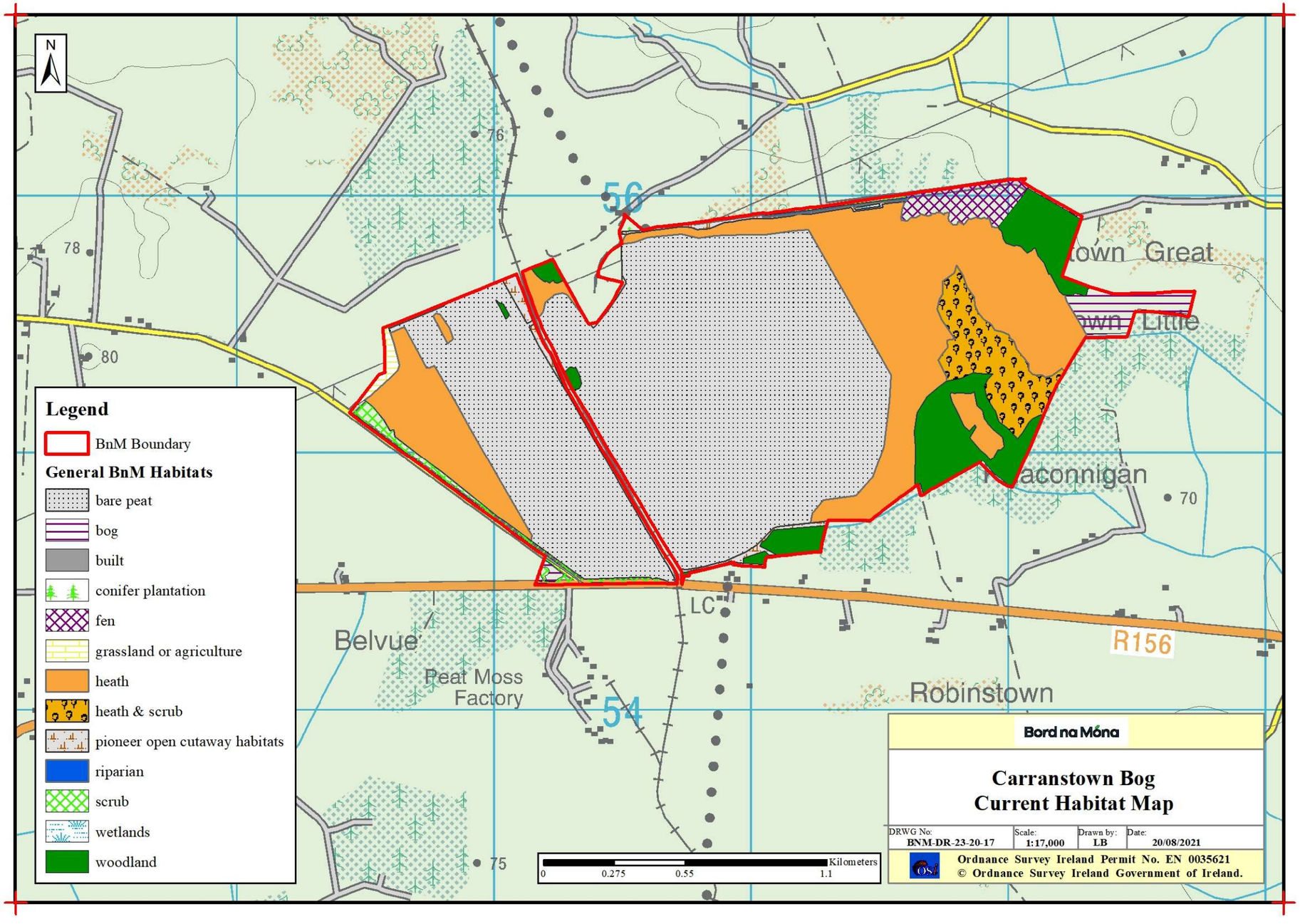

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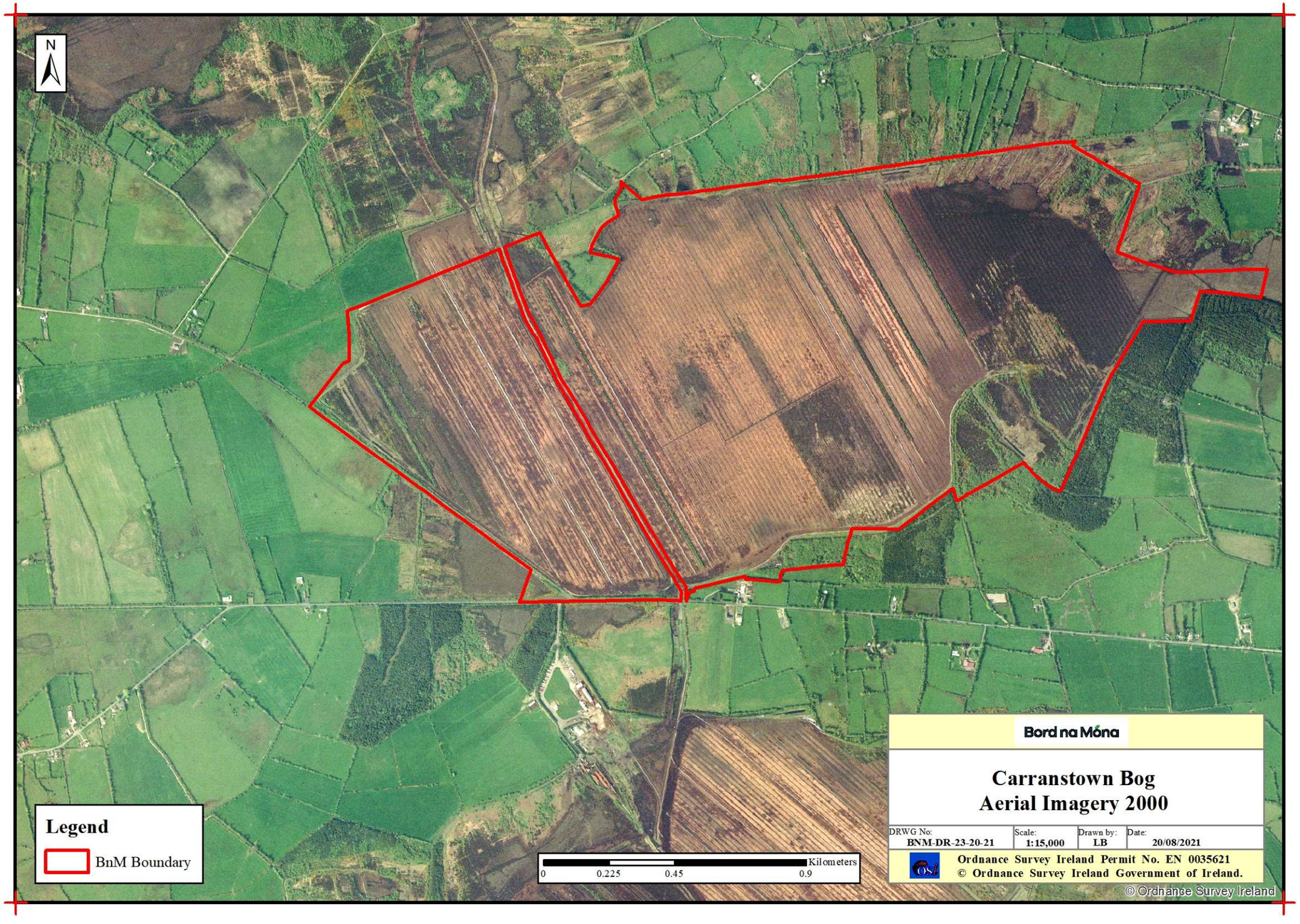

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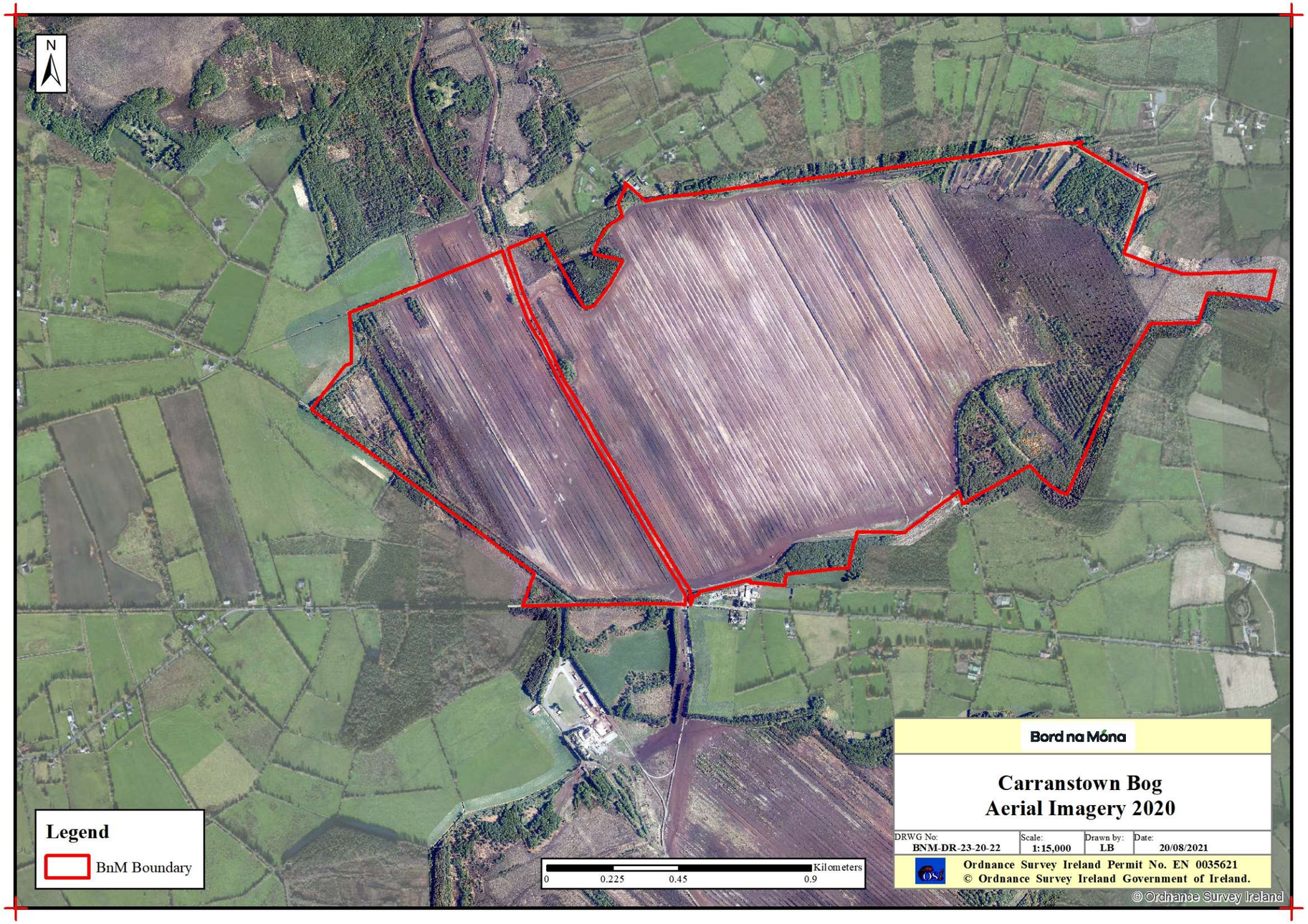

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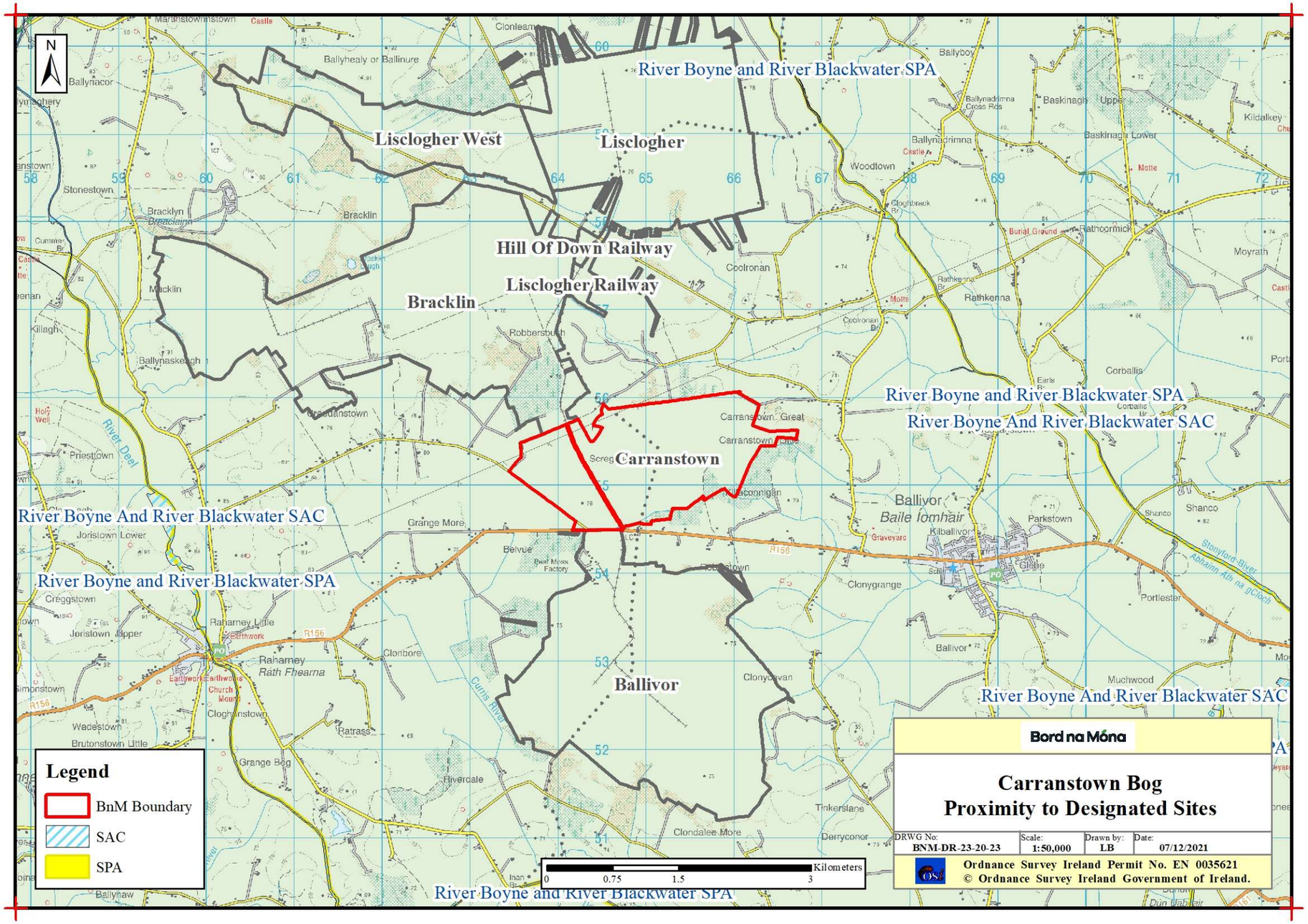

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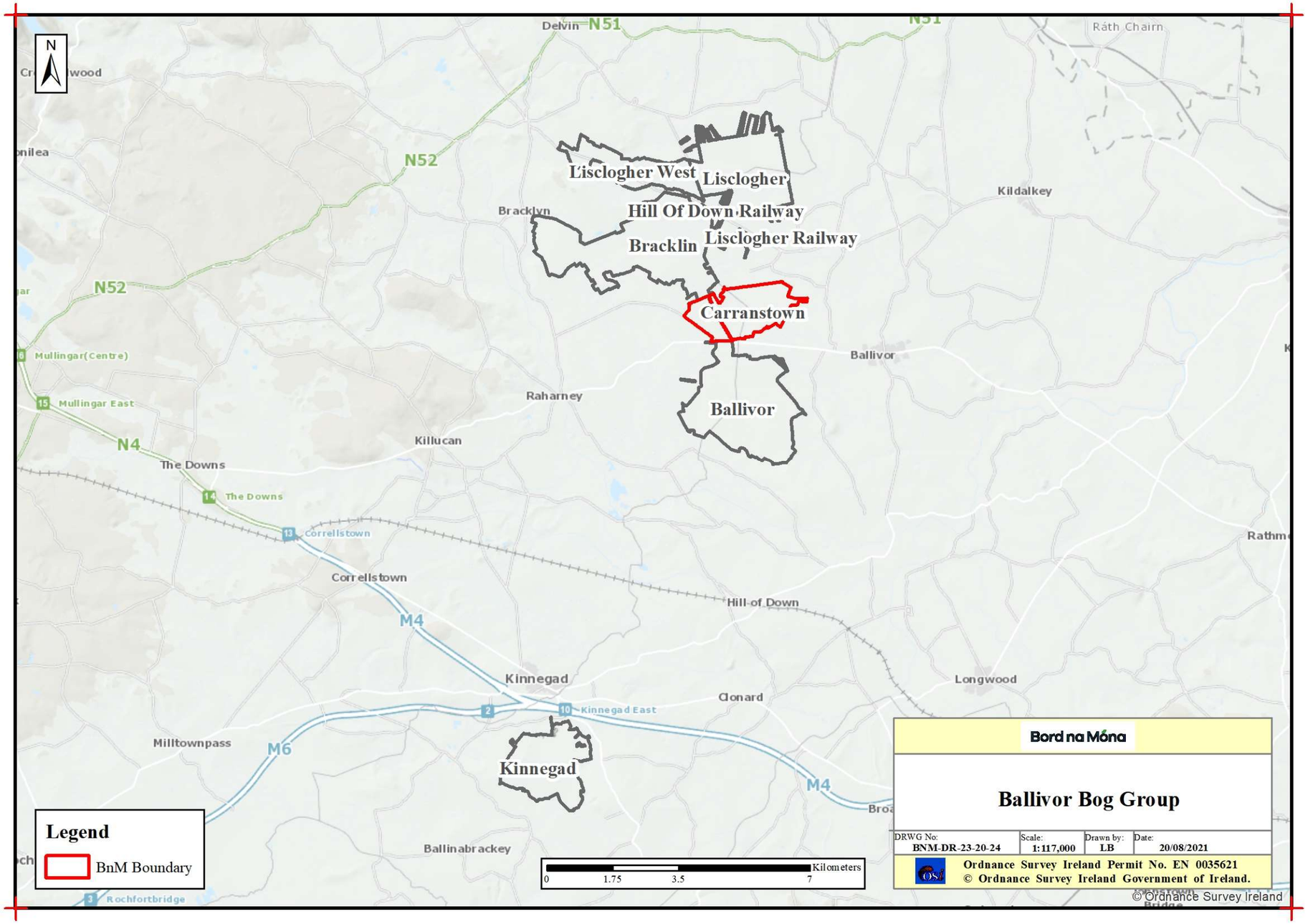

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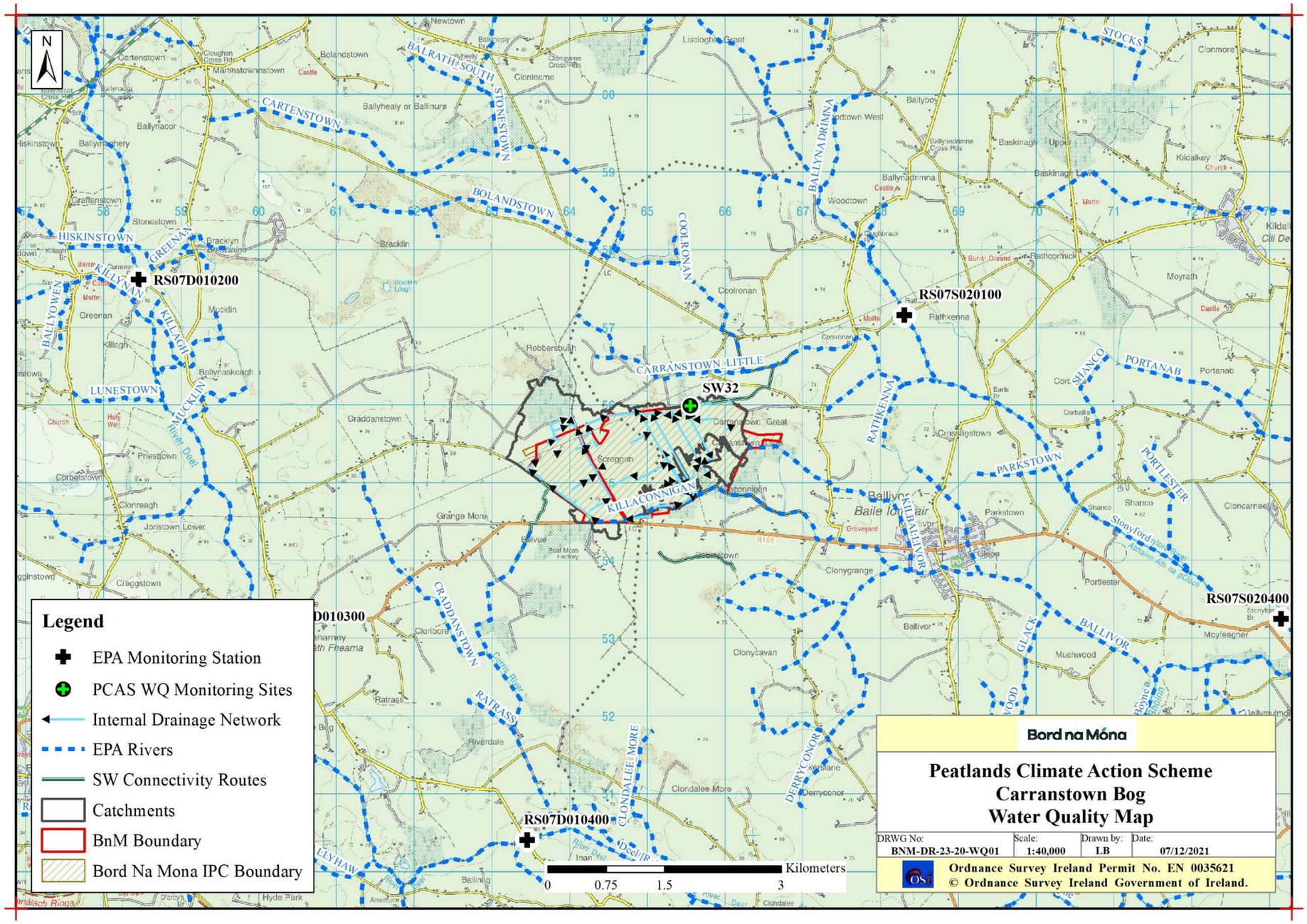

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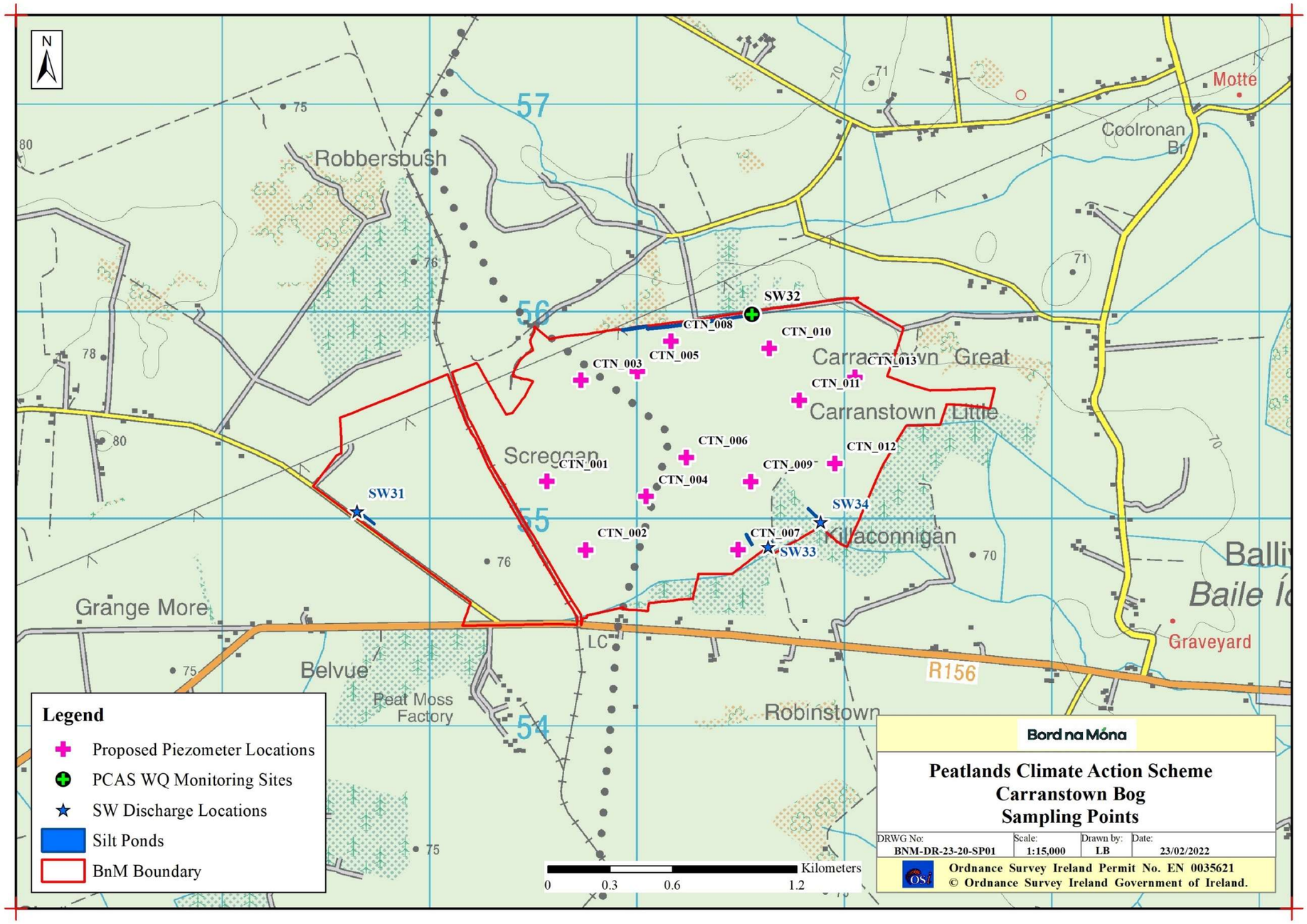

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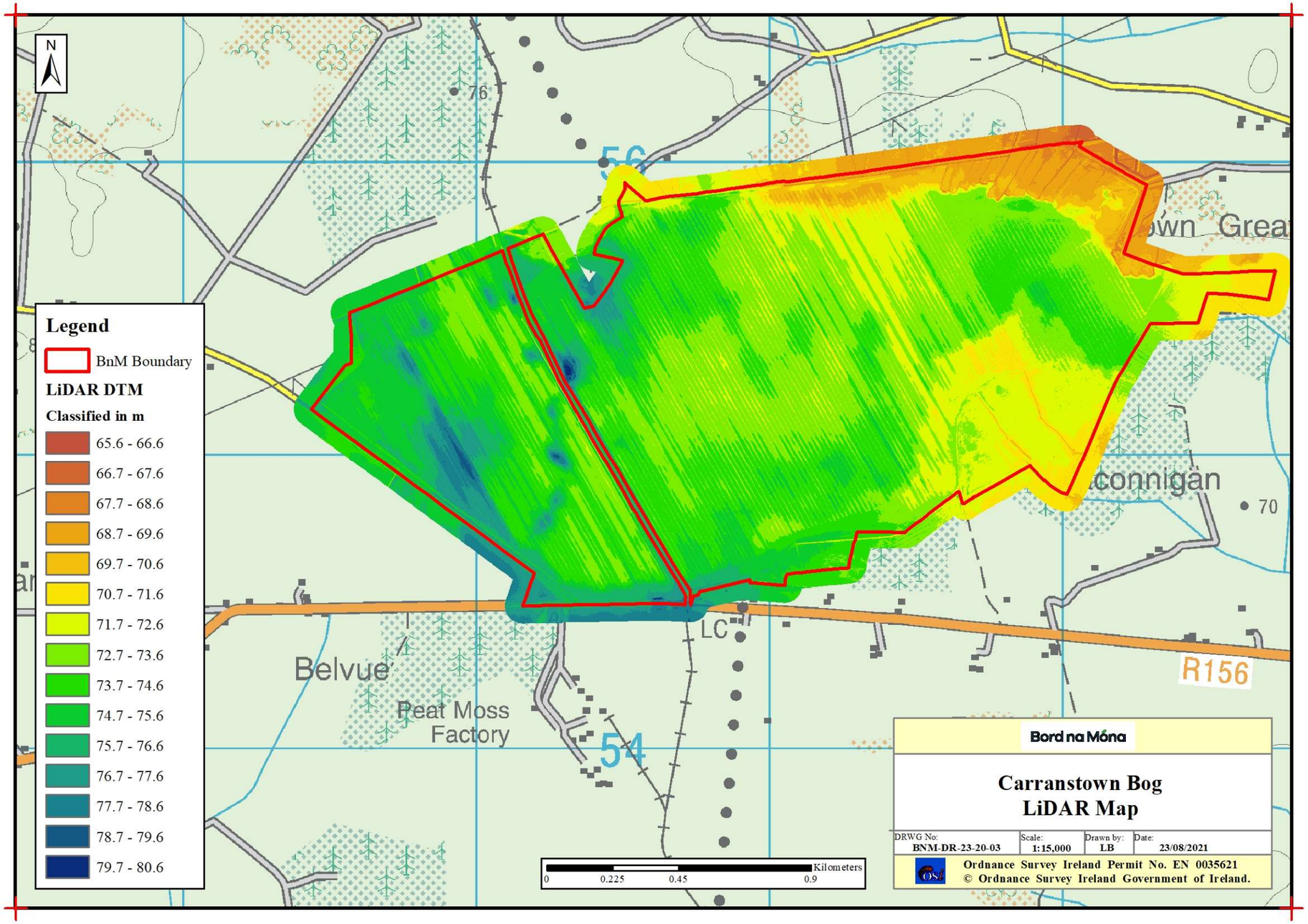

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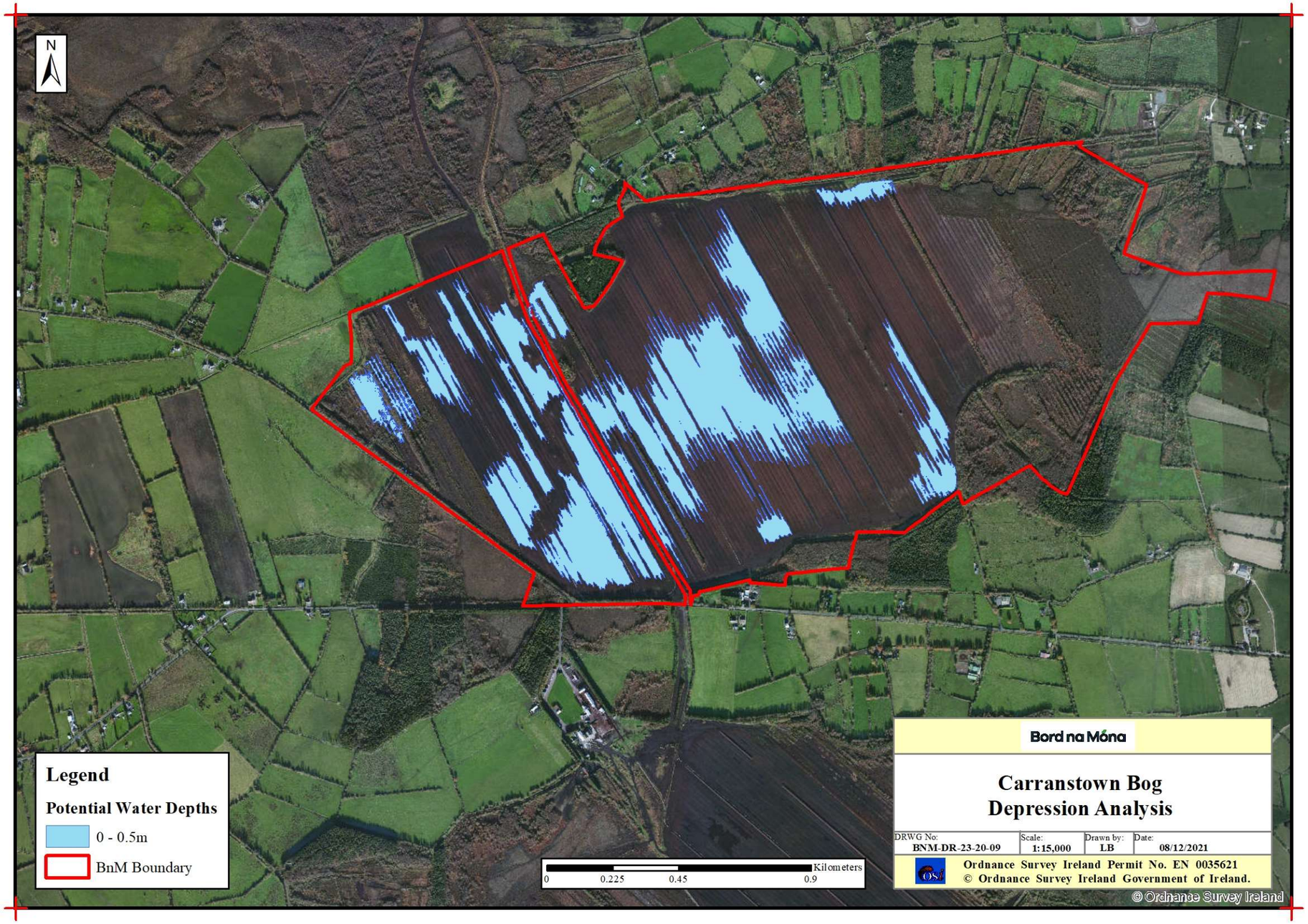

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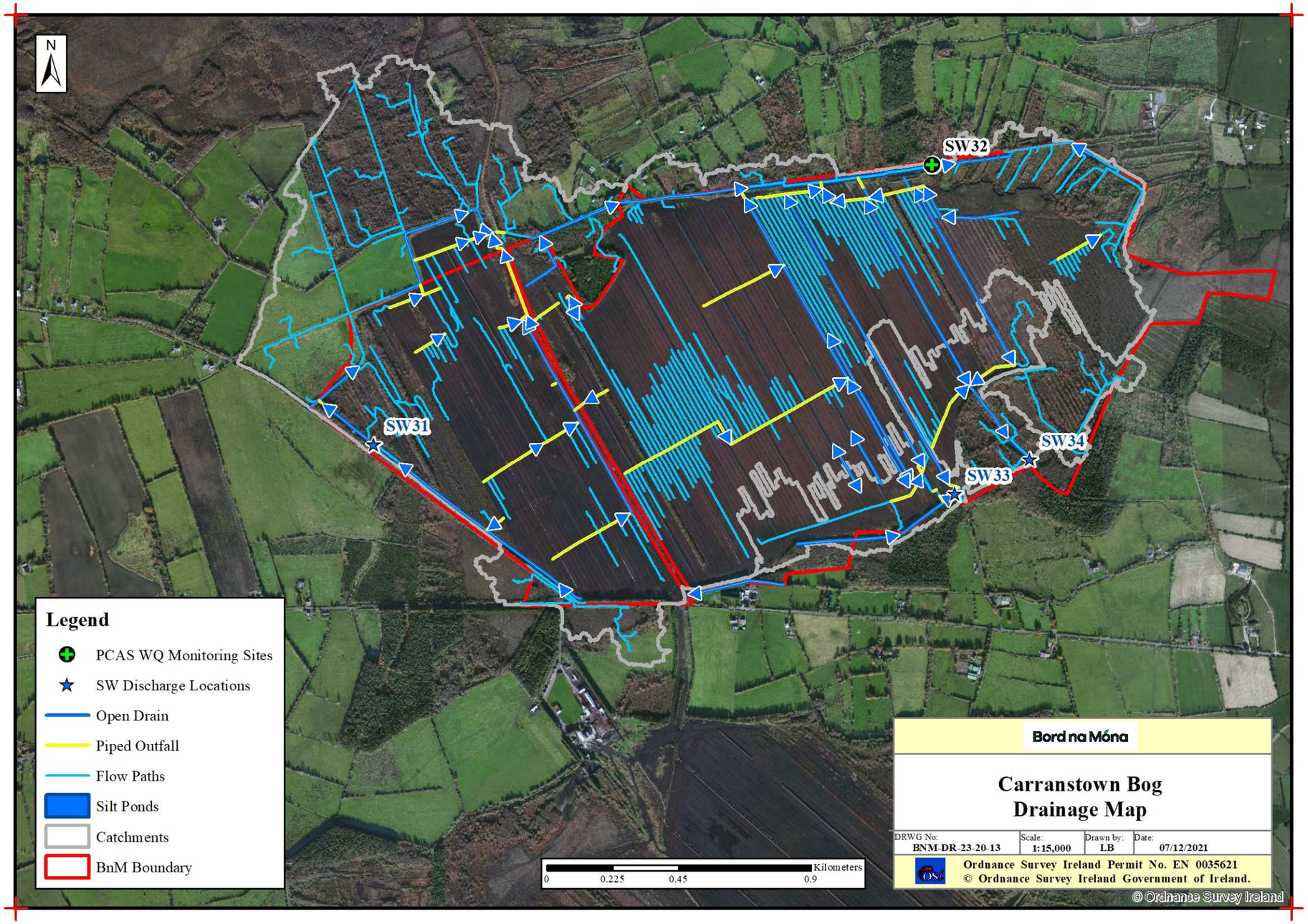

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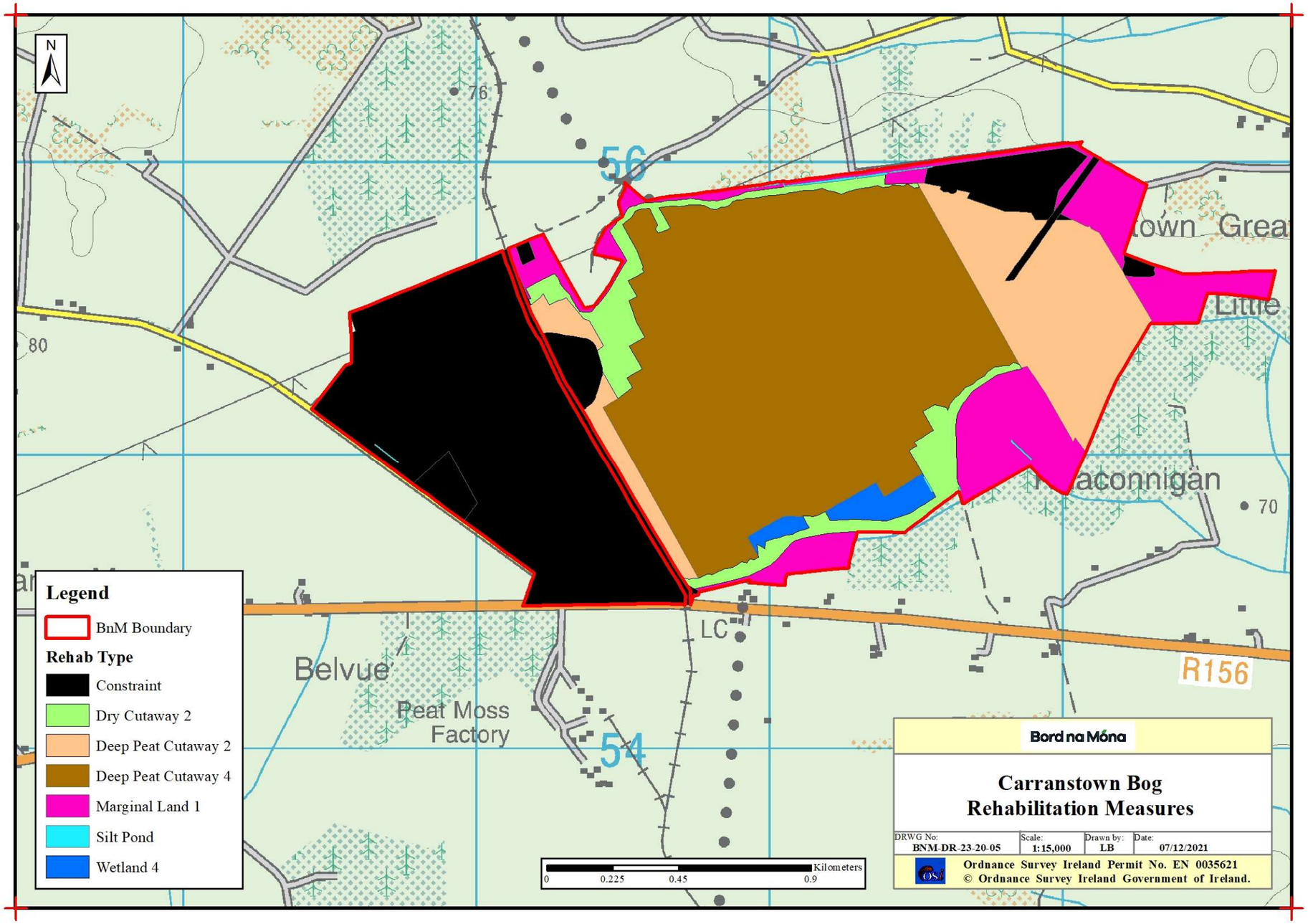

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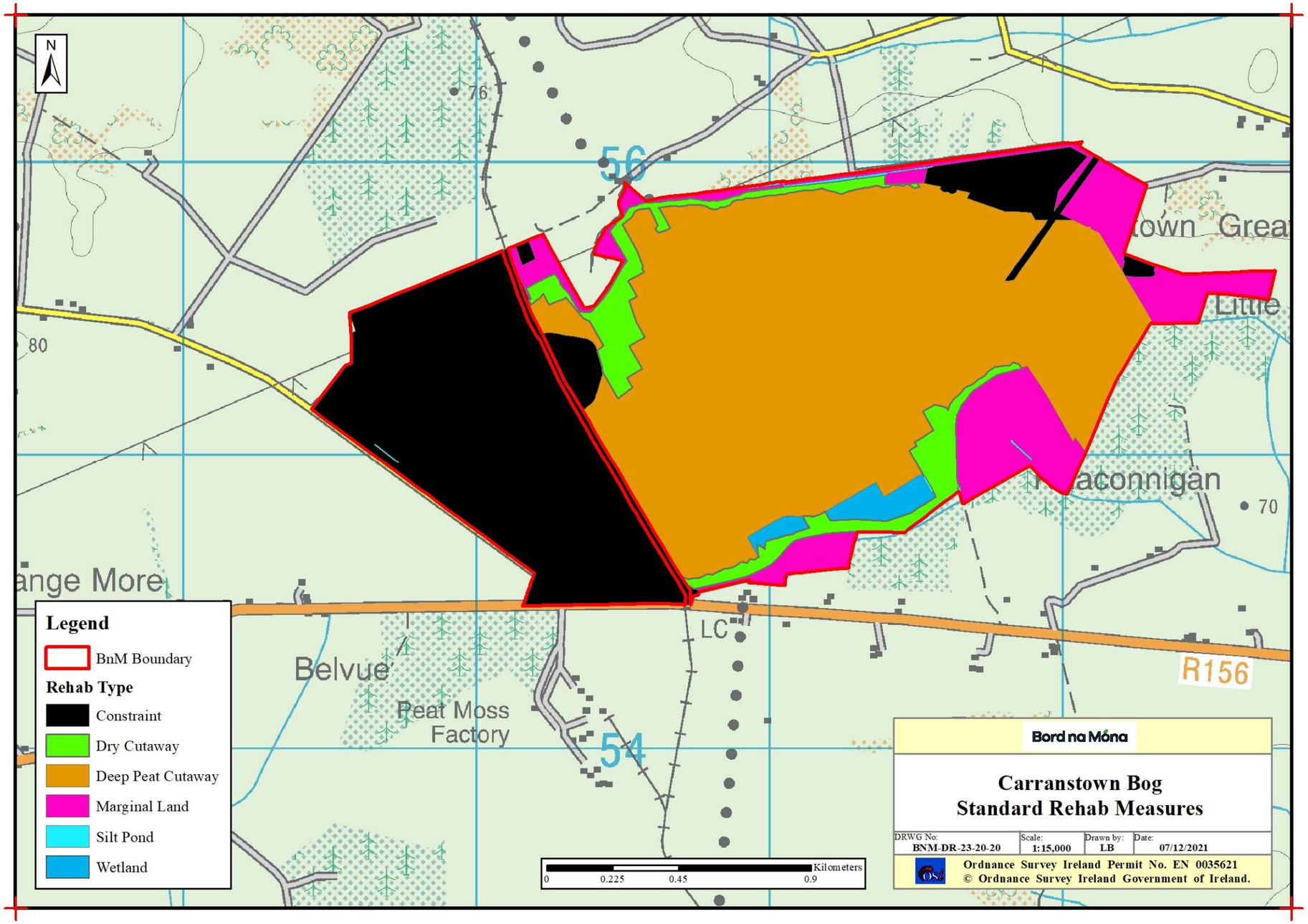

Bord na Móna

# Lisclogher East Bog

# Cutaway Bog Decommissioning and Rehabilitation Plan

# 2024

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This document seeks to address the requirements of Condition 10.2 of IPC License Ref. P0501-01:

> "*The licensee shall prepare, to the satisfaction of the Agency, a fully detailed and costed plan for permanent rehabilitation of the cutaway boglands within the licensed area.*"

*This licence condition requires Bord na Móna agree with the EPA the measures that will provide for rehabilitation, i.e. stabilisation of Lisclogher East Bog upon cessation of peat production and compliments the licence requirement to decommission the site.*

***Rehabilitation** generally comprises site stabilisation with natural colonisation with or without targeted management.*

*Industrial peat production has now fully ceased at Lisclogher East Bog.*

*Bord na Móna have defined the key rehabilitation outcome at Lisclogher East Bog as environmental stabilisation.*

*Any consideration of any other future after-uses for Lisclogher East Bog will be conducted in adherence to the relevant planning guidelines and consultation with relevant authorities and will be considered within the framework of this rehabilitation plan.*

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## Non-technical summary

- Bord na Móna is updating the draft rehabilitation plan for Lisclogher East Bog, located in Co. Meath/Westmeath.
- Lisclogher East Bog is part of the Ballivor-Derrygreenagh Bog Group with Lisclogher West Bog to west and Carranstown Bog, Ballivor Bog and Bracklin Bog located to the south of the site.
- This bog has been used for the production of horticultural peat in the past. Since the late 1990s the majority of the site has been out of industrial peat production except for some areas where sod moss and sod turf were extracted.
- Peat harvesting is now finished at Lisclogher East Bog.
- The bog still has relatively deep residual peat. Much of site is developing a range of peatland habitats on cutover bog. Some of the recently used areas comprises of bare peat.
- This rehabilitation plan has been prepared as Bord na Móna are obliged to carry out peatland rehabilitation via an IPC License issued by the Environmental Protection Agency (IPC Reg Ref. 0501-01).
- The key objective of peatland rehabilitation is environmental stabilisation. This means developing habitats and vegetation back onto the bare peat (putting a "skin" back onto the peat), and minimising effects to downstream waterbodies. Typical cutaway peatland communities such as Birch woodland, fen habitat and *Sphagnum*-rich embryonic bog communities are expected to develop.
- In general, soggy ground conditions are preferred. This means the remaining peat is wet and that plants that prefer wetter conditions, like Bog Cotton and Reeds will thrive.
- Rehab measures will include drain-blocking and other measures to raise water levels to the surface of the bog, thus encouraging the development of naturally functioning cutaway peatland habitats.
- Many Bord na Móna bogs cannot be restored back to raised bog, as so much peat has been removed and the environmental conditions have been modified. However other natural habitats will develop like shallow wetlands with Reedbeds and Birch woodland, and in time a naturalised peatland can be restored.
- The rehabilitation of Lisclogher East Bog will support biodiversity including plants, insects, birds and mammals. This includes some species that are rare and protected in the wider landscape. It will increase the national area of native woodland. Many wetland habitats in the wider landscape have been reclaimed for agriculture and other uses and peatland rehabilitation is an opportunity to create new wetland habitats.
- These rehabilitation measures will be planned by a team consisting of expert ecologists and engineers. It is a guiding principle of Bord na Móna rehabilitation planning that no actions or activities will be undertaken that would negatively impact on adjacent land. No boundary drains will be blocked. Water will still leave the bog via the existing outlets.
- It will take some time for vegetation and habitats to fully develop at Lisclogher East bog, and a peatland ecosystem to be restored. However, it is expected that most of the bare peat will be developing pioneer habitats after 10 years.
- Bord na Móna have submitted a planning application to An Bord Pleanála for a renewable energy project called Ballivor Wind Farm (Ref. PA25M.316212; https://www.ballivorwindfarmplanning.ie/). This proposed development has been submitted for planning permission, and the proposed layout design has informed the rehabilitation and constraints on Lisclogher East bog. It is expected that peatland rehabilitation for Lisclogher East Bog will be carried out alongside or after the proposed Wind Farm construction.

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- Any other proposed developments will be planned in adherence to relevant planning guidelines and will consider the rehabilitation and the condition of the site.
- Peatland rehabilitation of these bogs will bring a range of benefits to the local community via improvements to the local landscape and is also important for supporting national policies and strategies in relation to reduction of carbon emissions from these peatlands, supporting biodiversity and improvements to water quality.

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# 1. INTRODUCTION

Bord na Móna operates under IPC Licence issued and administered by the EPA to extract peat within the Ballivor-Derrygreenagh bog group (Ref. P0501-01). As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. Lisclogher East bog is part of the Ballivor-Derrygreenagh bog group (see Appendix I for details of the bog areas within the Ballivor-Derrygreenagh bog group). Lisclogher East Bog is located in Counties Meath andWestmeath.

This plan is a specific rehabilitation plan for the bog and outlines:

- Description of site management and status.
- Main issues and approaches to rehabilitation.
- Consultation to date with interested parties.
- Interaction with other policy and legislative frameworks (Appendix V).
- The planned rehabilitation goals and outcomes.
- The scope of the rehabilitation plan.
- Criteria which define the successful rehabilitation and key targets to validate rehabilitation.
- Proposed rehabilitation actions.
- Proposed timeframe to implement these measures.
- Budget and Costings.
- Associated aftercare, maintenance and monitoring.

*Note: This plan should be read in conjunction with the accompanying Map book*.

Bord na Móna announced in January 2021 the complete cessation of industrial peat production across its estate. Peat extraction ceased in Lisclogher East bog in 2020.

This draft rehabilitation plan outlines the proposed approach to be taken for IPC compliance in respect of Ballivor Bog. Bord na Móna is fully committed to meeting its obligations relating to rehabilitation and decommissioning under the Integrated Pollution Control Licence.

In April 2023, Bord na Móna Powergen Ltd lodged a planning application to An Bord Pleanála (Ref. PA25M.316212) for a development consisting of 26 no. wind turbines and associated works at the Ballivor Bog Group, known as Ballivor Wind Farm (https://www.ballivorWind Farm.ie/). The proposed wind farm is located on Ballivor bog, Carranstown bog, Bracklin bog, Lisclogher bog and agricultural land adjacent to Bracklin bog. This application was made directly to An Bord Pleanála as 'Strategic Infrastructure Development' (SID) under the provisions of Section 37E of the Planning and Development Act 2000, as amended (the Act). This position was confirmed by An Bord Pleanála in correspondence to the Applicant dated 5th April 2022 following pre-application consultations with the Board under Section 37B of the Act (ABP-307471-20). A separate EIAR and accompanying NIS was undertaken for the proposed wind farm development. At the time of writing, a decision had not yet been made by An Bord Pleanála with regards this application.

Bord na Móna has developed a number of onshore wind developments on lands which were previously subject to peat extraction, such as Mount Lucas Wind Farm and Cloncreen Wind Farm. These developments, among others, have demonstrated that peatland rehabilitation and wind farm development can co-exist successfully. The rehabilitation plan outlines how the site will be rehabilitated along with the construction and operation of the proposed Wind Farm. Further details of this proposed Wind Farm development can be obtained at the project website (Bord na Móna Wind Farm | Ballivor Wind Farm).

This rehabilitation plan has been specifically developed to integrate the proposed Ballivor Wind Farm development. It assumes that planning permission for the project will be granted in the future. If planning permission is not granted for this project, then Bord na Móna will revise the rehabilitation plan. Bord na Móna is fully committed to meeting its obligations relating to rehabilitation and decommissioning under the Integrated Pollution Control Licence.

It has been proposed by the Government that Bord na Móna carry out a Peatlands Enhanced Decommissioning, Rehabilitation and Restoration Scheme on its peatlands. This proposal is also known colloquially as the 'Peatlands Climate Action Scheme' (PCAS). The additional costs of the scheme will be supported by the Government through the Climate Action Fund and Ireland's National Recovery and Resilience Plan, administered by the Department of Environment, Climate and Communications (DECC), while the National Parks and Wildlife Service (NPWS) will act as the scheme regulator. The Peatlands Climate Action Scheme is expected to operate between 2021-2025. Over 13,000 ha of cutaway peatlands have been rehabilitated as part of this scheme to date, across multiple Bord na Móna peatlands. Enhanced rehabilitation measures that have been proposed as part of PCAS are **NOT** proposed as part of this draft Lisclogher East rehabilitation plan at this stage. The potential implementation of enhanced rehabilitation measures at Lisclogher East Bog will be dependent on the selection of Lisclogher East Bog as a site to be included in PCAS.

## 1.1 Constraints and Limitations

This document seeks to address the requirements of Condition 10.2 of IPC License Ref. P0501-01:

> "*The licensee shall prepare, to the satisfaction of the Agency, a fully detailed and costed plan for permanent rehabilitation of the cutaway boglands within the licensed area.*"

This document covers the area of **Lisclogher East Bog**.

Industrial peat extraction at Lisclogher East Bog permanently ceased in 2020 (with bog development having commenced in 1950).

Parts of Lisclogher East Bog (within and outside the areas owned and under the control of Bord na Móna) are currently being used by domestic turf cutters for intensive private sod peat production. These areas are ecologically and hydrologically linked to the area owned by Bord na Móna where rehabilitation is planned. It is beyond the scope of this rehabilitation plan to address turf cutting issues on Lisclogher East Bog that are outside of the control of Bord na Móna. Nevertheless, Bord na Móna are aware of such issues which may constrain the proposed rehabilitation actions, and this rehabilitation plan considered potential impacts of these on the delivery of the stated objectives.

Rehabilitation in other areas of the bog may also be constrained due to other property issues or issues such as rights of way. Several Rights of Way exist at or around the margin of Lisclogher East Bog, most of which lead to known turbary areas.

Bord na Móna is about to seek consent for a proposed renewable energy development at Lisclogher East and rehabilitation under IPC license compliance will be undertaken in a phased approach along with construction of the proposed development, should consent be granted.

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# 2. METHODOLOGY

This rehabilitation plan was developed with a combination of desktop and field surveys, consultations with internal and external stakeholders. The development of this rehabilitation plan considered **recently published** guidance issued by the EPA in 2020 – **Guidance on the process of preparing and implementing a bog rehabilitation plan**.

The ecological information and site information collected during the Bord na Móna ecological baseline survey, additional confirmatory site visits (covering the period 2012 to 2022 inclusive) and monitoring and desktop analysis forms the basis for the development of the rehabilitation plan for the bog, along with:

- Experience of 40 years of research on the after-use development and rehabilitation of the Bord na Móna cutaway bogs (Clarke, 2010; Bord na Móna, 2016);
- Significant international engagement during this period with other counties in relation to best-practise regarding peatland rehabilitation and after-use through the International Peat Society and the Society for Ecological Restoration (Joosten & Clarke, 2002; Clarke & Rieley, 2010; Gann *et al*., 2019);
- Consultation and engagement with internal and external stakeholders;
- GIS Mapping;
- BNM drainage surveys;
- Bog topography and LIDAR data;
- Previous research studies on site;
- Hydrological modelling.

## 2.1 Desk Study

The desk study involved collecting all relevant environmental and ecological data for the study area. The development of the rehabilitation plan also takes account of research, experience and engagement with other peatland restoration and rehabilitation projects and peatland research including Irish, UK, European and International best-practise guidance (full citations are in the References Section):

- Anderson *et al*. (2017). An overview of the progress and challenges of peatland restoration in Western Europe.
- Barry, T.A. et al (1973). A survey of cutover peats and underlying mineral soils. Soil Survey Bulletin No. 30. Dublin, Bord na Móna and An Foras Taluntais.
- Bonn *et al*. (2017). Peatland restoration and ecosystem services- science, policy and practice.
- Carroll *et al*. (2009). *Sphagnum* in the Peak District. Current Status and Potential for Restoration. Moors for the Future Report No 16.
- Clark & Rieley (2010). Strategy for responsible peatland management.
- Eades *et al*. (2003). The Wetland Restoration Manual.
- Farrell & Doyle (2003). Rehabilitation of Industrial Cutaway Atlantic Blanket Bog, NW Mayo, Ireland.
- Feehan, J. (2004). A long-lived wilderness. The future of the north midlands peatland network. Department of Environmental Resource Management, UCD.
- Foss, P.J., Crushell, P. & Gallagher, M.C. (2017) Title: Counties Longford &Roscommon Wetland Study. Report prepared for Longford and Roscommon County Councils.
- Gann *et al*. (2019). International Principles and Standards for the practice of Ecological Restoration.

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- Hinde *et al*. (2010). *Sphagnum* re-introduction project: A report on research into the re-introduction of *Sphagnum* mosses to degraded moorland. Moors for the Future Research Report 18.
- Joosten & Clarke (2002). Wise Use of mires and peatlands – Background and Principles including a framework for Decision-making.
- Lindsay (2010). Peatbogs and Carbon: A Critical Synthesis to Inform Policy Development in Oceanic Peat Bog Conservation and Restoration in the Context of Climate Change.
- Mackin *et al*. (2017). Best practice in raised bog restoration in Ireland. Irish Wildlife Manuals, No. 99. National Parks and Wildlife Service,
- McBride *et al*. (2011). The Fen Management Handbook (2011), Scottish Natural Heritage.
- McDonagh (1996). Drain blocking by machines on Raised Bogs. Unpublished report for National Parks and Wildlife Service.
- NPWS (2017a). National Raised Bog Special Areas of Conservation management plan. Department of Arts, Heritage and the Gaeltacht.
- Pschenyckyj et al., 2021, Optimising Water Quality Returns from Peatland Management while Delivering Co-Benefits for Climate and Biodiversity. An Fóram Uisce.
- Quinty & Rochefort (2003). Peatland Restoration Guide, second edition. Canadian *Sphagnum* Peat Moss Association and New Brunswick Department of Natural Resources and Energy.
- Regan*, et. al.* (2020). Ecohydrology, Greenhouse Gas Dynamics and Restoration Guidelines for Degraded Raised Bogs. EPA Research Report. Prepared for the Environmental Protection Agency by Trinity College Dublin.
- Renou-Wilson *et al*. (2011). BOGLAND - Sustainable Management of Peatlands in Ireland. STRIVE Report No 75 prepared for the Environmental Protection Agency.
- Schouten (2002). Conservation and Restoration of Raised Bogs: Geological, Hydrological and Ecological Studies. Dúchas - The Heritage Service of the Department of the Environment and Local Government, Ireland;
- Thom (2019). Conserving Bogs – Management Handbook.
- Wheeler & Shaw (1995). Restoration of Damaged Peatlands – with Particular Reference to Lowland Raised Bogs Affected by Peat Extraction.
- Wittram *et al*. (2015). A Practitioners Guide to Sphagnum Reintroduction. Moors for the Future Partnership.


Additional on-line resources were also incorporated into the desk study, including:

- Ballivor-Derrygreenagh Integrated Pollution Control Licence;
- Ballivor-Derrygreenagh Annual Environmental Reports;
- Review of the National Biodiversity Data Centre (NBDC) webmapper;
- Inland Fisheries Ireland (IFI) Reports;
- Environmental Protection Agency database (www.epa.ie);
- EPA Guidance on Requests for Alterations to a Licensed Industrial or Waste Activity;
- BirdWatch Ireland online data (including I-WeBS and CBS datasets; www.birdwatchireland.ie);
- Geological Survey of Ireland - National Draft Bedrock Aquifer map;
- Geological Survey of Ireland - Groundwater Database (www.gsi.ie);
- Historic Environment Viewer at https://webgis.archaeology.ie/historicenvironment/
- National Parks & Wildlife Services Public Map Viewer (www.npws.ie);

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- Water Framework Directive catchments.ie/maps/ Map Viewer (www.catchments.ie);
- OPW Indicative Flood Maps (www.floodmaps.ie);
- CFRAM Preliminary Flood Risk Assessment (PFRA) maps (www.cfram.ie);
- River Basin Management Plan for Ireland 2018 – 2021;
- Bord na Móna Annual Report 2023.
- Spatial data in respect of Article 17 reporting, available online at https://www.npws.ie/maps-and-data/habitat-and-species-data/article-17.

## 2.2 Consultation

A number of stakeholders have been identified during the course of Bord na Móna's rehabilitation and Biodiversity Action Plan activities and are contacted during the rehabilitation planning process for their views. See Section 4.

## 2.3 Field Surveys

Bord na Móna carried out a baseline ecological survey of all of its properties in 2009-2012 and developed habitat maps. As part of this exercise, Lisclogher East Bog was surveyed in April of 2010. Additional ecological walk-over surveys and visits have taken place at Lisclogher East Bog between 2010-2017 (visited during Spring 2017). Habitat maps have been updated, where required. This rehabilitation plan is informed by the original baseline survey as well as subsequent confirmatory site walk-over surveys and visits, and updates to baseline data.

Habitat mapping followed best-practise guidance from Smith *et al.* (2011). Map outputs including all habitat maps and target notes were produced using GIS software application packages (ArcGIS). General marginal habitats and other habitats that had not been modified significantly by industrial peat extraction were classified using Fossitt *et al*. (2000). Plant nomenclature for vascular plants follows Stace (2010), while mosses and liverworts nomenclature follows identification keys published by the British Bryological Society (2010). A more detailed Bord na Móna classification system was previously developed for classifying pioneer cutaway habitats as Fossitt categories were deemed not to be detailed enough for cutaway bog (much of cutaway bog could be classified as Cutover Bog - PB4).

A detailed ecological survey report for Lisclogher East Bog is contained in Appendix II.

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# 3. SITE DESCRIPTION

Lisclogher East is located in Co. Meath/Westmeath. This bog is part of the Ballivor-Derrygreenagh group of bogs. A minor road delineates the western boundary and separates Lisclogher West from Lisclogher East. A fire in 2008 burnt the majority of the main bog. A minor road runs close to the southern boundary of the bog.

The bog was traditionally used as a sod turf and sod moss supply bog. It was never converted to milled peat extraction. There is still relatively deep residual peat in Lisclogher East Bog. This bog has a gravity drainage regime.

Overall the site has begun to become colonised with typical cutover bog vegetation. Some of this is quite well established with habitats stabilising. The old rail lines are still clearly visible on the site as narrow, high ridges that contain habitats such as pioneer poor fen and Birch scrub. The former industrial peat production fields are lower than most of the site and contain open water in the wettest places with Common Bog Cotton having developed in the majority of the old production fields.

Drainage on the site had begun to break down with many old drains having become blocked and full of water, some drains contained *Sphagnum cuspidatum* while other drains contained Reedmace, Bog Cotton and rushes (mainly Soft Rush).

See Appendix II for more detail on site, habitats and local features. See Drawing number BNM-ECO-01-01 titled *Site Location map*, included in the accompanying Mapbook[1] , which illustrates the location of Lisclogher East Bog in context to the surrounding area.

## 3.1 Status and Situation

### *3.1.1 Site history*

Lisclogher East bog was in production from 1950 until 2003. Lisclogher East bog was used for the production of sod turf and horticultural peat in the past but since the late 1990s the site has been out of industrial peat extraction except for some areas in the northeast of the site where sod peat was still produced until recently.

### *3.1.2 Current land-use*

Industrial peat production has now permanently ceased at Lisclogher East Bog.

Overall the site has begun to become colonised with vegetation. This site has been used for the production of horticultural peat in the past while some turbary is active in the northeast of the site. These are mapped in the accompanying Mapbook.

### *3.1.3. Socio-Economic conditions*

Bord na Móna has historically been a vital employer for the rural community of the Midlands of Ireland. Bord na Móna compiled a report on the role of peat extraction in the midlands historically in which they report that in 1986, by the end of Bord na Móna's Third Development Programme, a total of twenty-three work locations had

[1] Cutaway Bog Decommissioning and Rehabilitation Plan – Lisclogher East Bog Map Book

been established around the country. The company had an average employment of approximately 4,688 in the mid 1980's, with a peak employment of 6,100 during the production season, which placed it among the country's largest commercial employers. The importance of such levels of employment were largely due to its regional concentration in the Midlands and the lack of alternative employment opportunities at the time.

According to the Energy Crop Socio-Economic Study undertaken by Fitzpatrick Associates in 2011, there were an estimated 1,443 jobs supported by the peat-to-power industry in Ireland at the time, some 81% of which were located in the catchment areas of the three peat-fired generating stations (Lough Ree, West Offaly, and Edenderry Power Stations). These constituted jobs in the plants and in peat extraction, jobs indirectly supported in upstream supply industries and jobs induced through the trickle-down effects of the wages and salaries of those supported directly or indirectly.

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In respect of Lisclogher East Bog, jobs included in the above study would have included those to facilitate the original ditching of this site.

As the primary employer in many Midland counties, Bord na Móna played a central role in building communities through several initiatives, including Education bursaries, support of local sporting clubs, the provision of community gain funds, charity programmes and the provision and building of amenity areas."

## 3.2 Geology and Peat Depths

### *3.2.1 Sub-soil geology*

The underlying geology of Lisclogher Bog comprises Waulsortian limestone[2] to the west and Lucan Formation to the east; divided by a narrow band of Tober Colleen Formation in the centre. The site is underlain with both gravel and marl.

### 3.2.2 *Peat type and depths*

The majority of Lisclogher East contains peat depths in excess of 2 m.

## 3.3 Key Biodiversity Features of Interest

Sections of remnant raised bog (PB1) are located at the northern and southern ends of the site. These areas are small and have been drained and are therefore dry and degraded. The recent fire also burned over the majority of these areas.

[2] https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=de7012a99d2748ea9106e7ee1b6ab8d5&scale=0

The Birch woodland (WN7) at the south of the site, is an excellent example of old Birch woodland that is well developed with a good age structure. This woodland is bordered on two sides by raised bog. The woodland is located in what appeared to be a small valley between the two sections of raised bog, a stream flows through the woodland at the bottom of the valley. The woodland is situated on peat soils. This habitat comprised Birch with large mature Oak (*Quercus robur*), mature Scots Pine, Rowan and Holly. The ground flora was made up of Bracken, Bilberry, Bramble, Creeping Bent Grass, Wood Rush, Sorrell, Honeysuckle, Ivy and Broad Buckler Fern. This woodland contained three patches of Laurel which is regarded as an invasive exotic species capable of suppressing other species and therefore reducing the level of biodiversity in areas where it becomes established.

The stream that flows through the woodland was deep and about one metre wide and was heavily shaded by the woodland, it does not appear to have been canalised and did not contain any signs of bank-side erosion. Moving west along the southern boundary from the main section of woodland, a narrow strip of Birch woodland occurs. This section of woodland was mainly comprised of Birch and had been almost entirely destroyed by the recent fire; however, the fire did not appear to have spread through the main section of woodland except for around its fringes.

The lower lying areas of the old production fields are wet and Bog Cotton is well established in these locations. These areas are likely to develop into areas of poor fen and flush.

The site is used occasionally by Hen Harrier and Peregrine Falcon in the winter (Biosphere Environmental Services 2014). The site is also used by breeding Skylark and Snipe.

Several areas of Birch woodland were also located around the site on the cutover sections of bog. These habitats appeared to be developing on any of the drier areas with Bog Cotton developing on the wettest sections. Some sections of bare peat were located on the site particularly in the north east and mid-west where turf cutting had been active recently.

Raised bog (PB1), Birch woodland (WN7), public roads (BL3), scrub (WS1), wet grassland (GS4) and improved agricultural grassland (GA1) are all found in locations adjacent to the site.

### *3.3.1 Current habitats*

The most common habitats present at Lisclogher East include (in order of dominance) (Codes refer to Heritage Council habitat classification, (Fossitt 2000)):

- Bare peat (BP)
- Birch woodland (WN7)
- Scrub (WS1)
- Pioneer poor fen (PF1)
- Raised bog remnant (PB1)
- Dry Heather-dominated vegetation (PB4)
- Open water

See Drawing number BNM-ECO-01-17 titled *Lisclogher East Bog: Current Habitat Map*, included in the accompanying Mapbook, which illustrates the habitats at Lisclogher East Bog.

| | |
|---|---|
|  <br>*Example of drainage ditches occurring within Lisclogher East, supporting Sphagnum mosses (May 2020)* |  <br>*Example of Sphagnum mosses at Lisclogher East (May 2020)* |
|  <br>*Example of bare peat at Lisclogher East bog (May 2020)* |  <br>*Example of the extensive drainage ditches occurring at Lisclogher East bog (May 2020)* |

*Table 1: Photos of Habitats at Lisclogher East Bog*

### *3.3.2 Species of conservation interest*

In a survey in 2017, several bird species were noted including Snipe, Meadow Pipit, Goldfinch, Woodcock, Mallard, Skylark as well as other common bird species such as Blackbird, Wren, Robin and Thrush have all been recorded.

Mammal species including badger (tracks and latrine observed), fox and hare have all been recorded in the bog or bog margins.

### *3.3.3 Invasive species*

Invasive alien species known to occur at the subject bog (or desktop review suggests presence is likely), and for which reasonably foreseeable source impact pathways for dispersal may result from the proposed rehabilitation and where necessary, rehabilitation will be in line with Best Practice.

## 3.4 Statutory Nature Conservation Designations

Lisclogher East has no overlapping designated sites.

The nearest EU Designated sites to Lisclogher East Bog are as follows:

- River Boyne and River Blackwater SAC (site code 002299) and SPA (site code 004232) located approx. 150m from the north east corner of the site;
- Girley (Drewstown) Bog SAC (Site Code 002203) (also an NHA) is located approx. 10km north of the site
- Mount Hevey Bog SAC (Site Code 002342) (also a pNHA) located approx. 10km south.

The nearest nationally Designated sites to Lisclogher East Bog are Girley (Drewstown) Bog NHA located approx. 10km north of the site and Molerick Bog NHA (Site Code 001582) located south. The nearest non-statutory designated sites i.e. proposed Natural Heritage Areas (pNHAs), in the wider area include the Royal Canal pNHA and Mount Hevey Bog pNHA, both located to the south.

### *3.4.1 Other Nature Conservation Designations*

The Ramsar Convention entered into force in Ireland on 15th March 1985. Ireland currently has 45 sites/wetlands designated as Wetlands of International Importance (Ramsar Sites). These cover a surface area of 66,994 ha. There are no Ramsar Sites in the local vicinity of Lisclogher East Bog (i.e. within 3km). The closest Ramsar Sites to Lisclogher East Bog are Lough Derravarragh, Lough Iron, Lough Ennell and Lough Owel, all of which are ca.18 km west of the site, as well as Raheenmore Bog ca.3 0km south west of the site.

See Figures *BNM-ECO-01-23: Lisclogher East Bog Proximity to Designated Sites* in the accompanying map book.

## 3.5 Hydrology and Hydrogeology

Lisclogher East bog forms part of the Boyne Catchment (Catchment ID : HA 07) as defined by the EPA under the Water Framework Directive (WFD) and is situated within the Boyne_SC_050 Sub-Catchment. The bog is located along the floodplain of the River Boyne. There are two tributaries of the Stoneyford River located on the site. The first one is a small stream on the eastern boundary that flows eastwards into the Stoneyford River. The second watercourse flows through the woodland at to southern end of the site; this stream flows southwards and is also a tributary of the Stoneyford River. Lisclogher East Bog has a gravity-based drainage system.

GSI data indicates that the underlying geology of Lisclogher East Bog comprises Waulsortian limestone[3] to the east and Lucan Formation to the west; divided by a narrow band of Tober Colleen Formation in the centre. The

[3] https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=de7012a99d2748ea9106e7ee1b6ab8d5&scale=0

of the bog is classified as a Locally Important Aquifer (Bedrock which is Moderately Productive only in Local Zones). There are also no mapped karst features within the surrounding area.

Quaternary Sediment maps show Lisclogher East underlain by peat, with some possible Till derived from cherts in the south east corner of the site. In a wider context, the bog is surrounded by Till derived from limestones. GSI Groundwater mapping indicates that the majority of the site is of low vulnerability. While Groundwater Vulnerability is typically used to indicate the susceptibility to groundwater pollution, it can provide a useful proxy indication of likely groundwater flow rates in the surrounding area.

## 3.6 Emissions to surface-water and water-courses

Lisclogher East bog has two treated surface water outlets to the Stonyford River (IE_EA_07S020100 STONYFORD_030) and (IE_EA_07S020400 STONYFORD_040)

The Stonyford rivers were listed as being under pressure from peat extraction in the 2nd cycle of the River Basin Management Plan for Ireland but are not indicated as remaining so in the third cycle which is currently out for consultation. Peat extraction was not identified as a pressure in the second cycle of the river basin management plan and is not indicated as being so in the third cycle.

Details of silt ponds, associated surface water emission points and those being monitored and sampled as part of the PCAS scheme are detailed on the attached water quality map (map book with drawing reference)

There is a robust monitoring program to track and verify any changes in baseline water quality conditions pre and post decommissioning and rehabilitation so that the success or otherwise can be tracked and verified for the National Parks & Wildlife Service, Environmental Protection Agency and Local Authority Water Program, amongst a range of stakeholders.

The main emission limit value associated with this bog is 35mg/l suspended solids, with trigger levels for ammonia of 2.78 mg/l and COD 100mg/l.

Lisclogher bog has been out of production since the late 1990s except for some areas in the north east of the site where sod moss was still produced until recently. This was the first full summer season without any sod peat extraction and as expected some of the key water quality parameters, that can impact water quality from peat extraction activities, such as suspended solids, remained relatively static. During this period, however, ammonia indicating significant peaks, from one surface water outlet SW25, which serviced this sod moss extraction area. From a review of historical results below, this trend is evident from SW25 and from analysis of ammonia across a range of peat types and uses, horticultural peat bogs tend to have higher ammonia. All other parameters fluctuated slightly, most likely influenced by normal weather patterns, especially rainfall.

Monthly ammonia concentrations from August 2020 to December 2021 had a range of 0.044 to 3.38mg/l with an average of 0.879 mg/l.

Results for suspended solids for the same period indicate a range of 2 to 17mg/l with an average of 4.71 mg/l.

From an analysis of any monitoring over the previous 5 years, during such time where peat extraction was undertaken each Summer, the IPC licence environmental monitoring of some of the discharges from this bog, indicate that results were under the ELV for SS and broadly under the trigger level for Ammonia, except for SW25 with COD regularly exceeding the trigger level, due to naturally occurring peat and subsoil interactions.

| Bog | SW | Monitoring | pH | SS | TS | Ammonia | TP | COD | Colour |
|---|---|---|---|---|---|---|---|---|---|
| Lisclogher | SW-23 | Q3 21 | 7.8 | 5 | 325 | 0.089 | 0.05 | 61 | 375 |
| Lisclogher | SW-24 | Q3 21 | 7.7 | 2 | 380 | 0.09 | 0.05 | 61 | 383 |
| Lisclogher | SW-25 | Q3 21 | 7.6 | 7 | 326 | 3.19 | 0.09 | 65 | 550 |
| Lisclogher | SW-19 | Q3 19 | 7.8 | 2 | 369 | 0.176 | 0.07 | 66 | 380 |
| Lisclogher | SW-20 | Q3 19 | 7.6 | 15 | 366 | 0.223 | 0.09 | 88 | 493 |
| Lisclogher | SW-21 | Q3 19 | 8 | 7 | 385 | 0.174 | 0.05 | 65 | 325 |
| Lisclogher | SW-22 | Q3 19 | 8.1 | 16 | 379 | 0.158 | 0.06 | 66 | 301 |
| Lisclogher | SW-23 | Q3 19 | 8 | 15 | 352 | 0.166 | 0.06 | 68 | 337 |
| Lisclogher | SW-24 | Q3 19 | 8.1 | 10 | 367 | 0.172 | 0.05 | 63 | |
| Lisclogher | SW-25 | Q3 19 | 7.5 | 5 | 357 | 3.49 | 0.09 | 74 | 489 |
| Lisclogher | SW-19 | Q1 18 | 6.8 | 5 | 124 | 0.1 | 0.05 | 72 | 340 |
| Lisclogher | SW-20 | Q1 18 | 5.8 | 5 | 160 | 0.14 | 0.05 | 119 | 548 |
| Lisclogher | SW-21 | Q1 18 | 5.4 | 5 | 116 | 0.11 | 0.05 | 96 | 417 |
| Lisclogher | SW-22 | Q1 18 | 6.9 | 5 | 164 | 0.96 | 0.05 | 93 | 544 |
| Lisclogher | SW-23 | Q1 18 | 7.3 | 5 | 196 | 1.6 | 0.06 | 82 | 399 |
| Lisclogher | SW-24 | Q1 18 | 4.3 | 5 | 60 | 0.09 | 0.05 | 47 | 212 |
| Lisclogher | SW-25 | Q1 18 | 7.4 | 5 | 358 | 2.9 | 0.12 | 85 | 277 |
| Lisclogher | SW-19 | Q2 15 | 7.5 | 5 | 202 | 0.66 | 0.05 | 81 | 481 |
| Lisclogher | SW-20 | Q2 15 | 7.1 | 5 | 196 | 1.2 | 0.05 | 82 | 499 |
| Lisclogher | SW-21 | Q2 15 | 4.6 | 5 | 84 | 0.11 | 0.05 | 81 | 315 |
| Lisclogher | SW-22 | Q2 15 | 7.4 | 24 | 378 | 3.4 | 0.14 | 62 | 140 |
| Lisclogher | SW-23 | Q3 15 | 7.8 | 5 | 450 | 0.21 | 0.05 | 24 | 72 |
| Lisclogher | SW-24 | Q3 15 | 4.6 | 5 | 141 | 0.11 | 0.05 | 146 | 350 |

**Decommissioning and Rehabilitation Programme Water Quality Monitoring.**

The licence obligation of quarterly sampling regime on a selected number of ponds to be sampled over a 3 year cycle will not be sufficient to be able to appropriately track the changing water chemistry that will occur as part of this enhanced rehabilitation programme, so this sampling regime will occur on a monthly basis.

In order to assist in monitoring surface water quality from this bog, it was agreed to increase the existing licence monitoring requirements of the IPC Licence, to sampling for the same parameters every month.

This new sampling programme commenced in November 2020 and is enabling a baseline to be established, with sampling to progress during the scheduled works, and for a period of up to 2 years post rehabilitation. Depending on the period required to confirm that the main two parameters, suspended solids and ammonia as remaining compliant with the licence emission and trigger limit values and there is an improving trajectory in these two parameters i.e. reduction in concentration, the monitoring programme and intensity will be periodically reviewed and amended.

In the preparation of this monitoring programme, Bord na Mona have been providing the Local Authority Water Programme (LAWPRO) with details of the surface water emissions points associated with this bog and will be amending some of the proposed monitoring locations on foot of this engagement. LAWPRO have in turn provided details of their 2021 monitoring programme and these are included in the Water Quality Map.

This is necessary to ensure that there is alignment with the WFD monitoring programme and that where possible, the monitoring programme will enable any improvements in water quality or establishing trends to be quantified against any available WFD monitoring data. It will also enable the periodic sharing of data which will inform the monitoring reports, success criteria and enable LAWPRO under the Water Framework Directive to track any changes in pressures and be aware of changes in water chemistry.

This enhanced monitoring programme will aim to include a minimum of 70% of a bog's drainage catchments, whatever number of surface water outlets these include.

Monitoring results will be maintained, trended every six months and reported on each year and as required, as part of the requirement to report on Condition 10.1 of the IPC Licence on Bog Rehabilitation in the Annual Environmental Report, and will be provided to LAWPRO and the EPA as required to inform progress and national monitoring requirements under the WFD. These results will also be available in April each year as a requirement of the Annual Environmental Report at www.epa.ie.

The parameters to be included as per condition 6.2 of the IPC Licence include monthly monitoring for pH, Flow, Suspended Solids, Total Solids, Total Phosphorus, Total Ammonia, Colour & COD. In addition, DOC has been included as a parameter to try and identify any changes in carbon in the surface water, and where required by LAWPRO, to assist in investigating other changes in water chemistry, the series of parameters can be reviewed and amended.

**Success criteria:**

The key water quality success criteria associated with this enhanced rehabilitation are as follow:

- That there is a stabilizing/improving concentration of suspended solids and ammonia in discharges from Bord na Móna sites, associated with the measures undertaken to stabilize the peat surface by the blocking of the internal drainage system and the maximized rewetting of the peat surface.
- Receiving water bodies have been classified under the River Basin Management Plan and this classification includes waters that are At Risk from peatlands and peat extraction. The success criteria will be that the At Risk classification will see improvements in the associated pressures from this peatland or if remaining At Risk, that there is an improving trajectory in the pressure from this peatland.

With regard to predicting and estimating likely trends that might materialize or could be considered as a target, monitoring of surface water ammonia emissions from Longfordpass bog in Littleton over 3 yrs., post cessation of peat extraction with ongoing rehabilitation, were considered. These are indicating a downward trend in Ammonia concentrations.

Similarly monitoring of surface water ammonia emissions from a Corlea bog in Mountdillon over the past 4 yrs. post cessation of peat extraction with ongoing rehabilitation, indicate downward trends.

As the monthly monitoring program at Lisclogher Bog continues in 2022, during the rehabilitation works, and data from the 2020/21/22 monitoring program is compiled, further trending will be produced to verify any ongoing trends.

## 3.7 Fugitive Emissions to air

The bog is no longer in industrial peat production. Rehabilitation of the cutaway peatland will seek to re-wet the dry peat where possible and re-vegetate all areas (whether wet or dry). Collectively, ceasing industrial peat production, re-wetting and re-vegetating will minimise any risk of emission to air from dust.

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## 3.8 Carbon emissions

The bog is likely to be a carbon source as it is a drained (degraded) peatland with some active drainage, which facilitates the oxidation of peat. Peat extraction generally transforms a natural peatland which acts as a modest carbon sink into a cutaway ecosystem which is a large source of carbon dioxide (2–5 t C/ha/year) (Waddington & McNeil, 2002; Alm *et al*., 2007; Wilson *et al*., 2007, Wilson *et al*., 2015). Furthermore, they are also a significant source of methane (Huttunen *et al*., 2003; Laine *et al*., 2007a) as a consequence of the conditions within the peat body that provide a suitable environment for the microbial breakdown of plant litter and root exudates. Degraded peatlands also release carbon/GHG emissions via the fluvial/aquatic pathway (Dissolved Organic Carbon – DOC, Suspended Solids/Particulate Matter, degassing of GHGs from water).

The EPA-funded CarbonRestore Project (Renou-Wilson et. al. 2012) found that rewetting of drained peatlands can lead to restoration of functional peatland, such as the return of typical plant and animal species, which in turn may lead to the restoration of peat-formation and the C-sink function. The EPA NEROS project carried out GHG flux research at Moyarwood Bog and found that Moyarwood Bog was overall a Carbon sink (sink for $CO_2$ and a source for Methane) 6 years after bog restoration was carried out (Renou-Wilson et al. 2018).

It is expected that Lisclogher East Bog will become a reduced Carbon source/part carbon sink following rehabilitation. The potential of any cutaway site to develop as a carbon sink in the longer-term depends on the success of the rehabilitation measures, the extent of development of *Sphagnum*-rich or other peat-forming habitats, the balance of carbon fluxes from different cutaway habitats and future climatic conditions. Much of this site is expected to develop *Sphagnum*-rich habitats, poor fen, heath and Bog woodland along with some wetland habitats with open water, Reed Swamp and fen habitats. Birch woodland is expected to develop on the drier mounds and peripheral headlands.

## 3.9 Current ecological rating

(Following NRA (2009) Evaluation Criteria)

Pioneer cutaway vegetation developing on the site has been given an ecological value of (**E**) with more mature cutaway habitats rated **D (high local ecological value).** Some marginal habitats such as Birch woodland (WN7), small remnant patches of raised bog (PB1), scrub (WS1) and some inactive cutover bog (PB4) have ecological ratings **(D)**.

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# 4. CONSULTATION

## 4.1 Consultation to date

Consultation seeks to engage an audience of relevant stakeholders at both a national and local level. National stakeholders have been identified from varied bog restoration and rehabilitation efforts undertaken by Bord na Móna over the past 40 years, with particular emphasis on engagement with stakeholders during their Biodiversity Action Plan programme, since 2010. National Stakeholders includes relevant government departments and agencies, relevant semi-state bodies, NGOs and other environmentally focused groups with a national remit.

There has been ongoing consultation about rehabilitation, biodiversity and other general issues over the years about Ballivor-Derrygreenagh bog group, including Lisclogher East Bog, with various stakeholders in relation to:

- General consultation with range of stakeholders at annual Bord na Mona Biodiversity Action Plan review days 2010-2018.
- Meetings and site visit with local community group - Meath-Westmeath Bog Group regarding rehabilitation of Bracklin Bog between 2013 - 2016.
- Meeting with Westmeath County Council regarding general rehabilitation plans for BnM bogs and BnM BAP (2016)
- Midlands & East Regional WFD Operational Committee (River Basin Management Plans),
- The proposed development of the nearby Ballivor wind farm,
- Archaeological Liaison Committee (National Museum of Ireland & Dept of Culture Heritage and the Gaeltacht).

There has been ongoing consultation about the planning and construction of Ballivor Wind Farm (Bord na Móna Wind Farm | Ballivor Wind Farm) as part of the planning process for that particular proposed development. This project website describes the project and has up to date project newsletters.

To inform the current Plan, both national and local stakeholders, including neighbours whose land adjoins Lisclogher East Bog and local representatives of national bodies (such as Regional National Parks and Wildlife Service staff) and relevant offices in County Councils (such as the Heritage or Environmental Offices) will be contacted. Any identified local interest groups will be sought and informed of the opportunity to engage with this rehabilitation plan, and when identified invited to submit their comments or observations in relation to the proposed rehabilitation at Lisclogher East Bog.

All correspondence received will be acknowledged and evaluated against the rehabilitation work proposed here, and the final draft of the Lisclogher East Bog Rehabilitation Plan will contain a review of the consultation.

## 4.2 Issues raised by Consultees

N/A Yet as consultation has not commenced.

## 4.3 Bord na Móna response to issues raised during consultation

N/A Yet as consultation has not commenced.

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# 5. REHABILITATION GOALS AND OUTCOMES

The rehabilitation goals and outcomes outline what Bord na Móna want to achieve by implementing the rehabilitation. These include:

- Meeting conditions of IPC Licence.
- Stabilisation or reduction in water quality parameters of water discharging from the site (e.g. suspended solids).
- Reducing pressure on receiving waterbodies that have been classified as At Risk from peatlands and from peat extraction, via stabilization or improving water-quality from this bog, and therefore, reducing pressures.
- Integrating peatland rehabilitation with future planned renewable energy infrastructure on site. It is proposed to re-wet areas in the surrounding cutaway peatland, where possible.
- Optimising hydrological conditions for the protection of exposed archaeological structures, their retention in situ and preservation into the future.
- The main goal and outcome of this plan is the successful rehabilitation (environmental stabilisation and restoration) of a peatland originally drained for industrial peat production, but not brought into production, in a manner that is acceptable to both external stakeholders and to Bord na Móna and which optimise climate action and other ecosystem service benefits.

The rehabilitation goals and outcomes take account of the following issues.

- Natural colonisation will form the basis for the environmental stabilisation of the bare peat areas. Re-wetting of the cutaway, where possible, is a general rehabilitation strategy. The main target will be to maintain water-levels close to the peat surface, and to avoid the creation of large-water bodies. Re-wetting and water levels close to the peat surface accelerates the re-vegetation processes, the development of vegetation cover and therefore environmental stabilisation. There is already significant potential for the creation of wet cutaway habitats at Lisclogher Bog due to the local topography (localised basins).
- It will take some time for stable naturally functioning habitats to fully develop at Lisclogher East Bog. This will happen over a longer timeframe than the implementation of this rehabilitation plan.
- Re-wetting residual peat will initially maintain and enhance the carbon storage capacity of the bog. There is scientific consensus that restoration of hydrology in damaged bog can improve carbon storage, water storage and attenuation and help support biodiversity both on the site and in the catchment (See Section 3.8). This will reduce Carbon emissions from the site from a larger carbon source to a smaller Carbon source/part Carbon sink. In time, the site has the capacity to develop in part as a Carbon sink.
- Rehabilitating former industrial peat production bog will also in the longer-term support other ecosystem services such as such the development of new habitat to support biodiversity and local attenuation of water flows from the bog.
- WFD status in receiving water bodies can be affected by peatlands and peat extraction but is also affected by other sources such as agriculture. In addition, receiving water bodies that are assessed as At Risk from peatlands and from peat extraction are likely to have several contributary sources of impacts (private peat extraction and Bord na Mona). Reducing pressures due to former peat extraction activities at Lisclogher East will contribute to stabilising or improving water quality status of receiving water bodies

in general. Ultimately, improving the WFD status of the receiving waterbody will depend on reducing pressure from a range of different sources, including peatlands in general (private and Bord na Mona).

- Re-wetting in general will benefit the future preservation of most known and unknown archaeological features. An Archaeological Impact Assessment (AIA) is to be carried out.

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# 6. SCOPE OF REHABILITATION

The principal scope of this enhanced rehabilitation plan is to rehabilitate the bog. This is defined by:

- The area of Lisclogher East Bog.
- EPA IPC Licence - Ref. P0501-01. As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. Lisclogher East bog is part of the Ballivor-Derrygreenagh bog group.
- The local environmental conditions of Lisclogher East Bog mean that deep peat measures and dry cutaway measures along with wetland creation is the most suitable rehabilitation approach for this site. Lisclogher East Bog does have residual deep peat along with shallower areas.
- The key goals and outcomes of rehabilitation are set by Bord na Móna. Bord na Móna have defined the key goal and outcome of rehabilitation at Lisclogher East Bog as **environmental stabilisation**, **optimising residual peat re-wetting, and the development of compatible habitats.**
- The cutaway is already developing a mosaic of woodland, grassland, wetland and cutaway peatland habitats. Much of this cutaway has largely stabilised. Rehabilitation is proposed to enhance residual peat re-wetting in these areas while taking account of future infrastructure and land-uses.
- Proposed land-use. Bord na Móna are currently developing a renewable energy project called Ballivor Wind Farm. This proposed project has been submitted for Planning Permission. The proposed renewable energy project will have a footprint on Ballivor Bog and has been mapped as a constraint in the rehabilitation plan.
- Rehabilitation of Lisclogher East Bog will support multiple national strategies of climate action, biodiversity action and other key environmental strategies such was the Water Framework Directive.
- The time frame for the delivery of the planned rehabilitation will be undertaken according to available resources and appropriate constraints.
- It is not proposed to carry out rehabilitation on all marginal or peripheral cutover bog zones. Generally, these bog remnants are narrow, or are subject to turbary, and do not have positive bog restoration prospects.

## 6.1 Key constraints

- **Bog conditions.** Rehabilitation outcomes of sites are constrained by the environmental characteristics of these particular areas. Drain blocking can be widespread in scale with each field drain being blocked (e.g. Kellysgrove) or more localised with targeted drain-blocking (e.g. Mountlucas Wind Farm) and both can be very effective. This can be used in conjunction with local topographical features like natural hollows to manage water levels or with other typical features of cutaway peatlands like high peat fields, which act as berms to hold water to some extent. Active management to create low berms to manage water-levels and create shallow wetland habitats dominated by emergent vegetation has also been successfully developed (e.g. Mountlucas Wind Farm, Bruckana Wind Farm, Oweninny, Lough Boora Discovery Park, Ballycon). In conjunction with the wind farm development and associated roads and embankments there will be further opportunities to manage water-levels using the new construction as a partial embankment, where possible. Material (peat and sub-soil) side-casted from the road construction can be used to develop low berms that would then prevent the adjacent cutaway from draining directly into the drains along the roads. This technique has been used at Mountlucas and Bruckana Wind Farm. Overflow pipes will be used to maintain maximum water levels across the cutaway and allow excess

surface water to flow into the drainage channels beside the roads and other infrastructure. Managing the cutaway in this way means that the cutaway can stay wet, while excess surface water can drain away through the drainage infrastructure.

- **Future land-use.** Planned renewable energy development. It is expected that the site will be part of the proposed Ballivor Wind Farm. This project has been submitted for Planning Permission. Any proposed rehabilitation measures will be integrated to enable any future renewable energy development. It is expected that the proposed development footprint associated with the renewable energy will be < 4% of the overall site. The potential impact of this infrastructure on the rehabilitated area is expected to be relatively minor and it does not change the overall goals and outcomes of the proposed rehabilitation (re-wetting residual peat) for the overall site. The key objective will be environmental stabilisation and re-wetting of the cutaway areas between the proposed Wind Farm infrastructure.
- The EIAR for the proposed Ballivor Wind Farm development details issues related to peat management during construction. In summary, during construction for access tracks, hardstands and other areas, peat is excavated from the cutaway, moved to the side, graded into berms not more than 1 m and allowed to natural re-vegetate This has proven successful during construction of Mountlucas Wind Farm. In the event that natural re-vegetation was unsuccessful, then other measures such as re-seeding would be considered.
- **Surrounding landscape and neighbours.** Another key constraint is the interaction between the Bord na Móna sites and the surrounding landscape. Care has to be taken that no active rehabilitation management is carried out that could negatively and knowingly impact on surrounding land. This includes any hydrological management on neighbouring farmland. It is anticipated that the work proposed here (blocking drains and re-wetting cutaway peatlands) will not have any flooding impacts on adjacent land.
- **Turbary.** There are a number of small, isolated turbary areas (constraints), to the north, east and south of the bog that are subject to active turbary.
- **Archaeology**. Should any previously unknown archaeological material be uncovered during the rehabilitation works, it will be avoided and reported to Bord na Móna Archaeological Liaison Officer and the National Museum of Ireland.
- **Public Rights of Way**. Where a public right of way or similar burden exists on Bord na Móna property, consideration will be given to ensuring that this remain intact where possible. In some instances, depending upon previous land uses and management, alternative solutions may be required. These will be explored in consultation with local communities and statutory bodies during the consultation work associated with the decommissioning and rehabilitation work described here.

## 6.2 Key Assumptions

- It is assumed that Bord na Móna will have all resources required to deliver this project.
- It is expected that weather conditions will be within normal limits over the rehabilitation plan timeframe. Long periods of wet weather have the capacity to significantly affect ground conditions and constrain drain blocking and other ground activities.

## 6.3 Key Exclusions

The scope of this rehabilitation plan does not cover:

- The longer-term development of stable naturally functioning habitats to fully develop at Lisclogher East Bog. The plan covers the short-term rehabilitation **actions** and **an additional monitoring and after-care programme** to monitor the rehabilitation and to respond to any needs.
- This plan is not intended to be an after-use or future land-use plan for Lisclogher East Bog.
- The longer-term management of this site, potentially as a nature conservation site, or for amenity, or for other uses in the future.

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# 7. CRITERIA FOR SUCCESSFUL REHABILITATION

This section outlines what criteria will be used to indicate successful rehabilitation and what critical success factors are needed to achieve successful rehabilitation. All criteria used to indicate successful rehabilitation will be measured to validate the achievement of the rehabilitation goals and outcomes and validate the completion of the rehabilitation.

The key objective of this enhanced rehabilitation plan is **environmental stabilisation** and the stabilisation of any emissions from the site that related to the former industrial drainage activities.

Rehabilitation is generally defined by Bord na Móna as

- stabilisation of bare peat areas via targeted active management (e.g. drain-blocking/re-wetting) slowing movement of water across the site and encouraging a naturally functioning raised bog ecosystem; and
- mitigation of key emissions (e.g. potential suspended solids run-off).

## 7.1. Criteria for successful rehabilitation to meet EPA IPC licence conditions:

- Rewetting of residual peat in the area originally drained of industrial peat production (but never harvested) to offset potential run off of suspended solids and to encourage and accelerate development of vegetation cover via natural colonisation, and increase in the area of potentially peat forming habitats. See Table 7.1 for a summary of the criteria for successful rehabilitation and associated monitoring. The target will be the delivery of measures and this will be measured by an aerial survey after rehabilitation is completed.
- That there is a stabilizing/improving concentration of suspended solids and ammonia in discharges from Bord na Móna sites, associated with the measures undertaken to stabilize the peat surface by the blocking of the internal drainage system and the maximized rewetting of the peat surface. This will be demonstrated by developing a stable or downward trajectory of water quality indicators (suspended solids and ammonia) towards what would be typical of a re-wetted cutaway bog. This will be measured via water quality monitoring (suspended solids and ammonia) for at least 2 years after the rehabilitation has been completed.
- Receiving water bodies have been classified under the River Basin Management Plan and this classification includes waters that are At-Risk from peatlands and peat extraction. The success criteria will be that the At-Risk classification will see improvements in the associated pressures from this peatland or if remaining At-Risk, that there is an improving trajectory in the pressure from this peatland.

With regard to predicting and estimating likely trends that might materialize or could be considered as a target, monitoring of surface water ammonia emissions from Longfordpass bog in Littleton over 3 yrs., post cessation of peat extraction with ongoing rehabilitation, were considered. These are indicating a downward trend in Ammonia concentrations (Figure 7.1).

Similarly monitoring of surface water ammonia emissions from a Corlea bog in Mountdillon over the past 3 yrs. post cessation of peat extraction with ongoing rehabilitation, indicate downward trends.

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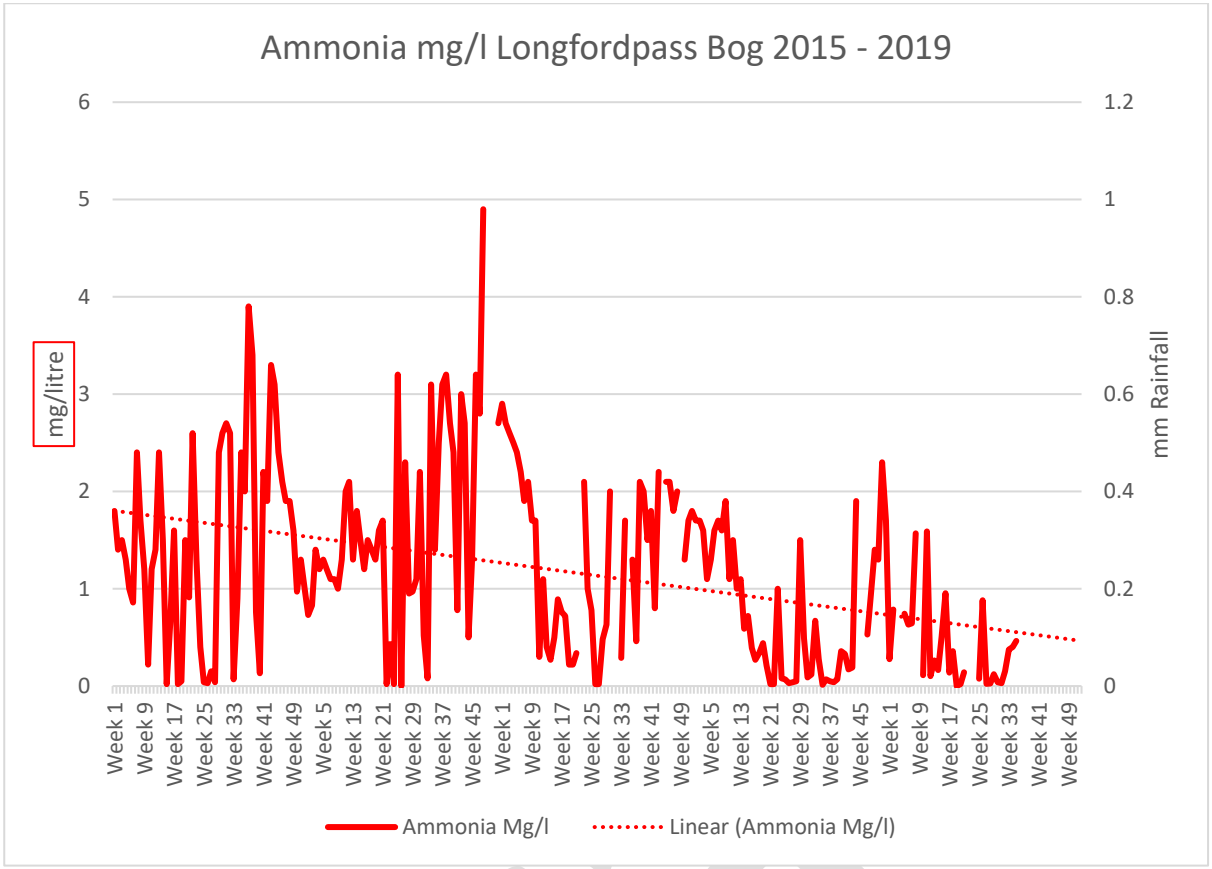


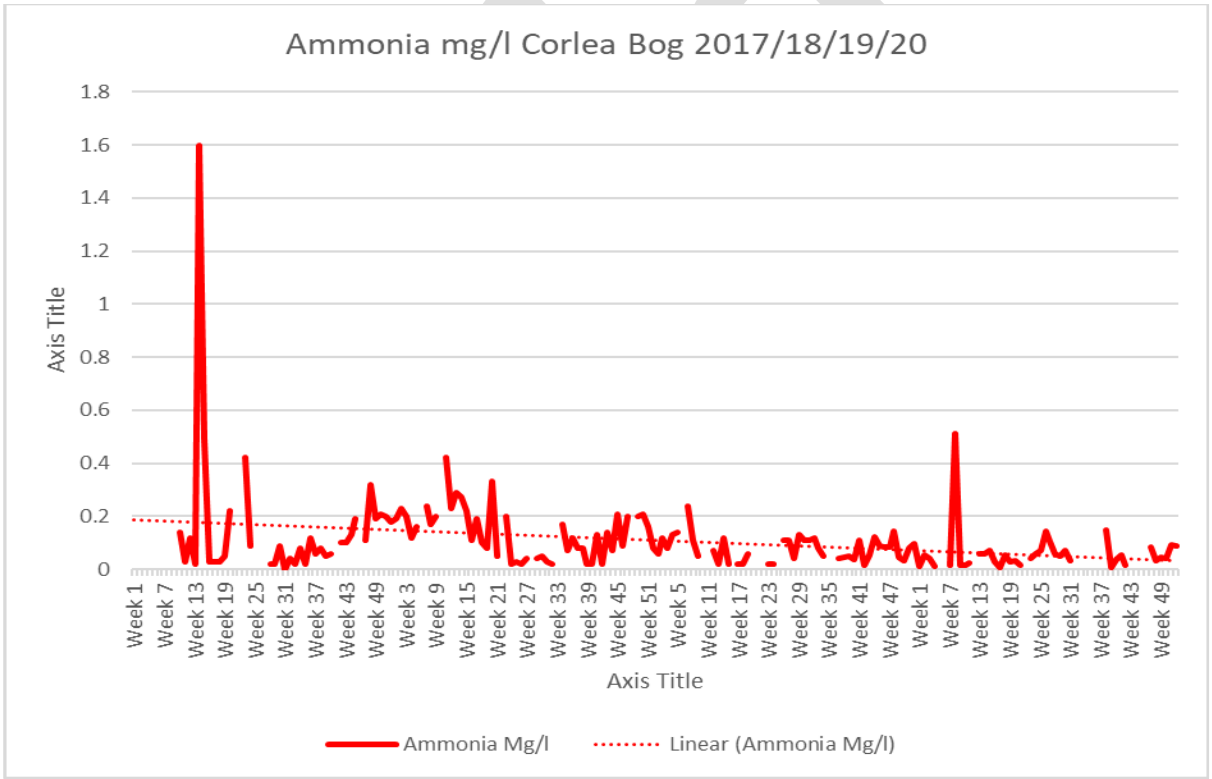


**Figure 7.1.** Ammonia levels over the period 2015-2019/2020 at Longfordpass and Corlea.

**Table 7.1. Summary of Success criteria, targets, how various success criteria will be measured and expected time-frames.**

| Criteria type | Criteria | Target | Measured by | Expected Time-frame |
|---|---|---|---|---|
| IPC validation | Rewetting in the former area of industrial drainage | Delivery of rehabilitation measures<br>Restoration of hydrological regime | Aerial photography after rehabilitation has been completed – to demonstrate measures (drain-blocking)<br>Establishment of a baseline for future monitoring of bare peat, vegetation establishment and habitat condition | 3 years |
| IPC validation | Key water quality parameters<br>Ammonia, Phosphorous, Suspended solids, pH and conductivity | Reduction or stabilisation of key water quality parameters associated with this bog | Water quality monitoring for a period after rehabilitation has been completed | 2 years |
| IPC validation | Reducing pressure from drainage on the local water body catchment (WFD) | Where this section of the water body (that this bog drains to) has not been identified as under pressure from peat extraction, that the intervening EPA monitoring programme associated with its Programme of Measures for this water body, confirms that its classification remains at not being at risk from peat extraction associated with activities at this bog. | EPA WFD monitoring programme | WFD schedule |

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## 7.2. Critical success factors needed to achieve successful rehabilitation as outlined in the plan

The achievement of successful rehabilitation as outlined in the plan requires:

- **Funding to pay for resources required to deliver the planned rehabilitation (Bord na Móna).** Bord na Móna maintains a Provision on its balance sheet to pay for these future costs when industrial peat extraction ceases. Bord na Móna is fully committed to meeting its obligations relating to rehabilitation and decommissioning under the Integrated Pollution Control Licence.
- **Bord na Móna to have sufficient resources (staff and training) to deliver the planned rehabilitation with required associated skills and competencies.**
- **Bord na Móna to have sufficient resources (suitable machinery) and staff to maintain this machinery.**
- **Weather conditions to be within normal limits over the rehabilitation plan timeframe.** Long periods of wet weather have the capacity to significantly affect ground conditions and constrain the delivery of rehabilitation. The potential impact of wet weather on ground conditions can be reduced by appropriate planning and management. Bord na Móna have significant experience of managing these issues through 70 years of working in these peatland environments.
- **Rehabilitation measures to be effective.** The rehabilitation measures proposed in this plan are based on 40 years of Bord na Móna experience of peatland management and best practise applied internationally in peatland management. Measures proposed in this plan have already been shown to be affective at other sites. Bord na Móna will apply a flexible and adaptable approach to the more innovative rehabilitation measures proposed in this plan**.** If measures are not initially effective, Bord na Móna will review any requirement for additional practical rehabilitation.
- **Natural colonisation of vegetation to develop semi-natural habitats at a rate within the normal limits.** The development of naturally functioning semi-natural habitats on cutaway peatland takes time. Pioneer vegetation can develop relatively quickly (3-10 years) and wetland habitats can develop relatively quickly. Birch woodland make take 20-30 years to develop. However, it may take 50 years for active raised bog vegetation to re-develop on ground that was previously cutaway. Different environmental conditions will have a significant impact on the rate of natural colonisation, and as a result of the combination of different environmental conditions and the application of different rehabilitation measures, there will be a variety of habitat outcomes.
- **Rehabilitation measures have been designed to accelerate and work with natural colonisation and other natural processes.** Bord na Móna experience of rehabilitation and restoration has shown that re-wetting improves conditions for natural colonisation and that natural colonisation is accelerated where the environmental conditions are most suitable. Rehabilitation measures have been designed to modify the conditions of areas within sites where conditions are less suitable for natural colonisation (modifying hydrology, topography, nutrient status or availability of potential seed sources).
- **Monitoring to be robust and effective.** Rehabilitation Monitoring will be established to validate the success of rehabilitation as required by Condition 10 of the IPC Licence and to verify the benefits of the proposed enhanced measures to optimise climate action. This will focus on a collecting a range of scientific data that can then quickly be adapted and into metrics that can be used to measure changes in various ecosystem services.

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# 8. REHABILITATION ACTIONS AND TIME FRAME

Peatland restoration and rehabilitation requires detailed planning and the use of data from desktop surveys and field surveys. This data in association with topographical and hydrological modelling will be important in planning the future peatland landscapes and planning the use of the most appropriate rehabilitation methodologies to maximise climate action benefits. Hydrological modelling indicates those areas that are likely to re-wet when drains are blocked, based on the current topography, and areas where water levels may have to be modified, where needed. Enhanced restoration and rehabilitation measures will look to optimise hydrological conditions for re-wetting peat in other areas. This planning is also essential for matching the most sustainable rehabilitation methodology to the most suitable cutaway environment to maximise the benefits of the resource outlay (maximising cost/benefit).

A number of illustrative figures have been produced to inform Rehab Planning and Design, including Aerial Photography, Peat Depths and LiDAR Surface Maps; these are included in the accompanying Mapbook as the drawings referenced below:

BNM- ECO-01-22: titled *Lisclogher East Bog: Aerial Imagery 2020*

BNM- ECO-01-04: titled *Lisclogher East Bog: Peat Depths*

BNM- ECO-01-03: titled *Lisclogher East Bog: LiDAR Map*

The distribution of these measures is provisionally outlined in drawing titled BNM-ECO-01-20: Lisclogher East Bog: *Standard Rehab Measures* in the accompanying Mapbook (Note that the actual distribution of these measures may be subject to change in response to stakeholder consultation and refinement of the rehabilitation measures.)

These rehabilitation measures for Lisclogher East bog will include (see Table 8.1):

- A widespread drain-blocking programme will be implemented across the cutaway, where possible. In general, field drains will be blocked where possible to re-wet cutaway and re-wet to the optimum water-level. More intensive measures will be targeted towards the bare peat.
- Less intensive measures (targeted drain-blocking) will be used in areas where habitats have already established.
- Measures including drain blocking (3/100 m), modifying outfalls and managing water levels with overflow pipes;
- Wetland measures including modifying outfalls and managing water levels with overflow pipes.

*Table 8.1: Types of and areas for rehabilitation measures at Lisclogher East Bog.* Note that the types of rehab and areas of rehab may change in response to stakeholder consultation and refinement of the enhanced rehabilitation measures.

| Type | Code | Description | Area (Ha) |
|---|---|---|---|
| Deep Peat Cutover Bog | DPT1 | Regular drain blocking (3/100 m) + blocking outfalls and managing water levels with overflow pipes | 305.7 |
| Dry Cutaway | DCT1 | Blocking outfalls and managing water levels with overflow pipes | 148.7 |
| Marginal Land | MLT1 | No work required | 65.5 |
| Other | | Silt-ponds | 0.36 |
| **Total** | | | **520.3** |

## 8.1 Completed and ongoing

- The majority of the site has already re-vegetated, with pioneer vegetation maturing and developing a mosaic of typical cutaway peatland habitats with Birch woodland predominating. Bare peat areas within the older cutaway areas are reducing. Natural re-colonisation of the cutaway so far has been quite effective. Other parts of the site (younger cutaway) are naturally colonising for more than 10 years and are developing a mosaic of cutaway habitats. Natural re-colonisation of the cutaway so far has been quite effective.

## 8.2 Short-term planning actions (0-1 years)

- Seek formal approval of the rehabilitation plan from the EPA.
- Develop a detailed site plan outlining how the various rehabilitation methodologies will be applied to Lisclogher East Bog. This will take account of peat depths, topography, drainage and hydrological modelling (See map for an indicative view of the application of different rehabilitation methodologies).
- A drainage management assessment of the proposed enhanced rehabilitation measures will be carried out and any issues identified resolved and the rehabilitation plan adapted.
- A review of issues that may constrain rehabilitation such as known rights of way, turbary and existing land agreements is to be carried out
- An ecological appraisal of the potential impacts of the planned rehabilitation on the presence of sensitive ground-nesting bird breeding species (e.g. breeding waders) is to be carried out. The scheduling of rehabilitation operations will be adapted, where required.
- Ensure all activities comply with the environmental protection requirements of the IPC Licence.
- Carry out Appropriate Assessment (AA) of the Rehabilitation Plan. Incorporate any required mitigation measures from the AA in the plan for the delivery of rehabilitation and decommissioning across the site.
- Track implementation and enforcement of the relevant IPC Licence conditions, the mitigation measures (AA) and other environmental control measures during the implantation of the rehabilitation plan.

## 8.2 Short-term practical actions (0-2 years)

- Carry out proposed measures as per the detailed site plan. This will include intensive drain blocking and targeted hydrological management prescriptions in the cutaway. All rehabilitation will be carried out with regard to best practice environmental control measures (Appendix III).
- Monitor the success of rehabilitation measures in relation to developing suitable hydrological conditions.
- Carry out the proposed monitoring, as outlined.
- Silt ponds will be monitored during this period and there will be continued maintenance and cleaning to prevent potential suspended solids run-off from the site during the rehabilitation phase.

## 8.4 Long-term (>3 years)

- Evaluate success of short-term rehabilitation measures outlined above and remediate where necessary.
- Delivery of a monitoring, aftercare and maintenance programme (See section 10.2 below).

- Decommissioning of silt-ponds will be assessed and carried out, where required.
- Reporting to the EPA will continue until the IPC License is surrendered.

## 8.4 Long-term (Post Wind Farm construction) (>3 years)

- Site conditions and drainage are likely to change somewhat after the construction of the wind farm, so continued assessment could be made of further rehabilitation and maintenance works such as localised drain blocking and berm creation in association with the wind farm infrastructure. Similar rehabilitation works have already been carried out successfully at Mountlucas Wind Farm in County Offaly.
- Evaluate success of short-term rehabilitation measures outlined above and remediate where necessary.
- Delivery of a monitoring, aftercare and maintenance programme (See section 10.2 below).
- Decommissioning of silt-ponds will be assessed and carried out, where required.
- Reporting to the EPA will continue until the IPC License is surrendered.

## 8.5 Long-term (Post Wind Farm decommissioning)

- At this stage it is expected that the site will have no bare peat cover and that the entire site will be developing a suite of maturing cutaway habitats that reflect the mosaic of environmental conditions. The wind farm infrastructure will have been integrated into the landscape and there are likely to be other land-uses across the site including amenity.

## 8.6 Timeframe (when finalised)

- **Year 1**: Short-term planning actions.
- **Year 1**: Short-term practical actions.
- **> Year 3**: Long term practical actions. Evaluate success of short-term rehabilitation measures outlined above and remediate where necessary.
- **> Year 3**: Decommission silt-ponds, if necessary.

## 8.7 Budget and costing

Bord na Móna maintains a provision on its balance sheet to pay for the future costs of **standard** rehabilitation and decommissioning when industrial peat extraction ceases. This is updated every year - for more information see the Bord na Móna Annual Report (Bord na Móna 2023). Bord na Móna is fully committed to meeting its obligations relating to rehabilitation and decommissioning under the Integrated Pollution Control Licence.

At this time, a 'standard' rehabilitation provision (sufficient to discharge the requirement of Condition 10 in the licence) has been be allocated to the site based on the area of different drainage and turf cutting types across the site (See Drawing BNM-ECO-01-20 Lisclogher Bog Standard Rehab Measures).

Specific peatland rehabilitation measures that may be conditioned as part of the planning conditions for the proposed Ballivor Wind Farm will be funded via the Wind Farm construction programme.

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# 9. AFTERCARE AND MAINTENANCE

## 9.1 Programme for monitoring, aftercare and maintenance

This programme for monitoring, aftercare and maintenance has been designed to meet the Conditions of the IPC Licence. This is defined as:

- There will be **initial quarterly monitoring assessments** of the site to determine the general status of the site, the condition of the silt ponds, assess the condition of the rehabilitation work, monitoring of any potential impacts on neighbours land, general land security, boundary management, dumping and littering.
- The number of these site visits will reduce after 2 years to bi-annually and then after 5 years to annual visits.
- These monitoring visits will also consider any requirements for further practical rehabilitation measures.
- The **baseline condition of the site will be established** post-rehabilitation implementation by using an aerial survey to take an up to date aerial photo, when rehabilitation is completed. This will be used to verify completion of rehabilitation measures. The extent of bare peat will be assessed using this baseline data, and habitat maps will be updated, if needed. It is proposed that sites can be monitored against this baseline in the future.
- **Water quality monitoring** at the bog will be established. The main objective of this water quality monitoring will be to establish a baseline and then monitor the impact of peatland rehabilitation on water quality from the bog.
- Monitoring results will be maintained, trended every six months and reported on each year and as required, as part of the requirement to report on Condition 10.1 of the IPC Licence on Bog Rehabilitation in the Annual Environmental Report, and will be provided to LAWPRO and the EPA as required to inform progress and national monitoring requirements under the WFD. These results will also be available in April each year as a requirement of the Annual Environmental Report at www.epa.ie.
- The parameters to be included (as per condition 6.2 of the IPC Licence) include monthly monitoring for pH, Suspended Solids, Total Solids, Total Phosphorus, Total Ammonia, Colour, and COD and DOC.
- If, after two years, key criteria for successful rehabilitation are being achieved and key targets are being met, then the water quality monitoring will be reviewed, with consideration of potential ongoing research on site. The water quality data, the aerial surveys and the habitat mapping will be collated and will be submitted to the EPA as part of the final validation report.
- Where other uses are proposed for the site that are compatible the provision of biodiversity and ecosystem services, these will be assessed by Bord na Móna in consultation with interested parties. Other after-uses can be proposed for licensed areas and must go through the required assessment process and planning procedures.

## 9.2 Rehabilitation plan validation and licence surrender – report as required under condition 10.4

***IPC License Condition 10.4.*** *A final validation report to include a certificate of completion for the Rehabilitation Plan, for all or part of the site as necessary, shall be submitted to the Agency within six months of execution of the plan. The licensee shall carry out such tests, investigations or submit certification, as requested by the Agency, to confirm that there is no continuing risk to the environment.*

Reporting to the EPA will continue until the IPC License is surrendered. The bog will be included in the full licence surrender process as per the Guidance to Licensees on Surrender, Cessation and Closure of Licensed Sites EPA, 2012, when:

- The planned rehabilitation has been completed;
- The key criteria for successful rehabilitation has been achieved and key targets have been met;
- Water quality monitoring demonstrates that water quality of discharge is stabilising or improving; and
- The site has been environmentally stabilised.

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## APPENDIX I: BOG GROUP CONTEXT

The Ballivor-Derrygreenagh Bog Group comprises 11 discrete and defined bog units within Co's. Offaly, Westmeath and Meath (and one site used for transport – Hill of Down Railway). There are two main sub-groups; Ballivor (7 sites) and Derrygreenagh (5 sites). Nearly all of the Derrygreenagh sub-group and all of the Ballivor sub-group is located within the River Boyne catchment. A small portion of the western side of Toar Bog is located in the River Shannon catchment. Each bog area further comprises a range of habitats from bare milled former peat extraction areas to re-colonising cutaway to workshops areas and transport infrastructure.

Industrial peat extraction in the Ballivor-Derrygreenagh Bog Group ceased in 2020.

The Ballivor Bogs sub-group is located close to Ballivor Town in Co. Meath and most of the bogs extend across the Meath and Westmeath border. The Bord na Móna Ballivor Peat Moss factory is located 4 km from Ballivor Village on the margin of Ballivor Bog. An industrial railway links Ballivor to Carrenstown, Bracklin and Lisclogher East. Milled peat was supplied from Ballivor, Carrenstown, and part of Bracklin to Ballivor peat moss factory for horticultural products, with milled fuel peat being transported via road to Lough Ree Power (Lanesborough Co. Longford).

Intensive decommissioning and rehabilitation for the Ballivor-Derrygreenagh Bog Group started in 2021 at a number of individual bogs.

Industrial peat extraction in the Ballivor-Derrygreenagh Bog Group ceased in 2020. Decommissioning for the Ballivor-Derrygreenagh Bog Group started in 2021 at a number of individual bogs. Enhanced rehabilitation as part of the Peatland Climate Action Scheme (PCAS) has been carried out at Carranstown Bog and Lisclogher West Bog.

Bord na Móna is currently developing a wind energy project called Ballivor Wind Farm. This proposed project has been submitted for Planning Permission. Bord na Móna are also continuing to review its landbank for future potential renewable energy projects.

A breakdown of the component bog areas for the Ballivor-Derrygreenagh Bog Group IPC License Ref. PO-501-01 is outlined in Table Ap-2.

*Table Ap-2: Ballivor-Derrygreenagh Bog Group names, area and indicative status (Derrygreenagh Energy Peat sub-group)*

| Bog Name | Area (ha) | Stage of development | Land-Use and History | Peat Production Cessation | Rehab Plan Status |
|---|---|---|---|---|---|
| Ballivor | 654 | Industrial peat production commenced at Ballivor in the 1940s.<br>Some sections have been cutaway. Some sections still have relatively deep residual peat. | Ballivor Bog formerly supplied a range of commercial functions including the supply of horticultural peat, sod peat and latterly; fuel peat for Lough Ree Power.<br>Some sections were never re-developed to milled peat and have revegetated as cutaway..<br>Some areas of cutaway are developing pioneer cutaway vegetation communities.<br>Expected to be part of the proposed Ballivor Wind Farm. Submitted for planning.. | 2020 | Draft updated 2024 |

| Bog Name | Area (ha) | Stage of development | Land-Use and History | Peat Production Cessation | Rehab Plan Status |
|---|---|---|---|---|---|
| Bracklin | 680 | Industrial peat production commenced at Bracklin in the 1940s.<br>Some sections have been cutaway. Some sections still have relatively deep residual peat. | Bracklin Bog formerly supplied a range of commercial functions including the supply of horticultural peat, sod peat and latterly; fuel peat for Lough Ree Power.<br>The main section was never re-developed to milled peat and has revegetated as mature cutaway habitats<br>Bare peat is prevalent in the western section, which was in milled peat extraction. A separate specific rehabilitation plan for Bracklin West has been finalised and approved by EPA and rehab in this area is ongoing.<br>Bracklin expected to be part of the proposed Ballivor Wind Farm. Submitted for planning.. | 2020 | Bracklin West rehab plan finalised 2023<br>Bracklin Drat rehab plan updated 2024 |
| Carrenstown | 306 | Industrial peat production commenced at Carrenstown in the 1980s.<br>The majority of the site has relatively deep peat. | Carrenstown Bog formerly supplied a range of commercial functions including the supply of horticultural peat and latterly; fuel peat for Lough Ree Power.<br>The majority of the site is bare peat. There are cutaway habitats developing on the eastern side.<br>Expected to be part of the proposed Ballivor Wind Farm. Submitted for planning. . | 2020 | Finalised in 2022<br>Rehabilitation ongoing |
| Lisclogher East | 486 | Industrial peat production commenced at Lisclogher East in the 1950s.<br>Part of the site is cutaway while there is a mosaic of residual peat depths. | Lisclogher East formerly supplied sod turf both for fuel and horticulture. This bog was never re-developed to supply milled peat.<br>The majority of the bog is developing cutaway habitats and there is a mosaic of bare peat areas where there has been recent sod peat extraction. | 2020 | Draft updated 2024 |
| Lisclogher West | 239 | Lisclogher West was drained in 1980s.<br>The bog is drained and still has residual vegetation in places. | Lisclogher West was drained but never fully developed for industrial peat extraction. | N/A | Finalised in 2023.<br>Rehabilitation ongoing |
| Kinnegad | 352 | Industrial peat production commenced at Kinnegad in the 1980s.<br>The majority of the site still has relatively deep peat. | Kinnegad Bog formerly supplied a range of commercial functions -mainly the supply of horticultural peat and latterly; fuel peat for Lough Ree Power.<br>The majority of the site is bare peat. | 2020 | Draft 2017 |
| Hill of Down Railway | 22 | | Rail link – not used for peat extraction | N/A | |
| Ballybeg | 847 | Industrial peat production commenced at Ballybeg in the 1950s.<br>Most of the site is cutaway | Ballybeg Bog formerly supplied a range of commercial functions including the supply of horticultural peat and fuel peat for Edenderry Power.<br>Much of the site is bare peat. The northern half has been cutaway and is establishing cutaway habitats.<br>Expected to be part of the proposed Derrygreenagh Energy Project, which is currently in pre-planning. | 2020 | Draft 2023 |
| Derryarkin | 710 | Industrial peat production commenced at Derryarkin in the 1950s. | Derryarkin Bog formerly supplied a range of commercial functions including the supply of | 2015 | Draft 2023 |

| Bog Name | Area (ha) | Stage of development | Land-Use and History | Peat Production Cessation | Rehab Plan Status |
|---|---|---|---|---|---|
| | | Most of the site is cutaway | fuel peat for Rhode Power Station, Croghan Brickette Factory and Edenderry Power.<br>Most of the site is developing cutaway habitats. Some re-wetting was carried out in the past.<br>Part used for gravel extraction.<br>Expected to be part of the proposed Derrygreenagh Energy Project, which is currently in pre-planning. | | |
| Derryhinch | 337 | Industrial peat production commenced at Derryhinch in the 1950s.<br>There is a mosaic of residual peat depths left | Derryhinch Bog formerly supplied a range of commercial functions including the supply of fuel peat for Rhode Power Station, Croghan Brickette Factory and Edenderry Power.<br>Most of the site is bare peat with emerging cutaway habitats.<br>Part of the site was used to trial herb production | 2020 | Draft 2023 |
| Drumman | 1,122 | Industrial peat production commenced at Drumman in the 1950s.<br>Most of the site is cutaway | Drumman Bog formerly supplied a range of commercial functions including the supply of fuel peat for Rhode Power Station, Croghan Brickette Factory and Edenderry Power.<br>Most of the site is developing cutaway habitats. Some re-wetting was carried out in the past.<br>Part used for gravel extraction.<br>Part of the site was used to trial herb production.<br>Part of the site is used for log storage (biomass).<br>Expected to be part of the proposed Derrygreenagh Energy Project, which is currently in pre-planning. | 2020 | Draft 2023 |
| Toar | 445 | Industrial peat production commenced at Toar in the 1980s.<br>Most of the site has deep residual peat. | Toar Bog formerly supplied a range of commercial functions including the supply of horticultural peat and fuel peat for Edenderry Power.<br>Most of the site is bare peat.<br>Part of the site is used for log storage (biomass) | 2020 | Draft 2021 |

See Drawing number BNM-ECO-03-01 titled Ballivor-Derrygreenagh Bog Group, included in the accompanying Mapbook which illustrates the location of Bracklin Bog and the Ballivor-Derrygreenagh Bog Group in context to the surrounding area.

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## APPENDIX II: ECOLOGICAL SURVEY REPORT

**Ecological Survey Report**

*Note: This report outlines an ecological survey of the bog. This report should not be taken as a management plan for the site as other land-uses may still be considered. Information within this report may inform the development of other land-uses and identify areas with particular biodiversity value.*

| | | | |
|---|---|---|---|
| **Bog Name:** | **Lisclogher East** | **Area (ha):** | 486ha |
| **Works Name:** | Ballivor | **County:** | Meath and Westmeath |
| **Recorder(s):** | DF | **Survey Date(s):** | April 1 2010 |

**Habitats present (in order of dominance)**

The most common habitats present at this site include:

- (Codes refer BnM classification of pioneer habitats of production bog).
- (Codes refer to Heritage Council habitat classification, Fossitt 2000).
- pEang
- Bare peat (BP)
- Birch woodland (WN7)
- oBir
- eBir
- pJeff
- Raised bog remnant (PB1)
- pCamp
- dHeath
- Open water

**Description of site**

Lisclogher East is located in north-east Co Westmeath, 4.3 km south-east of Delvin. This bog is part of the Ballivor group of bogs. A minor road delineates the western boundary and separates Lisclogher West from Lisclogher East. A recent fire in 2008 burnt the majority of the main bog. A minor road runs close to the southern boundary of the bog.

This bog has been used for the production of horticultural peat in the past but since the late 1990s the site has been out of production except for some areas in the north east of the site where sod peat is still produced.

Overall the site has begun to become colonised with vegetation. The old rail lines are still clearly visible on the site as narrow, high ridges that contain habitats such as dHeath, eBir and pJeff. The former production fields are lower than most of the site and contain open water in the wettest places with pEang having developed in the majority of the old production fields.

Drainage on the site had begun to break down with many old drains having become blocked and full of water, some drains contained *Sphagnum cuspidatum* while other drains contained Reedmace, Bog Cotton and rushes (mainly Soft Rush).

Sections of remnant raised bog (PB1) are located at the northern and southern ends of the site. These areas are small and have been drained and are therefore dry and degraded. The recent fire also burned over the majority of these areas.

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A relatively large section of Birch woodland (WN7) is located at the southern end of the site. This woodland is bordered on two sides by raised bog. The woodland is located in what appeared to be a small valley between the two sections of raised bog, a stream flows through the woodland at the bottom of the valley. The woodland is situated on peat soils. This habitat comprised Birch with large mature Oak (*Quercus robur*), mature Scots Pine, Rowan and Holly. The ground flora was made up of Bracken, Bilberry, Bramble, Creeping Bent Grass, Wood Rush, Sorrell, Honeysuckle, Ivy and Broad Buckler Fern. This woodland contained three patches of Laurel which is regarded as an invasive exotic species capable of suppressing other species and therefore reducing the level of biodiversity in areas where it becomes established.

The stream that flows through the woodland was deep and about one metre wide and was heavily shaded by the woodland, it does not appear to have been canalised and did not contain any signs of bank-side erosion. Moving west along the southern boundary from the main section of woodland, a narrow strip of Birch woodland occurs. This section of woodland was mainly comprised of Birch and had been almost entirely destroyed by the recent fire; however the fire did not appear to have spread through the main section of woodland except for around its fringes.

Several areas of Birch woodland were also located around the site on the cutover sections of bog. These habitats appeared to be developing on any of the drier areas with Bog Cotton developing on the wettest sections. Some sections of bare peat were located on the site particularly in the north east and mid west where turf cutting had been active in the past year.

**Designated areas on site (cSAC, NHA, pNHA, SPA other)**

None

**Adjacent habitats and land-use**

Raised bog (PB1), Birch woodland (WN7), public roads (BL3), scrub (WS1), wet grassland (GS4) and improved agricultural grassland (GA1) are all found in locations adjacent to the site.

**Watercourses (major water features on/off site)**

- This bog is located within the Boyne catchment.
- There are two tributaries of the Stoneyford River located on the site. The first one is a small stream on the eastern boundary that flows eastwards into the Stoneyford River. The second watercourse flows through the woodland at to southern end of the site; this stream flows southwards and is also a tributary of the Stoneyford River.

**Peat type and sub-soils**

This site has been used for the production of horticultural peat in the past while some turf cutting is active in the north east of the site.

**Fauna biodiversity**

Several bird species were noted on the site during the survey.

- Three Snipe
- Numerous Meadow Pipit
- A large flock of Goldfinch (14)
- A single Woodcock was observed on the site

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- Six Mallard
- One Skylark
- Many other common bird species such as Blackbird, Wren, Robin and Thrush were observed at many points on the site.

Mammals

- Badger tracks and latrine observed on the site
- Fox droppings observed at numerous points around the site
- Two hares were observed on the site

**Fungal biodiversity**

The ecological survey was not carried out at a time of year that was suitable for a fungal survey.

**HABITAT DESCRIPTIONS**

(See Habitats Description Document for detailed description of each vegetation community not described in this section.)

**HABITAT DESCRIPTIONS**

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## APPENDIX III. ENVIRONMENTAL CONTROL MEASURES TO BE APPLIED TO BOG REHABILITATION

- Bog restoration/rehabilitation measures will be restricted to within the footprint of the proposed rehabilitation area.
- The proposed rehabilitation will have due regard to noise limits and hours of operation (i.e. dusk and dawn) to minimise any potential disturbance on resident and local fauna that utilise the site and immediate environs.
- All plant and equipment for use will comply with the Construction Plant and Equipment Permissible Noise Levels Regulations (SI 359/1996).
- The proposed activities will be restricted to daylight hours and there will be no requirement for artificial lighting.
- Silt ponds will be inspected and maintained as per the IPC Licence.
- During periods of heavy precipitation and run-off, activities will be halted.
- Measures will be carried out using a suitably sized machine and, in all circumstances, excavation depths and volumes will be minimised where possible.
- All machines will be regularly checked and maintained prior to arrival at the site to prevent hydrocarbon leakage.
- Hoses and valves will be checked regularly for signs of wear and will be closed and securely locked when not in use.
- Fuelling and lubrication of equipment shall only be carried out in designated areas away from surface water drainage features and ecologically sensitive areas.
- Waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the site for disposal or re-cycling.
- Vehicles will never be left unattended during refuelling.
- No direct discharges to waters will be made. No washings from vehicles, plant or equipment will be carried out on site.
- All plant refuelling will take place using mobile fuel bowsers. Only dedicated trained and competent personnel will carry out refuelling operations.
- Mobile storage such as fuel bowsers will be bunded to 110% capacity to prevent spills. Tanks for bowsers and generators shall be double skinned. When not in use, all valves and fuel trigger guns from fuel storage containers will be locked. All pumps using fuel or containing oil will be locally and securely bunded where there is the possibility of discharge to waters.
- Potential impacts caused by spillages etc. during rehabilitation will be reduced by keeping spill kits and other appropriate equipment on-site.
- Site activities will be carried out in accordance with 'best practice'. In order to ensure compliance and implementation of 'best practice', these measures will be communicated to relevant Bord na Móna staff and updated as required.

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## APPENDIX IV. BIOSECURITY

The potential for importation or introduction of non-native plant species (such as Japanese Knotweed, Himalayan Balsam, etc.) during future rehabilitation management, such as drain-blocking using excavators, has the potential to result in the establishment of invasive species within the site. Section 49 of the European Communities (Birds and Natural Habitats) Regulations 2011 prohibits the introduction and dispersal of invasive alien species (particularly plant species) listed on Part 1 (third column) of the 'Third Schedule'.

This section aims to reduce the risk from, and impacts of, invasive species and protecting biodiversity on lands under Bord na Móna ownership. Rehabilitation and decommissioning in the bog will have due regard to the relevant biosecurity measures outlined below:

- Records of problematic invasive species within the various bog units will be marked out with signs to highlight areas of infestation to personnel.
- All plant machinery will be restricted from disturbing known colonies of invasive species.
- All plant machinery will avoid unnecessary crossings to adjoining lands.
- Good site hygiene will be employed to prevent the introduction and spread of problematic invasive alien plant species (i.e. Japanese Knotweed (*Fallopia japonica*), Himalayan Balsam (*Impatiens glandulifera*), Himalayan Knotweed (*Persicaria wallichii*), etc.) by thoroughly washing vehicles prior to entering the area.

The biosecurity measures outlined above are in line with best practice guidelines issued by the National Roads Authority (NRA, 2010) – The Management of Noxious Weeds and Non-native Invasive Plant Species on National Roads and broadly based on the Environment Agency's (2013) – The Knotweed Code of Practice: Managing Japanese Knotweed on Development Sites (Version 3, amended in 2013, accessed on the Environment Agency's website on the 11th of July 2016).

In addition to the above, Best Practise measures around the prevention and spread of Crayfish plague[4] will be adhered with throughout all rehabilitation measures and activities.

[4] https://www.biodiversityireland.ie/projects/invasive-species/crayfish-plague/

# APPENDIX V. POLICY AND REGULATORY FRAMEWORK

Bord na Móna Plc is a publicly owned company, originally established in 1934 to develop some of Ireland's extensive peat resources for the purposes of economic development and to support energy security. In the decades since its establishment the company has employed tens of thousands of people in its fuel, energy, and horticultural growing media businesses. For much of its history the company's support of important national policy aims has been enabled and encouraged in a variety of ways by Government.

Today, Bord na Móna is undertaking a number of highly significant actions in support of climate policy. These actions involve a radical transformation and decarbonisation of nearly the entire Bord na Móna business. This transformation will be driven by unlocking the full potential of our land and creating significant value for Ireland and the Midlands in particular.

Bord na Móna is an integral part of the economic, social, and environmental fabric of Ireland and Irish life. As a key employer in the Midlands, the company is conscious that its obligations go beyond purely commercial and environmental – there is also a social responsibility to employees and the communities served by Bord na Móna. It is the company's role and absolute priority to ensure that its long-term strategy delivers on all of these important areas in a robust and balanced way.

There are a wide range of policies, plans, legislation and land designations that inform the development of this Bord na Móna peatland rehabilitation plan. Bord na Móna have also developed and operate various policies and strategies that also inform the development of this rehabilitation plan.

## 1 EPA IPC Licence

Bord na Móna operates under IPC Licence issued and administered by the EPA to extract peat within the Ballivor-Derrygreenagh Bog Group (Ref. PO-501-01). As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. The bog is part of the Ballivor-Derrygreenagh group. This regulatory requirement is the main driver of the development of this rehabilitation plan.

## 2 National Climate Policy

The National Policy Position establishes the fundamental national objective of achieving a transition to a competitive, low carbon, climate-resilient and environmentally sustainable economy by 2050. It sets out:

- the context for the objective;
- clarifies the level of GHG mitigation ambition envisaged; and
- establishes the process to pursue and achieve the overall objective.

The evolution of climate policy in Ireland will be an iterative process based on the adoption by government of a series of national plans over the period to 2050. GHG mitigation and adaptation to the impacts of climate change are to be addressed in parallel national plans – respectively through the National Climate Action Plan. The plans will be continually updated, as well as being reviewed on a structured basis at appropriate intervals and, at a minimum, every five years. This will include early identification and ongoing updating of possible transition pathways to 2050 to inform sectoral strategic choices.

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Bord na Móna is following a decarbonisation programme aimed at reducing the carbon emissions from its activities. Industrial peat production has now ceased and several other decarbonisation measures are being implemented. The company aims to further develop renewable energy and resource recovery markets with a key objective of reducing the carbon intensity of all products. In addition, the carbon emission mitigation benefits associated with the post-peat extraction rehabilitated peatland following re-wetting, revegetation and colonisation of significant areas with native woodland will make a significant contribution to achieving the State's carbon emission reduction targets.

## 3 National Peatlands Strategy

The National Peatlands Strategy (2015) contains a comprehensive list of actions, necessary to ensure that Ireland's peatlands are preserved, nurtured and become living assets within the communities that live beside them. It sets out a cross-governmental approach to managing issues that relate to peatlands, including compliance with EU environmental law, climate change, forestry, flood control, energy, nature conservation, planning, and agriculture. The Strategy has been developed in partnership between relevant Government Departments/State bodies and key stakeholders through the Peatlands Council.

The strategy recognises that Ireland's peatlands will continue to contribute to a wide variety of human needs and to be put to many uses. It aims to ensure that Ireland's peatlands are sustainably managed so that their benefits can be enjoyed responsibly. It aims to inform appropriate regulatory systems to facilitate good decision making in support of responsible use. It also aims to inform the provision of appropriate incentives, financial supports and disincentives where required. The strategy attempts to strike an appropriate balance between different needs, including local stakeholders like turf-cutters and semi-state bodies such as Bord na Móna.

In line with a National Peatlands Strategy recommendation, a Peatlands Strategy Implementation Group (PSIG), was established, assisted in the finalisation of the Strategy, is overseeing subsequent implementation and will report to Government on an annual basis on the implementation of the actions and principles contained within the Strategy.

Bord na Móna is a key stakeholder in the National Peatlands Strategy and the Peatlands Strategy Implementation Group. The strategy recognises the potential for some Bord na Móna sites to be restored and to contribute to the national SAC and NHA network of protected raised bog sites. The strategy (agreed in 2015) also recognises the various different values of cutaway bog and developed six key principles (with Bord na Móna) for the after-use of cutaway bog.

- Bord na Móna will continue to assess and evaluate the potential of the company's land bank, using a land use review system. The assessment will help prepare a set of evidence-based management plans for the various areas of peatland. These plans will also inform its cutaway bog rehabilitation.
- The policy of Bord na Móna is not to open up any undrained new bogs for peat production.
- Lands identified by Bord na Móna as having high biodiversity value and/or priority habitats will be reserved for these purposes as the proposed future land use.
- Generally, Bord na Móna cutaway bogs that flood naturally will be permitted to flood unless there is a clear environmental and/or economic case to maintain pumped drainage.
- In deciding on the most appropriate afteruse of cutaway peatlands, consideration shall be given to encouraging, where possible, the return to a natural functioning peatland ecosystem.

- This will require re-wetting of the cutaway peatlands which may lead in time to the restoration of the peatland ecosystem.
- Environmentally, socially and economically viable options should be analysed to plan the future use of industrial cutaway peatlands, in conjunction with limiting factors as outlined in Bord na Móna's Strategic Framework for the Future Use of Peatlands.

The National Peatlands Strategy highlights the importance and value of developing peatland rehabilitation plans for Bord na Móna cutaway sites and implementing this peatland rehabilitation. Some of these principles have now been superseded by the company's decision to cease industrial peat extraction. The National Peatlands Strategy is currently being reviewed by Government.

## 4 Draft National River Basin Management Plan 2022-2027 (Water Framework Directive)

The National River Basin Management Plan (Department of Housing, Planning, Community and Local Government 2017) is the key national plan for Ireland to achieve the objectives of the Water Framework Directive (WFD). In broad terms, the objectives of the WFD are (1) to prevent the deterioration of water bodies and to protect, enhance and restore them with the aim of achieving at least good status and (2) to achieve compliance with the requirements for designated protected areas.

The NRBMP 2018-2021 outlined how peat extraction can be a potentially significant pressure on various water quality parameters. Peatland rehabilitation of Bord na Móna cutaway (in addition to other measures) was part of the WFD (2018-2021) programme of measures. The NRBMP 2018-2021 takes account of the fact that Bord na Móna was in the process of phasing out the extraction of peat for energy production, that it set a target to rehabilitate 9,000 ha of cutaway bogs (covering 25 peatlands) by 2021 (in 2018) and will look to implement best-available mitigation measures to further reduce water quality impacts caused by peat extraction while the phasing-out process is taking place. This NRBMP 2018-2021 rehabilitation target was superseded by the acceleration of the Bord na Móna de-carbonisation programme and the Scheme **(PCAS)**.

The development of site rehabilitation plans and the delivery of peatland rehabilitation by Bord na Móna was expected to have a positive impact on water quality and will help the NRBMP 2018-2021 deliver its objectives in relation to the Water Framework Directive and is one of the five key principle actions.

The draft NWBMP 2022-2027 describes how the number of waterbodies impacted by peat, industry and forestry have decreased by 10, 10 and 5 waterbodies, respectively since the second cycle. Impacts on water quality and river habitat arising from peat and peat extraction and associated drainage include the release of ammonium and fine-grained suspended sediments, and physical alteration of aquatic habitats. Drainage of peatlands also results in changes to the hydromorphological condition of rivers.

The draft NWBMP 2022-2027 outlines how maintaining and restoring Irish bogs will lead to a decrease in waterborne carbon leaching to levels comparable with intact bogs as well as reducing losses of peat silt and ammonia. Vegetation on the surface of the peat can also slow the flow of water over the land surface. Based on the EPA's most recent reports, peat extraction and drainage are impacting on 106 water bodies across the country, with peat the single pressure on 28 of these water bodies. However, compared to the data in the second-cycle plan, the number of water bodies impacted by peat has decreased.

The cessation of industrial peat extraction by Bord na Móna in 2021 was expected to have a significant positive impact on water quality of receiving water courses by reducing the impact of peat extraction as a key pressure

on particular water courses. This is now being supported by the results and conclusions of the draft NWBMP 2022-2027.

## 5 National Biodiversity Action Plan 2016-2021

The National Biodiversity Action Plan 2016-2022 has a vision that biodiversity and ecosystems in Ireland are conserved and restored, delivering benefits essential for all sectors of society and that Ireland contributes to efforts to halt the loss of biodiversity and the degradation of ecosystems in the EU and globally. Ireland's 2nd National Biodiversity Action Plan outlines the main policies, strategies, actions and targets in relation to biodiversity. This plan has several Bord na Móna specific objectives and actions including implementing the BnM Biodiversity Action Plan 2016-2021 and overlaps with both the National Peatlands Strategy and the National Raised Bog Special Areas of Conservation Management Plan 2017-2022.

## 6 National conservation designations

Bord na Móna operates in a wider landscape that also includes a network of European and National nature conservation sites (Special Areas of Conservation (SACs), Special Protection Areas (SPAs), National Heritage Areas (NHAs, cNHAs) and National Nature Reserves). Bord na Móna will take account of this network of conservation objectives and their conservation objectives when developing these rehabilitation plans. It is expected that peatland rehabilitation will, in general, benefit the conservation objectives of this network of nature conservation sites.

## 7 National Raised Bog Special Area of Conservation Management Plan 2017-2022.

The National Raised Bog Special Area of Conservation Management Plan 2017-2022 sets out a roadmap for the long-term management, restoration and conservation of protected raised bogs in Ireland. The Plan strikes an appropriate balance between the need to conserve and restore Ireland's raised bog network as part of Ireland's commitments towards the EU Habitats Directive, and the needs of stakeholders and gives recognition to the important role that communities have to play in the conservation and restoration of raised bogs. The National Raised Bog Special Areas of Conservation (SACs) Management Plan 2017-2022 is part of the measures being implemented in response to the on-going infringement action against Ireland in relation to the implementation of the EU Habitats Directive, with regard to the regulation of turf cutting on the Special Areas of Conservation (SACs). The then Minister for Arts, Heritage and the Gaeltacht, also published a **Review of Raised Bog Natural Heritage Area Network** in 2014.

Bord na Móna has played a key role in the development of the National Raised Bog Special Area of Conservation Management Plan 2017-2022 and the Review of the Raised Bog Natural Heritage Area Network. Several Bord na Móna sites were assessed by the National Parks and Wildlife Service as part of the above Plan and Review and there is an expectation that several Bord na Móna sites will be designated as SACs and NHAs in the future. This will reinforce the network of protected raised bog sites and replace in part sites that will be de-designated as they have been deemed to be significantly damaged and are deemed to have no raised bog restoration prospects. PCAS is expected to restore several sites that will contribute to The National Raised Bog Special Areas of Conservation (SACs) Management Plan 2017-2022 targets in relation to the restoration of raised bog habitat.

Bord na Móna has also responded to the needs of the NRBMP and provided several sites to the government for the relocation of turf-cutters from SACs. This is part of a suite of ongoing bog conservation measures in the NRBMP to manage turf-cutting in protected sites. Bord na Móna and the National Parks and Wildlife Service continues to engage regarding the ongoing relocation of turf-cutters from protected raised bog sites.

## 8 All-Ireland Pollinator Plan 2021-2025

The All-Ireland Pollinator Plan 2021-2025 outlines key objectives and actions to protect and support pollinating insects and the habitats they rely on. A Bord na Móna specific action in this plan includes the adoption of pollinator-friendly management within the Bord na Móna network of sites. One action to help achieve this objective is habitat rehabilitation and restoration, where possible, of pollinator-friendly habitats, including peatland habitats.

## 9 Land-use planning policies

As Bord na Móna operates in many counties across Ireland, it is important to note the respective development plans in these counties. Many of the existing development plans recognise the potential that exists in the after-use of cutover/cutaway peatlands. Bord na Móna seeks to work with all of the relevant local authorities to ensure that the most appropriate after-uses are reflected in local planning policy. The following areas of consistent importance are of both direct and indirect relevance to Bord na Móna: heritage, tourism, biodiversity/conservation, landscape, renewable energy, and economy/enterprise.

## 10 National Archaeology Code of Practice

Bord na Móna operates under an agreed Code of Practice regarding archaeology with the Department of Arts, Heritage and the Gaeltacht and the National Museum of Ireland which provides a framework to enable the Company to progress peat extraction whilst carrying out archaeological mitigation. (https://www.archaeology.ie/sites/default/files/media/publications/cop-bord-na-mona-en.pdf

The Code replaced a set of Principles agreed with the Department of Arts, Heritage and the Gaeltacht in the 1990s. Under the Code Bord na Móna, the Minister and Director work together to ensure that appropriate archaeological mitigation is carried out in advance of peat extraction.

- BNM must ensure that any monuments or archaeological objects discovered during peat extraction are protected in an appropriate manner by following the Archaeological Protection Procedures.
- BNM must ensure that any newly discovered monuments on Bord na Móna lands are reported in a timely manner to the National Monuments Service of the Department of Arts, Heritage and the Gaeltacht.
- BNM must ensure that any archaeological objects discovered on Bord na Móna lands are reported immediately to the Duty Officer of the National Museum of Ireland.
- Bord na Móna will adhere to the Archaeology Code of Practice relating to management of any archaeological finds that may arise during cutaway peatland rehabilitation and decommissioning.

Draft

## 11 Bord na Móna Biodiversity Action Plan 2016-2021

Rehabilitation of industrial peatlands is a key objective of the Bord na Móna Biodiversity Action Plan 2016-2021. This action plan outlines the main objectives and actions around biodiversity on Bord na Móna lands. The Bord na Móna Biodiversity Action Plan also outlines key International and European policy in relation to biodiversity. This includes the **United Nations Convention on Biodiversity 2011-2020 (CBD)** and **European Biodiversity Strategy to 2020**. Further details of these policies and Bord na Móna s responses can be found in the Bord na Móna Biodiversity Action Plan (Bord na Móna 2016). Both policy documents highlight targets such as reducing pressure on biodiversity, promoting sustainability, habitat restoration and benefits of ecosystem services.

One example of a key CBD target is:

- *"Restore at least 15% of degraded areas through conservation and restoration activities."*

The EUs headline target for progress by 2020 is to:

- *"halt the loss of biodiversity and the degradation of ecosystems in the EU by 2020, restore them as far as feasible, while stepping up the EU contribution to averting global biodiversity loss."*

This rehabilitation plan is aligned to the CBD target and the EU Biodiversity Strategy target and will help Ireland meet its commitment to these international Biodiversity polices.

## 12 Bord na Móna commitments

Bord na Móna made the commitment in 2009 not to develop any new peatland sites for industrial peat production. The company has continued to work with different stakeholders.

The company announced that industrial peat production would be cut by over 50 percent in 2019 and would entirely cease over most of its lands by the mid-2020s. Rehabilitation measures would continue to be carried out with the focus on re-wetting and rehabilitation of cutover and cutaway areas in line with national policies (such as the National Peatland Strategy, the National Biodiversity Action Plan, the Climate Action Plan 2019, the Water Framework Directive, etc.) and rehabilitation guidelines set down by the Environmental Protection Agency. To date, 15,000 hectares of cutaway and cutover bog have been rehabilitated using this approach with 5,000 hectares in active rehabilitation.

In line with Bord na Móna's accelerated decarbonisation programme, the company made a further commitment to a significantly larger rehabilitation target. This was reflected in our plans to rehabilitate a further 20,000 hectares of cutaway and cutover bog to wetland and woodland mosaics by 2025. In addition, we planned to restore a further 1,000 hectares of raised bog habitat by 2025.

The above commitments have now been followed by the decision by the company to cease industrial peat extraction and rehabilitate a target of 33,000 ha between 2021-2025.

These commitments outline the importance of peatland rehabilitation to Bord na Móna. The company will continue to demonstrate environmental responsibility and continue to deliver on these commitments in relation to peatland rehabilitation and in relation to the future management of these lands to maximise their benefits, particularly their ecosystem service benefits, along with the sustainable development of a portion of the land bank for other uses, such as renewable energy.

Draft

## 13 Bord na Móna Strategic Framework for the future use of cutaway peatlands 2020 (Draft)

The general after-use strategy of Bord na Móna is outlined in the Bord na Móna Strategic Framework for Future-Use of Cutaway Bogs 2020 (draft document). This document outlines how Bord na Móna's cutover peatland estate is complex in nature with great variability in terms of peat depths, peat types, drainage, subsoil condition and environmental value. Thus, future options require consideration on a site-specific basis, also bearing in mind the considerable internal variation within bogs. The development of the land-bank will also take account of national needs, while also taking account of the various national legislation, policies and plans related to the management of peatlands. In general, Bord na Móna will seek to balance and optimise commercial, social, and environmental value of these sites, and develop integrated land-uses, while taking account of the need for sustainability and their biodiversity value.

Any consideration of other future after-uses for Bord na Móna land such as development or other mixed uses will be conducted following the relevant planning guidelines and consultation with relevant authorities and will be considered within the framework of this peatland rehabilitation plan.

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# APPENDIX VI. DECOMMISSIONING

## 1. Condition 10 Decommissioning

This is a requirement of the applicable Integrated Pollution Control Licence issued by the Environmental Protection Agency. This condition 10.1 requires the following:

*10.1 Following termination of use or involvement of all or part of the site in the licensed activity, the licensee shall:*

*10.1.1 Decommission, render safe or remove for disposal/recovery, any soil, subsoils, buildings, plant or equipment, or any waste, materials or substances or other matter contained therein or thereon, that may result in environmental pollution.*

The main success criteria pertaining to successfully complying with this condition is ensuring that no environmental liability remains from this infrastructure and material and that the bog can be deemed suitable for surrender of the license under section 95 of the EPA Acts. This is achieved by Bord na Móna identifying and quantifying any mechanical and infrastructural resources that were installed in the bog to enable the development and production operation at the site. This list is then refined to identify any items that would be deemed as possibly resulting in environmental pollution, should they not be removed.

Typically, these items/infrastructures would be any remaining, unconsolidated plant, equipment and attachments, waste materials, unused raw materials such as land drainage pipes, remaining peat stockpiles, stock pile covering, pumps, septic tanks and fuel tanks.

In relation to this bog, the list and tasks would be as follows:

| Item | Description | Lisclogher East Decommissioning Plan |
|---|---|---|
| 1 | Clean-up of remaining or unconsolidated waste or materials located in Bogs, Yards, Buildings and Offices | Clean-up of Bog |
| 2 | Cleaning Silt Ponds | Cleaning Silt Ponds |
| 3 | Decommissioning Peat Stockpiles | Peat Stockpile Management |
| 4 | Decommissioning or Removal of Buildings and Compounds | Not relevant |
| 5 | Decommissioning Fuel Tanks and associated facilities | Not relevant |
| 6 | Decommissioning and Removal of Bog Pump Sites | Not relevant |
| 7 | Decommissioning or Removal of Septic Tanks | Where required |

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In addition, condition 7 of the licence requires these now defined waste items to be disposed of or recovered as follows:

7.1 Disposal or recovery of waste shall take place only as specified in *Schedule 2(i) Hazardous Wastes for Disposal/Recovery* and *Schedule 2(ii) Other Wastes for Disposal/Recovery* of this licence and in accordance with the appropriate National and European legislation and protocols. No other waste shall be disposed of/recovered either on-site or off-site without prior notice to, and prior written agreement of, the Agency.

7.2 Waste sent off-site for recovery or disposal shall only be conveyed to a waste contractor, as agreed by the Agency, and only transported from the site of the activity to the site of recovery/disposal in a manner which will not adversely affect the environment.

7.3 A full record, which shall be open to inspection by authorized persons of the Agency at all times, shall be kept by the licensee on matters relating to the waste management operations and practices at this site. This record shall as a minimum contain details of the following:

7.3.1 The names of the agent and transporter of the waste.

7.3.2 The name of the persons responsible for the ultimate disposal/recovery of the

waste.

7.3.3 The ultimate destination of the waste.

7.3.4 Written confirmation of the acceptance and disposal/recovery of any hazardous waste consignments sent off-site.

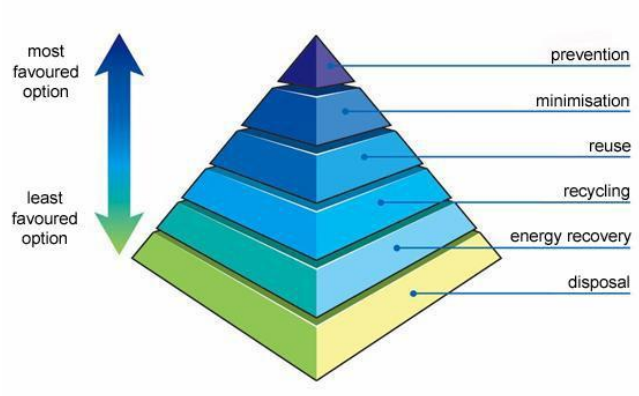
7.3.5 The tonnages and EWC Code for the waste materials listed in *Schedule 2(i) Hazardous Wastes for Disposal/Recovery* and *Schedule 2(ii) Other Wastes for Disposal/Recovery* sent off-site for disposal/recovery.

7.3.6 Details of any rejected consignments.

A copy of this Waste Management record shall be submitted to the Agency as part of the AER for the site.

As required by the licence, these waste items will be removed for recycling or disposal, using external contractors with the required waste collection permits, approved under 7.2, with waste records maintained as required under 7.3.

Where possible, Bord na Móna will utilize the appropriate waste hierarchy to identify waste that can reused or recycled ahead of disposal.



The validation of the success of condition 10.1 is carried out through an Independent Closure Audit (ICA), followed by and EPA Exit Audit (EA) and the eventual partial or full surrender of the licence.

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## APPENDIX VII. GLOSSARY

**Cutaway Bog:** A Bord na Móna site generally becomes cutaway when it is economically unviable to continue industrial peat extraction or when the majority of peat has been removed.

**Deep peat cutover bog.** Deep peat cutover bog is defined as former raised bogs that have been in industrial peat production, where production has ceased but the residual peat depth is typically in excess of 2m. *Sphagnum* mosses are key species of raised bogs and the majority of the peat mass is formed from these mosses. *Sphagnum* species and other raised bog species are a key part of raised bog habitat function and prefer more acidic, nutrient poor, water-logged conditions. Typical raised bog *Sphagnum* mosses and other bog species do not thrive with the more typical alkaline water chemistry of cutover bog but do grow well in these more acidic conditions where peat has been re-wetted. There is potential to re-develop embryonic *Sphagnum*-rich plant communities in these conditions if the peat can be re-wetted. This brings the opportunity of re-developing embryonic *Sphagnum*-rich vegetation communities that are considered Carbon sinks or peat-forming habitats and restoring the carbon sequestration function of these sites.

**Dry cutaway bog:** Cutaway bog is categorised as dry cutaway where it is not practical or feasible to re-wet these areas completely. It is inevitable that some areas of cutaway will remain relatively dry due to the heterogenous topography of the cutaway, as well as requirements for continued drainage on site for identified after-uses, or off site in relation to neighbouring lands or other infrastructure. Ridges and mounds of glacial deposits can become exposed during peat extraction and form a heterogenous topographical mosaic separated by basins. Dry cutaway may have very thin or no residual peat where ridges and mounds have been exposed. The exposed sub-soils are a mix of glacial gravels, muds and tills that can be quite free-draining. Dry cutaway may also have deeper residual peat but in a location (ie. at the margin) where the peat cannot be re-wetted due to boundary constraints. Dry cutaway may also develop in situations where there a relatively steep slope that inhibits re-wetting. The majority of dry cutaway will develop towards grassland, heath, scrub and dry woodland habitats.

**Environmental stabilisiation:** The key objective of peatland rehabilitation is environmental stabilisation. This means developing habitats and vegetation back onto the bare peat, slowing water movement across the bog, minimising effects to downstream waterbodies and meeting the conditions of the IPC Lisence. This is achieved by a combination of re-wetting, where possible, and natural colonisation of the former cutaway, with or without intervention**.** Habitats will develop that reflect the underlying environmental conditions. Other after-use development may also serve to act as environmental stabilisiation.

**Marginal land.** Marginal land is defined as land around the margin of the industrial peat production area. This margin generally contains a range of habitats including scrub, Birch woodland, cutover bog and raised bog remnants. It has a variety of land-uses including turf-cutting (private turbary). Rehabilitation and restoration actions (e.g. drain blocking) within marginal land zones will be considered where appropriate.

**Rehabilitation:** Rehabilitation is defined in general by Bord na Móna as environmental stabilisation of the former cutaway. This is generally achieved via re-wetting, where possible, and natural colonisation of the former cutaway, with or without intervention. It is not possible to restore raised bog habitats on BnM cutaway in general in the short-term. In general, most of the peat mass has been removed from many BnM cutaway sites and the environmental characteristics of these areas have therefore changed radically (peat depths, hydrology, water chemistry, substrate type, nutrient status. This means there will therefore be different habitat outcomes (wetlands, fen, heathland, grassland and Birch woodland). Other after-use development may also serve to act as rehabilitation.

**Restoration:** Ecological restoration to defined as the process of re-establishing to the extent possible the structure, function and integrity of indigenous ecosystems and the sustaining habitats they provide" (SER 2004). Defined in this way, restoration encompasses the repair of ecosystems (Whisenant 1999) and the **improvement of ecological conditions in damaged wildlands** through the **reinstatement of ecological processes**. In general, Bord na Móna cutaway peatlands cannot be restored back to raised bog in a reasonable timeframe as their environmental conditions has changed so radically (with the removal of the acrotelem – the living layer and much of the peat mass). However, they can be returned to a **trajectory** towards a naturally functioning peatland system (Renou-Wilson 2012). **Raised bog restoration** is an objective of some BnM sites where there is residual natural raised bog vegetation and where the majority of the peat is still intact.

**Standard rehabilitation:** This is defined as rehabilitation that is designed to meet the conditions of the EPA IPC Licence. The key objective of rehabilitation is environmental stabilisation. This is achieved by a combination of re-wetting, where possible, and natural colonisation of the former cutaway, with or without intervention**.** Other after-use development may also serve to act as rehabilitation.

**Standard decommissioning:** This is defined as decommissioning that is designed to meet the conditions of the EPA IPC Licence. This is defined as to render safe or remove for disposal/recovery, any soil, subsoils, buildings, plant or equipment, or any waste, materials or substances or other matter contained therein or thereon, that may result in environmental pollution.

**Wetland cutaway bog.** Wetland cutaway bog is defined as former raised bogs that have been in industrial peat production, where production has ceased and the majority of peat has been cutaway, and where this cutaway has the potential to be re-wetted. A significant number of Bord na Móna sites have pumped drainage and these sites are likely to develop a mosaic of wetland habitats when pumping in reduced or stopped. The water chemistry of wetland cutaway frequently is strongly influenced by the more alkaline sub-soils that have been exposed during peat production. This means that pioneer vegetation is more typical of fen and wetland, rather than raised bog. Wetland cutaway will have a broad range of hydrological conditions depending on the local topography. In some cases, these wetlands may form deep water (> 0.5 m) whilst other areas may have the water table at or just below the surface of the ground.

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# APPENDIX VIII. EXTRACTIVE WASTE MANAGEMENT PLAN

## (Minimisation, treatment, recovery and disposal)

**Objective:**
The objective of this generic plan is to comply with the requirements of regulation 5 of the Waste Management (Management of Waste from Extractive Industries) Regulations, and to prevent or reduce waste production and its harmfulness.

**Scope:**
This plan covers IPPC Licence's Ref P0501-01, Ballivor- Derrygreenagh Group of Bogs in Counties Meath and Westmeath.

**1.0 Extractive Waste:**
Waste classified as extractive waste from peat extraction operations arise from three operations associated with this activity.

**1.1 Silt Pond excavations and maintenance.**
All peat extraction activities are serviced by a silt lagoons/ponds. During the excavation of these silt ponds, pre IPPC Licensing in 1999 and since licensing, the excavated material is stored adjacent to the silt pond, where it either remains in situ ores levelled out. As required by condition 6.6, these silt lagoons are cleaned twice per annum or more often if inspections dictate. These silt cleanings are also deposited on the same location, adjacent to the silt pond, where they may be levelled periodically to allow room for subsequent cleanings. These mounds of silt pond excavation material and cleanings are generally no higher that 2-3 metres.

**1.2 Power Station screenings:**
Lough Ree Power Ltd screens the peat from the bogs prior to processing. This screening removes oversized peat, stones and bogs timbers. Schedule 3 (ii) of the IPPC licence permits disposal of these peat screenings back to the bog, where it is levelled and graded into the surrounding peat landscape. These locations have been agreed with the Agency as per condition 7.4 of the IPPC Licence, and as per the attached locations.

**1.3 Bog Timbers:**
During peat extraction operations, bog timbers often arise in the bog surface and are required to be cleared. These timbers consist of bog pine, oak and some yew. Some of these timbers, such as the oak and yew are removed for use in the wood craft industry, with the remaining bog pine stockpiled in locations at the opposite end of each bog, where it generally becomes a habitat for flora and fauna. These piles of timber are generally no higher than 1-2 metres.

**2.0 P0501-01 IPPC Licence Extractive Waste Conditions**

**2.1 Condition 7.5 Extractive Waste Management**
The licensee shall draw up a Waste Management Plan (to be known as an Extractive Waste Management Plan) for the minimisation, treatment, recovery and disposal of extractive waste. This Plan shall meet the requirements of regulation 5 of the Waste Management (Management of Waste from the Extractive Industries) Regulations,2009. The Plan shall be submitted for agreement by the Agency by the 31' December2012. The Plan shall be reviewed at least once every five years thereafter in a manner agreeable to the Agency and amended in the event of substantial changes to the operation of a waste facility or to the waste deposited. Any amendments shall be notified to the Agency.
All extractive waste shall be managed in accordance with the Extractive Waste Management Plan. A report on the implementation of the Extractive Waste Management Plan shall be provided in the AER.

**2.2 Condition 7.6 Waste Facility**
(i) No new waste facility may be developed or an existing waste facility modified unless agreed by the Agency.
(ii) The licensee shall ensure that all existing waste facilities are managed and maintained to ensure their physical stability and to prevent pollution or contamination of soil, air, surface water or groundwater.
(iii) The licensee shall ensure that all new waste facilities are constructed, managed and maintained to ensure their physical stability and to prevent pollution or contamination of soil, air, surface water or groundwater.
(iv) Operational measures shall be continuously employed to prevent damage to waste facilities from personnel, plant or equipment.
(v) The licensee shall establish and maintain a system for regular monitoring and inspection of waste facilities.
(vi) All records of monitoring and inspection of waste facilities, as required under the licence, shall be maintained on-site in order to ensure the appropriate handover of information in the event of a change of operator or relevant personnel.

**2.3 Condition 7.7 Excavation Voids**
7.7.1 Unless otherwise agreed by the Agency, only extractive waste shall be placed in excavation voids.
7.7.2 When placing extractive waste into excavation voids for rehabilitation and construction purposes, the licensee shall, in accordance with regulation 10 of the Waste Management (Management of Waste from the Extractive Industries) Regulations, 2009, and the Extractive Waste Management Plan:

- Secure the stability of the waste
- Put in place measures to prevent pollution of soil, surface water and ground water.
- Carry out monitoring of the extractive waste and excavation void.

**Condition 7.5. Extractive Waste Management Plan. 5 (1)**

**3.0 Minimisation.**
**3.1 Silt pond excavation material and cleanings.**
IPPC Licence conditions require all production areas to be serviced by an appropriately designed silt pond based on storage volume and retention time. Condition 6.6 requires all ponds to be cleaned bi-annually and more often if inspections dictate, so the only opportunity for minimisation of same is

through Standard Operating Procedures. These are required under condition 2.2.2 (i) regarding minimisation of suspended solids, and are in-place to minimise the generation of silt, which in-turn will minimise the generation of silt pond waste.

**3.2 Power Station Screenings.**
These screenings cannot be minimised as they are a consequence of peat production, stones, timbers and oversize peat materials are naturally occurring on the bog, and are required to be removed prior to processing.

**3.3 Bog Timbers.**
Bog timbers are also naturally occurring materials within a bog and are required to be removed prior for production. The volume of these bog timbers varies from bog to bog and as such their minimisation is not controllable or quantifiable.

**4.0 Treatment**
**4.1 Silt pond excavation material and cleanings.**
The silt pond excavation material and silt cleanings do not require any treatment for its end use which will be either backfilling these silt pond voids as per condition 7.7.1 above as part of the Bog Rehabilitation Plan, or reincorporated into the surrounding peatlands.

**4.2 Power Station Screenings.**
The factory screenings are permitted to be returned to the bog as they were naturally occurring materials from the bog, and as such do not require any treatment to serve this purpose.

**4.3 Bog Timbers**
As per 1.3 above, these timbers are stockpiled at two locations in each bog, as per the attached list of sites and become habitats for various flora and fauna.

**5.0 Recovery**
**5.1 Silt pond excavation material and cleanings.**
Condition 2.2.2 (vi) requires the reuse of silt pond waste to be examined. This was undertaken in 2006, the outcome of which was that this waste peat silt material, as a fuel, was contaminated with sub-soils, rendering it unsuitable for combustion. In addition, volumes are small compared to overall peat production volumes.

**5.2 Power Station Screenings.**
Given the nature of these screenings as outlined in 1.2 above, there is no further use identified and they are permitted to be disposed of back to the bog.

**5.3 Bog Timbers**
Investigations into processing these materials into smaller fractions for potential heating purposes did not yield any viable results. In addition, these older stockpiles are now classified as habitats and as such would not be considered for reuse as a fuel.

**6.0 Disposal**
**6.1 Silt pond excavation material and cleanings.**
Schedule 3 (ii) permits the disposal of silt pond cleanings (Lagoon Sediments) to the bog and these locations, adjacent to the silt pond site, are presented in the attached spreadsheet, with associated grid coordinates.

**6.2 Power Station Screenings.**
Schedule 3 (ii) permits the disposal of screenings (Peat Screenings) to the bog at designated locations agreed under Condition 7.4, and these locations, are presented in the attached spreadsheet, with associated grid coordinates.

**6.3 Bog Timbers**
These naturally occurring bog timbers are stockpiled at locations in each bog, grid coordinates attached.

**7.0 Extractive Waste Management Plan**

**5 (2a)(i)**
The vast majority of peat extraction bogs were all designed and drained for production prior to the 1960's and as such the production fields layout cannot' be altered. Under our Cleaner Reduction Procedures, various design changes have been implemented to the production machines and process to reduce lost peat which eventually is captured in the silt ponds and requires removal as waste peat silt. This along with training and ongoing research and development will continuously reduce waste peat and subsequently waste silt pond cleanings. Bog timbers are present naturally in various volumes and quantities in different bogs and as peat production involves stripping peat in layers, the exposure, generation and removal of these timbers is unavoidable. Work has been undertaken recently into project looking at grinding of these bog timbers in situ using a timber miller, and if this project becomes viable it will contribute to the reduction of bog timbers.

**5 (2a)(ii)**
Given the nature and expanse of peat bogs, the stockpiling and storage of these waste materials do not present a visual, storage or stability problem. As required under Condition 10 of the IPPC Licence, the silt pond excavations and screenings will be utilised to backfill the silt pond voids once the bogs have finished and stabilised in accordance with out Bog Rehabilitation Plan. Storage of these wastes in the interim, open to the elements does not present a change on the nature of these wastes that will threaten the environment or prevent their reuse during the bog rehabilitation process.

**5 (2a)(iii)**
Under Condition 10 of the IPPC Licence, all silt ponds will be decommissioned once the bog surface has stabilised, in agreement with the Agency. This will involve the removal of weirs and flow controls, returning the silt pond back to its original drain or removing the silt pond from the drainage system. Both of these activities will involve placing the silt pond extraction and cleaning material back into the excavation void.

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**5 (2a)(iv)**
The peat bogs do not contain any topsoil, so this is not required.

**5 (2a)(v)**
Peat mineral resources do not undergo any treatment.

**5 (2b)**
These three extractive waste are all being reused and recovered back to their original extraction points and have not undergone any physical, chemical, or biological change.

**5 (2c)(i, ii & iii)**
These three extractive wastes, stored on the bog for reuse or recovery during the bog rehabilitation phase, do not require any management or monitoring during the operation of these bogs. Silt pond excavations and cleanings are stored adjacent to the silt pond and quickly revegetated and stabilise, the screenings are graded back into the bog at the agreed locations upon disposal and the bog timbers do not prevent any water or airborne danger to the environment.

**5 (3)**
The three extractive wastes arising from peat extraction operations at this site are classified wastes from mineral non-metalliferous excavation, with an EWC code of 0101 02. The materials are not classified as hazardous under Directive 91/689/EEC20, and do not contain substances or preparations classified as dangerous under Directives 67/548/EEC5 or 1999/45/EC6 above a certain threshold.
The peat excavations and cleanings are stored in locations and in a manner that they could not collapse, and are remote in their nature. The stockpiles are located adjacent to silt ponds that are cleaned regularly and as such these stockpiles are managed and levelled to facilitate further cleanings.
Therefore the material stored at these waste facilities would not be considered to be a Category A waste facility.

**Classification in accordance Annex II.**

| **Waste Material** | Description | **C**lassification | Chemical Process treatment | Deposition description | Transport System |
|---|---|---|---|---|---|
| Silt Pond Excavations and cleanings | Peat and mineral soils associated with peatlands. Stored for reuse during bog rehabilitation, with no displacement of overburden | 01 01 02 | None | Excavated from silt ponds by excavator and deposited adjacent to the silt pond. | Excavator |
| Peat Screenings | Stones, timbers and oversized peat particles, reincorporated into low areas, agreed with the Agency, and stabilized under normal natural bog conditions | 01 01 02 | None | Removed by screen at the factory and transported by tractor and trailer to the designated and agreed locations | Tractor and trailer. |
| Bog Timbers | Pine, Oak and Yew species, stored at locations in each bog. Not subject to any stability issues due to exposure to atmospheric/meteorological conditions. | 01 01 02 | None | Removed from the bog surface by excavator and transported by tractor and trailer to the agreed locations | Tractor and Trailer |

**Description of operations.**
Silt pond excavations arise from the requirement to have silt ponds treating all peat extraction sites. Silt pond cleanings arise from the removal of peat silt from silt ponds as required under IPPC Licence. Bog timbers arise from preparation of the bogs surface for peat production. Estimated quantities of materials are below:

**Closure plan. (Bog Rehabilitation Plan).**
Condition 10.1 – 10.3 of the IPPC Licence requires the following:

- 10.1 Following termination of use or involvement of all or part of the site in the licensed activity, the licensee shall:
- 10.1.1 Decommission, render safe or remove for disposal/recovery, any soil, subsoils, buildings, plant or equipment, or any waste, materials or substances or other matter contained therein or thereon, that may result in environmental pollution.
- 10.1.2 Implement the agreed cutaway bog rehabilitation plan (refer Condition 10.2).

10.2 Cutaway Bog Rehabilitation Plan:

- 10.2.1 The licensee shall prepare, to the satisfaction of the Agency, a fully detailed and costed plan for permanent rehabilitation of the cutaway boglands within the licensed area. This plan shall be submitted to the Agency for agreement within eighteen months of the date of grant of this licence.

- 10.2.2 The plan shall be reviewed every two years and proposed amendments thereto notified to the Agency for agreement as part of the AER. No amendments may be implemented without the written agreement of the Agency.

10.3 The Rehabilitation Plan shall include as a minimum, the following:

- 10.3.1 A scope statement for the plan; to include outcome of consultations with relevant Agencies, Authorities and affected parties (to be identified by the licensee).
- 10.3.2 The criteria which define the successful rehabilitation of the activity or part thereof, which ensures minimum impact to the environment.
- 10.3.3 A programme to achieve the stated criteria.
- 10.3.4 Where relevant, a test programme to demonstrate the successful implementation of the rehabilitation plan.
- 10.3.5 A programme for aftercare and maintenance.

10.4 A final validation report to include a certificate of completion for the Rehabilitation Plan, for all or part of the site as necessary, shall be submitted to the Agency within six months of execution of the plan. The licensee shall carry out such tests, investigations or submit certification, as requested by the Agency, to confirm that there is no continuing risk to the environment. This plan including maps and ecological classifications are available on file at the Ballivor-Derrygreenagh IPPC Licence Coordinators office.
The location in relation to the silt pond excavations and cleanings are adjacent to the silt ponds, which are considered under the Shannon River Basin Management Plan in accordance with the requirements of Directive 2000/60/EC.
Screenings and bog timbers are all naturally occurring elements of peatland and there placement back to the bog in smaller concentrated designated waste facilities does not constitute a risk to the prevention of water compliance.
The lands under where these materials are deposited are peatlands and are un-effected by the placing of this material.

**Review.**
This plan will be reviewed every five years, the first review to take place in September 2017. This review will entail an inspection of these waste facilities to ensure their placing, management, maintenance and stability comply with the requirements of the Extractive Waste Management requirements and condition 7.5, 7.6 and 7.7 of the Ballivor-Derrygreenagh IPPC Licence P0501-01.

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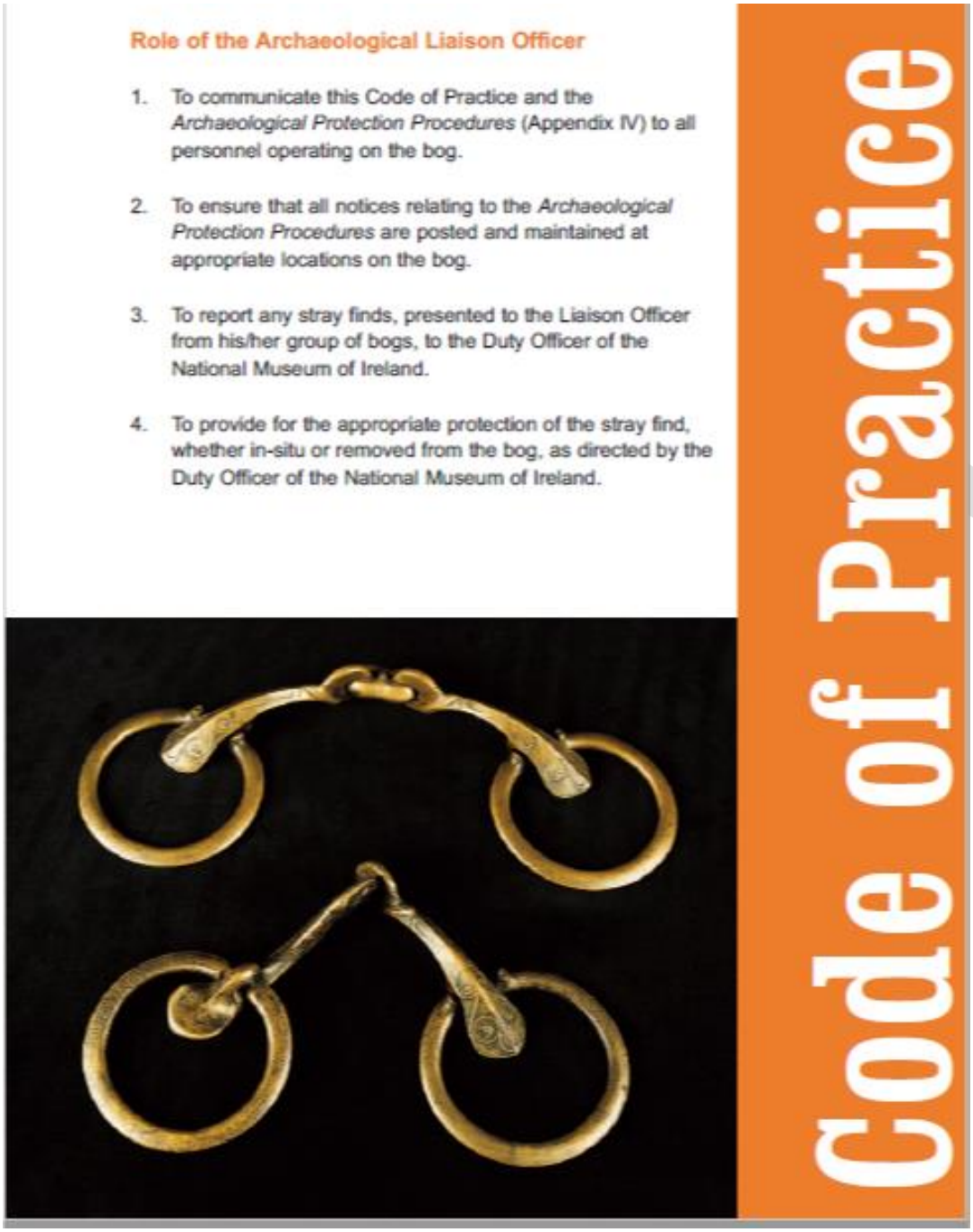
## APPENDIX IX. MITIGATION MEASURES FOR THE APPLICATION OF FERTILISER

- Any fertiliser used will be Rock Phosphate and will not be applied in the following conditions:
    1. The land is waterlogged;
    2. The land is flooded, or it is likely to flood;
    3. The land is frozen, or covered with snow;
    4. Heavy rain is forecast within 48 hours (forecasts will be checked from Met Éireann).
    5. The ground slopes steeply and there is a risk of water pollution, when factors such as surface run-off pathways, the presence of land drains, the absence of hedgerows to mitigate surface flow, soil condition and ground cover are taken into account.
- No fertiliser will be spread on land within 2 metres of a surface watercourse.
- Buffer zones in respect of waterbodies, as specified on https://www.epa.ie/about/faq/name,57156,en.html, will be adhered with at all times with regard to fertiliser application. Reproduced as follows:

| Water body / Feature | Buffer zone |
|---|---|
| Any water supply source providing 100m$^3$ or more of water per day, or serving 500 or more people | 200 metres (or as little as 30 metres where a local authority allows) |
| Any water supply source providing 10m$^3$ or more of water per day, or serving 50 or more people | 100 metres (or as little as 30 metres where a local authority allows) |
| Any other water supply for human consumption | 25 metres (or as little as 30 metres where a local authority allows) |
| Lake shoreline | 20 metres |
| Exposed cavernous or karstified limestone features (such as swallow holes or collapse features) | 15 metres |
| Any surface watercourse where the slope towards the watercourse exceeds 10% | 10 metres |
| Any other surface waters | 5 metres* |

## APPENDIX XI. ARCHAEOLOGY



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Code of Practice

5. To arrange for the delivery or collection of the stray find, as directed by the Duty Officer of the National Museum of Ireland.

6. To complete the Report of Discovery of Archaeological Object(s) in Bogs (Appendix V), as directed by the Duty Officer of the National Museum of Ireland.

7. To maintain a file of all stray finds and associated documentation and provide copies to the Project Archaeologist.

8. To provide assistance, where required, to the Department during archaeological surveys.

9. To provide assistance, where required, to Bord na Móna's Consultant Archaeologists, during investigation and mitigation of monuments.

10. To report to the Bord na Móna members on the Archaeology Management Liaison Committee any planned developments or new activities on cutaway peatland areas within his/her group of bogs.



Bord na Móna

# Lisclogher Bog
# Rehab Plan
# GIS Map Book
# 2022

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| Bord na Móna | **Procedure: ENV017** | **Rev: 1** |
|---|---|---|
| **Title: Archaeological Findings** | **Approved: EM** | **Date:** |

**1) Purpose**

The purpose of this procedure is to describe the arrangements in Bord na Móna for findings of Archaeological material (Stray Finds).

**All objects, sites or monuments, no matter how fragmentary, are important elements of our heritage.**

**2) Procedure**

1. Check whether there are any known archaeological monuments in your area.
2. Be vigilant at all times - objects or traces of structures can be found on the field surfaces, in the drain faces, on the bog margins or caught within the mechanics of machinery.
3. If an object is found leave it in place, if it is safe to do so, note its position and immediately contact your Archaeological Liaison Officer who will assess the situation and contact the Duty Officer of the National Museum of Ireland.
4. Resist the temptation to investigate the find spot as this may disturb fragile archaeological deposits.
5. If the object is already dislodged or is in imminent danger, remove it carefully, mark its find spot and report it immediately to your Archaeological Liaison Officer.
6. Objects made of wood, leather or textile, which are removed from peat should be kept in conditions similar to those in which they are found. This can be done by packing them in peat or, if waterlogged, placing them in a clean basin of water and sealing the container. Resist the temptation to clean or remove peat from the object.
7. If timbers or other materials, such as gravel or stones, which could be part of a man-made structure are noted on the bog, mark the location and report it immediately to your Archaeological Liaison Officer. If you suspect the find is of archaeological importance, resist the temptation to expose it any further as this could result in damage to the structure.
8. Report anything that looks unnatural in the bog – your Archaeological Liaison Officer will decide whether it should be referred to the appropriate authorities.

**NOTE:** Our archaeological heritage is a finite, non-renewable resource. Once a site is destroyed its information is lost forever and we have lost the chance to understand a little more about our past, where we have come from and perhaps the opportunity to learn for the future.

Your Archaeological Liaison Officer is ……

**3) Records**

| Revision Index | | | |
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| Revision | Date | Description of change | Approved |
| 1 | | | |
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| Document Control Sheet | |
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# Bog Site Information Maps

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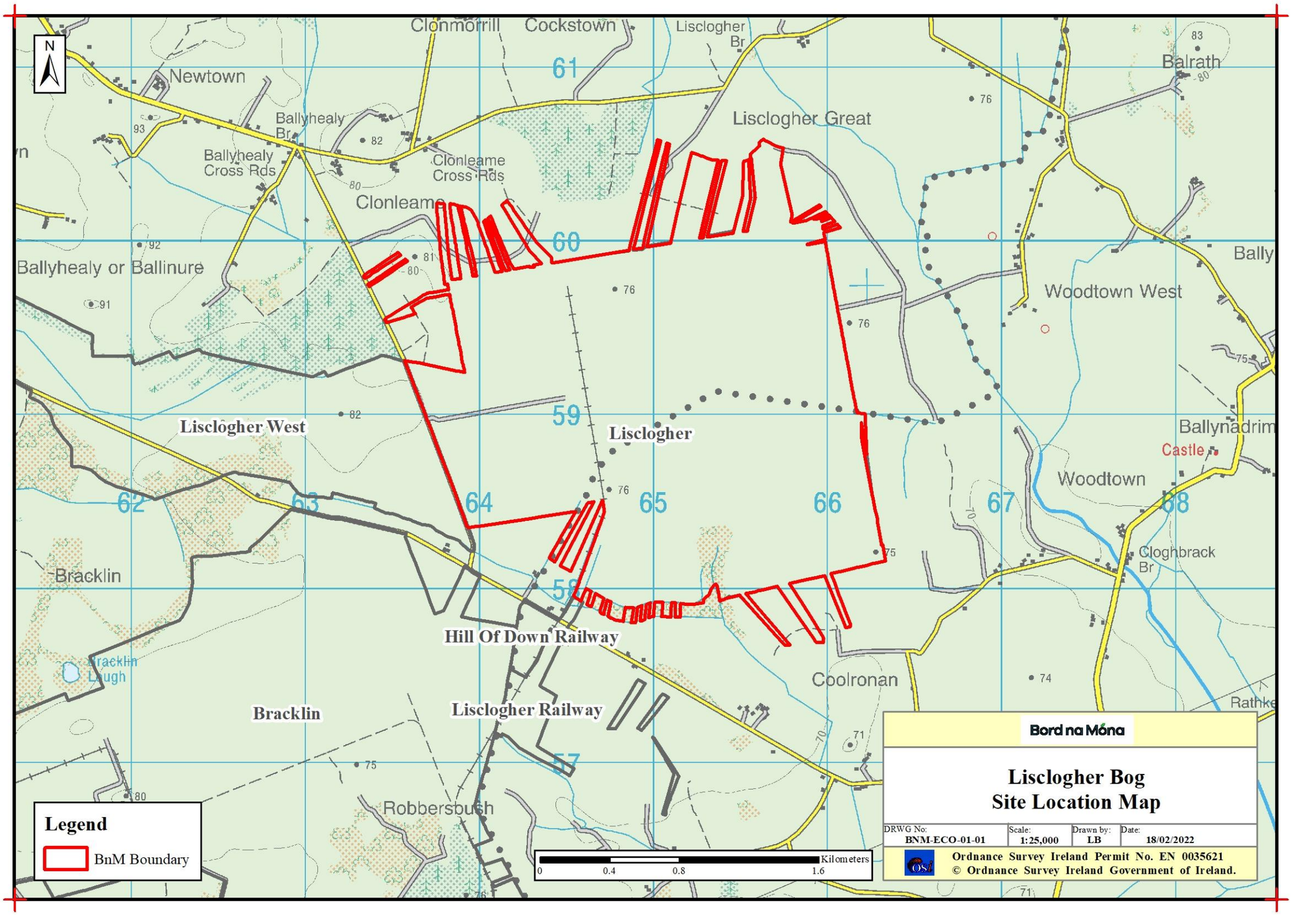

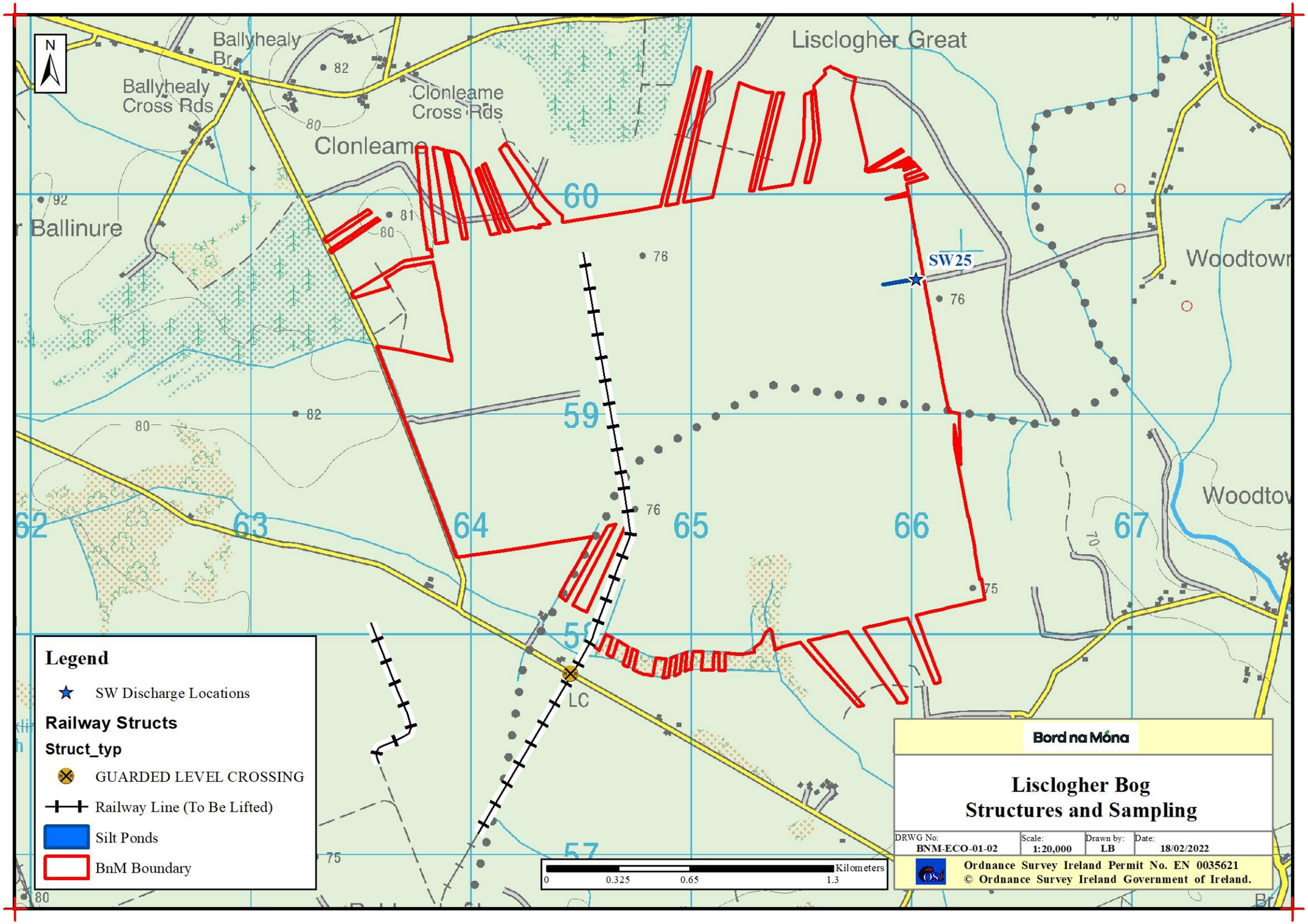
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Structures and Sampling
DRWG No: BNM-ECO-01-02
Scale: 1:20,000
Drawn by: LB
Date: 18/02/2022
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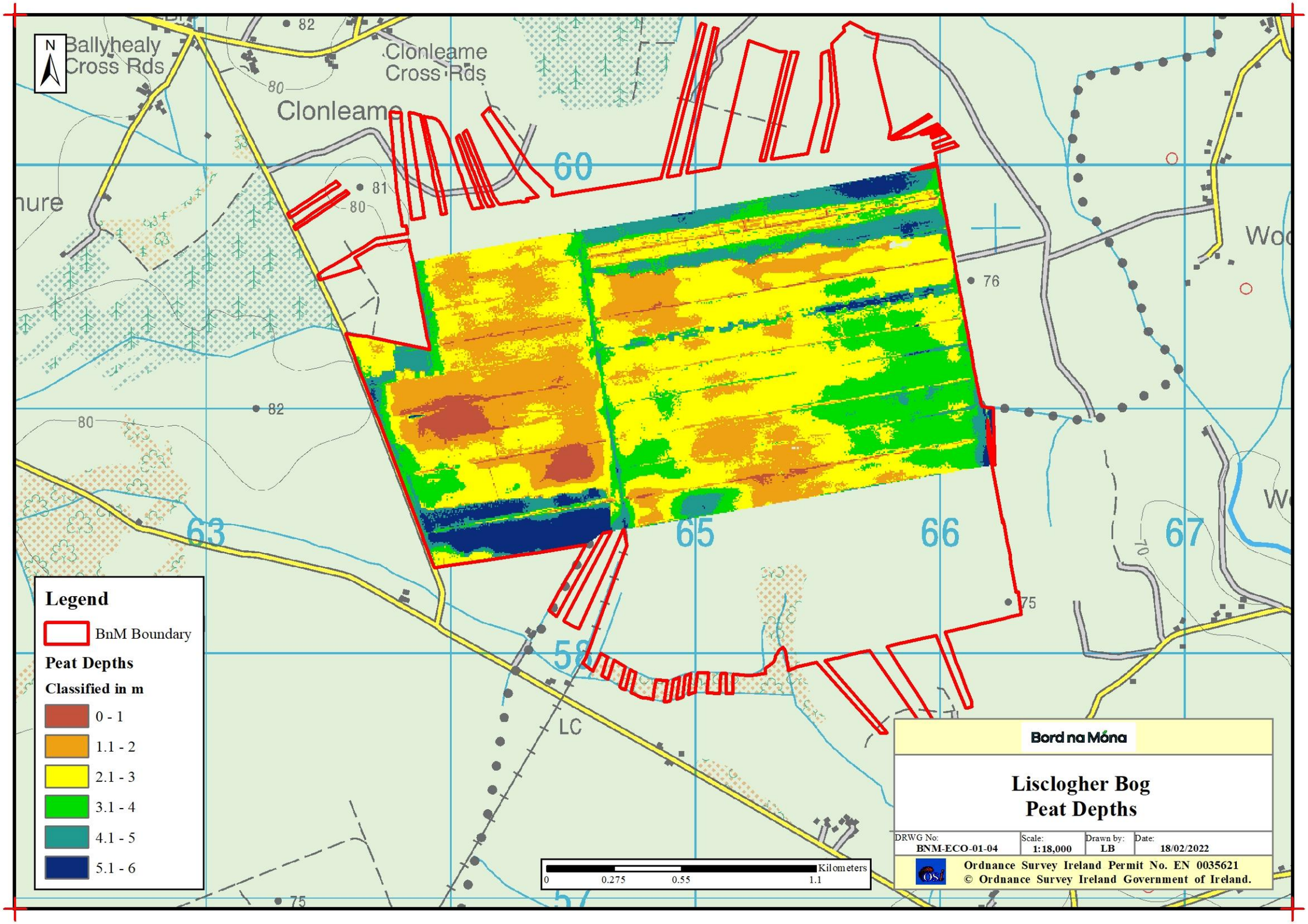

**BNM-ECO-01-17: Current Habitat Map**

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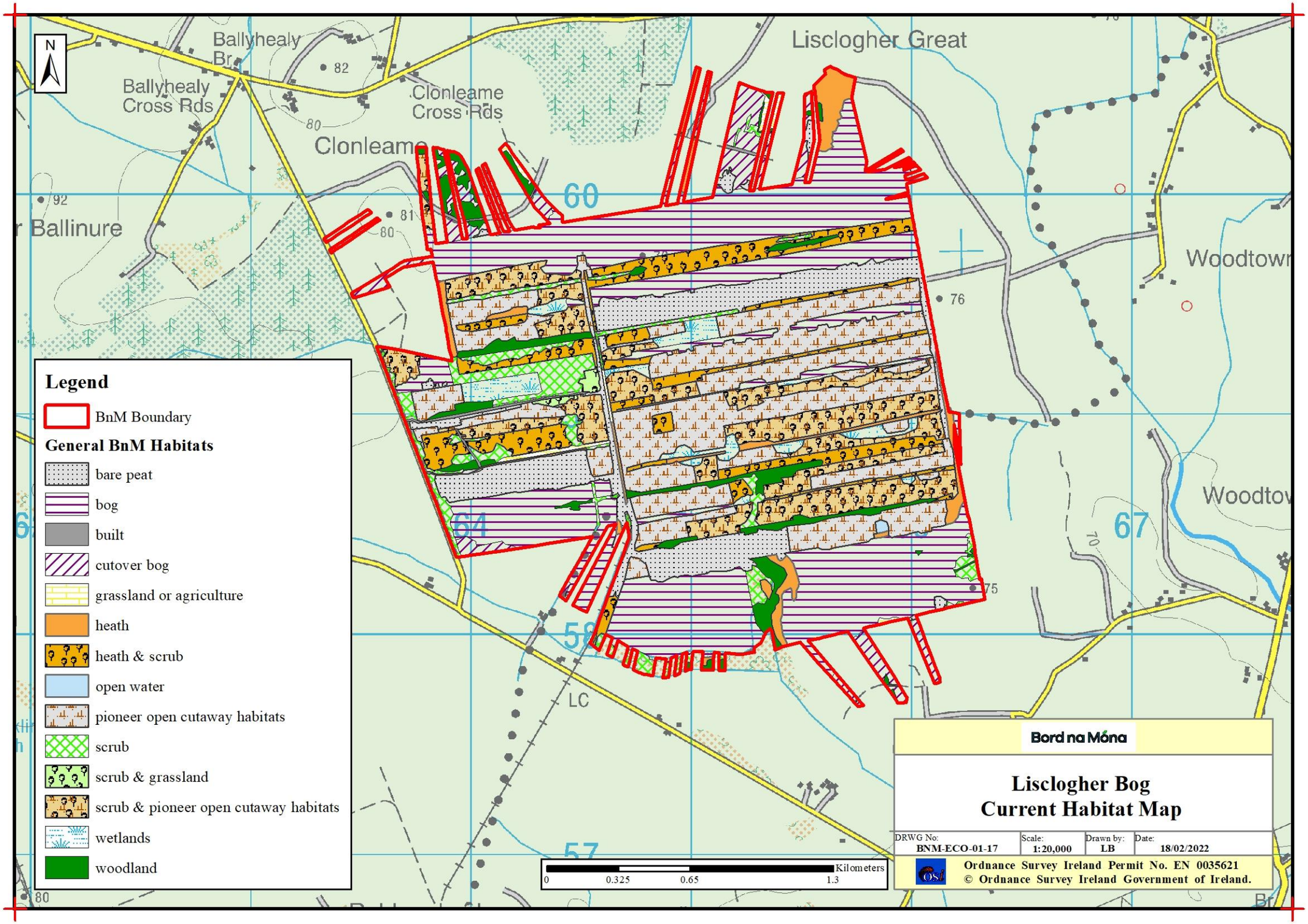

**BNM-ECO-01-18: Potential Future Habitats**

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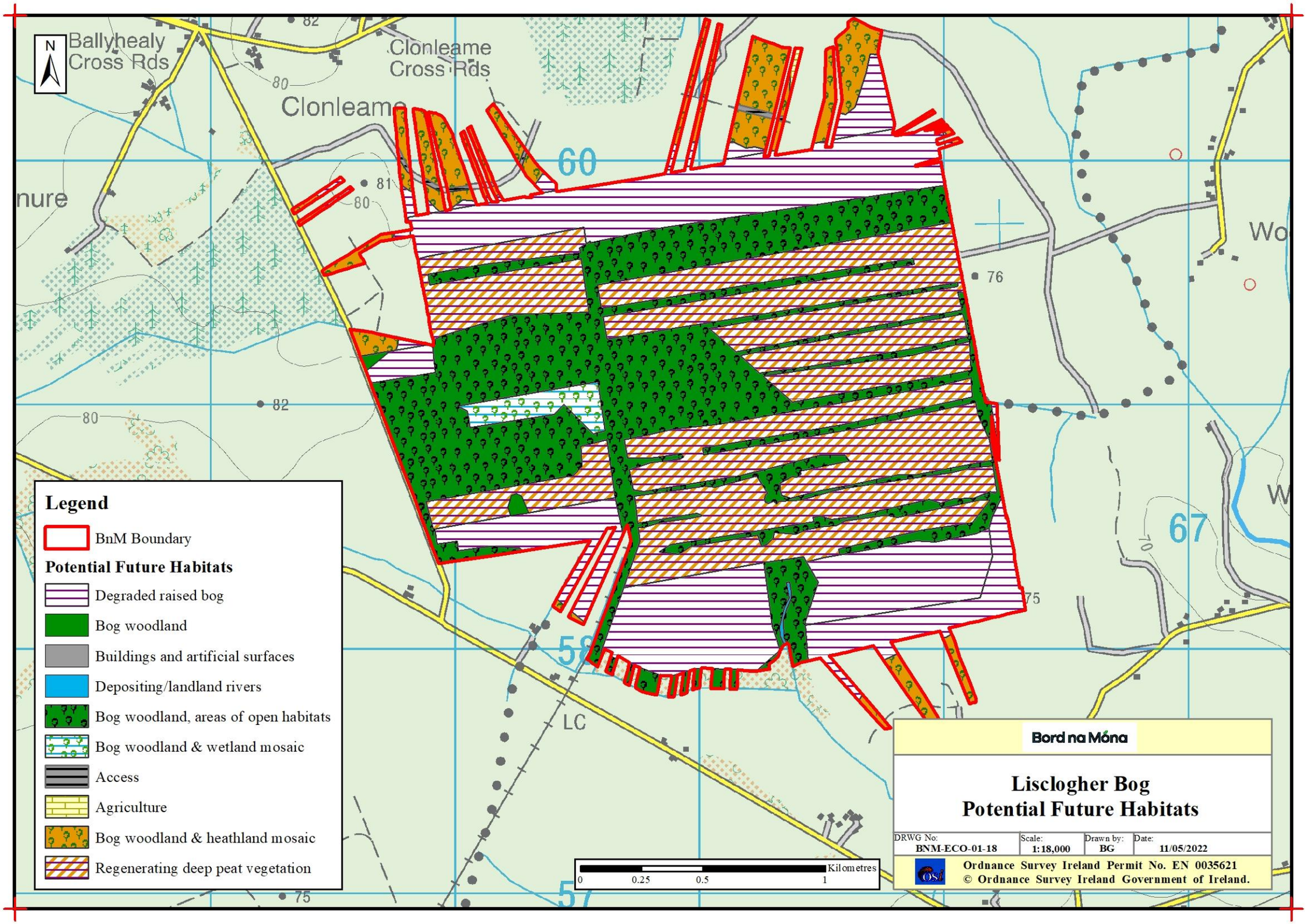

**BNM-ECO-01-21: Aerial Imagery 2000**

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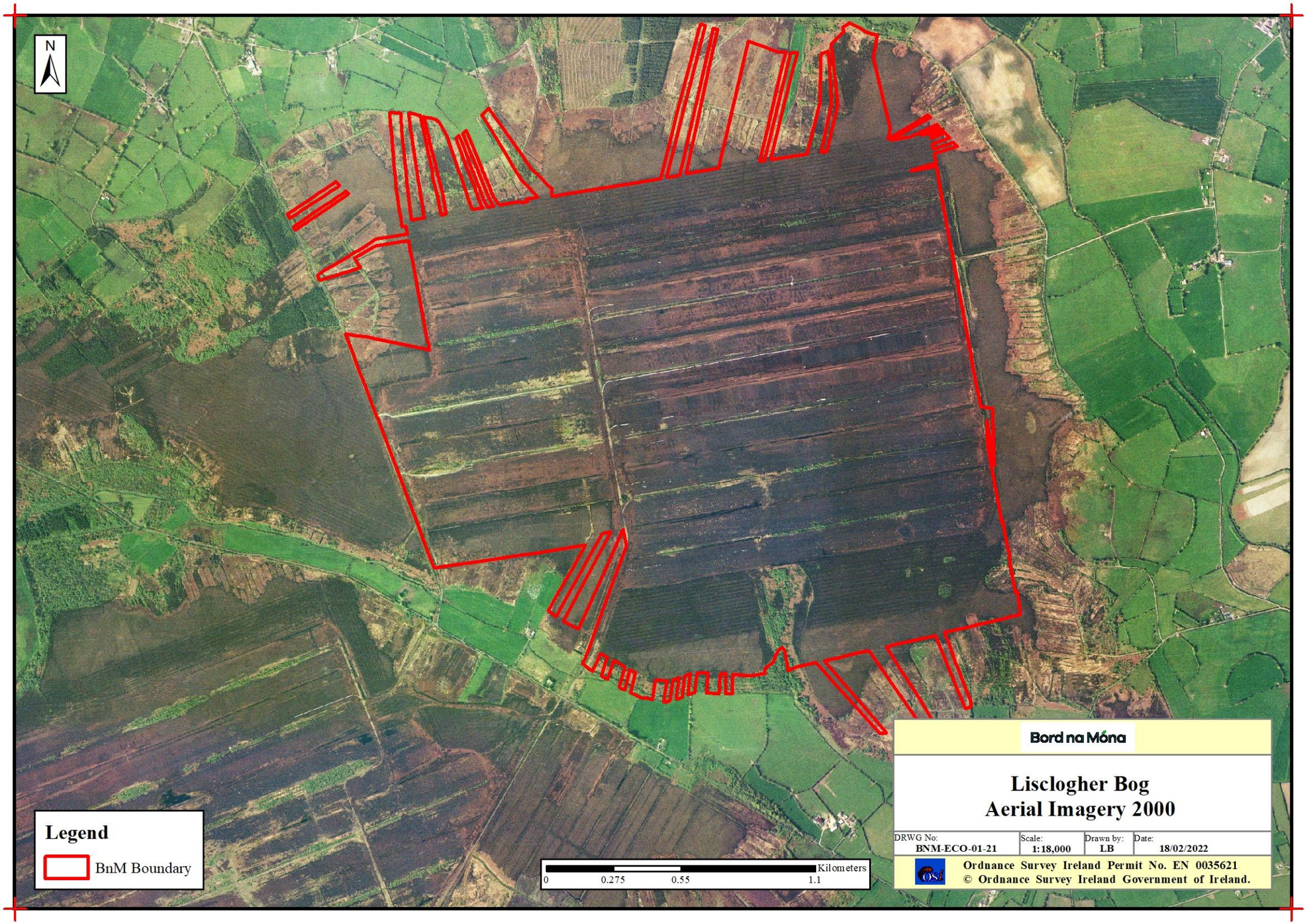

**BNM-ECO-01-22: Aerial Imagery 2020**

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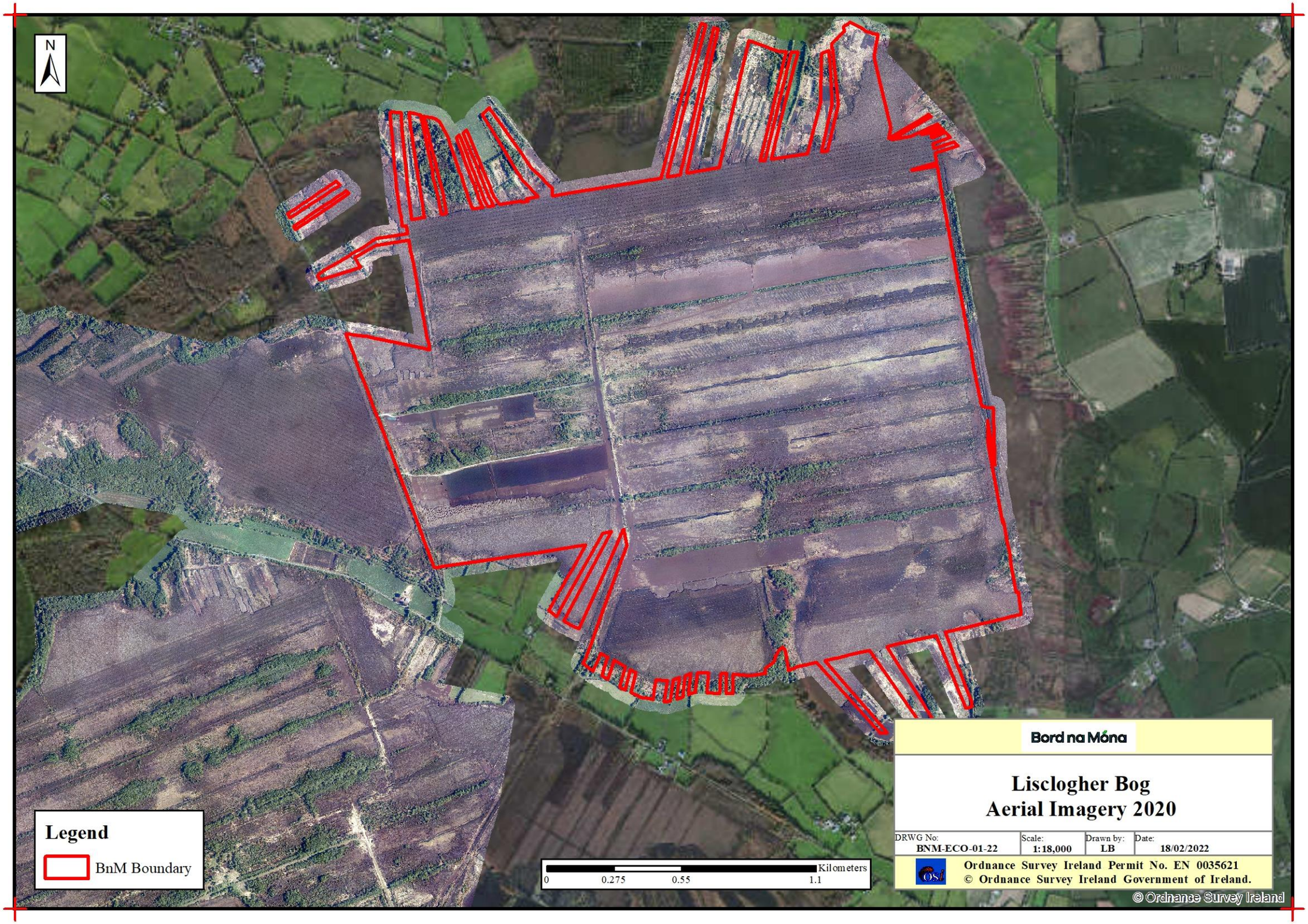

**BNM-ECO-01-23: Proximity Designated Sites**

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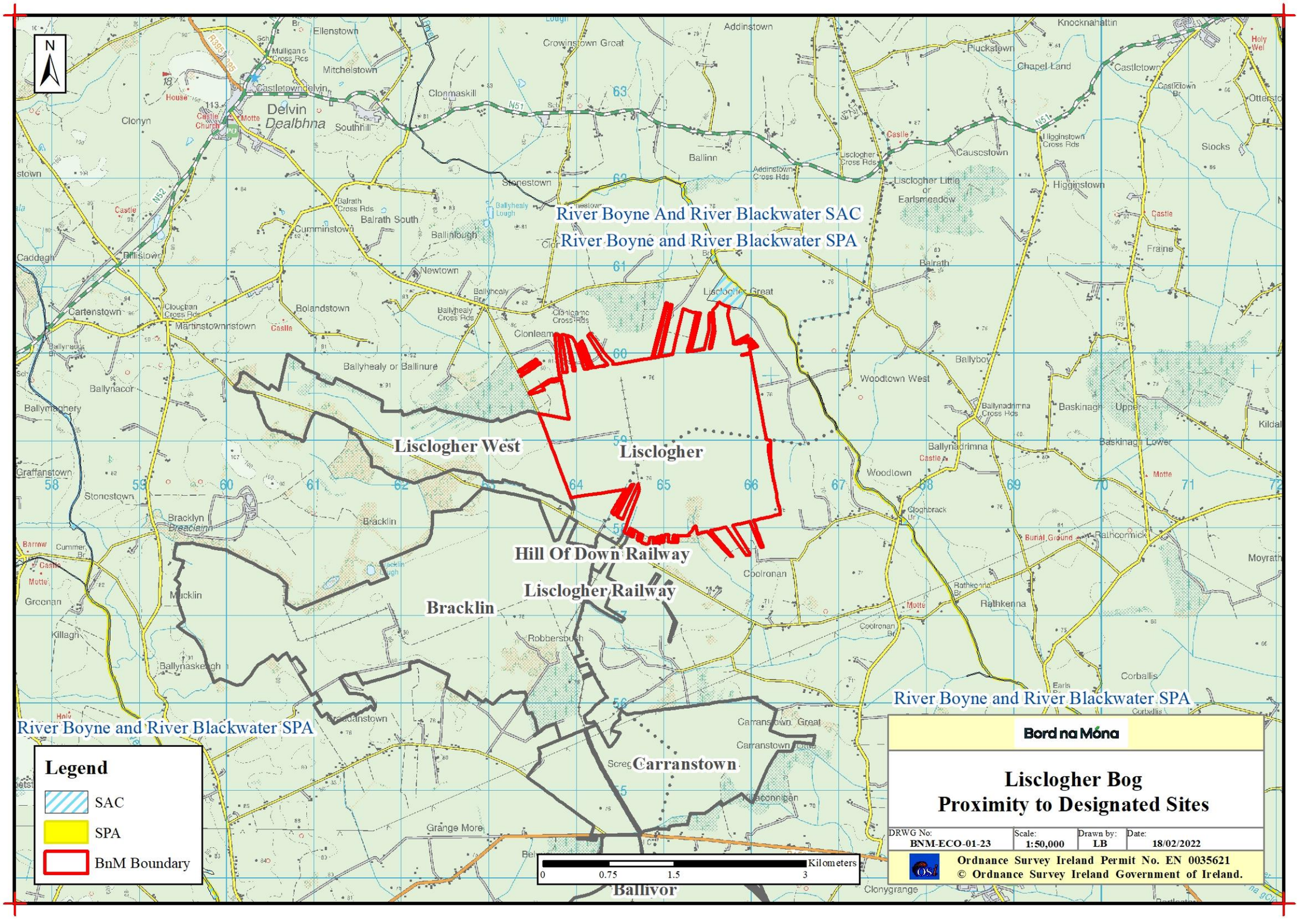

**BNM-ECO-01-24: Bog Group Map**

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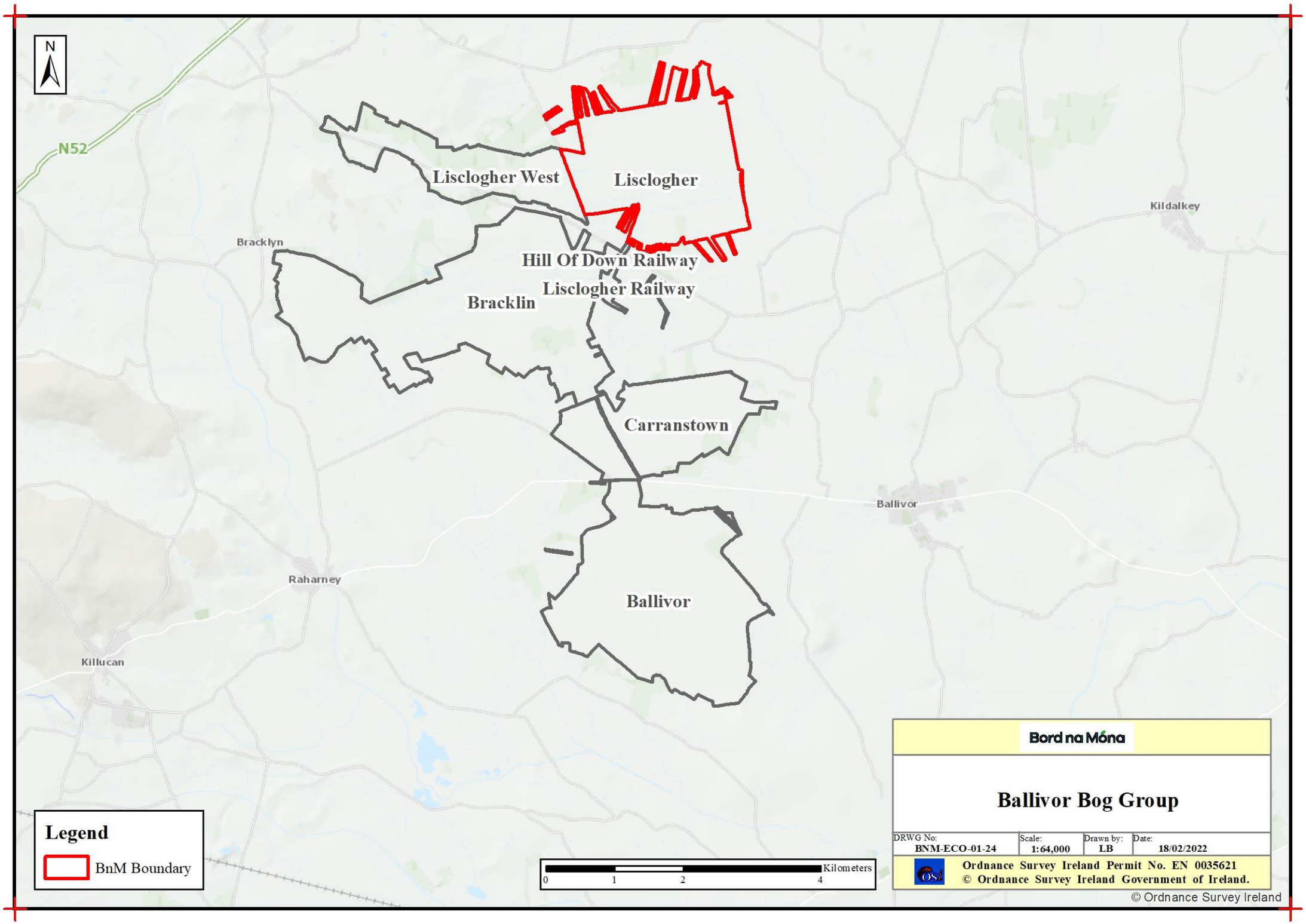

# Hydrology / Topography Maps

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**BNM-ECO-01-WQ01: Water Quality Map**

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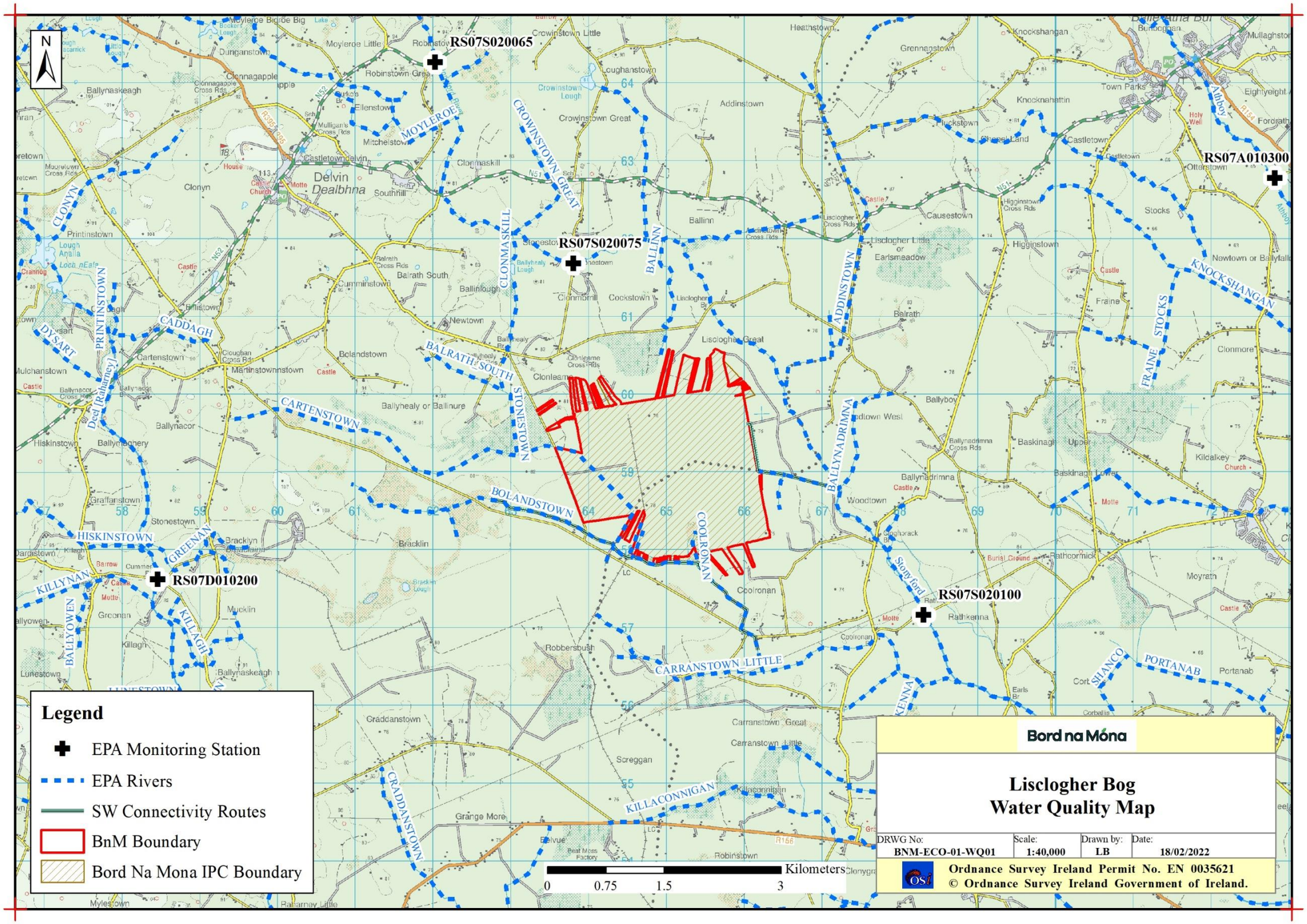

**BNM-ECO-01-SP01: Sampling Points**

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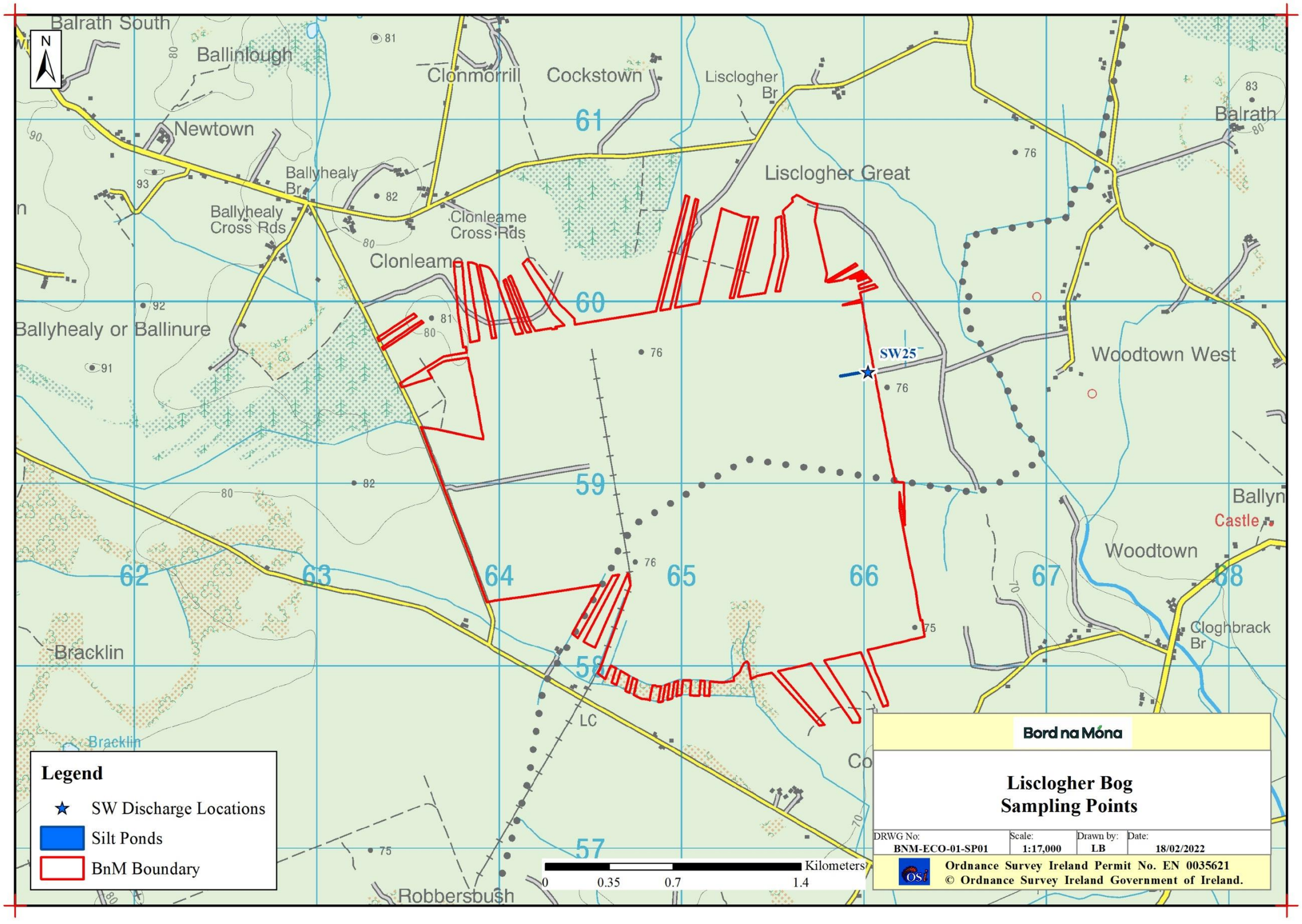

**BNM-ECO-01-03: LiDAR Map**

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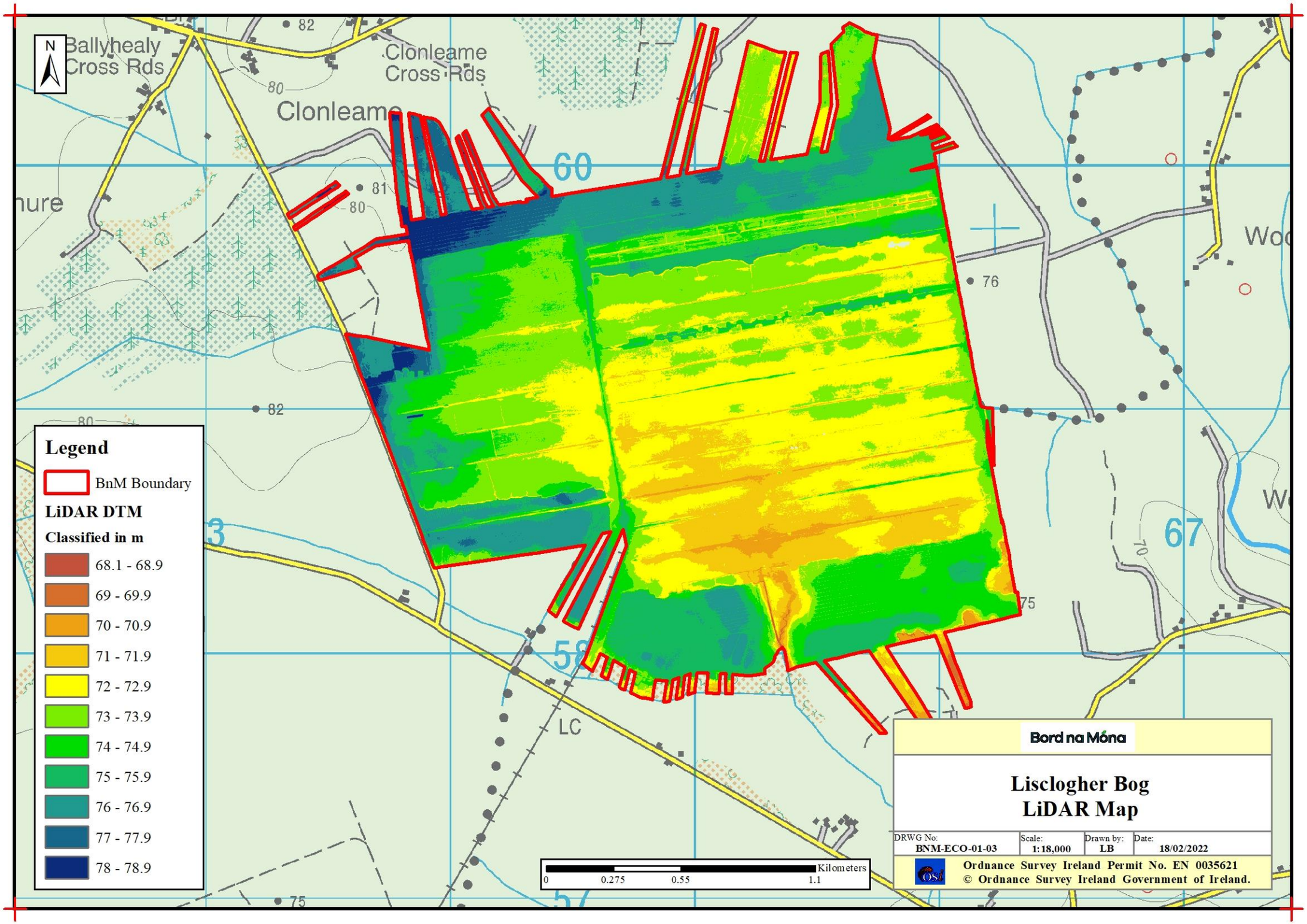

# Rehabilitation Maps

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**BNM-ECO-01-20: Standard Rehab Measures**

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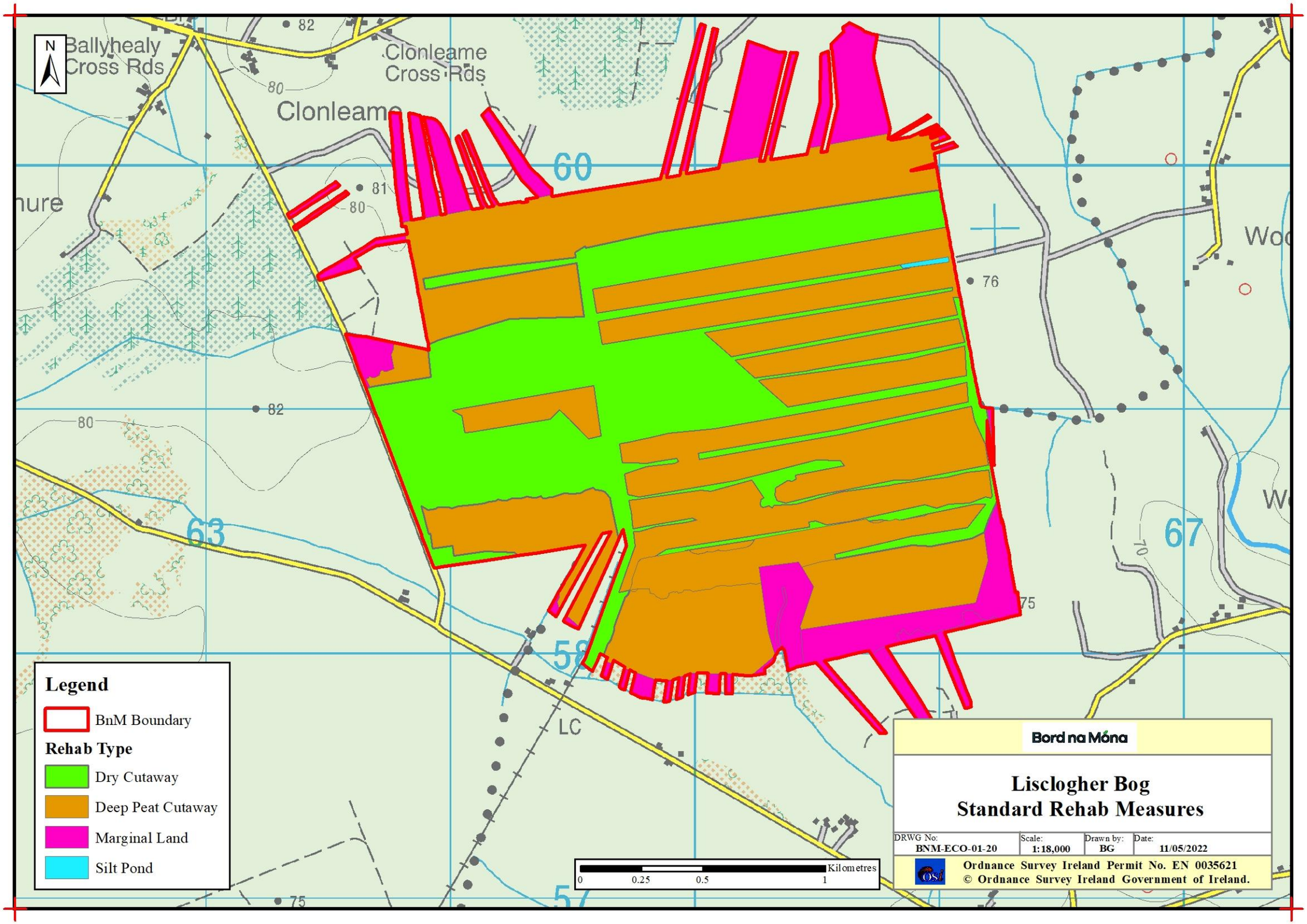

Bord na Móna

# Lisclogher West Bog

# Cutaway Bog Decommissioning and Rehabilitation Plan

# 2023

This document seeks to address the requirements of Condition 10.2 of IPC License Ref. P0501-01:

> "*The licensee shall prepare, to the satisfaction of the Agency, a fully detailed and costed plan for permanent rehabilitation of the cutaway boglands within the licensed area.*"

*This licence condition requires Bord na Móna agree with the EPA the measures that will provide for rehabilitation, i.e. stabilisation of Lisclogher West Bog upon cessation of peat production and compliments the licence requirement to decommission the site.*

***Rehabilitation** generally comprises site stabilisation with natural colonisation with or without targeted management.*

*Industrial peat production has now fully ceased at Lisclogher West Bog.*

*In addition, to preparing this document to comply with Condition 10 of IPC Licence Ref. P0501-01, due regard was also given to the Peatlands Climate Action Scheme (PCAS) announced by the Minster. This Scheme will see the Minister support, via the Climate Action Fund* and Ireland's National Recovery and Resilience Plan*, Bord na Móna in developing a package of measures, 'the Scheme', for enhanced decommissioning, rehabilitation and restoration of cutaway peatlands referred to as, the Peatlands Climate Action Scheme'. However, only the additional costs associated with the additional and enhanced rehabilitation, i.e., measures which go beyond the existing standard mandatory decommissioning and rehabilitation requirements arising from Condition 10 will be eligible for support. The additional costs of the Scheme will be supported by Government, administered by the Department of Environment, Climate and Communications (DECC), while the National Parks and Wildlife Service (NPWS) will act as the Scheme regulator.*

*While this document outlines the enhanced rehabilitation measures planned for Lisclogher West bog, activities which goes beyond that required by Condition 10 in the Licence, rehabilitation necessary to comply with the 'standard' requirement of Condition 10 (in the absence of the Scheme) is also included, to estimate costs. The inclusion of the 'standard' rehabilitation together with the enhanced rehabilitation in this document allows the Scheme Regulator to distinguish and objectively determine the specific activities (and their associated costs) eligible for support under the Scheme.*

*Bord na Móna have defined the key rehabilitation outcome at Lisclogher West Bog as environmental stabilisation, re-wetting and setting the bog on a trajectory towards raised bog restoration.*

*Any consideration of any other future after-uses for Lisclogher West Bog will be conducted in adherence to the relevant planning guidelines and consultation with relevant authorities and will be considered within the framework of this rehabilitation plan.*

| Document Control Sheet | |
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Note: This finalised version of the Rehabilitation Plan has been updated to take account that several planning actions listed in Section 8.1 have been completed and have been incorporated into the plan. This includes an Appropriate Assessment of the rehabilitation plan. See Lisclogher West Decommissioning and Rehabilitation Plan – Addendum 1 for more details.

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## Non-technical summary

- Bord na Móna is planning to rehabilitate Lisclogher West Bog, located in north-east Co Westmeath, approximately 4.3 km south-east of Delvin.
- It was drained in the 1980s but was never brought into industrial peat production.
- This rehabilitation plan has been prepared as Bord na Móna are obliged to carry out peatland rehabilitation via an IPC License issued by the Environmental protection Agency. In addition, the Government has agreed to support peatland rehabilitation via the establishment of the Peatland Climate Action Scheme (PCAS). This is funded via the Government and by Bord na Móna.
- The key objective of peatland rehabilitation is environmental stabilisation. This means developing habitats and vegetation typical of a raised bog community at Lisclogher West. Drain blocking at Lisclogher West will minimise pollution of downstream waterbodies. Better results for water quality improvements, climate action, the reduction of carbon emissions and biodiversity are achieved when the deep peat is re-wetted. This means drain-blocking and other measures to raise water levels to the surface of the bog and to encourage the development of naturally functioning raised bog habitat.
- The key objective is to re-wet and restore Lisclogher West raised bog and to encourage Annex I active raised bog development (peat-forming habitat).
- In general, soggy ground conditions are preferred. This means the remaining peat is wet and that plants that prefer wetter conditions, like Bog Cotton and *Sphagnum* moss will thrive.
- Re-wetting peat is also better for climate action. This reduces carbon emissions as re-wetting the remaining peat reduces carbon losses such as the production of Carbon Dioxide, the main Greenhouse Gas. The site is expected to still be a reduced carbon source for some time, but eventually the carbon sink function can re-establish as peat-forming conditions are restored. This will take some time.
- The development of a range of habitats in Lisclogher West Bog will support biodiversity including plants, insects, birds and mammals. This includes some species that are rare and protected in the wider landscape. Many wetland habitats in the wider landscape have been reclaimed for agriculture and other uses and peatland rehabilitation is an opportunity to create new wetland habitats.
- Measures proposed for Lisclogher West Bog include internal drain blocking and other measures required to raise water levels to the surface of the peat.
- Bord na Mona plan to carry out this work in 2023.
- These rehabilitation measures will be planned by a team consisting of expert ecologists, hydrologists and engineers. It is a guiding principle of Bord na Móna rehabilitation planning that no actions or activities will be undertaken that would negatively impact on adjacent land. No boundary drains will be blocked. Water will still leave the bog via the existing outlets.
- It will take some time for active raised bog communities to fully develop at Lisclogher West, and an active raised bog peatland ecosystem to be restored. However, it is expected that Lisclogher West will be developing some active raised bog after 10 years given the occurrence of *Sphagnum* mosses at the site and the measures proposed.
- This is a peatland rehabilitation plan. This plan does not consider future after-use or development. Bord na Móna continually reviews its land-bank to consider future commercial or industrial developments, such as renewable energy. Bord na Móna are currently developing a renewable energy project called Ballivor Wind Farm. This proposed project is in the planning stage, the planning application was submitted in April 2023. Lisclogher West Bog had been initially included within the boundary of this project, although no renewable energy development or infrastructure has been proposed for the Bog.

- Any other proposed development will be planned in adherence to relevant planning guidelines and will consider the rehabilitation and the condition of the site.
- Peatland rehabilitation of these bogs will bring a range of benefits to the local community via improvements to the local landscape and is also important for supporting national policies and strategies in relation to reduction of carbon emissions from these peatlands, supporting biodiversity and improvements to water quality.

# 1. INTRODUCTION

Bord na Móna operates under IPC Licence issued and administered by the EPA to extract peat within the Ballivor-Derrygreenagh bog group (Ref. P0501-01). Lisclogher West bog is part of this bog group (see Appendix II for details). As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area.

This document seeks to address the requirements of Condition 10.2 of IPC License Ref. P0501-01:

> "*The licensee shall prepare, to the satisfaction of the Agency, a fully detailed and costed plan for permanent rehabilitation of the cutaway boglands within the licensed area.*"

It also seeks to outline measures to optimise climate action and other ecosystem services benefits, mainly through hydrological management.

This plan is a specific rehabilitation plan for the bog and outlines:

- Description of site management and status.
- Main issues and approaches to rehabilitation.
- Consultation to date with interested parties.
- Interaction with other policy and legislative frameworks (Appendix VI).
- The planned rehabilitation goals and outcomes.
- The scope of the rehabilitation plan.
- Criteria which define the successful rehabilitation and key targets to validate rehabilitation.
- Proposed rehabilitation actions.
- Proposed timeframe to implement these measures.
- Budget and Costings.
- Associated aftercare, maintenance, and monitoring.

*Note: This plan should be read in conjunction with the accompanying Map book*.

It is proposed by Government that Bord na Móna carry out a Peatlands Enhanced Decommissioning, Rehabilitation and Restoration Scheme on its peatlands. Note this proposal is also known colloquially as the 'Peatlands Climate Action Scheme' (PCAS). The additional costs of the Scheme will be supported by Government through the Climate Action Fund, and Ireland's National Recovery and Resilience Plan administered by the Department of Environment, Climate and Communications (DECC), while the National Parks and Wildlife Service (NPWS) will act as the Scheme regulator. Bord na Móna have previously identified a footprint of 33,000 ha as peatlands suitable for this scheme. This Scheme will significantly go beyond what is required to meet rehabilitation and decommissioning obligations (Appendix VII & IX) under existing EPA IPC licence conditions. Improvements supported by the Scheme will ensure that environmental stabilisation is achieved (meaning IPC obligations are met), and importantly, significant additional benefits, particularly relating to climate action and other ecosystem services, will also be delivered. The Scheme commenced in 2021.

Only the costs associated with the additional, enhanced and accelerated rehabilitation, i.e. those measures which go beyond the existing decommissioning and rehabilitation requirements arising from Condition 10, will be eligible for support under the Scheme. Bord na Móna have now announced the complete cessation of industrial peat production across its estate (January 2021).

It is expected that the Scheme (PCAS) will have benefits accruing from biodiversity provision, water quality and storage attenuation as well as increased carbon storage, reduced carbon emissions and acceleration towards

carbon sequestration. The Scheme will also facilitate monitoring of carbon fluxes (Greenhouse Gases and fluvial carbon) in selected areas (in addition to other established Research programmes), to monitor changes in where the interventions will accelerate the trajectory towards a naturally functioning peatland ecosystem.

It is envisaged that the Rehabilitation Scheme will support activities, interventions, or measures across the Bord na Móna cutaway peatlands which accelerate the original timelines. Selected rehabilitation measures will take account of site environmental conditions, which can vary significantly. These measures potentially include:

- more intensive management of water levels through pump management, drain-blocking and cell bunding;
- re-profiling that will deliver suitable conditions for development of wetlands, fens and bog habitats;
- targeted fertiliser applications;
- seeding of targeted vegetation; and
- proactive inoculation of suitable peatland areas with *Sphagnum.*

These are collectively designed to optimise hydrological conditions (ideally and where possible water-levels at peat surface ± 10 cm) for climate action benefits and to accelerate the trajectory of the site towards a naturally functioning ecosystem, and eventually a reduced carbon source/carbon sink again. In some areas of dry cutaway this trajectory will be significantly longer, and it is not feasible in the short-term to re-wet some areas. These areas will develop other habitats. The key to optimising climate action benefits is the restoration of suitable hydrological conditions and more intensive intervention means that the extent of suitable hydrological conditions can be optimised.

These measures are designed to encourage the development of peat-forming habitats, where possible. They are also designed to further slow the movement of water across the site (with the site acting similarly to a constructed wetland), slowing the release of water (improving local water attenuation) and water quality is also expected to improve as the site returns to a naturally functioning peatland ecosystem. It is anticipated that the combination of active enhanced rehabilitation measures and natural colonisation will quickly accelerate environmental stabilisation. Nevertheless, it will still take some time (30-50 years) for naturally functioning wetland and peatland ecosystems to fully re-establish.

The measures will also accelerate the development of new habitats for a range of species under pressure in the wider landscape and will have the potential to develop habitats (e.g. Annex I raised bog, wetlands that support wader water birds of conservation interest) that will contribute towards the delivery of national biodiversity objectives.

Lisclogher West Bog is proposed to be part of this Scheme (PCAS), which commenced in 2021 and this rehabilitation plan outlines the approach to be taken.

## 1.1 Constraints and Limitations

This document covers the area of **Lisclogher West Bog**.

There are a number of small, isolated areas of high bog along the margins, to the south of the bog that are subject to active turbary (within the area owned and under the control of Bord na Móna). These areas are ecologically and hydrologically linked to the area owned by Bord na Móna where rehabilitation is planned. It is beyond the scope of this rehabilitation plan to address turf cutting issues on Lisclogher West Bog. Nevertheless, Bord na Móna are aware of such issues which may constrain the proposed rehabilitation actions, and this rehabilitation plan considered potential impacts of these on the delivery of the stated objectives.

The Royal County Aeromodellers Club has a lease area within the south of the site on a small area of old cutover bog. This area will be excluded from rehabilitation works.

Coillte have planted some cutover bog and high bog with Lodgepole Pine along the northern side of this bog. Coniferous forestry also occurs fringing the two parcels of bog south of the local road. It is not proposed to change or affect any conifer or commercial forestry via this scheme outside the BNM landholding. Some of the Pine planted on high bog is proposed for 'Forest to Bog' restoration subject to agreement with Coillte.

The proposed Ballivor Wind Farm is located adjacent to this site. This project is currently in pre-planning. This proposed wind farm project does not affect the scope of the rehabilitation. Lisclogher West Bog is outside of the development boundary of this project.

# 2. METHODOLOGY

This rehabilitation plan was developed with a combination of desktop and field surveys, consultations with internal and external stakeholders and cognisance of the Scheme (PCAS). The development of this rehabilitation plan considered recently published guidance issued by the EPA in 2020 – '*Guidance on the Process of Preparing and Implementing a Bog Rehabilitation Plan*'.

The ecological information and site information collected during the Bord na Móna ecological baseline survey, additional confirmatory site visits (covering the period 2012 to 2021 inclusive) and monitoring and desktop analysis forms the basis for the development of the rehabilitation plan for the bog, along with:

- Experience of 40 years of research on the after-use development and rehabilitation of the Bord na Móna cutaway bogs (Clarke, 2010; Bord na Móna, 2016);
- Significant international engagement during this period with other counties in relation to best-practise regarding peatland rehabilitation and after-use through the International Peat Society and the Society for Ecological Restoration (Joosten & Clarke, 2002; Clarke & Rieley, 2010; Gann *et al*., 2019);
- Consultation and engagement with internal and external stakeholders;
- GIS Mapping;
- BNM drainage surveys;
- Bog topography and LIDAR data;
- Previous research studies on site;
- Hydrological modelling; and
- The development of a Methodology Paper outlining the Scheme (PCAS)[1]. This rehabilitation includes enhanced measures defined in the Methodology Paper which are designed to exceed the standard stabilisation requirements as defined by the IPC Licence and to enhance the ecosystem services of Derryshannoge Bog optimising climate action benefits.

## 2.1 Desk Study

The desk study involved collecting all relevant environmental and ecological data for the study area. The development of the rehabilitation plan also takes account of research, experience and engagement with other peatland restoration and rehabilitation projects and peatland research including Irish, UK, European and International best-practise guidance (full citations are in the References Section):

- Anderson *et al*. (2017). An overview of the progress and challenges of peatland restoration in Western Europe.
- Barry, T.A. et al (1973). A survey of cutover peats and underlying mineral soils. Soil Survey Bulletin No. 30. Dublin, Bord na Móna and An Foras Taluntais.
- Bonn *et al*. (2017). Peatland restoration and ecosystem services- science, policy and practice.
- Carroll *et al*. (2009). *Sphagnum* in the Peak District. Current Status and Potential for Restoration. Moors for the Future Report No 16.
- Clark & Rieley (2010). Strategy for responsible peatland management.
- Eades *et al*. (2003). The Wetland Restoration Manual.

[1] https://www.bnmpcas.ie/supporting-material/

- Farrell & Doyle (2003). Rehabilitation of Industrial Cutaway Atlantic Blanket Bog, NW Mayo, Ireland.
- Feehan, J. (2004). A long-lived wilderness. The future of the north midlands peatland network. Department of Environmental Resource Management, UCD.
- Foss, P.J., Crushell, P. & Gallagher, M.C. (2017) Title: Counties Longford &Roscommon Wetland Study. Report prepared for Longford and Roscommon County Councils.
- Gann *et al*. (2019). International Principles and Standards for the practice of Ecological Restoration.
- Hinde *et al*. (2010). *Sphagnum* re-introduction project: A report on research into the re-introduction of *Sphagnum* mosses to degraded moorland. Moors for the Future Research Report 18.
- Joosten & Clarke (2002). Wise Use of mires and peatlands – Background and Principles including a framework for Decision-making.
- Lindsay (2010). Peatbogs and Carbon: A Critical Synthesis to Inform Policy Development in Oceanic Peat Bog Conservation and Restoration in the Context of Climate Change.
- Mackin *et al*. (2017). Best practice in raised bog restoration in Ireland. Irish Wildlife Manuals, No. 99. National Parks and Wildlife Service,
- McBride *et al*. (2011). The Fen Management Handbook (2011), Scottish Natural Heritage.
- McDonagh (1996). Drain blocking by machines on Raised Bogs. Unpublished report for National Parks and Wildlife Service.
- NPWS (2017a). National Raised Bog Special Areas of Conservation management plan. Department of Arts, Heritage and the Gaeltacht.
- Pschenyckyj et al., 2021, Optimising Water Quality Returns from Peatland Management while Delivering Co-Benefits for Climate and Biodiversity. An Fóram Uisce.
- Quinty & Rochefort (2003). Peatland Restoration Guide, second edition. Canadian *Sphagnum* Peat Moss Association and New Brunswick Department of Natural Resources and Energy.
- Regan*, et. al.* (2020). Ecohydrology, Greenhouse Gas Dynamics and Restoration Guidelines for Degraded Raised Bogs. EPA Research Report. Prepared for the Environmental Protection Agency by Trinity College Dublin.
- Renou-Wilson *et al*. (2011). BOGLAND - Sustainable Management of Peatlands in Ireland. STRIVE Report No 75 prepared for the Environmental Protection Agency.
- Schouten (2002). Conservation and Restoration of Raised Bogs: Geological, Hydrological and Ecological Studies. Dúchas - The Heritage Service of the Department of the Environment and Local Government, Ireland;
- Thom (2019). Conserving Bogs – Management Handbook.
- Wheeler & Shaw (1995). Restoration of Damaged Peatlands – with Particular Reference to Lowland Raised Bogs Affected by Peat Extraction.
- Wittram *et al*. (2015). A Practitioners Guide to Sphagnum Reintroduction. Moors for the Future Partnership.


Additional on-line resources were also incorporated into the desk study, including:

- Ballivor Integrated Pollution Control Licence;
- Ballivor Annual Environmental Reports;
- Review of the National Biodiversity Data Centre (NBDC) webmapper;
- Inland Fisheries Ireland (IFI) Reports;
- Environmental Protection Agency database (www.epa.ie);
- EPA Guidance on Requests for Alterations to a Licensed Industrial or Waste Activity;

- BirdWatch Ireland online data (including I-WeBS and CBS datasets; www.birdwatchireland.ie);
- Geological Survey of Ireland - National Draft Bedrock Aquifer map;
- Geological Survey of Ireland - Groundwater Database (www.gsi.ie);
- Historic Environment Viewer at https://webgis.archaeology.ie/historicenvironment/
- National Parks & Wildlife Services Public Map Viewer (www.npws.ie);
- Water Framework Directive catchments.ie/maps/ Map Viewer (www.catchments.ie);
- OPW Indicative Flood Maps (www.floodmaps.ie);
- CFRAM Preliminary Flood Risk Assessment (PFRA) maps (www.cfram.ie);
- River Basin Management Plan for Ireland 2022-2027
- Bord na Móna Annual Report 2021 & 2022.
- Spatial data in respect of Article 17 reporting, available online at https://www.npws.ie/maps-and-data/habitat-and-species-data/article-17.

## 2.2 Consultation

A number of stakeholders have been identified during the course of Bord na Móna's rehabilitation and Biodiversity Action Plan activities and are contacted during the rehabilitation planning process for their views. See Section 4.

## 2.3 Field Surveys

Bord na Móna carried out a baseline ecological survey of all of its properties in 2009-2012 and developed habitat maps. As part of this exercise, Lisclogher West Bog was surveyed in July of 2012. A site visit was used to categorise any changes in habitat extent at Lisclogher West in September 2021. Habitat maps have been updated, where required. This rehabilitation plan is informed by the original baseline surveys as well as subsequent confirmatory site walk-over surveys and visits, and updates to baseline data.

Habitat mapping followed best-practise guidance from Smith *et al.* (2011). Map outputs including all habitat maps and target notes were produced using GIS software application packages (ArcGIS). General marginal habitats and other habitats that had not been modified significantly by industrial peat extraction were classified using Fossitt *et al*. (2000). Plant nomenclature for vascular plants follows Stace (2019), while moss and liverwort nomenclature follow identification keys published by the British Bryological Society (2010).

An ecotope survey was carried out at Lisclogher West Bog in August 2022. The main objective of the field survey was to identify and map the ecotopes of the intact high bog and to identify any areas of active raised bog. High bog vegetation was described and mapped based on raised bog ecotope vegetation community complexes developed by Kelly *et al*. (1995) and outlined in Fernandez *et al*. (2014) with some adaptations. Ecotope mapping methodology followed Fernandez *et al.* (2014). Data was recorded using ArcGIS Field Maps on GPS enabled tablets. Ecotope community complexes were identified and mapped along with ecotope boundaries. During the ecotope survey cutover habitats were classified in accordance with the classification outlined in Smith and Crowley (2020), or where appropriate, the Heritage Council's 'Guide to Habitats in Ireland' (Fossitt, 2000). The results of the ecotope survey are set out in the accompanying ecotope survey report.

A detailed ecological survey report for Lisclogher West Bog is contained in Appendix II.

# 3. SITE DESCRIPTION

Lisclogher West is located in north-east Co Westmeath, 4.3 km south-east of Delvin. This bog is part of the Derrygreenagh (Ballivor) group of bogs. A minor road runs along the southern side of the site, forming the boundary in parts and also cutting off two smaller areas of high bog and associated habitats from the main bog. A second minor road delineates the eastern boundary and separates Lisclogher West from Lisclogher.

Lisclogher West Bog was drained in the 1980s but was never brought into industrial peat production, therefore the bog has retained many of its natural raised bog features, although there has also been significant degradation and the high bog is dry with relatively deep field drains. Two thirds of the bog were burned in 2008, and more recent burning has occurred in the western section of the bog, south of the local road. As a result of burning the bog is quite dry and firm, with regenerating Heather the most prominent species across the bog. The western end is somewhat wetter and in better condition. There is active turf cutting around the margins at several locations.

The main bog is relatively narrow and elongated. An esker runs along the northern side of the bog and limits the extent of the basin for this bog. The majority of the margins have been abandoned or unmanaged for some time and extensive Birch woodland and mixed conifer woodland has developed on cutover bog.

One of the main topographical features of the main bog is the presence of some more recent conifer plantation, with Lodgepole Pine that extends in strips from the northern margin about midway along the bog. This conifer plantation is managed by Coillte. Several blocks have failed, and the trees are quite sparse with colonisation by Birch. However, the largest blocks are in relatively good condition. This plantation was planted in the 1980's and is at the un-thinned post-thicket stage.

See Drawing number BNM-DR-24-19-01: Bog Site Location, included in the accompanying Mapbook, which illustrates the location of Lisclogher West Bog in context to the surrounding area.

## 3.1 Status and Situation

### *3.1.1 Site history*

Lisclogher West bog was ditched in the 1980s but was never brought into production.

Some of the marginal Birch woodland is particularly well-developed and Scot's Pine is a prominent feature of much of the woodland around the site. The 2nd edition OSI 6 inch map (prepared around 1910-20) maps most of the margins as conifer woodland, indicating that this woodland may not have developed naturally but was probably planted at some stage. This map also indicates that woodland or wooded sections on the high bog were more extensive in the past and some areas have been cleared or reverted back to high bog, indicating that there has been a relatively long history of forestry around this site.

### *3.1.2 Current land-use*

Some marginal areas to the northeast and south of the bog are used for private turbary, some within the Bord na Móna site boundary. Peat extraction is still carried out in the central section of the bog, south of the local road, with evidence of relatively recent turbary (within the past two years). During the survey part of the cutaway habitat in this area was in use as spread lands. Turbary areas are mapped as constraints in the accompanying Mapbook.

Bord na Móna are currently developing a renewable energy project called Ballivor Wind Farm. Bord na Móna Wind Farm | Ballivor Wind Farm. This proposed project is in the planning stage, the planning application was submitted in April 2023. Lisclogher West Bog is located outside of the Wind Farm development site boundary. The proposed renewable energy project will not impact on Lisclogher West Bog.

### *3.1.3 Socio-Economic conditions*

Bord na Móna has historically been a vital employer for the rural community of the Midlands of Ireland. Bord na Móna compiled a report on the role of peat extraction in the midlands historically in which they report that in 1986, by the end of Bord na Móna's Third Development Programme, a total of twenty-three work locations had been established around the country. The company had an average employment of approximately 4,688 in the mid 1980's, with a peak employment of 6,100 during the production season, which placed it among the country's largest commercial employers. The importance of such levels of employment were largely due to its regional concentration in the Midlands and the lack of alternative employment opportunities at the time.

According to the Energy Crop Socio-Economic Study undertaken by Fitzpatrick Associates in 2011, there were an estimated 1,443 jobs supported by the peat-to-power industry in Ireland at the time, some 81% of which were located in the catchment areas of the three peat-fired generating stations (Lough Ree, West Offaly, and Edenderry Power Stations). These constituted jobs in the plants and in peat extraction, jobs indirectly supported in upstream supply industries and jobs induced through the trickle-down effects of the wages and salaries of those supported directly or indirectly.

In respect of Lisclogher West Bog, jobs included in the above study would have included those to facilitate the original ditching of this site.

As the primary employer in many Midland counties, Bord na Móna played a central role in building communities through several initiatives, including Education bursaries, support of local sporting clubs, the provision of community gain funds, charity programmes and the provision and building of amenity areas.

These job numbers have now declined with the cessation of peat extraction at this bog. It is anticipated that the scheme (PCAS) will provide some employment for a team of workers at this site for a period of time (> 1 year). There are approximately 1400 people working in Bord na Móna at present. There are approximately 255 roles directly involved in PCAS.

## 3.2 Geology and Peat Depths

### *3.2.1 Sub-soil geology*

The underlying geology of Lisclogher Bog comprises Waulsortian limestone[2] to the west and Lucan Formation to the east; divided by a narrow band of Tober Colleen Formation in the centre. The site is underlain with both gravel and marl.

[2] https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=de7012a99d2748ea9106e7ee1b6ab8d5&scale=0

### 3.2.2 *Peat type and depths*

Lisclogher West still contains significant peat depths. Peat depths are largely 3-4 m.

## 3.3 Key Biodiversity Features of Interest

The majority of Lisclogher West Bog within the Bord na Móna boundary consists of drained raised bog, as this bog was drained but never put into production and thus retains its vegetation however, there has been significant degradation, due to drainage and burning. Two thirds of the bog were burned in 2008, and more recent burning has occurred in the western section of the bog, south of the local road.

### *3.3.1 Current habitats*

The most common vegetation communities present include (Categories in brackets refer to the Fossitt Code):

- Raised bog (PB1)
- Cutover Bog (PB4);
- Conifer plantation (on high bog and cutover bog, Coillte managed) (WD4);
- Birch woodland (WN7) (non-Annex) (on cutover bog dominated by Birch and/or Scot's Pine);
- Mixed broad-leaved/conifer woodland (WD2) (old plantations);
- Scrub (WS1) (on old cutover bog);
- Poor fen and flush (PF2) (part of high bog);
- Wet grassland (GS4);
- Hedgerows (WL1) (linear development of scrub along boundaries such as roads);
- Depositing stream/river (FW2);
- Buildings and artificial surfaces (BL3) (roads, tracks and hard surfaces along access routes);

An ecotope survey of Lisclogher West was carried out in August 2022. The primary objective was to assess the baseline condition of the raised bog by mapping high bog ecotopes and identifying any areas of EU Habitats Directive Annex I Active Raised Bog (ARB) (7110) or Degraded Raised Bogs Still Capable of Natural Regeneration (DRB) (7120).

The majority of the bog does not have a well-developed micro-topography, lacking pools and hummocks. It is generally uniform, dominated by low heather, lacking *Sphagnum* mosses and is firm and dry underfoot. The western section of the bog, south of the road had a more natural raised bog topography including hummocks, and pools, although it had been recently burned.

Historical peat-cutting has taken place around the margins of the high bog and old cutover banks are evident along the northern and western margins of the bog. Some marginal areas to the northeast and south of the bog are used for private turbary, some within the Bord na Móna site boundary. Peat extraction is still carried out in the central section of the bog, south of the local road, with evidence of relatively recent turbary (within the past two years). During the survey part of the cutaway habitat in this area was in use as spread lands.

Drainage, burning, turbary and conifer plantations has had a significant negative impact on the quality of the high bog. The majority of the bog is considered raised bog of lower quality, with very dry conditions, a low water table

and with low *Sphagnum* cover. There are some small pockets of marginally better-quality areas present, in the western section of the site, with higher *Sphagnum* cover.

The site is characterised by several different ecotope communities, depending on topography, hydrology, and species composition. The Annex I habitat Active Raised Bog (7110) within the site is limited to a small area of sub-central ecotope and active flush, covering approximately <2 ha.

The remaining ecotopes recorded at Lisclogher West Bog include sub marginal, marginal, facebank and inactive flush, which are all important supporting high bog habitat.

Approximately 13 ha of high bog conforms to the Annex I habitat *Degraded Raised Bog Capable of Natural Regeneration (7120),* where if the hydrology can be repaired following rehabilitation, there is a reasonable expectation of re-establishing vegetation with peat-forming capability within 30 years. This area was determined by hydrological modelling undertaken using LiDAR imagery. This DRB overlaps with marginal ecotope.

A flush occurs in the western section of the bog, situated within the drained basin of Martinstown Lough. The outer margins of the flush are classified as inactive, due to low *Sphagnum* cover. The former basin of the lake is still evident, and the lowest section is quite wet and quaking, with higher *Sphagnum* cover. This area conforms to active flush and sub-central ecotope and is considered Annex I "Active Raised Bog".

The high bog is also surrounded by semi-natural habitats (mainly Birch woodland and scrub) that have developed on cutover bog. These add to the overall biodiversity value of the site and some of the woodland (WN7, non-Annex) is of particular ecological value as it is dominated by mature Scot's Pine and is particularly well-developed.

The invasive species *Rhododendron ponticum* was recorded in the western section of Lisclogher West, with occasional small localised stands/individual plants recorded in the flush area.

See Drawing number BNM-DR-24-19-17**:** Current Habitat Map, included in the accompanying Mapbook, which illustrates the habitats at Lisclogher West Bog.

*Faunal biodiversity*

The site is used occasionally by Hen Harrier and small flocks of Golden Plover in the winter (Biosphere Environmental Services 2014). The site is also used by breeding Snipe and Skylark.

Several bird species were noted on the site during previous surveys. Mallard, Buzzard, Snipe, Coal Tit, Blue Tit and Long-tailed Tit, Magpie, Blackbird, Pheasant, Grey Crow, Rook, Wren, Robin and Meadow Pipit have all been recorded.

Mammal species including Deer (most likely Fallow Deer), Badger, Irish hare, fox and mink have all been recorded in the bog or bog margins.



*Plate 3.1 Example of drainage ditches occurring within Lisclogher West, supporting Sphagnum mosses (May 2020).*



*Plate 3.2 Example of Birch dominated woodland and some Scot's pine at Lisclogher West (May 2020)*



*Plate 3.3 Example of degraded/dry heather Lisclogher West bog (August 2022).*



*Plate 3.4* Sub-central ecotope located in the active flush in the western section of the bog, formed in the basin of a former lake. *(August 2022).*

## 3.4 Statutory Nature Conservation Designations

Lisclogher West has no overlapping designated sites. The nearest EU Designated sites to Lisclogher West Bog are as follows:

- River Boyne And River Blackwater SAC (site code: 002299) located 1.7km to the west,
- River Boyne And River Blackwater SPA (site code: 004232) located 2.5km to the south-west
- Mount Hevey Bog SAC (Site Code 002342) (also a pNHA) located approximately 10km south

In addition, there are a number of nationally designated sites (NHAs and pNHAs) in proximity to the bog:

- Lough Shesk pNHA (site code: 000556) located 6 km to the north
- Royal Canal pNHA (site code: 002103) lies 9.7 km south

- Mount Hevey Bog pNHA (site code: 002342) located approximately 10 km south

There are no Ramsar Sites in the local vicinity of Lisclogher West Bog (i.e. within 3km).

See Figures BNM-DR-24-19-23: Lisclogher West Bog Proximity to Designated Sites in the accompanying map book.

## 3.5 Hydrology and Hydrogeology

Lisclogher West bog forms part of the Boyne Catchment (Catchment ID: HA 07) as defined by the EPA under the Water Framework Directive (WFD) and is situated within the Boyne_SC_050 Sub-Catchment. Lisclogher West bog is drained by both the Cartenstown Stream, (historically diverted and now flowing along the southern boundary of Lisclogher), and the Bolandstown stream, located along southern boundary of the bog, and their associated tributaries. These primarily drain in an easterly direction towards the River Boyne. Lisclogher West Bog has a gravity-based drainage system.

GSI data indicates that the underlying geology of Lisclogher Bog comprises Waulsortian limestone[3] to the west and Lucan Formation to the east; divided by a narrow band of Tober Colleen Formation in the centre. The majority of the bog is classified as a Locally Important Aquifer (Bedrock which is Moderately Productive only in Local Zones). There are also no mapped karst features within the surrounding area.

Quaternary Sediment maps show Lisclogher West underlain by peat. A narrow Esker ridge, comprised of gravels of basic reaction, occurs along the southern boundary of the site. In a wider context, the bog is surrounded by Till derived from limestones and a small area to the south west of the bog underlayment by Gravels derived from Limestones. GSI Groundwater mapping indicates that the majority of the site is of low vulnerability, with a small proportion of the southern part of the site assessed as moderate vulnerability. While Groundwater Vulnerability is typically used to indicate the susceptibility to groundwater pollution, it can provide a useful proxy indication of likely groundwater flow rates in the surrounding area.

## 3.6 Emissions to surface-water and watercourses

Lisclogher West Big has 4 treated surface water outlets from a previously drained peatlands that were never brought into active peat extraction, which discharge to the Stonyford River (IE_EA_07S020400 STONYFORD_040).

Details of silt ponds, associated surface water emission points and those being monitored and sampled as part of the PCAS scheme are detailed on the attached water quality map.

While the IE_EA_07S020100 STONYFORD_030 is identified as under pressure in the third cycle of the River Basin Management Plan for Ireland 2023 to 2027, the applicable IE_EA_07S020400 STONYFORD_040 is not.

There is a robust monitoring program to track and verify any changes in baseline water quality conditions pre and post decommissioning and rehabilitation so that the success or otherwise can be tracked and verified for the National Parks & Wildlife Service, Environmental Protection Agency and Local Authority Water Program, amongst a range of stakeholders.

[3] https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=de7012a99d2748ea9106e7ee1b6ab8d5&scale=0

Initial monthly results are included in appendix XIII. These results are from the period November 2020 to January 2023 and are from the surface water outlet from the main sections of bog to be rehabilitated in 2023. Peat extraction never commenced in this bog with results above remaining on a relatively static trajectory, post rehabilitation planned for the coming year.

From an analysis of water quality results over since November 2020, these indicate that results were under the Emission Limit Value for Suspended Solids and Ammonia and broadly under the trigger level for COD.

The main emission limit value associated with this bog is 35mg/l suspended solids, with trigger levels for ammonia of 2.78 mg/l and COD 100mg/l.

Monthly ammonia concentrations from November 2020 to January 2023 had a range of 0.005 to 1.17 mg/l with an average of 0.182 mg/l. Results for suspended solids for the same period indicate a range of 2 to 8mg/l with an average of 2.57 mg/l.

Water quality of water discharges from restored peatlands normally improves as a result of bog restoration measures and the restoration of natural peatland processes (Bonn *et al*., 20017). Bog restoration is also expected to improve water attenuation of the site as the drains are blocked, slowing water movement and water release from the site. Restored peatlands help slow the release of water and aid the natural regulation of floods downstream (Minayeva *et al*., 2017). The National River Basin Management Plan (NRBMP) 2018-2021 (DHPCLG, 2017) is the key national plan for Ireland to achieve the objectives of the Water Framework Directive (WFD). The NRBMP outlines how key actions such as the Bord na Móna peatland rehabilitation is expected to have a positive impact on water quality and help the NWBMP deliver its objectives in relation to the WFD.

Water will still discharge from designated emission points when rehabilitation at Lisclogher West has been completed. This discharge will have improving water quality and there will be increased wetland attenuation, meaning slower release of water. This is expected to have a positive impact on status of the key water body receptor, the Stonyford River, and is expected to support the future status of the waterbody as being of Good Status.

**Decommissioning and Rehabilitation Programme Water Quality Monitoring.**

The licence obligation of quarterly sampling regime on a selected number of ponds to be sampled over a 3 year cycle will not be sufficient to be able to appropriately track the changing water chemistry that will occur as part of this enhanced rehabilitation programme, so this sampling regime will occur on a monthly basis.

In order to assist in monitoring surface water quality from this bog, it was agreed to increase the existing licence monitoring requirements of the IPC Licence, to sampling for the same parameters every month.

This new sampling programme commenced in November 2020 and is enabling a baseline to be established, with sampling to progress during the scheduled works, and for a period of up to 2 years post rehabilitation. Depending on the period required to confirm that the main two parameters, suspended solids and ammonia as remaining compliant with the licence emission and trigger limit values and there is an improving trajectory in these two parameters i.e. reduction in concentration, the monitoring programme and intensity will be periodically reviewed and amended.

In the preparation of this monitoring programme, Bord na Mona have been providing the Local Authority Water Programme (LAWPRO) with details of the surface water emissions points associated with this bog and will be amending some of the proposed monitoring locations on foot of this engagement. LAWPRO have in turn provided details of their monitoring programme and these are included in the Water Quality Map.

This is necessary to ensure that there is alignment with the WFD monitoring programme and that where possible, the monitoring programme will enable any improvements in water quality or establishing trends to be quantified against any available WFD monitoring data. It will also enable the periodic sharing of data which will inform the monitoring reports, success criteria and enable LAWPRO under the Water Framework Directive to track any changes in pressures and be aware of changes in water chemistry.

Monitoring results will be maintained, trended every six months and reported on each year and as required, as part of the requirement to report on Condition 10.1 of the IPC Licence on Bog Rehabilitation in the Annual Environmental Report, and will be provided to LAWPRO and the EPA as required to inform progress and national monitoring requirements under the WFD. These results will also be available in April each year as a requirement of the Annual Environmental Report at www.epa.ie.

The parameters to be included as per condition 6.2 of the IPC Licence include monthly monitoring for pH, Flow, Suspended Solids, Total Solids, Total Phosphorus, Total Ammonia, Colour & COD. In addition, DOC has been included as a parameter to try and identify any changes in carbon in the surface water, and where required by LAWPRO, to assist in investigating other changes in water chemistry, the series of parameters can be reviewed and amended.

## 3.7 Fugitive Emissions to air

The bog was never brought into industrial peat production. Rehabilitation of the drained peatland will seek to re-wet the dry peat where possible. Collectively re-wetting and re-vegetating will minimise any risk of emission to air from dust.

## 3.8 Carbon emissions

Irish peatlands are a huge carbon store, containing more than 75% of the national soil organic carbon (Renou-Wilson *et al.* 2012). Peatland drainage and extraction transforms a natural peatland which acts as a modest carbon sink into a carbon source (Waddington & McNeil, 2002; Alm *et al*., 2007; Wilson *et al*., 2007, Wilson *et al*., 2015). A natural peatland can take in 0.1 to 1.1 t of carbon as CO2-C /ha/yr while drainage and extraction can create large source of carbon dioxide releasing 1.3 to 2.2 t of carbon as CO2-C /ha/yr (based on Tier 1 Emission factors, Evans *et al.* 2017). Renou-Wilson *et al.* (2018) reported losses of between 0.81 – 1.51 CO2-C /ha/yr from drained peatlands located in Ireland.

Re-wetting of dry peatlands will increase methane emissions (Gunther *et al.* 2020) as a consequence of the anoxic conditions within the peat body that provide a suitable environment for the microbial breakdown of plant litter and root exudates. Tanneberger *et al.* (2021) describes how peatland management has to choose between $CO_2$ emissions from drained peatlands or increased methane ($CH_4$) emissions from rewetted industrial peatlands. However, when radiative effects and atmospheric lifetimes of both GHG gases are considered and modelled, postponing rewetting increases the long-term warming effect of continued $CO_2$ emissions (Gunther *et al.* 2020). This means the increase in methane due to rewetting of dry peatlands is still negated by the $CO_2$ emissions reductions. Degraded peatlands also release carbon/GHG emissions via the fluvial/aquatic pathway (Dissolved Organic Carbon – DOC, Suspended Solids/Particulate Matter, degassing of GHGs from water).

The EPA-funded CarbonRestore Project (Renou-Wilson *et al.* 2012) found that rewetting of drained peatlands can lead to restoration of functional peatland, such as the return of typical plant and animal species, which in turn may lead to the restoration of peat-formation and the C-sink function. The EPA NEROS project carried out GHG

flux research at Moyarwood Bog and found that Moyarwood Bog was overall a Carbon sink (sink for $CO_2$ and a source for Methane) 6 years after bog restoration was carried out (Renou-Wilson *et al.* 2018). Further, Wilson *et al.* (2022) confirmed the benefit of rapid rewetting at this site to achieve strong carbon reductions and potentially altering the warming dynamics from warming to cooling depending upon the climate scenario.

It is expected that Lisclogher West Bog will become a reduced Carbon source/part carbon sink following rehabilitation. The potential of any cutaway site to develop as a carbon sink in the longer-term depends on the success of the rehabilitation measures, the extent of development of *Sphagnum*-rich or other peat-forming habitats, the balance of carbon fluxes from different cutaway habitats and future climatic conditions. Much of this site is expected to develop as restored raised bog with some *Sphagnum*-rich habitat. Other marginal habitats include poor fen, heath and Birch woodland.

## 3.9 Current ecological rating

(Following NRA (2009) Evaluation Criteria)

This site can be rated as having a **County-National ecological value (C-B)** due to its raised bog restoration potential, its location as an outlier in relation to raised bog distribution in Ireland, and as it is dominated by a significant area of semi-natural habitats in relatively good condition, with potential for restoration.

# 4. CONSULTATION

## 4.1 Consultation to date

Consultation seeks to engage an audience of relevant stakeholders at both a national and local level. National stakeholders have been identified from varied bog restoration and rehabilitation efforts undertaken by Bord na Móna over the past 40 years, with particular emphasis on engagement with stakeholders during their Biodiversity Action Plan programme, since 2010. National Stakeholders includes relevant government departments and agencies, relevant semi-state bodies, NGOs and other environmentally-focused groups with a national remit.

There has been ongoing consultation about rehabilitation, biodiversity and other general issues over the years about Ballivor-Derrygreenagh bog group, including Lisclogher West Bog, with various stakeholders in relation to:

- General consultation with range of stakeholders at annual Bord na Mona Biodiversity Action Plan review days 2010-2018,
- Ongoing consultation with Coillte regarding forestry management (forestry leased to Coillte),
- Occasional consultation with NPWS regarding the status of Lisclogher West Bog.
- Midlands & East Regional WFD Operational Committee (River Basin Management Plans),
- The proposed development of the nearby Ballivor wind farm,
- Archaeological Liaison Committee (National Museum of Ireland & Dept of Culture Heritage and the Gaeltacht).

There has been ongoing consultation about the planning and construction of Ballivor Wind Farm (Bord na Móna Wind Farm | Ballivor Wind Farm) as part of that planning for that particular proposed development. This website describes the project and has up to date project newsletters.

To inform the current Plan, both national and local stakeholders, including neighbours whose land adjoins Lisclogher West Bog and local representatives of national bodies (such as Regional National Parks and Wildlife Service staff) and relevant offices in County Councils (such as the Heritage or Environmental Offices) will be contacted. Any identified local interest groups will be sought and informed of the opportunity to engage with this rehabilitation plan, and when identified invited to submit their comments or observations in relation to the proposed rehabilitation at Lisclogher West Bog.

All correspondence received will be acknowledged and evaluated against the rehabilitation work proposed here, and the final draft of the Lisclogher West Bog Rehabilitation Plan will contain a review of the consultation.

## 4.2 Issues raised by Consultees

To date, a number of issues have been raised by consultees during the consultation process for both the current and previous drafts of the rehabilitation plan for Lisclogher West Bog – these are summarised below.

### *4.2.1 Assessments of rehabilitation*

During the initial commencement of PCAS, a number of consultees including: the Irish Farmers Association (IFA), the Irish Creamery Milk Suppliers Association (ICMSA) and Trinity College Dublin have raised concerns regarding the duration and scope of consultation period. Stakeholders suggested that the consultation period should be extended to allow all potential stakeholders to make submissions where required.

Queries on pre-rehabilitation assessments were raised by NPWS and the National Museum of Ireland relating to the finalisation of several bog rehab plans in 2021 in relation to Appropriate Assessment, Environmental Impact Assessment and Strategic Environmental Assessment.

#### *4.2.2 Restoration scope*

Restoration/rehabilitation of marginal habitats was raised by the Irish Peatland Conservation Council (IPCC) and Butterfly Conservation Ireland (BCI) relating to the finalisation of several bog rehab plans in 2021 and 2022 as worthy of consideration within the rehabilitation measures to support carbon sequestration and biodiversity objectives.

#### *4.2.3 Monitoring*

Further details on monitoring of ecological metrics, and how and where reporting on this monitoring would take place, was raised by the IPCC, University College Dublin and Trinity College researchers in their respective submissions relating to the finalisation of several bog rehab plans in 2021. Uisce Éireann (formerly Irish Water) reiterated the requirement of a strong monitoring program with respect to water quality during and post rehabilitation.

#### *4.2.4 Flooding and drainage*

The Irish Farmers Association (IFA), The Department of Agriculture Food and the Marine, individual local residents and ICMSA queried likely impacts relating to the finalisation of several bog rehabilitation plans in 2021 and 2022, arising from the proposed re-wetting in relation to flooding on adjoining lands and, specifically, with regards to the maintenance of drains. The IFA also raised the issue of Health and Safety in relation to raising water levels as well as possible impacts on land and property prices. The Office of Public Works (OPW) raised concerns and queried potential for impacts on Arterial Drainage Maintenance and future drainage maintenance on the OPW Boyne scheme channels, namely C1/32/7/3 and C1/32/23.

#### *4.2.5 Future management*

In submissions made on earlier PCAS plans the Irish Farmers Association (IFA) expressed concerns regarding the future ownership of the BnM bogs subject to rehabilitation. They expressed a desire for contingency planning for potential future ownership of designated bogs so as to ensure no negative impacts arise on adjacent properties from any new ownership.

#### *4.2.6 Other issues*

Other issues (raised by IPCC) during the finalisation of several bog rehab plans in 2021, 2022 and in 2023 and also applicable for Lisclogher West Bog included after use of the bog and turf cutting on the margins of the bog (outside of the area owned by Bord na Móna).

Archaeological end of life survey of all the bogs were requested by National Museum of Ireland and National Monuments Unit. The National Museum of Ireland also requested that due diligence be taken during works to

protect any archaeologically significant findings or areas. They also reiterated the importance of peatlands for the preservation of archaeology and requested they be consulted as part of any EIA undertaken.

For a complete summary of submissions received and replies, see Appendix XI.

## 4.3 Bord na Móna response to issues raised during consultation

### *4.3.1 Consultation*

BnM are carrying out consultation as part of the process of developing the rehabilitation plan for Lisclogher West Bog. This is ongoing with a dedicated Community Liaison Officer communicating with affected and interested parties. A website has been developed to make information available. This will be continually updated. Some PCAS Bogs have been used as demonstration sites so that interested stakeholders can come to visit and observe the measures on the ground.

### *4.3.2 Assessments of rehabilitation*

Appropriate Assessment screening will be undertaken on all the bogs as part of PCAS and this is currently being undertaken by external consultants for Lisclogher West Bog. If required, a Natura Impact Statement shall be completed and submitted to the Minister in accordance with 42(9) and 42(10) of the Habitats Regulation, noting that Bord na Móna is prescribed as a 'public authority' under this legislation. In relation to the SEA Directive and EIAR Directive, this has been considered and the legal advice to date is that the scheme does not come under these Directives.

An Archaeological Impact Assessment (AIA) has been undertaken on all the bogs in PCAS (Appendix XII). The aim for known archaeology on these bogs is to accomplish preservation in-situ and BNM are taking steps to identify and avoid all known archaeology. It is anticipated that any archaeology will benefit from the ultimate remit of the rehabilitation, in that water tables will be raised thereby preserving in-situ. There is also an identified procedure for managing stray finds that may arise during rehabilitation works.

Implementation of rehabilitation measures including machine access across the bog will be carried out in conjunction with BnM Ecology Department. Seasonal and other restrictions will be put in place to mitigate against any impacts on biodiversity.

### *4.3.3 Restoration scope*

As part of PCAS, all restoration/rehabilitation options have been developed to support climate action and biodiversity objectives. Other issues such as existing amenity, social impacts, industrial history, archaeology were not part of the direct scope of PCAS but were considered when developing the rehabilitation plan. After-use of the bog is outside the scope of PCAS. Rehabilitation will lead to the development of a stable diverse re-wetted cutaway landscape that will have added benefits for amenity in the future.

As part of PCAS, one of the objectives for the rehabilitation of bogs is to promote the development of a naturally functioning peatland system. BnM would envisage benefits to biodiversity on these bogs as a result of rehabilitation. The most intensive peatland re-wetting will be applied to bare peat areas. Where there are diverse habitats already present, less intensive, targeted drain-blocking will be applied. While the overall objective is to

make the bog wetter and increase the footprint of wet peatland habitats, there will still be a mosaic of habitats present, including a transition from wet to drier areas of peat, in areas that cannot be re-wetted.

The local environmental conditions of Lisclogher West Bog mean that deep peat measures along with some forest to bog and additional works measures are the most suitable rehabilitation approach for this site to optimise benefits for climate. Lisclogher West Bog is predominantly a deep peat bog which was ditched but never brought into peat production. The absence of production has meant that the site has retained many of its natural raised bog features, although there has also been significant degradation and the high bog is relatively dry with relatively deep field drains. The majority of area proposed for rehabilitation is expected to develop as deep peat habitat. A key expected habitat is raised bog habitat on deeper residual peat. Degraded raised bog within the site will improve in overall habitat condition. Lisclogher West Bog has a gravity based drainage system.

### *4.3.4 Monitoring*

As part of the PCAS, a monitoring and verification plan has been developed to support climate action and biodiversity objectives. This will include stratified monitoring of bog condition, habitats and biodiversity at several different scales. It is proposed to monitor the improvement of some biodiversity ecosystem services. The appearance of key species such as *Sphagnum* moss will be monitored during walk-over surveys and general monitoring visits. It is not proposed to carry out any additional monitoring of biodiversity ecosystem services at this site. Biodiversity monitoring for PCAS planned for a stratified approach with different targeted monitoring at different sites based on the site characteristics.

### *4.3.5 Flooding, drainage or other impacts on adjacent land.*

It is the intention of Bord na Móna that the re-wetting of the bogs will be carried out in such a manner that does not impact on third party lands. Where it is deemed that blocking of a shared drain would cause any adjoining lands to be adversely affected, this will be avoided, and alterations made to the rehabilitation plan. In general, drains around the margins of the bog will not be blocked.

External consultants have been appointed to carry a hydrological assessment to identify any potential impacts to neighbouring lands and to mitigate against any such impacts. No issues were identified. There is no potential for direct impacts on arterial drainage downstream.

The rehabilitation measures proposed at Lisclogher West Bog will generally result in reduced runoff and drainage from the existing peat fields through a mixture of techniques including drain blocking, cell bunding and re-profiling. It is intended that these measures will not significantly alter the existing topographical catchments and that the spine of the drainage networks, those which the upstream catchments drain through, will be retained by Bord na Móna. Based on evidence from other bogs, rehabilitation measures will reduce the run-off from the bog by returning the peatlands towards its natural water retention function.

### *4.3.6 Amenity*

Creating amenity developments such as walking tracks is not part of the direct scope of PCAS. However, PCAS will enable and support any future amenity development.

#### *4.3.7 Water quality*

It is the expectation of BnM that rehabilitation measures should positively impact the water quality in receiving water bodies through enhancing the water attenuation across rehabilitated sites. The robust water monitoring programme implemented as part of PCAS will be used to assess water quality leaving rehabilitated sites at designated points.

#### *4.3.8 Future management*

Bord na Móna will continue to manage their land bank into the future. As peat production has now ceased on Bord na Móna lands and rehabilitation measures will be carried out, a regular drainage maintenance programme will not be required or carried out as would have been the case in the past. However, if issues arise with the Bord na Móna internal drainage system that affects upstream or downstream landowners, then these issues will be addressed by Bord na Móna.

Bord na Móna considers issues regarding estate security, fire risk, invasive species and water pollution of utmost importance. BnM intends to maintain security and manage fire risk over the entirety of the estate. In this regard, PCAS activities, should have no detrimental impact on these issues. Regarding water pollution, BnM is regulated by the EPA and as such adheres to the strict water pollution measures laid out by the same.

#### *4.3.9 Other issues*

Other issues, including after-use and management issues outside the boundary of Lisclogher West Bog, are acknowledged but are specifically outside the scope of this rehabilitation plan.

Security: It is the intention of Bord na Móna to keep secure the estate and ensure that any anti-social behaviour that occurs within the estate is reported and dealt with by the appropriate authorities.

#### *4.3.10 Concluding statement*

- No specific issues were raised during consultation that required significant changes to the substance of the rehabilitation plan.
- Marginal drains will not be blocked to avoid impacts on adjacent lands, rights of way or turf-banks. This does not change the overall rehabilitation goals and outcomes and can be integrated with the other rehabilitation measures to allow cutaway re-wetting.
- Turbary rights, if present, will remain unaffected.
- Bord na Móna intend to continue management of this site into the future and issues such as security and trespass will be addressed on an ongoing basis in association with other stakeholders.
- Bord na Móna intends to maintain a “No Shooting” policy at this site.

# 5. REHABILITATION GOALS AND OUTCOMES

The rehabilitation goals and outcomes outline what Bord na Móna want to achieve by implementing the rehabilitation. These include:

- Meeting conditions of IPC Licence.
- Stabilisation or reduction in water quality parameters of water discharging from the site (e.g. suspended solids).
- Reducing pressure on receiving waterbodies that have been classified as At Risk from peatlands and from peat extraction, via stabilization or improving water-quality from this bog, and therefore, reducing pressures.
- Optimising hydrological conditions for **climate action benefits as part of PCAS**.
- Carrying out an intensive rehabilitation measures in including drain-blocking to encourage raised bog restoration and the development of active raised bog habitat, where possible.
- The main goal and outcome of this plan is the successful rehabilitation (environmental stabilisation and restoration) of a peatland originally drained for industrial peat production, but not brought into production, in a manner that is acceptable to both external stakeholders and to Bord na Móna and which optimise climate action and other ecosystem service benefits.
- Supporting current land-uses (amenity).
- Optimising hydrological conditions for the protection of exposed archaeological structures, their retention in situ and preservation into the future, where possible.
- Integrating rehabilitation measures with existing conifer forestry. It is not proposed at this stage to change or affect any conifer or commercial forestry via this scheme. The future forestry management of these areas will be defined by Coillte.

The rehabilitation goals and outcomes take account of the following issues.

- It will take some time for stable naturally functioning habitats to fully develop at Lisclogher West Bog. This will happen over a longer timeframe than the implementation of this rehabilitation plan.
- Re-wetting residual peat will initially maintain and enhance the carbon storage capacity of the bog. There is scientific consensus that restoration of hydrology in damaged bog can improve carbon storage, water storage and attenuation and help support biodiversity both on the site and in the catchment (See Section 3.8). This will reduce carbon emissions from the site from a larger carbon source to a smaller carbon source/part Carbon sink. In time, the site has the capacity to develop in part as a carbon sink. PCAS is expected to deliver significant contributions to Ireland's climate action.
- It is expected that the site has the potential to develop some active raised bog (ARB) analogous to the priority EU Habitats Directive Annex I habitat within the foreseeable future. Other peatland habitats will develop in a wider mosaic that reflects underlying conditions.
- Restoration of the bog will also support other ecosystem services such as such the development of habitat to support biodiversity and local attenuation of water flows from the bog.
- WFD status in receiving water bodies can be affected by peatlands and peat extraction but is also affected by other sources such as agriculture. In addition, receiving water bodies that are assessed as At Risk from peatlands and from peat extraction are likely to have several contributary sources of impacts (private peat extraction and Bord na Móna). Reducing pressures due to former peat extraction activities at Lisclogher West will contribute to stabilising or improving water quality status of receiving water bodies

in general. Ultimately, improving the WFD status of the receiving waterbody will depend on reducing pressure from a range of different sources, including peatlands in general (private and Bord na Móna).

- Re-wetting in general will benefit the future preservation of most known and unknown archaeological features. An Archaeological Impact Assessment (AIA) is to be carried out under the PCAS scheme.

# 6. SCOPE OF REHABILITATION

The principal scope of this enhanced rehabilitation plan is to rehabilitate the bog. This is defined by:

- The area of Lisclogher West Bog.
- EPA IPC Licence - Ref. P0501-01. As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. Lisclogher West bog is part of the Ballivor-Derrygreenagh bog group.
- The Scheme is designed to exceed the stabilisation requirements as defined by the IPC Licence. This scheme is designed to enhance the ecosystem services of Lisclogher West Bog, in particular, optimising **climate action benefits**. The proposed interventions will mean that environmental stabilization is achieved (meaning IPC obligations are met) and, in addition, significant other ecosystem service benefits particularly for climate action will be accrued.
- The local environmental conditions of Lisclogher West Bog mean that **raised bog restoration** is the most suitable rehabilitation approach for this site. Lisclogher West Bog is comprised of a significant area of drained raised bog containing deep peat reserves.
- The key goals and outcomes of rehabilitation set by Bord na Móna. Bord na Móna have defined the key goal and outcome of rehabilitation at Lisclogher West Bog as **environmental stabilisation**, **raised bog restoration, and the development of active raised bog, where possible.**
- Rehabilitation of Lisclogher West Bog will support multiple national strategies of climate action, biodiversity action and other key environmental strategies such was the Water Framework Directive.
- The time frame for the delivery of the planned rehabilitation will be undertaken according to available resources and appropriate constraints.
- **Coillte.** Coillte have planted some high bog with Lodgepole Pine along the northern side of this bog. Bord na Móna will engage with Coillte regarding the potential to remove this forestry from the high bog to benefit raised bog restoration.
- It is not proposed to carry out rehabilitation on all marginal or peripheral cutover bog zones, however some rehabilitation measures will be implemented in some pockets of cutover in the north-east and south east of the bog margins. Generally, marginal bog remnants are narrow, or are subject to turbary, and do not have positive bog restoration prospects.

## 6.1 Key constraints

- **Bog conditions.** Rehabilitation outcomes of sites are constrained by the environmental characteristics of these particular areas. For example, there is potential for raised bog restoration at some sites, like Lisclogher West, where there has not been significant industrial peat extraction and the peat body is largely intact (deep peat sites that are drained). At other sites, most of the peat mass has been removed, the environmental characteristics of these areas have therefore changed radically (peat depths, hydrology, water chemistry, substrate type, nutrient status, etc.) and there will therefore be different habitat outcomes (wetlands, fen, heathland, grassland and Birch woodland).
- **Surrounding landscape and neighbours.** Another key constraint is the interaction between the Bord na Móna sites and the surrounding landscape. Care will be taken that no active rehabilitation management is carried out that could negatively and knowingly impact on surrounding land. This includes any hydrological management on neighbouring farmland. It is anticipated that the work proposed here (blocking drains and re-wetting cutaway peatlands) will not have any flooding impacts on adjacent land.

- **Turbary.** Some marginal areas to the northeast and south of the bog are used for private turbary, some within the Bord na Móna site boundary. Peat extraction is still carried out in the central section of the bog, south of the local road, with evidence of relatively recent turbary (within the past two years). During the recent bog survey part of the cutaway habitat in this area was in use as spread lands.
- **Adjacent future potential land-use.** Planned renewable energy development. The proposed Ballivor Wind Farm is located adjacent to this site. This project is currently in planning, the planning application was submitted in April 2023. This proposed wind farm project does not affect the scope of the rehabilitation. Lisclogher West Bog is not located in the wind farm development boundary.
- **Coillte.** Coillte have planted some cutover bog with Lodgepole Pine along the northern side of this bog, within the PCAS footprint and in the wider area of Lisclogher outside of the PCAS rehabilitation footprint. Rehabilitation measures will ensure there are no impacts on Coillte forestry outside of the rehabilitation footprint.
- **Archaeology**. An Archaeological Impact Assessment will be carried out to mitigate against any impact on found archaeology at Lisclogher West Bog. Should any previously unknown archaeological material be uncovered during the rehabilitation works, it will be avoided and reported to Bord na Móna Archaeological Liaison Officer and the National Museum of Ireland, see Appendix XI.
- **Current Land-use.** The Royal County Aeromodellers Club has a lease area within the south of the site on a small area of old cutover bog. This area will be excluded from rehabilitation.
- **Public Rights of Way**. Where a public right of way or similar burden exists on Bord na Móna property, consideration will be given to ensuring that this remain intact where possible. In some instances, depending upon previous land uses and management, alternative solutions may be required. These will be explored in consultation with local communities and statutory bodies during the consultation work associated with the decommissioning and rehabilitation work described here.

## 6.2 Key Assumptions

- It is assumed that Bord na Móna will have all resources required to deliver this project.
- It is expected that weather conditions will be within normal limits over the rehabilitation plan timeframe. Long periods of wet weather have the capacity to significantly affect ground conditions and constrain drain blocking and other ground activities.

## 6.3 Key Exclusions

The scope of this rehabilitation plan does not cover:

- The longer-term development of stable naturally functioning habitats to fully develop at Lisclogher West Bog. The plan covers the short-term rehabilitation **actions** and **an additional monitoring and after-care programme** to monitor the rehabilitation and to respond to any needs.
- This plan is not intended to be an after-use or future land-use plan for Lisclogher West Bog.
- The longer-term management of this site, potentially as a nature conservation site, or for amenity, or for other uses in the future.

# 7. CRITERIA FOR SUCCESSFUL REHABILITATION

This section outlines what criteria will be used to indicate successful rehabilitation and what critical success factors are needed to achieve successful rehabilitation. All criteria used to indicate successful rehabilitation will be measured to validate the achievement of the rehabilitation goals and outcomes and validate the completion of the rehabilitation.

The key objective of this enhanced rehabilitation plan is **environmental stabilisation** and the stabilisation of any emissions from the site that related to the former industrial drainage activities.

Rehabilitation is generally defined by Bord na Móna as

- Stabilisation of bare peat areas via targeted active management (e.g. drain-blocking/re-wetting) slowing movement of water across the site and encouraging natural colonisation; and
- Mitigation of potential key emissions (e.g. suspended solids).

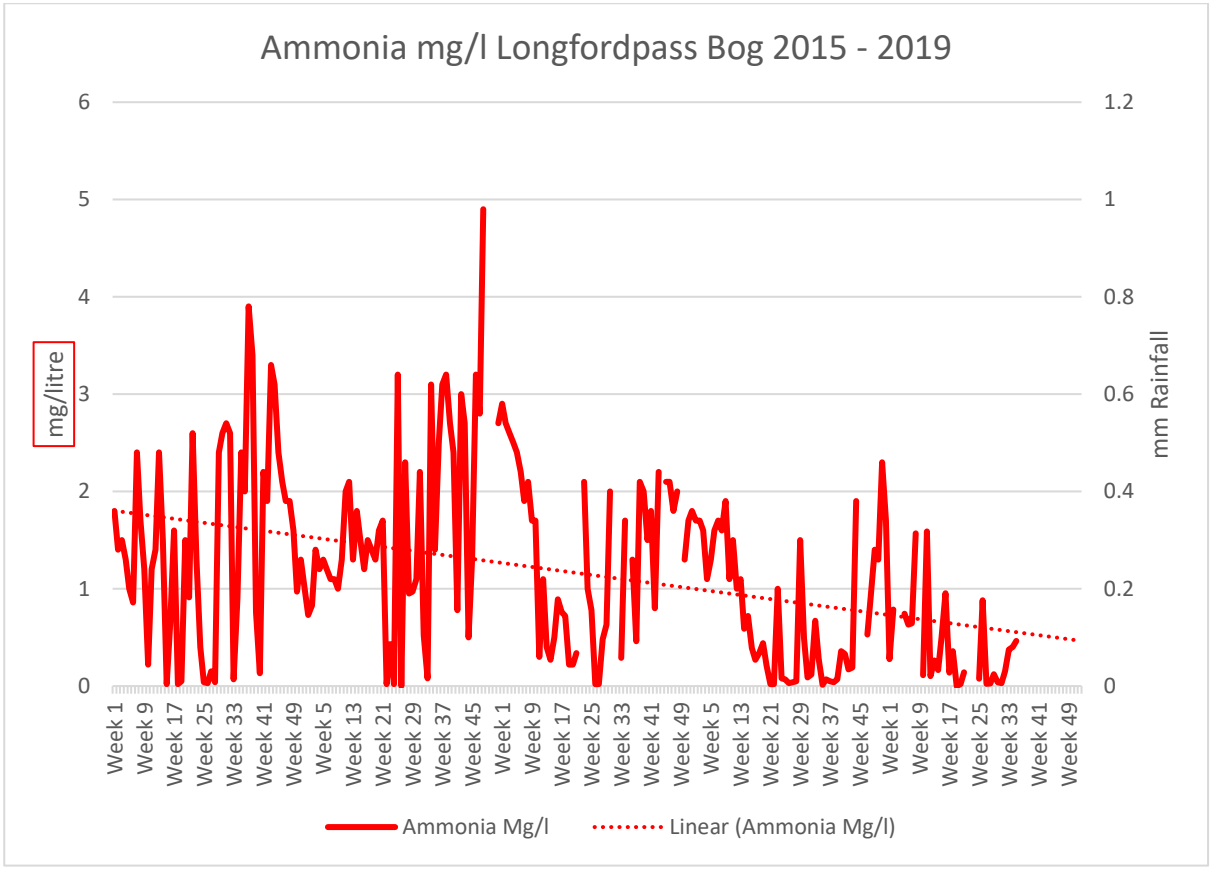
## 7.1. Criteria for successful rehabilitation to meet EPA IPC licence conditions:

- Rewetting of residual peat in the area originally drained for industrial peat production (but never harvested) to offset potential run off of suspended solids and to encourage and accelerate development of vegetation cover via natural colonisation, and increase in the area of potentially peat forming habitats. See Table 7.1 for a summary of the criteria for successful rehabilitation and associated monitoring. The target will be the delivery of measures and this will be measured by an aerial survey after rehabilitation is completed.
- That there is a stabilizing/improving concentration of suspended solids and ammonia in discharges from Bord na Móna sites, associated with the measures undertaken to stabilize the peat surface by the blocking of the internal drainage system and the maximized rewetting of the peat surface. This will be demonstrated by developing a stable or downward trajectory of water quality indicators (suspended solids and ammonia) towards what would be typical of a re-wetted cutaway bog. This will be measured via water quality monitoring (suspended solids and ammonia) for at least 2 years after the rehabilitation has been completed.
- Receiving water bodies have been classified under the River Basin Management Plan and this classification includes waters that are At Risk from peatlands and peat extraction. The success criteria will be that the At Risk classification will see improvements in the associated pressures from this peatland or if remaining At Risk, that there is an improving trajectory in the pressure from this peatland.

With regard to predicting and estimating likely trends that might materialize or could be considered as a target, monitoring of surface water ammonia emissions from Longfordpass bog in Littleton over 3 yrs., post cessation of peat extraction with ongoing rehabilitation, were considered. These are indicating a downward trend in Ammonia concentrations (Figure 7.1).

Similarly monitoring of surface water ammonia emissions from a Corlea bog in Mountdillon over the past 3 yrs. post cessation of peat extraction with ongoing rehabilitation, indicate downward trends.

Following commencement, and as the monthly monitoring program at Lisclogher West continues in 2023 during the rehabilitation works planned for 2023, with data from the 2022 monitoring program, further trending will be produced to verify any ongoing trends.



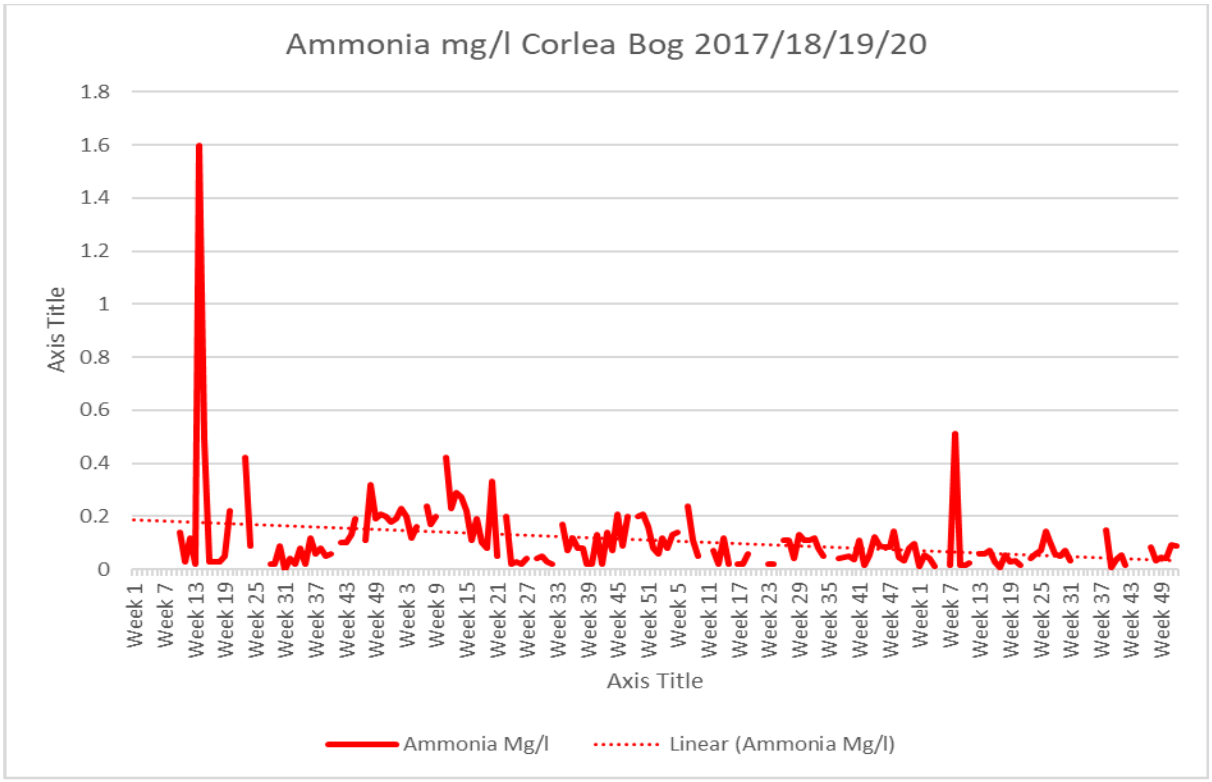




**Figure 7.1.** Ammonia levels over the period 2015-2019/2020 at Longfordpass and Corlea.

**Additional criteria for successful rehabilitation to optimise climate action and other ecosystem service benefits:**

- Optimising the extent of suitable hydrological conditions to optimise climate action and other ecosystem service benefits (optimising and maximising residual peat re-wetting). This will be measured by an aerial survey after rehabilitation has been completed.
- Accelerating the trajectory of the bog towards becoming a reduced carbon source/part carbon sink. This will be measured through habitat mapping and the development of cutaway bog condition assessment. This cutaway bog condition assessment will include assessment of environmental and ecological indicators such as vegetation cover, vegetation communities, presence of key species, *Sphagnum* cover, bare peat cover and water levels. Baseline monitoring will be carried after rehabilitation is completed (during the scheme). It is proposed that sites can be monitored against this baseline in the future.
- Reduction in carbon emissions. This will be estimated via a combination of habitat condition assessment and application of appropriate carbon emission factors derived from other sites. Baseline monitoring (habitat condition) will be carried after rehabilitation is completed (during the scheme). It is proposed that sites can be monitored against this baseline in the future.
- Setting the site on a trajectory towards establishment of a mosaic of compatible habitats including re-wetted raised bog and marginal Birch woodland, where conditions are suitable. Some of these habitats have already in part established. It will take some time for stable naturally functioning habitats to fully develop at Lisclogher West Bog. This will be demonstrated and measured via aerial photography, habitat mapping and cutaway/habitat condition assessment. Baseline monitoring will be carried after rehabilitation is completed (during the scheme). It is proposed that sites can be monitored against this baseline in the future.
- Improvement in biodiversity and ecosystem services. This will be demonstrated by metrics outlined in Section 9.1 that can be used to measure changes in ecosystem services. This will be measured by collecting a range of scientific data that can then quickly be adapted and into metrics that can be used to measure changes in various ecosystem services. Baseline monitoring will be carried after rehabilitation is completed (during the scheme). It is proposed that sites can be monitored against this baseline in the future.

**Table 7.1. Summary of Success criteria, targets, how various success criteria will be measured and expected time-frames.**

| Criteria type | Criteria | Target | Measured by | Expected Timeframe |
|---|---|---|---|---|
| IPC validation | Rewetting in the former area of industrial drainage. | Delivery of rehabilitation measures<br>Restoration of hydrological regime. | Aerial photography after rehabilitation has been completed – to demonstrate measures (drain-blocking)<br>Establishment of a baseline for future monitoring of bare peat, vegetation establishment and habitat condition. | 2023-2025 |
| IPC validation | Key water quality parameters<br>Ammonia, Phosphorous, Suspended solids, pH and conductivity | Reduction or stabilisation of key water quality parameters associated with this bog | Water quality monitoring for a period after rehabilitation has been completed | 2022-2024 |
| IPC validation | Reducing pressure from drainage on the local water body catchment (WFD) | Where this section of the water body (that this bog drains to) has not been identified as under pressure from peat extraction, that the intervening EPA monitoring programme associated with its Programme of Measures for this water body, confirms that its classification remains at not being at risk from peat extraction associated with activities at this bog. | EPA WFD monitoring programme | WFD schedule |

| Criteria type | Criteria | Target | Measured by | Expected Timeframe |
|---|---|---|---|---|
| Climate action verification | Optimising the extent of suitable hydrological conditions to optimise climate action | Optimal extent of suitable hydrological conditions | Aerial photography and Habitat mapping to map extent of suitable hydrological conditions.<br>Baseline monitoring to be carried out during the scheme when rehabilitation is complete. Sites can be re-monitored in the future and compared against this baseline. | 2023-2025 |
| Climate action verification | Reduction in carbon emissions. | Reduction in carbon emissions | Carbon emissions – estimated using a bog condition assessment and appropriate carbon emission factors. | 2023-2025 |

Meeting climate action verification criteria and monitoring of these criteria after the scheme has been completed is dependent on support from the *Climate Action Fund* and Ireland's *National Recovery and Resilience Plan* or other sources of funding. Note that monitoring and verification of the overall scheme will be stratified – not all these criteria will be measured at each individual site. Baseline monitoring to be carried out during the scheme when rehabilitation is complete. Sites can be re-monitored in the future and compared against this baseline.

## 7.2. Critical success factors needed to achieve successful rehabilitation as outlined in the plan

The achievement of successful rehabilitation as outlined in the plan requires:

- **Funding to pay for resources required to deliver the planned rehabilitation (Bord na Móna and external).** Bord na Móna maintains a Provision on its balance sheet to pay for these future costs when industrial peat extraction ceases. Bord na Móna is fully committed to meeting its obligations relating to rehabilitation and decommissioning under the Integrated Pollution Control Licence. It is expected that additional costs of enhanced rehabilitation will be supported by Government through the Climate Action Fund and Ireland's National Recovery and Resilience Plan.
- **Bord na Móna to have sufficient resources (staff and training) to deliver the planned rehabilitation with required associated skills and competencies.**
- **Bord na Móna to have sufficient resources (suitable machinery) and staff to maintain this machinery.**
- **Weather conditions to be within normal limits over the rehabilitation plan timeframe.** Long periods of wet weather have the capacity to significantly affect ground conditions and constrain the delivery of rehabilitation. The potential impact of wet weather on ground conditions can be reduced by appropriate

planning and management. Bord na Móna have significant experience of managing these issues through 70 years of working in these peatland environments.

- **Rehabilitation measures to be effective.** The rehabilitation measures proposed in this plan are based on 40 years of Bord na Móna experience of peatland management and best practise applied internationally in peatland management. Measures proposed in this plan have already been shown to be affective at other sites. Bord na Móna will apply a flexible and adaptable approach to the more innovative rehabilitation measures proposed in this plan**.** If measures are not initially effective, Bord na Móna will review any requirement for additional practical rehabilitation.
- **Natural colonisation of vegetation to develop semi-natural habitats at a rate within the normal limits.** The development of naturally functioning semi-natural habitats on degraded bog takes time. It may take 10-20 years for the establishment of active raised bog communities to establish on the bog following restoration. However, Bord na Móna experience has demonstrated the effectiveness of these type of measures for re-wetting bog and creating carbon sinks (Renou-Wilson *et al.* 2018).
- Rehabilitation measures have been designed to accelerate and work with natural colonisation and other natural processes. Bord na Móna experience of rehabilitation and restoration has shown that re-wetting improves conditions for natural colonisation and that natural colonisation is accelerated where the environmental conditions are most suitable. Rehabilitation measures have been designed to modify the conditions of areas within sites where conditions are less suitable for natural colonisation (modifying hydrology, topography, nutrient status or availability of potential seed sources).
- **Monitoring to be robust and effective.** Rehabilitation Monitoring will be established to validate the success of rehabilitation as required by Condition 10 of the IPC Licence and to verify the benefits of the proposed enhanced measures to optimise climate action. This will focus on a collecting a range of scientific data that can then quickly be adapted and into metrics that can be used to measure changes in various ecosystem services.

# 8. REHABILITATION ACTIONS AND TIME FRAME

Peatland restoration and rehabilitation requires detailed planning and the use of data from desktop surveys and field surveys. This data in association with topographical and hydrological modelling will be important in planning the future peatland landscapes and planning the use of the most appropriate rehabilitation methodologies to maximise climate action benefits. Hydrological modelling indicates those areas that are likely to re-wet when drains are blocked, based on the current topography, and areas where water levels may have to be modified, where needed. Enhanced restoration and rehabilitation measures will look to optimise hydrological conditions for re-wetting peat in other areas. This planning is also essential for matching the most sustainable rehabilitation methodology to the most suitable cutaway environment to maximise the benefits of the resource outlay (maximising cost/benefit).

A number of illustrative figures have been produced to inform Rehab Planning and Design, including Aerial Photography, Peat Depths and LiDAR Surface Maps; these are included in the accompanying Mapbook as the drawings referenced below:

BNM-DR-24-19-21 titled **Lisclogher West Bog: Aerial Imagery2020**

BNM-DR-24-19-04 titled **Lisclogher West Bog: Peat Depths**

BNM-DR-24-19-03 titled **Lisclogher West Bog: LiDAR Map**

The restoration and rehabilitation actions themselves will be a combination of PCAS measures to re-wet peat. The distribution of these measures is provisionally outlined in drawing titled **BNM-DR-24-19-05: Lisclogher West Bog Rehabilitation Measures** in the accompanying Mapbook (Note that the actual distribution of these measures may be subject to change in response to stakeholder consultation and refinement of the enhanced rehabilitation measures.)

These measures for Lisclogher West bog will include (see Table 8.1):

- Raised bog restoration measures including intensive drain-blocking (7/100 m);
- Modifying outfalls, and management of water levels with overflow pipes and blocking of internal outfalls;
- Regular drain blocking (3/100) on dry cutaway along with the blocking of outfalls and management of water levels;
- Re-wetting the deep peat in the cutover areas of the bog using berms and peat dams. This enhanced measure seeks to create large (c. 45m x 60m) flat areas or cells of shallow (levels at peat surface +/- 10 cm) water conditions on bare areas and vegetated areas of cutover bog;
- Removal of conifer forestry from the high bog (Forest to Bog restoration). A small part of the high bog was planted with conifer forestry. It is proposed to remove this forestry to support raised bog restoration. Trees will be felled and removed, conifer stumps will be “flipped”, the bog surface will be reprofiled (smoothed) and the drains will be blocked to encourage the redevelopment of bog vegetation. This requires engagement and agreement with Coillte and with the Forest Service. This enhanced bog restoration measure is proposed to be carried out as a trial at Lisclogher West to learn new techniques and to inform the feasibility and potential to use these new techniques at other sites to remove conifers (See Appendix XIV).
- Removal of feral self-sown conifer trees from the high bog (TCT1). Conifers from adjacent plantations have colonised the bog. These trees will be felled to waste to support raise bog restoration.
- Silt control measures will be retained and maintained during the rehabilitation phase. During the monitoring and verification phase silt ponds and silt control measures will be continually inspected and

maintained, where appropriate. When it is deemed that silt ponds are not required, as the bog has been successfully stabilised and water quality parameters meet targets the condition of the silt ponds will be reviewed. Silt ponds will either be de-watered (water levels lowered to a level where the silt pond will naturally develop as a small wetland feature), left in situ, or infilled (where discharges do not require silt control).

*Table 8-1 Types of and areas for enhanced rehabilitation measures at Lisclogher West Bog.*

| Type* | Enhanced Rehabilitation Measure | | Extent (Ha) |
|---|---|---|---|
| Deep Peat | DPT2 | Intensive drain blocking (max 7/100 metres), modifying outfalls | 119.24 |
| Deep Peat | DPT4 | Berms and field re-profiling (45m x 60m cell), modifying outfalls and managing overflows, drainage channels for excess water, *Sphagnum* inoculation | 5.47 |
| Conifer removal | TCT1 | Removal of self-seeded feral conifers from high bog. Fell to waste. This overlaps with the deep peat (DPT2) footprint. | 119.24** |
| Forest to bog | FTB1 | Forest to Bog. Agreement with Coillte and Forest Service, felling of conifers, removal of felled material, where possible, reprofiling the planting area (stump-flipping and surface-smoothing), Drain-blocking. | 6.98 |
| Additional works | AW2 | Targeted Drain Blocking, where possible | 29.06 |
| Marginal land | MLT1 | No work required | 47.54 |
| Silt ponds | Silt pond | Silt ponds | 0.19 |
| Constraint | Constraint | Other Constraints | 29.92 |
| **Total** | | | **238.40** |

**Note that the types of rehab and areas of rehab may change in response to stakeholder consultation and refinement of the enhanced rehabilitation measures.*

*** Note that this is not an additional area. This area overlaps the deep peat footprint (DPT2) footprint. Targeted conifer removal will take place in this area.*

## 8.1 Short-term planning actions (0-1 years)

- Seek formal approval of the enhanced plan, noting the alternative standard plan should funding from the Scheme does not materialise, from the EPA.
- Agree an *ex ante* budget of eligible costs (based on the approved enhanced plan) with the Scheme regulator.
- Develop a detailed site plan with engineering drawings outlining how the various rehabilitation methodologies (PCAS measures) will be applied to Lisclogher West Bog. This will take account of peat depths, topography, drainage and hydrological modelling (see map for an indicative view of the application of different rehabilitation methodologies).
- A drainage management assessment of the proposed enhanced rehabilitation measures will be carried out and any issues identified resolved and the rehabilitation plan adapted.

- A review of known archaeology and an archaeological impact appraisal of the proposed rehabilitation will be carried out. The results of this assessment will be incorporated into the rehabilitation plan to minimise known archaeological disturbance, where possible.
- A review of issues that may constrain rehabilitation such as known rights of way, turbary and existing land agreements is to be carried out
- An ecological appraisal of the potential impacts of the planned rehabilitation on the presence of sensitive ground-nesting bird breeding species (e.g. breeding waders) is to be carried out. The scheduling of rehabilitation operations will be adapted, where required.
- Ensure all activities comply with the environmental protection requirements of the IPC Licence.
- Carry out Appropriate Assessment (AA) of the Rehabilitation Plan.
- Engage with Coillte and the Forest Service regarding the feasibility of removing conifer plantations from the high bog at Lisclogher West.
- Track implementation and enforcement of the relevant IPC Licence conditions, the mitigation measures (AA) and other environmental control measures during the implantation of the rehabilitation plan.

## 8.2 Short-term practical actions (0-2 years)

- Carry out proposed measures as per the detailed site plan. This will include intensive drain blocking and targeted hydrological management prescriptions. All rehabilitation will be carried out with regard to best practice environmental control measures (Appendix IV).
- Carry out actions to remove conifer forestry from the high bog, including tree-felling, removal of biomass (where possible), stump-flipping, surface smoothing and drain-blocking.
- Monitor the success of rehabilitation measures in relation to developing suitable hydrological conditions.
- Carry out the proposed monitoring, as outlined.
- Silt ponds will be monitored during this period and there will be continued maintenance and cleaning to prevent potential suspended solids run-off from the site during the rehabilitation phase.
- Submit an *ex post* report to the Scheme regulator to verify the eligible measures to be carried out in year 1 of the Scheme, and an *ex ante* estimate for year 2 of the Scheme; and so on for each year of the Scheme.

## 8.3 Long-term (>3 years)

- Evaluate success of short-term rehabilitation measures outlined above and remediate where necessary.
- Delivery of a monitoring, aftercare and maintenance programme (See section 10.2 below).
- Decommissioning of silt-ponds will be assessed and carried out, where required.
- Reporting to the EPA will continue until the IPC License is surrendered.

## 8.4 Timeframe

- **2022-2023**: Short-term planning actions.
- **2023-2024**: Short-term practical actions.

- **2024-2025**: Long term practical actions. Evaluate success of short-term rehabilitation measures outlined above and remediate where necessary.
- **2025**: Decommission silt-ponds, if necessary.

## 8.5 Budget and costing

Bord na Móna (BnM) appreciates the Minister's intention to support Bord na Móna in developing a package of measures, 'the Scheme', for enhanced decommissioning, rehabilitation and restoration of cutaway peatlands referred to as the 'Peatlands Climate Action Scheme'. *However, only the additional costs associated with the additional and enhanced rehabilitation, i.e., measures which go beyond the existing standard mandatory decommissioning and rehabilitation requirements arising from Condition 10 will be eligible for support.*

The enhanced decommissioning, rehabilitation and restoration of the peatlands funded by the Scheme will deliver benefits across climate action (GHG mitigation through reduced carbon emissions and acceleration towards carbon sequestration), enrich the State's natural capital, increase eco-system services, strengthen biodiversity, improve water quality and storage attenuation as well as developing the amenity potential of the peatlands.

Bord na Móna maintains a provision on its balance sheet to pay for the future costs of **standard** rehabilitation and decommissioning when industrial peat extraction ceases. This is updated every year - for more information see the Bord na Móna Annual Report (Bord na Móna 2021). Bord na Móna is fully committed to meeting its obligations relating to rehabilitation and decommissioning under the Integrated Pollution Control Licence.

At this time, a 'standard' rehabilitation provision (sufficient to discharge the requirement of Condition 10 in the licence) has been be allocated to the site based on the area of different drainage and turf cutting types across the site (See Appendix I).

# 9. AFTERCARE AND MAINTENANCE

## 9.1 Programme for monitoring, aftercare and maintenance

This programme for monitoring, aftercare and maintenance has been designed to meet the Conditions of the IPC Licence. This is defined as:

- There will be **initial quarterly monitoring assessments** of the site to determine the general status of the site, the condition of the silt ponds, assess the condition of the rehabilitation work, monitoring of any potential impacts on neighbours land, general land security, boundary management, dumping and littering.
- The number of these site visits will reduce after 2 years to bi-annually and then after 5 years to annual visits.
- These monitoring visits will also consider any requirements for further practical rehabilitation measures.
- The **baseline condition of the site will be established** post-rehabilitation implementation by using an aerial survey to take an up to date aerial photography when rehabilitation is completed. This will be used to verify completion of rehabilitation measures. The extent of bare peat will be assessed using this baseline data, and habitat maps will be updated, if needed. It is proposed that sites can be monitored against this baseline in the future.
- **Water quality monitoring** at the bog will be established. The main objective of this water quality monitoring will be to establish a baseline and then monitor the impact of peatland rehabilitation on water quality from the bog.
- In order to assist in monitoring surface water quality from this bog, it is planned to increase the existing licence monitoring requirements to sampling for the same parameters to every month during the scheduled activities and for a period up to two years. post rehabilitation, depending on the period required to confirm that the main two parameters, suspended solids and ammonia are remaining compliant with the licence emission and trigger limit values and there is an improving trajectory in these two parameters i.e. reduction in concentration.
- Enhanced water quality monitoring will aim to include up to 70% of a bogs drainage catchments.
- Monitoring results will be maintained, trended and reported on each year as part of the requirement to report on Condition 10.1 of the IPC Licence on Bog Rehabilitation in the Annual Environmental Report, which will be available in April each year at www.epa.ie.
- The parameters to be included (as per condition 6.2 of the IPC Licence) include monthly monitoring for pH, Suspended Solids, Total Solids, Total Phosphorus, Total Ammonia, Colour, and COD and DOC.
- This monthly sampling regime on a selected number of silt ponds will be carried out over a two-year cycle. The original (licence) requirement was for a quarterly sampling regime, but this has been increased to a monthly regime to appropriately track the changing water chemistry that will occur as part of this enhanced rehabilitation. In addition, DOC will be included as a parameter to try and identify any changes in carbon in the surface water.
- If, after two years, key criteria for successful rehabilitation are being achieved and key targets are being met, then the water quality monitoring will be reviewed, with consideration of potential ongoing research on site. The water quality data, the aerial surveys and the habitat mapping will be collated and will be submitted to the EPA as part of the final validation report.
- If, after two years, key criteria for successful rehabilitation have **not** been achieved and key targets have **not** been met, then the rehabilitation measures and status of the site will be evaluated and enhanced, where required. This evaluation may indicate no requirement for additional enhancement of

rehabilitation measures but may demonstrate that more time is required before key criteria for rehabilitation has been achieved. Monitoring of water quality will then also continue for another period to be defined.

- Where other uses are proposed for the site that are compatible the provision of biodiversity and ecosystem services, these will be assessed by Bord na Móna in consultation with interested parties. Other after-uses can be proposed for licensed areas and must go through the required assessment process and planning procedures.

Additional monitoring measures are also proposed to monitor ecosystem service benefits that have been derived by enhanced rehabilitation. These proposed monitoring measures will be funded by the proposed *Climate Action Fund* and Ireland's *National Recovery and Resilience Plan* or additional other funding. Monitoring of climate action and other ecosystem service benefits will be designed to take account of the requirements of monitoring benefits of the overall Scheme and will be stratified; that is not all monitoring will be carried out in each site. These are defined as:

- Vegetation and habitat monitoring after rehabilitation is completed using a bog condition assessment (ecotope mapping). This assessment will include assessment of on environmental and ecological indicators such as vegetation cover, vegetation communities, presence of key species, *Sphagnum* cover, bare peat cover and water levels. It is proposed that sites can be monitored against this baseline in the future.
- The condition of the bog can be assessed using the condition assessment and suitable Greenhouse Gas (GHG) emission factors can be assigned to different habitats. GHG emission factors have been determined for various peatland habitats in Ireland (Wilson *et al*., 2015) and are constantly being refined with more and more research. BnM is actively supporting research into GHG fluxes in different rehabilitated peatland habitats. This means that potential GHG emissions can be estimated from the site, as the site continues along its trajectory towards a naturally functioning peatland ecosystem.

## 9.2 Rehabilitation plan validation and licence surrender – report as required under condition 10.4

***IPC License Condition 10.4.*** *A final validation report to include a certificate of completion for the Rehabilitation Plan, for all or part of the site as necessary, shall be submitted to the Agency within six months of execution of the plan. The licensee shall carry out such tests, investigations or submit certification, as requested by the Agency, to confirm that there is no continuing risk to the environment.*

Reporting to the EPA will continue until the IPC License is surrendered. The bog will be included in the full licence surrender process as per the Guidance to Licensees on Surrender, Cessation and Closure of Licensed Sites EPA, 2012, when:

- The planned rehabilitation has been completed;
- The key criteria for successful rehabilitation has been achieved and key targets have been met;
- Water quality monitoring demonstrates that water quality of discharge is stabilising or improving; and
- The site has been environmentally stabilised.

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# LISCLOGHER WEST DECOMMISSIONING AND REHABILITATION PLAN - ADDENDUM 1

Bord na Móna operates under IPC Licence issued and administered by the EPA to extract peat within the Ballivor-Derrygreenagh bog group (Ref. P0501-01). As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. Lisclogher West Bog is located in Co. Westmeath.

This addendum outlines the findings of the Appropriate Assessment reporting carried out in respect of proposed PCAS activities at Lisclogher West.

### Appropriate Assessment Reporting Findings

An Appropriate Assessment Screening Report[4] was commissioned by Bord na Móna to inform whether the proposed PCAS activities at Lisclogher West Bog had the potential to result in Likely Significant Effects on European Sites.

The concluding statement of this report reads as follows:

> *'It is concluded beyond reasonable scientific doubt, in view of best scientific knowledge, on the basis of objective information and in light of the conservation objectives of the relevant European sites, that the proposed Decommissioning and Rehabilitation, individually or in combination with other plans and projects, will not have a significant effect on any European Site.'*

Therefore following screening, Appropriate Assessment is not required for the project as it is not directly connected with or necessary to the management of any European Site(s) and as it can be concluded, on the basis of objective information, that the project, individually or in combination with other plans or projects is not likely to have a significant effect on any European Site(s).

[4] MKO (2023). Article 6 (3) Appropriate Assessment Screening Report. Lisclogher West Bog, Co. Westmeath, Decommissioning and Rehabilitation Plan 2023

## APPENDIX I. A STANDARD PEATLAND REHABILITATION PLAN TO MEET CONDITIONS OF THE IPC LICENCE

In the event that the Scheme (PCAS) is not supported by additional funding, Bord na Móna is still obligated to carry out peatland rehabilitation to meet the conditions of the IPC Licence. Under its EPA licences and following cessation of peat extraction, BnM is mandated to 'decommission' its operations by removing materials 'that may result in environmental pollution' and establish that 'rehabilitation' measures have environmentally stabilised the drained peatland.

This proposed standard peatland rehabilitation plan is outlined here to **estimate potential costs**. Bord na Móna will still be expected to cover the costs that would have accrued from standard decommissioning and rehabilitation activities, as part of its original obligations. The existing costs associated with both the removal of potentially polluting materials and the environmental stabilisation of the peatlands resides with Bord na Móna. However, the expenditure necessary to deliver the additional and enhanced decommissioning, rehabilitation and restoration and the benefits that flow from these measures and interventions/improvements will be eligible for funding by government through the Climate Action Fund and Ireland's National Recovery and Resilience Plan.

The same process as outlined in Section 2 will be followed.

### Scope of rehabilitation

The principal scope of this rehabilitation plan is to rehabilitate the bog. This is defined by:

- The area of Lisclogher West Bog.
- EPA IPC Licence - Ref. P0501-01. As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. Lisclogher West bog is part of the Ballivor-Derrygreenagh bog group.
- The current condition of Lisclogher West Bog.
- The key objective of rehabilitation, as defined by this licence, is **environmental stabilisation** of the bog.
- To minimise potential impacts on neighbouring land. Some boundary drains around Lisclogher West Bog will be left unblocked as blocking boundary drains could affect adjacent land.
- Land-use: Bord na Móna have submitted a planning application to build a wind farm on cutaway bog in the Ballivor area. This project is known as Ballivor Wind Farm. Lisclogher West Bog will not be part of this project.

### Rehabilitation goals and outcomes

The key rehabilitation goal and outcome for Lisclogher West Bog is environmental stabilisation of the site via the hydrological restoration of the bog. This is defined as:

- Carrying out intensive drain blocking to re-wet peat and slow runoff.
- Stabilising potential emissions from the site (e.g. suspended solids).
- Environmental stabilisation.

The outcome is setting the site on a trajectory towards establishment of natural habitats.

**Criteria for successful rehabilitation:**

- Rewetting of the degraded (dry) raised bog following industrial peat drainage, that was never brought into peat production/extraction. Drain blocking and other associated rehabilitation measures will reduce or eliminate any potential run off of suspended solids and will encourage the development of peat forming vegetation (*Sphagnum* moss) cover via natural colonisation. This will in time reduce the area of bare exposed peat.
- This will be demonstrated by developing a stable or downward trajectory of water quality indicators (suspended solids and ammonia) towards what would be typical of a restored raised bog. This will be measured via water quality monitoring (suspended solids and ammonia).
- Receiving water bodies have been classified under the River Basin Management Plan and this classification includes waters that are At Risk from peatlands and peat extraction i.e. the STONYFORD_040 watercourse (EPA mapped watercourses[5]). The success criteria will be that the At Risk classification will see improvements in the associated pressures from this peatland or if remaining At Risk, that there is an improving trajectory in the pressure from this peatland.

**Rehabilitation targets**

- Demonstrating the delivery of the rehabilitation through site visits and through updated aerial photography (indicating presence of peat blockages and re-wetting). This will be demonstrated by a post rehab aerial survey.
- Stabilising potential emissions from the site (e.g. suspended solids). The key target will be developing a stable or downward trajectory of water quality indicators (suspended solids and ammonia) towards what would be typical of a re-wetted cutaway bog. This will be demonstrated by water quality monitoring results.

**Rehabilitation measures:**

- Intensive blocking of field drains, associated with former industrial drainage of the site, along each field drain to re-wet and restore the bog.
- Re-alignment of any piped drainage; and management of water levels to re-wet peat.
- No measures are planned for the other surrounding marginal peatland habitat where a hydraulic break is missing between the bog and adjacent lands.
- Silt ponds will continue to be maintained during the rehabilitation and decommissioning phase.
- Evaluate success of short-term rehabilitation measures and enhance where necessary.
- Decommissioning of silt-ponds will be assessed and carried out, where required.

**Timeframe:**

- 2023. 1st phase of rehabilitation. Field drain blocking.
- 2024-2026. Evaluate success of short-term rehabilitation measures outlined above and remediate where necessary.

[5] EPA, 2021, EPA online map viewer: Online, Available at: https://gis.epa.ie/EPAMaps/, Accessed 10.12.2021

- 2024-2026. Decommission silt-ponds, if necessary.

Table AP-1. Rehabilitation measures and target area.

| Type | Code | Description | Area (Ha) |
|---|---|---|---|
| Deep peat | DPT1 | Regular drain blocking (3/100 m) + modifying outfalls with overflow pipes | 124.7 |
| Marginal land | MLT1 | No work required | 83.58 |
| Silt ponds | Silt pond | Silt ponds | 0.19 |
| Constraint | Constraint | Other Constraints | 29.92 |
| **Total** | | | **238.59** |

See Drawing number BNM-DR-24-19-20: Lisclogher West Bog: Standard Rehabilitation Measures included in the accompanying Mapbook which illustrates the standard rehab measures to be applied.

**Monitoring, after-care and maintenance**

- There will be initial quarterly monitoring assessments of the site to determine the general status of the site, the condition of the silt-ponds, assess the condition of the rehabilitation work, asses the progress of natural colonisation, monitoring of any potential impacts on neighbouring land and general land security. The number of site visits will reduce after 2 years to bi-annually. These site visits will assess the need to additional rehabilitation.
- Water quality monitoring will be established.
- Monitoring results will be maintained, trended and reported on each year as part of the requirement to report on Condition 10.1 of the IPC Licence on Bog Rehabilitation in the Annual Environmental Report, which will be available in April each year at www.epa.ie.
- The parameters to be included (as per condition 6.2 of the IPC Licence) include monthly monitoring for pH, Flow, Suspended Solids, Total Solids, Total Phosphorus, Total Ammonia, Colour, and COD.
- This sampling regime on a selected number of silt ponds will be carried out over a two-year cycle. The original (licence) requirement was for a quarterly sampling regime.
- Where other uses are proposed for the site, these will be assessed by Bord na Móna in consultation with interested parties. Other after-uses can be proposed for licensed areas and must go through the required assessment and planning procedures.

**Validation and IPC Licence surrender**

Reporting to the EPA will continue until the IPC License is surrendered. The bog will be included in the full licence surrender process as per the Guidance to Licensees on Surrender, Cessation and Closure of Licensed Sites (EPA, 2012) when:

- The planned rehabilitation has been completed;
- Water quality monitoring demonstrates that water quality of discharge is stabilising or improving; and
- The site has been environmentally stabilised.

## APPENDIX II. BOG GROUP CONTEXT

The Derrygreenagh Bog Group comprises 11 discrete and defined bog units within Counties Offaly, Westmeath and Meath (and one site used for transport – Hill of Down Railway). There are two main sub-groups; Ballivor (7 sites) and Derrygreenagh (5 sites). Nearly all of the Derrygreenagh sub-group and all of the Ballivor sub-group is located within the River Boyne catchment. A small portion of the western side of Toar Bog is located in the River Shannon catchment. Each bog area further comprises a range of habitats from bare milled former peat extraction areas to re-colonising cutaway to workshops areas and transport infrastructure.

Industrial peat extraction in the Derrygreenagh Bog Group ceased in 2020.

The Ballivor Bogs sub-group is located close to Ballivor Town in Co. Meath and most of the bogs extend across the Meath and Westmeath border. The Bord na Móna Ballivor Peat Moss factory is located 4 km from Ballivor Village on the margin of Ballivor Bog. An industrial railway links Ballivor to Carranstown, Bracklin and Lisclogher East. Milled peat was supplied from Ballivor, Carranstown, and part of Bracklin to Ballivor peat moss factory for horticultural products, with milled fuel peat being transported via road to Lough Ree Power (Lanesborough Co. Longford). Kinnegad Bog is an isolated bog unit with no industrial railway link to the other bogs. Kinnegad Bog is located to the south of Kinnegad in Co. Meath. This bog supplied mainly milled horticultural peat via road to various customers.

The Derrygreenagh Bogs sub-group is located to the south and east of Rochfortbridge (Co. Westmeath), along the borders of Co. Westmeath, Offaly and Meath. Four bogs (Ballybeg, Derryhinch, Drumman, Toar) supplied milled fuel peat via industrial railway to Edenderry Power.

Lisclogher East was never developed for milled peat production but there was still some sod peat production on this site. A large section of Bracklin was formerly a sod peat production bog and was never converted to milled peat production. This area is now considered cutaway. Lisclogher West was drained in the 1980's but has never been put into industrial peat production. Bogs that have been in industrial peat production for decades (such as Ballybeg and Drumman) have become cutaway as peat is extracted from the sites and the industrial peat production area is shrinking. A large section of cutaway in Derryarkin and Drumman has been developed since 2001 for sand and gravel extraction by a joint venture between Roadstone and Bord na Móna (Derryarkin Sand & Gravel Ltd). A large section of Derryarkin was also rehabilitated in 2001-2002 with wetland development via outfall blocking.

There has already been significant rehabilitation work carried out within the Derrygreenagh Bog Group. Bord na Móna originally established a grassland research unit and farm at Derryarkin. This farm has now been closed for some time but grassland established from cutaway has been sold to local farmers. Older rehabilitation includes the establishment of confer plantations in the 1980s and 1990s. Several rehabilitation trials (test programmes) have been developed more recently, where different techniques have been trailed and implemented.

One of the main outfalls of a large section of cutaway in Drumman (north) was blocked in 2005 creating a large wetland (~75 ha). Fertiliser and nursery crop trials were carried out on bare peat cutaway in Drumman (north) in 2010 over an area of 19 ha. Further applications of fertiliser were applied to an additional 22.6 ha of mostly bare peat cutaway in Drumman (north) in 2012. There have been further crop trials in Drumman in 2014 (grass-seed).

In Derryarkin, wetlands (143 ha) were created in 2001-2002 when main outfalls were blocked and cutaway was deliberately re-wetted.

A small area of cutaway at Derryarkin has been leased to DAMX Ltd for the development of an off-road moto-cross track at Derryarkin.

An area of cutaway (13 ha) with significant bare peat cover adjacent to the road in Derryarkin was treated with fertiliser to encourage natural colonisation in 2016.

During the 1980's/1990's about 176 ha of cutaway and marginal bog was developed for conifer forestry by Coillte at Drumman and Derryarkin in several different areas. There is ongoing management of these areas by Coillte.

Part of the cutaway at Ballybeg (76 ha) was planted with Alder (2008-2009) as a biomass trial (for fuel).

An area of marginal raised bog (19 ha) was restored at Bracklin Bog in 2016, as part of the Bord na Móna Raised Bog Restoration Programme. An extensive drain blocking programme was carried out to raise water levels and help re-wet the bog area, encouraging the development of *Sphagnum*-rich 'active' peat-forming raised bog. This area is of significant biodiversity and cultural interest to the Meath-Westmeath Bog Group and is likely to be part of a lease to this group in the future.

Some rehabilitation was carried out in a small area of cutaway in Ballivor Bog (9 ha) in 2015. This involved drain-blocking to maintain and enhance re-wetting of an area of cutaway with *Sphagnum*-rich poor fen peat-forming vegetation.

Rehabilitation and re-wetting as part of the Peatland Climate Action Scheme started at Carranstown in 2022.

Intensive decommissioning and rehabilitation for the Derrygreenagh Bog Group started in 2021 at a number of individual bogs.

Industrial peat extraction in the Derrygreenagh Group ceased in 2020. Decommissioning for the Derrygreenagh Group started in 2021 at a number of individual bogs and PCAS rehabilitation started in 2021. There is still some historical energy peat stock remaining on some bogs and these peat stock will be transferred via the BnM rail network to Edenderry Power Station up to 2024 when the power station is expected to have ceased using peat as fuel.

Bord na Móna is currently developing a wind energy project called Ballivor Wind Farm (Bord na Móna Wind Farm | Ballivor Wind Farm.) This proposed project is in the planning stage, the planning application was submitted in April 2023. The proposed wind farm extends across parts of Bracklin, Lisclogher East, Carranstown and Ballivor Bogs. There is no wind farm infrastructure located in Lisclogher West Bog..

Bord na Móna is currently developing a renewable energy project called Derrygreenagh Energy Park. Derrygreenagh - Bord Na Mona (bnmenergypark.ie). This project is proposed to host a range of different renewable energy and energy storage technologies. The proposed location extends across Derryhinch, Drumman, Derryarkin and Ballybeg Bogs. This proposed project is currently in pre-planning. Bord na Móna will continue to implement its general strategy of integrated land-use and will look to integrate this renewable energy infrastructure with the current cutaway landscape and also with other land-uses. Bord na Móna are also continuing to review its landbank for future potential renewable energy projects.

A breakdown of the component bog areas for the Derrygreenagh Bog Group (Ballivor) IPC License Ref. P0-501-01 is outlined in Table Ap-1.

*Table Ap-1: Derrygreenagh Bog Group names, area and indicative status*

| Bog Name | Area (ha) | Stage of development | Land-Use and History | Peat Production Cessation | Rehab Plan Status |
|---|---|---|---|---|---|
| Ballivor | 654 | Industrial peat production commenced at Ballivor in the 1940s.<br>Some sections have been cutaway. Some sections still have relatively deep residual peat. | Ballivor Bog formerly supplied a range of commercial functions including the supply of horticultural peat, sod peat and latterly; fuel peat for Lough Ree Power.<br>Some sections were never re-developed to milled peat and have revegetated as cutaway..<br>Some areas of cutaway are developing pioneer cutaway vegetation communities.<br>Is part of the proposed Ballivor Wind Farm, which is currently in planning. | 2020 | Draft 2021 |
| Bracklin (excluding Bracklin West) | 680 | Industrial peat production commenced at Bracklin in the 1940s.<br>Some sections have been cutaway. Some sections still have relatively deep residual peat. | Bracklin Bog formerly supplied a range of commercial functions including the supply of horticultural peat, sod peat and latterly; fuel peat for Lough Ree Power.<br>The main section was never re-developed to milled peat and has revegetated as mature cutaway habitats<br>Bare peat is prevalent in the western section, which was in milled peat extraction.<br>Is part of the proposed Ballivor Wind Farm, which is currently in planning.<br>Part of Bracklin is being assessed for PCAS in 2023. | 2020 | To be part finalised in 2023 |
| Carranstown | 306 | Industrial peat production commenced at Carrenstown in the 1980s.<br>The majority of the site has relatively deep peat. | Carrenstown Bog formerly supplied a range of commercial functions including the supply of horticultural peat and latterly; fuel peat for Lough Ree Power.<br>The majority of the site is bare peat. There are cutaway habitats developing on the eastern side.<br>Part of Carranstown is included in the Ballivor Wind Farm footprint, which is currently in planning. | 2020 | Finalised 2022<br>Rehab started in 2022 |
| Lisclogher East | 486 | Industrial peat production commenced at Lisclogher East in the 1950s.<br>Part of the site is cutaway while there is a mosaic of residual peat depths. | Lisclogher East formerly supplied sod turf both for fuel and horticulture. This bog was never re-developed to supply milled peat.<br>The majority of the bog is developing cutaway habitats and there is a mosaic of bare peat areas where there has been recent sod peat extraction.<br>Expected to be part of the proposed Ballivor Wind Farm, which is currently in pre-planning. | 2020 | Draft 2021 |
| Lisclogher West | 239 | Lisclogher West was drained in 1980s.<br>The bog is drained and still has residual vegetation in places. | Lisclogher West was drained but never fully developed for industrial peat extraction. | N/A | To be finalised 2023 |
| Kinnegad | 352 | Industrial peat production commenced at Kinnegad in the 1980s.<br>The majority of the site still has relatively deep peat. | Kinnegad Bog formerly supplied a range of commercial functions -mainly the supply of horticultural peat and latterly; fuel peat for Lough Ree Power. | 2020 | Draft 2017 |

| | | | | | |
|---|---|---|---|---|---|
| | | | The majority of the site is bare peat. | | |
| Hill of Down Railway | 22 | | Rail link – not used for peat extraction | N/A | Draft 2017 |
| Ballybeg | 847 | Industrial peat production commenced at Ballybeg in the 1950s.<br>Most of the site is cutaway | Ballybeg Bog formerly supplied a range of commercial functions including the supply of horticultural peat and fuel peat for Edenderry Power.<br>Much of the site is bare peat. The northern half has been cutaway and is establishing cutaway habitats.<br>Being considered for Derrgreenagh Energy Park, which is currently in pre-planning. | 2020 | Draft 2017 |
| Derryarkin | 710 | Industrial peat production commenced at Derryarkin in the 1950s.<br>Most of the site is cutaway | Derryarkin Bog formerly supplied a range of commercial functions including the supply of fuel peat for Rhode Power Station, Croghan Brickette Factory and Edenderry Power.<br>Most of the site is developing cutaway habitats. Some re-wetting was carried out in the past.<br>Part used for gravel extraction.<br>Being considered for Derrgreenagh Energy Park, which is currently in pre-planning. | 2015 | Draft 2017 |
| Derryhinch | 337 | Industrial peat production commenced at Derryhinch in the 1950s.<br>There is a mosaic of residual peat depths left | Derryhinch Bog formerly supplied a range of commercial functions including the supply of fuel peat for Rhode Power Station, Croghan Brickette Factory and Edenderry Power.<br>Most of the site is bare peat with emerging cutaway habitats.<br>Part of the site was used to trial herb production. This initiative has now ceased.<br>Being considered for Derrgreenagh Energy Park, which is currently in pre-planning. | 2020 | Draft 2017 |
| Drumman | 1,122 | Industrial peat production commenced at Drumman in the 1950s.<br>Most of the site is cutaway | Drumman Bog formerly supplied a range of commercial functions including the supply of fuel peat for Rhode Power Station, Croghan Brickette Factory and Edenderry Power.<br>Most of the site is developing cutaway habitats. Some re-wetting was carried out in the past.<br>Part used for gravel extraction.<br>Part of the site was used to trial herb production.<br>Part of the site is used for log storage (biomass)<br>Being considered for Derrgreenagh Energy Park, which is currently in pre-planning. | 2020 | Draft 2017 |
| Toar | 445 | Industrial peat production commenced at Toar in the 1980s.<br>Most of the site has deep residual peat. | Toar Bog formerly supplied a range of commercial functions including the supply of horticultural peat and fuel peat for Edenderry Power.<br>Most of the site is bare peat.<br>Part of the site is used for log storage (biomass).<br>Part of the site is being considered for gravel extraction. This proposal is at the feasibility stage. | 2020 | To be finalised 2023 |

See Drawing number *BNM-DR-23-19-24 Bog Group Map*, included in the accompanying Mapbook which illustrates the location of Lisclogher West Bog and the Derrygreenagh Bog Group in context to the surrounding area.

# APPENDIX III. ECOLOGICAL SURVEY REPORT

**Ecological Survey Report**

*Note: This report outlines an ecological survey of the bog. This report should not be taken as a management plan for the site as other land-uses may still be considered. Information within this report may inform the development of other land-uses and identify areas with particular biodiversity value.*

| | | | |
|---|---|---|---|
| **Bog Name:** | **Lisclogher West** | **Area (ha):** | 239ha |
| **Works Name:** | Ballivor | **County:** | Westmeath |
| **Recorder(s):** | MMC | **Survey Date(s):** | 1/04/2010 |

**Habitats present (in order of dominance)**

The most common habitats present at this site include:

- Raised bog (PB1) (Codes refer to Heritage Council habitat classification, (Fossitt 2000), See Appendix II.)
- Cutover Bog (PB4)
- Conifer plantation (on high bog and cutover bog, Coillte managed) (WD4)
- Birch woodland (WN7) (on cutover bog dominated by Birch and/or Scot's Pine)
- Mixed broad-leaved/conifer woodland (WD2) (old plantations)
- Scrub (WS1) (on old cutover bog)
- Poor fen and flush (PF2) (part of high bog)
- Wet grassland (GS4)
- Hedgerows (WL1) (linear development of scrub along boundaries such as roads)
- Depositing stream/river (FW2)
- Buildings and artificial surfaces (BL3) (roads, tracks and hard surfaces along access routes)

**Description of site**

Lisclogher West is located in north-east Co Westmeath, 4.3 km south-east of Delvin. This bog is part of the Ballivor group of bogs. It was ditched in the 1980s but was never brought into production. Adjacent Bord na Móna properties at Lisclogher East and Bracklin have been in production for horticultural peat. A minor road runs along the southern side of the site, forming the boundary in sections and also cutting off two smaller areas of high bog and associated habitats from the main bog. A second minor road delineates the eastern boundary and separates Lisclogher West from Lisclogher. The absence of production has meant that the site has retained many of its natural raised bog features, although there has also been significant degradation. A recent fire in 2008 burned about two thirds of the main bog and the burnt section is currently in very poor condition.

The main bog is relatively narrow and elongated. An esker runs along the northern side of the bog and limits the extent of the basin for this bog. The majority of the margins have been abandoned or unmanaged for some time and extensive Birch woodland and mixed conifer woodland has developed on cutover bog. Some of this Birch woodland is particularly well-developed and Scot's Pine is a prominent feature of much of the woodland around the site. The 2nd edition OSI 6 inch map (prepared around 1910-20) maps most of the margins as conifer woodland, indicating that this woodland may not have developed naturally but was probably planted at some stage. This map also indicates that woodland or wooded sections on the high bog were more extensive in the past and some areas have been cleared or reverted back to high bog, indicating that there has been a relatively long history of forestry around this site.

One of the main topographical features of the main bog is the presence of some more recent conifer plantation, with Lodgepole Pine that extends in strips from the northern margin about midway along the bog. This conifer plantation is managed by Coillte. Several blocks have failed and the trees are quite sparse with colonisation by Birch. However, the largest blocks are in relatively good condition. This plantation was planted in the 1980's and is at the un-thinned post-thicket stage.

The majority of the high bog has been badly damaged by the recent fire and has been stripped of vegetation. It is quite dry and firm with regenerating Heather the most prominent species. Bare peat is very prominent in this section and is being colonised by *Campylopus introflexus,* which is abundant. Deergrass is also prominently regenerating. It was likely to have also been significantly dried out by the ditching in the past. Nearly all of the drains are actively functioning and are not infilling. The generally narrow topography of the bog also leads its-self to being drier than usual as it was quite narrow and there are relatively steep slopes on both sides leading to the margins. Water was flowing in many of the drains from rain the previous evening. *Sphagnum* sp. cover was quite rare (< 1% cover) in the burnt section. There were also very few hollows or typical wet hollows. *S. capillifolium*, S. *papillosum* and S. subnitens were all noted within the burnt section of the high bog and *S. cuspidatum* and *S. magellanicum* was only noted on one occasion is a small blacked drain associated with the conifer forestry. Some of the burnt section also had standing dead trees (Pine and Birch) that had been scattered over the bog.

In contrast, the vegetation of the un-burned section of high bog to the west is dominated by tall Heather. This section also contains *Cladonia* spp. cover. And some more typical raised bog vegetation dominated by species such as Carnation Sedge, Deergrass, Bog Asphodel and Bog Cotton. This section of high bog is also relatively dry and the surface was spongy but generally firm. The drains within this section are still active. *Sphagnum* cover was also low in this section with occasional small hummocks and the moss cover was dominated by *Hypnum* spp. Some sections do have frequent Pine colonising the high bog, generally close to the more mature margins. These trees are relatively small and poorly developed on the high bog.

There are two main flushes on the high bog at this site. The eastern flush extends across the whole of the high bog and has been burnt. The vegetation is dominated by Purple Moor-grass and some scattered Birch, now standing dead. Several Pine are also present. Bog Myrtle is also present and is regenerating. Other species noted in this flush include Bilberry, Bog Rosemary, Lousewort and hummocks of *Polytrichum* sp. *Campylopus introflexus* is abundant on the bare peat present in the flush.

The western flush is actually situated on the site of a former lake called Martinstown Lough. This lake was drained and has infilled and now has poor flush characteristics. The flush and the surrounding area are populated with Pine and Birch. The former basin of the lake is still evident and the lowest section is quite wet and quaking. This small section could be considered active flush (active raised bog). *Sphagnum* cover was abundant and was dominated by *S. magellanicum* and there was also frequent *Aulacomnium palustre*. Cranberry was also frequent within this wet zone.

There are several patches of Birch woodland (WN7) (dry) on very old cutover, along the margins of the main bog. Several of these patches are dominated by Birch but have occasional or frequent mature Scot's pine in the canopy. There is some encroachment of Birch and Gorse onto the high bog along the margins. Other species present include Grey Willow, Holly, Bracken, Bilberry, Bramble, Purple Moor-grass, Board-buckler Fern and Ivy. Leaf litter is prominent in the ground cover and there is frequent moss cover with *Hypnum* spp., *Pseudoscleropodium purum* and *Thuidium tamariscinum* all common. Some of the Birch and Holly have dbh of 30-40 cm.

Some of the Birch woodland along the margins of the road (southern boundary) is particularly well-developed. This woodland, although being dominated by Birch and Scot's Pine, contains Yew, Oak, Alder, Beech, Ash and Hazel.

A second area of high bog located to the south of the minor road and to the west of the site was also surveyed (in Bracklin Townland). The high bog was unditched and was generally dry and un-burnt. Scot's Pine is spreading onto the bog around the margins. There was a small wet section in the central part of the bog, possibly associated with a main drainage feature. This area has the appearance of being a flush and was very wet and quaking in places. It has the appearance of being an old soak or perhaps a subsided area that has re-wetted. It may have been a former lough but there was no indication of a lake from the old maps. This area is in a small hollow and is vegetated with Pine and Birch, which are mainly stunted and depauperate. The ground cover is dominated by Heather and Hair's-tail Bog Cotton. Cross-leaved Heath and Cranberry also appear on the hummocks. *Sphagnum* spp. cover is abundant (100% in places) and there are large hummocks of *S. capillifolium*, *S. palustre, S. fallax* and probably other species. *Sphagnum cuspidatum* is frequently found in hollows. Purple Moor-grass and Bilberry are found around the edges where it is somewhat drier and firmer underfoot.

Adjacent to this wet area (in Bracklin Townland) is a small copse of very mature Scot's Pine that have developed (or planted) on the adjacent cutover. These Scot's Pine are some of the best developed of this species seen yet on the survey (> 20 m high) and are a typical example of the type of woodland that is found around the margins of this bog. The understorey and shrub layers were quite open with Holly and Birch present. The ground cover was dominated by Purple Moorgrass, Bilberry and Bracken. There were some wet areas but the ground cover was mainly dry.

**Designated areas on site (cSAC, NHA, pNHA, SPA other)**

None

**Adjacent habitats and land-use**

Habitats around the margins of the site include:

- Improved grassland (GA1) and wet grassland (GS4) that are both grazed by cattle.
- Other typical marginal peatland habitats are present including remnant high bog (PB1), cutover bog (PB4), scrub (WS1) and Birch woodland (WN7).
- Conifer plantations (WD4) have been developed adjacent to the site at several locations.
- There is some active peat cutting by private individuals on the high bog both inside and outside the BnM boundary.

**Watercourses (major water features on/off site)**

- The southern boundary of part of the site is marked by a stream/river that flows east and is part of the Boyne catchment.
- Martinstown Lough is a former lough located towards the west side of the site that was drained and is now a flush.

**Fauna biodiversity**

Several bird species were noted on the site during the survey.

- Two pairs of Mallard were noted on the high bog using the drains.
- A Buzzard over-flew the bog.
- Two Snipe were noted on high bog.
- Coal Tit, Blue Tit and Long-tailed Tit were all recorded within the Birch woodland around the margins of the bog.
- Other more common birds were noted on the site. These included Magpie, Blackbird (on cutover bog), Pheasant (calling around margins in woodland), Grey Crow (over-flying site, occasionally roosting on trees on bog), Rook (over-flying site, occasionally roosting on trees on bog), Wren, Robin and Meadow Pipit (on high bog).

**Mammals**

- Signs of Deer (most likely Fallow Deer) were noted at several locations around the site with some tracks across the bog and within some of the Birch woodland.
- Hare was noted on the high bog.
- Fox scats were deposited on the high bog at several locations.
- There were signs of Mink along the stream located along the southern boundary of the site. This stream/river also has potential for occasional usage by Otter.

## APPENDIX IV. ENVIRONMENTAL CONTROL MEASURES TO BE APPLIED TO BOG REHABILITATION

- Bog restoration/rehabilitation measures will be restricted to within the footprint of the proposed rehabilitation area.
- The proposed rehabilitation will have due regard to noise limits and hours of operation (i.e. dusk and dawn) to minimise any potential disturbance on resident and local fauna that utilise the site and immediate environs.
- All plant and equipment for use will comply with the Construction Plant and Equipment Permissible Noise Levels Regulations (SI 359/1996).
- The proposed activities will be restricted to daylight hours and there will be no requirement for artificial lighting.
- Silt ponds will be inspected and maintained as per the IPC Licence.
- During periods of heavy precipitation and run-off, activities will be halted.
- Measures will be carried out using a suitably sized machine and, in all circumstances,, excavation depths and volumes will be minimised where possible.
- All machines will be regularly checked and maintained prior to arrival at the site to prevent hydrocarbon leakage.
- Hoses and valves will be checked regularly for signs of wear and will be closed and securely locked when not in use.
- Fuelling and lubrication of equipment shall only be carried out in designated areas away from surface water drainage features and ecologically sensitive areas.
- Waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the site for disposal or re-cycling.
- Vehicles will never be left unattended during refuelling.
- No direct discharges to waters will be made. No washings from vehicles, plant or equipment will be carried out on site.
- All plant refuelling will take place using mobile fuel bowsers. Only dedicated trained and competent personnel will carry out refuelling operations.
- Mobile storage such as fuel bowsers will be bunded to 110% capacity to prevent spills. Tanks for bowsers and generators shall be double skinned. When not in use, all valves and fuel trigger guns from fuel storage containers will be locked. All pumps using fuel or containing oil will be locally and securely bunded where there is the possibility of discharge to waters.
- Potential impacts caused by spillages etc. during rehabilitation will be reduced by keeping spill kits and other appropriate equipment on-site.
- Site activities will be carried out in accordance with 'best practice'. In order to ensure compliance and implementation of 'best practice', these measures will be communicated to relevant Bord na Móna staff and updated as required.

# APPENDIX V. BIOSECURITY

The potential for importation or introduction of non-native plant species (such as Japanese Knotweed, Himalayan Balsam, etc.) during future rehabilitation management, such as drain-blocking using excavators, has the potential to result in the establishment of invasive species within the site. Section 49 of the European Communities (Birds and Natural Habitats) Regulations 2011 prohibits the introduction and dispersal of invasive alien species (particularly plant species) listed on Part 1 (third column) of the 'Third Schedule'.

This section aims to reduce the risk from, and impacts of, invasive species and protecting biodiversity on lands under Bord na Móna ownership. Rehabilitation and decommissioning in the bog will have due regard to the relevant biosecurity measures outlined below:

- Records of problematic invasive species within the various bog units will be marked out with signs to highlight areas of infestation to personnel.
- All plant machinery will be restricted from disturbing known colonies of invasive species.
- All plant machinery will avoid unnecessary crossings to adjoining lands.
- Good site hygiene will be employed to prevent the introduction and spread of problematic invasive alien plant species (i.e. Japanese Knotweed (*Fallopia japonica*), Himalayan Balsam (*Impatiens glandulifera*), Himalayan Knotweed (*Persicaria wallichii*), etc.) by thoroughly washing vehicles prior to entering the area.

The biosecurity measures outlined above are in line with best practice guidelines issued by the National Roads Authority (NRA, 2010) – The Management of Noxious Weeds and Non-native Invasive Plant Species on National Roads and broadly based on the Environment Agency's (2013) – The Knotweed Code of Practice: Managing Japanese Knotweed on Development Sites (Version 3, amended in 2013, accessed on the Environment Agency's website on the 11th of July 2016).

In addition to the above, Best Practise measures around the prevention and spread of Crayfish plague[6] will be adhered with throughout all rehabilitation measures and activities.

[6] https://www.biodiversityireland.ie/projects/invasive-species/crayfish-plague/

# APPENDIX VI. POLICY AND REGULATORY FRAMEWORK

Bord na Móna Plc is a publicly owned company, originally established in 1934 to develop some of Ireland's extensive peat resources for the purposes of economic development and to support energy security, In the decades since its establishment the company has employed tens of thousands of people in its fuel, energy, and horticultural growing media businesses. For much of its history the company's support of important national policy aims has been enabled and encouraged in a variety of ways by Government.

Today, Bord na Móna is undertaking a number of highly significant actions in support of climate policy. These actions involve a radical transformation and decarbonisation of nearly the entire Bord na Móna business. This transformation will be driven by unlocking the full potential of our land and creating significant value for Ireland and the Midlands in particular.

Bord na Móna is an integral part of the economic, social, and environmental fabric of Ireland and Irish life. As a key employer in the Midlands, the company is conscious that its obligations go beyond purely commercial and environmental – there is also a social responsibility to employees and the communities served by Bord na Móna. It is the company's role and absolute priority to ensure that its long-term strategy delivers on all of these important areas in a robust and balanced way.

There are a wide range of policies, plans, legislation and land designations that inform the development of this Bord na Móna peatland rehabilitation plan. Bord na Móna have also developed and operate various policies and strategies that also inform the development of this rehabilitation plan.

## 1 EPA IPC Licence

Bord na Móna operates under IPC Licence issued and administered by the EPA to extract peat within the Ballivor-Derrygreenagh Bog Group (Ref. PO-501-01). As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. The bog is part of the Ballivor group. This regulatory requirement is the main driver of the development of this rehabilitation plan.

## 2 The Peatlands Climate Action Scheme (PCAS)

Bord na Móna (BnM) understand that it is the Minister's (DECC) intention to impose an obligation on Bord na Móna to develop a programme of measures, 'the Scheme', for the enhanced decommissioning, rehabilitation and restoration of boglands previously used to supply peat for electricity generation within the State. The enhanced decommissioning, rehabilitation and restoration of the peatlands funded by the Scheme (PCAS) will deliver benefits across climate action (GHG mitigation through reduced carbon emissions and acceleration towards carbon sequestration), enrich the State's natural capital, increase eco-system services, strengthen biodiversity, improve water quality and storage attenuation as well as developing the amenity potential of the peatlands.

It is envisaged that Bord na Móna carry out an enhanced decommissioning, rehabilitation and restoration, under the Scheme (PCAS), and supported by the Climate Action Fund and Ireland's National Recovery and Resilience Plan across a footprint of 33,000 ha. This scheme will significantly go beyond what is required to meet rehabilitation and decommissioning obligations under existing EPA IPC licence conditions. Interventions and measures supported by the Scheme will ensure that environmental stabilisation is achieved (meaning IPC obligations are met), and importantly, significant additional benefits, particularly relating to climate action and other ecosystem services, will also be delivered. However, only the additional costs associated with the additional

and enhanced rehabilitation, i.e., those activities which go beyond the existing decommissioning and rehabilitation requirements arising from Condition 10 will be eligible for support under the Scheme.

The proposed enhanced rehabilitation detailed in this document, are predicated on the understanding that the element of the activities, over and above the 'standard' rehabilitation necessary to comply with pre-existing Condition 10 IPC Licence requirements, will be deemed eligible costs by the Scheme regulator and funded by the Climate Action Fund and Ireland's National Recovery and Resilience Plan.

For the avoidance of doubt, should the Scheme and the associated statutory obligation on Bord na Móna not materialise, Bord na Móna will not carry out the enhanced decommissioning, rehabilitation and restoration measures described in this plan. Bord na Móna will instead plan to complete an adapted standard decommissioning and rehabilitation measures required under Condition 10 and outlined in Appendix I.

## 3 National and EU Climate and Biodiversity Policy

The National Policy Position establishes the fundamental national objective of achieving a transition to a competitive, low carbon, climate-resilient and environmentally sustainable economy by 2050. It sets out:

- the context for the objective;
- clarifies the level of GHG mitigation ambition envisaged; and
- establishes the process to pursue and achieve the overall objective.

The evolution of climate policy in Ireland will be an iterative process based on the adoption by government of a series of national plans over the period to 2050. GHG mitigation and adaptation to the impacts of climate change are to be addressed in parallel national plans – respectively through the National Climate Action Plan. The plans will be continually updated, as well as being reviewed on a structured basis at appropriate intervals and, at a minimum, every five years. This will include early identification and ongoing updating of possible transition pathways to 2050 to inform sectoral strategic choices.

Bord na Móna is following a decarbonisation programme aimed at reducing the carbon emissions from its activities. Industrial peat production has now ceased, and several other decarbonisation measures are being implemented. The company aims to further develop renewable energy and resource recovery markets with a key objective of reducing the carbon intensity of all products. In addition, the carbon emission mitigation benefits associated with the post-peat extraction rehabilitated peatland following re-wetting, revegetation and colonisation of significant areas with native woodland will make a significant contribution to achieving the State's carbon emission reduction targets.

Peatlands rehabilitation and restoration is referenced in Section 17.3.3 of the Land Use, Land Use Change, Forestry and Marine Chapter of the National Climate Action Plan 2021 as follows:

"The rehabilitation of degraded peatlands to a condition in which they regain their ability to deliver specific ecosystem services has considerable potential for initial mitigation gains, and future carbon sequestration. Additional benefits of peatland restoration include positive socio-economic outcomes for the Midlands, increased natural capital, enriched biodiversity, improved water quality, and flood attenuation."

The scheme is included as Action 33 in the Climate Action Plan 2021 Annex of Actions - Deliver the Enhanced Decommissioning, Rehabilitation and Restoration (EDRR) Scheme for Bord na Mona Peatlands.

EDRRS is also referenced in the Climate Action Plan 2021 as a measure to deliver a Just Transition in the Midlands.

International research and scientific understanding of peatlands is now reflected in key Irish national policy and strategy documents such as the National Raised Bog Special Areas of Conservation (SACs) Management Plan 2017 - 2022 (Department of Arts, Heritage and the Gaeltacht 2017), The National Peatland Strategy (Department of Arts, Heritage and the Gaeltacht 2015), The National Biodiversity Action Plan (National Parks and Wildlife Service 2017), The River Basin Management Plan for Ireland 2018-2021 (Department of Housing, Planning and Local Government 2018), and the Biodiversity – Climate Change Sectoral Action Plan (Department of Arts, Heritage and the Gaeltacht 2019). Each of the national plans, which are also complemented with the recently published EU Green Deal communication on Biodiversity Strategy for 2030 (COM 2020) have overlapping objectives and actions that focus on the restoration of peatlands damaged by turf-cutting, drainage and other impacts, as well as the re-wetting of Bord na Móna industrial peat extraction bogs.

While not specifically identified as a restoration implementor, EDRRS objectives are in line with those of the United Nations Decade on Ecosystem Restoration 2021-2030 of Preventing, Halting and Reversing the Degradation of Ecosystems worldwide.

EDRRS is also in line with the EU Commission proposal for a Nature Restoration Law which will apply legally binding targets for nature restoration in different eco-systems to every Member State. The aim is to cover at least 20% of the EU's land and sea areas by 2030 with nature restoration measures and eventually extend these to all ecosystems in need of restoration by 2050.

## 4 National Peatlands Strategy

The National Peatlands Strategy (2015) contains a comprehensive list of actions, necessary to ensure that Ireland's peatlands are preserved, nurtured and become living assets within the communities that live beside them. It sets out a cross-governmental approach to managing issues that relate to peatlands, including compliance with EU environmental law, climate change, forestry, flood control, energy, nature conservation, planning, and agriculture. The Strategy has been developed in partnership between relevant Government Departments/State bodies and key stakeholders through the Peatlands Council.

The strategy recognises that Ireland's peatlands will continue to contribute to a wide variety of human needs and to be put to many uses. It aims to ensure that Ireland's peatlands are sustainably managed so that their benefits can be enjoyed responsibly. It aims to inform appropriate regulatory systems to facilitate good decision making in support of responsible use. It also aims to inform the provision of appropriate incentives, financial supports and disincentives where required. The strategy attempts to strike an appropriate balance between different needs, including local stakeholders like turf-cutters and semi-state bodies such as Bord na Móna.

In line with a National Peatlands Strategy recommendation, a Peatlands Strategy Implementation Group (PSIG), was established, assisted in the finalisation of the Strategy, is overseeing subsequent implementation and will report to Government on an annual basis on the implementation of the actions and principles contained within the Strategy.

Bord na Móna is a key stakeholder in the National Peatlands Strategy and the Peatlands Strategy Implementation Group. The strategy recognises the potential for some Bord na Móna sites to be restored and to contribute to the national SAC and NHA network of protected raised bog sites. The strategy (agreed in 2015) also recognises the various different values of cutaway bog and developed six key principles (with Bord na Móna) for the after-use of cutaway bog.

- Bord na Móna will continue to assess and evaluate the potential of the company's land bank, using a land use review system. The assessment will help prepare a set of evidence-based management plans for the various areas of peatland. These plans will also inform its cutaway bog rehabilitation.
- The policy of Bord na Móna is not to open up any undrained new bogs for peat production.
- Lands identified by Bord na Móna as having high biodiversity value and/or priority habitats will be reserved for these purposes as the proposed future land use.
- Generally, Bord na Móna cutaway bogs that flood naturally will be permitted to flood unless there is a clear environmental and/or economic case to maintain pumped drainage.
- In deciding on the most appropriate afteruse of cutaway peatlands, consideration shall be given to encouraging, where possible, the return to a natural functioning peatland ecosystem.
- This will require re-wetting of the cutaway peatlands which may lead in time to the restoration of the peatland ecosystem.
- Environmentally, socially and economically viable options should be analysed to plan the future use of industrial cutaway peatlands, in conjunction with limiting factors as outlined in Bord na Móna's Strategic Framework for the Future Use of Peatlands.

The National Peatlands Strategy highlights the importance and value of developing peatland rehabilitation plans for Bord na Móna cutaway sites and implementing this peatland rehabilitation. Some of these principles have now been superseded by the company's decision to cease industrial peat extraction. The National Peatlands Strategy is currently being reviewed by Government.

## 5 Draft National River Basin Management Plan 2022-2027 (Water Framework Directive)

The National River Basin Management Plan (Department of Housing, Planning, Community and Local Government 2017) is the key national plan for Ireland to achieve the objectives of the Water Framework Directive (WFD). In broad terms, the objectives of the WFD are (1) to prevent the deterioration of water bodies and to protect, enhance and restore them with the aim of achieving at least good status and (2) to achieve compliance with the requirements for designated protected areas.

The NRBMP 2018-2021 outlined how peat extraction can be a potentially significant pressure on various water quality parameters. Peatland rehabilitation of Bord na Móna cutaway (in addition to other measures) was part of the WFD (2018-2021) programme of measures. The NRBMP 2018-2021 takes account of the fact that Bord na Móna was in the process of phasing out the extraction of peat for energy production, that it set a target to rehabilitate 9,000 ha of cutaway bogs (covering 25 peatlands) by 2021 (in 2018) and will look to implement best-available mitigation measures to further reduce water quality impacts caused by peat extraction while the phasing-out process is taking place. This NRBMP 2018-2021 rehabilitation target was superseded by the acceleration of the Bord na Móna de-carbonisation programme and the Scheme **(PCAS)**.

The development of site rehabilitation plans and the delivery of peatland rehabilitation by Bord na Móna was expected to have a positive impact on water quality and will help the NRBMP 2018-2021 deliver its objectives in relation to the Water Framework Directive and is one of the five key principle actions.

The draft NWBMP 2022-2027 describes how the number of waterbodies impacted by peat, industry and forestry have decreased by 10, 10 and 5 waterbodies, respectively since the second cycle. Impacts on water quality and river habitat arising from peat and peat extraction and associated drainage include the release of ammonium and

fine-grained suspended sediments, and physical alteration of aquatic habitats. Drainage of peatlands also results in changes to the hydromorphological condition of rivers.

The draft NWBMP 2022-2027 outlines how maintaining and restoring Irish bogs will lead to a decrease in waterborne carbon leaching to levels comparable with intact bogs as well as reducing losses of peat silt and ammonia. Vegetation on the surface of the peat can also slow the flow of water over the land surface. Based on the EPA's most recent reports, peat extraction and drainage are impacting on 106 water bodies across the country, with peat the single pressure on 28 of these water bodies. However, compared to the data in the second-cycle plan, the number of water bodies impacted by peat has decreased.

The cessation of industrial peat extraction by Bord na Móna in 2021 was expected to have a significant positive impact on water quality of receiving water courses by reducing the impact of peat extraction as a key pressure on particular water courses. This is now being supported by the results and conclusions of the draft NWBMP 2022-2027.

## 6 National Biodiversity Action Plan 2016-2021

The National Biodiversity Action Plan 2016-2022 has a vision that biodiversity and ecosystems in Ireland are conserved and restored, delivering benefits essential for all sectors of society and that Ireland contributes to efforts to halt the loss of biodiversity and the degradation of ecosystems in the EU and globally. Ireland's 2nd National Biodiversity Action Plan outlines the main policies, strategies, actions and targets in relation to biodiversity. This plan has several Bord na Móna specific objectives and actions including implementing the BnM Biodiversity Action Plan 2016-2021 and overlaps with both the National Peatlands Strategy and the National Raised Bog Special Areas of Conservation Management Plan 2017-2022.

The delivery of rehabilitation via PCAS is expected to significantly contribute in the future to actions and targets of the National Biodiversity Action Plan 2016-2021, particularly in relation to peatland restoration and creation of new habitats such as wetlands and woodlands.

A new National Biodiversity Action Plan is currently being developed.

## 7 National conservation designations

Bord na Móna operates in a wider landscape that also includes a network of European and National nature conservation sites (Special Areas of Conservation (SACs), Special Protection Areas (SPAs), National Heritage Areas (NHAs, cNHAs) and National Nature Reserves). Bord na Móna will take account of this network of conservation objectives and their conservation objectives when developing these rehabilitation plans. It is expected that peatland rehabilitation will, in general, benefit the conservation objectives of this network of nature conservation sites.

## 8 National Raised Bog Special Area of Conservation Management Plan 2017-2022.

The National Raised Bog Special Area of Conservation Management Plan 2017-2022 sets out a roadmap for the long-term management, restoration and conservation of protected raised bogs in Ireland. The Plan strikes an appropriate balance between the need to conserve and restore Ireland's raised bog network as part of Ireland's commitments towards the EU Habitats Directive, and the needs of stakeholders and gives recognition to the

important role that communities have to play in the conservation and restoration of raised bogs. The National Raised Bog Special Areas of Conservation (SACs) Management Plan 2017-2022 is part of the measures being implemented in response to the on-going infringement action against Ireland in relation to the implementation of the EU Habitats Directive, with regard to the regulation of turf cutting on the Special Areas of Conservation (SACs). The then Minister for Arts, Heritage and the Gaeltacht, also published a **Review of Raised Bog Natural Heritage Area Network** in 2014.

Bord na Móna has played a key role in the development of the National Raised Bog Special Area of Conservation Management Plan 2017-2022 and the Review of the Raised Bog Natural Heritage Area Network. Several Bord na Móna sites were assessed by the National Parks and Wildlife Service as part of the above Plan and Review and there is an expectation that several Bord na Móna sites will be designated as SACs and NHAs in the future. This will reinforce the network of protected raised bog sites and replace in part sites that will be de-designated as they have been deemed to be significantly damaged and are deemed to have no raised bog restoration prospects. PCAS is expected to restore several sites that will contribute to The National Raised Bog Special Areas of Conservation (SACs) Management Plan 2017-2022 targets in relation to the restoration of raised bog habitat.

Bord na Móna has also responded to the needs of the NRBMP and provided several sites to the government for the relocation of turf-cutters from SACs. This is part of a suite of ongoing bog conservation measures in the NRBMP to manage turf-cutting in protected sites. Bord na Móna and the National Parks and Wildlife Service continues to engage regarding the ongoing relocation of turf-cutters from protected raised bog sites.

## 9 All-Ireland Pollinator Plan 2021-2025

The All-Ireland Pollinator Plan 2021-2025 outlines key objectives and actions to protect and support pollinating insects and the habitats they rely on. A Bord na Móna specific action in this plan includes the adoption of pollinator-friendly management within the Bord na Móna network of sites. One action to help achieve this objective is habitat rehabilitation and restoration, where possible, of pollinator-friendly habitats, including peatland habitats.

## 10 Land-use planning policies

As Bord na Móna operates in many counties across Ireland, it is important to note the respective development plans in these counties. Many of the existing development plans recognise the potential that exists in the after-use of cutover/cutaway peatlands. Bord na Móna seeks to work with all of the relevant local authorities to ensure that the most appropriate after-uses are reflected in local planning policy. The following areas of consistent importance are of both direct and indirect relevance to Bord na Móna: heritage, tourism, biodiversity/conservation, landscape, renewable energy, and economy/enterprise.

## 11 National Archaeology Code of Practise

Bord na Móna operates under an agreed Code of Practice regarding archaeology with the Department of Arts, Heritage and the Gaeltacht and the National Museum of Ireland which provides a framework to enable the Company to progress peat extraction whilst carrying out archaeological mitigation. (https://www.archaeology.ie/sites/default/files/media/publications/cop-bord-na-mona-en.pdf

The Code replaced a set of Principles agreed with the Department of Arts, Heritage and the Gaeltacht in the 1990s. Under the Code Bord na Móna, the Minister and Director work together to ensure that appropriate archaeological mitigation is carried out in advance of peat extraction.

- BNM must ensure that any monuments or archaeological objects discovered during peat extraction are protected in an appropriate manner by following the Archaeological Protection Procedures.
- BNM must ensure that any newly discovered monuments on Bord na Móna lands are reported in a timely manner to the National Monuments Service of the Department of Arts, Heritage and the Gaeltacht.
- BNM must ensure that any archaeological objects discovered on Bord na Móna lands are reported immediately to the Duty Officer of the National Museum of Ireland.
- Bord na Móna will adhere to the Archaeology Code of Practise relating to management of any archaeological finds that may arise during cutaway peatland rehabilitation and decommissioning.

## 12 Bord na Móna Biodiversity Action Plan 2016-2021

Rehabilitation of industrial peatlands is a key objective of the Bord na Móna Biodiversity Action Plan 2016-2021. This action plan outlines the main objectives and actions around biodiversity on Bord na Móna lands. The Bord na Móna Biodiversity Action Plan also outlines key International and European policy in relation to biodiversity. This includes the **United Nations Convention on Biodiversity 2011-2020 (CBD)** and **European Biodiversity Strategy to 2020**. Further details of these policies and Bord na Móna s responses can be found in the Bord na Móna Biodiversity Action Plan (Bord na Móna 2016). Both policy documents highlight targets such as reducing pressure on biodiversity, promoting sustainability, habitat restoration and benefits of ecosystem services.

One example of a key CBD target is:

- *"Restore at least 15% of degraded areas through conservation and restoration activities."*

The EUs headline target for progress by 2020 is to:

- *"halt the loss of biodiversity and the degradation of ecosystems in the EU by 2020, restore them as far as feasible, while stepping up the EU contribution to averting global biodiversity loss."*

This rehabilitation plan is aligned to the CBD target and the EU Biodiversity Strategy target and will help Ireland meet its commitment to these international Biodiversity polices.

## 13 Bord na Móna commitments

Bord na Móna made the commitment in 2009 not to develop any new peatland sites for industrial peat production. The company has continued to work with different stakeholders.

The company announced that industrial peat production would be cut by over 50 percent in 2019 and would entirely cease over most of its lands by the mid-2020s. Rehabilitation measures would continue to be carried out with the focus on re-wetting and rehabilitation of cutover and cutaway areas in line with national policies (such as the National Peatland Strategy, the National Biodiversity Action Plan, the Climate Action Plan 2019, the Water Framework Directive, etc.) and rehabilitation guidelines set down by the Environmental Protection Agency. To date, 15,000 hectares of cutaway and cutover bog have been rehabilitated using this approach with 5,000 hectares in active rehabilitation.

In line with Bord na Móna's accelerated decarbonisation programme, the company made a further commitment to a significantly larger rehabilitation target. This was reflected in our plans to rehabilitate a further 20,000 hectares of cutaway and cutover bog to wetland and woodland mosaics by 2025. In addition, we planned to restore a further 1,000 hectares of raised bog habitat by 2025.

The above commitments have now been followed by the decision by the company to cease industrial peat extraction and rehabilitate a target of 33,000 ha between 2021-2025.

These commitments outline the importance of peatland rehabilitation to Bord na Móna. The company will continue to demonstrate environmental responsibility and continue to deliver on these commitments in relation to peatland rehabilitation and in relation to the future management of these lands to maximise their benefits, particularly their ecosystem service benefits, along with the sustainable development of a portion of the land bank for other uses, such as renewable energy.

## 14 Bord na Móna Strategic Framework for the future use of cutaway peatlands 2020 (Draft)

The general after-use strategy of Bord na Móna is outlined in the Bord na Móna Strategic Framework for Future-Use of Cutaway Bogs 2020 (draft document). This document outlines how Bord na Móna's cutover peatland estate is complex in nature with great variability in terms of peat depths, peat types, drainage, subsoil condition and environmental value. Thus, future options require consideration on a site-specific basis, also bearing in mind the considerable internal variation within bogs. The development of the land-bank will also take account of national needs, while also taking account of the various national legislation, policies and plans related to the management of peatlands. In general, Bord na Móna will seek to balance and optimise commercial, social, and environmental value of these sites, and develop integrated land-uses, while taking account of the need for sustainability and their biodiversity value.

Any consideration of other future after-uses for Bord na Móna land such as development or other mixed uses will be conducted following the relevant planning guidelines and consultation with relevant authorities and will be considered within the framework of this peatland rehabilitation plan.

# APPENDIX VII. DECOMMISSIONING

## 1. Condition 10 Decommissioning

This is a requirement of the applicable Integrated Pollution Control Licence issued by the Environmental Protection Agency. This condition 10.1 requires the following:

*10.1 Following termination of use or involvement of all or part of the site in the licensed activity, the licensee shall:*

*10.1.1 Decommission, render safe or remove for disposal/recovery, any soil, subsoils, buildings, plant or equipment, or any waste, materials or substances or other matter contained therein or thereon, that may result in environmental pollution.*

The main success criteria pertaining to successfully complying with this condition is ensuring that no environmental liability remains from this infrastructure and material and that the bog can be deemed suitable for surrender of the license under section 95 of the EPA Acts. This is achieved by Bord na Móna identifying and quantifying any mechanical and infrastructural resources that were installed in the bog to enable the development and production operation at the site. This list is then refined to identify any items that would be deemed as possibly resulting in environmental pollution, should they not be removed.

Typically, these items/infrastructures would be any remaining, unconsolidated plant, equipment and attachments, waste materials, unused raw materials such as land drainage pipes, remaining peat stockpiles, stock pile covering, pumps, septic tanks and fuel tanks.

In relation to this bog, the list and tasks would be as follows:

| Item | Description | Lisclogher West Decommissioning Plan |
|---|---|---|
| 1 | Clean-up of remaining or unconsolidated waste or materials located in Bogs, Yards, Buildings and Offices | Not relevant |
| 2 | Cleaning Silt Ponds | Cleaning Silt Ponds |
| 3 | Decommissioning Peat Stockpiles | Not relevant |
| 4 | Decommissioning or Removal of Buildings and Compounds | Not relevant |
| 5 | Decommissioning Fuel Tanks and associated facilities | Not relevant |
| 6 | Decommissioning and Removal of Bog Pump Sites | Not relevant |
| 7 | Decommissioning or Removal of Septic Tanks | Where required |

In addition, condition 7 of the licence requires these now defined waste items to be disposed of or recovered as follows:

7.1 Disposal or recovery of waste shall take place only as specified in *Schedule 2(i) Hazardous Wastes for Disposal/Recovery* and *Schedule 2(ii) Other Wastes for Disposal/Recovery* of this licence and in accordance with the appropriate National and European legislation and protocols. No other waste shall be disposed of/recovered either on-site or off-site without prior notice to, and prior written agreement of, the Agency.

7.2 Waste sent off-site for recovery or disposal shall only be conveyed to a waste contractor, as agreed by the Agency, and only transported from the site of the activity to the site of recovery/disposal in a manner which will not adversely affect the environment.

7.3 A full record, which shall be open to inspection by authorized persons of the Agency at all times, shall be kept by the licensee on matters relating to the waste management operations and practices at this site. This record shall as a minimum contain details of the following:

7.3.1 The names of the agent and transporter of the waste.

7.3.2 The name of the persons responsible for the ultimate disposal/recovery of the

waste.

7.3.3 The ultimate destination of the waste.

7.3.4 Written confirmation of the acceptance and disposal/recovery of any hazardous waste consignments sent off-site.

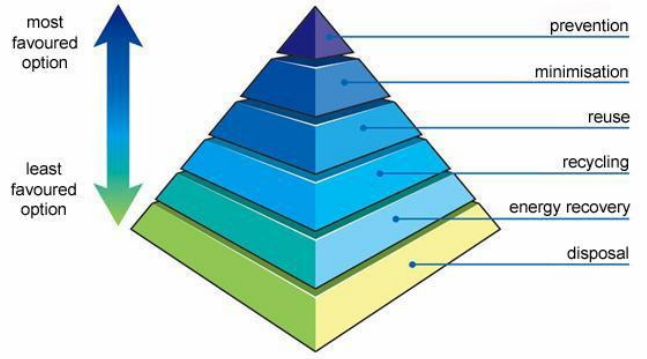
7.3.5 The tonnages and EWC Code for the waste materials listed in *Schedule 2(i) Hazardous Wastes for Disposal/Recovery* and *Schedule 2(ii) Other Wastes for Disposal/Recovery* sent off-site for disposal/recovery.

7.3.6 Details of any rejected consignments.

A copy of this Waste Management record shall be submitted to the Agency as part of the AER for the site.

As required by the licence, these waste items will be removed for recycling or disposal, using external contractors with the required waste collection permits, approved under 7.2, with waste records maintained as required under 7.3.

Where possible, Bord na Móna will utilize the appropriate waste hierarchy to identify waste that can reused or recycled ahead of disposal.




The validation of the success of condition 10.1 is carried out through an Independent Closure Audit (ICA), followed by and EPA Exit Audit (EA) and the eventual partial or full surrender of the licence.

## 2. Enhanced Decommissioning.

The remaining infrastructure does not constitute a risk to the environment and would not be a requirement of condition 10 of the licence. The removal of these are deemed as enhanced measures. These may enhance the future afteruse of the bog for amenity value, security against access for illegal and unsocial activities and general State and community benefit. In relation to this bog, this would include the infrastructure defined below:

| Item | Enhanced Decommissioning Type | Lisclogher West Decommissioning Plan |
|---|---|---|
| 1 | Removal of Railway Lines | Not Applicable |
| 2 | Decommissioning Bridges and Underpasses | Not Applicable |
| 3 | Decommissioning Railway Level Crossing | Not Applicable |
| 4 | Restricting Access (bogs and silt ponds) | Restricting Access to Bog |
| 5 | Removal of High Voltage Power Lines | Not Applicable |

* It is noted that the Bord na Móna industrial railway is currently designated as a protected structure in the current Westmeath County Council County Development Plan. This is currently being assessed by archaeological consultants for Bord na Móna.

## APPENDIX VIII. GLOSSARY

**Cutaway Bog:** A Bord na Móna site generally becomes cutaway when it is economically unviable to continue industrial peat extraction or when the majority of peat has been removed.

**Deep peat cutover bog.** Deep peat cutover bog is defined as former raised bogs that have been in industrial peat production, where production has ceased but the residual peat depth is typically in excess of 2m. *Sphagnum* mosses are key species of raised bogs and the majority of the peat mass is formed from these mosses. *Sphagnum* species and other raised bog species are a key part of raised bog habitat function and prefer more acidic, nutrient poor, water-logged conditions. Typical raised bog *Sphagnum* mosses and other bog species do not thrive with the more typical alkaline water chemistry of cutaway bog but do grow well in these more acidic conditions where peat has been re-wetted. There is potential to re-develop embryonic *Sphagnum*-rich plant communities in these conditions if the peat can be re-wetted. This brings the opportunity of re-developing embryonic *Sphagnum*-rich vegetation communities that are considered Carbon sinks or peat-forming habitats and restoring the carbon sequestration function of these sites.

**Dry cutaway bog:** Cutaway bog is categorised as dry cutaway where it is not practical or feasible to re-wet these areas completely. It is inevitable that some areas of cutaway will remain relatively dry due to the heterogenous topography of the cutaway, as well as requirements for continued drainage on site for identified after-uses, or off site in relation to neighbouring lands or other infrastructure. Ridges and mounds of glacial deposits can become exposed during peat extraction and form a heterogenous topographical mosaic separated by basins. Dry cutaway may have very thin or no residual peat where ridges and mounds have been exposed. The exposed sub-soils are a mix of glacial gravels, muds and tills that can be quite free-draining. Dry cutaway may also have deeper residual peat but in a location (ie. at the margin) where the peat cannot be re-wetted due to boundary constraints. Dry cutaway may also develop in situations where there a relatively steep slope that inhibits re-wetting. The majority of dry cutaway will develop towards grassland, heath, scrub and dry woodland habitats.

**Enhanced decommissioning:** This is defined as decommissioning carried out under Scheme, which is proposed to externally funded.

**Enhanced rehabilitation:** This is defined as rehabilitation carried out under Scheme, which is proposed to be externally funded. It is proposed by Government that Bord na Móna be obligated to carry out enhanced decommissioning, rehabilitation and restoration on peatlands. This Scheme will significantly go beyond what is required to meet rehabilitation and decommissioning obligations under existing EPA IPC licence conditions. Interventions and activities supported by the Scheme will ensure that environmental stabilisation is achieved (meaning IPC obligations are met), and importantly, significant additional benefits, particularly relating to climate action and other ecosystem services, will also be delivered. However, only the costs associated with the additional, enhanced and accelerated measures, i.e., those interventions which go beyond the existing decommissioning and rehabilitation requirements arising from Condition 10 will be eligible for support under the Scheme.

**Environmental stabilisiation:** The key objective of peatland rehabilitation is environmental stabilisation. This means developing habitats and vegetation back onto the bare peat, slowing water movement across the bog, minimising effects to downstream waterbodies and meeting the conditions of the IPC Lisence. This is achieved by a combination of re-wetting, where possible, and natural colonisation of the former cutaway, with or without intervention**.** Habitats will develop that reflect the underlying environmental conditions. Other after-use development may also serve to act as environmental stabilisiation.

**Marginal land.** Marginal land is defined as land around the margin of the industrial peat production area. This margin generally contains a range of habitats including scrub, Birch woodland, cutover bog and raised bog remnants. It has a variety of land-uses including turf-cutting (private turbary). The Scheme will consider potential rehabilitation and restoration actions (e.g. drain blocking) within marginal land zones, where appropriate.

**Rehabilitation:** Rehabilitation is defined in general by Bord na Móna as environmental stabilisation of the former cutaway. This is generally achieved via re-wetting, where possible, and natural colonisation of the former cutaway, with or without intervention. It is not possible to restore raised bog habitats on BnM cutaway in general in the short-term. In general, most of the peat mass has been removed from many BnM cutaway sites and the environmental characteristics of these areas have therefore changed radically (peat depths, hydrology, water chemistry, substrate type, nutrient status. This means there will therefore be different habitat outcomes (wetlands, fen, heathland, grassland and Birch woodland). Other after-use development may also serve to act as rehabilitation.

**Restoration:** Ecological restoration to defined as the process of re-establishing to the extent possible the structure, function and integrity of indigenous ecosystems and the sustaining habitats they provide" (SER 2004). Defined in this way, restoration encompasses the repair of ecosystems (Whisenant 1999) and the **improvement of ecological conditions in damaged wildlands** through the **reinstatement of ecological processes**. In general, Bord na Móna cutaway peatlands cannot be restored back to raised bog in a reasonable timeframe as their environmental conditions has changed so radically (with the removal of the acrotelem – the living layer and much of the peat mass). However, they can be returned to a **trajectory** towards a naturally functioning peatland system (Renou-Wilson 2012). **Raised bog restoration** is an objective of some BnM sites where there is residual natural raised bog vegetation and where the majority of the peat is still intact.

**Standard rehabilitation:** This is defined as rehabilitation that is designed to meet the conditions of the EPA IPC Licence. The key objective of rehabilitation is environmental stabilisation. This is achieved by a combination of re-wetting, where possible, and natural colonisation of the former cutaway, with or without intervention**.** Other after-use development may also serve to act as rehabilitation.

**Standard decommissioning:** This is defined as decommissioning that is designed to meet the conditions of the EPA IPC Licence. This is defined as to render safe or remove for disposal/recovery, any soil, subsoils, buildings, plant or equipment, or any waste, materials or substances or other matter contained therein or thereon, that may result in environmental pollution.

**Wetland cutaway bog.** Wetland cutaway bog is defined as former raised bogs that have been in industrial peat production, where production has ceased and the majority of peat has been cutaway, and where this cutaway has the potential to be re-wetted. A significant number of Bord na Móna sites have pumped drainage and these sites are likely to develop a mosaic of wetland habitats when pumping in reduced or stopped. The water chemistry of wetland cutaway frequently is strongly influenced by the more alkaline sub-soils that have been exposed during peat production. This means that pioneer vegetation is more typical of fen and wetland, rather than raised bog. Wetland cutaway will have a broad range of hydrological conditions depending on the local topography. In some cases, these wetlands may form deep water (> 0.5 m) whilst other areas may have the water table at or just below the surface of the ground.

# APPENDIX IX. EXTRACTIVE WASTE MANAGEMENT PLAN

## (Minimisation, treatment, recovery and disposal)

**Objective:**
The objective of this generic plan is to comply with the requirements of regulation 5 of the Waste Management (Management of Waste from Extractive Industries) Regulations, and to prevent or reduce waste production and its harmfulness.

**Scope:**
This plan covers IPPC Licence's Ref P0501-01, Derrygreenagh-Ballivor Group of Bogs in Counties Meath and Mestmeath.

**1.0 Extractive Waste:**
Waste classified as extractive waste from peat extraction operations arise from three operations associated with this activity.

**1.1 Silt Pond excavations and maintenance.**
All peat extraction activities are serviced by a silt lagoons/ponds. During the excavation of these silt ponds, pre IPPC Licensing in 1999 and since licensing, the excavated material is stored adjacent to the silt pond, where it either remains in situ ores levelled out. As required by condition 6.6, these silt lagoons are cleaned twice per annum or more often if inspections dictate. These silt cleanings are also deposited on the same location, adjacent to the silt pond, where they may be levelled periodically to allow room for subsequent cleanings. These mounds of silt pond excavation material and cleanings are generally no higher that 2-3 metres.

**1.2 Power Station screenings:**
Lough Ree Power Ltd screens the peat from the bogs prior to processing. This screening removes oversized peat, stones and bogs timbers. Schedule 3 (ii) of the IPPC licence permits disposal of these peat screenings back to the bog, where it is levelled and graded into the surrounding peat landscape. These locations have been agreed with the Agency as per condition 7.4 of the IPPC Licence, and as per the attached locations.

**1.3 Bog Timbers:**
During peat extraction operations, bog timbers often arise in the bog surface and are required to be cleared. These timbers consist of bog pine, oak and some yew. Some of these timbers, such as the oak and yew are removed for use in the wood craft industry, with the remaining bog pine stockpiled in locations at the opposite end of each bog, where it generally becomes a habitat for flora and fauna. These piles of timber are generally no higher than 1-2 metres.

**2.0 P0501-01 IPPC Licence Extractive Waste Conditions**

**2.1 Condition 7.5 Extractive Waste Management**
The licensee shall draw up a Waste Management Plan (to be known as an Extractive Waste Management Plan) for the minimisation, treatment, recovery and disposal of extractive waste. This Plan shall meet the requirements of regulation 5 of the Waste Management (Management of Waste from the Extractive Industries) Regulations,2009. The Plan shall be submitted for agreement by the Agency by the 31' December2012. The Plan shall be reviewed at least once every five years thereafter in a manner agreeable to the Agency and amended in the event of substantial changes to the operation of a waste facility or to the waste deposited. Any amendments shall be notified to the Agency.
All extractive waste shall be managed in accordance with the Extractive Waste Management Plan. A report on the implementation of the Extractive Waste Management Plan shall be provided in the AER.

**2.2 Condition 7.6 Waste Facility**
(i) No new waste facility may be developed or an existing waste facility modified unless agreed by the Agency.
(ii) The licensee shall ensure that all existing waste facilities are managed and maintained to ensure their physical stability and to prevent pollution or contamination of soil, air, surface water or groundwater.
(iii) The licensee shall ensure that all new waste facilities are constructed, managed and maintained to ensure their physical stability and to prevent pollution or contamination of soil, air, surface water or groundwater.
(iv) Operational measures shall be continuously employed to prevent damage to waste facilities from personnel, plant or equipment.
(v) The licensee shall establish and maintain a system for regular monitoring and inspection of waste facilities.
(vi) All records of monitoring and inspection of waste facilities, as required under the licence, shall be maintained on-site in order to ensure the appropriate handover of information in the event of a change of operator or relevant personnel.

**2.3 Condition 7.7 Excavation Voids**
7.7.1 Unless otherwise agreed by the Agency, only extractive waste shall be placed in excavation voids.
7.7.2 When placing extractive waste into excavation voids for rehabilitation and construction purposes, the licensee shall, in accordance with regulation 10 of the Waste Management (Management of Waste from the Extractive Industries) Regulations, 2009, and the Extractive Waste Management Plan:

- Secure the stability of the waste
- Put in place measures to prevent pollution of soil, surface water and ground water.
- Carry out monitoring of the extractive waste and excavation void.

**Condition 7.5. Extractive Waste Management Plan. 5 (1)**

**3.0 Minimisation.**
**3.1 Silt pond excavation material and cleanings.**
IPPC Licence conditions require all production areas to be serviced by an appropriately designed silt pond based on storage volume and retention time. Condition 6.6 requires all ponds to be cleaned bi-annually and more often if inspections dictate, so the only opportunity for minimisation of same is through Standard Operating Procedures. These are required under condition 2.2.2 (i) regarding minimisation of suspended solids, and are in-place to minimise the generation of silt, which in-turn will minimise the generation of silt pond waste.

**3.2 Power Station Screenings.**
These screenings cannot be minimised as they are a consequence of peat production, stones, timbers and oversize peat materials are naturally occurring on the bog, and are required to be removed prior to processing.

**3.3 Bog Timbers.**
Bog timbers are also naturally occurring materials within a bog and are required to be removed prior for production. The volume of these bog timbers varies from bog to bog and as such their minimisation is not controllable or quantifiable.

**4.0 Treatment**
**4.1 Silt pond excavation material and cleanings.**
The silt pond excavation material and silt cleanings do not require any treatment for its end use which will be either backfilling these silt pond voids as per condition 7.7.1 above as part of the Bog Rehabilitation Plan, or reincorporated into the surrounding peatlands.

**4.2 Power Station Screenings.**
The factory screenings are permitted to be returned to the bog as they were naturally occurring materials from the bog, and as such do not require any treatment to serve this purpose.

**4.3 Bog Timbers**
As per 1.3 above, these timbers are stockpiled at two locations in each bog, as per the attached list of sites and become habitats for various flora and fauna.

**5.0 Recovery**
**5.1 Silt pond excavation material and cleanings.**
Condition 2.2.2 (vi) requires the reuse of silt pond waste to be examined. This was undertaken in 2006, the outcome of which was that this waste peat silt material, as a fuel, was contaminated with sub-soils, rendering it unsuitable for combustion. In addition, volumes are small compared to overall peat production volumes.

**5.2 Power Station Screenings.**
Given the nature of these screenings as outlined in 1.2 above, there is no further use identified and they are permitted to be disposed of back to the bog.

**5.3 Bog Timbers**
Investigations into processing these materials into smaller fractions for potential heating purposes did not yield any viable results. In addition, these older stockpiles are now classified as habitats and as such would not be considered for reuse as a fuel.

**6.0 Disposal**
**6.1 Silt pond excavation material and cleanings.**
Schedule 3 (ii) permits the disposal of silt pond cleanings (Lagoon Sediments) to the bog and these locations, adjacent to the silt pond site, are presented in the attached spreadsheet, with associated grid coordinates.

**6.2 Power Station Screenings.**
Schedule 3 (ii) permits the disposal of screenings (Peat Screenings) to the bog at designated locations agreed under Condition 7.4, and these locations, are presented in the attached spreadsheet, with associated grid coordinates.

**6.3 Bog Timbers**
These naturally occurring bog timbers are stockpiled at locations in each bog, grid coordinates attached.

**7.0 Extractive Waste Management Plan**

**5 (2a)(i)**
The vast majority of peat extraction bogs were all designed and drained for production prior to the 1960's and as such the production fields layout cannot' be altered. Under our Cleaner Reduction Procedures, various design changes have been implemented to the production machines and process to reduce lost peat which eventually is captured in the silt ponds and requires removal as waste peat silt. This along with training and ongoing research and development will continuously reduce waste peat and subsequently waste silt pond cleanings. Bog timbers are present naturally in various volumes and quantities in different bogs and as peat production involves stripping peat in layers, the exposure, generation and removal of these timbers is unavoidable. Work has been undertaken recently into project looking at grinding of these bog timbers in situ using a timber miller, and if this project becomes viable it will contribute to the reduction of bog timbers.

**5 (2a)(ii)**
Given the nature and expanse of peat bogs, the stockpiling and storage of these waste materials do not present a visual, storage or stability problem. As required under Condition 10 of the IPPC Licence, the silt pond excavations and screenings will be utilised to backfill the silt pond voids once the bogs have finished and stabilised in accordance with out Bog Rehabilitation Plan. Storage of these wastes in the interim, open to the elements does not present a change on the nature of these wastes that will threaten the environment or prevent their reuse during the bog rehabilitation process.

**5 (2a)(iii)**
Under Condition 10 of the IPPC Licence, all silt ponds will be decommissioned once the bog surface has stabilised, in agreement with the Agency. This will involve the removal of weirs and flow controls, returning the silt pond back to its original drain or removing the silt pond from the drainage system. Both of these activities will involve placing the silt pond extraction and cleaning material back into the excavation void.

**5 (2a)(iv)**

The peat bogs do not contain any topsoil, so this is not required.

**5 (2a)(v)**
Peat mineral resources do not undergo any treatment.

**5 (2b)**
These three extractive waste are all being reused and recovered back to their original extraction points and have not undergone any physical, chemical, or biological change.

**5 (2c)(i, ii & iii)**
These three extractive wastes, stored on the bog for reuse or recovery during the bog rehabilitation phase, do not require any management or monitoring during the operation of these bogs. Silt pond excavations and cleanings are stored adjacent to the silt pond and quickly revegetated and stabilise, the screenings are graded back into the bog at the agreed locations upon disposal and the bog timbers do not prevent any water or airborne danger to the environment.

**5 (3)**
The three extractive wastes arising from peat extraction operations at this site are classified wastes from mineral non-metalliferous excavation, with an EWC code of 0101 02. The materials are not classified as hazardous under Directive 91/689/EEC20, and do not contain substances or preparations classified as dangerous under Directives 67/548/EEC5 or 1999/45/EC6 above a certain threshold.
The peat excavations and cleanings are stored in locations and in a manner that they could not collapse, and are remote in their nature. The stockpiles are located adjacent to silt ponds that are cleaned regularly and as such these stockpiles are managed and levelled to facilitate further cleanings.
Therefore the material stored at these waste facilities would not be considered to be a Category A waste facility.

**Classification in accordance Annex II.**

| **Waste Material** | Description | **C**lassification | Chemical Process treatment | Deposition description | Transport System |
|---|---|---|---|---|---|
| Silt Pond Excavations and cleanings | Peat and mineral soils associated with peatlands. Stored for reuse during bog rehabilitation, with no displacement of overburden | 01 01 02 | None | Excavated from silt ponds by excavator and deposited adjacent to the silt pond. | Excavator |
| Peat Screenings | Stones, timbers and oversized peat particles, reincorporated into low areas, agreed with the Agency, and stabilized under normal natural bog conditions | 01 01 02 | None | Removed by screen at the factory and transported by tractor and trailer to the designated and agreed locations | Tractor and trailer. |
| Bog Timbers | Pine, Oak and Yew species, stored at locations in each bog. Not subject to any stability issues due to exposure to atmospheric/meteorological conditions. | 01 01 02 | None | Removed from the bog surface by excavator and transported by tractor and trailer to the agreed locations | Tractor and Trailer |

**Description of operations.**
Silt pond excavations arise from the requirement to have silt ponds treating all peat extraction sites. Silt pond cleanings arise from the removal of peat silt from silt ponds as required under IPPC Licence. Bog timbers arise from preparation of the bogs surface for peat production. Estimated quantities of materials are below:

**Closure plan. (Bog Rehabilitation Plan).**
Condition 10.1 – 10.3 of the IPPC Licence requires the following:

- 10.1 Following termination of use or involvement of all or part of the site in the licensed activity, the licensee shall:
- 10.1.1 Decommission, render safe or remove for disposal/recovery, any soil, subsoils, buildings, plant or equipment, or any waste, materials or substances or other matter contained therein or thereon, that may result in environmental pollution.
- 10.1.2 Implement the agreed cutaway bog rehabilitation plan (refer Condition 10.2).

10.2 Cutaway Bog Rehabilitation Plan:

- 10.2.1 The licensee shall prepare, to the satisfaction of the Agency, a fully detailed and costed plan for permanent rehabilitation of the cutaway boglands within the licensed area. This plan shall be submitted to the Agency for agreement within eighteen months of the date of grant of this licence.
- 10.2.2 The plan shall be reviewed every two years and proposed amendments thereto notified to the Agency for agreement as part of the AER. No amendments may be implemented without the written agreement of the Agency.

10.3 The Rehabilitation Plan shall include as a minimum, the following:

- 10.3.1 A scope statement for the plan; to include outcome of consultations with relevant Agencies, Authorities and affected parties (to be identified by the licensee).
- 10.3.2 The criteria which define the successful rehabilitation of the activity or part thereof, which ensures minimum impact to the environment.
- 10.3.3 A programme to achieve the stated criteria.
- 10.3.4 Where relevant, a test programme to demonstrate the successful implementation of the rehabilitation plan.
- 10.3.5 A programme for aftercare and maintenance.

10.4 A final validation report to include a certificate of completion for the Rehabilitation Plan, for all or part of the site as necessary, shall be submitted to the Agency within six months of execution of the plan. The licensee shall carry out such tests, investigations or submit certification, as requested by the Agency, to confirm that there is no continuing risk to the environment. This plan including maps and ecological classifications are available on file at the Ballivor IPPC Licence Coordinators office.
The location in relation to the silt pond excavations and cleanings are adjacent to the silt ponds, which are considered under the Shannon River Basin Management Plan in accordance with the requirements of Directive 2000/60/EC.
Screenings and bog timbers are all naturally occurring elements of peatland and there placement back to the bog in smaller concentrated designated waste facilities does not constitute a risk to the prevention of water compliance.
The lands under where these materials are deposited are peatlands and are un-effected by the placing of this material.

**Review.**
This plan will be reviewed every five years, the first review to take place in September 2017. This review will entail an inspection of these waste facilities to ensure their placing, management, maintenance and stability comply with the requirements of the Extractive Waste Management requirements and condition 7.5, 7.6 and 7.7 of the Ballivor IPPC Licence P0501-01.

# APPENDIX X. MITIGATION MEASURES FOR THE APPLICATION OF FERTILISER

- Any fertiliser used will be Rock Phosphate and will not be applied in the following conditions:
    1. The land is waterlogged;
    2. The land is flooded, or it is likely to flood;
    3. The land is frozen, or covered with snow;
    4. Heavy rain is forecast within 48 hours (forecasts will be checked from Met Éireann).
    5. The ground slopes steeply and there is a risk of water pollution, when factors such as surface run-off pathways, the presence of land drains, the absence of hedgerows to mitigate surface flow, soil condition and ground cover are taken into account.
- Buffer zones in respect of waterbodies, as specified on https://www.epa.ie/about/faq/name,57156,en.html, will be adhered with at all times with regard to fertiliser application.
- No fertiliser will be spread within or in proximity to European Sites. Fertiliser will not be spread within 25m of a hydraulic break (where slope indicates runoff potential); 25m of an area subject to annual winter inundation, 25m of a natural watercourse, or 25m of any drains where conveyance is to be retained through the proposed rehabilitation extent.
- Fertiliser will be applied to headlands and bare fields where the surface slope indicates runoff is directed away from the above areas, and to within 2m of internal drainage channels within the cutover high field areas. These drainage channels will be blocked in advance of fertiliser application, restricting potential run-off to downstream drainage channels

| Water body / Feature | Buffer zone |
|---|---|
| Any water supply source providing 100m$^3$ or more of water per day, or serving 500 or more people | 200 metres (or as little as 30 metres where a local authority allows) |
| Any water supply source providing 10m$^3$ or more of water per day, or serving 50 or more people | 100 metres (or as little as 30 metres where a local authority allows) |
| Any other water supply for human consumption | 25 metres (or as little as 30 metres where a local authority allows) |
| Lake shoreline | 20 metres |
| Exposed cavernous or karstified limestone features (such as swallow holes or collapse features) | 15 metres |
| Any surface watercourse where the slope towards the watercourse exceeds 10% | 10 metres |
| Any other surface waters | 5 metres* |

# APPENDIX XI. CONSULTATION SUMMARIES

**Table APX -1 Consultees contacted**

| Bog Name | Contact Organisation | Contact Name | Date of Issue | Format | Date Response Received | Response Format |
|---|---|---|---|---|---|---|
| Lisclogher West | Department of Agriculture, Food and the Marine | environmentalco-ordination@agriculture.gov.ie; | 17/05/2023 | Email | | |
| Lisclogher West | Head of Ecological Assessment - NPWS | General Email Contact | 17/05/2023 | Email | | |
| Lisclogher West | Department of Housing, Local Government and Heritage NPWS | General Email Contact | 17/05/2023 | Email | 24/05/2023 | N/A |
| Lisclogher West | Department of Housing, Local Government and Heritage NPWS | General Email Contact | 17/05/2023 | Email | | |
| Lisclogher West | National Museum of Ireland | General Email Contact | 17/05/2023 | Email | 01/06/2023 | N/A |
| Lisclogher West | Dept of Agriculture Food & the Marine | Environmental_Co-ordination@agriculture.gov.ie; | 17/05/2023 | Email | | |
| Lisclogher West | Department of Environment, Climate and Communications | General Email Contact | 17/05/2023 | Email | | |
| Lisclogher West | Dept of Rural and Community Development | info@drcd.gov.ie; | 17/05/2023 | Email | | |

| Bog Name | Contact Organisation | Contact Name | Date of Issue | Format | Date Response Received | Response Format |
|---|---|---|---|---|---|---|
| Lisclogher West | Minister of state for Agriculture with responsibility for Land use and Biodiversity | Eoghan.murphy@agriculture.gov.ie ; | 17/05/2023 | Email | | |
| Lisclogher West | Oireachtas | General Email Contact | 17/05/2023 | Email | | |
| Lisclogher West | An Taisce | heritage@antaisce.org; | 17/05/2023 | Email | 22/05/2023 | Email |
| Lisclogher West | Environmental Protection Agency | General Email Contact | 17/05/2023 | Email | | |
| Lisclogher West | Inland Fisheries Ireland | info@fisheriesireland.ie; | 17/05/2023 | Email | | |
| Lisclogher West | Local Authority Waters Programme (Midlands and Eastern Region) | General Email Contact | 17/05/2023 | Email | | |
| Lisclogher West | Local Authority Waters Programme | General Email Contact | 17/05/2023 | Email | | |
| Lisclogher West | Local Authority Waters Programme (Midlands and Eastern Region) | General Email Contact | 17/05/2023 | Email | | |
| Lisclogher West | Teagasc | General Email Contact | 17/05/2023 | Email | | |
| Lisclogher West | The Heritage Council | General Email Contact | 17/05/2023 | Email | | |

| Bog Name | Contact Organisation | Contact Name | Date of Issue | Format | Date Response Received | Response Format |
|---|---|---|---|---|---|---|
| Lisclogher West | Waterways Ireland | info@waterwaysireland.org; | 17/05/2023 | Email | | |
| Lisclogher West | An Forum Uisce (The Water Forum) | info@thewaterforum.ie; | 17/05/2023 | Email | | |
| Lisclogher West | Coillte | General Email Contact | 17/05/2023 | Email | | |
| Lisclogher West | Irish Water | General Email Contact | 17/05/2023 | Email | | |
| Lisclogher West | Irish Water- Water Supply Project Eastern and Midlands Region | General Email Contact | 17/05/2023 | Email | | |
| Lisclogher West | Irish Water | General Email Contact | 17/05/2023 | Email | | |
| Lisclogher West | Office of Public Works | General Email Contact | 17/05/2023 | Email | 30/05/2023 | Email |
| Lisclogher West | CARO (Climate Action Regional Office) Eastern and Midlands | General Email Contact | 17/05/2023 | Email | | |
| Lisclogher West | An Taisce | General Email Contact | 17/05/2023 | Email | | |
| Lisclogher West | Bat Conservation Ireland | General Email Contact | 17/05/2023 | Email | | |

| Bog Name | Contact Organisation | Contact Name | Date of Issue | Format | Date Response Received | Response Format |
|---|---|---|---|---|---|---|
| Lisclogher West | Birdwatch Ireland | General Email Contact | 17/05/2023 | Email | 24/05/2023 | Email |
| Lisclogher West | Butterfly Conservation Ireland | General Email Contact | 17/05/2023 | Email | | |
| Lisclogher West | Eastern and Midland Regional Assembly | General Email Contact | 17/05/2023 | Email | | |
| Lisclogher West | Fisheries Ireland | General Email Contact | 17/05/2023 | Email | | |
| Lisclogher West | Friends of the Irish Environment | General Email Contact | 17/05/2023 | Email | | |
| Lisclogher West | ICMSA (Irish Creamery Milk Suppliers Association) | General Email Contact | 17/05/2023 | Email | | |
| Lisclogher West | ICSA (Irish Cattle and Sheep Farmers Association) | General Email Contact | 17/05/2023 | | | |
| Lisclogher West | Irish Environmental Network (Agriculture and Land Use Policy and Advocacy Officer) | General Email Contact | 17/05/2023 | Email | | |
| Lisclogher West | Irish Farmers Association | General Email Contact | 17/05/2023 | Email | 07/06/2023 | Email |
| Lisclogher West | Irish Farmers Association (Senior Policy Exec) | General Email Contact | 17/05/2023 | | | |

| Bog Name | Contact Organisation | Contact Name | Date of Issue | Format | Date Response Received | Response Format |
|---|---|---|---|---|---|---|
| Lisclogher West | Irish Farmers Association (Laois Offaly and Westmeath Office) | General Email Contact | 17/05/2023 | Email | | |
| Lisclogher West | Irish Peatlands Conservation Council | General Email Contact | 17/05/2023 | Email | | |
| Lisclogher West | Irish Raptor Study Group | General Email Contact | 17/05/2023 | Email | | |
| Lisclogher West | Irish Rural Link (Community Wetlands Forum) | General Email Contact | 17/05/2023 | Email | | |
| Lisclogher West | Irish Rural Link | General Email Contact | 17/05/2023 | Email | | |
| Lisclogher West | Irish Wildlife Trust | General Email Contact | 17/05/2023 | Email | 06/06/2023 | N/A |
| Lisclogher West | IWAI | General Email Contact | 17/05/2023 | Email | | |
| Lisclogher West | National Association of Regional Game Councils | nargc@nargc.ie; | 17/05/2023 | Email | | |
| Lisclogher West | NPWS Rangers North Midlands (Westmeath Bogs) | General Email Contact | 17/05/2023 | Email | | |
| Lisclogher West | NUIG Galway | General Email Contact | 17/05/2023 | Email | | |

| Bog Name | Contact Organisation | Contact Name | Date of Issue | Format | Date Response Received | Response Format |
|---|---|---|---|---|---|---|
| Lisclogher West | PPN Westmeath Public Participation Network | ppn@longfordcoco longfordcoco | 17/05/2023 | Email | | |
| Lisclogher West | ORNI | General Email Contact | 17/05/2023 | Email | | |
| Lisclogher West | Ranger Association Committee | General Email Contact | 17/05/2023 | Email | | |
| Lisclogher West | Shannon Flood Risk State Agency Co-ordination Working Group | General Email Contact | 17/05/2023 | Email | | |
| Lisclogher West | Sustainable Water Action Network (SWAN) | http://www.swanireland.ie;/ | 17/05/2023 | Email | | |
| Lisclogher West | Trinity College Dublin | General Email Contact | 17/05/2023 | Email | | |
| Lisclogher West | Turf Cutters and Contractors Association | General Email Contact | 17/05/2023 | Email | | |
| Lisclogher West | UCD / Irish Rural Link | General Email Contact | 17/05/2023 | Email | | |
| Lisclogher West | University College Dublin | General Email Contact | 17/05/2023 | Email | | |
| Lisclogher West | Waterways Ireland Org | General Email Contact | 17/05/2023 | Email | | |

| Bog Name | Contact Organisation | Contact Name | Date of Issue | Format | Date Response Received | Response Format |
|---|---|---|---|---|---|---|
| Lisclogher West | Woodlands of Ireland | info@woodlandsofireland woodlandsofireland | 17/05/2023 | Email | | |
| Lisclogher West | University of Galway | General Email Contact | 17/05/2023 | Email | | |
| Lisclogher West | Westmeath County Council | General Email Contact | 17/05/2023 | Email | | |
| Lisclogher West | Chief Executive Westmeath County Council | General Email Contact | 17/05/2023 | Email | | |
| Lisclogher West | Westmeath County Council - Heritage Officer | Westmeath County Council | 17/05/2023 | Email | | |
| Lisclogher West | Westmeath County Councillors – Mullingar -Kinnegad | John Shaw | 17/05/2023 | Email | | |
| Lisclogher West | Westmeath County Councillors – Mullingar -Kinnegad | Emily Wallace | 17/05/2023 | Email | | |
| Lisclogher West | Westmeath County Councillors – Mullingar -Kinnegad | Andrew Duncan | 17/05/2023 | Email | | |
| Lisclogher West | Westmeath County Councillors – Mullingar -Kinnegad | Michael Dollard | 17/05/2023 | Email | | |
| Lisclogher West | Westmeath County Councillors – Mullingar -Kinnegad | Aoife Davitt | 17/05/2023 | Email | | |

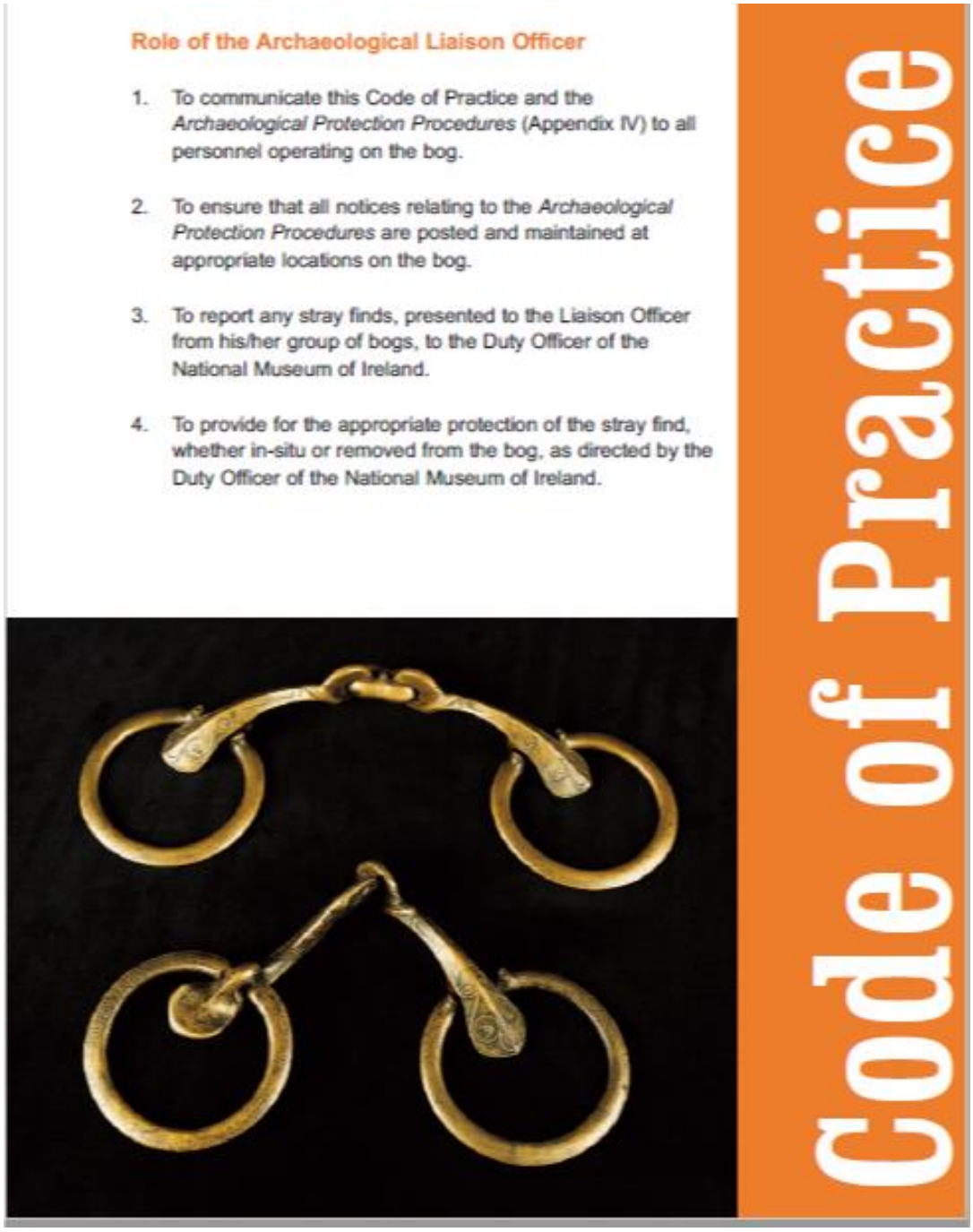
| Bog Name | Contact Organisation | Contact Name | Date of Issue | Format | Date Response Received | Response Format |
|---|---|---|---|---|---|---|
| Lisclogher West | Westmeath County Councillors – Mullingar -Kinnegad | Denis Leonard | 17/05/2023 | Email | | |
| Lisclogher West | Westmeath County Councillors – Mullingar -Kinnegad | Ken Glynn | 17/05/2023 | Email | | |
| Lisclogher West | Westmeath County Councillors – Mullingar -Kinnegad | Hazel Smyth | 17/05/2023 | Email | | |
| Lisclogher West | Westmeath County Councillors – Mullingar -Kinnegad | Billy Collentine | 17/05/2023 | Email | | |
| Lisclogher West | Westmeath County Councillors – Mullingar -Kinnegad | Frank McDermott | 17/05/2023 | Email | | |
| Lisclogher West | Westmeath County Councillors – Mullingar -Kinnegad | Paddy Hill | 17/05/2023 | Email | | |
| Lisclogher West | Minister of State at the Department of Housing, Local Government and Heritage | General Email Contact | 17/05/2023 | Email | | |
| Lisclogher West | Minister of State at the Department of Enterprise, Trade and Employment | General Email Contact | 17/05/2023 | Email | | |
| Lisclogher West | All Land- owners in vicinity of bog | Leaflet Drop | 24/05/2023 | Leaflet | | |

**Table APX -2 Response summary from Consultees contacted**

| Organisation | Summary of Response by Stakeholder | BnM Response |
|---|---|---|
| Department of Housing, Local Government and Heritage | The Department of Housing, Local Government and Heritage responded via email on 24/05/2023 to acknowledge receipt of the rehabilitation consultation email. | No response required. |
| National Museum of Ireland | Email received on 01/06/2023 to advise that the National Museum of Ireland will shortly issue an overall collective response in respect of the email received regarding this particular bog and the other bogs which we have been consulted upon. | No response required. |
| An Taisce | General comment received by email on 22/05/2023 on the email address to be used for planning consultations. | No response required. |
| BirdWatch Ireland | Email received on 24/05/2023 regarding protection of breeding birds from machinery disturbance during rehabilitation works. | Email sent 29/05/2023 |
| Office of Public Works (OPW) | OPW responded via e-mail on 30/05/2023 and queried potential for impacts on Arterial Drainage Maintenance and future drainage maintenance on the OPW Boyne scheme channels, namely C1/32/7/3 and C1/32/23. | Dialogue is ongoing. |
| Irish farmers Association | A submission via email was received from the IFA on the 07/06/2023. The submission raises multiple concerns with the proposed rehabilitation works including flooding, health and safety, turf cutting and property value. | Email sent 08/06/2023 |

| Organisation | Summary of Response by Stakeholder | BnM Response |
|---|---|---|
| Irish Wildlife Trust | Acknowledgement of receipt of email received from IWT on the 06/06/2023. | No response required. |
| Delvin & District Gun Club | A submission via email was received from Delvin & District Gun Club on the 16/06/2023. The submission raises the issue of stewardship post rehabilitation works and potential involvement in the overall project. | Dialogue is ongoing. |

## APPENDIX XII ARCHAEOLOGY



22

Code of Practice

5. To arrange for the delivery or collection of the stray find, as directed by the Duty Officer of the National Museum of Ireland.

6. To complete the Report of Discovery of Archaeological Object(s) in Bogs (Appendix V), as directed by the Duty Officer of the National Museum of Ireland.

7. To maintain a file of all stray finds and associated documentation and provide copies to the Project Archaeologist.

8. To provide assistance, where required, to the Department during archaeological surveys.

9. To provide assistance, where required, to Bord na Móna's Consultant Archaeologists, during investigation and mitigation of monuments.

10. To report to the Bord na Móna members on the Archaeology Management Liaison Committee any planned developments or new activities on cutaway peatland areas within his/her group of bogs.



| Bord na Móna | **Procedure: ENV017** | **Rev: 1** |
|---|---|---|
| **Title: Archaeological Findings** | **Approved: EM** | **Date:** |

**1) Purpose**

The purpose of this procedure is to describe the arrangements in Bord na Móna for findings of Archaeological material (Stray Finds).

**All objects, sites or monuments, no matter how fragmentary, are important elements of our heritage.**

**2) Procedure**

1. Check whether there are any known archaeological monuments in your area.
2. Be vigilant at all times - objects or traces of structures can be found on the field surfaces, in the drain faces, on the bog margins or caught within the mechanics of machinery.
3. If an object is found leave it in place, if it is safe to do so, note its position and immediately contact your Archaeological Liaison Officer who will assess the situation and contact the Duty Officer of the National Museum of Ireland.
4. Resist the temptation to investigate the find spot as this may disturb fragile archaeological deposits.
5. If the object is already dislodged or is in imminent danger, remove it carefully, mark its find spot and report it immediately to your Archaeological Liaison Officer.
6. Objects made of wood, leather or textile, which are removed from peat should be kept in conditions similar to those in which they are found. This can be done by packing them in peat or, if waterlogged, placing them in a clean basin of water and sealing the container. Resist the temptation to clean or remove peat from the object.
7. If timbers or other materials, such as gravel or stones, which could be part of a man-made structure are noted on the bog, mark the location and report it immediately to your Archaeological Liaison Officer. If you suspect the find is of archaeological importance, resist the temptation to expose it any further as this could result in damage to the structure.
8. Report anything that looks unnatural in the bog – your Archaeological Liaison Officer will decide whether it should be referred to the appropriate authorities.

**NOTE:** Our archaeological heritage is a finite, non-renewable resource. Once a site is destroyed its information is lost forever and we have lost the chance to understand a little more about our past, where we have come from and perhaps the opportunity to learn for the future.

Your Archaeological Liaison Officer is ……

**3) Records**

| Revision Index | | | |
|---|---|---|---|
| Revision | Date | Description of change | Approved |
| 1 | | | |
| 2 | | | |

# Archaeological Impact Assessment of Proposed Bog Decommissioning and Rehabilitation at Lisclogher West Bog, Co. Westmeath

## Report For

## Bord Na Móna Energy Ltd.

## Author

## Dr. Charles Mount

## Bord Na Móna Project Archaeologist

## Introduction

The EPA (2002) *Guidance on the process of preparing and implementing a bog rehabilitation plan* notes that the licensee should characterise the bog prior to embarking on detailed planning and implementation. This characterisation should detail how the land is classified in terms of statutory protections, e.g. as European sites, world heritage sites, RAMSAR sites, National Heritage Areas, national monuments, archaeological heritage, etc. This archaeological impact assessment report was prepared by Dr. Charles Mount for Bord na Móna Energy Ltd to fulfil this characterisation in relation to archaeological heritage. It represents the results of a desk-based assessment of the impact of proposed bog rehabilitation on c.239 hectares at Lisclogher West Bog, Co. Westmeath on the known archaeological heritage of the bog. The proposed rehabilitation actions will be a combination of measures to create wetlands and re-wet deep peat as outlined in the draft Methodology Paper for the proposed Bord na Móna Decommissioning, Rehabilitation and Restoration Scheme. These enhanced measures for Lisclogher West Bog will include:

- Raised bog restoration measures including intensive drain-blocking (7/100 m);
- Modifying outfalls, and management of water levels with overflow pipes and blocking of internal outfalls;
- Regular drain blocking (3/100) on dry cutaway along with the blocking of outfalls and management of water levels;
- Re-wetting the deep peat in the cutover areas of the bog using berms and peat dams. This enhanced measure seeks to create large (c. 45m x 60m) flat areas or cells of shallow (levels at peat surface +/- 10 cm) water conditions on bare areas and vegetated areas of cutover bog;
- Removal of conifer forestry from the high bog (Forest to Bog restoration). A small part of the high bog was planted with conifer forestry. It is proposed to remove this forestry to support raised bog restoration. Trees will be felled and removed, conifer stumps will be “flipped”, the bog surface will be reprofiled (smoothed) and the drains will be blocked to encourage the redevelopment of bog vegetation. This requires engagement and agreement with Coillte and with the Forest Service. This enhanced bog restoration measure is proposed to be carried out as a trial at Lisclogher West to learn new techniques and to inform the feasibility and potential to use these new techniques at other sites to remove conifers (See Appendix XIII).
- Removal of feral self-sown conifer trees from the high bog. Conifers from adjacent plantations have colonised the bog. These trees will be felled to waste to support raise bog restoration.
- Silt control measures will be retained and maintained during the rehabilitation phase. During the monitoring and verification phase silt ponds and silt control measures will be continually inspected and maintained, where appropriate. When it is deemed that silt ponds are not required, as the bog has been successfully stabilised and water quality parameters meet targets the condition of the silt ponds will be reviewed. Silt ponds will either be de-watered (water levels lowered to a level where the silt pond will naturally develop as a small wetland feature), left in situ, or infilled (where discharges do not require silt control).

Lisclogher West Bog is located c.2.6km south of Delvin and there is a minor road running through it for most of its length. The bog rehabilitation area occupies the townlands of Ballyhealy or Ballinure, Bolandstown, Bracklin and Martinstown on OS 6-inch sheet Westmeath No. 14.

## Methodology

This is a desk-based archaeological assessment that includes a collation of existing written and graphic information to identify the likely archaeological potential of Lisclogher West Bog. The extent of the rehabilitation area is indicated in Fig. 1. This area was examined using information from:

- The IAWU Peatland Survey
- The 2005 Peatland Survey
- The Record of Monuments and Places
- The Sites and Monuments Record (SMR) that is maintained by the Dept of Housing, Local Government and Heritage
- The Excavations database
- Previous assessments

An impact assessment has been prepared and recommendations have been made.

## Desktop assessment

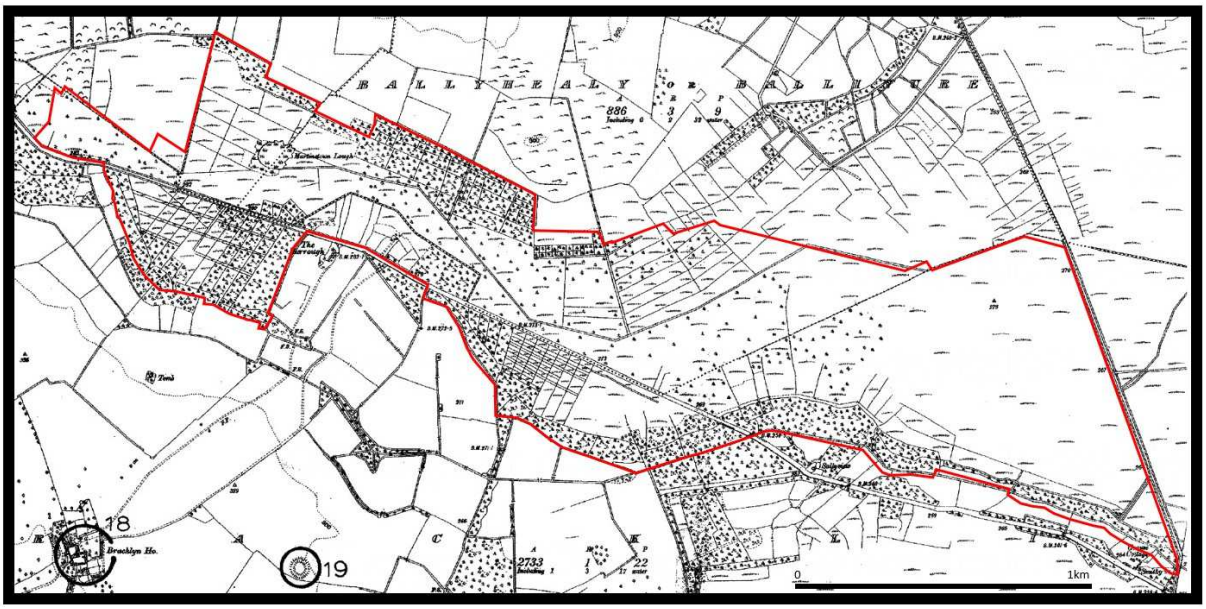



Fig. 1. Lisclogher West Bog, Co. Westmeath, detail of the Record of Monuments and Places map sheets Westmeath No. 14. The proposed rehabilitation area is outlined with the red line.

**Peatland survey**

Lisclogher West Bog was not surveyed by the Irish Archaeological Wetland Unit (IAWU).

**Recorded Monuments**

The Record of Monuments and Places (RMP) for Co. Westmeath which was established under Section 12 of the National Monuments (Amendment) Act, 1994 was examined as part of the assessment (DAHGI 1997). This record was published by the Minister in 1997 and includes sites and monuments that were known in Lisclogher West Bog before that date. This review established that there are no RMPs located in the proposed rehabilitation area (see Fig. 1).

**2005 Archaeological Survey of Ireland Peatland Survey**

Lisclogher West Bog was surveyed by ADS Ltd in 2005 as part of the Archaeological Survey of Ireland Peatland Survey (Licence No. 05E0792). No sightings of archaeological heritage were recorded during the fieldwalking survey (Whitaker 2006, 11-12).

**Archaeological Excavations**

The Excavations Bulletin at excavations.ie was checked for reports of licenced excavations carried out in the rehabilitation area. This indicates that there have been no licenced excavations carried out in the rehabilitation area.

**Sites and Monuments Record**

The Sites and Monuments Record (SMR) which is maintained by the Department of Housing, Local Government and Heritage was examined as part of the assessment on the 8th of May 2023. This review established that there are no SMRs located in the proposed rehabilitation area (see Fig. 2).




Fig. 2. Lisclogher West Bog, Co. Westmeath, detail of the Sites and Monuments Record. The proposed rehabilitation area is outlined with the red line.

**Previous assessments**

Lisclogher West Bog has been the subject of an Environmental Impact Assessment Report (EIAR) carried out by Irish Archaeological Consultancy LTD in 2018 for Bord na Móna Energy Limited in relation to IPC Licence P0500-03. This assessment included a review of the topographical files and finds registers of the National Museum of Ireland intended to identify all archaeological objects from the bog reported to the Museum by that date and these are included below in Table 1 (Pers Comm. Jane Whitaker). The assessment noted that there was a potential for archaeological heritage to be uncovered during the course of any future development works in Lisclogher West Bog.

**Reported finds**

As noted above the EIAR carried out by Irish Archaeological Consultancy LTD in in relation to IPC Licence P0500-03 contains a complete list of known archaeological objects from Lisclogher West Bog reported to the National Museum of Ireland up to 2018 (see Table 1).

| Townland | Museum No./ catalogue No. | Description |
|---|---|---|
| Lisclogher | 1954:54 | Bronze Axehead |
| Lisclogher | IA/104/1982 | 14 pieces of wood |

Table 1. List of archaeological finds from Lisclogher West Bog reported to the National Museum of Ireland.

## Impact assessment

There are no known sightings of archaeological material in the rehabilitation area. There are some archaeological objects known from the bog that have been removed to the National Museum (see Table 1).

## Recommendations

There are no known sightings of archaeological monuments in the rehabilitation area. There are some archaeological objects known from the bog that have been removed to the National Museum (see Table 1). Should any previously unknown archaeological heritage be uncovered during the rehabilitation works, it should also be avoided and reported to the Bord na Móna Archaeological Liaison Officer and the National Museum of Ireland.

## Conclusion

This is a desk-based archaeological assessment and includes a collation of existing written and graphic information to identify the likely archaeological potential of the proposed rehabilitation area. Lisclogher West Bog was surveyed by ADS Ltd in 2005 as part of the Archaeological Survey of Ireland Peatland Survey and no sightings of archaeological heritage were recorded. There are no known sightings of archaeological monuments in the rehabilitation area. There are some archaeological objects known from the bog that have been removed to the national Museum (see Table 1). Should any previously unknown archaeological heritage be uncovered during the rehabilitation works, it should also be avoided and reported to the Bord na Móna Archaeological Liaison Officer and the National Museum of Ireland.

## References

DAHGI 1997. Recorded Monuments Protected under Section 12 of the National Monuments (Amendment) Act, 1994. County Westmeath.

EPA 2020. Guidance on the process of preparing and implementing a bog rehabilitation plan.

Mackin *et al.* 2017. Best practice in raised bog restoration in Ireland. Irish Wildlife Manuals, No. 99. National Parks and Wildlife Service.

Whitaker, J. 2006. Peatland Survey 2005 Allen, Kilberry & Coolnamóna Bogs Counties Kildare, Laois, Meath, Offaly, & Westmeath. Unpublished report for Department of the Environment, Heritage and Local Government.

Dr. Charles Mount
9 May 2023

# APPENDIX XIII. WATER QUALITY MONITORING RESULTS FOR LISCLOGHER WEST BOG

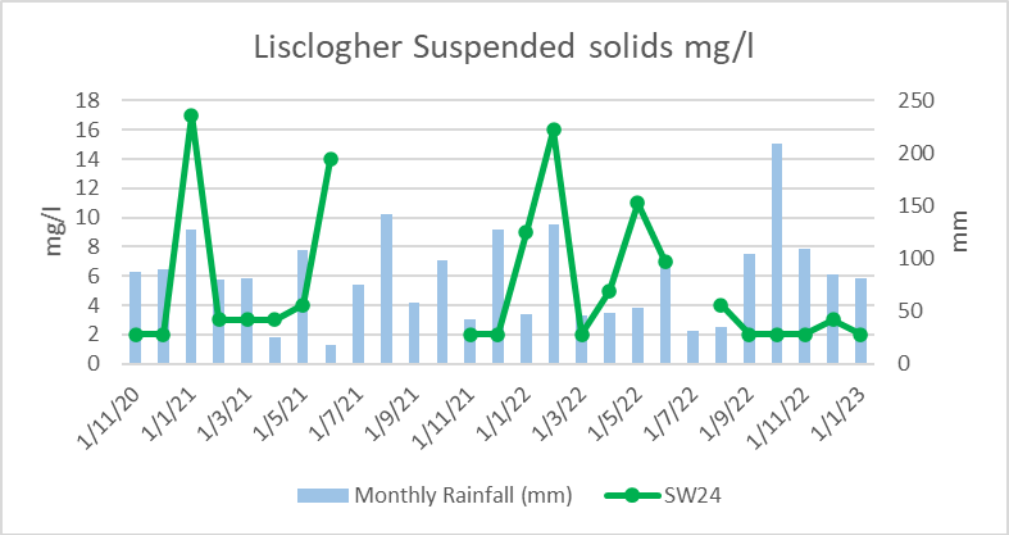



*Plate 12-1 Results of suspended solids monitoring at Lisclogher West November 2020 - January 2023*

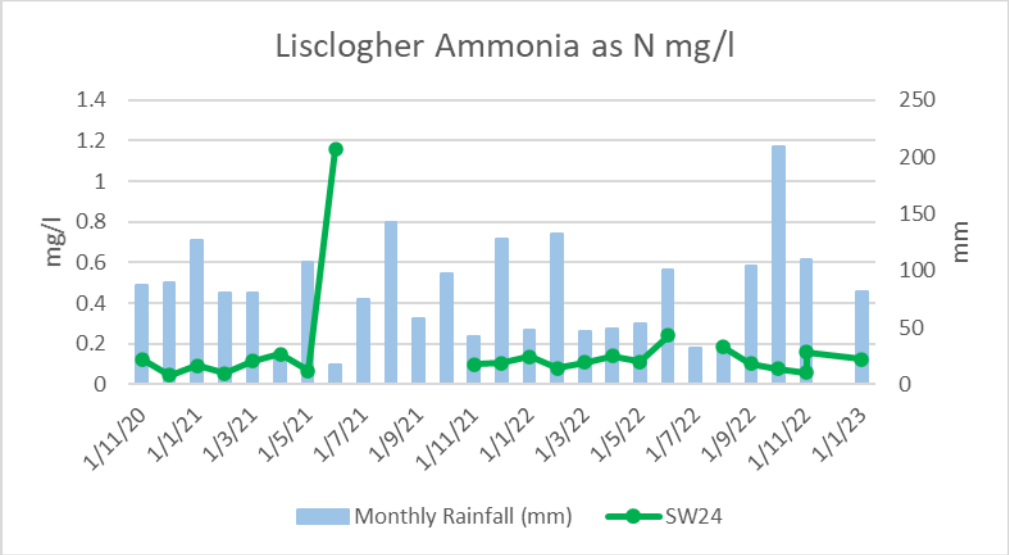



*Plate 12-2 Results of Ammonia monitoring at Lisclogher West November 2020 - January 2023*

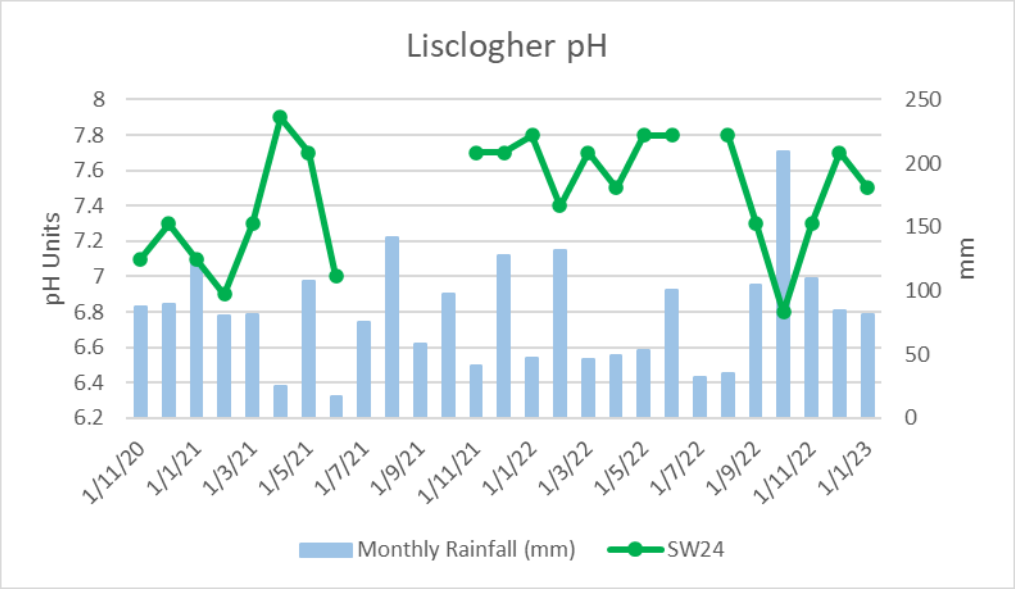



*Plate 12-3 Results of pH monitoring at Lisclogher West November 2020 - January 2023*

Table AP12.1. Water quality data for 12 months from November 2020 to Dec 2021 at Lisclogher West bog.

| PCAS SW Sampling Scheme | | | | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids | Suspended Solids |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bog Group | Licence No | Bog Name | SW Code -GIS | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l |
| | | | | 1/11/20 | 1/12/20 | 1/1/21 | 1/2/21 | 1/3/21 | 1/4/21 | 1/5/21 | 1/6/21 | 1/7/21 | 1/8/21 | 1/9/21 | 1/10/21 | 1/11/21 | 1/12/21 | 1/1/22 | 1/2/22 | 1/3/22 | 1/4/22 | 1/5/22 | 1/6/22 | 1/7/22 | 1/8/22 | 1/9/22 | 1/10/22 | 1/11/22 | 1/12/22 | 1/1/23 |
| Derrygreenagh | P0501-01 | Lisclogher | SW24 | 2 | 2 | 17 | 3 | 3 | 3 | 4 | 14 | N/F | N/F | N/F | N/F | 2 | 2 | 9 | 16 | 2 | 5 | 11 | 7 | | 4 | 2 | 2 | 2 | 3 | 2 | |
| | | | Monthly Rainfall (mm) | 87.7 | 89.3 | 126.9 | 80.3 | 80.9 | 25.5 | 107.4 | 17.4 | 74.9 | 142.1 | 58.1 | 97.7 | 41.6 | 128 | 47.6 | 131.8 | 46.2 | 48.7 | 53.4 | 100.6 | 31.6 | 35.2 | 104.1 | 208.8 | 109.3 | 84.5 | 81.1 | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PCAS SW Sampling Scheme | | | | Colour | Colour | Colour | Colour | Colour | Colour | Colour | Colour | Colour | Colour | Colour | Colour | Colour | Colour | Colour | Colour | Colour | Colour | Colour | Colour | Colour | Colour | Colour | Colour | Colour | Colour | Colour |
| Bog Group | Licence No | Bog Name | SW Code -GIS | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co | mg/l Pt Co |
| | | | | 1/11/20 | 1/12/20 | 1/1/21 | 1/2/21 | 1/3/21 | 1/4/21 | 1/5/21 | 1/6/21 | 1/7/21 | 1/8/21 | 1/9/21 | 1/10/21 | 1/11/21 | 1/12/21 | 1/1/22 | 1/2/22 | 1/3/22 | 1/4/22 | 1/5/22 | 1/6/22 | 1/7/22 | 1/8/22 | 1/9/22 | 1/10/22 | 1/11/22 | 1/12/22 | 1/1/23 | |
| Derrygreenagh | P0501-01 | Lisclogher | SW24 | 354 | 224 | 471 | 271 | 204 | 222 | 522 | 388 | N/F | N/F | N/F | N/F | 342 | 274 | 265 | 456 | 324 | 404 | 276 | 283 | N/F | 178 | 471 | 569 | 358 | 253 | 341 | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PCAS SW Sampling Scheme | | | | COD | COD | COD | COD | COD | COD | COD | COD | COD | COD | COD | COD | COD | COD | COD | COD | COD | COD | COD | COD | COD | COD | COD | COD | COD | COD | COD |
| Bog Group | Licence No | Bog Name | SW Code -GIS | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l |
| | | | | 1/11/20 | 1/12/20 | 1/1/21 | 1/2/21 | 1/3/21 | 1/4/21 | 1/5/21 | 1/6/21 | 1/7/21 | 1/8/21 | 1/9/21 | 1/10/21 | 1/11/21 | 1/12/21 | 1/1/22 | 1/2/22 | 1/3/22 | 1/4/22 | 1/5/22 | 1/6/22 | 1/7/22 | 1/8/22 | 1/9/22 | 1/10/22 | 1/11/22 | 1/12/22 | 1/1/23 | |
| Derrygreenagh | P0501-01 | Lisclogher | SW24 | 71 | 41 | 93 | 62 | 52 | 44 | 90 | 88 | N/F | N/F | N/F | N/F | 56 | 59 | 58 | 87 | 62 | 75 | 58 | 52 | N/F | 36 | 92 | 113 | 88 | 58 | 68 | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PCAS SW Sampling Scheme | | | | pH | pH | pH | pH | pH | pH | pH | pH | pH | pH | pH | pH | Ph | Ph | pH | pH | pH | pH | pH | pH | Ph | Ph | Ph | Ph | Ph | Ph | pH |
| Bog Group | Licence No | Bog Name | SW Code -GIS | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units | pH Units |
| | | | | 1/11/20 | 1/12/20 | 1/1/21 | 1/2/21 | 1/3/21 | 1/4/21 | 1/5/21 | 1/6/21 | 1/7/21 | 1/8/21 | 1/9/21 | 1/10/21 | 1/11/21 | 1/12/21 | 1/1/22 | 1/2/22 | 1/3/22 | 1/4/22 | 1/5/22 | 1/6/22 | 1/7/22 | 1/8/22 | 1/9/22 | 1/10/22 | 1/11/22 | 1/12/22 | 1/1/23 | |
| Derrygreenagh | P0501-01 | Lisclogher | SW24 | 7.1 | 7.3 | 7.1 | 6.9 | 7.3 | 7.9 | 7.7 | 7 | N/F | N/F | N/F | N/F | 7.7 | 7.7 | 7.8 | 7.4 | 7.7 | 7.5 | 7.8 | 7.8 | | 7.8 | 7.3 | 6.8 | 7.3 | 7.7 | 7.5 | |
| | | | Monthly Rainfall (mm) | 87.7 | 89.3 | 126.9 | 80.3 | 80.9 | 25.5 | 107.4 | 17.4 | 74.9 | 142.1 | 58.1 | 97.7 | 41.6 | 128 | 47.6 | 131.8 | 46.2 | 48.7 | 53.4 | 100.6 | 31.6 | 35.2 | 104.1 | 208.8 | 109.3 | 84.5 | 81.1 | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PCAS SW Sampling Scheme | | | | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P | TP as P |
| Bog Group | Licence No | Bog Name | SW Code -GIS | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l |
| | | | | 1/11/20 | 1/12/20 | 1/1/21 | 1/2/21 | 1/3/21 | 1/4/21 | 1/5/21 | 1/6/21 | 1/7/21 | 1/8/21 | 1/9/21 | 1/10/21 | 1/11/22 | 1/12/21 | 1/1/22 | 1/2/22 | 1/3/22 | 1/4/22 | 1/5/22 | 1/6/22 | 1/7/22 | 1/8/22 | 1/9/22 | 1/10/22 | 1/11/22 | 1/12/22 | 1/1/23 | |
| Derrygreenagh | P0501-01 | Lisclogher | SW24 | 0.09 | 0.05 | 0.09 | 0.05 | 0.08 | 0.05 | 0.05 | 0.25 | N/F | N/F | N/F | N/F | 0.05 | 0.05 | 0.06 | 0.07 | 0.05 | 0.06 | 0.07 | 0.11 | N/F | 0.06 | 0.06 | 0.06 | 0.05 | 0.05 | 0.05 | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PCAS SW Sampling Scheme | | | | TS | TS | TS | TS | TS | TS | TS | TS | TS | TS | TS | TS | TS | TS | TS | TS | TS | TS | TS | TS | TS | TS | TS | TS | TS | TS | TS |
| Bog Group | Licence No | Bog Name | SW Code -GIS | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l |
| | | | | 1/11/20 | 1/12/20 | 1/1/21 | 1/2/21 | 1/3/21 | 1/4/21 | 1/5/21 | 1/6/21 | 1/7/21 | 1/8/21 | 1/9/21 | 1/10/21 | 1/11/21 | 1/12/21 | 1/1/22 | 1/2/22 | 1/3/22 | 1/4/22 | 1/5/22 | 1/6/22 | 1/7/22 | 1/8/22 | 1/9/22 | 1/10/22 | 1/11/22 | 1/11/22 | 1/1/23 | |
| Derrygreenagh | P0501-01 | Lisclogher | SW24 | 198 | 154 | 144 | 150 | 186 | 377 | 311 | 425 | N/F | N/F | N/F | N/F | 427 | 374 | 443 | 362 | 310 | 297 | 384 | 413 | N/F | 466 | 291 | 255 | 427 | 419 | 410 | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PCAS SW Sampling Scheme | | | | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N | Ammonia as N |
| Bog Group | Licence No | Bog Name | SW Code -GIS | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l |
| | | | | 1/11/20 | 1/12/20 | 1/1/21 | 1/2/21 | 1/3/21 | 1/4/21 | 1/5/21 | 1/6/21 | 1/7/21 | 1/8/21 | 1/9/21 | 1/10/21 | 1/11/21 | 1/12/21 | 1/1/22 | 1/2/22 | 1/3/22 | 1/4/22 | 1/5/22 | 1/6/22 | 1/7/22 | 1/8/22 | 1/9/22 | 1/10/22 | 1/11/22 | 1/11/22 | 1/1/23 | |
| Derrygreenagh | P0501-01 | Lisclogher | SW24 | 0.124 | 0.044 | 0.094 | 0.055 | 0.114 | 0.149 | 0.066 | 1.16 | N/F | N/F | N/F | N/F | 0.1 | 0.105 | 0.138 | 0.079 | 0.107 | 0.139 | 0.111 | 0.242 | | 0.184 | 0.102 | 0.077 | 0.058 | 0.158 | 0.123 | |
| | | | Monthly Rainfall (mm) | 87.7 | 89.3 | 126.9 | 80.3 | 80.9 | 25.5 | 107.4 | 17.4 | 74.9 | 142.1 | 58.1 | 97.7 | 41.6 | 128 | 47.6 | 131.8 | 46.2 | 48.7 | 53.4 | 100.6 | 31.6 | 35.2 | 104.1 | 208.8 | 109.3 | 84.5 | 81.1 | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PCAS SW Sampling Scheme | | | | DOC | DOC | DOC | DOC | DOC | DOC | DOC | DOC | DOC | DOC | DOC | DOC | DOC | DOC | DOC | DOC | DOC | DOC | DOC | DOC | DOC | DOC | DOC | DOC | DOC | DOC | DOC |
| Bog Group | Licence No | Bog Name | SW Code -GIS | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l |
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| Derrygreenagh | P0501-01 | Lisclogher | SW24 | 30 | 19.6 | 29.6 | 21.3 | 20.4 | 16.2 | 32.5 | 27.2 | N/F | N/F | N/F | N/F | 26 | 24 | 21.3 | 31.9 | 24.6 | 28.9 | 20.4 | 19.4 | N/F | 15 | 34 | 44.3 | 32.1 | 21.9 | 25.8 | |

## APPENDIX XIV. FOREST TO BOG RESTORATION.

There have been several case-studies and examples of the removal of planted conifer forestry from raised and blanket bogs to support raised bog restoration in Ireland and Britain. Mackin et al. (2017) provided case studies and guidance for the removal of forestry from raised bogs carried out Coillte in Ireland. Key issues include

- establishing if a forestry crop is commercially viable;
- ground conditions, the use of a forestry harvester and the use of brash;
- limiting impacts to the bog surface;
- the potential for peat-forming bog vegetation;
- blocking forestry drains;
- timing of forestry operations;
- re-planting obligations;
- re-growth of trees.

Forest to bog restoration is gaining more and more interest in Scotland, Wales and England, particularly when considering the value of peatlands as a carbon store, carbon sink potential and other ecosystem services like biodiversity. Forest to bog restoration is seen as one way to lower carbon emissions from areas of peatlands that were planted with forestry (Hermans et al. 2019, Anderson 2021). It may take 15-20 years after restoration before there is a net positive climate action impact. Forest biomass (the timber) is a sink for carbon and forest to bog restoration is only recommended for conifer stands where there is a low conifer yield class. However, the long-term climate action benefit of continued forestry management on these deep peats is not likely to match the benefits of peatland restoration.

Felled-to-waste restoration (felling trees and allowing them to decompose naturally) has largely been replaced by newer management approaches (whole tree harvest, re-profiling, furrow blocking), which have the potential to accelerate recovery of water table and vegetation (Anderson 2017, Hermans et al. 2019, Anderson 2021). One key issue highlighted by the original trials and research was the regrowth of trees that were colonising the somewhat drier low ridges in the peatland that were originally created when the peatland was drained. New methods to counteract this issue include re-profiling of the drained peatland surface to flatten out this mico-topography. This includes stump-flipping, where conifer stumps are pulled out and pushed back into the bog to remove a slightly drier mound. Surface smoothing is a technique that flattens out the ridges created by drainage. These new techniques, in addition to drain-blocking, create a surface where there are optimised water levels close to the bog surface and this will help reduce new tree colonisation as the bog is recovering.

Bord na Móna worked with NPWS and private contractors to apply these techniques to a small area of Carrenagappaul Bog, Co. Galway as part of the recent Living Bog LIFE Project.

The Forestry Commission in England (Forestry Commission 2022) have recently published a draft decision-making support tool to support decisions about forestry and peat, when to restore peatlands, when to re-plant forestry, when to fell and allow development of a different habitat and when to establish new woodland/forestry on peat soils. The application of this tool to the conifer forestry on the Lisclogher West site indicates that forest to bog restoration is appropriate as:

- This is a deep peat raised bog site with peat depths of between 3-6 m.
- There is important habitat on site (Annex I degraded raised bog capable of restoration)
- The conifer trees are likely to be having a negative impact of the condition of this habitat.

- This overall site (Lisclogher West Bog) has been identified as having high restoration potential and is targeted for restoration.
- The yield class for the planted conifers on the bog is less than YC10.

It is proposed to trial forest to bog restoration at Lisclogher West Bog. The target area (approx. 7 ha) is relatively small and suitable to be developed as a trial. Trees will be felled and removed, conifer stumps will be "flipped", the bog surface will be reprofiled (smoothed) and the drains will be blocked to encourage the redevelopment of bog vegetation. Bord na Móna will engage with practitioners of forest to bog restoration in Britain to be able to apply these new techniques at Lisclogher West. This trial will allow Bord na Móna to learn new forest to bog techniques and will inform the feasibility and potential to use these new techniques at other sites to remove conifers. The first step of this proposed restoration is to engage and reach agreement with Coillte and with the Forest Service.

Bord na Móna

# Lisclogher West Bog
# Rehab Plan
# GIS Map Book
# 2023

MAKING COMPLEX EASY

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# Bog Site Information Maps

**BNM-DR-24-19-01: Site Location Map**

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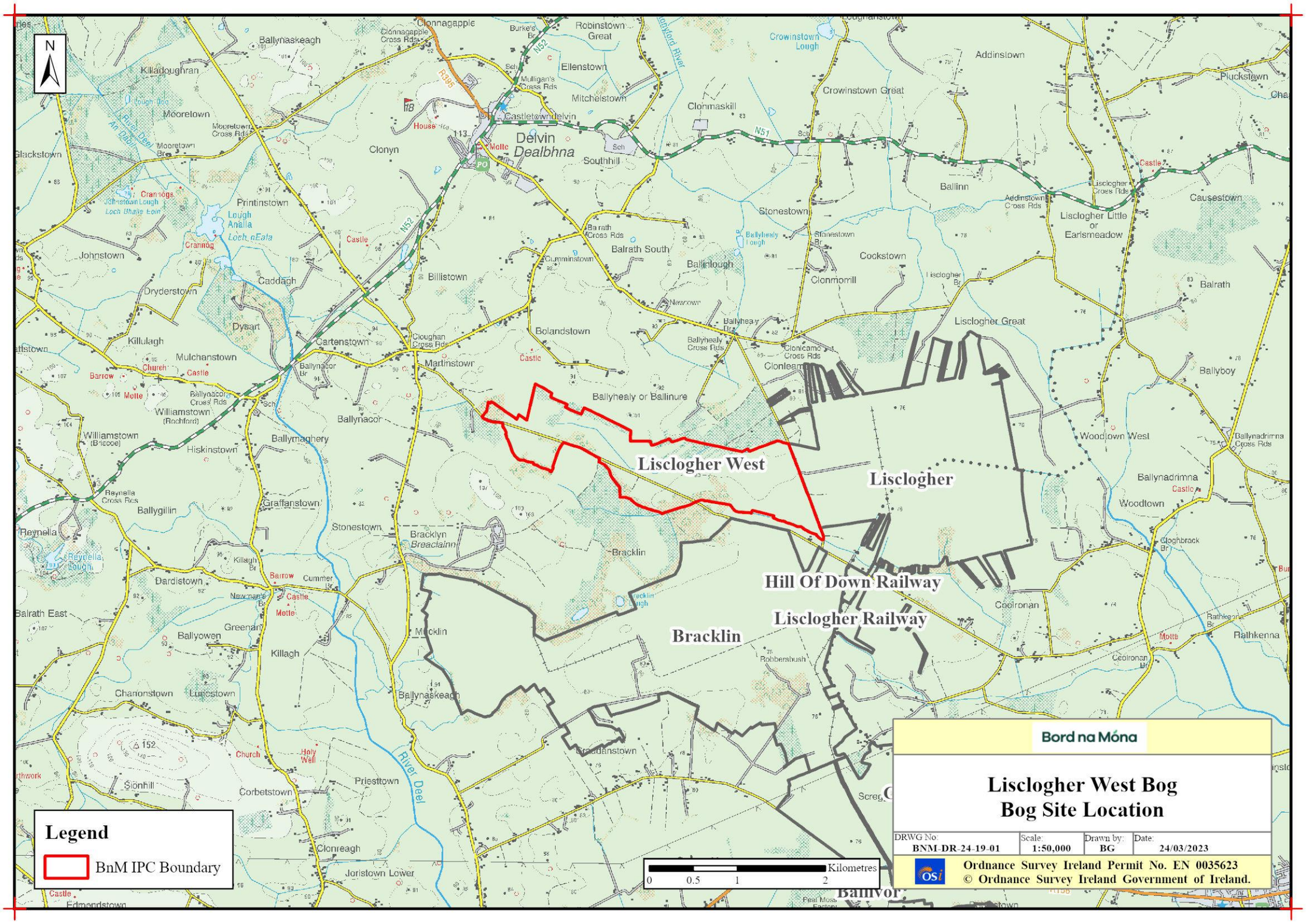

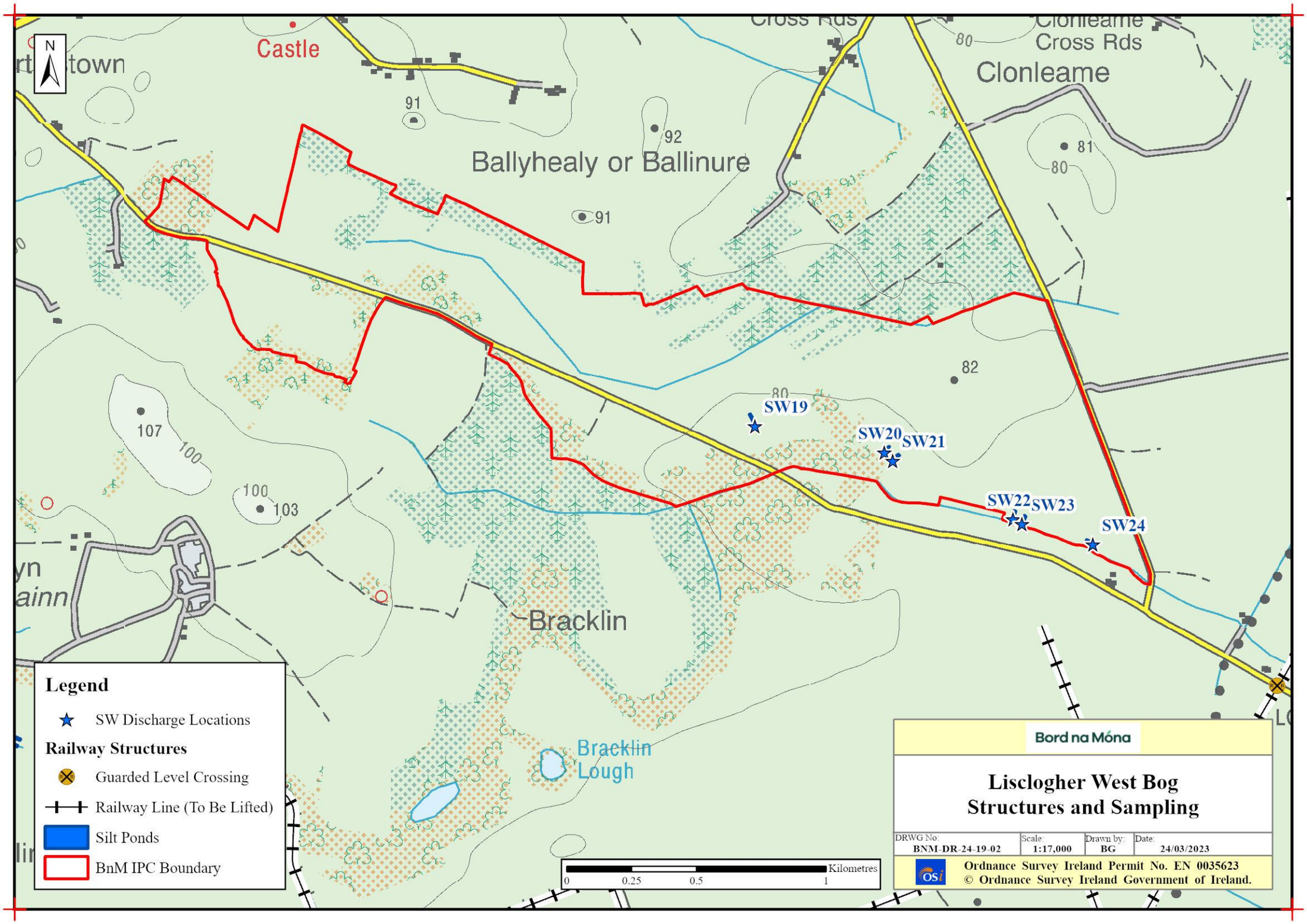
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103
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SW21
SW22
SW23
SW24
Bracklin
Bracklin
Lough
Legend
SW Discharge Locations
Railway Structures
Guarded Level Crossing
Railway Line (To Be Lifted)
Silt Ponds
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Kilometres
Bord na Móna
Lisclogher West Bog
Structures and Sampling
DRWG No: BNM-DR-24-19-02
Scale: 1:17,000
Drawn by: BG
Date: 24/03/2023
Ordnance Survey Ireland Permit No. EN 0035623
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**BNM-DR-24-19-04: Peat Depths**

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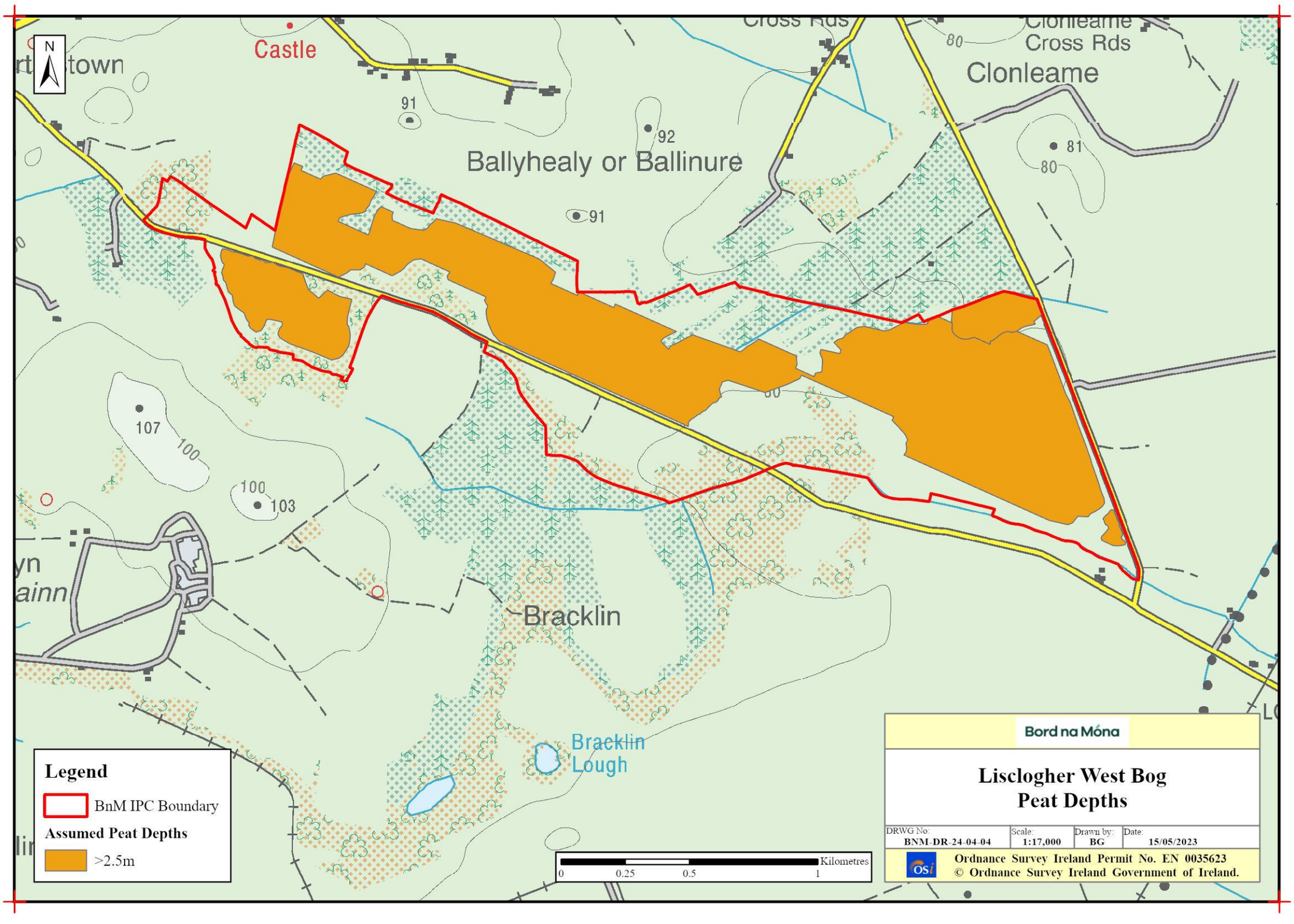

**BNM-DR-24-19-17: Current Habitat Map**

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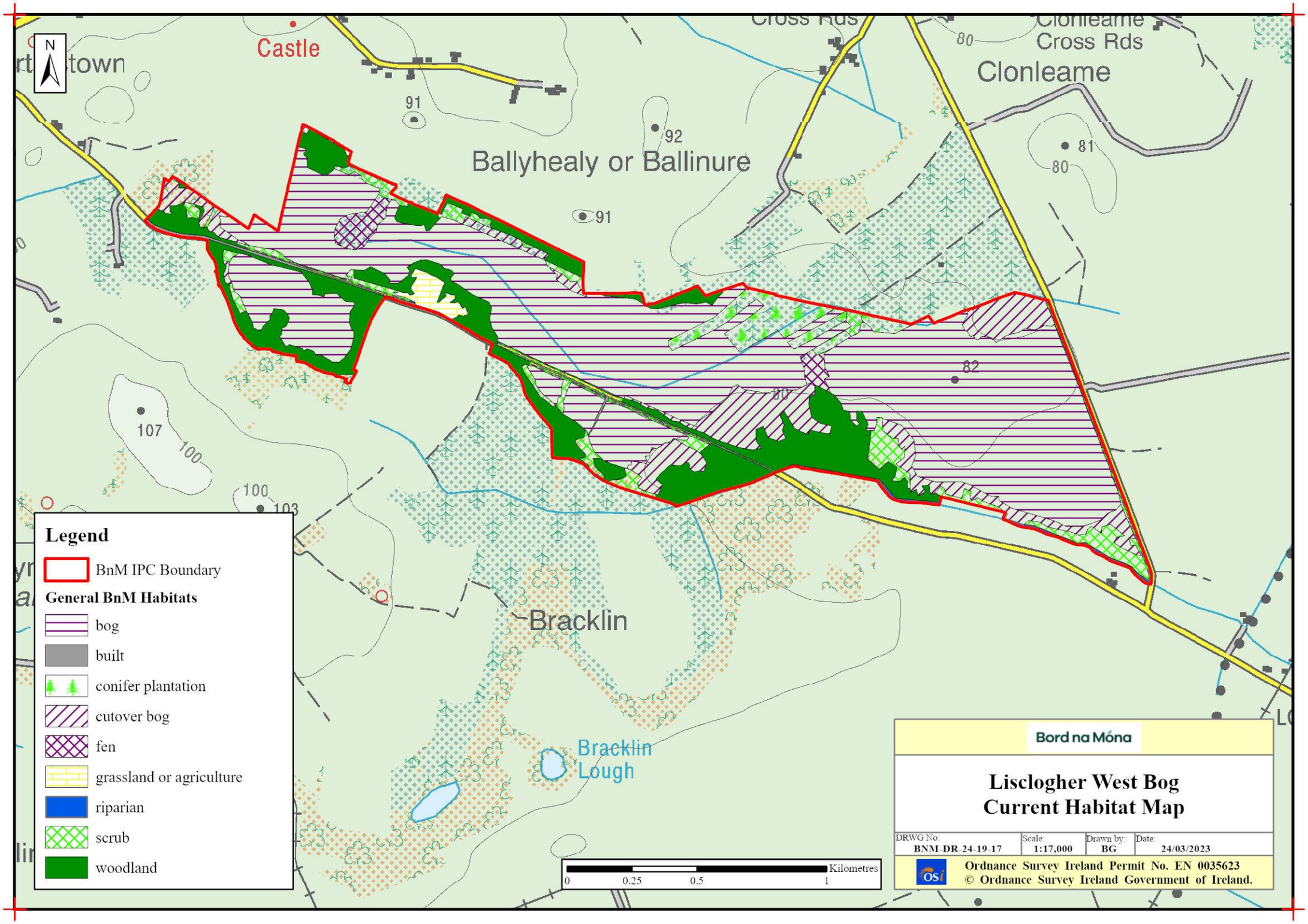

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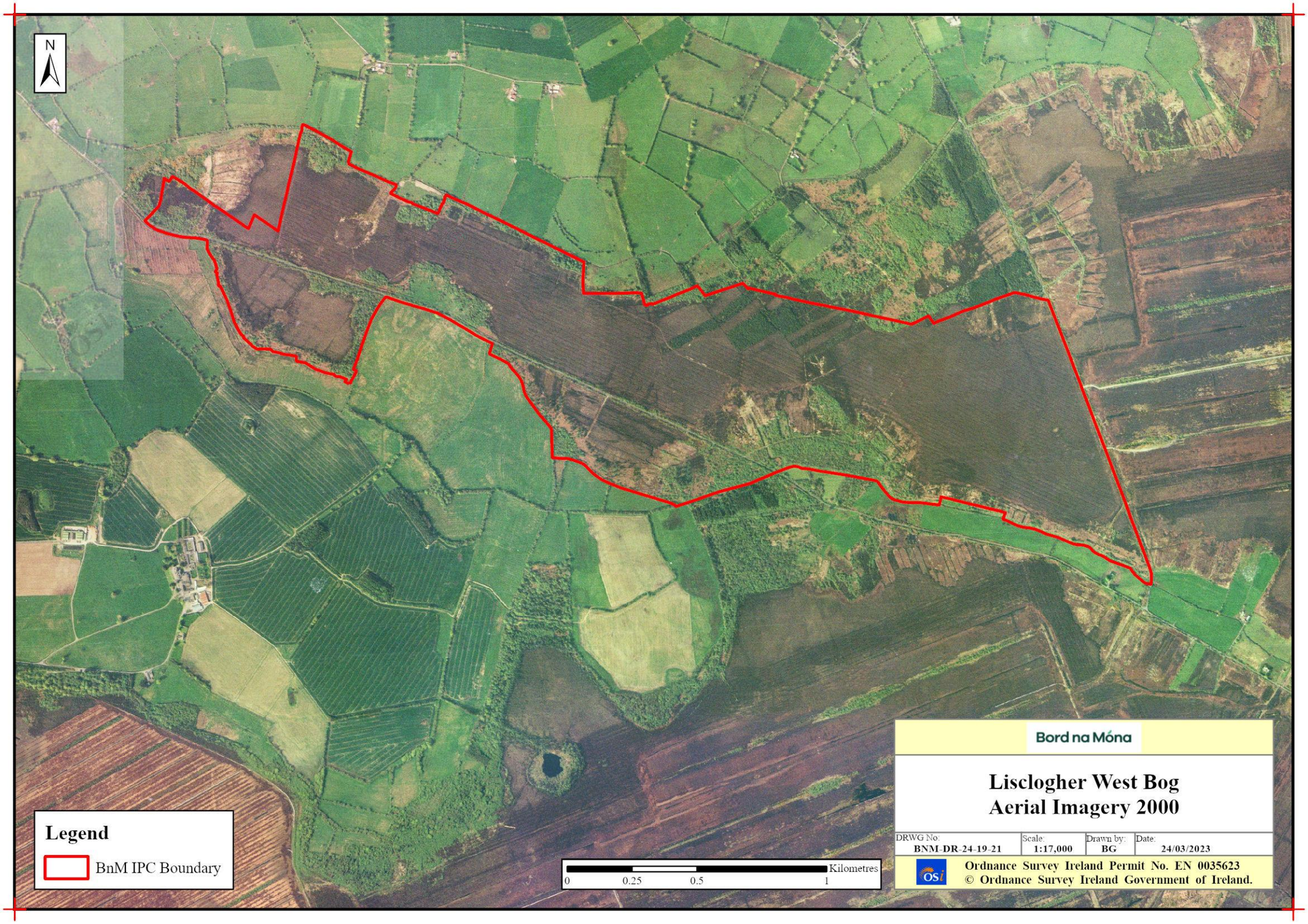

**BNM-DR-24-19-22: Aerial Imagery 2020**

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**BNM-DR-24-19-23: Proximity Designated Sites**

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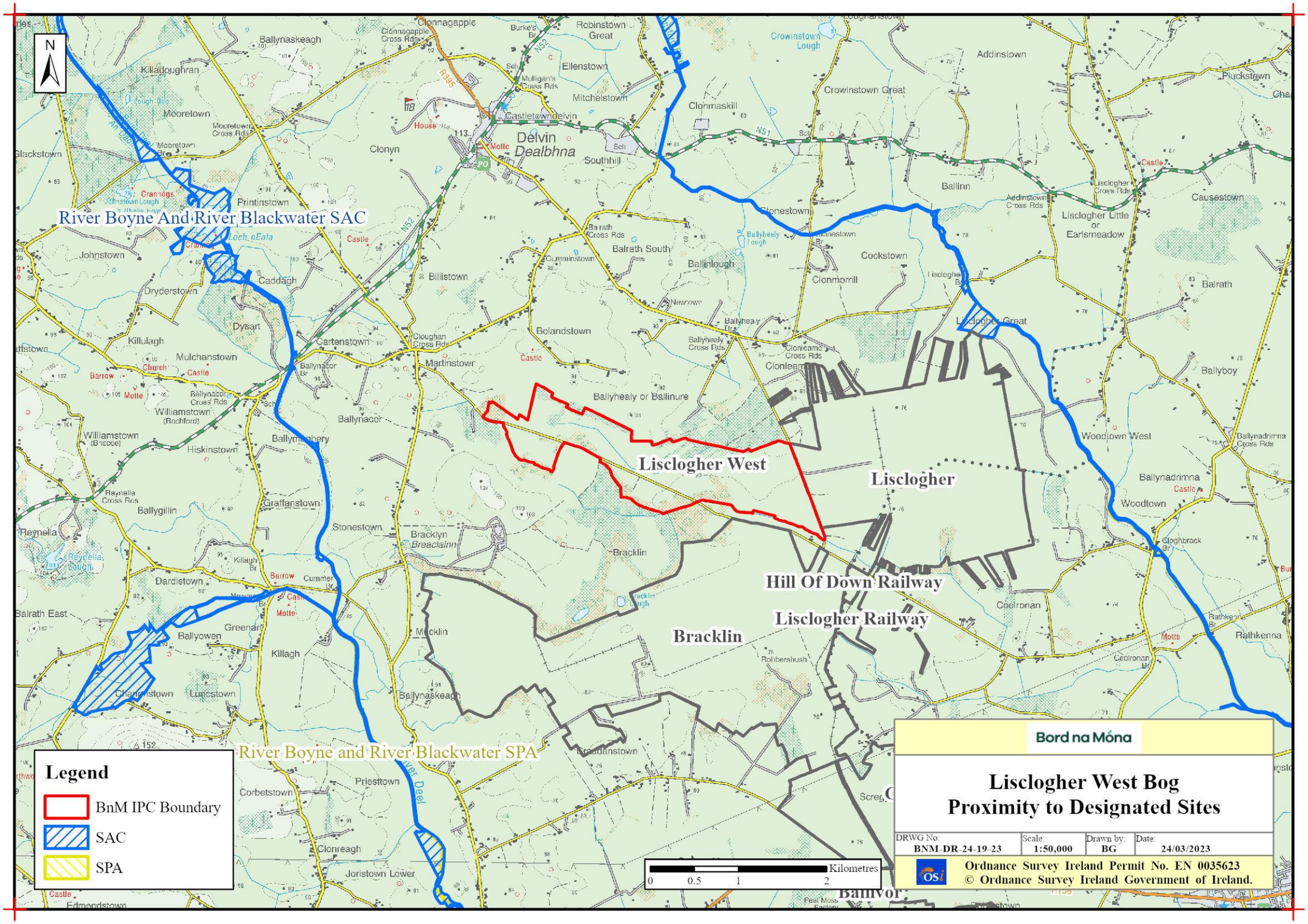

**BNM-DR-24-19-24: Bog Group Map**

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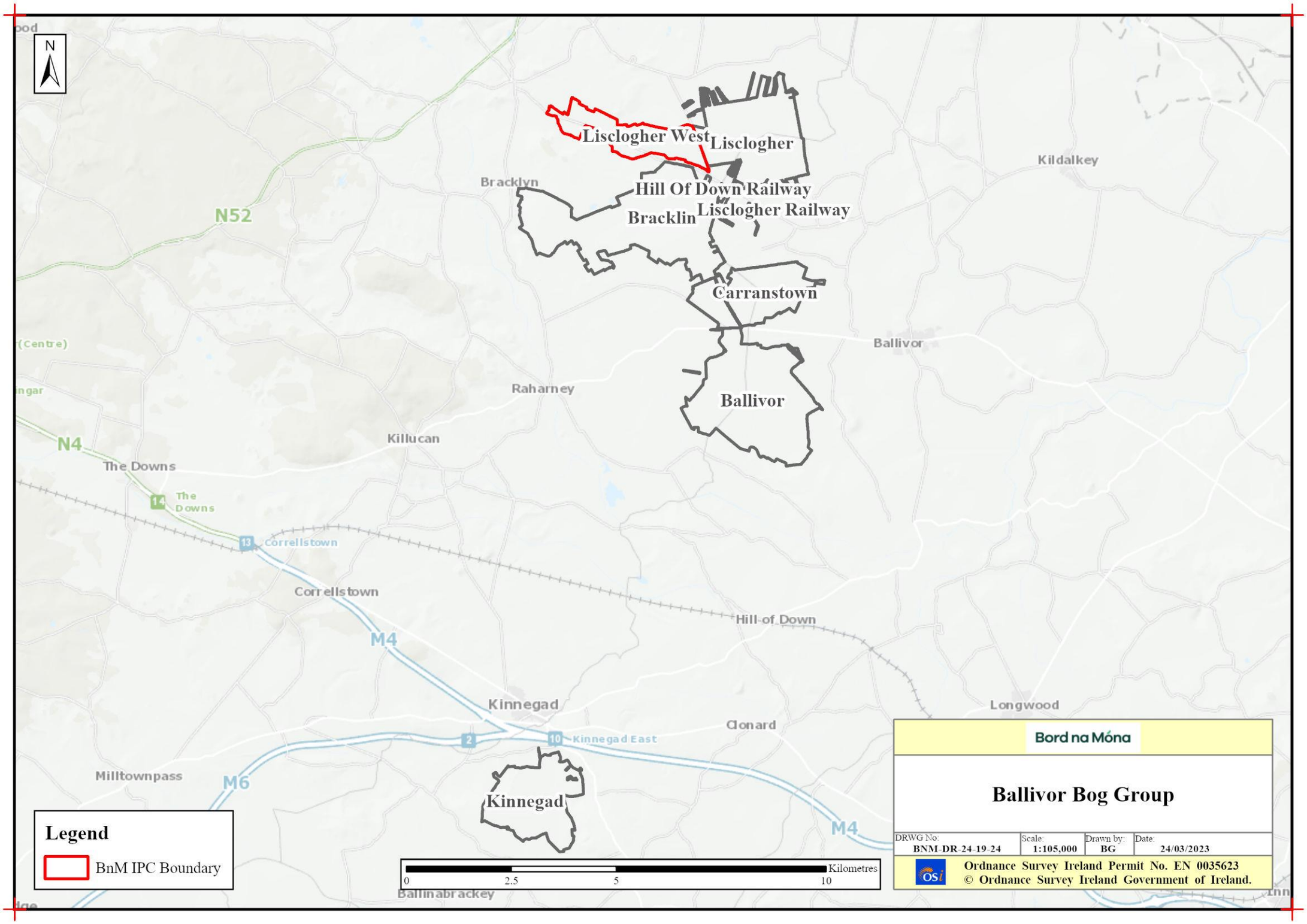

# Hydrology / Topography Maps

**BNM-DR-24-19-WQ01: Water Quality Map**

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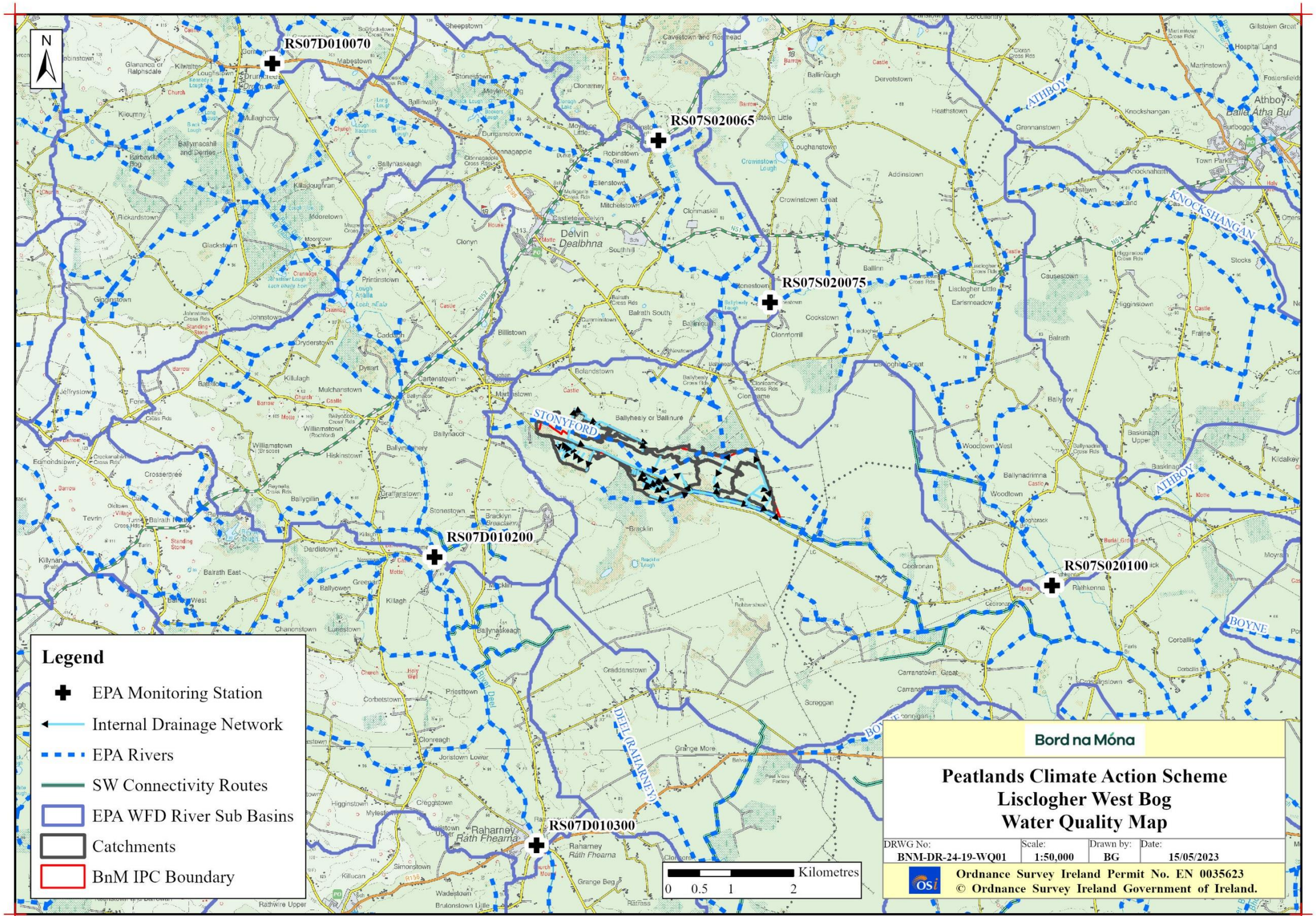

**BNM-DR-24-19-SP01: Sampling Points**

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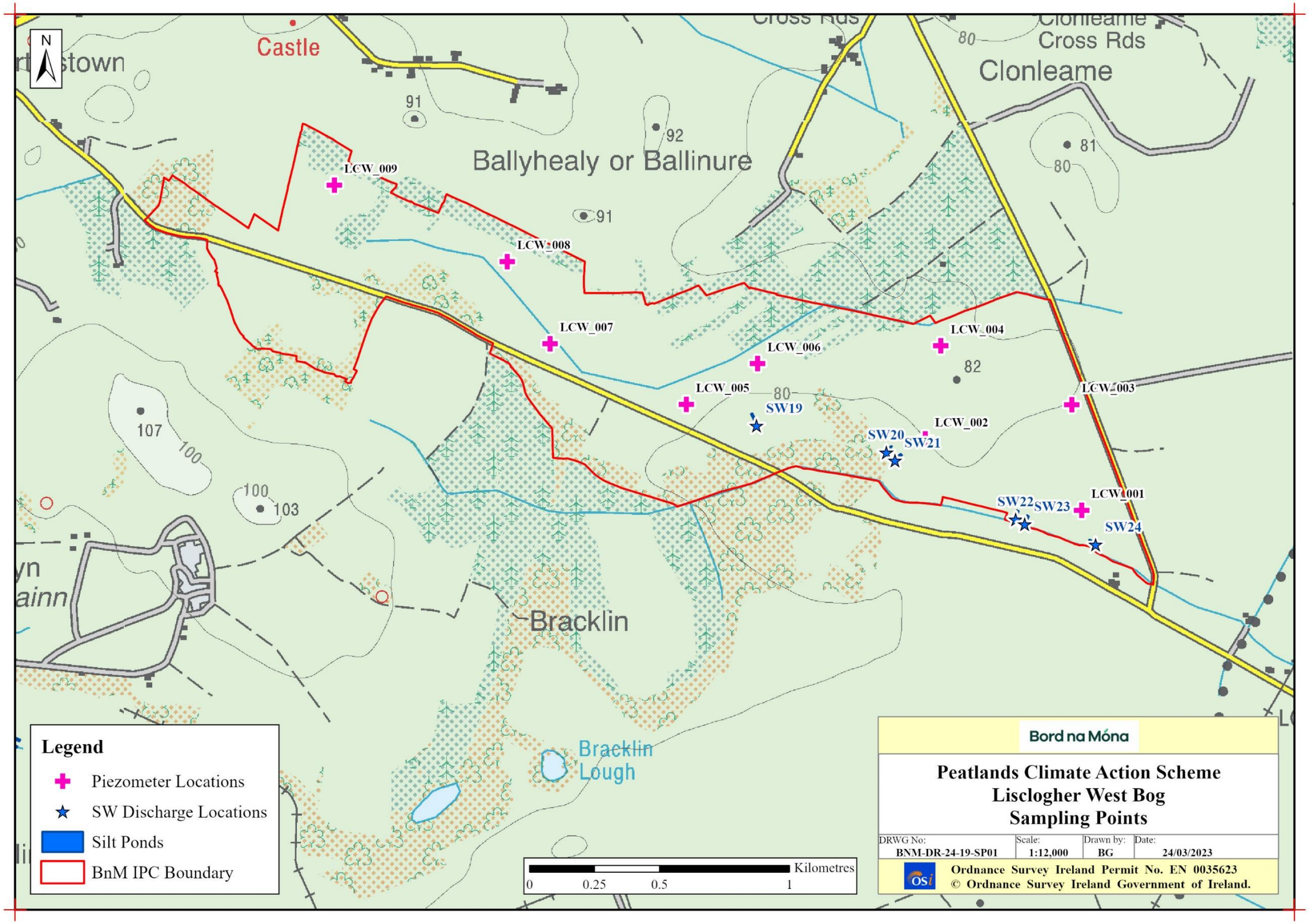

**BNM-DR-24-19-03: LiDAR Map**

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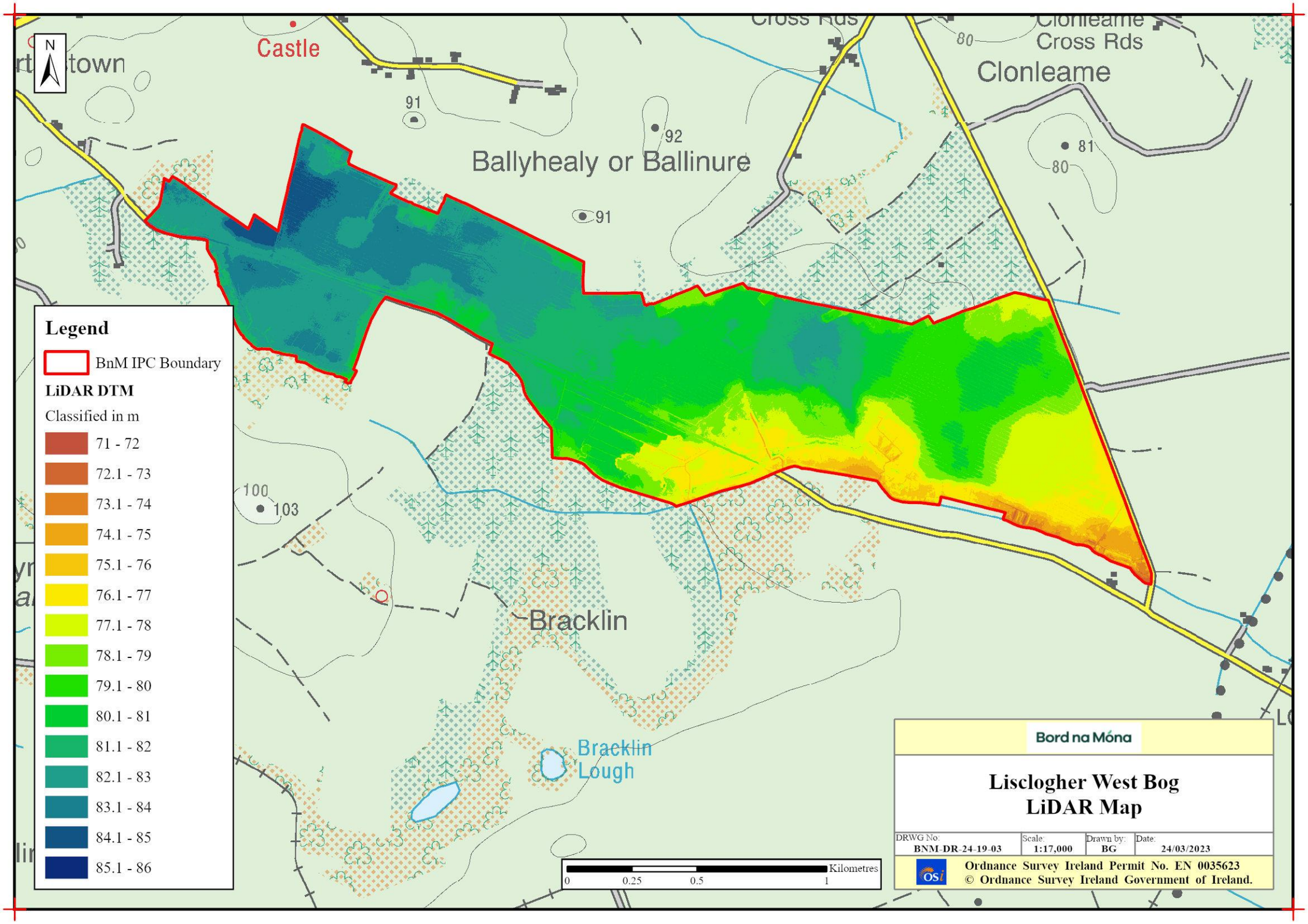

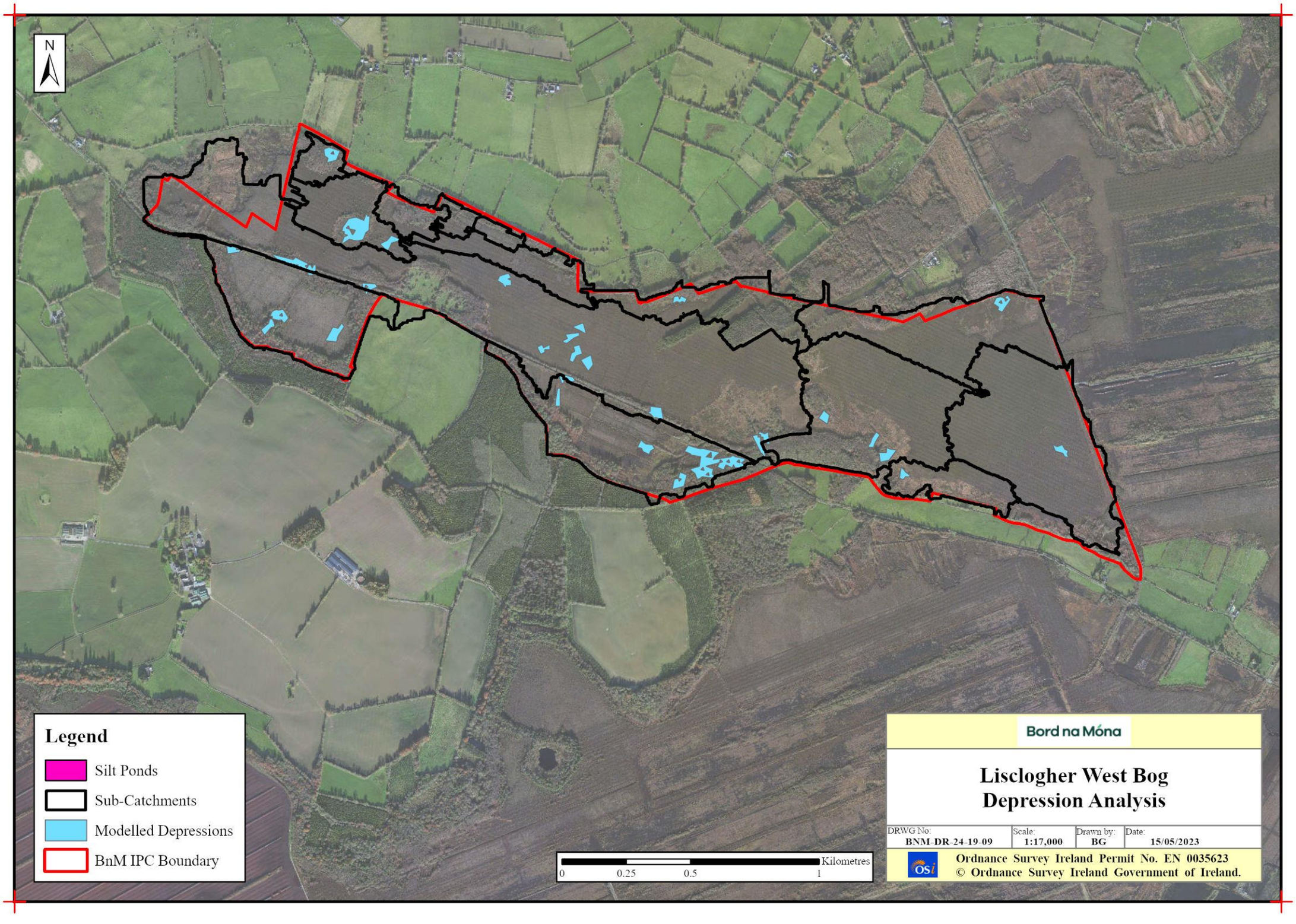
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Legend
Silt Ponds
Sub-Catchments
Modelled Depressions
BnM IPC Boundary
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Kilometres
Bord na Móna
Lisclogher West Bog
Depression Analysis
DRWG No: BNM-DR-24-19-09
Scale: 1:17,000
Drawn by: BG
Date: 15/05/2023
Ordnance Survey Ireland Permit No. EN 0035623
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**BNM-DR-24-19-13: General Drainage Map**

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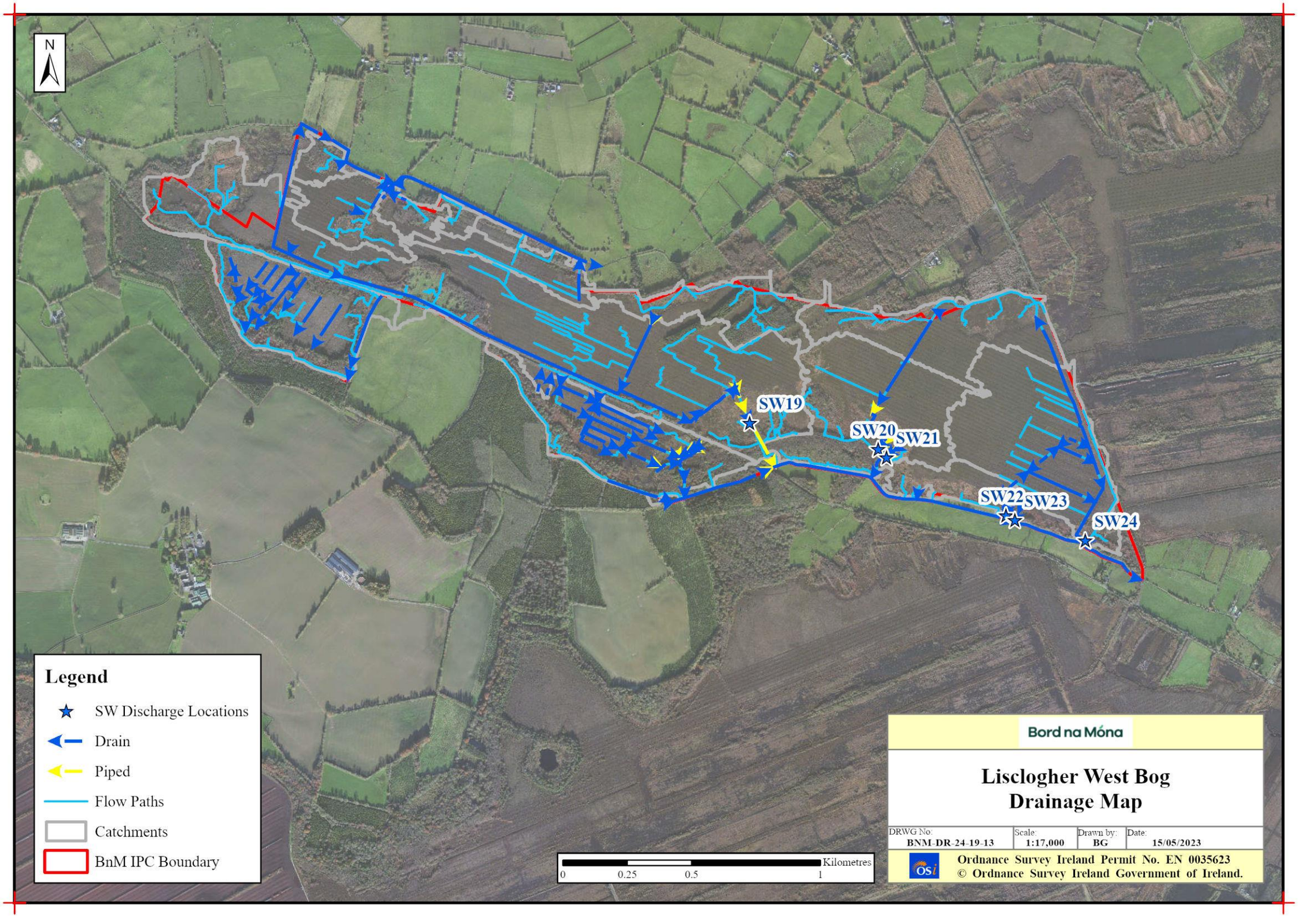
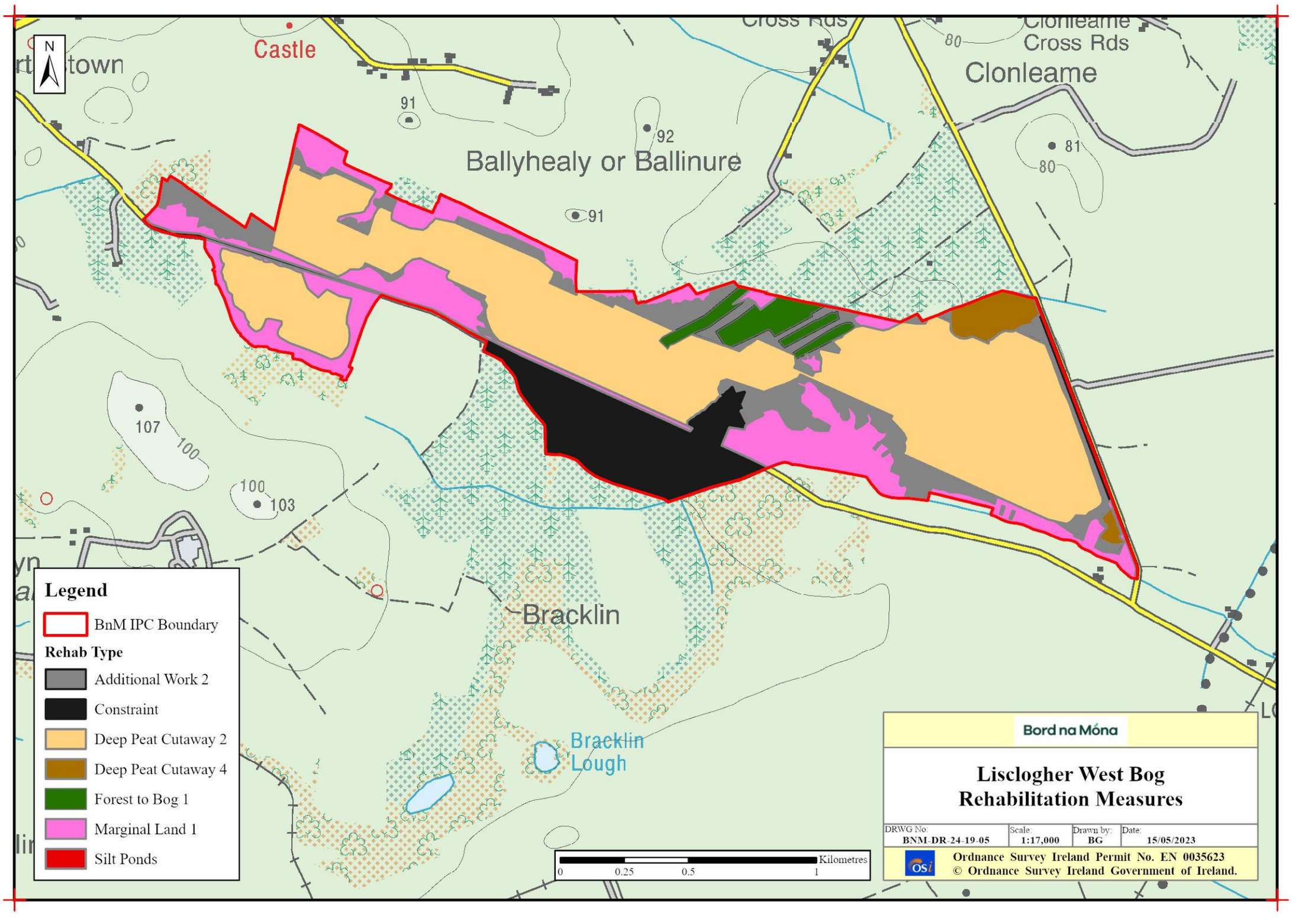


# Rehabilitation Maps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Clonleame
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Clonleame
Ballyhealy or Ballinure
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103
Bracklin
Bracklin
Lough
Legend
BnM IPC Boundary
Rehab Type
Additional Work 2
Constraint
Deep Peat Cutaway 2
Deep Peat Cutaway 4
Forest to Bog 1
Marginal Land 1
Silt Ponds
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Kilometres
Bord na Móna
Lisclogher West Bog
Rehabilitation Measures
DRWG No: BNM-DR-24-19-05
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Drawn by: BG
Date: 15/05/2023
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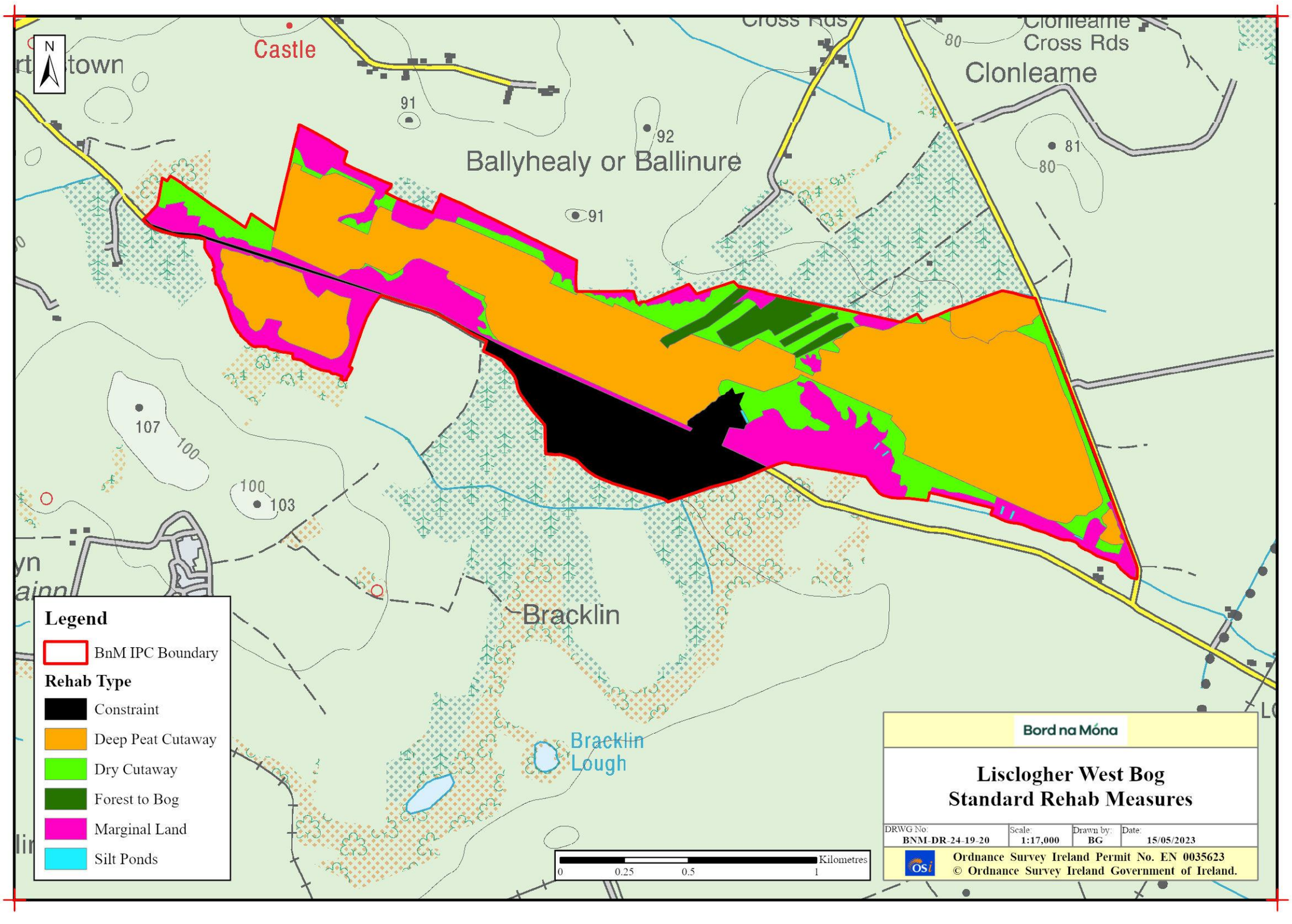
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Bracklin
Bracklin
Lough
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BnM IPC Boundary
Rehab Type
Constraint
Deep Peat Cutaway
Dry Cutaway
Forest to Bog
Marginal Land
Silt Ponds
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0.25
0.5
1
Kilometres
Bord na Móna
Lisclogher West Bog
Standard Rehab Measures
DRWG No: BNM-DR-24-19-20
Scale: 1:17,000
Drawn by: BG
Date: 15/05/2023
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# APPENDIX 4-3

***ANNUAL ENVIRONMENTAL REPORTS***

# BORD NA MÓNA

BORD NA MÓNA ENERGY LIMITED
Derrygreenagh,Rochfortbridge,Mullingar,Co-Westmeath.

# Annual Environmental Report

**March 2001**

EPA
IPC ENFORCEMENT WEXFORD.
Main File
Public File
Evaluation File
Date 2/3/01
For Assessment by Inspector

The Environmental Protection Agency
1 - MAR 2001
IPC ENFORCEMENT

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**Appendix 3:** Complaints Log Form.

**Appendix 4:** Silt Pond Inspection Form.

**Appendix 5:** Workshop Inspection Form.

**Appendix 6:** Waste Receipts

**Appendix 7:** Boiler combustion efficiency

# 1 Introduction

## 1.1 Company Details

| | |
|---|---|
| Name: | **Bord na Mona Energy Limited.** |
| Address: | **Derrygreenagh Group**<br>**Derrygreenagh Works**<br>**Rochfortbridge**<br>**Mullingar**<br>**Co Westmeath.** |
| Telephone No: | **044 / 22181** Fax No: **044 / 22344** |
| Contact Name: | **Finn Campbell** |
| Position: | **General Manager.** |
| National Grid Reference: | **E249450 N238140** |

## 1.2 Activities

The Derrygreenagh Group consists of the Derrygreenagh and Ballivor Groups and Rossan Bog.
The Derrygreenagh group of bogs is located in North Offaly and Southeast Westmeath. The Derrygreenagh group comprises of 3664 acquired hectares, of which there are 1300 nett production hectares. The main catchment of these areas is the River Boyne.

The Ballivor group is made up of the bogs in the Ballivor, Carranstown, Bracklin and Lisclogher areas. There is a total of 283 hectares in production and each of these areas are linked by peatland railway to the Bord na Mona horticultural factory, situated between Ballivor and Raharney villages. Drainage from these bogs is to the Deel and Stonyford rivers, tributaries of the Boyne.

Rossan bog is situated one mile from Kinnegad village. There are currently 142 hectares in milled moss production. This bog drains to the Kinnegad River, a tributary of the River Boyne.

The Derrygreenagh Group currently employs 96 permanent and 31 seasonal workers. Transport operations are carried out on a seven day cycle throughout the year. Production operations are typically carried out over a seven day week (weather permitting) for 12 to 15 hours per day.

**Peat Milling Operations.**

For milled peat production the bog is laid out in a series of rectangular fields of varying length and 15m wide with drains located between. There are essentially four operations involved in milled peat production:

- Milling.
- Harrowing.
- Ridging.
- Harvesting.

**Milling.**
Special milling machines work there way along the fields, milling approximately 15mm of peat of the top of the bog in a pass.

**Harrowing**
In the course of drying, the milled peat is turned a number of times to avail of the drying conditions. This is achieved with a machine called a harrow. The milled peat is harrowed until its moisture content is down to approximately 40-50%, which can take up to two to three days, weather depending.

**Ridging**
The dry peat is then scraped into long ridges running down the centre of each field. This is done with a ridger, a machine consisting of a series of blades in the shape of a v that opens the full width of the field.

**Harvesting**
During harvesting every eleventh field is used to stockpile the peat, with this field receiving the milled peat from the five fields either side.

The milled peat is then transported via the existing network of peatland railways to one of the following locations.

- Power station ( ESB )
- Briquette Factory.
- Horticultural Factory.

1.3 Environmental Policy

# BORD NA MÓNA

**BORD NA MÓNA ENERGY LIMITED**
**Derrygreenagh,Rochfortbridge,Mullingar,Co-Westmeath.**

Bord na Mona Energy Limited is a commercial semi-state body with responsibility to develop Irelands peat resources in the national interest.

Bord na Mona Energy Limited is committed to gather and make available information on all aspects of its environmental impact and to help improve understanding among the public generally of its role and the importance of Irish peatlands.

Bord na Mona Energy Limited recognises the importance of peatland conservation.

Bord na Mona Energy Limited will leave behind all areas it owns as either an economically or socially integrated resource of a high environmental value.

Bord na Mona Energy Limited seeks to conduct all aspects of its buisness in an environmentally sensitive value.

Bord na Mona Energy Limited will establish an environmental management system specifically addressing the following impacts.

- Discharges to water.
- Emissions to atmosphere.
- Waste disposal.
- Use of natural resources.
- Noise, vibration, odour, dust and visual effects.
- Natural environment and eco-system.

The environmental management system will be monitored, maintained and continually improved.

A system of regular environmental audits will be put in place.

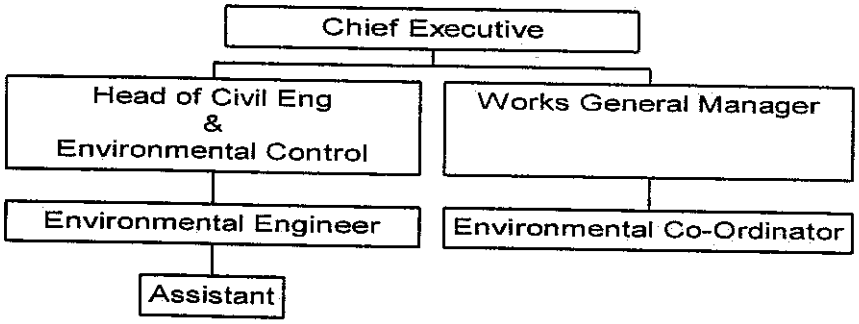
Bord na Mona Energy Limited will continue research and development into all aspects of its environmental impact.

This statement is published and is available at all locations within the division and its contents are brought to the attention of all employees.

1.4 Environmental Management of the Company

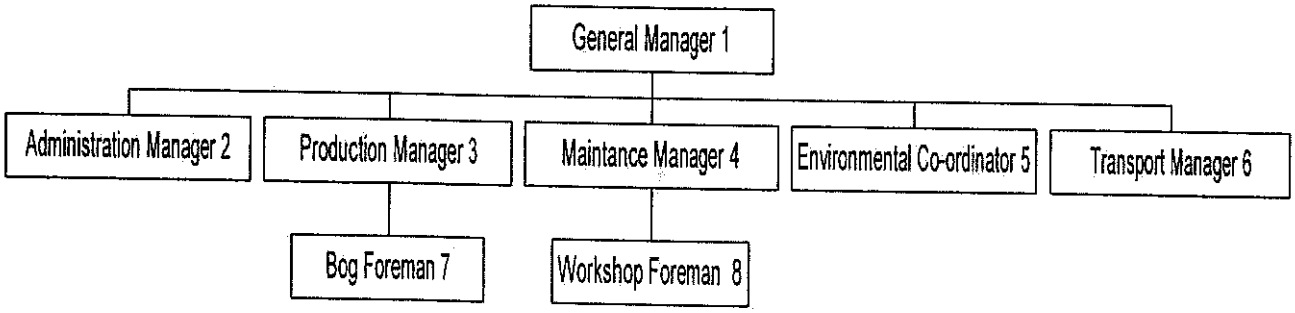
The organisational structure within Bord na Mona and the Derrygreenagh Group is presented in the flow charts below.

# Environmental Responsibilities




# Derrygreenagh Group

## Environmental Responsibilities




(1) Overall environmental responsibilities
(2) Records of complaints and registers
(3) All production related issues
(4) Machine maintenance
(5) Co-ordinating environmental affairs
(6) All peat transportation matters
(7) Silt pond maintenance, tea centres codes of practice
(8) Fuel loading, oil traps, weekly workshop inspections.

# 2 Summary Information

## 2.1 Emissions to Water Summary

### 2.1.1 Silt Pond Emissions

The attached tables are a summary of the emissions to surface waters from within the Derrygreenagh Group. As the emission sampling point proposal, was not required to be submitted, until six months after our IPC licence was issued, only one round of sample results, covering Sep/Oct/Nov could be submitted with the AER. Therefore the results in the table are the actual results as opposed to an average.

As part of the silt pond upgrade programme a number of the sampling points have been improved over the past months. These improvements include the enlargement of ponds where required and the installation of piped outlets, to accommodate the measurement of flow. A copy of a silt pond inspection form is attached in **Appendix 4**

**Bord na Mona Group : Derrygreenagh**
**IPC Licence No.: 501**
**Emissions to water summary**

**Location: SW1.**
**Sept/Oct/Nov (Final Quarter 2000)**

| Parameter | Average Emission (mg/l) | Emission Limit Value (ELV) (mg/l) |
|---|---|---|
| pH units | 7.5 | |
| Flow (L/sec) | 0.4 (L/S) | |
| Suspended Solids (mg/l) | < 5 | 35mg/l |
| Total Solids (mg/l) | | |
| Total Phosphorus (mg/l) | <0.05 | |
| Ammonia (mg/l) | 3.2 | |
| Colour (Pt Co units) | 88 | |
| COD (mg/l) | 56 | |

**Location: SW6.**
**Sept/Oct/Nov (Final Quarter 2000)**

| Parameter | Average Emission (mg/l) | Emission Limit Value (ELV) (mg/l) |
|---|---|---|
| pH units | 7.6 | |
| Flow (L/sec) | 31.1 (L/S) | |
| Suspended Solids (mg/l) | 6 | 35mg/l |
| Total Solids (mg/l) | | |
| Total Phosphorus (mg/l) | <0.05 | |
| Ammonia (mg/l) | <0.2 | |
| Colour (Pt Co units) | 60 | |
| COD (mg/l) | 42 | |

**Location : SW14.**
**Sept/Oct/Nov (Final Quarter 2000)**

| Parameter | Average Emission (mg/l) | Emission Limit Value (ELV) (mg/l) |
|---|---|---|
| pH units | 7 | |
| Flow (L/sec) | 5.2 (L/S) | |
| Suspended Solids (mg/l) | <5 | 35mg/l |
| Total Solids (mg/l) | | |
| Total Phosphorus (mg/l) | <0.05 | |
| Ammonia (mg/l) | 2.5 | |
| Colour (Pt Co units) | 249 | |
| COD (mg/l) | 66 | |

**Location : SW30.**
**Sept/Oct/Nov (Final Quarter 2000)**

| Parameter | Average Emission (mg/l) | Emission Limit Value (ELV) (mg/l) |
|---|---|---|
| pH units | 7.3 | |
| Flow (L/sec) | No Flow | |
| Suspended Solids (mg/l) | <5 | 35mg/l |
| Total Solids (mg/l) | | |
| Total Phosphorus (mg/l) | 0.08 | |
| Ammonia (mg/l) | 2.1 | |
| Colour (Pt Co units) | 176 | |
| COD (mg/l) | 69 | |

**Location : SW32.**
**Sept/Oct/Nov (Final Quarter 2000)**

| Parameter | Average Emission (mg/l) | Emission Limit Value (ELV) (mg/l) |
|---|---|---|
| pH units | 7.1 | |
| Flow (L/sec) | No Flow | |
| Suspended Solids (mg/l) | 15 | 35mg/l |
| Total Solids (mg/l) | | |
| Total Phosphorus (mg/l) | 0.19 | |
| Ammonia (mg/l) | 2 | |
| Colour (Pt Co units) | 278 | |
| COD (mg/l) | 95 | |

**Location : SW43.**
**Sept/Oct/Nov (Final Quarter 2000)**

| Parameter | Average Emission (mg/l) | Emission Limit Value (ELV) (mg/l) |
|---|---|---|
| pH units | 7.3 | |
| Flow (L/sec) | .7 (L/S) | |
| Suspended Solids (mg/l) | <5 | 35mg/l |
| Total Solids (mg/l) | | |
| Total Phosphorus (mg/l) | <0.05 | |
| Ammonia (mg/l) | 2.6 | |
| Colour (Pt Co units) | 312 | |
| COD (mg/l) | 117 | |

* Total solids to be included in future results.

2.1.2 Surface Water Discharge Monitoring Location Programme Review

The surface water discharge monitoring location programme remains the same as was submitted and accepted by the Agency in June 2000.
Pipes have been fitted at each location in order to accommodate flow metres and the provision of safe access is also ongoing.
Emission point signs have been designed for these sampling points and are being put in place.

## Monitoring May to December 2000

| Emission Pt. | Parameter | Emission Mg/l | Emission Limit Value (ELV) Mg/l for 75% of grab samples. | % Compliance |
|---|---|---|---|---|
| Sw no.1 | **Suspended Solids** | < 5 | 35mg/l | 100% |
| Sw no.6 | **Suspended Solids** | 6 | 35mg/l | 100% |
| Sw no.14 | **Suspended Solids** | < 5 | 35mg/l | 100% |
| Sw no.30 | **Suspended Solids** | < 5 | 35mg/l | 100% |
| Sw no.32 | **Suspended Solids** | 15 | 35mg/l | 100% |
| Sw no.43 | **Suspended Solids** | < 5 | 35mg/l | 100% |
| | | | | |
| | | | | |
| | | | | |

2.1.3 Yard Run-off

The attached tables are a summary of the emissions to surface waters from yards and workshops within the Derrygreenagh Group. This summary is the average of the results submitted, covering the periods June/July/August and Sept/Oct/Nov 2000.

At present work is on going on the rationalisation of yard run off at the various workshops, in order to ensure that all run off be diverted through a properly designed oil trap as per condition 9.1.8.

Some of this work is being carried out in conjunction with the construction of adequate bunding at the various locations.

Emission point signs have been designed for these sampling points and are being put in place. A copy of workshop/yard inspection form has been attached in **Appendix 5**

**Bord na Mona Group : Derrygreenagh**
**IPC Licence No.: 501**
**Emissions to water summary yards/workshops**

**Location:Derrygreenagh SWE-1.**
**June - December 2000**

| Parameter | Average Emission (mg/l) | Emission Limit Value (ELV) (mg/l) |
|---|---|---|
| COD (mg/l) | 62 | NA |

**Location:Derrygreenagh SWE-2.**
**June - December 2000**

| Parameter | Average Emission (mg/l) | Emission Limit Value (ELV) (mg/l) |
|---|---|---|
| COD (mg/l) | 49 | NA |

2.1.4 Composite Sampler Programme

A composite sampler location proposal has been submitted to the Agency and accepted verbally. This acceptance occurred after december 2000 therefore no results are available for submission in this AER. However results will appear in next years AER in tabular form.
Work on the installation of the sampler is underway and monitoring will commence in the near future.

**Selection of sampling programme.**

Our proposal is based around the provision of equipment , which would require going to each site once a week rather than daily.

The equipment would have the following features:

a) Multi-bottled. We propose that the sampler would have 8 x 2 litre bottles. (This will allow for a full weeks sampling to be carried out, where upon each bottle would represent exactly 24 hours flow. These samples would be taken flow proportional over this 24 hour period.

b) **Portable and battery operated.**

No permanent power source available

c) **Built in data logger.**

This will store the flow and sampling data for each week, which could be downloaded when the samples are being collected.

Our proposal is as follows:

For sampling we propose the Isco 6700 8 x 2 litre composite sampler which is set up at the proposed site and would collect a full week of flow proportional 24 hour samples. The sampler is powered by a deep discharge marine lead acid battery.

For flow measurement, we propose that a concrete pipe be installed at the end of the silt pond. The flow would then be measured by the Isco 710 Ultrasonic Flow Module, which plugs into the sampler. Flow data is stored on the sampler and can be accessed using the Isco 581 Manual transfer device.

The operator would thus have a weekly requirement to arrive at each site with a 2nd newly charged battery which he would exchange, the 581 RTD to down load the flow data and 7 collection bottles to take the samples and restart the sampler.

The most recent 24hour sample of the 7 should be considered for any specific parameter that may be required to be analysed within 24 hrs.

The parameters to be analysed below are in accordance with Schedule 1(ii) Monitoring of Emissions to Water:

| Parameter | Monitoring Frequency | Location of analysis |
|---|---|---|
| pH units | Weekly | On-site |
| Flow L/sec | Daily | On-site |
| Suspended Solids mg/l | Daily | Laboratory |
| Total Solids mg/l | Daily | Laboratory |
| Total Phosphorus mg/l | Weekly | Laboratory |
| Ammonia mg/l | Weekly | Laboratory |
| Colour Hazen units | Weekly | Laboratory |
| COD mg/l | Weekly | Laboratory |

## 2.1.5 Bunding Programme

At present tenders are out for the provision of adequate bunding at our oil/diesel storage facilities. The successful contractor will be expected to commence the work by the beginning of March 2001.
A number of locations have been identified for the construction of bunds, some at existing storage/loading facilities and some at completely new locations.

A new bund will be constructed at Derrygreenagh.
Incorporated into this work will be the construction of a fill area, which will satisfy condition 9.1.7 of the Derrygreenagh Licence.
The bund size will satisfy condition 9.1.4

Testing of this bund will be carried out as per condition 9.1.6 and the results of this testing will be reported on as part of next years AER.

## 2.2Emissions to Air

2.2.1 Dust Monitoring Locations Programme
Approval for the dust sensitive locations was not received until after production finished in 2000 therefore no results can be reported on in this AER.

In order to comply with Condition 5.4 of the licence in relation to Dust Sensitive Locations the following sampling method are proposed to be adopted for the 2001 production season.

**Methodology**
Dust monitoring will be conducted using the Bergerhoff method as referred to in the TA-Luft guidelines (VDI-guidelines 2119/Part 2). The input of the atmospheric material will be determined over a planned period of measurement, probably one month, by exposing the collection pots. The sample is then evaporated down and the dry residue is determined gravimetrically, the result being reported in mg/m2/d.

In addition to this a control sampler will be set up in a location free from the influence of peat production in order to establish the background levels.

The apparatus consists of a plastic collecting pot and a post with a protective basket, set at 1500mm above the ground level in accordance with the guidelines set out in the VDI 2119/Part 2.

Measurement, collection and determination will be carried out in accordance with the guidelines in an ILAB accredited laboratory. The environmental co-ordinator will change the sample pots or an employee nominated by him/her. The samples will be sent to the laboratory under a strict chain of custody and the results will be reported on each year as part of the AER
In addition to this, Bord na Mona have adopted the following codes of practice in relation to dust.

### Dust Control

- Identify and record sensitive areas.
- Plant shelter belts in sensitive areas.
- Avoid harvesting in sensitive areas during windy weather.
- Use grassed passways for machinery.
- Keep headlands clean-remove loose peat.
- Slow down when travelling along dusty headlands.
- When harvesting keep jib low on stockpile.
- Roll final harvest on uncovered stockpiles
- Plant shelter belts around outloading facilities.
- Clean road crossings after use.

### 2.2.2 Boiler Combustion Efficiency

The boiler at Derrygreenagh works was tested in April 1999 as part of the original application. Derrygreenagh didn't receive its licence until April 2000 therefore under condition 5.1 of the licence, testing will be required during 2001 and the results will be submitted in next years AER.

The results of the boiler efficiency test are attached in **Appendix 7.**

**Boiler Details**
Twin Danstoker solid fuel units each rated at 725KW, fuelled by loose briquettes. Operating from Oct-Mar approximately.

## 2.3Waste Arisings

### 2.3.1 Hazardous Waste

Derrygreenagh being a central location, is used as a collection point for all hazardous wastes eminating from all the areas in both the Allen and Derrygreenagh Groups. All waste oils, filters, spent batteries, etc are collected centrally at Derrygreenagh before being removed by a licenced waste contractor such as Atlas Waste Oil, Hammond Lane, Returnabatt, etc.

A system is in place where by every area has its own waste oil and filter barrel. These barrels are painted yellow to distinguish them from ordinary barrels and are clearly marked waste filters or waste oil.

When the barrels are getting near full, the area team leader informs our Derrygreenagh stores and a truck is dispatched to collect the full barrels and replace them with empties. Any spent batteries will also be collected if the need arises.
The following table is a record of all the hazardous wastes handled by the Derrygreenagh Group from May-December 2000

BORD NA MÓNA

BORD NA MÓNA ENERGY LIMITED

## Waste Management Record (Hazardous)

**Group : Derrygreenagh IPC Licence no. : 501**

**Works : Derrygreenagh**

| WASTE DESCRIPTION | EWC CODE | TONNES | NAME OF CONTRACTOR | NAME OF PERSON ULTIMATELY RESPONSIBLE | DESTINATION | DATE |
|---|---|---|---|---|---|---|
| Waste Oil | 130200 | 0.2 | Atlas Waste Oil | Atlas Waste Oil | Portlaoise Co Laois | 18/05/00 |
| Waste Oil | 130200 | 3 | Atlas Waste Oil | Atlas Waste Oil | Portlaoise Co Laois | 01/06/00 |
| Waste Oil | 130200 | 2.75 | Atlas Waste Oil | Atlas Waste Oil | Portlaoise Co Laois | 04/07/00 |
| Fuel/Oil Filters | 130601 | 1.3 | Atlas Waste Oil | Atlas Waste Oil | Portlaoise Co Laois | 18/05/00 |
| Fuel/Oil Filters | 130601 | 0.39 | Atlas Waste Oil | Atlas Waste Oil | Portlaoise Co Laois | 20/06/00 |
| Contaminated Earth | 050105 | 0.4 | Atlas Waste Oil | Atlas Waste Oil | Portlaoise Co Laois | 18/05/00 |
| Empty Oil Barrels | 130601 | 0.918 | Dempsey Drums | Dempsey Drums | North Wall Dublin | 17/05/00 |
| Empty Oil Barrels | 130601 | 0.9 | Dempsey Drums | Dempsey Drums | North Wall Dublin | 30/05/00 |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

| DETAILS OF ANY REJECTED CONSIGNMENTS | | | | | | |
|---|---|---|---|---|---|---|
| None to date | | | | | | |
| | | | | | | |
| | | | | | | |

### 2.3.2 Non-Hazardous Waste

The following table is a summary of the Non-Hazardous wastes produced on site, from the period May-December 2000.

Of the total amount of waste produced and collected from the Derrygreenagh works, 92% was atributted to silt pond waste, 6% eminated from the Works itself and the remaining 2% came from the various tea centres.

Silt pond cleanings are anhydrous ( 2% solid matter ) and their weight is calculated accordingly ( tonnes dry weight ). This will explain the great difference in the tonnage's between 1998 and May-Dec 2000 on the summary data tables. As the 98 figures were calculated on the actual pond volumes.

# BORD NA MÓNA

BORD NA MÓNA ENERGY LIMITED

## Waste Management Record ( Non-Hazardous)

**Group : Derrygreenagh** **IPC Licence no. : 501**

**Works : Derrygreenagh**

| *WASTE DESCRIPTION* | *EWC CODE* | *TONNES* | *NAME OF CONTRACTOR* | *NAME OF PERSON ULTIMATELY RESPONSIBLE* | *DESTINATION* | *DATE* |
|---|---|---|---|---|---|---|
| Septic Tank Sludge | 200304 | 6 | Pat Hinch Plant Hire | Pat Hinch Plant Hire | Tullamore Landfill | 29/06/00 |
| Scrap Metal | 16/01/04 | 25 | Hammond Lane | Hammond Lane | Athlone, Westmeath | May-Dec |
| Canteen Waste | 200301 | 4 | Midland Refuse Ltd | Midland Refuse Ltd | Tullamore Landfill | May-Dec |
| General Waste | 200301 | 6 | Rentabin Tullamore | Rentabin Tullamore | Tullamore Landfill | May-Dec |
| Silt Pond Waste | 010102 | 947* | | | | May-Dec |
| Tea Centre Waste | 200301 | 1 | Midland Refuse Ltd | Midland Refuse Ltd | Tullamore Landfill | May-Dec |
| | | | | | | |
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*: The figures for silt pond waste are tonnes dry weight

## 2.4 Energy and Water Consumption

The table below is a summary of the energy consumption for the Derrygreenagh Group, from the dates May – Decemder 2000.

Water is not included, as it is not used as part of the production process. It is only used in offices, canteens and workshops on a domestic scale.

**Bord na Mona Group : Derrygreenagh**
**IPC Licence No.: 501**
**Energy Consumption Summary**

| Fuel May - Dec 2000 | Volume | Tonnes | MW/Hours |
|---|---|---|---|
| Diesel | 624m3 | 518 | 6117 |
| Petrol | 1.26m3 | 0.956 | 11.45 |
| Electricity | NA | NA | 636 |
| Peat Briquettes | NA | 79.4 | 397 |

## 2.5 Environmental Incidents and Complaints

There was one incident within the Derrygreenagh Group, which occurred in December 2000. Although only a minor incident, the Agency was informed.

| Environmental Incidents | Number of Incidents |
|---|---|
| Incidents | 1 |
| Incidents requiring corrective action | 1 |
| **Categories of Incident** | |
| Odour | |
| Noise | |
| Water | 1 |
| Air | |
| Procedural | |
| Miscellaneous | |

There were two complaints within the Derrygreenagh Group, both were received in July 2000. The Agency was informed.

| Environmental Complaints | Number of complaints |
|---|---|
| Complaints received | 2 |
| Complaints requiring corrective action | 2 |
| **Categories of complaint** | |
| Odour | |
| Noise | |
| Water | |
| Air | 2 |
| Procedural | |
| Miscellaneous | |

A copy of a complaint form is attached in **Appendix3**

## 2.6 De-Silting Report
## Summary Data Table of Ponds De-Silted From May-December 2000

| Bog | No Silt Ponds | Cleaned Once | Cleaned Twice | Cleaned Three Times | Notes |
|---|---|---|---|---|---|
| Ballivor | 7 | 4 | | | |
| Carranstown | 5 | 3 | | | |
| Bracklin West | 6 | 2 | | 4 | |
| Lisclogher | 7 | | | | * |
| Kinnegad | 8 | 1 | 3 | 2 | |
| D/Arkin | 2 | | | | ** |
| D/Hinch | 4 | 4 | | | |
| Drumman | 5 | 2 | | | |
| Ballybeg | 6 | 5 | | | |
| Toar | 6 | 5 | | | |

*: Bog still under development, no production.
**: Bog cut out, no production at this Bog.

**% Ponds Cleaned May-Dec 2000**

| % Ponds Not Cleaned | % Ponds Cleaned Once | % Ponds Cleaned Twice | % Ponds Cleaned Thrice |
|---|---|---|---|
| 38% | 46% | 5.3% | 10.7% |

The reason why some of the silt ponds listed above have been cleaned up to four times, is that if the cleaning machine is passing a pond on its way to clean a full pond, the operative will clean it, no matter if it is only one quarter full.

Special long reach machines are primarily used in the cleaning of the ponds, although more conventional machines that have been working on the silt pond up-grade programme are also being used to clean ponds. This is another reason why some ponds have been cleaned more frequently between May-Dec 2000.

Fortnightly Silt Pond inspections are also on going and a cleaning roster is being established from these inspection records. A copy of a silt pond inspection form is attached in **Appendix 4**
All the inspections forms are on file at the Derrygreenagh office.

## 2.7 Silt pond Up-Grade Programme

A silt pond up-grade programme has been submitted and accepted by the Agency.
A copy of this programme is attached in **Appendix 2.**
This programme has been ongoing from receipt of licence and some ponds have been improved in order to meet condition 6.1 of the Derrygreenagh licence.

The work so far has included the construction of new ponds, the enlargement of ponds where necessary, the installation of controlled inlet and outlet pipes, and the construction of pond by-passes, to accommodate cleaning and flood conditions.
Approximately 5000 cubic metres of material have already been excavated in the progress of these works.
Further to this, operatives cleaning ponds have been instructed to deepen the ponds if possible in order to increase the volume.
The work began on Drumman and Derryhinch bog, which is almost complete, and is about to move to Toar bog in early March 2001.

The work completed so far has included programme one, and some of stages one and two of programme two, of the silt pond up-grade programme.

## 2.8 Bog Development and Operational Programme

The bogs in the Derrygreenagh Group are well into their productive lives, therefore there will be no development in the year 2001.
However in the Ballivor Group, Carranstown bog is currently under development, with approximately 120 acres to be developed.
It is proposed to develop initially part of this total for the 2002 production season, with no production planned at the site for 2001.
Expressed as a percentage this equates to 12% of the total number of bogs in the group.

## 2.9 AER Summary Data Table

| Summary Of Emissions | | |
|---|---|---|
| Company | | Bord na Mona Energy Ltd |
| Address | | Derrygreenagh Rochfortbridge Mullingar Co Westmeath. |
| Contact Name | | Finn Campbell |
| Telephone | | 044/22181 |
| E-mail | | finn.campbell&bnm.ie |
| GPS Co-ordinates(4N,4E) | | E249450 N238140 |
| IPC Register Number | | 501 |
| IPC Class | | 1 |
| IPPC Class | | |
| NOSE-P Code | | |
| NACE CODES | Section | C |
| | Sub Section | A |
| | Division | |
| | Group | |
| | Class | 1.4 |

## Emissions to Waters

**Indicate with "X" if emissions are to :** Freshwater or Sewer or Sea

| Parameter | Unit | Licensed emission | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|
| Volume | $M^3$ | Not Applicable see 2.1.1 | | | | |
| Suspended Solids | Kg | | | | | |
| BOD | Kg | | | | | |
| COD | Kg | | | | | |
| Total Dissolved Solids | Kg | | | | | |
| Total Nitrogen | Kg | | | | | |
| Phosphate | Kg | | | | | |
| Toxicity | TU | | | | | |
| Hg | Kg | | | | | |
| Cd | Kg | | | | | |
| Pb | Kg | | | | | |
| Cr | Kg | | | | | |
| As | Kg | | | | | |
| Zn | Kg | | | | | |
| Cu | Kg | | | | | |
| Ni | Kg | | | | | |
| % Compliance | % | | | | | |
| Number of samples | | | | | | |

| Emissions to air | | | | | | |
|---|---|---|---|---|---|---|
| Parameter | Unit | Licensed emission | 1998 | 1999 | 2000 | 2001 |
| Particulates | Kg | Not Applicable see 2.2.1 | | | | |
| Sox | Kg | | | | | |
| Nox | Kg | | | | | |
| Co2 | Kg | | | | | |
| TA Luft Class I | Kg | | | | | |
| TA Luft Class II | Kg | | | | | |
| TA Luft Class III | Kg | | | | | |
| Total Organic (as C) | Kg | | | | | |
| Non-Methane VOC | Kg | | | | | |
| Ammonia | Kg | | | | | |
| Total Heavy Metals | Kg | | | | | |
| % Compliance | % | | | | | |
| Number of samples | | | | | | |

| Boiler Emissions to air | | | | | | |
|---|---|---|---|---|---|---|
| Parameter | Unit | Licensed emission | 1998 | 1999 | 2000 | 2001 |
| Dust | Kg | Not Applicable see 2.2.2 | | | | |
| Sox | Kg | | | | | |
| Nox | Kg | | | | | |
| CO2 | Kg | | | | | |
| CO | Kg | | | | | |

| Energy Consumption | Unit | Sulphur Content | 1998 | 1999 | May-Dec 2000 | 2001 |
|---|---|---|---|---|---|---|
| Heavy Fuel Oil | $M^3$ | | | | NA | |
| Light Fuel Oil | $M^3$ | | | | 625 | |
| Natural Gas | $M^3$ | | | | NA | |
| Electricity | MW | | | | 636 | |
| Coal | Kg | | | | NA | |

## Environmental Complaints

| | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|
| Complaints received | | | 2 | |
| Complaints requiring corrective action | | | 2 | |

## Categories of complaint

| | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|
| Odour | | | | |
| Noise | | | | |
| Water | | | | |
| Air | | | 2 | |
| Procedural | | | | |
| Miscellaneous | | | | |

| Water | Unit | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|
| On-site groundwater use | $m^3$ | | | N/A | |
| On-site surface water use | $m^3$ | | | N/A | |
| Municipal water use | $m^3$ | | | N/A | |

| Accreditation | |
|---|---|
| EMAS (Yes/No) | NO |
| ISO 14000 (Yes/No) | NO |
| Certification Pending | NO |

| European Waste Catalogue Code | Hazardous (Yes/No) | Description of Waste | Quantity (Tonnes/year) | Method of Disposal Recovery | Location of Disposal/ Recovery | Name of Waste Disposal Recovery Contractor |
|---|---|---|---|---|---|---|
| 160104 | NO | Scrap Metal | 25 | R4 | Athlone, Westmeath | Hammond Lane |
| 200304 | NO | Septic tank sludge | 6 | D1 | Mullingar Landfill | Pat Hinch Plant |
| 200301 | NO | Canteen Waste | 4 | D1 | Tullamore Landfill | Midland Refuse |
| 200301 | NO | General Waste | 6 | D1 | Mullingar Landfill | Tullamore Plant Hire |
| 010102 | NO | Silt Pond Waste | 947* | D4 | On site | NA |
| 200301 | NO | Tea Centre | 1 | D1 | Tullamore Landfill | Midland Refuse |
| 020104 | NO | Polyethelene | 71 | R13 | | |
| 130200 | Yes | Waste Oil | 5.95 | R9 | Portlaoise Co Laois | Atlas Waste Oil |
| 130601 | Yes | Fuel/Oil Filters | 1.69 | R9,R4 | Portlaoise Co Laois | Atlas Waste Oil |
| 050105 | Yes | Contaminated Earth | 0.4 | R3 | Portlaoise Co Laois | Atlas Waste Oil |
| 130601 | Yes | Empty Oil Barrels | 0.9 | R4 | North Wall Dublin | Dempsey Drums |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

** The figures for silt pond waste are tonnes dry weight.*

| Waste | 1998 | 1999 | May-Dec 2000 | 2001 |
|---|---|---|---|---|
| **Total quantity of waste produced in calendar year(Tonnes)** | 1693 | | 998 | |
| total quantity of waste disposed of on-site | 1339 | | 947 | |
| total quantity of waste disposed of off-site | 15 | | 17 | |
| total quantity of waste recovered on-site | 0 | | 0 | |
| total quantity of waste recovered off-site | 339 | | 34.858 | |
| | 1998 | 1999 | May-Dec 2000 | 2001 |
| **Quantity of non-hazardous waste produced in calendar year** | 1668 | | 989 | |
| quantity of non-hazardous waste disposed of on-site | 1335 | | 947 | |
| quantity of non-hazardous waste disposed of off-site | 15 | | 17 | |
| quantity of non-hazardous waste recovered on-site | | | 0 | |
| quantity of non-hazardous waste recovered off-site | 318 | | 25 | |
| | 1998 | 1999 | May-Dec 2000 | 2001 |
| **Quantity of hazardous waste produced in calendar year (Tonnes)** | 25.56 | | 9.858 | |
| quantity of hazardous waste disposed of on-site | 4.14 | | 0 | |
| quantity of hazardous waste disposed of off-site | 0 | | 0 | |
| quantity of hazardous waste recovered on-site | 0 | | 0 | |
| quantity of hazardous waste recovered off-site | 21.42 | | 9.858 | |

## 3.0 Management of the Activity

### 3.1 Environmental Management Programme Report

The Derrygreenagh updated Environmental Management Programme was submitted after december 2000, but some of the works specified in that document are at present in progress.
Training has taken place for both management and operatives, as stated in project one and two of the EMP.
Codes of practice for all aspects of Bord na Mona's operations are at present in place.
Emergency Response Procedures have also been put in place.
Projects 6 & 7 of the EMP are currently under way. This was mentioned earlier under section 2.1.5 Bunding Programme.

### 3.2 Environmental Management Programme Proposal

As stated above an updated Environmental Management Programme has only recently been submitted in Feb 2001.
A copy of this is attached in **Appendix 1.**

### 3.3 Environmental Expenditure

The table below lists the environmental costs incurred by the Derrygreenagh Group between May-December 2000.

| Expenditure Related to the Operation of the Derrygreenagh IPC Licence During the Period March 2000 – December 2000 | |
|---|---|
| **Description** | **Cost (£)** |
| Capital Costs | 5138 |
| Plant | 48000 |
| Labour | 20000 |
| Materials | 3000 |
| Overheads (ESB, Phones, Consumables) | 150 |
| External Environmental Consultancy | 1000 |
| EPA Fees | 2779 |
| Total | 80067 |

### 3.4 Bog Rehabilition Report

The above mentioned report is not due for submission until October 2001, therefore a summary will appear in next years AER based on that report.

## 4.0 Summary

As the reporting period only covered date of licence to December 2000 and the Quarterly results only cover Sept/Oct/Nov, an accurate assessment of the results cannot be made. However, the AER for 2002 will include a full set of quarterly results from the grab sampling and a full years composite sampling results allowing a more representative and accurate assessment of Bord na Mona Energy's impacts on the environment. The attached Environmental Management Programme has been implemented throughout the group, operating procedures have been put in place, and training has been provided for all personnel involved in compliance with the licence.

Bord na Mona Energy Ltd would like to take this opportunity to advise the Environmental Protection Agency of its continued commitment to improving its environmental performance by adopting cleaner production methods and improving its environmental protection measures.

The Environmental Protection Agency
04 MAR 2002
IPC ENFORCEMENT

BORD NA MÓNA

BORD NA MÓNA ENERGY LIMITED
Derrygreenagh,Rochfortbridge,Mullingar,Co-Westmeath.

# Annual Environmental Report
# IPC LICENCE 501

**March 2002**

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**Appendix 1:** Composite Sampler Report

**Appendix 2:** EMP Project 4

**Appendix 3:** EMP Project 8

**Appendix 4:** EMP Project 9

**Appendix 5:** EMP Project 10

**Appendix 6:** EMP Project 11

# 1 Introduction

## 1.1 Company Details

| | |
|---|---|
| Name: | **Bord na Mona Energy Limited.** |
| Address: | **Derrygreenagh Group**<br>**Derrygreenagh Works**<br>**Rochfortbridge**<br>**Mullingar**<br>**Co Westmeath.** |
| Telephone No: | **044 / 22181** Fax No: **044 / 22344** |
| Contact Name: | **Finn Campbell** |
| Position: | **General Manager.** |
| National Grid Reference: | **E249450 N238140** |

1.2 Activities

The Derrygreenagh Group consists of the Derrygreenagh and Ballivor Groups and Rossan Bog.
The Derrygreenagh group of bogs is located in North Offaly and Southeast Westmeath. The Derrygreenagh group comprises of 3664 acquired hectares, of which there are 1300 nett production hectares. The main catchment of these areas is the River Boyne.

The Ballivor group is made up of the bogs in the Ballivor, Carranstown, Bracklin and Lisclogher areas. There is a total of 283 hectares in production and each of these areas are linked by peatland railway to the Bord na Mona horticultural factory, situated between Ballivor and Raharney villages. Drainage from these bogs is to the Deel and Stonyford rivers, tributaries of the Boyne.

Rossan bog is situated one mile from Kinnegad village. There are currently 142 hectares in milled moss production. This bog drains to the Kinnegad River, a tributary of the River Boyne.

The Derrygreenagh Group currently employs 87 permanent and 24 seasonal workers. Transport operations are carried out on a seven day cycle throughout the year. Production operations are typically carried out over a seven day week (weather permitting) for 12 to 15 hours per day.

**Peat Milling Operations.**

For milled peat production the bog is laid out in a series of rectangular fields of varying length and 15m wide with drains located between. There are essentially four operations involved in milled peat production:

- Milling.
- Harrowing.
- Ridging.
- Harvesting.

**Milling.**
Special milling machines work there way along the fields, milling approximately 15mm of peat of the top of the bog in a pass.

**Harrowing**
In the course of drying, the milled peat is turned a number of times to avail of the drying conditions. This is achieved with a machine called a harrow. The milled peat is harrowed until its moisture content is down to approximately 40-50%, which can take up to two to three days, weather depending.

**Ridging**
The dry peat is then scraped into long ridges running down the centre of each field. This is done with a ridger, a machine consisting of a series of blades in the shape of a v that opens the full width of the field.

**Harvesting**
During harvesting every eleventh field is used to stockpile the peat, with this field receiving the milled peat from the five fields either side.

The milled peat is then transported via the existing network of peatland railways to one of the following locations.

- Power station ( EPL )
- Horticultural Factory.

1.3 Environmental Policy

# BORD NA MÓNA

**BORD NA MÓNA ENERGY LIMITED**
**Derrygreenagh,Rochfortbridge,Mullingar,Co-Westmeath.**

Bord na Mona Energy Limited is a commercial semi-state body with responsibility to develop Irelands peat resources in the national interest.

Bord na Mona Energy Limited is committed to gather and make available information on all aspects of its environmental impact and to help improve understanding among the public generally of its role and the importance of Irish peatlands.

Bord na Mona Energy Limited recognises the importance of peatland conservation.

Bord na Mona Energy Limited will leave behind all areas it owns as either an economically or socially integrated resource of a high environmental value.

Bord na Mona Energy Limited seeks to conduct all aspects of its buisness in an environmentally sensitive value.

Bord na Mona Energy Limited will establish an environmental management system specifically addressing the following impacts.

- Discharges to water.
- Emissions to atmosphere.
- Waste disposal.
- Use of natural resources.
- Noise, vibration, odour, dust and visual effects.
- Natural environment and eco-system.

The environmental management system will be monitored, maintained and continually improved.

A system of regular environmental audits will be put in place.

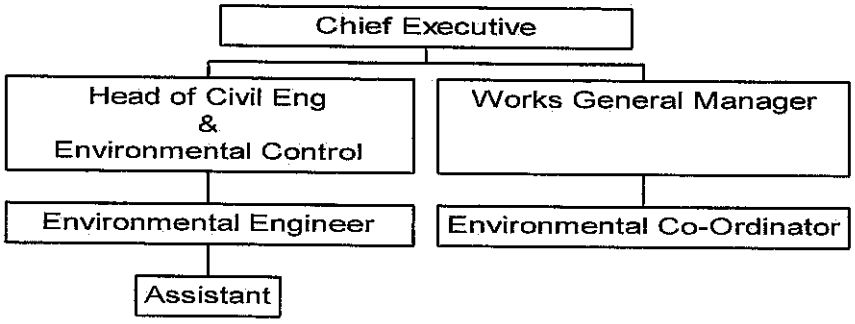
Bord na Mona Energy Limited will continue research and development into all aspects of its environmental impact.

This statement is published and is available at all locations within the division and its contents are brought to the attention of all employees.

1.4 Environmental Management of the Company

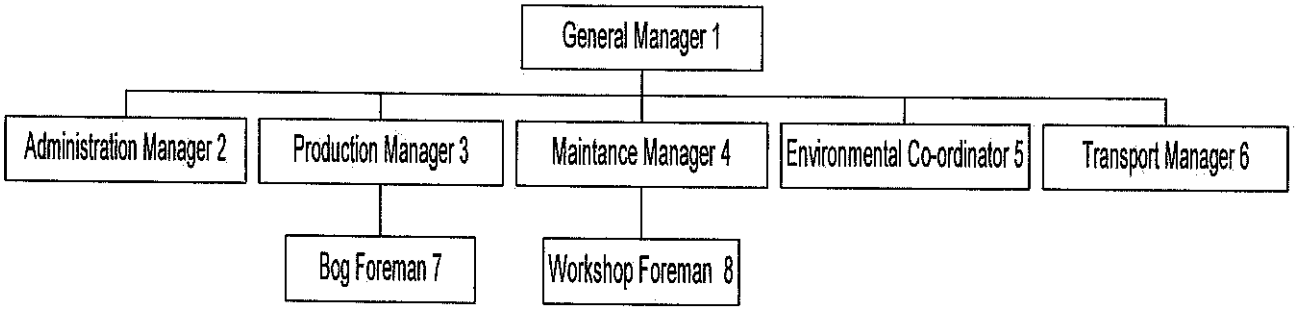
The organisational structure within Bord na Mona and the Derrygreenagh Group is presented in the flow charts below.

# Environmental Responsibilities




# Derrygreenagh Group

## Environmental Responsibilities




(1) Overall environmental responsibilities
(2) Records of complaints and registers
(3) All production related issues
(4) Machine maintenance
(5) Co-ordinating environmental affairs
(6) All peat transportation matters
(7) Silt pond maintenance, tea centres, codes of practice
(8) Fuel loading, oil traps, weekly workshop inspections.

# 2 Summary Information

## 2.1 Emissions to Water Summary

### 2.1.1 Silt Pond Emissions

The following tables contain a summary of the emissions to surface waters from within the Derrygreenagh Group.

| Silt Pond No: DH 1 Reporting Period (Jan-Dec 2001) | SW No. 1 | | | | |
|---|---|---|---|---|---|
| Parameter | Dec/Jan/Feb/Mar Emission (mg/l) | April/May/June Emission (mg/l) | July/Aug/Sept Emission (mg/l) | Oct/Nov/Dec Emission (mg/l) | Emission Limit Value (mg/l) |
| pH units | 7.6 | 7.7 | 6.8 | 7.5 | ~ |
| Flow (L/sec) | 36.2 | 3.1 | 24 | 1.3 | ~ |
| Suspended Solids (mg/l) | 32 | <5 | 21 | <5 | 35mg/l |
| Total Solids (mg/l) | 280 | 250 | 116 | 276 | ~ |
| Total Phosphorus (mg/l) | <0.05 | <0.05 | <0.05 | <0.05 | ~ |
| Ammonia (mg/l) | 1.2 | 1.5 | 1.5 | 2.7 | ~ |
| Colour (Pt Co units) | 188 | 100 | 273 | 200 | ~ |
| COD (mg/l) | 32 | 38 | 113 | 74 | ~ |

| Silt Pond No: DM 6 Reporting Period (Jan-Dec 2001) | SW No. 6 | | | | |
|---|---|---|---|---|---|
| Parameter | Dec/Jan/Feb/Mar Emission (mg/l) | April/May/June Emission (mg/l) | July/Aug/Sept Emission (mg/l) | Oct/Nov/Dec Emission (mg/l) | Emission Limit Value (mg/l) |
| pH units | 7.8 | 8.2 | 7.3 | 7.8 | ~ |
| Flow (L/sec) | 359.5 | 61.7 | 96.1 | 38.9 | ~ |
| Suspended Solids (mg/l) | 42 | 6 | 15 | <5 | 35mg/l |
| Total Solids (mg/l) | 452 | 412 | 240 | 204 | ~ |
| Total Phosphorus (mg/l) | <0.05 | <0.05 | <0.05 | <0.05 | ~ |
| Ammonia (mg/l) | 0.6 | 0.2 | 3.3 | 0.6 | ~ |
| Colour (Pt Co units) | 96 | 54 | 168 | 62 | ~ |
| COD (mg/l) | 23 | 20 | 75 | 44 | ~ |

| Silt Pond No: TR 19 Reporting Period (Jan-Dec 2001) | SW No. 14 | | | | |
|---|---|---|---|---|---|
| Parameter | Dec/Jan/Feb/Mar Emission (mg/l) | April/May/June Emission (mg/l) | July/Aug/Sept Emission (mg/l) | Oct/Nov/Dec Emission (mg/l) | Emission Limit Value (mg/l) |
| pH units | 7.3 | 7.3 | 5.7 | 7 | ~ |
| Flow (L/sec) | 34.2 | 1.2 | 84 | 23.8 | ~ |
| Suspended Solids (mg/l) | 51 | 8 | 15 | <5 | 35mg/l |
| Total Solids (mg/l) | 196 | 96 | 84 | 24 | ~ |
| Total Phosphorus (mg/l) | <0.05 | <0.05 | <0.05 | <0.05 | ~ |
| Ammonia (mg/l) | 1.2 | 1.9 | 1.2 | 1.6 | ~ |
| Colour (Pt Co units) | 282 | 266 | 226 | 259 | ~ |
| COD (mg/l) | 72 | 54 | 97 | 73 | ~ |

| Silt Pond No: BN 36 Reporting Period (Jan-Dec 2001) | SW No. 30 | | | | |
|---|---|---|---|---|---|
| Parameter | Dec/Jan/Feb/Mar Emission (mg/l) | April/May/June Emission (mg/l) | July/Aug/Sept Emission (mg/l) | Oct/Nov/Dec Emission (mg/l) | Emission Limit Value (mg/l) |
| pH units | 7.1 | 7.6 | 5.9 | 7.2 | ~ |
| Flow (L/sec) | 95.4 | NA | 24.5 | 15.5 | ~ |
| Suspended Solids (mg/l) | 31 | 6 | 20 | <5 | 35mg/l |
| Total Solids (mg/l) | 88 | 296 | 112 | 158 | ~ |
| Total Phosphorus (mg/l) | <0.05 | <0.05 | <0.05 | <0.05 | ~ |
| Ammonia (mg/l) | <0.2 | 2 | 0.6 | 1.0 | ~ |
| Colour (Pt Co units) | 140 | 123 | 233 | 206 | ~ |
| COD (mg/l) | 28 | 46 | 106 | 58 | ~ |

| Silt Pond No: CN 39 Reporting Period (Jan-Dec 2001) | SW No. 32 | | | | |
|---|---|---|---|---|---|
| Parameter | Dec/Jan/Feb/Mar Emission (mg/l) | April/May/June Emission (mg/l) | July/Aug/Sept Emission (mg/l) | Oct/Nov/Dec Emission (mg/l) | Emission Limit Value (mg/l) |
| pH units | 5.7 | 7.8 | 6.5 | 7.3 | ~ |
| Flow (L/sec) | 110.3 | 1.2 | 58.9 | 42.6 | ~ |
| Suspended Solids (mg/l) | 8 | 8 | 10 | <5 | 35mg/l |
| Total Solids (mg/l) | 86 | 270 | 144 | 204 | ~ |
| Total Phosphorus (mg/l) | <0.05 | 0.08 | <0.05 | <0.05 | ~ |
| Ammonia (mg/l) | <0.2 | 0.3 | 0.6 | 0.5 | ~ |
| Colour (Pt Co units) | 262 | 288 | 318 | 287 | ~ |
| COD (mg/l) | 46 | 103 | 104 | 88 | ~ |

| **Silt Pond No: KD 50 Reporting Period (Jan-Dec 2001)** | | **SW No. 43** | | | |
|---|---|---|---|---|---|
| **Parameter** | **Dec/Jan/Feb/Mar Emission (mg/l)** | **April/May/June Emission (mg/l)** | **July/Aug/Sept Emission (mg/l)** | **Oct/Nov/Dec Emission (mg/l)** | **Emission Limit Value (mg/l)** |
| pH units | 7 | 7.4 | 5.3 | 7.2 | ~ |
| Flow (L/sec) | 141 | 2.8 | 181 | 18.9 | ~ |
| Suspended Solids (mg/l) | 31 | 10 | 52 | <5 | 35mg/l |
| Total Solids (mg/l) | 158 | 96 | 124 | 196 | ~ |
| Total Phosphorus (mg/l) | <0.05 | 0.1 | <0.05 | 0.09 | ~ |
| Ammonia (mg/l) | 1 | 2 | 1.9 | 2.4 | ~ |
| Colour (Pt Co units) | 268 | 306 | 146 | 307 | ~ |
| COD (mg/l) | 86 | 84 | 185 | 110 | ~ |

### 2.1.2 Surface Water Discharge Monitoring Location Programme Review

The surface water discharge monitoring location programme remains the same as was submitted and accepted by the Agency in June 2000.
Pipes have been fitted at each location in order to accommodate flow metres and the provision of safe access is also ongoing.
Emission point signs have been designed and are in place.
Additional work has also being carried out at these locations as part of the ongoing silt pond upgrade programme.
Monitoring will be carried out at these same locations in the forthcoming year and reported on in next years AER.

### 2.1.3 Yard Run-off

The table below is a summary of the emissions to surface waters from yards and workshops within the Derrygreenagh Group. This summary is the average of the results submitted, covering the period Jan – Dec 2001.
It should be noted that the amount of emission points at Derrygreenagh have been reduced from 2 to 1 as a result of work carried out to rationalise surface water emission points.

| **Jan - Dec 2001**<br>**Derrygreenagh :SWE-1** | | |
|---|---|---|
| **Parameter** | **Average Emission (mg/l)** | **Emission Limit Value (ELV) (mg/l)** |
| | | |
| COD | 32 | ~ |
| | | |

### 2.1.4 Composite Sampler Programme

Attached in Appendix 1 are the results of the monitoring carried out using the composite sampler.
Sampling began on May 9th 2001 and has been continuous ever since.
In the attached Appendix, the results for each day of sampling are shown.
The days where there are no results can be attributed to, battery failure, pump tubing failure or no flow at the location.
A graph showing flow rates for the period is also contained in the Appendix.

2.1.5 Bunding Programme

New bunds were constructed at Derrygreenagh and Kinnegad.
Incorporated into this work was a fill area, which will satisfy condition 9.1.7 of the Derrygreenagh Licence.The bund size will satisfy condition 9.1.4.
A bund integrity test was carried out during the year and the results of this were submitted to the agency on 29th Nov in a letter Ref ( DG501/Bund 001 )
At present plans are in place to bund the oil store at Derrygreenagh.

## 2.2Emissions to Air

2.2.1 Dust Monitoring Locations Programme
The tables below contain the dust emissions for each dust monitoring location within the Derrygreenagh Group. Monitoring took place on three separate occasions during the periods, June – July, July – August, August – September 2001.

**June - July**

| Emission Point | Parameter | Emission ($mg/m^2$ /day) | Emission Limit Value |
|---|---|---|---|
| DM 01 | Dust | 59 | (350$mg/m^2$ /Day) |
| DM 02 | Dust | 160 | (350$mg/m^2$ /Day) |
| DM 03 | Dust | 202 | (350$mg/m^2$ /Day) |

**July - Aug**

| Emission Point | Parameter | Emission ($mg/m^2$ /day) | Emission Limit Value |
|---|---|---|---|
| DM 01 | Dust | 77 | (350$mg/m^2$ /Day) |
| DM 02 | Dust | 83 | (350$mg/m^2$ /Day) |
| DM 03 | Dust | 101 | (350$mg/m^2$ /Day) |

**Aug - Sep**

| Emission Point | Parameter | Emission ($mg/m^2$ /day) | Emission Limit Value |
|---|---|---|---|
| DM 01 | Dust | 30 | (350$mg/m^2$ /Day) |
| DM 02 | Dust | 184 | (350$mg/m^2$ /Day) |
| DM 03 | Dust | 77 | (350$mg/m^2$ /Day) |

**Note:** DM 01= Toar Bog. DM 02 = Derryhinch Bog. DM 03 = Ballivor Bog.

## 2.2.2 Boiler Combustion Efficiency

Boiler Details
Twin Danstoker solid fuel units each rated at 725KW, fuelled by loose briquettes.
Operating from Oct-Mar approximately at Derrygreenagh Works.

A boiler efficiency test was carried out on the 01/11/01. The results of this test showed the boiler to be operating at an efficiency level of 84.2%.
A full breakdown of the test is retained on file at the Derrygreenagh office.

## 2.3Waste Arisings

### 2.3.1 Hazardous Waste

Derrygreenagh being a central location, is used as a collection point for all hazardous wastes eminating from all the areas in both the Allen and Derrygreenagh Groups. All waste oils, filters, spent batteries, etc are collected centrally at Derrygreenagh before being removed by a licenced waste contractor such as Atlas Waste Oil, Hammond Lane, Returnabatt, etc.
A system is in place where by every area has its own waste oil and filter barrel.
These barrels are painted yellow to distinguish them from ordinary barrels and are clearly marked waste filters or waste oil.
When the barrels are getting near full, the area team leader informs our Derrygreenagh stores and a truck is dispatched to collect the full barrels and replace them with empties. Any spent batteries will also be collected if the need arises.
The following table is a record of all the hazardous wastes handled by the Derrygreenagh Group from January - December 2001.

| WASTE DESCRIPTION | EWC CODE | TONNES | NAME OF CONTRACTOR | DESTINATION | DATE | REJECTED CONSIGNMENTS |
|---|---|---|---|---|---|---|
| Empty Oil Drums | 150104 | 88NR | Wallace Recycling | Mullingar | 05/04/01 | NA |
| Waste Oil | 130202 | 6800L | Atlas Waste Oil | Portlaoise | 17/04/01 | NA |
| Empty Grease Drums | 150104 | 356 kg | Shannon Environmental | Shannon | 06/06/01 | NA |
| Empty Oil Drums | 150104 | 47NR | Wallace Recycling | Mullingar | 12/06/01 | NA |
| Waste Oil | 130202 | 4150L | Atlas Waste Oil | Portlaoise | 20/06/01 | NA |
| Nickel Cadium Batteries | 160602 | 33kg | Returnbatt LTD | Kildare Town | 19/07/01 | NA |
| Nickel Cadium Batteries | 160602 | 173kg | Returnbatt LTD | Kildare Town | 19/07/01 | NA |
| Lead Acid Batteries | 160601 | 160Nr | Returnbatt LTD | Kildare Town | 19/07/01 | NA |
| Waste Oil | 130202 | 1200L | Atlas Waste Oil | Portlaoise | 30/07/01 | NA |
| Skip of Oil Filters | 130601 | 2500kg * | Atlas Waste Oil | Portlaoise | 13/11/01 | NA |
| Asbestos Panels | 170105 | 9 | Willich Insulations | Fermoy Co Cork | 15/11/01 | NA |
| Empty Oil Drums | 150104 | 18NR | Wallace Recycling | Mullingar | 11/12/01 | NA |
| Empty Oil Drums | 150104 | 18NR | Wallace Recycling | Mullingar | 14/12/01 | NA |
| Empty Oil Drums | 150104 | 10NR | Wallace Recycling | Mullingar | 18/12/01 | NA |

**Note**: * Approximate weight.

2.3.2 Non-Hazardous Waste

The non-hazardous waste produced by the Derrygreenagh Group consists mainly of silt pond cleanings, mixed municipal waste and scrap metal. Midland Refuse and have a contract to collect the waste from the various tea centres across the region by way of a wheelie bin system. Rentabin Tullamore (Alina Waste) were used for skip hire although this has recently changed to a new contractor with a Local Authority Waste Permit.
In calculating the amounts of waste sent off site via wheelie bins a figure of 40kg, 110kg and 180kg was used for bin sizes 240 litre, 660 litre and 1100 litre respectively.
Silt pond cleanings are anhydrous ( 2% solid matter ) and their weight is calculated accordingly (tonnes dry weight ).

The whole waste system is at the moment being reviewed within the Derrygreenagh Group,with the option of recycling being examined to reduce the amount of waste going to landfill.

Of the total amount of non-hazardous waste produced by the Allen group, 71.5% came from silt pond cleanings, 26.5% came from scrap metal and 2 % was the result of municipal waste.
Of this municipal waste 79% came from the workshops and the remaining 21% came from the tea centres.

The following table lists the quantities of the wastes generated from January-December 2001 from all of the Derrygreenagh Group.

| Waste Type | Quantity ( Tonnes ) |
|---|---|
| Silt Pond Waste | 272 |
| Scrap Metal | 100.57 |
| Mixed Municipal Waste | 8.3 |
| Total | 380.87 |

## 2.4 Energy and Water Consumption

The table below is a summary of the energy consumption for the Derrygreenagh Group, from the dates January – Decemder 2001.

Water is not included, as it is not used as part of the production process. It is only used in offices, canteens and workshops on a domestic scale.

**Bord na Mona Group : Derrygreenagh**
**IPC Licence No.: 501**
**Energy Consumption Summary**

| Fuel | Volume $M^3$ | Tonnes | MW/Hours |
|---|---|---|---|
| **Jan - Dec 2001** | | | |
| Diesel | 1172 | 972 | 11469 |
| Petrol | 1.311 | 0.989 | 11.84 |
| Electricity | NA | NA | 433 |
| Peat Briquettes | NA | 297 | 1485 |
| Total MW/Hours | | | 13398 |

## 2.5 Environmental Incidents, Complaints & Non-Compliances

There was one incident within the Derrygreenagh Group, which occurred in July 2001. This incident was very minor and the Agency was not informed.

| Environmental Incidents | Number of Incidents |
|---|---|
| Incidents | 1 |
| Incidents requiring corrective action | 1 |
| **Categories of Incident** | |
| Odour | |
| Noise | |
| Water | |
| Air | 1 |
| Procedural | |
| Miscellaneous | |

There were no complaints within the Derrygreenagh Group, in the period January - December 2001.

| Environmental Complaints | Number of complaints |
|---|---|
| Complaints received | 0 |
| Complaints requiring corrective action | |
| **Categories of complaint** | |
| Odour | |
| Noise | |
| Water | |
| Air | |
| Procedural | |
| Miscellaneous | |

There was two non-compliances within the Derrygreenagh Group, in the period January - December 2001.

| Environmental Non-Compliance | Number of Non-Compliance |
|---|---|
| Issued by EPA | 1 |
| As a result of monitoring | 1 |
| **Categories of Non-Compliance** | |
| Odour | |
| Noise | |
| Water | 1 |
| Air | |
| Procedural | 1 |
| Miscellaneous | |

## 2.6 De-Silting Report
## Summary Data Table of Ponds De-Silted From Jan-December 2001

| Bog | No Silt Ponds | Cleaned Once | Cleaned Twice | Cleaned >Three Times | Notes |
|---|---|---|---|---|---|
| Ballivor | 10 | | 7 | | |
| Carranstown | 5 | 2 | 1 | | |
| Bracklin West | 6 | | 6 | | |
| Lisclogher | 7 | 1 | | | * |
| Kinnegad | 8 | | | 8 | |
| D/Arkin | 2 | | | | ** |
| D/Hinch | 4 | 4 | | | |
| Drumman | 6 | 6 | | | |
| Ballybeg | 6 | 6 | | | |
| Toar | 6 | 6 | | | |

*: Bog still under development, no production.
**: Bog cut out, no production at this Bog.

**% Ponds Cleaned Jan-Dec 2001**

| % Ponds Not Cleaned | % Ponds Cleaned Once | % Ponds Cleaned Twice | % Ponds Cleaned Thrice |
|---|---|---|---|
| 22 | 41.6 | 23.3 | 13.1 |

Special long reach machines are primarily used in the cleaning of the ponds, although more conventional machines that have been working on the silt pond up-grade programme are also being used to clean ponds. However during the reporting period maintenance problems occurred with regard to the longreach machines, due to the fact of their age, parts were difficult to come by and as a result, servicing of these machines took longer than usual and this in turn to led to the cleaning frequency being affected.

A new improved fortnightly inspection and cleaning roster is currently being developed.

## 2.7 Silt pond Up-Grade Programme

The work so far has included the construction of new ponds, the enlargement of ponds where necessary, the installation of controlled inlet and outlet pipes, and the construction of pond by-passes, to accommodate cleaning and flood conditions.
Further to this, operatives cleaning ponds have been instructed to deepen the ponds if possible in order to increase the volume.
Progress so far has included programme one, and the majority of stage one of programme two.
Stage two of programme two is also ongoing. It is difficult to say exactly how long it will take to fully complete.

## 2.8 Bog Development and Operational Programme

The bogs in the Derrygreenagh Group are well into their productive lives, therefore there will be no development in the year 2002.
However in the Ballivor Group, Carranstown bog is currently under development, with approximately 120 acres to be developed.
It is proposed to develop initially part of this total for the 2003 production season, with no production planned at the site for 2002.

Due to the pre-mature closure of Rhode Power Station there will be no production on Drumman, Derryhinch and Toar bogs in the forthcomming production season ( Summer 2002 )

## 3.0 Management of the Activity

### 3.1 Environmental Management Programme Report

| Project | Description | Status |
|---|---|---|
| **Project 1 & Project 2** | (1)The reduction of fugitive dust emissions.<br>(2)The minimisation of suspended solids movement to surface waters.<br>(3)The examination of production machine modification.<br>(4)The results of dust monitoring. | 1&3: Training complete,<br>Codes of practice in place.<br>2: See appendix 2.<br>4: See appendix 2 |
| **Project 3** | Rationalisation of surface water discharge points. | D/Hinch Bog – Under consideration<br>Toar Bog – Not feasible<br>Ballybeg Bog – Not feasible |
| **Project 4** | Investigation of reed bed systems for final polish of silt pond discharges. | Study complete<br>See appendix: 3 |
| **Project 5** | The separation of flood water and external runoff from production runoff. | Ballybeg Bog – Not feasible<br>Drumman Bog – Not feasible<br>Toar Bog – Not Feasible |
| **Project 6** | The effective spill/leak management of mobile fueling units by implementing a programme of training and adopting Codes of Practice. | 1: Survey complete.<br>2: Procedures in place.<br>3: Training complete<br>4: ERP in place. |
| **Project 7** | Programme of bunding at all bulk diesel storage facilities | Bunding complete. |
| **Project 8** | Investigation into the reuse of silt pond waste | Study about to begin<br>See appendix: 4 |
| **Project 9** | Study into the collection storage and reuse of polyethelene covering | Project in progress<br>See appendix: 5 |
| **Project 10** | Examination of the use of reusable materials in the protection of stockpiles | Study in progress<br>See appendix: 6 |
| **Project 11** | Examination of wind power technology for pumped drainage. | Study ongoing<br>See appendix: 7 |

### 3.2 Environmental Expenditure

The table below lists the environmental costs incurred by the Derrygreenagh Group between May-December 2000.
In calculating the environmental costs 70% of the total costs were attributed to Licence 503 and 30% to Licence 501.The Ballivor Group costs were then added to the Derrygreenagh totals.

| Expenditure Related to the Operation of the Derrygreenagh IPC Licence During the Period January – December 2001 | |
|---|---|
| **Description** | **Cost (€)** |
| Capital Costs | 42,690 |
| Plant @ €40/hour | 215,300 |
| Labour | 53,820 |
| Materials | 7,514 |
| Overheads (ESB, Phones, Consumables) | 5,800 |
| Laboratory Analysis | 10,000 |
| EPA Fees | 7,403 |
| Total | € 342,527 |

### 3.3 Bog Rehabilition Report

Management guidelines for the planning and implementation of cutaway bog rehabilitation have been adopted and the document is currently available for inspection on file at the Derrygreenagh office.

## 4.0 Summary

With regard to environmental compliance at the Derrygreenagh Group of Bogs, there were no exceedences in the quarterly grab sampling of the ponds in the Surface Water Discharge Monitoring Location Programme.
There was one non-compliances in relation to the Composite Sampler during the operation period May to the end of December. Dust monitoring results at the dust sensitive locations were also below the Emission Limit Value and there were no complaints of an environmental nature received during the reporting period.

The staff awareness through training and involvement in the operation of the licence has also improved immensely. A full programme of training and awareness has been conducted at the works and has targeted all personnel ie. office, workshop, transport and production.

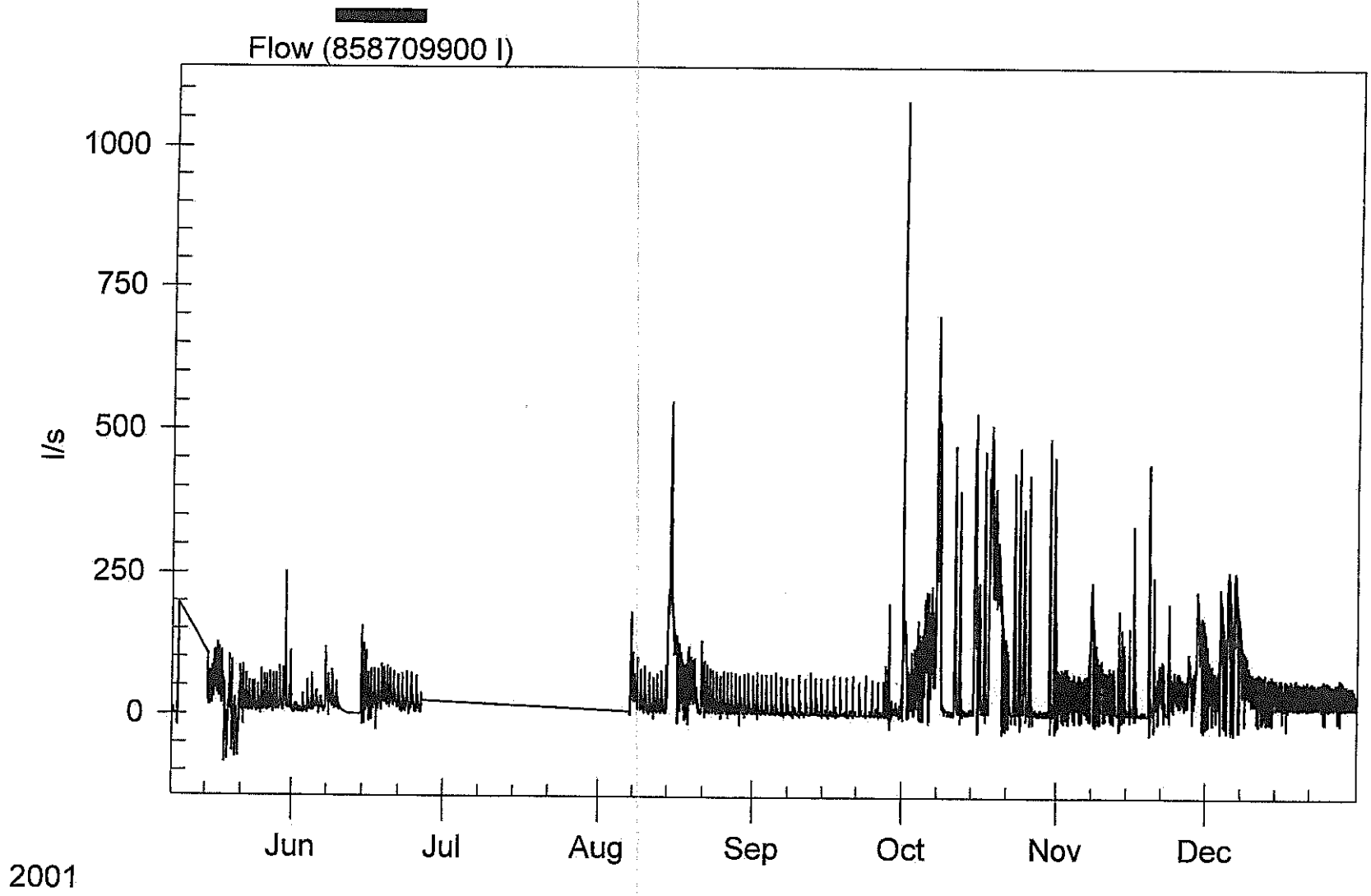
Bord na Mona are participating on the three Rivers project, (Boyne, Liffey and Suir) water quality, monitoring and management.
Bord na Mona are also involved in catchment management on the River Barrow.

Bord na Mona Energy Ltd would like to take this opportunity to advise the Environmental Protection Agency of its continued commitment to improving its environmental performance by adopting cleaner production methods and improving its environmental protection measures.

# APPENDIX 1

# Derrygreenagh Flow Rates

From May 8/091 to Dec.31/01



**Bord Na Mona Energy Ltd, Derrygreenagh Group, Rochfordsbridge, Mullingar Co Westmeath.**

**Composite Sampler Results**

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| May | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2001 | | mg/l | N mg/l | Phosphoru | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | |
| 9 | | | | | | | | 329370 | | | | | |
| 10 | | | | | | | | 7623477 | | | | | |
| 11 | | | | | | | | 9338112 | | | | | |
| 12 | | | | | | | | 9338112 | | | | | |
| 13 | | | | | | | | 9338112 | | | | | |
| 14 | | | | | | | | 9338112 | | | | | |
| 15 | | | | | 21 | 410 | | 9338112 | | | | 196.10 | 3828.63 |
| 16 | | | | | 27 | 410 | | 3561203 | | | | 96.15 | 1460.09 |
| 17 | | | | | 22 | 364 | | 5859278 | | | | 128.90 | 2132.78 |
| 18 | | | | | 5 | 326 | | 5763613 | | | | 28.82 | 1878.94 |
| 19 | | | | | 26 | 102 | | 114849 | | | | 2.99 | 11.71 |
| 20 | | | | | | | | 1306812 | | | | | |
| 21 | 8.2 | 68 | 1.2 | 0.05 | 34 | 480 | | -1431617 | -97.35 | -1.72 | -0.07 | -48.67 | -687.18 |
| 22 | | | | | [illegible] | 464 | | 928125 | | | | 62.18 | 430.65 |
| 23 | | | | | [illegible] | 486 | 94 | 2301294 | | | | 230.13 | 1118.43 |
| 24 | | | | | | | | 1618716 | | | | | |
| 25 | | | | | [illegible] | 498 | | 1870496 | | | | 108.49 | 931.51 |
| 26 | | | | | 29 | 492 | | 1755410 | | | | 50.91 | 863.66 |
| 27 | | | | | 29 | 416 | | 2257230 | | | | 65.46 | 939.01 |
| 28 | 8.4 | 64 | 1 | 0.05 | 25 | 474 | | 1909902 | 122.23 | 1.91 | 0.10 | 47.75 | 905.29 |
| 29 | | | | | 6 | 214 | | 2268529 | | | | 13.61 | 485.47 |
| 30 | | | | | [illegible] | 582 | 75 | 2115511 | | | | 188.28 | 1231.23 |
| 31 | | | | | 28 | 490 | | 3517178 | | | | 98.48 | 1723.42 |

A minus figure usually means the pond was flooded or backflowing

**Bord Na Mona Energy Ltd, Derrygreenagh Group, Rochfordsbridge, Mullingar Co Westmeath.**

**Composite Sampler Results**

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| June | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2001 | | mg/l | N mg/l | Phosphoru | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 22 | 514 | | 1799015 | | | | 39.58 | 924.69 |
| 2 | | | | | 25 | 490 | | 839568 | | | | 20.99 | 411.39 |
| 3 | | | | | 8 | 532 | | 786146 | | | | 6.29 | 418.23 |
| 4 | 8.3 | 58 | 1 | 0.05 | 6 | 568 | 73 | 1386033 | 80.39 | 1.39 | 0.07 | 8.32 | 787.27 |
| 5 | | | | | 26 | 500 | | 1969142 | | | | 51.20 | 984.57 |
| 6 | | | | | 30 | 456 | | 1732472 | | | | 51.97 | 790.01 |
| 7 | | | | | 22 | 460 | | 1405486 | | | | 30.92 | 646.52 |
| 8 | | | | | 5 | 454 | | 2890984 | | | | 14.45 | 1312.51 |
| 9 | | | | | 9 | 472 | | 2759718 | | | | 24.84 | 1302.59 |
| 10 | | | | | 12 | 460 | | 2085601 | | | | 25.03 | 959.38 |
| 11 | 7.8 | 54 | 0.8 | 0.05 | 6 | 488 | 86 | 805046 | 43.47 | 0.64 | 0.04 | 4.83 | 392.86 |
| 12 | | | | | 52 | 456 | | 275237 | | | | 17.06 | 125.51 |
| 13 | | | | | | | | 137605 | | | | | |
| 14 | | | | | 3 | 524 | | 77808 | | | | 4.20 | 40.77 |
| 15 | | | | | 11 | 248 | | 2738742 | | | | 30.13 | 679.21 |
| 16 | | | | | 10 | 362 | | 3003235 | | | | 30.03 | 1087.17 |
| 17 | | | | | 6 | 330 | | 2400243 | | | | 14.40 | 792.08 |
| 18 | 8.1 | 57 | 1.4 | 0.05 | 6 | 224 | 82 | 2857967 | 162.90 | 4.00 | 0.14 | 17.15 | 640.18 |
| 19 | | | | | 5 | 468 | | 2967938 | | | | 14.84 | 1388.99 |
| 20 | | | | | 12 | 396 | | 2956563 | | | | 35.48 | 1170.80 |
| 21 | | | | | 10 | 438 | | 2904737 | | | | 29.05 | 1272.27 |
| 22 | | | | | 13 | 440 | | 2348008 | | | | 30.52 | 1033.12 |
| 23 | | | | | 11 | 444 | | 1873888 | | | | 20.61 | 832.01 |
| 24 | | | | | 10 | 468 | | 1968810 | | | | 19.69 | 921.40 |
| 25 | 8.4 | 65 | 1.1 | 0.05 | 12 | 436 | 86 | 1924502 | 125.09 | 2.12 | 0.10 | 23.09 | 839.08 |
| 26 | | | | | 52 | 470 | | 1616276 | | | | 84.05 | 759.65 |
| 27 | | | | | 36 | 462 | | 812967 | | | | 29.27 | 375.59 |
| 28 | | | | | 53 | 428 | | 607081 | | | | 32.18 | 259.83 |
| 29 | | | | | | | | 607081 | | | | | |
| 30 | | | | | | | | 607081 | | | | | |
| | | | | | | | | | | | | | |

A minus figure usually means the pond was flooded or backflowing

**Bord Na Mona Energy Ltd, Derrygreenagh Group, Rochfordsbridge, Mullingar Co Westmeath.**

**Composite Sampler Results**

| August 2001 | pH | COD mg/l | Ammonia as N mg/l | Total Phosphoru mg/l | Suspended Solids mg/l | Total Solids mg/l | Colour Pt Co units | Flow Daily Total (litres) | COD Kg/Day | Ammonia as Kg/Day | Total Phosphorus Kg/Day | Suspended Solids Kg/Day | Total Solids Kg/Day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | 607081 | | | | | |
| 2 | | | | | | | | 607081 | | | | | |
| 3 | | | | | | | | 607081 | | | | | |
| 4 | | | | | | | | 607081 | | | | | |
| 5 | | | | | | | | 607081 | | | | | |
| 6 | 7.6 | 56 | 1.1 | 0.07 | 9 | 440 | 111 | 607081 | 34.00 | 0.67 | 0.04 | 5.46 | 267.12 |
| 7 | | | | | 8 | 410 | | 545490 | | | | 4.36 | 223.65 |
| 8 | | | | | 5 | 386 | | 6193691 | | | | 30.97 | 2390.76 |
| 9 | | | | | 6 | 412 | | 3322533 | | | | 19.94 | 1368.88 |
| 10 | | | | | 6 | 434 | | 1964966 | | | | 11.79 | 852.80 |
| 11 | | | | | 5 | 450 | | 2156978 | | | | 10.78 | 970.64 |
| 12 | | | | | 5 | 448 | | 1961030 | | | | 9.81 | 878.54 |
| 13 | 8.2 | 59 | 2.7 | 0.25 | 7 | 418 | 90 | 1926921 | 113.69 | 5.20 | 0.48 | 13.49 | 805.45 |
| 14 | | | | | 5 | 438 | | 1609170 | | | | 8.05 | 704.82 |
| 15 | | | | | 10 | 222 | | 7908786 | | | | 79.09 | 1755.75 |
| 16 | | | | | 7 | 274 | | 22809900 | | | | 159.67 | 6249.91 |
| 17 | | | | | 5 | 342 | | 8392378 | | | | 41.96 | 2870.19 |
| 18 | | | | | 5 | 398 | | 3756532 | | | | 18.78 | 1495.10 |
| 19 | | | | | 5 | 370 | | 2988439 | | | | 14.94 | 1105.72 |
| 20 | 8 | 67 | 2 | 0.05 | 5 | 386 | 170 | 4268899 | 286.02 | 8.54 | 0.21 | 21.34 | 1647.80 |
| 21 | | | | | 5 | 434 | | 1950336 | | | | 9.75 | 846.45 |
| 22 | | | | | 5 | 438 | | 2910411 | | | | 14.55 | 1274.76 |
| 23 | | | | | 5 | 460 | | 2319306 | | | | 11.60 | 1066.88 |
| 24 | | | | | 5 | 604 | | 2552861 | | | | 12.76 | 1541.93 |
| 25 | | | | | 13 | 456 | | 1561298 | | | | 20.30 | 711.95 |
| 26 | | | | | 5 | 508 | | 2236700 | | | | 11.18 | 1136.24 |
| 27 | 8.3 | 58 | 1.6 | 0.05 | 6 | 516 | 106 | 1662949 | 96.45 | 2.66 | 0.08 | 9.98 | 858.08 |
| 28 | | | | | 8 | 400 | | 1335402 | | | | 10.68 | 534.16 |
| 29 | | | | | 7 | 436 | | 1407372 | | | | 9.85 | 613.61 |
| 30 | | | | | 10 | 404 | | 1794764 | | | | 17.95 | 725.08 |
| 31 | | | | | 8 | 396 | | 1498757 | | | | 11.99 | 593.51 |

A minus figure usually means the pond was flooded or backflowing

## Bord Na Mona Energy Ltd, Derrygreenagh Group, Rochfordsbridge, Mullingar Co Westmeath.

## Composite Sampler Results

| September 2001 | pH | COD mg/l | Ammonia as N mg/l | Total Phosphoru mg/l | Suspended Solids mg/l | Total Solids mg/l | Colour Pt Co units | Flow Daily Total (litres) | COD Kg/Day | Ammonia as Kg/Day | Total Phosphorus Kg/Day | Suspended Solids Kg/Day | Total Solids Kg/Day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | 5 | 444 | | 1157500 | | | | 5.79 | 513.93 |
| 2 | | | | | 7 | 422 | | 1260885 | | | | 8.83 | 532.09 |
| 3 | 8.2 | 51 | 1.2 | IS | 5 | 440 | 82 | 1134871 | 57.88 | 1.36 | | 5.67 | 499.34 |
| 4 | | | | | 24 | 398 | | 1194251 | | | | 28.66 | 475.31 |
| 5 | | | | | 5 | 424 | | 1221137 | | | | 6.11 | 517.76 |
| 6 | | | | | 14 | 428 | | 1053025 | | | | 14.74 | 450.69 |
| 7 | | | | | 10 | 452 | | 919176 | | | | 9.19 | 415.47 |
| 8 | | | | | NA | | | 955316 | | | | | |
| 9 | | | | | NA | | | 716214 | | | | | |
| 10 | 7.7 | 40 | 1.1 | 0.05 | 5 | 464 | 78 | 854328 | 34.17 | 0.94 | 0.04 | 4.27 | 396.41 |
| 11 | | | | | 18 | 442 | | 489119 | | | | 8.80 | 216.19 |
| 12 | | | | | 15 | 470 | | 941862 | | | | 14.13 | 442.68 |
| 13 | | | | | 13 | 484 | | 1063738 | | | | 13.83 | 514.85 |
| 14 | | | | | 7 | 476 | | 1243499 | | | | 8.70 | 591.91 |
| 15 | | | | | 12 | 460 | | 955662 | | | | 11.47 | 439.60 |
| 16 | 8.1 | 46 | 1.4 | 0.05 | 9 | 464 | 64 | 614803 | 28.28 | 0.86 | 0.03 | 5.53 | 285.27 |
| 17 | | | | | NA | | | 502364 | | | | | |
| 18 | | | | | NA | | | 411005 | | | | | |
| 19 | | | | | NA | | | 729170 | | | | | |
| 20 | | | | | NA | | | 592217 | | | | | |
| 21 | | | | | NA | | | 666123 | | | | | |
| 22 | | | | | NA | | | 191026 | | | | | |
| 23 | | | | | NA | | | 1011456 | | | | | |
| 24 | 8 | 39 | 1.7 | 0.05 | 5 | 468 | 74 | 593855 | 23.16 | 1.01 | 0.03 | 2.97 | 277.92 |
| 25 | | | | | NA | | | 546132 | | | | | |
| 26 | | | | | NA | | | 363024 | | | | | |
| 27 | | | | | 8 | 434 | | 315784 | | | | 2.53 | 137.05 |
| 28 | | | | | 12 | 484 | | 2298250 | | | | 96.53 | 1112.35 |
| 29 | | | | | NA | | | 1256877 | | | | | |
| 30 | | | | | 33 | 306 | | 539601 | | | | 17.81 | 165.12 |
| | | | | | | | | | | | | | |

A minus figure usually means the pond was flooded or backflowing

## Bord Na Mona Energy Ltd, Derrygreenagh Group, Rochfordsbridge, Mullingar Co Westmeath.

## Composite Sampler Results

| November 2001 | pH | COD mg/l | Ammonia as N mg/l | Total Phosphoru mg/l | Suspended Solids mg/l | Total Solids mg/l | Colour Pt Co units | Flow Daily Total (litres) | COD Kg/Day | Ammonia as Kg/Day | Total Phosphorus Kg/Day | Suspended Solids Kg/Day | Total Solids Kg/Day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | 5 | 390 | | 8659302 | | | | 43.30 | 3377.13 |
| 2 | | | | | 6 | 412 | | 4020629 | | | | 24.12 | 1656.50 |
| 3 | | | | | 5 | 422 | | 4059637 | | | | 20.30 | 1713.17 |
| 4 | | | | | 5 | 458 | | 3408766 | | | | 17.04 | 1561.21 |
| 5 | 8.2 | 52 | 2.1 | 0.05 | 7 | 404 | 114 | 3003877 | 156.20 | 6.31 | 0.15 | 21.03 | 1213.57 |
| 6 | | | | | 5 | 402 | | 3484998 | | | | 17.42 | 1400.97 |
| 7 | | | | | 5 | 254 | | 3201347 | | | | 16.01 | 813.14 |
| 8 | | | | | 5 | 310 | | 10883490 | | | | 54.42 | 3373.88 |
| 9 | | | | | 8 | 326 | | 6926824 | | | | 55.41 | 2258.14 |
| 10 | | | | | 5 | 272 | | 5306752 | | | | 26.53 | 1443.44 |
| 11 | | | | | 5 | 84 | | 4297295 | | | | 21.49 | 360.97 |
| 12 | 8.2 | 65 | 1.9 | 0.05 | 8 | 128 | 160 | 4604395 | 299.29 | 8.75 | 0.23 | 36.84 | 589.36 |
| 13 | | | | | 7 | 346 | | 1667897 | | | | 11.68 | 577.09 |
| 14 | | | | | 7 | 404 | | 4267856 | | | | 29.87 | 1724.21 |
| 15 | | | | | 20 | 416 | | 2393259 | | | | 47.87 | 995.60 |
| 16 | | | | | 8 | 356 | | 1431889 | | | | 11.46 | 509.75 |
| 17 | | | | | NA | NA | | 4396882 | | | | | |
| 18 | | | | | NA | NA | | 249570 | | | | | |
| 19 | 7.9 | 60 | 2.2 | 0.05 | 12 | 358 | 130 | 311510 | 18.69 | 0.69 | 0.02 | 3.74 | 111.52 |
| 20 | | | | | 5 | 416 | | 5573800 | | | | 27.87 | 2318.70 |
| 21 | | | | | 5 | 452 | | 3983426 | | | | 19.92 | 1800.51 |
| 22 | | | | | 6 | 352 | | 4615916 | | | | 27.70 | 1624.80 |
| 23 | | | | | 5 | 358 | | 1820315 | | | | 9.10 | 651.67 |
| 24 | | | | | 5 | 420 | | 5242528 | | | | 26.21 | 2201.86 |
| 25 | 8.1 | 68 | 1.9 | 0.05 | 5 | 346 | 195 | 4895712 | 332.91 | 9.30 | 0.24 | 24.48 | 1693.92 |
| 26 | | | | | 5 | 414 | | 4816267 | | | | 24.08 | 1993.93 |
| 27 | | | | | 5 | 358 | | 4406860 | | | | 22.03 | 1577.66 |
| 28 | | | | | 5 | 348 | | 6044126 | | | | 30.22 | 2103.36 |
| 29 | | | | | 6 | 226 | | 7701463 | | | | 46.21 | 1740.53 |
| 30 | | | | | 5 | 258 | | 12893480 | | | | 64.47 | 3326.52 |

A minus figure usually means the pond was flooded or backflowing

# APPENDIX 2

# Environmental Management Programme Report

**Project 1.**

Condition 5.4 of the Derrygreenagh licence calls for an emission limit of 350mg/m2/day in accordance with the Batneec guidelines, with regard to dust emissions from milled peat production bogs. Condition 2.2.2 (iv) of the Environmental Management Programme calls for the reduction of fugitive dust emissions during loading and transfer operations on the bog and during unloading operations at the tippler and works yard areas. Also Condition (v) calls for the provision of measures to protect dust sensitive areas.

**Project Summary:**

The Environmental code of Practice for Bord na Mona Works which is included in Attachment no.10 of the Attachments Folder, under the Derrygreenagh application documents, cover the control of fugitive dust emissions.

1. Training for operatives at the various production cycles will be carried out to cover all locations and the existing dust sensitive locations in the Derrygreenagh group (Toar, Ballivor & Derryhinch). This will also incorporate a system of Cleaner Production Methods training, so as to implement the Codes of Practice in relation to dust and increase the awareness of Bord na Mona's production personnel to fugitive dust emissions and waste minimisation.
2. The programme will also include examining production machines, regarding process modifications and improved process control with the objective of increasing production efficiency, while reducing emissions. This will be carried out, with technical assistance from the Research & Development dept.
3. Procedures will be prepared so as to ensure compliance with condition 5.5 of the licence, in relation to dust control.
4. The results from the monitoring of the dust sensitive locations in accordance with condition 5.3 of the licence, will also be examined and used in improving process control

**Project Report:**

(3) With regard to examining production machines, in relation to process modifications and improved process control, it is proposed to examine three elements of the peat harvester in relation to dust control. Once a production field has been milled, harrowed, ridged it is ready for lifting on the belt of a peat harvester and deposited into a central stockpile for storage or sale. During this process, dust can be generated at various points on the harvester, ie the belt transfer points, the potato chain elevator and while discharging onto the stockpile.

It is proposed to asses these dust sensitive points on the machine by investigating methods of covering or dust proofing these locations on the lift of the harvester and on the jib. Trials on the suitability and benefits of this dust suppression system will be assessed in Monettia bog, in the Boora group of bogs. Here its performance and environmental benefits will be assessed along side existing harvesters and a report will be submitted on its feasability in the Annual Environmental Report 2003.

It is proposed to start the pilot project by March 31st.

(4) There were no non-compliances or complaints in relation to dust during the production year past. This would indicate that the training given to operatives and the codes of practice adopted were a success. See dust monitoring results section 2.2.1 in the body of the report.

# Environmental Management Programme Report

## Project 2.

Schedule 1 (i) of the Derrygreenagh licence calls for an emission limit of 35mg/litre in accordance with the Batneec guidelines, with regard to silt emissions from milled peat production bogs. Condition 2.2.2 (i) of the Environmental Management Programme calls for the minimisation of suspended solids movement to surface water systems via peatland surface water drainage channels during development and operation of boglands, to be addressed.

## Project Summary:

1. The program will look at improving process control and will involve a programme of cleaner production methods being implemented in the various stages of the production cycle, as waste minimisation measures.
2. A large part of the programme will involve training for management and operatives involved at the various stages of a production cycle i.e. milling, harrowing, ridging, harvesting, loading, ditching etc.
3. Procedures will be prepared, which will highlight the best practice in milled peat production. These procedures will be used to implement the Codes of Practice in peat production and will assist in waste minimisation.
4. Process modification will also be examined with the assistance of the Research & Development Dept, which may improve the efficiency of the production machines, reducing the amount of milled peat lost as silt.

## Project Report:

With regard to process modifications, to reduce peat loss on the bog, inspections will be carried out during the next production season, to see what improvements can be effected to reduce losses and leakages of peat from Millers, Harrows, Ridgers & Harvestors. These machines will be tested at Monnettia in the Boora Group and will involve looking at belt seals, hydraulic harrows, ridger blades, offset millers etc.

These modifications will be examined along side existing machines to quantify any benefits that me be achieved. A report on this project will be submitted as part of the 2002 AER.

# Environmental Management Programme Report

**Project 4.**

Condition 2.2.2 (iii) calls for the Investigation of reed-bed systems for final polish of silt pond discharges to be addressed. Condition 9.1.7.

**Project Summary:**

This project will be a desk-based study to examine the different types of reed-beds in use and the different types of wastewater's that are suitable for final polishing.

1. An Engineer will be appointed to examine and research existing systems that may be in use, and assess
   their suitability, advantaged/disadvantages etc to the Bord na Mona situation. He/She will liaise with 3rd level Institutions who may be carrying out research into reed-bed systems and their applications for final polishing of wastewater.
2. If the above research shows that demonstrating the effectiveness or not of the system, warrants a pilot area to be selected and a reed-bed constructed, then a test area will be selected
3. If the research shows that the system is not suitable for final polishing of silt pond discharges, the rationale for this will be included in the AER.

**Project Report:**

**The potential for using reedbed systems for the final polishing of silt pond discharges.**

The installation of reedbed treatment systems for the final polishing of silt pond waste is not, in most respects, a feasible option for Bord na Mona. The results collected from composite samplers at two sites (Allen and Blackwater) and also from grab samples at these sites (see report on silt pond efficiency) indicate that BOD, suspended solids, phosphorus and ammonia values are below environmental quality standards given by the EPA. The Lough Ree, Lough Derg study found similar results except that ammonia levels emanating from the worked bog were high. This meant that ammonia levels in the little Cloghan River were elevated downstream of the operational site. If reedbeds could be proven to significantly reduce ammonia from silt pond discharges their installation would be justified, however for the greater part, discharges from worked bogs into catchments satisfy environmental quality standards and literature shows that ammonia removal efficiency is unreliable and unpredictable (Jing *et. al.*, 2001, Steer *et. al.*,2002, Luederitz *et. al.*, 2001). TMER results (Leuderitz *et. al.*, 2001) would indicate that reedbed treatment systems would not be a desirable option for the final polishing of silt pond waste. Practical problems would also arise in terms of site accessibility and the difficulty of working with peat.

**Silt removal efficiency trial of Bord na Mona settlement ponds.**

The results of efficiency tests from this study indicate that the Barnaran and Creggan ponds were not very efficient but as explained, water entering the ponds in most cases had low suspended solid concentrations. As the amount of silt entering the pond increased, the representative efficiency of the ponds was revealed. Despite this, the requirements of the license were still fulfilled in terms of concentrations of suspended solids in the outflow from the pond.

The results achieved in this test are not typical as previous tests by Hannon and Coffey (1980) and Harkins (1991) have shown silt ponds to be highly efficient at removing peat silt. This is due to the fact that the majority of the silt is retained on the bog in the old sod trenches in the case of Barnaran, while Creggen bog is pumped drainage with the silt being retained in the pump sump. It is proposed to sample another pond, which is a more representative example of a gravity drained system, in the coming year. Operational practices and improved maintenance of the ponds would also ensure greater silt removal efficiency.

# APPENDIX 4

# Environmental Management Programme Report

**Project 8.**

Condition 2.2.2 (vii) of the EMP calls for an investigation into the reuse of silt pond waste.

**Project Summary:**

The difficulty with reusing peat silt is the contamination of the peat by subsoil, because of the location of the silt ponds. This results in high ash content.

1. The project will select 1 to 2 ponds in the Bord na Mona Energy Ltd group, with a view to examining the possibilities of silt containment in intermediate settlement ponds.
2. Examine the methods used for extracting the silt and the physical make-up of the silt once it has been mechanically taken from the silt pond with regard to contamination.
3. Methods for incorporating the silt back into the stockpiles will be examined for feasibility, effectiveness etc.
4. Alternative uses for the silt will also be explored, either for further use within Bord na Mona Energy Ltd, or for public use.

Two suitable ponds will be introduced to the project on a phased basis, to conduct trials. The results from the first pond will determine whether a second test site worth exploring.

**Project Report:**

Suitable locations for examining the possibility of reusing silt pond waste will be selected prior to the 2002 production season and monitored in the second half of the year.

# APPENDIX 5

# Environmental Management Programme Report

**Project 9.**

Condition 2.2.2 (viii) of the EMP calls for the collection, storage, and reuse of polythene covering to be explored.

**Project Summary:**

1. The project will initially be in the form of desk based study, to examine the methods available for the removal, collection and the storage of the stockpile covering.
2. It will also cover research into the development of a Bord na Mona specific machine/method for the effectiveness and economical removal of the covering
3. Polythene reuse will be examined in relation to reuse in Bord na Mona Energy Ltd, other divisions in Bord na Mona Ltd, or other industry.

The collection and reuse of the material will also be examined in conjunction with the licensed waste contractor, engaged to recycle the used polythene covering. The company is actively pursuing these objectives with Shabra Plastics and is also exploring other outlets for the waste polythene.

**Project Report:**

Trials were carried out by a private company (Banner Re-cycling) on the baling of used polythene for removal to a recycling depot. The loose polythene is brought to the nearest hard stand on site and is baled into approx. 400 kg square bales. It is then in a suitable form for transportation for recycling. The company will soon have a dedicated machine for Bord Na Mona use.

Baling took place at Boora and Coolnamona and this will be extended to all Works.

Bord Na Mona have an agreement with Shabra Plastics Ltd. (Monaghan) to re-cycle this polythene and during the year 2001, 185 Tonnes was delivered to them .
Shabra use this high grade material to manufacture a raw material in bead form for use in other industries.

We are at present in discussions with two companies regarding re-cycling our used polythene into Bio-Bead for use by Bord Na Mona Environmental Ltd in its products.

# APPENDIX 6

# Environmental Management Programme Report

**Project 10.**

Condition 2.2.2 (ix) of the EMP calls for an examination of the use of reusable material for stockpile protection.

**Project Summary:**

1. This project will be initially in the form of a desk-based study, to examine the various materials on the market, which may suit stockpile protection.
2. It will re-examine previous Bord na Mona research into alternative stockpile protection measures and assess any advances in technology.
   It will take into account, the methods of application, life of the product, methods of removal, recyclebility, and economics etc and its suitability to Bord na Mona's requirements

This will be reported, on a quarterly basis, to the Head of Civil Engineering & Environmental Control and the results of the research documented.

**Project Report:**

Currently Bord na Mona use 350 gauge, 89 micron, low density black polythene for stockpile protection for a variety of reasons.

1. Weight per roll of polythene, is suitable for transport on the bog, where low bearing pressures are important.

2. It is also suitable for handling and covering of the stockpile on the bog and when removing during peat sales.

3. The polythene is also suitable for baling for recycling (see project 9).

Bord na Mona have also commissioned a study on biodegradable polymers used in the manufacture of film. The objectives of the study are to compare biodegradable films to polyethylene film for use as peat protective cover. The comparison will be based on product performance, end of life, degradation processes, product shelf life and cost.

The report will detail the current state of the art in commercially available biodegradable polymers. Polymer converters manufacturing biodegradable film will also be detailed. The comparison of biodegradable polymers to polyethylene will also be reported with particular emphasis on the performance requirements of Bord na Mona

The project, which is being carried out by the Polymer Development Centre, in The Athlone Business & Technology Park, has commenced since 11/02/02, and a report is due by 11/03/02

# Environmental Management Programme Report

**Project 11.**

Condition 2.2.2 (x) of the EMP calls for the examination of wind power technology for pumped drainage.

**Project Summary:**

1 It will also involve examining previous research carried out by Bord na Mona and assessing changes in technology.
The project will initially be in the form of desk based study, to examine the technology availability, the pumping requirements of the various licensed activities, wind regimes, and the suitability of bogs for the installation of wind powered pumps.

**Project Report:**

Previous studies into utilising wind power technology for pumped drainage in Bord na Mona have show it to be unfeasible, for a number of reasons.

1. In order for a wind powered pump to operate when required ie. after periods of rainfall, wind is required. As rainfall is not always accompanied with high winds, a separate electrical pump would be required , therefore installation costs would be higher as both systems would be required on site. The requirement for a reliable and responsive pumping system is very important when operating in a production bog as it provides for the drainage of the catchment in situations where gravity drainage is no longer possible. The drainage is important in order to maintain the production fields for production operations and for the protection of existing stock on the bog.

2. Typical Bord na Mona pumping capacity is approx 2.47 l/sec/hectare. Wind pumping capacity of one wind pump investigated was found to be 20,000 to 40,000 litres depending on water head, which converts to 0.46l/sec, which is less than one fifth of the Bord na Mona requirements.

3. Wind regimes on BNM bogs at low heights are not suitable for wind power due to low wind speeds and obstacles on the bog surface and surrounding land such a forestry plantations which create "wind shade".

4. Due to the lack of wind data availability for the majority of Ireland, a wind test mast would have to be installed at each site to assess the potential wind regime. This would have to remain on site for 12mths to establish reliable wind speed data. These test masts would also require planning permission.

5. All wind turbines, regardless of hub height require planning permission from the local authority, and may require some environmental monitoring, or even an EIS.

However, regardless of the above, Bord na Mona is advances advances in technology regarding wind energy, and will continue to monitor and examine any possible uses in pumped drainage.

The Environmental Protection Agency
31 MAR 2003
IPC ENFORCEMENT

# BORD NA MÓNA

BORD NA MÓNA ENERGY LIMITED
Derrygreenagh,Rochfortbridge,Mullingar,Co-Westmeath

# Annual Environmental Report
# IPC LICENCE 501

**March 2003**

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## 5 Summary

**Appendix 1:** Composite Sampler Results

# 1 Introduction

## 1.1 Company Details

| | |
|---|---|
| Name: | **Bord na Mona Energy Limited.** |
| Address: | **Derrygreenagh Group**<br>**Derrygreenagh Works**<br>**Rochfortbridge**<br>**Mullingar**<br>**Co Westmeath.** |
| Telephone No: | **044 / 22181** Fax No: **044 / 22344** |
| Contact Name: | **Paul Riordan** |
| Position: | **Regional Manager.** |
| National Grid Reference: | **E249450 N238140** |

## 1.2 Activities

The Derrygreenagh Group consists of the Derrygreenagh and Ballivor Groups and Rossan Bog.
The Derrygreenagh group of bogs is located in North Offaly and Southeast Westmeath. The Derrygreenagh group comprises of 3664 acquired hectares, of which there was 285 nett hectares in production in the 2002 season. The main catchment of these areas is the River Boyne.

The Ballivor group is made up of the bogs in the Ballivor, Carranstown, Bracklin and Lisclogher areas. There is a total of 275 hectares in production and each of these areas are linked by peatland railway to the Bord na Mona horticultural factory, situated between Ballivor and Raharney villages. Drainage from these bogs is to the Deel and Stonyford rivers, tributaries of the Boyne.

Rossan bog is situated one mile from Kinnegad village. There are currently 142 hectares in milled moss production. This bog drains to the Kinnegad River, a tributary of the River Boyne.

The Derrygreenagh Group currently employs 48 permanent and 5 seasonal workers. The Ballivor bogs employing 11 permanant and 3 seasonals, with 3 premanent and 3 seasonals employed in Rossan. Giving a total of 62 permanent and 11 seasonal employees across the licence area.

Transport operations are carried out on a seven day cycle throughout the year. Production operations are typically carried out over a seven day week (weather permitting) for 12 to 15 hours per day.

**Peat Milling Operations.**

For milled peat production the bog is laid out in a series of rectangular fields of varying length and 15m wide with drains located between. There are essentially four operations involved in milled peat production:

- Milling.
- Harrowing.
- Ridging.
- Harvesting.

**Milling.**
Special milling machines work there way along the fields, milling approximately 15mm of peat of the top of the bog in a pass.

**Harrowing**
In the course of drying, the milled peat is turned a number of times to avail of the drying conditions. This is achieved with a machine called a harrow. The milled peat is harrowed until its moisture content is down to approximately 40-50%, which can take up to two to three days, weather depending.

**Ridging**
The dry peat is then scraped into long ridges running down the centre of each field. This is done with a ridger, a machine consisting of a series of blades in the shape of a v that opens the full width of the field.

**Harvesting**
During harvesting every eleventh field is used to stockpile the peat, with this field receiving the milled peat from the five fields either side.

The milled peat is then transported via the existing network of peatland railways to one of the following locations.

- Power station ( EPL )
- Horticultural Factory.

1.3 Environmental Policy

**BORD NA MÓNA**

**BORD NA MÓNA ENERGY LIMITED**
**Derrygreenagh,Rochfortbridge,Mullingar,Co-Westmeath.**

Bord na Mona Energy Limited is a commercial semi-state body with responsibility to develop Irelands peat resources in the national interest.

Bord na Mona Energy Limited is committed to gather and make available information on all aspects of its environmental impact and to help improve understanding among the public generally of its role and the importance of Irish peatlands.

Bord na Mona Energy Limited recognises the importance of peatland conservation.

Bord na Mona Energy Limited will leave behind all areas it owns as either an economically or socially integrated resource of a high environmental value.

Bord na Mona Energy Limited seeks to conduct all aspects of its buisness in an environmentally sensitive value.

Bord na Mona Energy Limited will establish an environmental management system specifically addressing the following impacts.

- Discharges to water.
- Emissions to atmosphere.
- Waste disposal.
- Use of natural resources.
- Noise, vibration, odour, dust and visual effects.
- Natural environment and eco-system.

The environmental management system will be monitored, maintained and continually improved.

A system of regular environmental audits will be put in place.

Bord na Mona Energy Limited will continue research and development into all aspects of its environmental impact.

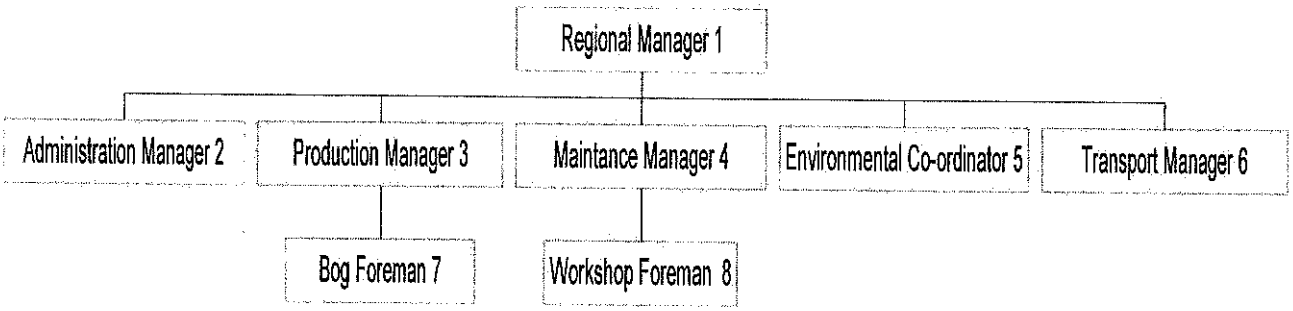
This statement is published and is available at all locations within the division and its contents are brought to the attention of all employees.

1.4 Environmental Management of the Company

The organisational structure within the Derrygreenagh Group is presented in the flow chart below.

# Derrygreenagh Group

## Environmental Responsibilities




(1) Overall environmental responsibilities
(2) Records of complaints and registers
(3) All production related issues
(4) Machine maintenance
(5) Co-ordinating environmental affairs
(6) All peat transportation matters
(7) Silt pond maintenance, tea centres, codes of practice
(8) Fuel loading, oil traps, weekly workshop inspections.

# 2 Summary Information

## 2.1 Emissions to Water Summary

### 2.1.1 Silt Pond Emissions

The following tables contain a summary of the emissions to surface waters from within the Derrygreenagh Group.

| Silt Pond No: DH 1 Reporting Period (Jan-Dec 2002) | SW No. 1 | | | | | |
|---|---|---|---|---|---|---|
| Parameter | Jan/Feb/Mar Emission (mg/l) | April/May/June Emission (mg/l) | July/Aug/Sept Emission (mg/l) | Oct/Nov/Dec Emission (mg/l) | E L V (mg/l) | Compliant |
| pH units | 7.8 | 7.7 | 7.5 | 6.9 | ~ | |
| Flow (L/sec) | 3.1 | 2.5 | 0.5 | 18.2 | ~ | |
| Suspended Solids (mg/l) | <5 | <5 | <5 | 10 | 35mg/l | YES |
| Total Solids (mg/l) | 388 | 346 | 400 | 172 | ~ | |
| Total Phosphorus (mg/l) | <0.05 | <0.05 | <0.05 | <0.05 | ~ | |
| Ammonia (mg/l) | 1.6 | 1.8 | 2.3 | 1.0 | ~ | |
| Colour (Pt Co units) | 99 | 150 | 55 | 258 | ~ | |
| COD (mg/l) | 48 | 62 | 38 | 69 | ~ | |

| Silt Pond No: DM 6 Reporting Period (Jan-Dec 2002) | SW No. 6 | | | | | |
|---|---|---|---|---|---|---|
| Parameter | Jan/Feb/Mar Emission (mg/l) | April/May/June Emission (mg/l) | July/Aug/Sept Emission (mg/l) | Oct/Nov/Dec Emission (mg/l) | E L V (mg/l) | Compliant |
| pH units | 8.2 | 8.0 | 8.0 | 7.4 | ~ | |
| Flow (L/sec) | 156 | 117 | 81.2 | 400.7 | ~ | |
| Suspended Solids (mg/l) | <5 | <5 | 15 | 6 | 35mg/l | YES |
| Total Solids (mg/l) | 550 | 512 | 548 | 124 | ~ | |
| Total Phosphorus (mg/l) | 0.06 | <0.05 | 0.07 | 0.05 | ~ | |
| Ammonia (mg/l) | 0.6 | 0.4 | 0.4 | 0.8 | ~ | |
| Colour (Pt Co units) | 50 | 75 | 32 | 125 | ~ | |
| COD (mg/l) | 32 | 33 | 20 | 53 | ~ | |

| Silt Pond No: TR 19 Reporting Period (Jan-Dec 2002) | SW No. 14 | | | | | |
|---|---|---|---|---|---|---|
| Parameter | Jan/Feb/Mar Emission (mg/l) | April/May/June Emission (mg/l) | July/Aug/Sept Emission (mg/l) | Oct/Nov/Dec Emission (mg/l) | E L V (mg/l) | Compliant |
| pH units | 7.5 | 7.3 | 7.7 | 6.7 | ~ | |
| Flow (L/sec) | 13.8 | 35 | 6.1 | 46.3 | ~ | |
| Suspended Solids (mg/l) | 35 | <5 | 14 | 8 | 35mg/l | YES |
| Total Solids (mg/l) | 278 | 176 | 408 | 230 | ~ | |
| Total Phosphorus (mg/l) | 0.09 | 0.05 | 0.07 | <0.05 | ~ | |
| Ammonia (mg/l) | 2.0 | 1.1 | 2.1 | 0.9 | ~ | |
| Colour (Pt Co units) | 203 | 286 | 94 | 348 | ~ | |
| COD (mg/l) | 90 | 70 | 43 | 77 | ~ | |

| Silt Pond No: BN 36 Reporting Period (Jan-Dec 2002) | SW No. 30 | | | | | |
|---|---|---|---|---|---|---|
| Parameter | Jan/Feb/Mar Emission (mg/l) | April/May/June Emission (mg/l) | July/Aug/Sept Emission (mg/l) | Oct/Nov/Dec Emission (mg/l) | E L V (mg/l) | Compliant |
| pH units | 7.7 | 7.3 | 7.8 | 7.0 | ~ | |
| Flow (L/sec) | 1.25 | 5.3 | 1.56 | 16.5 | ~ | |
| Suspended Solids (mg/l) | 5 | 6 | 6 | 7 | 35mg/l | YES |
| Total Solids (mg/l) | 218 | 98 | 340 | 250 | ~ | |
| Total Phosphorus (mg/l) | <0.05 | 0.08 | <0.05 | <0.05 | ~ | |
| Ammonia (mg/l) | 0.5 | 0.4 | 0.3 | 0.4 | ~ | |
| Colour (Pt Co units) | 325 | 232 | 146 | 412 | ~ | |
| COD (mg/l) | 92 | 66 | 87 | 113 | ~ | |

| Silt Pond No: CN 39 Reporting Period (Jan-Dec 2002) | SW No. 32 | | | | | |
|---|---|---|---|---|---|---|
| Parameter | Jan/Feb/Mar Emission (mg/l) | April/May/June Emission (mg/l) | July/Aug/Sept Emission (mg/l) | Oct/Nov/Dec Emission (mg/l) | E L V (mg/l) | Compliant |
| pH units | 7.5 | 7.5 | 7.3 | 7.5 | ~ | |
| Flow (L/sec) | 39.6 | 106 | 0.02 | 114 | ~ | |
| Suspended Solids (mg/l) | <5 | 10 | 8 | 6 | 35mg/l | YES |
| Total Solids (mg/l) | 164 | 196 | 376 | 478 | ~ | |
| Total Phosphorus (mg/l) | <0.05 | 0.05 | 0.09 | 0.11 | ~ | |
| Ammonia (mg/l) | 1.0 | 0.4 | 2.1 | 0.5 | ~ | |
| Colour (Pt Co units) | 206 | 434 | 103 | 89 | ~ | |
| COD (mg/l) | 46 | 114 | 62 | 36 | ~ | |

| Silt Pond No: KD 50 Reporting Period (Jan-Dec 2002) | SW No. 43 | | | | | |
|---|---|---|---|---|---|---|
| Parameter | Jan/Feb/Mar Emission (mg/l) | April/May/June Emission (mg/l) | July/Aug/Sept Emission (mg/l) | Oct/Nov/Dec Emission (mg/l) | E L V (mg/l) | Compliant |
| pH units | 7.6 | 7.5 | 7.7 | 6.6 | ~ | |
| Flow (L/sec) | 30 | 66 | 38 | 47.5 | ~ | |
| Suspended Solids (mg/l) | <5 | <5 | <5 | 317 | 35mg/l | NO |
| Total Solids (mg/l) | 184 | 184 | 270 | 288 | ~ | |
| Total Phosphorus (mg/l) | 0.09 | 0.08 | <0.05 | 0.04 | ~ | |
| Ammonia (mg/l) | 2.0 | 1.9 | 2.8 | 1.0 | ~ | |
| Colour (Pt Co units) | 244 | 275 | 204 | 320 | ~ | |
| COD (mg/l) | 73 | 87 | 62 | 434 | ~ | |

## 2.2 Emissions to Air

### 2.2.1 Dust Monitoring

The tables below contain the dust emissions for each dust monitoring location within the Derrygreenagh Group. Monitoring took place on three separate occasions during the periods, June – July, July – August, August – September 2002.

**June - July**

| Emission Point | Parameter | Emission ($mg/m^2$ /day) | Emission Limit Value | Compliant |
|---|---|---|---|---|
| DM 01 | Dust | 49 | (350$mg/m^2$ /Day) | YES |
| DM 02 | Dust | 31 | (350$mg/m^2$ /Day) | YES |
| DM 03 | Dust | 12 | (350$mg/m^2$ /Day) | YES |

**July - Aug**

| Emission Point | Parameter | Emission ($mg/m^2$ /day) | Emission Limit Value | Compliant |
|---|---|---|---|---|
| DM 01 | Dust | 18 | (350$mg/m^2$ /Day) | YES |
| DM 02 | Dust | 25 | (350$mg/m^2$ /Day) | YES |
| DM 03 | Dust | 18 | (350$mg/m^2$ /Day) | YES |

**Aug - Sep**

| Emission Point | Parameter | Emission ($mg/m^2$ /day) | Emission Limit Value | Compliant |
|---|---|---|---|---|
| DM 01 | Dust | 18 | (350$mg/m^2$ /Day) | YES |
| DM 02 | Dust | 18 | (350$mg/m^2$ /Day) | YES |
| DM 03 | Dust | 37 | (350$mg/m^2$ /Day) | YES |

**Note:** DM 01= Toar Bog. DM 02 = Derryhinch Bog. DM 03 = Ballivor Bog.

### 2.2.2 Non-compliance's

There was no non-compliance, in relation to air in the reporting period.

## 2.3Waste Arisings

### 2.3.1 Hazardous Waste

The following table is a record of all the hazardous wastes handled by the Derrygreenagh Group from January - December 2002.

| WASTE DESCRIPTION | EWC CODE | TONNES / LITRES | NAME OF CONTRACTOR | DESTINATION | DATE | REJECTED CONSIGNMENTS |
|---|---|---|---|---|---|---|
| Waste Oil | 130202 | 6300L | Atlas Waste Oil | Portlaoise | 07/03/02 | NA |
| Lead Acid Batteries | 160601 | 56Nr | Returnbatt LTD | Kildare Town | 14/05/02 | NA |
| Lead Acid Batteries | 160601 | 40Nr | Returnbatt LTD | Kildare Town | 01/07/02 | NA |
| Waste Oil | 130202 | 7200L | Atlas Waste Oil | Portlaoise | 31/07/02 | NA |
| Lead Acid Batteries | 160601 | 80NR | Returnbatt LTD | Kildare Town | 26/08/02 | NA |
| Waste Oil | 130202 | 4000L | Atlas Waste Oil | Portlaoise | 19/09/02 | NA |
| Waste Oil | 130202 | 1500L | Atlas Waste Oil | Portlaoise | 07/10/02 | NA |
| Oil Filters | | * 2.5 | Atlas Waste Oil | Portlaoise | 07/10/02 | NA |
| Waste Oil | 130202 | 18000L | Atlas Waste Oil | Portlaoise | 17/10/02 | NA |
| Fluorescent Tube | 200121 | 0.049 | Irish Lamp Recycling | Athy Co Kildare | 26/11/02 | NA |
| Waste Oil | 130202 | 7800L | Atlas Waste Oil | Portlaoise | 05/12/02 | NA |
| | | | | | | |
| | | | | | | |
| | | | | | | |

**Note**: * Approximate weight.

2.3.2 Non-Hazardous Waste

The following table lists the quantities of the wastes generated from January-December 2002 from all of the Derrygreenagh Group.

| Waste Type | Quantity ( Tonnes ) |
|---|---|
| Silt Pond Waste | 631.22 |
| Scrap Metal | 64.01 |
| Mixed Municipal Waste | 15.4 |
| **Total** | **710.63** |

## 2.4 Energy Consumption

The table below is a summary of the energy consumption for the Derrygreenagh Group, from the dates January – December 2002.

Water is not included, as it is not used as part of the production process. It is only used in offices, canteens and workshops on a domestic scale.

| Fuel | Volume $M^3$ | Tonnes | MW/Hours |
|---|---|---|---|
| **Jan - Dec 2002** | | | |
| Diesel | 992 | 823 | 9711 |
| Petrol | Nil | Nil | 0 |
| Electricity | NA | NA | 41.33 |
| Peat Briquettes | NA | 210 | 1050 |
| **Total** | **992** | **1033** | **10802.33** |

## 2.5 Environmental Incidents & Complaints

There were no incidents within the Derrygreenagh Group, in the period January - December 2002.

| Environmental Incidents | Number of Incidents |
|---|---|
| Incidents | 0 |
| Incidents requiring corrective action | 0 |
| **Categories of Incident** | |
| Odour | |
| Noise | |
| Water | |
| Air | |
| Procedural | |
| Miscellaneous | |

There was one complaint within the Ballivor Group, in the period January - December 2002.

| Environmental Complaints | Number of complaints |
|---|---|
| Complaints received | 1 |
| Complaints requiring corrective action | 1 |
| **Categories of complaint** | |
| Odour | |
| Noise | |
| Water | √ |
| Air | |
| Procedural | |
| Miscellaneous | |

## 3 Management of the Activity

3.1 Environmental Management Programme Report

| Project | Description | Status |
|---|---|---|
| **Project 1 & Project 2** | (1)The reduction of fugitive dust emissions.<br>(2)The minimisation of suspended solids movement to surface waters.<br>(3)The examination of production machine modification.<br>(4)The results of dust monitoring. | Projects ongoing, with production methods and training continuously being assessed for improvement, although production machine modification is behind schedule due to the inclement weather experienced during the 02 season. All personnel have been trained. |
| **Project 3** | Rationalisation of surface water discharge points. | Project Complete where feasible. |
| **Project 4** | Investigation of reed bed systems for final polish of silt pond discharges. | Project complete and retained on file. Report concludes that reed beds are not suitable for Bord na Mona's silt treatment systems. |
| **Project 5** | The separation of flood water and external runoff from production runoff. | Project Complete where feasible. |
| **Project 6** | The effective spill/leak management of mobile fueling units by implementing a programme of training and adopting Codes of Practice. | 1: Procedures in place.<br>2: Training complete<br>3: ERP in place.<br>4: Upgrading of fueling units ongoing. |
| **Project 7** | Programme of bunding at all bulk diesel storage facilities | Project complete and works certified. |
| **Project 8** | Investigation into the reuse of silt pond waste | A silt pond has be constructed, in the Kilberry Group of Bogs, where trials will be carried out to examine the potential for re-using the silt waste from the silt pond as the main product, or as a by-product. This project was due to commence in 2002, but failed to do so, due to the weather conditions during the 2002 production season. |
| **Project 9** | Study into the collection storage and reuse of polyethelene covering | Project Completed by Polymer Institute, Athlone I. T, report on file. |
| **Project 10** | Examination of the use of reusable materials in the protection of stockpiles | Project complete, report on file. Concludes that wind power pumping not suitable to Bord na Mona's requirements |
| **Project 11** | Examination of wind power technology for pumped drainage. | Project complete, report on file. Concludes that wind power pumping not suitable to Bord na Mona's requirements |

### 3.2 Environmental Expenditure

The table below lists the environmental costs incurred by the Derrygreenagh Group between January – December 2002.
In calculating the environmental costs 70% of the total costs were attributed to Licence 503 and 30% to Licence 501.The Ballivor Group costs were then added to the Derrygreenagh totals.

| Expenditure Related to the Operation of the Derrygreenagh IPC Licence During the Period January – December 2002 | | | |
|---|---|---|---|
| **Description** | **Ballivor Cost** | **D/Green Cost** | **Total Cost (€)** |
| Plant @ €40/hour | 21,600 | 173,280 | 194,880 |
| Labour | 6,480 | 54,769 | 61,249 |
| Materials | NA | 31,728 | 31,728 |
| Overheads (ESB, Phones, Consumables) | 2,000 | 6,000 | 8,000 |
| Laboratory Analysis | NA | 17,500 | 17,500 |
| EPA Fees | NA | 7,920 | 7,920 |
| **Total** | **€ 30,080** | **€ 291,197** | **€ 321,277** |

## 4 Licence Specific Reports

### 4.1 Surface Water Discharge Monitoring Location Programme Review

The surface water discharge monitoring location programme remains the same as was submitted and accepted by the Agency in June 2000.
Pipes have been fitted at each location in order to accommodate flow metres and the provision of safe access is also ongoing.
Emission point signs have been designed and are in place.
Additional work has also being carried out at these locations as part of the ongoing silt pond upgrade programme.
Monitoring will be carried out at these same locations in the forthcoming year and reported on in next years AER.

### 4.2 Bunding Programme

The bunding programme for large scale oil storage facilities is complete and the works certified.

4.3 Boiler Combustion Efficiency

Boiler Details
Twin Danstoker solid fuel units each rated at 725KW, fuelled by loose briquettes. Operating from Oct-Mar approximately at Derrygreenagh Works.

A boiler efficiency test was carried out on the 09/12/02. The results of this test showed the boiler to be operating at an efficiency level of 82.1%.
A full breakdown of the test is retained on file at the Derrygreenagh office.

4.4 Resource consumption Summary

There was a total of 142,168 tonnes of milled peat produced across the licence area in the production season 2002.
There was also a total of 121,877 tonnes of stock peat sold during the reporting period. Of this total 42,916 tonnes were sold to Edenderry Power Limited, 1,061 tonnes to Derrinlough Briquette Factory, 51,500 tonnes to Ballivor Moss Factory and 26,400 tonnes direct to Dublin Port for export.

4.5 De-silting programme report

**Summary Data Table of Ponds De-Silted From Jan-December 2002**

| Bog | No Silt Ponds | Cleaned Once | Cleaned Twice | Cleaned >Three Times | Notes |
|---|---|---|---|---|---|
| Ballivor | 10 | 6 | 4 | | |
| Carranstown | 5 | | 5 | | |
| Bracklin West | 6 | | | 6 | |
| Lisclogher | 7 | | | | * |
| Kinnegad | 6 | 4 | 2 | | |
| D/Hinch | 4 | 4 | | | ** |
| Drumman | 6 | 2 | | | ** |
| Ballybeg | 6 | 4 | 2 | | |
| Toar | 6 | 4 | 2 | | ** |

*: Bog still under development, no production.
**: No production at this Bog.
It should be noted that the unusually inclement weather experienced during the year, greatly hampered the silt pond cleaning programme.

4.6 Bog Development and Operational Programme

The bogs in the Derrygreenagh Group are well into their productive lives, therefore there will be no development in the year 2003.
However in the Ballivor Group, Carranstown bog is currently under development, this work is ongoing during summer months on a part time basis.

There will be 658.74 nett hectares in production in the 2003 season, yeilding 127,359 tonnes @ 55% moisture content.

Derrygreenagh will account for 49,279tonnes and 243.41 hectares.
Ballivor will account for 51,480 tonnes and 274.33 hectares and Rossan will account for 26,600 tonnes and 141 hectares.

4.7 Bog Rehabilition Report

Management guidelines for the planning and implementation of cutaway bog rehabilitation have been adopted and the document is currently available for inspection on file at the Derrygreenagh office.

## 5 Summary

With regard to environmental compliance at the Derrygreenagh Group of Bogs, there was one exceedence in the quarterly grab sampling of the ponds in the Surface Water Discharge Monitoring Location Programme.
There were Five non-compliances in relation to the Composite Sampler during the period January to December 2002. Dust monitoring results at the dust sensitive locations were below the Emission Limit Value and there was one complaint of an environmental nature received during the reporting period.

The staff awareness through training and involvement in the operation of the licence has also improved immensely. A full programme of training and awareness has been conducted at the works and has targeted all personnel ie. Office, Workshop, Transport and Production.

Bord na Mona are project partners of the Southeastern River Basin District Management, as set up under the Water Framework Directive.
Bord na Mona are also involved in catchment management on the River Barrow.

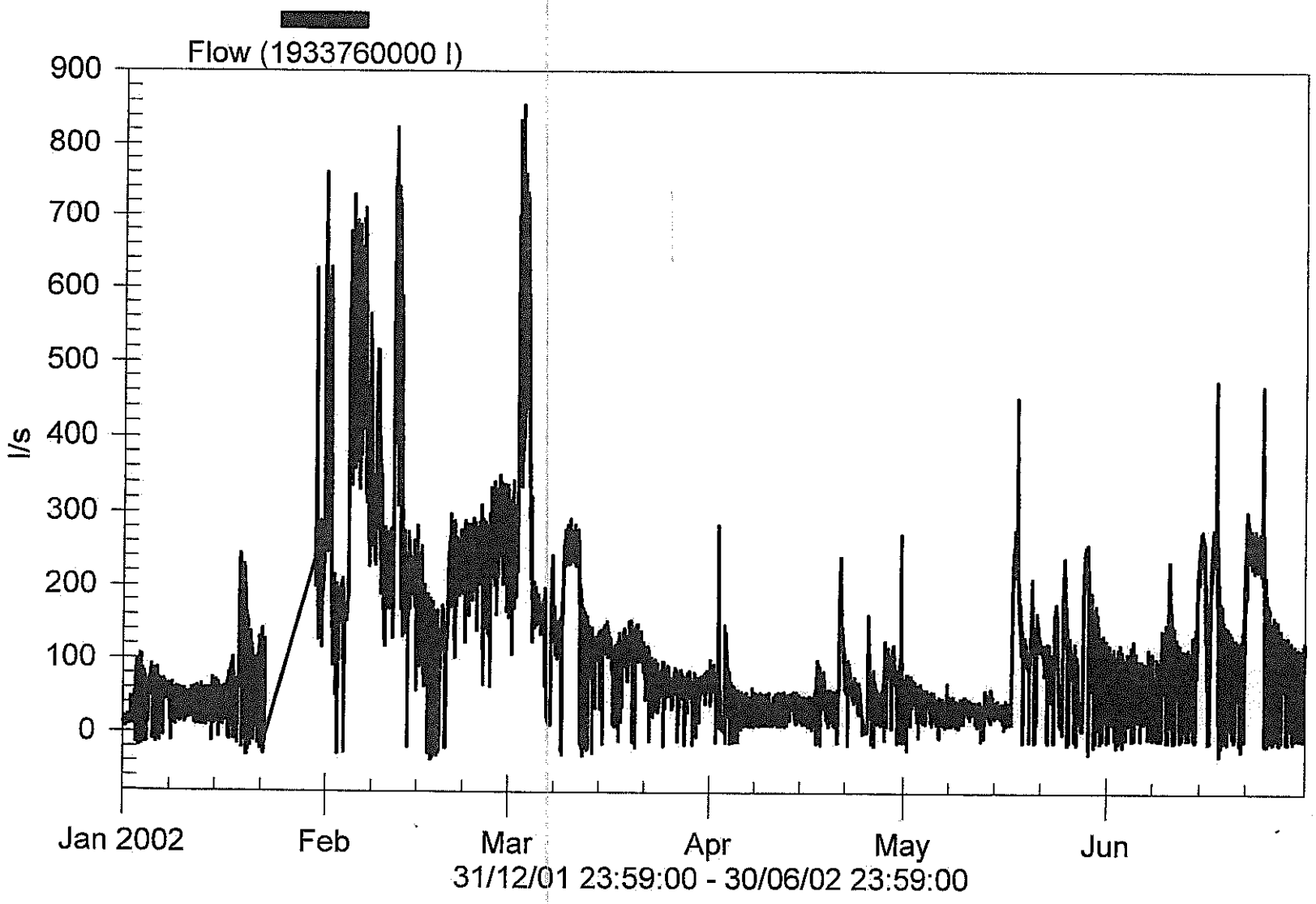
Bord na Mona Energy Ltd would like to take this opportunity to advise the Environmental Protection Agency of its continued commitment to improving its environmental performance by adopting cleaner production methods and improving its environmental protection measures.

# APPENDIX 1

# Composite Sampler Results

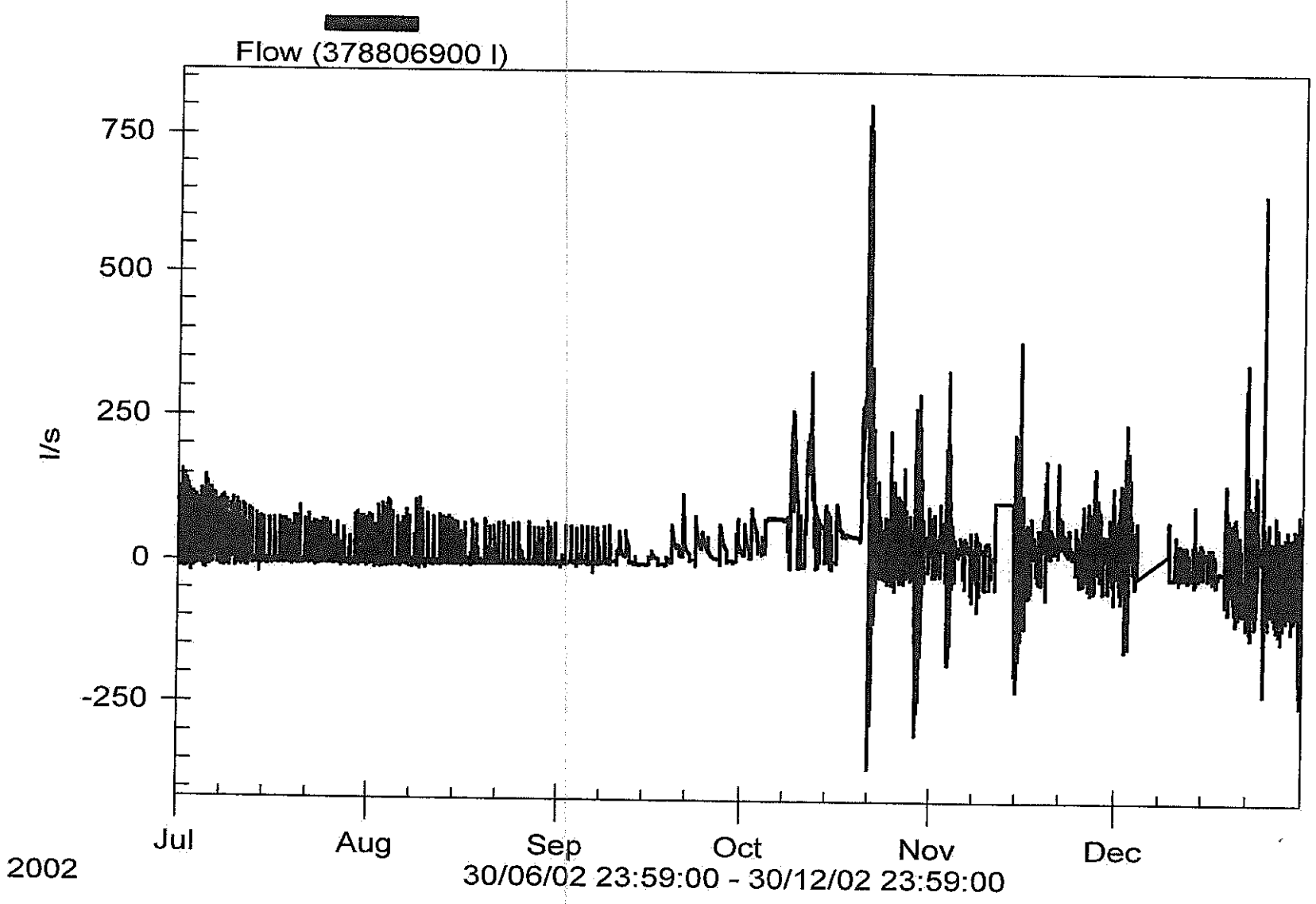
# Derrygreenagh Composite Sampler

Jan - June 02



# Derrygreenagh Composite Sampler

July - Dec 02



**Bord Na Mona Energy Ltd, Derrygreenagh Group, Rochfordsbridge, Co Westmeath**

**Composite Sampler Results Licence 501**

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2002 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | IS | IS | | 1373671 | 0.00 | 0.00 | 0.00 | #VALUE! | #VALUE! |
| 2 | | | | | IS | IS | | 1924262 | 0.00 | 0.00 | 0.00 | #VALUE! | #VALUE! |
| 3 | 7.7 | 68 | 2.2 | 0.05 | 6 | 128 | 208 | 4885898 | 332.24 | 10.75 | 0.24 | 29.32 | 625.39 |
| 4 | | | | | 5 | 330 | | 3717102 | 0.00 | 0.00 | 0.00 | 18.59 | 1226.64 |
| 5 | | | | | 5 | 304 | | 5737152 | 0.00 | 0.00 | 0.00 | 28.69 | 1744.09 |
| 6 | | | | | 5 | 332 | | 5133392 | 0.00 | 0.00 | 0.00 | 25.67 | 1704.29 |
| 7 | | | | | 5 | 340 | | 4820438 | 0.00 | 0.00 | 0.00 | 24.10 | 1638.95 |
| 8 | | | | | 5 | 372 | | 4090144 | 0.00 | 0.00 | 0.00 | 20.45 | 1521.53 |
| 9 | | | | | 5 | 146 | | 4049188 | 0.00 | 0.00 | 0.00 | 20.25 | 591.18 |
| 10 | 8 | 57 | 0.7 | 0.06 | 6 | 378 | 144 | 3650476 | 208.08 | 2.56 | 0.22 | 21.90 | 1379.88 |
| 11 | | | | | 5 | 310 | | 4070429 | 0.00 | 0.00 | 0.00 | 20.35 | 1261.83 |
| 12 | | | | | 9 | 376 | | 3285525 | 0.00 | 0.00 | 0.00 | 29.57 | 1235.36 |
| 13 | | | | | 6 | 336 | | 4056539 | 0.00 | 0.00 | 0.00 | 24.34 | 1363.00 |
| 14 | | | | | IS | IS | | 3868676 | 0.00 | 0.00 | 0.00 | #VALUE! | #VALUE! |
| 15 | | | | | 8 | 338 | | 4067333 | 0.00 | 0.00 | 0.00 | 32.54 | 1374.76 |
| 16 | | | | | 5 | 328 | | 4343261 | 0.00 | 0.00 | 0.00 | 21.72 | 1424.59 |
| 17 | 8.3 | 76 | 1.9 | 0.16 | 5 | 268 | 265 | 5834252 | 443.40 | 11.09 | 0.93 | 29.17 | 1563.58 |
| 18 | | | | | 5 | 314 | | 8461173 | 0.00 | 0.00 | 0.00 | 42.31 | 2656.81 |
| 19 | | | | | 5 | 210 | | 12065440 | 0.00 | 0.00 | 0.00 | 60.33 | 2533.74 |
| 20 | | | | | 6 | 248 | | 7233897 | 0.00 | 0.00 | 0.00 | 43.40 | 1794.01 |
| 21 | | | | | 5 | 320 | | 6144772 | 0.00 | 0.00 | 0.00 | 30.72 | 1966.33 |
| 22 | | | | | 5 | 218 | | 9825067 | 0.00 | 0.00 | 0.00 | 49.13 | 2141.86 |
| 23 | | | | | 20 | 198 | | 20380030 | 0.00 | 0.00 | 407.60 | 407.60 | 4035.25 |
| 24 | 7.5 | 69 | 1.9 | 0.05 | 26 | 214 | 220 | 20380030 | 1406.22 | 38.72 | 1.02 | 529.88 | 4361.33 |
| 25 | | | | | 5 | 216 | | 20380030 | 0.00 | 0.00 | 0.00 | 101.90 | 4402.09 |
| 26 | | | | | 6 | 220 | | 20380030 | 0.00 | 0.00 | 0.00 | 122.28 | 4483.61 |
| 27 | | | | | 5 | 244 | | 20380030 | 0.00 | 0.00 | 0.00 | 101.90 | 4972.73 |
| 28 | | | | | 10 | 266 | | 20380030 | 0.00 | 0.00 | 0.00 | 203.80 | 5421.09 |
| 29 | | | | | 5 | 246 | | 20380030 | 0.00 | 0.00 | 0.00 | 101.90 | 5013.49 |
| 30 | | | | | 6 | 232 | | 22986260 | 0.00 | 0.00 | 0.00 | 137.92 | 5332.81 |
| 31 | 8.1 | 54 | 1.3 | 0.05 | 5 | 312 | 163 | 27523870 | 1486.29 | 35.78 | 1.38 | 137.62 | 8587.45 |

**IS:** Insufficient amount of sample due to low flow or sampler malfunction.

**Bord Na Mona Energy Ltd, Derrygreenagh Group, Rochfordsbridge, Co Westmeath**

**Composite Sampler Results Licence 501**

| Month | Parameters | | | | | | | | Daily Totals | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| February 2002 | pH | COD mg/l | Ammonia as N mg/l | Total Phosphorus mg/l | Suspended Solids mg/l | Total Solids mg/l | Colour Pt Co units | Flow Daily Total (litres) | COD Kg/Day | Ammonia as Kg/Day | Total Phosphorus Kg/Day | Suspended Solids Kg/Day | Total Solids Kg/Day |
| 1 | | | | | 10 | 300 | | 30803950 | 0.00 | 0.00 | 0.00 | 308.04 | 9241.19 |
| 2 | | | | | 10 | 122 | | 14542360 | 0.00 | 0.00 | 0.00 | 145.42 | 1774.17 |
| 3 | | | | | 5 | 140 | | 14583170 | 0.00 | 0.00 | 0.00 | 72.92 | 2041.64 |
| 4 | 7.9 | 66 | 0.5 | 0.05 | 12 | 286 | 176 | 32370490 | 2136.45 | 16.19 | 1.62 | 388.45 | 9257.96 |
| 5 | | | | | 6 | 218 | | 43948120 | 0.00 | 0.00 | 0.00 | 263.69 | 9580.69 |
| 6 | | | | | 5 | 246 | | 47957830 | 0.00 | 0.00 | 0.00 | 239.79 | 11797.63 |
| 7 | | | | | 6 | 278 | | 33326550 | 0.00 | 0.00 | 0.00 | 199.96 | 9264.78 |
| 8 | | | | | 5 | 312 | | 29711610 | 0.00 | 0.00 | 0.00 | 148.56 | 9270.02 |
| 9 | | | | | 5 | 314 | | 25741340 | 0.00 | 0.00 | 0.00 | 128.71 | 8082.78 |
| 10 | | | | | 5 | 332 | | 20012160 | 0.00 | 0.00 | 0.00 | 100.06 | 6644.04 |
| 11 | 8 | 62 | 0.8 | 0.05 | 12 | 230 | 200 | 38401970 | 2380.92 | 30.72 | 1.92 | 460.82 | 8832.45 |
| 12 | | | | | 6 | 124 | | 36490710 | 0.00 | 0.00 | 0.00 | 218.94 | 4524.85 |
| 13 | | | | | 5 | 246 | | 17284290 | 0.00 | 0.00 | 0.00 | 86.42 | 4251.94 |
| 14 | | | | | 5 | 252 | | 18345120 | 0.00 | 0.00 | 0.00 | 91.73 | 4622.97 |
| 15 | | | | | 5 | 304 | | 16990360 | 0.00 | 0.00 | 0.00 | 84.95 | 5165.07 |
| 16 | | | | | 5 | 418 | | 13770990 | 0.00 | 0.00 | 0.00 | 68.85 | 5756.27 |
| 17 | | | | | 10 | 122 | | 8068980 | 0.00 | 0.00 | 0.00 | 80.69 | 984.42 |
| 18 | | | | | 5 | 278 | | 5978991 | 0.00 | 0.00 | 0.00 | 29.89 | 1662.16 |
| 19 | 8.4 | 42 | 0.8 | 0.05 | 5 | 358 | 86 | 12857140 | 540.00 | 10.29 | 0.64 | 64.29 | 4602.86 |
| 20 | | | | | 11 | 186 | | 20818180 | 0.00 | 0.00 | 0.00 | 229.00 | 3872.18 |
| 21 | | | | | 9 | 116 | | 20358220 | 0.00 | 0.00 | 0.00 | 183.22 | 2361.55 |
| 22 | | | | | 10 | 242 | | 21191480 | 0.00 | 0.00 | 211.91 | 211.91 | 5128.34 |
| 23 | | | | | 8 | 276 | | 20727650 | 0.00 | 0.00 | 165.82 | 165.82 | 5720.83 |
| 24 | | | | | 5 | 286 | | 21008280 | 0.00 | 0.00 | 0.00 | 105.04 | 6008.37 |
| 25 | | | | | 5 | 254 | | 20895830 | 0.00 | 0.00 | 0.00 | 104.48 | 5307.54 |
| 26 | 8.1 | 56 | 0.7 | 0.05 | 6 | 212 | 165 | 23737200 | 1329.28 | 16.62 | 1.19 | 142.42 | 5032.29 |
| 27 | | | | | 5 | 282 | | 24578460 | 0.00 | 0.00 | 0.00 | 122.89 | 6931.13 |
| 28 | | | | | 5 | 252 | | 23981510 | 0.00 | 0.00 | 0.00 | 119.91 | 6043.34 |
| 29 | | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | |
| 31 | | | | | | | | | | | | | |

**IS:** Insufficient amount of sample due to low flow or sampler malfunction.

**Bord Na Mona Energy Ltd, Derrygreenagh Group, Rochfordsbridge, Co Westmeath**

**Composite Sampler Results Licence 501**

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| March 2002 | pH | COD mg/l | Ammonia as N mg/l | Total Phosphorus mg/l | Suspended Solids mg/l | Total Solids mg/l | Colour Pt Co units | Flow Daily Total (litres) | COD Kg/Day | Ammonia as Kg/Day | Total Phosphorus Kg/Day | Suspended Solids Kg/Day | Total Solids Kg/Day |
| 1 | | | | | 6 | 256 | | 21413250 | 0.00 | 0.00 | 0.00 | 128.48 | 5481.79 |
| 2 | | | | | 5 | 242 | | 33116550 | 0.00 | 0.00 | 0.00 | 165.58 | 8014.21 |
| 3 | | | | | 5 | 274 | | 49078810 | 0.00 | 0.00 | 0.00 | 245.39 | 13447.59 |
| 4 | 8.5 | 50 | 1.1 | 0.05 | 6 | 330 | 80 | 26508180 | 1325.41 | 29.16 | 1.33 | 159.05 | 8747.70 |
| 5 | | | | | 5 | 434 | | 15083470 | 0.00 | 0.00 | 0.00 | 75.42 | 6546.23 |
| 6 | | | | | 5 | 172 | | 11485200 | 0.00 | 0.00 | 0.00 | 57.43 | 1975.45 |
| 7 | | | | | 6 | 410 | | 8235851 | 0.00 | 0.00 | 0.00 | 49.42 | 3376.70 |
| 8 | | | | | 5 | 386 | | 11427790 | 0.00 | 0.00 | 0.00 | 57.14 | 4411.13 |
| 9 | | | | | 5 | 394 | | 17241370 | 0.00 | 0.00 | 0.00 | 86.21 | 6793.10 |
| 10 | | | | | 5 | 278 | | 22445510 | 0.00 | 0.00 | 0.00 | 112.23 | 6239.85 |
| 11 | 8.4 | 54 | 1 | 0.05 | 8 | 288 | 160 | 21492770 | 1160.61 | 21.49 | 1.07 | 171.94 | 6189.92 |
| 12 | | | | | 12 | 406 | | 11509700 | 0.00 | 0.00 | 0.00 | 138.12 | 4672.94 |
| 13 | | | | | 11 | 410 | | 9158142 | 0.00 | 0.00 | 0.00 | 100.74 | 3754.84 |
| 14 | | | | | 13 | 414 | | 8362460 | 0.00 | 0.00 | 0.00 | 108.71 | 3462.06 |
| 15 | | | | | 9 | 438 | | 9965805 | 0.00 | 0.00 | 0.00 | 89.69 | 4365.02 |
| 16 | | | | | 5 | 374 | | 10650260 | 0.00 | 0.00 | 0.00 | 53.25 | 3983.20 |
| 17 | | | | | 7 | 390 | | 6501623 | 0.00 | 0.00 | 0.00 | 45.51 | 2535.63 |
| 18 | | | | | 5 | 396 | | 7599758 | 0.00 | 0.00 | 0.00 | 38.00 | 3009.50 |
| 19 | 8.4 | 42 | 0.2 | 0.05 | 5 | 346 | 102 | 10183490 | 427.71 | 2.04 | 0.51 | 50.92 | 3523.49 |
| 20 | | | | | IS | IS | | 10184200 | 0.00 | 0.00 | 0.00 | #VALUE! | #VALUE! |
| 21 | | | | | 5 | 376 | | 10045740 | 0.00 | 0.00 | 0.00 | 50.23 | 3777.20 |
| 22 | | | | | 5 | 388 | | 7833826 | 0.00 | 0.00 | 0.00 | 39.17 | 3039.52 |
| 23 | | | | | 6 | 398 | | 5468129 | 0.00 | 0.00 | 0.00 | 32.81 | 2176.32 |
| 24 | | | | | 5 | 396 | | 5644058 | 0.00 | 0.00 | 0.00 | 28.22 | 2235.05 |
| 25 | | | | | 5 | 406 | | 5753254 | 0.00 | 0.00 | 0.00 | 28.77 | 2335.82 |
| 26 | 8.5 | 42 | 0.8 | 0.05 | 5 | 434 | 94 | 5840192 | 245.29 | 4.67 | 0.29 | 29.20 | 2534.64 |
| 27 | | | | | 5 | 442 | | 5555475 | 0.00 | 0.00 | 0.00 | 27.78 | 2455.52 |
| 28 | | | | | 5 | 458 | | 5159035 | 0.00 | 0.00 | 0.00 | 25.80 | 2362.84 |
| 29 | | | | | 5 | 476 | | 4809714 | 0.00 | 0.00 | 0.00 | 24.05 | 2289.42 |
| 30 | | | | | 5 | 460 | | 5295284 | 0.00 | 0.00 | 0.00 | 26.48 | 2435.83 |
| 31 | | | | | 5 | 440 | | 6142406 | 0.00 | 0.00 | 0.00 | 30.71 | 2702.66 |

**IS:** Insufficient amount of sample due to low flow or sampler malfunction.

## Bord Na Mona Energy Ltd, Derrygreenagh Group, Rochfordsbridge, Co Westmeath

## Composite Sampler Results Licence 501

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| April 2002 | pH | COD mg/l | Ammonia as N mg/l | Total Phosphorus mg/l | Suspended Solids mg/l | Total Solids mg/l | Colour Pt Co units | Flow Daily Total (litres) | COD Kg/Day | Ammonia as Kg/Day | Total Phosphorus Kg/Day | Suspended Solids Kg/Day | Total Solids Kg/Day |
| 1 | | | | | 5 | 326 | | 6045528 | 0.00 | 0.00 | 0.00 | 30.23 | 1970.84 |
| 2 | 8.4 | 71 | 0.7 | 0.1 | 5 | 290 | 172 | 4772579 | 338.85 | 3.34 | 0.48 | 23.86 | 1384.05 |
| 3 | | | | | 5 | 418 | | 5045961 | 0.00 | 0.00 | 0.00 | 25.23 | 2109.21 |
| 4 | | | | | 5 | 356 | | 3844577 | 0.00 | 0.00 | 0.00 | 19.22 | 1368.67 |
| 5 | | | | | 5 | 424 | | 2274568 | 0.00 | 0.00 | 0.00 | 11.37 | 964.42 |
| 6 | | | | | 5 | 412 | | 2055583 | 0.00 | 0.00 | 0.00 | 10.28 | 846.90 |
| 7 | | | | | 5 | 412 | | 2382841 | 0.00 | 0.00 | 0.00 | 11.91 | 981.73 |
| 8 | | | | | 16 | 420 | | 2813592 | 0.00 | 0.00 | 0.00 | 45.02 | 1181.71 |
| 9 | 8.4 | 51 | 0.9 | 0.05 | 5 | 456 | 83 | 2384195 | 121.59 | 2.15 | 0.12 | 11.92 | 1087.19 |
| 10 | | | | | 5 | 436 | | 2162734 | 0.00 | 0.00 | 0.00 | 10.81 | 942.95 |
| 11 | | | | | 5 | 444 | | 3075893 | 0.00 | 0.00 | 0.00 | 15.38 | 1365.70 |
| 12 | | | | | 5 | 456 | | 2498646 | 0.00 | 0.00 | 0.00 | 12.49 | 1139.38 |
| 13 | | | | | 6 | 446 | | 3503696 | 0.00 | 0.00 | 0.00 | 21.02 | 1562.65 |
| 14 | | | | | 5 | 382 | | 3321978 | 0.00 | 0.00 | 0.00 | 16.61 | 1269.00 |
| 15 | | | | | 5 | 454 | | 3170347 | 0.00 | 0.00 | 0.00 | 15.85 | 1439.34 |
| 16 | 8.6 | 44 | 0.6 | 0.1 | 5 | 438 | 70 | 2474893 | 108.90 | 1.48 | 0.25 | 12.37 | 1084.00 |
| 17 | | | | | 5 | 414 | | 4419141 | 0.00 | 0.00 | 0.00 | 22.10 | 1829.52 |
| 18 | | | | | 5 | 330 | | 5336712 | 0.00 | 0.00 | 0.00 | 26.68 | 1761.11 |
| 19 | | | | | 5 | 336 | | 3755097 | 0.00 | 0.00 | 0.00 | 18.78 | 1261.71 |
| 20 | | | | | 5 | 426 | | 2908602 | 0.00 | 0.00 | 0.00 | 14.54 | 1239.06 |
| 21 | | | | | 5 | 430 | | 12272180 | 0.00 | 0.00 | 0.00 | 61.36 | 5277.04 |
| 22 | | | | | 5 | 206 | | 6513135 | 0.00 | 0.00 | 0.00 | 32.57 | 1341.71 |
| 23 | 8.1 | 90 | 0.2 | 0.05 | 5 | 228 | 250 | 5067288 | 456.06 | 1.01 | 0.25 | 25.34 | 1155.34 |
| 24 | | | | | 5 | 460 | | 2834024 | 0.00 | 0.00 | 0.00 | 14.17 | 1303.65 |
| 25 | | | | | 5 | 444 | | 4012386 | 0.00 | 0.00 | 0.00 | 20.06 | 1781.50 |
| 26 | | | | | 5 | 422 | | 4529500 | 0.00 | 0.00 | 0.00 | 22.65 | 1911.45 |
| 27 | | | | | 5 | 326 | | 3991374 | 0.00 | 0.00 | 0.00 | 19.96 | 1301.19 |
| 28 | | | | | 5 | 386 | | 7659929 | 0.00 | 0.00 | 0.00 | 38.30 | 2956.73 |
| 29 | | | | | 5 | 318 | | 6497580 | 0.00 | 0.00 | 0.00 | 32.49 | 2066.23 |
| 30 | 8.4 | 58 | 1 | 0.05 | 5 | 366 | 150 | 6909327 | 400.74 | 6.91 | 0.35 | 34.55 | 2528.81 |
| 31 | | | | | | | | | | | | | |

**IS:** Insufficient amount of sample due to low flow or sampler malfunction.

**Bord Na Mona Energy Ltd, Derrygreenagh Group, Rochfordsbridge, Co Westmeath**

**Composite Sampler Results Licence 501**

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| May | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2002 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 5 | 390 | | 5052108 | 0.00 | 0.00 | 0.00 | 25.26 | 1970.32 |
| 2 | | | | | 5 | 430 | | 4769555 | 0.00 | 0.00 | 0.00 | 23.85 | 2050.91 |
| 3 | | | | | 5 | 478 | | 4125723 | 0.00 | 0.00 | 0.00 | 20.63 | 1972.10 |
| 4 | | | | | 5 | 448 | | 3785800 | 0.00 | 0.00 | 0.00 | 18.93 | 1696.04 |
| 5 | | | | | 5 | 520 | | 3599088 | 0.00 | 0.00 | 0.00 | 18.00 | 1871.53 |
| 6 | | | | | 5 | 454 | | 2305355 | 0.00 | 0.00 | 0.00 | 11.53 | 1046.63 |
| 7 | 8.4 | 61 | 0.4 | 0.05 | 5 | 454 | 98 | 2245395 | 136.97 | 0.90 | 0.11 | 11.23 | 1019.41 |
| 8 | | | | | 5 | 418 | | 2058126 | 0.00 | 0.00 | 0.00 | 10.29 | 860.30 |
| 9 | | | | | 11 | 480 | | 2029439 | 0.00 | 0.00 | 0.00 | 22.32 | 974.13 |
| 10 | | | | | 5 | 444 | | 3084443 | 0.00 | 0.00 | 0.00 | 15.42 | 1369.49 |
| 11 | | | | | 5 | 478 | | 2983885 | 0.00 | 0.00 | 0.00 | 14.92 | 1426.30 |
| 12 | | | | | 5 | 454 | | 2553823 | 0.00 | 0.00 | 0.00 | 12.77 | 1159.44 |
| 13 | | | | | 5 | 334 | | 2716685 | 0.00 | 0.00 | 0.00 | 13.58 | 907.37 |
| 14 | 8.8 | 72 | 0.2 | 0.07 | 5 | 320 | 142 | 3412407 | 245.69 | 0.68 | 0.24 | 17.06 | 1091.97 |
| 15 | | | | | 5 | 412 | | 2795524 | 0.00 | 0.00 | 0.00 | 13.98 | 1151.76 |
| 16 | | | | | 6 | 390 | | 2662682 | 0.00 | 0.00 | 0.00 | 15.98 | 1038.45 |
| 17 | | | | | 5 | 376 | | 8163281 | 0.00 | 0.00 | 0.00 | 40.82 | 3069.39 |
| 18 | | | | | 5 | 142 | | 21136560 | 0.00 | 0.00 | 0.00 | 105.68 | 3001.39 |
| 19 | | | | | 5 | 286 | | 9270142 | 0.00 | 0.00 | 0.00 | 46.35 | 2651.26 |
| 20 | | | | | 5 | 322 | | 10932280 | 0.00 | 0.00 | 0.00 | 54.66 | 3520.19 |
| 21 | 8.2 | 62 | 1.7 | 0.05 | 5 | 388 | 122 | 8774911 | 544.04 | 14.92 | 0.44 | 43.87 | 3404.67 |
| 22 | | | | | 5 | 436 | | 9679893 | 0.00 | 0.00 | 0.00 | 48.40 | 4220.43 |
| 23 | | | | | 5 | 306 | | 8028518 | 0.00 | 0.00 | 0.00 | 40.14 | 2456.73 |
| 24 | | | | | 5 | 296 | | 9085522 | 0.00 | 0.00 | 0.00 | 45.43 | 2689.31 |
| 25 | | | | | 5 | 372 | | 10588770 | 0.00 | 0.00 | 0.00 | 52.94 | 3939.02 |
| 26 | | | | | 5 | 364 | | 8319564 | 0.00 | 0.00 | 0.00 | 41.60 | 3028.32 |
| 27 | | | | | 5 | 404 | | 4970332 | 0.00 | 0.00 | 0.00 | 24.85 | 2008.01 |
| 28 | 8.3 | 63 | 1.2 | 0.06 | 5 | 380 | 146 | 11362980 | 715.87 | 13.64 | 0.68 | 56.81 | 4317.93 |
| 29 | | | | | 5 | 342 | | 13598080 | 0.00 | 0.00 | 0.00 | 67.99 | 4650.54 |
| 30 | | | | | 5 | 392 | | 8185101 | 0.00 | 0.00 | 0.00 | 40.93 | 3208.56 |
| 31 | | | | | 5 | 178 | | 4892403 | 0.00 | 0.00 | 0.00 | 24.46 | 870.85 |

**IS:** Insufficient amount of sample due to low flow or sampler malfunction.

**Bord Na Mona Energy Ltd, Derrygreenagh Group, Rochfordsbridge, Co Westmeath**

**Composite Sampler Results Licence 501**

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| June | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2002 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 5 | 384 | | 4304582 | 0.00 | 0.00 | 0.00 | 21.52 | 1652.96 |
| 2 | | | | | 5 | 436 | | 3468706 | 0.00 | 0.00 | 0.00 | 17.34 | 1512.36 |
| 3 | | | | | 5 | 384 | | 4729174 | 0.00 | 0.00 | 0.00 | 23.65 | 1816.00 |
| 4 | 8.6 | 47 | 0.9 | 0.05 | 5 | 458 | 89 | 4656917 | 218.88 | 4.19 | 0.23 | 23.28 | 2132.87 |
| 5 | | | | | 5 | 370 | | 4436988 | 0.00 | 0.00 | 0.00 | 22.18 | 1641.69 |
| 6 | | | | | 5 | 416 | | 4599031 | 0.00 | 0.00 | 0.00 | 23.00 | 1913.20 |
| 7 | | | | | 5 | 348 | | 4388420 | 0.00 | 0.00 | 0.00 | 21.94 | 1527.17 |
| 8 | | | | | 5 | 404 | | 2225853 | 0.00 | 0.00 | 0.00 | 11.13 | 899.24 |
| 9 | | | | | 5 | 402 | | 5868940 | 0.00 | 0.00 | 0.00 | 29.34 | 2359.31 |
| 10 | | | | | 5 | 314 | | 9649843 | 0.00 | 0.00 | 0.00 | 48.25 | 3030.05 |
| 11 | 8.2 | 61 | 0.7 | 0.07 | 5 | 278 | 239 | 6085864 | 371.24 | 4.26 | 0.43 | 30.43 | 1691.87 |
| 12 | | | | | 11 | 414 | | 4495947 | 0.00 | 0.00 | 0.00 | 49.46 | 1861.32 |
| 13 | | | | | 5 | 414 | | 4183408 | 0.00 | 0.00 | 0.00 | 20.92 | 1731.93 |
| 14 | | | | | 5 | 340 | | 9293656 | 0.00 | 0.00 | 0.00 | 46.47 | 3159.84 |
| 15 | | | | | 14 | 210 | | 20184010 | 0.00 | 0.00 | 0.00 | 282.58 | 4238.64 |
| 16 | | | | | 6 | 284 | | 12368480 | 0.00 | 0.00 | 0.00 | 74.21 | 3512.65 |
| 17 | | | | | 6 | 240 | | 21651540 | 0.00 | 0.00 | 0.00 | 129.91 | 5196.37 |
| 18 | 8.2 | 69 | 0.7 | 0.05 | 5 | 373 | 120 | 7380098 | 509.23 | 5.17 | 0.37 | 36.90 | 2752.78 |
| 19 | | | | | 5 | 418 | | 5539314 | 0.00 | 0.00 | 0.00 | 27.70 | 2315.43 |
| 20 | | | | | 5 | 466 | | 4673188 | 0.00 | 0.00 | 0.00 | 23.37 | 2177.71 |
| 21 | | | | | 5 | 442 | | 6495130 | 0.00 | 0.00 | 0.00 | 32.48 | 2870.85 |
| 22 | | | | | 7 | 204 | | 22406680 | 0.00 | 0.00 | 0.00 | 156.85 | 4570.96 |
| 23 | | | | | 5 | 290 | | 21990660 | 0.00 | 0.00 | 0.00 | 109.95 | 6377.29 |
| 24 | | | | | 5 | 300 | | 22265240 | 0.00 | 0.00 | 0.00 | 111.33 | 6679.57 |
| 25 | 8.4 | 51 | 0.7 | 0.05 | 5 | 416 | 140 | 10259890 | 523.25 | 7.18 | 0.51 | 51.30 | 4268.11 |
| 26 | | | | | 5 | 490 | | 7435733 | 0.00 | 0.00 | 0.00 | 37.18 | 3643.51 |
| 27 | | | | | 5 | 497 | | 5511237 | 0.00 | 0.00 | 0.00 | 27.56 | 2739.08 |
| 28 | | | | | 5 | 520 | | 5160226 | 0.00 | 0.00 | 0.00 | 25.80 | 2683.32 |
| 29 | | | | | 5 | 460 | | 4810536 | 0.00 | 0.00 | 0.00 | 24.05 | 2212.85 |
| 30 | | | | | 5 | 438 | | 4061482 | 0.00 | 0.00 | 0.00 | 20.31 | 1778.93 |
| 31 | | | | | | | | | | | | | |

**IS:** Insufficient amount of sample due to low flow or sampler malfunction.

**Bord Na Mona Energy Ltd, Derrygreenagh Group, Rochfordsbridge, Co Westmeath**

**Composite Sampler Results Licence 501**

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| August 2002 | pH | COD mg/l | Ammonia as N mg/l | Total Phosphorus mg/l | Suspended Solids mg/l | Total Solids mg/l | Colour Pt Co units | Flow Daily Total (litres) | COD Kg/Day | Ammonia as Kg/Day | Total Phosphorus Kg/Day | Suspended Solids Kg/Day | Total Solids Kg/Day |
| 1 | | | | | 5 | 456 | | 1282676 | 0.00 | 0.00 | 0.00 | 6.41 | 584.90 |
| 2 | | | | | 10 | 436 | | 1416876 | 0.00 | 0.00 | 0.00 | 14.17 | 617.76 |
| 3 | | | | | 5 | 390 | | 631382 | 0.00 | 0.00 | 0.00 | 3.16 | 246.24 |
| 4 | | | | | 5 | 358 | | 2125391 | 0.00 | 0.00 | 0.00 | 10.63 | 760.89 |
| 5 | | | | | 7 | 426 | | 373019 | 0.00 | 0.00 | 0.00 | 2.61 | 158.91 |
| 6 | 8.4 | 64 | 0.9 | 0.05 | 5 | 436 | 162 | 1431059 | 91.59 | 1.29 | 0.07 | 7.16 | 623.94 |
| 7 | | | | | 8 | 450 | | 365555 | 0.00 | 0.00 | 0.00 | 2.92 | 164.50 |
| 8 | | | | | 12 | 440 | | 191324 | 0.00 | 0.00 | 0.00 | 2.30 | 84.18 |
| 9 | | | | | 10 | 336 | | 1202265 | 0.00 | 0.00 | 0.00 | 12.02 | 403.96 |
| 10 | | | | | 12 | 378 | | 217650 | 0.00 | 0.00 | 0.00 | 2.61 | 82.27 |
| 11 | | | | | 10 | 452 | | 671030 | 0.00 | 0.00 | 0.00 | 6.71 | 303.31 |
| 12 | | | | | 10 | 448 | | 200724 | 0.00 | 0.00 | 0.00 | 2.01 | 89.92 |
| 13 | 8.4 | 54 | 0.5 | 0.05 | 18 | 438 | 89 | 1086139 | 58.65 | 0.54 | 0.05 | 19.55 | 475.73 |
| 14 | | | | | 26 | 396 | | 1111533 | 0.00 | 0.00 | 0.00 | 28.90 | 440.17 |
| 15 | | | | | 12 | 412 | | 481462 | 0.00 | 0.00 | 0.00 | 5.78 | 198.36 |
| 16 | | | | | 34 | 230 | | 327698 | 0.00 | 0.00 | 0.00 | 11.14 | 75.37 |
| 17 | | | | | 35 | 546 | | 166946 | 0.00 | 0.00 | 0.00 | 5.84 | 91.15 |
| 18 | | | | | 21 | 462 | | 612716 | 0.00 | 0.00 | 0.00 | 12.87 | 283.07 |
| 19 | | | | | 35 | IS | | 47230 | 0.00 | 0.00 | 0.00 | 1.65 | #VALUE! |
| 20 | 8.3 | 55 | 1.6 | 0.05 | 5 | 314 | 84 | 891502 | 49.03 | 1.43 | 0.04 | 4.46 | 279.93 |
| 21 | | | | | 10 | 468 | | 645588 | 0.00 | 0.00 | 0.00 | 6.46 | 302.14 |
| 22 | | | | | 54 | 514 | | 308676 | 0.00 | 0.00 | 0.00 | 16.67 | 158.66 |
| 23 | | | | | 14 | 350 | | 870880 | 0.00 | 0.00 | 0.00 | 12.19 | 304.81 |
| 24 | | | | | 28 | 506 | | 410266 | 0.00 | 0.00 | 0.00 | 11.49 | 207.59 |
| 25 | | | | | 39 | 394 | | 604323 | 0.00 | 0.00 | 0.00 | 23.57 | 238.10 |
| 26 | | | | | 23 | 454 | | 76737 | 0.00 | 0.00 | 0.00 | 1.76 | 34.84 |
| 27 | 8 | 50 | 0.7 | 0.05 | 7 | 480 | 81 | 609232 | 30.46 | 0.43 | 0.03 | 4.26 | 292.43 |
| 28 | | | | | 5 | 458 | | 583270 | 0.00 | 0.00 | 0.00 | 2.92 | 267.14 |
| 29 | | | | | 63 | 506 | | 163049 | 0.00 | 0.00 | 0.00 | 10.27 | 82.50 |
| 30 | | | | | 17 | 474 | | 939722 | 0.00 | 0.00 | 0.00 | 15.98 | 445.43 |
| 31 | | | | | 36 | 428 | | 201697 | 0.00 | 0.00 | 0.00 | 7.26 | 86.33 |

**IS:** Insufficient amount of sample due to low flow or sampler malfunction.

## Bord Na Mona Energy Ltd, Derrygreenagh Group, Rochfordsbridge, Co Westmeath

## Composite Sampler Results Licence 501

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| September 2002 | pH | COD mg/l | Ammonia as N mg/l | Total Phosphorus mg/l | Suspended Solids mg/l | Total Solids mg/l | Colour Pt Co units | Flow Daily Total (litres) | COD Kg/Day | Ammonia as Kg/Day | Total Phosphorus Kg/Day | Suspended Solids Kg/Day | Total Solids Kg/Day |
| 1 | | | | | 41 | 490 | | 29614 | 0.00 | 0.00 | 0.00 | 1.21 | 14.51 |
| 2 | | | | | IS | IS | | 423928 | 0.00 | 0.00 | 0.00 | #VALUE! | #VALUE! |
| 3 | 8 | 52 | 1.3 | 0.05 | 5 | 489 | 66 | 276978 | 14.40 | 0.36 | 0.01 | 1.38 | 135.44 |
| 4 | | | | | 8 | 496 | | 494015 | 0.00 | 0.00 | 0.00 | 3.95 | 245.03 |
| 5 | | | | | 12 | 502 | | 419672 | 0.00 | 0.00 | 0.00 | 5.04 | 210.68 |
| 6 | | | | | 6 | 434 | | 503079 | 0.00 | 0.00 | 0.00 | 3.02 | 218.34 |
| 7 | | | | | 8 | 488 | | 997022 | 0.00 | 0.00 | 0.00 | 7.98 | 486.55 |
| 8 | | | | | 5 | 414 | | 579179 | 0.00 | 0.00 | 0.00 | 2.90 | 239.78 |
| 9 | | | | | 13 | 454 | | 405016 | 0.00 | 0.00 | 0.00 | 5.27 | 183.88 |
| 10 | 8.2 | 54 | 1.1 | 0.1 | 14 | 424 | 70 | 745606 | 40.26 | 0.82 | 0.07 | 10.44 | 316.14 |
| 11 | | | | | IS | IS | | 1862682 | 0.00 | 0.00 | 0.00 | #VALUE! | #VALUE! |
| 12 | | | | | IS | IS | | 1935663 | 0.00 | 0.00 | 0.00 | #VALUE! | #VALUE! |
| 13 | | | | | IS | IS | | -24918 | 0.00 | 0.00 | 0.00 | #VALUE! | #VALUE! |
| 14 | | | | | IS | IS | | -184399 | 0.00 | 0.00 | 0.00 | #VALUE! | #VALUE! |
| 15 | | | | | IS | IS | | 69286 | 0.00 | 0.00 | 0.00 | #VALUE! | #VALUE! |
| 16 | | | | | IS | IS | | 1076029 | 0.00 | 0.00 | 0.00 | #VALUE! | #VALUE! |
| 17 | 7.8 | 48 | 0.9 | 0.05 | 5 | 470 | 96 | 149546 | 7.18 | 0.13 | 0.01 | 0.75 | 70.29 |
| 18 | | | | | IS | IS | | 133831 | 0.00 | 0.00 | 0.00 | #VALUE! | #VALUE! |
| 19 | | | | | IS | IS | | 2136519 | 0.00 | 0.00 | 0.00 | #VALUE! | #VALUE! |
| 20 | | | | | IS | IS | | 2467397 | 0.00 | 0.00 | 0.00 | #VALUE! | #VALUE! |
| 21 | | | | | IS | IS | | 3401380 | 0.00 | 0.00 | 0.00 | #VALUE! | #VALUE! |
| 22 | | | | | IS | IS | | 1213150 | 0.00 | 0.00 | 0.00 | #VALUE! | #VALUE! |
| 23 | | | | | IS | IS | | 3021391 | 0.00 | 0.00 | 0.00 | #VALUE! | #VALUE! |
| 24 | 7.8 | 44 | 0.8 | 0.05 | 5 | 508 | 84 | 3300383 | 145.22 | 2.64 | 0.17 | 16.50 | 1676.59 |
| 25 | | | | | IS | IS | | 2166074 | 0.00 | 0.00 | 0.00 | #VALUE! | #VALUE! |
| 26 | | | | | IS | IS | | 946348 | 0.00 | 0.00 | 0.00 | #VALUE! | #VALUE! |
| 27 | | | | | IS | IS | | 2746009 | 0.00 | 0.00 | 0.00 | #VALUE! | #VALUE! |
| 28 | | | | | IS | IS | | 1721952 | 0.00 | 0.00 | 0.00 | #VALUE! | #VALUE! |
| 29 | | | | | IS | IS | | 477817 | 0.00 | 0.00 | 0.00 | #VALUE! | #VALUE! |
| 30 | | | | | IS | IS | | 2307910 | 0.00 | 0.00 | 0.00 | #VALUE! | #VALUE! |
| 31 | | | | | | | | | | | | | |

**IS:** Insufficient amount of sample due to low flow or sampler malfunction.

**Bord Na Mona Energy Ltd, Derrygreenagh Group, Rochfordsbridge, Co Westmeath**

**Composite Sampler Results Licence 501**

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| October | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2002 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | 7.8 | 43 | 0.8 | 0.05 | 5 | 466 | 90 | 2871286 | 123.47 | 2.30 | 0.14 | 14.36 | 1338.02 |
| 2 | | | | | 5 | 60 | | 3698870 | 0.00 | 0.00 | 0.00 | 18.49 | 221.93 |
| 3 | | | | | 30 | 450 | | 4587627 | 0.00 | 0.00 | 0.00 | 137.63 | 2064.43 |
| 4 | | | | | 11 | 462 | | 2752557 | 0.00 | 0.00 | 0.00 | 30.28 | 1271.68 |
| 5 | | | | | 14 | 334 | | 6897010 | 0.00 | 0.00 | 0.00 | 96.56 | 2303.60 |
| 6 | | | | | IS | IS | | 6969913 | 0.00 | 0.00 | 0.00 | #VALUE! | #VALUE! |
| 7 | | | | | IS | IS | | 6926518 | 0.00 | 0.00 | 0.00 | #VALUE! | #VALUE! |
| 8 | 8.2 | 122 | 3.5 | 0.14 | 33 | 322 | 202 | 5524656 | 674.01 | 19.34 | 0.77 | 182.31 | 1778.94 |
| 9 | | | | | 14 | 258 | | 15611960 | 0.00 | 0.00 | 0.00 | 218.57 | 4027.89 |
| 10 | | | | | 8 | 366 | | 3496425 | 0.00 | 0.00 | 0.00 | 27.97 | 1279.69 |
| 11 | | | | | 11 | 336 | | 6604664 | 0.00 | 0.00 | 0.00 | 72.65 | 2219.17 |
| 12 | | | | | 14 | 218 | | 15408270 | 0.00 | 0.00 | 0.00 | 215.72 | 3359.00 |
| 13 | | | | | 14 | 182 | | 4853050 | 0.00 | 0.00 | 0.00 | 67.94 | 883.26 |
| 14 | | | | | 8 | 300 | | 5800895 | 0.00 | 0.00 | 0.00 | 46.41 | 1740.27 |
| 15 | 7.9 | 78 | 1.8 | 0.06 | 18 | 408 | 144 | 1861128 | 145.17 | 3.35 | 0.11 | 33.50 | 759.34 |
| 16 | | | | | 12 | 432 | | 3224321 | 0.00 | 0.00 | 0.00 | 38.69 | 1392.91 |
| 17 | | | | | 8 | 434 | | 5111300 | 0.00 | 0.00 | 0.00 | 40.89 | 2218.30 |
| 18 | | | | | 11 | 424 | | 4496910 | 0.00 | 0.00 | 0.00 | 49.47 | 1906.69 |
| 19 | | | | | 30 | 148 | | 4321898 | 0.00 | 0.00 | 0.00 | 129.66 | 639.64 |
| 20 | | | | | 45 | 202 | | 9250424 | 0.00 | 0.00 | 0.00 | 416.27 | 1868.59 |
| 21 | | | | | 122 | 261 | | 36053430 | 0.00 | 0.00 | 0.00 | 4398.52 | 9409.95 |
| 22 | 7.8 | 100 | 1.3 | 0.11 | 24 | 250 | 164 | 4806866 | 480.69 | 6.25 | 0.53 | 115.36 | 1201.72 |
| 23 | | | | | 12 | 276 | | 4708351 | 0.00 | 0.00 | 0.00 | 56.50 | 1299.50 |
| 24 | | | | | 5 | 352 | | 1376895 | 0.00 | 0.00 | 0.00 | 6.88 | 484.67 |
| 25 | | | | | 17 | 256 | | 4043449 | 0.00 | 0.00 | 0.00 | 68.74 | 1035.12 |
| 26 | | | | | 20 | 269 | | 4197452 | 0.00 | 0.00 | 0.00 | 83.95 | 1129.11 |
| 27 | | | | | 19 | 242 | | 4933355 | 0.00 | 0.00 | 0.00 | 93.73 | 1193.87 |
| 28 | | | | | 12 | 344 | | 2680688 | 0.00 | 0.00 | 0.00 | 32.17 | 922.16 |
| 29 | 7.7 | 104 | 1.2 | 0.07 | 42 | 210 | 130 | 404690 | 42.09 | 0.49 | 0.03 | 17.00 | 84.98 |
| 30 | | | | | 28 | 216 | | 4333607 | 0.00 | 0.00 | 0.00 | 121.34 | 936.06 |
| 31 | | | | | 29 | 360 | | 3424794 | 0.00 | 0.00 | 0.00 | 99.32 | 1232.93 |

**IS:** Insufficient amount of sample due to low flow or sampler malfunction.

**Bord Na Mona Energy Ltd, Derrygreenagh Group, Rochfordsbridge, Co Westmeath**

**Composite Sampler Results Licence 501**

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dec 2002 | pH | COD mg/l | Ammonia as N mg/l | Total Phosphorus mg/l | Suspended Solids mg/l | Total Solids mg/l | Colour Pt Co units | Flow Daily Total (litres) | COD Kg/Day | Ammonia as Kg/Day | Total Phosphorus Kg/Day | Suspended Solids Kg/Day | Total Solids Kg/Day |
| 1 | | | | | 30 | 130 | | 4065842 | 0.00 | 0.00 | 0.00 | 121.98 | 528.56 |
| 2 | | | | | 17 | 212 | | 6334524 | 0.00 | 0.00 | 0.00 | 107.69 | 1342.92 |
| 3 | 7.5 | 74 | 0.2 | 0.07 | 23 | 116 | 157 | 3680492 | 272.36 | 0.74 | 0.26 | 84.65 | 426.94 |
| 4 | | | | | IS | IS | | 1389035 | 0.00 | 0.00 | 0.00 | #VALUE! | #VALUE! |
| 5 | | | | | IS | IS | | 1701907 | 0.00 | 0.00 | 0.00 | #VALUE! | #VALUE! |
| 6 | | | | | IS | IS | | 1701907 | 0.00 | 0.00 | 0.00 | #VALUE! | #VALUE! |
| 7 | | | | | IS | IS | | 1701907 | 0.00 | 0.00 | 0.00 | #VALUE! | #VALUE! |
| 8 | | | | | IS | IS | | 1701907 | 0.00 | 0.00 | 0.00 | #VALUE! | #VALUE! |
| 9 | | | | | IS | IS | | 645586 | 0.00 | 0.00 | 0.00 | #VALUE! | #VALUE! |
| 10 | | | | | IS | IS | | -125866 | 0.00 | 0.00 | 0.00 | #VALUE! | #VALUE! |
| 11 | | | | | IS | IS | | -699138 | 0.00 | 0.00 | 0.00 | #VALUE! | #VALUE! |
| 12 | | | | | IS | IS | | 608702 | 0.00 | 0.00 | 0.00 | #VALUE! | #VALUE! |
| 13 | | | | | IS | IS | | -785802 | 0.00 | 0.00 | 0.00 | #VALUE! | #VALUE! |
| 14 | | | | | IS | IS | | 964778 | 0.00 | 0.00 | 0.00 | #VALUE! | #VALUE! |
| 15 | 7.4 | 56 | 1.5 | 0.05 | 5 | 446 | 80 | 727426 | 40.74 | 1.09 | 0.04 | 3.64 | 324.43 |
| 16 | | | | | IS | IS | | -43083 | 0.00 | 0.00 | 0.00 | #VALUE! | #VALUE! |
| 17 | | | | | IS | IS | | -1391525 | 0.00 | 0.00 | 0.00 | #VALUE! | #VALUE! |
| 18 | | | | | IS | IS | | 999604 | 0.00 | 0.00 | 0.00 | #VALUE! | #VALUE! |
| 19 | | | | | IS | IS | | -817085 | 0.00 | 0.00 | 0.00 | #VALUE! | #VALUE! |
| 20 | | | | | 6 | 134 | | -2609276 | 0.00 | 0.00 | 0.00 | -15.66 | -349.64 |
| 21 | | | | | 11 | 288 | | -4101425 | 0.00 | 0.00 | 0.00 | -45.12 | -1181.21 |
| 22 | 8.1 | 74 | 1.4 | 0.1 | 6 | 248 | 128 | -3292648 | -243.66 | -4.61 | -0.33 | -19.76 | -816.58 |
| 23 | | | | | IS | IS | | -802314 | 0.00 | 0.00 | 0.00 | #VALUE! | #VALUE! |
| 24 | | | | | IS | IS | | -1515837 | 0.00 | 0.00 | 0.00 | #VALUE! | #VALUE! |
| 25 | | | | | IS | IS | | -3411269 | 0.00 | 0.00 | 0.00 | #VALUE! | #VALUE! |
| 26 | | | | | IS | IS | | -4012205 | 0.00 | 0.00 | 0.00 | #VALUE! | #VALUE! |
| 27 | | | | | IS | IS | | -4860392 | 0.00 | 0.00 | 0.00 | #VALUE! | #VALUE! |
| 28 | | | | | IS | IS | | -3397107 | 0.00 | 0.00 | 0.00 | #VALUE! | #VALUE! |
| 29 | 8 | 111 | 0.6 | 0.16 | 52 | 234 | 216 | -4212404 | -467.58 | -2.53 | -0.67 | -219.05 | -985.70 |
| 30 | | | | | IS | IS | | -7485171 | -830.85 | -4.49 | -1.20 | #VALUE! | #VALUE! |
| 31 | | | | | IS | IS | | | 0.00 | 0.00 | 0.00 | #VALUE! | #VALUE! |

**IS:** Insufficient amount of sample due to low flow or sampler malfunction.

BORD NA MÓNA

BORD NA MÓNA ENERGY LIMITED
Derrygreenagh,Rochfortbridge,Mullingar,Co-Westmeath.

# Annual Environmental Report
# IPC LICENCE 501

**March 2004**

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# 1 Introduction

1.1 IPC Licence Register No **501**

1.2 Name & Location of Site

| | |
|---|---|
| Name: | **Bord na Mona Energy Limited.** |
| Address: | **Derrygreenagh Group**<br>**Derrygreenagh Works**<br>**Rochfortbridge**<br>**Mullingar**<br>**Co Westmeath.** |
| Telephone No: | **044 / 22181** Fax No: **044 / 22344** |
| Contact Name: | **Paul Riordan** |
| Position: | **Regional Manager.** |
| National Grid Reference: | **E249450 N238140** |

1.3 Description of Activities

The Derrygreenagh Group consists of the Derrygreenagh and Ballivor Groups and Rossan Bog.
The Derrygreenagh group of bogs is located in North Offaly and Southeast Westmeath. The Derrygreenagh group comprises of 3664 acquired hectares, of which there was 244 nett hectares in production in the 2003 season. The main catchment of these areas is the River Boyne.

The Ballivor group is made up of the bogs in the Ballivor, Carranstown, Bracklin and Lisclogher areas. There is a total of 278 hectares in production and each of these areas are linked by peatland railway to the Bord na Mona horticultural factory, situated between Ballivor and Raharney villages. Drainage from these bogs is to the Deel and Stonyford rivers, tributaries of the Boyne.

Rossan bog is situated one mile from Kinnegad village. There are currently 148 hectares in milled moss production. This bog drains to the Kinnegad River, a tributary of the River Boyne.

The Derrygreenagh Group currently employs 48 permanent and 5 seasonal workers. The Ballivor bogs employing 11 permanant and 3 seasonals, with 3 premanent and 3 seasonals employed in Rossan. Giving a total of 62 permanent and 11 seasonal employees across the licence area.

Transport operations are carried out on a seven day cycle throughout the year. Production operations are typically carried out over a seven day week (weather permitting) for 12 to 15 hours per day.

**Peat Milling Operations.**

For milled peat production the bog is laid out in a series of rectangular fields of varying length and 15m wide with drains located between. There are essentially four operations involved in milled peat production:

- Milling.
- Harrowing.
- Ridging.
- Harvesting.

**Milling.**
Special milling machines work there way along the fields, milling approximately 15mm of peat of the top of the bog in a pass.

**Harrowing**
In the course of drying, the milled peat is turned a number of times to avail of the drying conditions. This is achieved with a machine called a harrow. The milled peat is harrowed until its moisture content is down to approximately 40-50%, which can take up to two to three days, weather depending.

**Ridging**
The dry peat is then scraped into long ridges running down the centre of each field. This is done with a ridger, a machine consisting of a series of blades in the shape of a v that opens the full width of the field.

**Harvesting**
During harvesting every eleventh field is used to stockpile the peat, with this field receiving the milled peat from the five fields either side.

The milled peat is then transported via the existing network of peatland railways to one of the following locations.

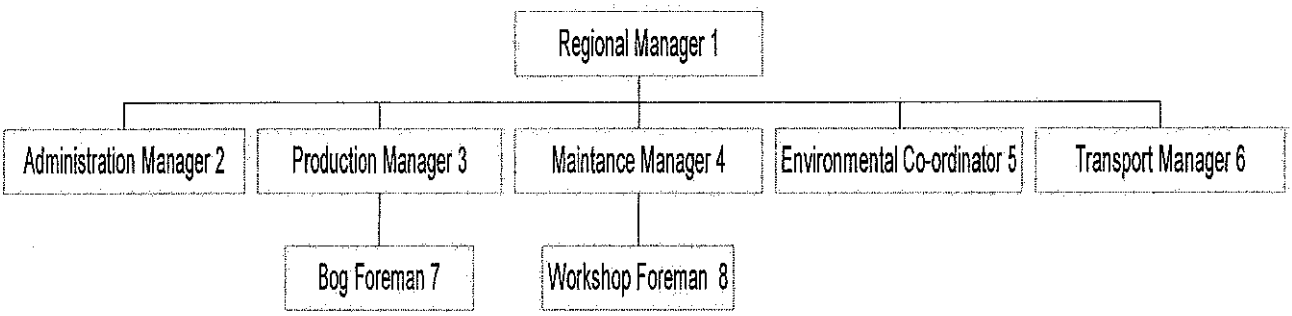
- Power station ( EPL )
- Horticultural Factory.

1.4 Environmental Management of the Company

The organisational structure within the Derrygreenagh Group is presented in the flow chart below.

# Derrygreenagh Group

## Environmental Responsibilities




(1) Overall environmental responsibilities
(2) Records of complaints and registers
(3) All production related issues
(4) Machine maintenance
(5) Co-ordinating environmental affairs
(6) All peat transportation matters
(7) Silt pond maintenance, tea centres, codes of practice
(8) Fuel loading, oil traps, weekly workshop inspections.

1.5 Environmental Policy

**BORD NA MÓNA**

**BORD NA MÓNA ENERGY LIMITED**
**Derrygreenagh,Rochfortbridge,Mullingar,Co-Westmeath.**

Bord na Mona Energy Limited is a commercial semi-state body with responsibility to develop Irelands peat resources in the national interest.

Bord na Mona Energy Limited is committed to gather and make available information on all aspects of its environmental impact and to help improve understanding among the public generally of its role and the importance of Irish peatlands.

Bord na Mona Energy Limited recognises the importance of peatland conservation.

Bord na Mona Energy Limited will leave behind all areas it owns as either an economically or socially integrated resource of a high environmental value.

Bord na Mona Energy Limited seeks to conduct all aspects of its buisness in an environmentally sensitive value.

Bord na Mona Energy Limited will establish an environmental management system specifically addressing the following impacts.

- Discharges to water.
- Emissions to atmosphere.
- Waste disposal.
- Use of natural resources.
- Noise, vibration, odour, dust and visual effects.
- Natural environment and eco-system.

The environmental management system will be monitored, maintained and continually improved.

A system of regular environmental audits will be put in place.

Bord na Mona Energy Limited will continue research and development into all aspects of its environmental impact.

This statement is published and is available at all locations within the division and its contents are brought to the attention of all employees.

## 2 Summary Information

2.1 Emissions to Water Summary

2.1.1 Silt Pond Emissions

The following tables contain a summary of the emissions to surface waters from within the Derrygreenagh Group.

| **Silt Pond No: DH 1 Reporting Period (Jan-Dec 2003)** | **SW No. 1** | | | | | |
|---|---|---|---|---|---|---|
| **Parameter** | **Jan/Feb/Mar Emission (mg/l)** | **April/May/June Emission (mg/l)** | **July/Aug/Sept Emission (mg/l)** | **Oct/Nov/Dec Emission (mg/l)** | **E L V (mg/l)** | **Compliant** |
| pH units | 7.4 | 7.6 | 7.5 | 7.5 | ~ | |
| Flow (L/sec) | 2 | 0.2 | 0.15 | 12.5 | ~ | |
| Suspended Solids (mg/l) | <5 | <5 | <5 | <5 | 35mg/l | YES |
| Total Solids (mg/l) | 246 | 344 | 428 | 214 | ~ | |
| Total Phosphorus (mg/l) | 0.08 | <0.05 | <0.05 | <0.05 | ~ | |
| Ammonia (mg/l) | 2.2 | 2.1 | 3.04 | 2.35 | ~ | |
| Colour (Pt Co units) | 110 | 110 | 85 | 132 | ~ | |
| COD (mg/l) | 44 | 61 | 63 | 56 | ~ | |

| Silt Pond No: DM 6 Reporting Period (Jan-Dec 2003) | SW No. 6 | | | | | |
|---|---|---|---|---|---|---|
| Parameter | Jan/Feb/Mar Emission (mg/l) | April/May/June Emission (mg/l) | July/Aug/Sept Emission (mg/l) | Oct/Nov/Dec Emission (mg/l) | E L V (mg/l) | Compliant |
| pH units | 7.6 | 8.1 | 7.7 | 7.7 | ~ | |
| Flow (L/sec) | 53.8 | 48.1 | 80.2 | 67.5 | ~ | |
| Suspended Solids (mg/l) | <5 | <5 | <5 | <5 | 35mg/l | YES |
| Total Solids (mg/l) | 390 | 514 | 555 | 322 | ~ | |
| Total Phosphorus (mg/l) | <0.05 | <0.05 | <0.05 | <0.05 | ~ | |
| Ammonia (mg/l) | 0.9 | <0.2 | 0.04 | 0.16 | ~ | |
| Colour (Pt Co units) | 48 | 52 | 51 | 70 | ~ | |
| COD (mg/l) | 28 | 38 | 42 | 31 | ~ | |

| Silt Pond No: TR 19 Reporting Period (Jan-Dec 2003) | SW No. 14 | | | | | |
|---|---|---|---|---|---|---|
| Parameter | Jan/Feb/Mar Emission (mg/l) | April/May/June Emission (mg/l) | July/Aug/Sept Emission (mg/l) | Oct/Nov/Dec Emission (mg/l) | E L V (mg/l) | Compliant |
| pH units | 7.4 | 7.7 | 7.4 | 7.3 | ~ | |
| Flow (L/sec) | 9 | 11 | 2.0 | 6.1 | ~ | |
| Suspended Solids (mg/l) | 6 | <5 | <5 | <5 | 35mg/l | YES |
| Total Solids (mg/l) | 210 | 250 | 404 | 248 | ~ | |
| Total Phosphorus (mg/l) | <0.05 | <0.05 | 0.07 | <0.05 | ~ | |
| Ammonia (mg/l) | 2.0 | 1.5 | 2.41 | 1.97 | ~ | |
| Colour (Pt Co units) | 240 | 311 | 73 | 211 | ~ | |
| COD (mg/l) | 47 | 77 | 56 | 56 | ~ | |

| Silt Pond No: BN 36 Reporting Period (Jan-Dec 2003) | SW No. 30 | | | | | |
|---|---|---|---|---|---|---|
| Parameter | Jan/Feb/Mar Emission (mg/l) | April/May/June Emission (mg/l) | July/Aug/Sept Emission (mg/l) | Oct/Nov/Dec Emission (mg/l) | E L V (mg/l) | Compliant |
| pH units | 7.6 | 7.4 | 7.1 | 7.2 | ~ | |
| Flow (L/sec) | 3.2 | 7.2 | 0.26 | 2.43 | ~ | |
| Suspended Solids (mg/l) | 8 | <5 | 10 | <5 | 35mg/l | YES |
| Total Solids (mg/l) | 256 | 428 | 206 | 216 | ~ | |
| Total Phosphorus (mg/l) | 0.07 | 0.15 | <0.05 | <0.05 | ~ | |
| Ammonia (mg/l) | 0.7 | 0.9 | 1.72 | 1.54 | ~ | |
| Colour (Pt Co units) | 322 | 144 | 139 | 161 | ~ | |
| COD (mg/l) | 79 | 41 | 58 | 57 | ~ | |

| Silt Pond No: CN 39 Reporting Period (Jan-Dec 2003) | SW No. 32 | | | | | |
|---|---|---|---|---|---|---|
| Parameter | Jan/Feb/Mar Emission (mg/l) | April/May/June Emission (mg/l) | July/Aug/Sept Emission (mg/l) | Oct/Nov/Dec Emission (mg/l) | E L V (mg/l) | Compliant |
| pH units | 7.4 | 7.3 | 7.5 | 7.3 | ~ | |
| Flow (L/sec) | 6.76 | 21 | 2.7 | 14.65 | ~ | |
| Suspended Solids (mg/l) | 12 | 6 | 31 | <5 | 35mg/l | YES |
| Total Solids (mg/l) | 290 | 196 | 352 | 212 | ~ | |
| Total Phosphorus (mg/l) | 0.13 | 0.05 | 0.12 | <0.05 | ~ | |
| Ammonia (mg/l) | 0.8 | 0.3 | 0.07 | 0.47 | ~ | |
| Colour (Pt Co units) | 316 | 404 | 214 | 231 | ~ | |
| COD (mg/l) | 81 | 121 | 103 | 83 | ~ | |

| **Silt Pond No: KD 50 Reporting Period (Jan-Dec 2003)** | **SW No. 43** | | | | | |
|---|---|---|---|---|---|---|
| **Parameter** | **Jan/Feb/Mar Emission (mg/l)** | **April/May/June Emission (mg/l)** | **July/Aug/Sept Emission (mg/l)** | **Oct/Nov/Dec Emission (mg/l)** | **E L V (mg/l)** | **Compliant** |
| pH units | 7.2 | 7.5 | 7.4 | 7.4 | ~ | |
| Flow (L/sec) | 18.7 | 8.6 | 6.8 | 42.7 | ~ | |
| Suspended Solids (mg/l) | <5 | <5 | <5 | <5 | 35mg/l | YES |
| Total Solids (mg/l) | 230 | 210 | 264 | 172 | ~ | |
| Total Phosphorus (mg/l) | 0.09 | 0.05 | 0.12 | <0.05 | ~ | |
| Ammonia (mg/l) | 2.6 | 2.1 | 2.26 | 2.82 | ~ | |
| Colour (Pt Co units) | 250 | 302 | 189 | 241 | ~ | |
| COD (mg/l) | 61 | 92 | 102 | 76 | ~ | |

2.1.2 Yard Discharge

The tables below are a summary of the emissions to surface waters from the yard and workshop at the Derrygreenagh Works.

**Derrygreenagh SWE-2**

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COD mg/l | 32 | 33 | | 63 | 29 | 40 | 25 | | | 48 | | |

**Note:** Due to the unusually dry year, fewer samples were available. In fact no samples were available on the day of sampling in the months March, August, September, November & December.

2.1.3 Composite Sampler Report

The composite sampler was relocated during the reporting period. It is now located at Derryhinch Bog at SW 3 on the outlet of silt pond DH 3. The sampler appears to be operating quite well at this location, although a programme of servicing is due to commence in the forthcoming year during which time the sampler will be out of commission to facilitate service works.
Attached in Appendix 1 are the results of the monitoring carried out using the composite sampler. There were no non-compliance's recorded by the sampler during the reporting period.

2.1.4 Non-compliance's

There were no non-compliance's, in relation to silt pond sampling during the reporting period.

## 2.2Emissions to Air

### 2.2.1 Dust Monitoring

The tables below contain the dust emissions for each dust monitoring location within the Derrygreenagh Group. Monitoring took place on three separate occasions during the periods, June – July, July – August, August – September 2003.

**June - July**

| Emission Point | Parameter | Emission ($mg/m^2$/day) | Emission Limit Value | Compliant |
|---|---|---|---|---|
| DM 01 | Dust | 128 | (350$mg/m^2$/Day) | YES |
| DM 02 | Dust | 83 | (350$mg/m^2$/Day) | YES |
| DM 03 | Dust | 139 | (350$mg/m^2$/Day) | YES |

**July - Aug**

| Emission Point | Parameter | Emission ($mg/m^2$/day) | Emission Limit Value | Compliant |
|---|---|---|---|---|
| DM 01 | Dust | 17 | (350$mg/m^2$/Day) | YES |
| DM 02 | Dust | 89 | (350$mg/m^2$/Day) | YES |
| DM 03 | Dust | 89 | (350$mg/m^2$/Day) | YES |

**Aug - Sep**

| Emission Point | Parameter | Emission ($mg/m^2$/day) | Emission Limit Value | Compliant |
|---|---|---|---|---|
| DM 01 | Dust | 24 | (350$mg/m^2$/Day) | YES |
| DM 02 | Dust | 42 | (350$mg/m^2$/Day) | YES |
| DM 03 | Dust | 136 | (350$mg/m^2$/Day) | YES |

**Note:** DM 01= Toar Bog. DM 02 = Derryhinch Bog. DM 03 = Ballivor Bog.

### 2.2.2 Non-compliance's

There was no non-compliance, in relation to air in the reporting period.

## 2.3Waste Arisings

2.3.1 Non-Hazardous Waste

The following table lists the quantities of the wastes generated from January-December 2003 from all of the Derrygreenagh Group.

| Waste Type | Quantity ( Tonnes ) |
|---|---|
| Silt Pond Waste | 387.2 |
| Scrap Metal | 39.190 |
| Mixed Municipal Waste | 4.950 |
| **Total** | **431.34** |

2.3.2 Hazardous Waste

The following table is a record of all the hazardous wastes handled by the Derrygreenagh Group from January - December 2003.

| WASTE DESCRIPTION | EWC CODE | TONNES | NAME OF CONTRACTOR | DESTINATION | DATE | REJECTED CONSIGNMENTS |
|---|---|---|---|---|---|---|
| Waste Oil | 130202 | 6300L | Atlas Waste Oil | Portlaoise | 04/03/03 | NA |
| Lead Acid Batteries | 160601 | 80NR | Returnbatt LTD | Kildare Town | 15/04/03 | NA |
| Waste Oil | 130202 | 7850L | Atlas Waste Oil | Portlaoise | 16/04/03 | NA |
| Lead Acid Batteries | 160601 | 1.5 | Returnbatt LTD | Kildare Town | 04/07/03 | NA |
| Oily rags | 150201 | 240L | Atlas Waste Oil | Portlaoise | 17/07/03 | NA |
| Waste Oil | 130202 | 4750L | Atlas Waste Oil | Portlaoise | 19/09/03 | NA |
| Skip of Oil Filters | 160107 | 2500kg | Atlas Waste Oil | Portlaoise | 13/11/03 | NA |
| Waste Oil | 130202 | 6800L | Atlas Waste Oil | Portlaoise | 25/11/03 | NA |
| Waste Grease | 130899 | 1 Barrell | Atlas Waste Oil | Portlaoise | 28/11/03 | NA |
| Oily rags | 150201 | 240L | Atlas Waste Oil | Portlaoise | 15/12/03 | NA |
| Oil Filters | 160107 | 660L | Atlas Waste Oil | Portlaoise | 15/12/03 | NA |
| | | | | | | |
| | | | | | | |

**Note**: * Approximate weight.

## 2.4 Energy and Water Consumption

2.4.1 Energy Consumption

The table below is a summary of the energy consumption for the Derrygreenagh Group, from the dates January – December 2003.

Water is not included, as it is not used as part of the production process. It is only used in offices, canteens and workshops on a domestic scale.

| Fuel | Volume $M^3$ | Tonnes | MW/Hours |
|---|---|---|---|
| **Jan - Dec 2003** | | | |
| Diesel | 99.6 | 82.6 | 974.6 |
| Electricity | NA | NA | 44.12 |
| Peat Briquettes | NA | 338 | 1690 |
| **Total** | **99.6** | **420.6** | **2708.72** |

## 2.5 Environmental Incidents & Complaints

2.5.1 Incidents

There were no incidents within the Derrygreenagh Group during the reporting period.

| Environmental Incidents | Number of Incidents |
|---|---|
| Incidents | 0 |
| Incidents requiring corrective action | 0 |
| **Categories of Incident** | |
| Odour | |
| Noise | |
| Water | |
| Air | |
| Procedural | |
| Miscellaneous | |

## 2.5.2 Complaints

There were no complaints within the Derrygreenagh Group, in the period January - December 2003.

| Environmental Complaints | Number of complaints |
|---|---|
| Complaints received | 0 |
| Complaints requiring corrective action | 0 |
| **Categories of complaint** | |
| Odour | |
| Noise | |
| Water | |
| Air | |
| Procedural | |
| Miscellaneous | |

## 3.0 Management of the Activity

3.1 Environmental Management Programme Report 2003

| Environmental Management Programme Report 2003 | |
|---|---|
| **Project** | |
| Project 1. Reduction of fugitive dust emissions. | **Training**<br>Training was provided for all personnel during 2002, and will be repeated in 2004. This will be in the form of a Cleaner Production Video, which is currently in production. This video deals with all dust related production issues and identifies good practice and codes of practice for peat production in Dust Sensitive Locations (DSL's).<br><br>**Headland Peat**<br>Headland peat is another potential source of dust generation from bog production traffic. This was address by the introduction of a pilot production unit, involving a dedicated unit for the collection of headland peat in the Boora Group of Bogs (IPC 500). This unit, made up of one same field harvester and 4/5 tractor and haku trailers units was in operation in the Boora group during 2003. Its main function was to gather all headland peat from the different units as often as possible, so as to reduce the volumes of loose peat dry peat that can cause dust problems. It has proved successful, and it is proposed to extend this programme in 2004.<br><br>**Hydraulic harrows**<br><br>Plans for the fabrication of hydraulically operated harrows were completed in 2003, and an order was placed for 8 harrows for the 2004 production season. |

| | |
|---|---|
| Project 2. Minimisation of Suspended Solids | Various projects are currently underway to address these issues. As already discussed the Cleaner Production Video examines bad production methods that can lead to waste peat entering the drainage system and subsequently the silt pond network. These can occur during bog maintenance, milling, harrowing, ridging, harvesting and loading. The video highlights these practices and demonstrates improvements that can be achieved through better driving and operation.<br><br>Other projects such as the hydraulic harrows and the collection of the headland peat are also related to cleaner production which will have a positive impact on waste minimisation and the reduction of waste peat that can potentially find its way into drainage network. |
| Project 3. Effective spill/leak management of mobile fuelling tanks | Mobile fuelling locations identified, and posted at each tea centre. The upgrading and overhaul of all mobile fuelling units is ongoing, with each unit being brought to the workshop for repairs / improvements. Codes of practice adopted and standard operating procedures in place as well as an emergency response procedure in the event of an oil spillage. |
| Project 4. Re-use of silt pond waste | No work has been carried out on this project to-date. It was proposed to monitor a silt pond constructed on the headland at Gilltown, in the Kilberry group of Bogs. Its close proximity to the production fields and stockpiles made it suitable for potentially reusing the waste peat excavated from the silt pond. This project will be examined again in 2004. |
| Project 5. Collection, storage and re-use of polythene. | Polythene for recycling has been collected from around the production areas, and stockpiled at a hard surface for baling/collection. A new mechanical method of stripping piles and rolling the polythene on a spool was developed and contracts for fabrication of 20 units externally, was agreed. This will produce a more compact and cleaner method of removing and transporting the polythene to a storage area. Polythene baled and loose has sent for recycling to various contractors and records of these are kept on file at the associated works. (see 2.3 Waste Arising). In total, approximately 1500 tonnes have been baled & collected, 700-800 tonnes of this recycled into pellets. |

3.2 Environmental Management Programme Proposal for 2004

| Environmental Management Programme for 2004 | |
|---|---|
| **Project** | |
| Project 1. Reduction of fugitive dust emissions. | Continue with the completion of the Cleaner Production Video for 2004.<br><br>A two day internal audit will be conducted on site and will include an assessment of dust protection measures in place at Dust Sensitive Locations<br><br>Project works for 2004 includes:<br>**Hydraulic Harrows**<br>Eight Hydraulic Harrows have been fabricated in 2004, specifically for Dust Sensitive Locations. These hydraulic harrows will allow the spoons to be lifted when not on the production fields. This will assist in reducing dust generation by the following:<br>1. Less harrowing of headlands and passways, will reduce the suspension of dust particles<br>2. The headland peat will not be broken down and dried as much from harrowing, which will reduce the volumes that may become suspended.<br>3. It will also leave it a better condition for subsequent collection by the proposed headland peat units.<br>t is proposed to have these 8 new hydraulic harrows in operation by the 2004 production season.<br>There is a 5 year policy in BNM to fabricate an additional 40 hydraulic harrows, which will include some for the 2005 production season. The total cost of this proposed work is circa €650,000 over the 5 years and will represent 15% of the total no. of harrows in operation.<br>**Headland Peat Collection**<br>Following the success of the headland collection trials in Boora in 2003, a machine design for mass manufacture was agreed and tendered outside BNM for manufacture. These units are planed for mid production season in Derrygreenagh, Mountdillon, Boora, Blackwater, Derryfadda & Littleton. In addition to these machines, 26 Tractor and Haku trailer units will be employed to transport the peat from the headland to the Haku piles, at an over all cost of €1.7 million.<br>All of the above modifications/new methods of production will be assessed, throughout the production year, to measure their performance and identify any potential improvements. The EMP will be updated on a regular basis to reflect these assessments. |

| | |
|---|---|
| Project 2. Minimisation of Suspended Solids | Work on this project is also covered by the Cleaner Production Video. Once completed it will be presented as part of the 2004 training programme and will target all production staff in all of the IPC Licence areas. It will cover all areas of production and will identify cleaner production methods aimed at reducing the generation of waste peat.<br><br>All of the projects for 2004, covered under Project 1, will also have a positive effect on the minimisation of suspended solids, as it will allow for the collection of more loose peat on the headlands that would previously have been unsuitable as fuel peat. |
| Project 3. Effective spill/leak management of mobile fuelling tanks | The continuing overhaul of all mobile fuelling units. The training of all relevant personnel in the safe handling of fuels in accordance with the adopted codes of practice and the training of all relevant personnel in the use of emergency spill kits. |
| Project 4. Re-use of silt pond waste | A silt pond has be constructed, on the headland at Gilltown Bog in the Kilberry Group of Bogs, where trials will be carried out to examine the potential for re-using the silt waste from the silt pond as the main product, or as a by-product. This project was due to commence in 2002, but failed to do so, due to the weather conditions during the 2002 production season. |
| Project 5. Collection, storage and re-use of polythene. | Collection of polythene is on-going. This is mainly the back-log of polythene.<br>There are currently 20 of the new polythene strippers being manufactured and are currently being delivered. All of the strippers will be delivered by the end of April, and will be assigned to the different locations within BNM. An additional 3 – 4 will also be fabricated by the late 04, early 05' this will bring to 25 the no in operation.<br><br>There are currently three potential contractors that could take the waste polythene for recycling. All involve shredding, washing and either baling or pelletising the polythene and BNM are currently assessing each contractor to assess their suitability, environmental compliance etc.<br>Once the back-log has been recycled, and BNM have all of the strippers in place, the day to day recycling of the polythene removed each year will be more efficient. |

3.3 Environmental Expenditure

The table below lists the environmental costs incurred by the Derrygreenagh Group between January – December 2003.
In calculating the environmental costs 70% of the total costs were attributed to Licence 503 and 30% to Licence 501.The Ballivor Group costs were then added to the Derrygreenagh totals.

| Expenditure Related to the Operation of the Derrygreenagh IPC Licence During the Period January – December 2003 | | | |
|---|---|---|---|
| **Description** | **Ballivor Cost** | **D/Green Cost** | **Total Cost (€)** |
| Plant @ €40/hour | 20,800 | 180,760 | 201,560 |
| Labour | 6,240 | 61,532 | 67,772 |
| Materials | NA | 28,252 | 28,252 |
| Overheads (ESB, Phones, Consumables) | 2,000 | 6,000 | 8,000 |
| Laboratory Analysis | NA | 17,355 | 17,355 |
| EPA Fees | NA | 9,249 | 9,249 |
| **Total** | **29,040** | **303,148** | **332,188** |

## 4.0 Licence Specific Reports

4.1 Surface Water Discharge Monitoring Location Programme Review

The surface water discharge monitoring location programme remains the same as was submitted and accepted by the Agency in June 2000.
Pipes have been fitted at each location in order to accommodate flow metres and the provision of safe access is also ongoing.
Emission point signs have been designed and are in place.
Additional work has also being carried out at these locations as part of the ongoing silt pond upgrade programme.
Monitoring will be carried out at these same locations in the forthcoming year and reported on in next years AER.

4.2 Bunding Programme

The bunding programme for large scale oil storage facilities is complete and the works certified.

4.3 Boiler Combustion Efficiency

Boiler Details
Twin Danstoker solid fuel units each rated at 725KW, fuelled by loose briquettes.
Operating from Oct-Mar approximately at Derrygreenagh Works.

A boiler efficiency test was carried out on the 09/12/03. The results of this test showed the boiler to be operating at an efficiency level of 82.1%.
A full breakdown of the test is retained on file at the Derrygreenagh office.

4.4 Resource consumption Summary

There was a total of 151,409 tonnes of milled peat produced across the licence area in the production season 2003.
There was also a total of 124,859 tonnes of stock peat sold during the reporting period. Of this total 47,849 tonnes were sold to Edenderry Power Limited, 1,505 tonnes to Derrinlough Briquette Factory, 30,500 tonnes to Ballivor Moss Factory, 3,560 tonnes to Kilberry Moss Factory and 41,445 tonnes direct to Dublin Port for export.

4.5 De-silting programme report

**Summary Data Table of Ponds De-Silted From Jan-December 2003**

| Bog | No Silt Ponds | Cleaned Once | Cleaned Twice | Cleaned >Three Times | Notes |
|---|---|---|---|---|---|
| Ballivor | 10 | 6 | 4 | | |
| Carranstown | 5 | 4 | | | |
| Bracklin West | 6 | | 6 | 4 | |
| Lisclogher | 7 | 6 | | | * |
| Kinnegad | 6 | | 6 | 2 | |
| D/Hinch | 4 | 0 | | | ** |
| Drumman | 6 | 1 | | | ** |
| Ballybeg | 6 | 4 | 2 | | |
| Toar | 6 | 0 | | | ** |

*: Bog still under development, no production.
**: No production at this Bog.

4.6 Bog Development and Operational Programme

The bogs in the Derrygreenagh Group are well into their productive lives, therefore there will be no development in the year 2004.
However in the Ballivor Group, Carranstown bog is currently under development, the works involve production field preparation and drainage works such as piping.

There will be 644.83 nett hectares in production in the 2004 season, yeilding 120,569 tonnes @ 55% moisture content.

Derrygreenagh will account for 45,569 tonnes and 229.5 hectares.
Ballivor will account for 50,000 tonnes and 274.33 hectares and Rossan will account for 25,000 tonnes and 141 hectares.

4.7 Bog Rehabilition Report
There was no bog rehabilitation carried out within the Derrygreenagh group during the reporting period.
Management guidelines for the planning and implementation of cutaway bog rehabilitation have been adopted and the document is currently available for inspection on file at the Derrygreenagh office.

## 5 Summary

With regard to environmental compliance at the Derrygreenagh Group of Bogs, there was one exceedence in the quarterly grab sampling of the ponds in the Surface Water Discharge Monitoring Location Programme.
There were Five non-compliances in relation to the Composite Sampler during the period January to December 2003. Dust monitoring results at the dust sensitive locations were below the Emission Limit Value and there was one complaint of an environmental nature received during the reporting period.

The staff awareness through training and involvement in the operation of the licence has also improved immensely. A full programme of training and awareness has been conducted at the works and has targeted all personnel ie. Office, Workshop, Transport and Production.

Bord na Mona are project partners of the Southeastern River Basin District Management, as set up under the Water Framework Directive.
Bord na Mona are also involved in catchment management on the River Barrow.

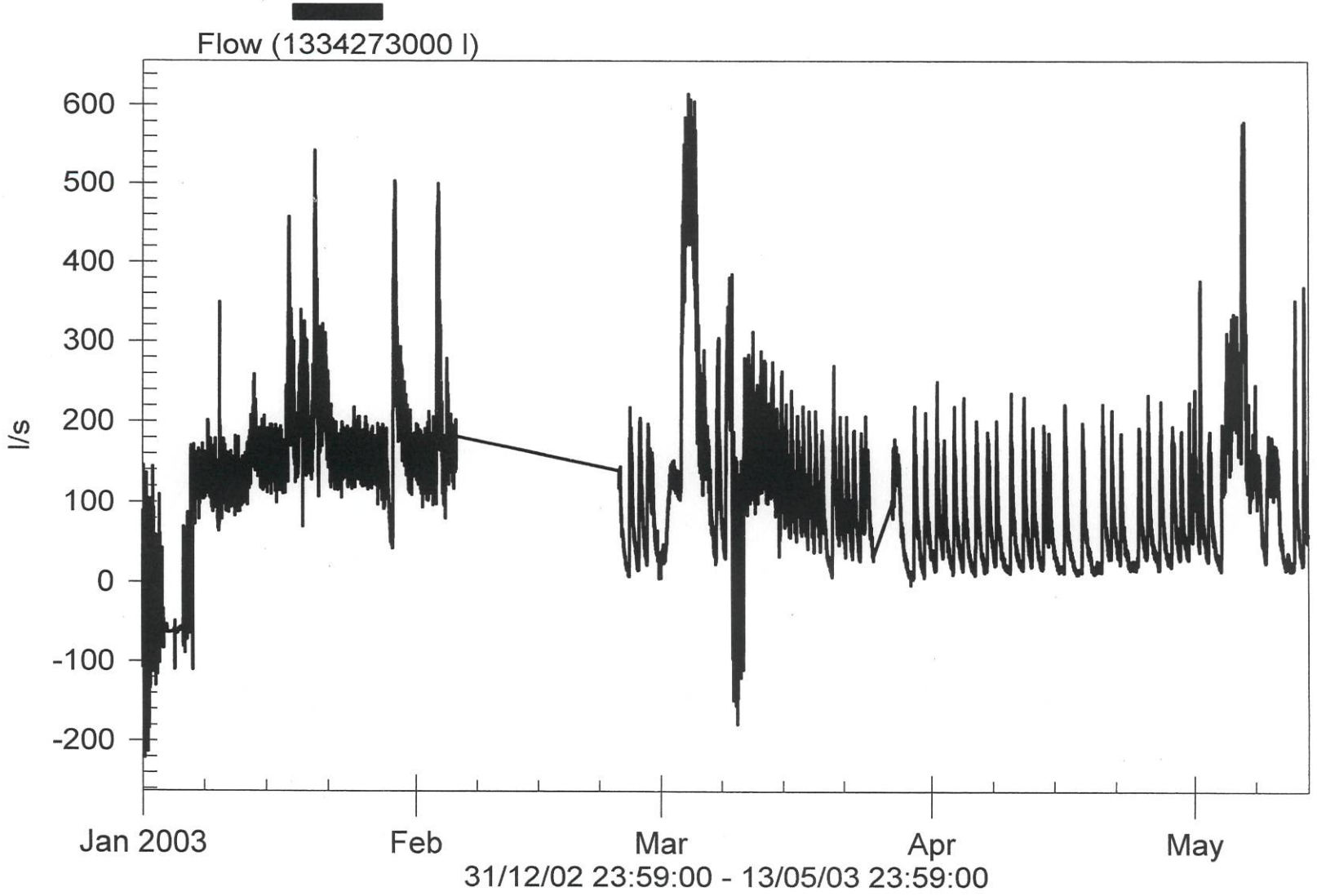
Bord na Mona Energy Ltd would like to take this opportunity to advise the Environmental Protection Agency of its continued commitment to improving its environmental performance by adopting cleaner production methods and improving its environmental protection measures.

# APPENDIX 1

# Composite Sampler Results

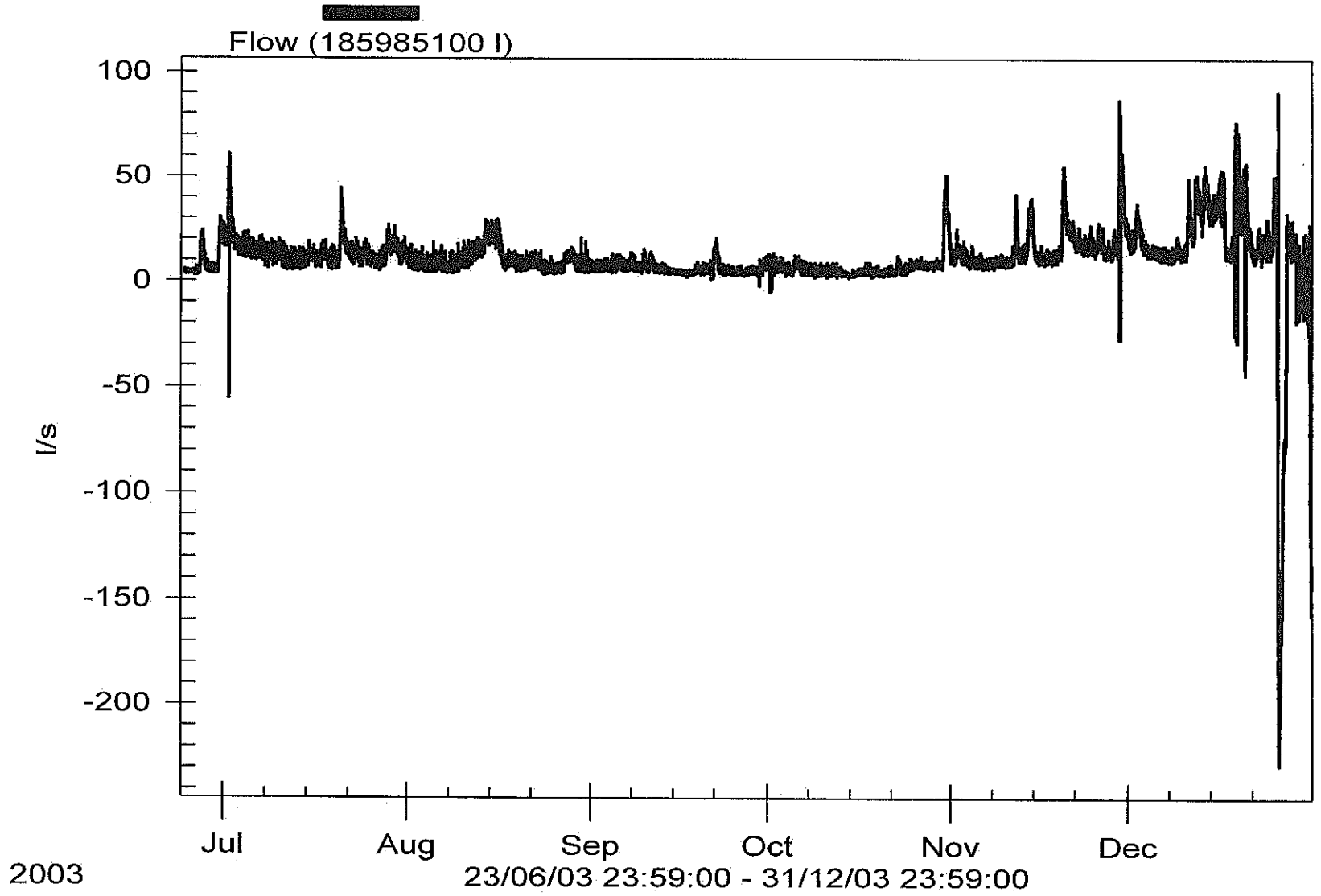
# Ballybeg (BB15) Composite Sampler

01/01/03 to 13/05/03



# Derryhinch (DH 03) Composite Sampler

24/06/03 to 31/12/03



**Bord Na Mona Energy Ltd, Derrygreenagh Group, Rochfordsbridge, Co Westmeath**

**Composite Sampler Results Licence 501**

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2003 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | IS | IS | | 7789923 | | | | | |
| 2 | | | | | IS | IS | | 3840880 | | | | | |
| 3 | | | | | IS | IS | | 4769522 | | | | | |
| 4 | | | | | IS | IS | | 5617487 | | | | | |
| 5 | 7.4 | 47 | 1.5 | 0.07 | 7 | 172 | 79 | 4936091 | 232.00 | 7.40 | 0.35 | 34.55 | 849.01 |
| 6 | | | | | 5 | 414 | | 6704616 | | | | 33.52 | 2775.71 |
| 7 | | | | | 6 | 314 | | 11354790 | | | | 68.13 | 3565.40 |
| 8 | | | | | 8 | 358 | | 11995150 | | | | 95.96 | 4294.26 |
| 9 | | | | | 5 | 442 | | 10408670 | | | | 52.04 | 4600.63 |
| 10 | | | | | 5 | 444 | | 11226370 | | | | 56.13 | 4984.51 |
| 11 | | | | | 38 | 488 | | 10953280 | | | | 416.22 | 5345.20 |
| 12 | 7.6 | 32 | 1.5 | 0.07 | 5 | 266 | 67 | 11425600 | 365.62 | 17.14 | 0.80 | 57.13 | 3039.21 |
| 13 | | | | | 5 | 304 | | 14855920 | | | | 74.28 | 4516.20 |
| 14 | | | | | 5 | 342 | | 13729380 | | | | 68.65 | 4695.45 |
| 15 | | | | | 5 | 388 | | 13275410 | | | | 66.38 | 5150.86 |
| 16 | | | | | 5 | 379 | | 12878520 | | | | 64.39 | 4880.96 |
| 17 | | | | | 12 | 112 | | 20093200 | | | | 241.12 | 2250.44 |
| 18 | | | | | 6 | 256 | | 17315590 | | | | 103.89 | 4432.79 |
| 19 | 8.1 | 53 | 0.9 | 0.08 | 5 | IS | 192 | 19045700 | 1009.42 | 17.14 | 1.52 | 95.23 | #VALUE! |
| 20 | | | | | 9 | 188 | | 22261950 | | | | 200.36 | 4185.25 |
| 21 | | | | | 5 | 308 | | 21766970 | | | | 108.83 | 6704.23 |
| 22 | | | | | 5 | 386 | | 14645310 | | | | 73.23 | 5653.09 |
| 23 | | | | | 5 | 408 | | 13480680 | | | | 67.40 | 5500.12 |
| 24 | | | | | 6 | 444 | | 13620860 | | | | 81.73 | 6047.66 |
| 25 | | | | | 6 | 348 | | 13960700 | | | | 83.76 | 4858.32 |
| 26 | 7.9 | 48 | 1.2 | 0.06 | 5 | 394 | 150 | 13727510 | 658.92 | 16.47 | 0.82 | 68.64 | 5408.64 |
| 27 | | | | | 5 | 414 | | 12957410 | | | | 64.79 | 5364.37 |
| 28 | | | | | 5 | 408 | | 11891860 | | | | 59.46 | 4851.88 |
| 29 | | | | | 14 | 270 | | 18921710 | | | | 264.90 | 5108.86 |
| 30 | | | | | 6 | 428 | | 18331520 | | | | 109.99 | 7845.89 |
| 31 | | | | | 5 | 466 | | 13782230 | | | | 68.91 | 6422.52 |

**IS:** Insufficient amount of sample due to low flow or sampler malfunction.

**Bord Na Mona Energy Ltd, Derrygreenagh Group, Rochfordsbridge, Co Westmeath**

**Composite Sampler Results Licence 501**

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| February | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2003 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 5 | 360 | | 13275810 | | | | 66.38 | 4779.29 |
| 2 | 8.1 | 48 | 1.2 | 0.05 | 5 | 344 | 153 | 13068710 | 627.30 | 15.68 | 0.65 | 65.34 | 4495.64 |
| 3 | | | | | 5 | 316 | | 21821610 | | | | 109.11 | 6895.63 |
| 4 | | | | | 5 | 352 | | 13829520 | | | | 69.15 | 4867.99 |
| 5 | | | | | 5 | 356 | | 13318290 | | | | 66.59 | 4741.31 |
| 6 | | | | | 5 | 416 | | 12052800 | | | | 60.26 | 5013.96 |
| 7 | | | | | 5 | 214 | | 12052800 | | | | 60.26 | 2579.30 |
| 8 | | | | | 5 | 460 | | 12052800 | | | | 60.26 | 5544.29 |
| 9 | 8.2 | 53 | 1.1 | 0.07 | 12 | 140 | 81 | 12052800 | 638.80 | 13.26 | 0.84 | 144.63 | 1687.39 |
| 10 | | | | | 5 | 290 | | 12052800 | | | | 60.26 | 3495.31 |
| 11 | | | | | 5 | 218 | | 12052800 | | | | 60.26 | 2627.51 |
| 12 | | | | | 5 | 408 | | 12052800 | | | | 60.26 | 4917.54 |
| 13 | | | | | 6 | 406 | | 12052800 | | | | 72.32 | 4893.44 |
| 14 | | | | | 6 | 296 | | 12052800 | | | | 72.32 | 3567.63 |
| 15 | | | | | IS | IS | | 12052800 | | | | | |
| 16 | 8 | 36 | 1.7 | 0.05 | 5 | 400 | 78 | 12052800 | 433.90 | 20.49 | 0.60 | 60.26 | 4821.12 |
| 17 | | | | | 5 | 398 | | 12052800 | | | | 60.26 | 4797.01 |
| 18 | | | | | 5 | 340 | | 12052800 | | | | 60.26 | 4097.95 |
| 19 | | | | | 5 | 472 | | 12052800 | | | | 60.26 | 5688.92 |
| 20 | | | | | 5 | 198 | | 12052800 | | | | 60.26 | 2386.45 |
| 21 | | | | | 5 | 250 | | 12052800 | | | | 60.26 | 3013.20 |
| 22 | | | | | 5 | 386 | | 12052800 | | | | 60.26 | 4652.38 |
| 23 | 8.1 | 36 | 1.8 | 0.05 | 5 | 182 | 71 | 12052800 | 433.90 | 21.70 | 0.60 | 60.26 | 2193.61 |
| 24 | | | | | 16 | 458 | | 7993264 | | | | 127.89 | 3660.91 |
| 25 | | | | | 5 | 170 | | 6593746 | | | | 32.97 | 1120.94 |
| 26 | | | | | 5 | 462 | | 6921965 | | | | 34.61 | 3197.95 |
| 27 | | | | | 5 | 302 | | 7956093 | | | | 39.78 | 2402.74 |
| 28 | | | | | 14 | 389 | | 4934699 | | | | 69.09 | 1919.60 |
| 29 | | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | |
| 31 | | | | | | | | | | | | | |

**IS:** Insufficient amount of sample due to low flow or sampler malfunction.

**Bord Na Mona Energy Ltd, Derrygreenagh Group, Rochfordsbridge, Co Westmeath**

**Composite Sampler Results Licence 501**

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| March 2003 | pH | COD mg/l | Ammonia as N mg/l | Total Phosphorus mg/l | Suspended Solids mg/l | Total Solids mg/l | Colour Pt Co units | Flow Daily Total (litres) | COD Kg/Day | Ammonia as Kg/Day | Total Phosphorus Kg/Day | Suspended Solids Kg/Day | Total Solids Kg/Day |
| 1 | | | | | 34 | 250 | | 4273220 | | | | 145.29 | 1068.31 |
| 2 | 7.6 | 76 | 1.3 | 0.14 | 28 | 217 | 144 | 11126560 | 845.62 | 14.46 | 1.56 | 311.54 | 2414.46 |
| 3 | | | | | 8 | 248 | | 26451060 | | | | 211.61 | 6559.86 |
| 4 | | | | | 7 | 146 | | 44020170 | | | | 308.14 | 6426.94 |
| 5 | | | | | 5 | IS | | 21269650 | | | | 106.35 | |
| 6 | | | | | 5 | 282 | | 12252450 | | | | 61.26 | 3455.19 |
| 7 | | | | | 5 | 330 | | 10234340 | | | | 51.17 | 3377.33 |
| 8 | | | | | 6 | 280 | | 13655460 | | | | 81.93 | 3823.53 |
| 9 | 7.9 | 57 | 1 | 0.06 | 5 | 212 | 173 | 7690499 | 438.36 | 7.69 | 0.46 | 38.45 | 1630.39 |
| 10 | | | | | 5 | 244 | | 9715159 | | | | 48.58 | 2370.50 |
| 11 | | | | | 5 | 232 | | 14688530 | | | | 73.44 | 3407.74 |
| 12 | | | | | 5 | 248 | | 16016010 | | | | 80.08 | 3971.97 |
| 13 | | | | | 5 | 218 | | 15245720 | | | | 76.23 | 3323.57 |
| 14 | | | | | 5 | 238 | | 12058810 | | | | 60.29 | 2870.00 |
| 15 | | | | | 5 | 234 | | 10011000 | | | | 50.06 | 2342.57 |
| 16 | | | | | 6 | 276 | | 10680300 | | | | 64.08 | 2947.76 |
| 17 | 7.9 | 36 | 1 | 0.07 | 5 | 266 | 80 | 8334120 | 300.03 | 8.33 | 0.58 | 41.67 | 2216.88 |
| 18 | | | | | 10 | 314 | | 9898372 | | | | 98.98 | 3108.09 |
| 19 | | | | | 9 | 382 | | 8050158 | | | | 72.45 | 3075.16 |
| 20 | | | | | 17 | 440 | | 5815313 | | | | 98.86 | 2558.74 |
| 21 | | | | | 5 | 416 | | 9172562 | | | | 45.86 | 3815.79 |
| 22 | | | | | 5 | 432 | | 7349564 | | | | 36.75 | 3175.01 |
| 23 | | | | | 5 | 427 | | 7452857 | | | | 37.26 | 3182.37 |
| 24 | 7.6 | 44 | 0.8 | 0.08 | 11 | 368 | 78 | 10149310 | 446.57 | 8.12 | 0.81 | 111.64 | 3734.95 |
| 25 | | | | | IS | IS | | 6755058 | | | | | |
| 26 | | | | | IS | IS | | 8384429 | | | | | |
| 27 | | | | | 5 | 358 | | 9976631 | | | | 49.88 | 3571.63 |
| 28 | | | | | 5 | 446 | | 8084401 | | | | 40.42 | 3605.64 |
| 29 | | | | | 5 | 468 | | 1231614 | | | | 6.16 | 576.40 |
| 30 | | | | | 5 | 392 | | 6661695 | | | | 33.31 | 2611.38 |
| 31 | 8.3 | 28 | 0.8 | 0.05 | 5 | 436 | 65 | 6208610 | 173.84 | 4.97 | 0.31 | 31.04 | 2706.95 |

**IS:** Insufficient amount of sample due to low flow or sampler malfunction.

**Bord Na Mona Energy Ltd, Derrygreenagh Group, Rochfordsbridge, Co Westmeath**

**Composite Sampler Results** **Licence 501**

| Month | | | | Parameters | | | | | Daily Totals | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| April | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2003 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 5 | 336 | | 6296932 | | | | 31.48 | 2115.77 |
| 2 | | | | | 5 | 182 | | 6707497 | | | | 33.54 | 1220.76 |
| 3 | | | | | 5 | 328 | | 5806547 | | | | 29.03 | 1904.55 |
| 4 | | | | | 5 | 463 | | 6136953 | | | | 30.68 | 2841.41 |
| 5 | | | | | 5 | 192 | | 2917155 | | | | 14.59 | 560.09 |
| 6 | | | | | 5 | 448 | | 6527260 | | | | 32.64 | 2924.21 |
| 7 | 8.5 | 18 | 0.2 | 0.05 | 5 | 466 | 71 | 6144158 | 110.59 | 1.23 | 0.31 | 30.72 | 2863.18 |
| 8 | | | | | 5 | 224 | | 6307052 | | | | 31.54 | 1412.78 |
| 9 | | | | | 5 | 252 | | 1979096 | | | | 9.90 | 498.73 |
| 10 | | | | | 5 | 332 | | 6999749 | | | | 35.00 | 2323.92 |
| 11 | | | | | 5 | 442 | | 6376709 | | | | 31.88 | 2818.51 |
| 12 | | | | | 5 | 336 | | 6278754 | | | | 31.39 | 2109.66 |
| 13 | | | | | 5 | 412 | | 4897624 | | | | 24.49 | 2017.82 |
| 14 | 8.3 | 58 | 0.2 | 0.05 | 5 | 318 | 69 | 7081850 | 410.75 | 1.42 | 0.35 | 35.41 | 2252.03 |
| 15 | | | | | 8 | 232 | | 2035693 | | | | 16.29 | 472.28 |
| 16 | | | | | 5 | 276 | | 6674664 | | | | 33.37 | 1842.21 |
| 17 | | | | | 5 | 256 | | 1647269 | | | | 8.24 | 421.70 |
| 18 | | | | | 5 | 254 | | 6356302 | | | | 31.78 | 1614.50 |
| 19 | | | | | 6 | 270 | | 1844888 | | | | 11.07 | 498.12 |
| 20 | | | | | 5 | 480 | | 6087622 | | | | 30.44 | 2922.06 |
| 21 | 8.3 | 55 | 0.9 | 0.05 | 6 | 290 | 62 | 6294666 | 346.21 | 5.67 | 0.31 | 37.77 | 1825.45 |
| 22 | | | | | 5 | 312 | | 5945695 | | | | 29.73 | 1855.06 |
| 23 | | | | | 5 | 366 | | 2674436 | | | | 13.37 | 978.84 |
| 24 | | | | | 5 | 282 | | 5516747 | | | | 27.58 | 1555.72 |
| 25 | | | | | 5 | 364 | | 7088751 | | | | 35.44 | 2580.31 |
| 26 | | | | | 5 | 354 | | 3540561 | | | | 17.70 | 1253.36 |
| 27 | | | | | 5 | 324 | | 6838260 | | | | 34.19 | 2215.60 |
| 28 | 8.2 | 40 | 7 | 0.05 | 5 | 364 | 82 | 6922454 | 276.90 | 48.46 | 0.35 | 34.61 | 2519.77 |
| 29 | | | | | 5 | 340 | | 6241581 | | | | 31.21 | 2122.14 |
| 30 | | | | | 5 | 398 | | 7075021 | | | | 35.38 | 2815.86 |
| 31 | | | | | | | | | | | | | |

**IS:** Insufficient amount of sample due to low flow or sampler malfunction.

**Bord Na Mona Energy Ltd, Derrygreenagh Group, Rochfordsbridge, Co Westmeath**

**Composite Sampler Results Licence 501**

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| May 2003 | pH | COD mg/l | Ammonia as N mg/l | Total Phosphorus mg/l | Suspended Solids mg/l | Total Solids mg/l | Colour Pt Co units | Flow Daily Total (litres) | COD Kg/Day | Ammonia as Kg/Day | Total Phosphorus Kg/Day | Suspended Solids Kg/Day | Total Solids Kg/Day |
| 1 | | | | | 5 | 310 | | 10403560 | | | | 52.02 | 3225.10 |
| 2 | | | | | 5 | 138 | | 6945837 | | | | 34.73 | 958.53 |
| 3 | | | | | 5 | 270 | | 3634873 | | | | 18.17 | 981.42 |
| 4 | | | | | 5 | 398 | | 14565200 | | | | 72.83 | 5796.95 |
| 5 | 8.1 | 57 | 2 | 0.06 | 10 | 176 | 223 | 22919280 | 1306.40 | 45.84 | 1.38 | 229.19 | 4033.79 |
| 6 | | | | | 5 | 190 | | 28150900 | | | | 140.75 | 5348.67 |
| 7 | | | | | 5 | 295 | | 12556500 | | | | 62.78 | 3704.17 |
| 8 | | | | | 5 | 412 | | 8719490 | | | | 43.60 | 3592.43 |
| 9 | | | | | 5 | 432 | | 9764944 | | | | 48.82 | 4218.46 |
| 10 | | | | | 5 | 486 | | 9941591 | | | | 49.71 | 4831.61 |
| 11 | | | | | 5 | 394 | | 2300668 | | | | 11.50 | 906.46 |
| 12 | 8.4 | 53 | 0.7 | 0.05 | 5 | 394 | 83 | 7088921 | 375.71 | 4.96 | 0.35 | 35.44 | 2793.03 |
| 13 | | | | | 5 | 400 | | 6810333 | | | | 34.05 | 2724.13 |
| 14 | | | | | 5 | 398 | | * | | | | | |
| 15 | | | | | 5 | 478 | | * | | | | | |
| 16 | | | | | 5 | 420 | | * | | | | | |
| 17 | | | | | 5 | 398 | | * | | | | | |
| 18 | | | | | 5 | 310 | | * | | | | | |
| 19 | 8.4 | 64 | 1 | 0.05 | 5 | 342 | 143 | * | | | | | |
| 20 | | | | | 5 | 334 | | * | | | | | |
| 21 | | | | | 5 | 385 | | * | | | | | |
| 22 | | | | | 5 | 266 | | * | | | | | |
| 23 | | | | | 5 | 332 | | * | | | | | |
| 24 | | | | | 5 | 278 | | * | | | | | |
| 25 | | | | | 5 | 270 | | * | | | | | |
| 26 | 8.1 | 51 | 0.51 | 0.07 | 5 | 292 | 126 | * | | | | | |
| 27 | | | | | 5 | 396 | | * | | | | | |
| 28 | | | | | 5 | 183 | | * | | | | | |
| 29 | | | | | 5 | 286 | | * | | | | | |
| 30 | | | | | 5 | 348 | | * | | | | | |
| 31 | | | | | 5 | 408 | | * | | | | | |

**IS:** Insufficient amount of sample due to low flow or sampler malfunction.

* Velocity meter malfunction

**Bord Na Mona Energy Ltd, Derrygreenagh Group, Rochfordsbridge, Co Westmeath**

**Composite Sampler Results Licence 501**

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| June 2003 | pH | COD mg/l | Ammonia as N mg/l | Total Phosphorus mg/l | Suspended Solids mg/l | Total Solids mg/l | Colour Pt Co units | Flow Daily Total (litres) | COD Kg/Day | Ammonia as Kg/Day | Total Phosphorus Kg/Day | Suspended Solids Kg/Day | Total Solids Kg/Day |
| 1 | | | | | 5 | 444 | | * | | | | | |
| 2 | 8.1 | 59 | 0.4 | 0.05 | 5 | 390 | 124 | * | | | | | |
| 3 | | | | | IS | IS | | * | | | | | |
| 4 | | | | | IS | IS | | * | | | | | |
| 5 | | | | | IS | IS | | * | | | | | |
| 6 | | | | | IS | IS | | * | | | | | |
| 7 | | | | | IS | IS | | * | | | | | |
| 8 | | | | | IS | IS | | * | | | | | |
| 9 | | | | | IS | IS | | * | | | | | |
| 10 | | | | | IS | IS | | * | | | | | |
| 11 | | | | | IS | IS | | * | | | | | |
| 12 | | | | | IS | IS | | * | | | | | |
| 13 | | | | | IS | IS | | * | | | | | |
| 14 | | | | | IS | IS | | * | | | | | |
| 15 | 7.5 | 48 | 1.1 | 0.05 | 5 | 300 | 74 | * | | | | | |
| 16 | | | | | IS | IS | | * | | | | | |
| 17 | | | | | IS | IS | | * | | | | | |
| 18 | | | | | IS | IS | | * | | | | | |
| 19 | | | | | IS | IS | | * | | | | | |
| 20 | | | | | IS | IS | | * | | | | | |
| 21 | | | | | IS | IS | | * | | | | | |
| 22 | 7.9 | 55 | 2.3 | 0.08 | 5 | 322 | 70 | * | | | | | |
| 23 | | | | | IS | IS | | * | | | | | |
| 24 | | | | | IS | IS | | 594907 | | | | | |
| 25 | | | | | IS | IS | | 455397 | | | | | |
| 26 | | | | | 5 | 320 | | 362637 | | | | 1.81 | 116.04 |
| 27 | | | | | 5 | 232 | | 343051 | | | | 1.72 | 79.59 |
| 28 | | | | | 5 | 256 | | 1179122 | | | | 5.90 | 301.86 |
| 29 | 8.1 | 36 | 2 | 0.06 | 5 | 318 | 101 | 526852 | 18.97 | 1.05 | 0.03 | 2.63 | 167.54 |
| 30 | | | | | 5 | 278 | | 423883 | | | | 2.12 | 117.84 |
| 31 | | | | | | | | | | | | | |

**IS:** Insufficient amount of sample due to low flow or sampler malfunction.

* Velocity meter malfunction

**Bord Na Mona Energy Ltd, Derrygreenagh Group, Rochfordsbridge, Co Westmeath**

**Composite Sampler Results Licence 501**

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| July | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2003 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 5 | 228 | | 1648917 | | | | 8.24 | 375.95 |
| 2 | | | | | 5 | 214 | | 2184999 | | | | 10.92 | 467.59 |
| 3 | | | | | 5 | 248 | | 2256312 | | | | 11.28 | 559.57 |
| 4 | | | | | 5 | 286 | | 1424804 | | | | 7.12 | 407.49 |
| 5 | | | | | 5 | 274 | | 1361803 | | | | 6.81 | 373.13 |
| 6 | 7.9 | 86 | 1.8 | 0.05 | 5 | 220 | 142 | 1286364 | 110.63 | 2.32 | 0.06 | 6.43 | 283.00 |
| 7 | | | | | 5 | 282 | | 1206542 | | | | 6.03 | 340.24 |
| 8 | | | | | 5 | 288 | | 1217167 | | | | 6.09 | 350.54 |
| 9 | | | | | 5 | 294 | | 1068490 | | | | 5.34 | 314.14 |
| 10 | | | | | 5 | 288 | | 961803 | | | | 4.81 | 277.00 |
| 11 | | | | | 5 | 284 | | 1074007 | | | | 5.37 | 305.02 |
| 12 | | | | | 5 | 279 | | 912553 | | | | 4.56 | 254.60 |
| 13 | 8.2 | 60 | 1.29 | 0.05 | 5 | 270 | 129 | 903490 | 54.21 | 1.17 | 0.05 | 4.52 | 243.94 |
| 14 | | | | | 5 | 282 | | 894642 | | | | 4.47 | 252.29 |
| 15 | | | | | 5 | 298 | | 912440 | | | | 4.56 | 271.91 |
| 16 | | | | | 5 | 292 | | 998282 | | | | 4.99 | 291.50 |
| 17 | | | | | 5 | 292 | | 930873 | | | | 4.65 | 271.81 |
| 18 | | | | | 5 | 284 | | 1108545 | | | | 5.54 | 314.83 |
| 19 | | | | | 5 | 258 | | 961054 | | | | 4.81 | 247.95 |
| 20 | 7.7 | 58 | 1.26 | 0.05 | 5 | 228 | 164 | 1017374 | 59.01 | 1.28 | 0.05 | 5.09 | 231.96 |
| 21 | | | | | 5 | 182 | | 1712623 | | | | 8.56 | 311.70 |
| 22 | | | | | 5 | 533 | | 1635002 | | | | 8.18 | 871.46 |
| 23 | | | | | 5 | 200 | | 1177241 | | | | 5.89 | 235.45 |
| 24 | | | | | 5 | 234 | | 1210511 | | | | 6.05 | 283.26 |
| 25 | | | | | 5 | 212 | | 1121393 | | | | 5.61 | 237.74 |
| 26 | | | | | 5 | 240 | | 1018582 | | | | 5.09 | 244.46 |
| 27 | 8.4 | 42 | 1.1 | 0.07 | 5 | 364 | 133 | 859570 | 36.10 | 0.95 | 0.06 | 4.30 | 312.88 |
| 28 | | | | | **IS** | **IS** | | 931398 | | | | | |
| 29 | | | | | **IS** | **IS** | | 1359661 | | | | | |
| 30 | | | | | **IS** | **IS** | | 1507563 | | | | | |
| 31 | | | | | **IS** | **IS** | | 1202255 | | | | | |

**IS:** Insufficient amount of sample due to low flow or sampler malfunction.

**Bord Na Mona Energy Ltd, Derrygreenagh Group, Rochfordsbridge, Co Westmeath**

**Composite Sampler Results Licence 501**

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| August | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2003 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | IS | IS | | 1216657 | | | | | |
| 2 | | | | | IS | IS | | 867021 | | | | | |
| 3 | | | | | IS | IS | | 673424 | | | | | |
| 4 | 7.5 | 82 | 2.57 | 0.17 | 5 | 324 | 135 | 753345 | 61.77 | 1.94 | 0.13 | 3.77 | 244.08 |
| 5 | | | | | 5 | 288 | | 556352 | | | | 2.78 | 160.23 |
| 6 | | | | | 5 | 304 | | 649228 | | | | 3.25 | 197.37 |
| 7 | | | | | 6 | 306 | | 681640 | | | | 4.09 | 208.58 |
| 8 | | | | | 13 | 304 | | 556403 | | | | 7.23 | 169.15 |
| 9 | | | | | 5 | 292 | | 620766 | | | | 3.10 | 181.26 |
| 10 | | | | | 5 | 278 | | 740104 | | | | 3.70 | 205.75 |
| 11 | 7.8 | 66 | 2.02 | 0.06 | 5 | 282 | 176 | 902347 | 59.55 | 1.82 | 0.05 | 4.51 | 254.46 |
| 12 | | | | | 5 | 240 | | 1064022 | | | | 5.32 | 255.37 |
| 13 | | | | | 5 | 196 | | 1232545 | | | | 6.16 | 241.58 |
| 14 | | | | | 5 | 190 | | 1384606 | | | | 6.92 | 263.08 |
| 15 | | | | | 5 | 198 | | 1978323 | | | | 9.89 | 391.71 |
| 16 | | | | | 5 | 172 | | 1941786 | | | | 9.71 | 333.99 |
| 17 | | | | | 5 | 204 | | 1676179 | | | | 8.38 | 341.94 |
| 18 | | | | | 5 | 267 | | 854737 | | | | 4.27 | 228.21 |
| 19 | 8.2 | 51 | 2.08 | 0.08 | 5 | 183 | 133 | 927954 | 47.33 | 1.93 | 0.07 | 4.64 | 169.82 |
| 20 | | | | | 5 | 200 | | 801379 | | | | 4.01 | 160.28 |
| 21 | | | | | 5 | 298 | | 741491 | | | | 3.71 | 220.96 |
| 22 | | | | | 5 | 320 | | 790722 | | | | 3.95 | 253.03 |
| 23 | | | | | 5 | 316 | | 857466 | | | | 4.29 | 270.96 |
| 24 | | | | | 5 | 320 | | 711380 | | | | 3.56 | 227.64 |
| 25 | | | | | 5 | 296 | | 520021 | | | | 2.60 | 153.93 |
| 26 | | | | | 5 | 256 | | 546265 | | | | 2.73 | 139.84 |
| 27 | 8.2 | 33 | 2.18 | 0.05 | 5 | 260 | 97 | 504069 | 16.63 | 1.10 | 0.03 | 2.52 | 131.06 |
| 28 | | | | | 5 | 274 | | 751553 | | | | 3.76 | 205.93 |
| 29 | | | | | 5 | 272 | | 1055509 | | | | 5.28 | 287.10 |
| 30 | | | | | 5 | 302 | | 820268 | | | | 4.10 | 247.72 |
| 31 | | | | | 5 | 286 | | 690428 | | | | 3.45 | 197.46 |

**IS:** Insufficient amount of sample due to low flow or sampler malfunction.

**Bord Na Mona Energy Ltd, Derrygreenagh Group, Rochfordsbridge, Co Westmeath**

**Composite Sampler Results Licence 501**

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| September 2003 | pH | COD mg/l | Ammonia as N mg/l | Total Phosphorus mg/l | Suspended Solids mg/l | Total Solids mg/l | Colour Pt Co units | Flow Daily Total (litres) | COD Kg/Day | Ammonia as Kg/Day | Total Phosphorus Kg/Day | Suspended Solids Kg/Day | Total Solids Kg/Day |
| 1 | | | | | 5 | 298 | | 683919 | | | | 3.42 | 203.81 |
| 2 | 8 | 43 | 2.12 | 0.07 | 5 | 302 | 97 | 606386 | 26.07 | 1.29 | 0.04 | 3.03 | 183.13 |
| 3 | | | | | 5 | 212 | | 654350 | | | | 3.27 | 138.72 |
| 4 | | | | | 5 | 242 | | 650376 | | | | 3.25 | 157.39 |
| 5 | | | | | 5 | 276 | | 558473 | | | | 2.79 | 154.14 |
| 6 | | | | | 5 | 258 | | 718577 | | | | 3.59 | 185.39 |
| 7 | | | | | 5 | 262 | | 665498 | | | | 3.33 | 174.36 |
| 8 | | | | | 5 | 248 | | 755937 | | | | 3.78 | 187.47 |
| 9 | 8 | 41 | 2.28 | 0.05 | 5 | 262 | 83 | 645866 | 26.48 | 1.47 | 0.03 | 3.23 | 169.22 |
| 10 | | | | | 5 | 274 | | 606811 | | | | 3.03 | 166.27 |
| 11 | | | | | 5 | 276 | | 683454 | | | | 3.42 | 188.63 |
| 12 | | | | | 5 | 206 | | 730682 | | | | 3.65 | 150.52 |
| 13 | | | | | 5 | 152 | | 516542 | | | | 2.58 | 78.51 |
| 14 | | | | | 5 | 216 | | 479354 | | | | 2.40 | 103.54 |
| 15 | | | | | 5 | 214 | | 435597 | | | | 2.18 | 93.22 |
| 16 | 8 | 47 | 2.46 | 0.05 | 5 | 238 | 90 | 399751 | 18.79 | 0.98 | 0.02 | 2.00 | 95.14 |
| 17 | | | | | 5 | 322 | | 374532 | | | | 1.87 | 120.60 |
| 18 | | | | | 6 | 307 | | 360077 | | | | 2.16 | 110.54 |
| 19 | | | | | 7 | 262 | | 416900 | | | | 2.92 | 109.23 |
| 20 | | | | | 13 | 242 | | 464259 | | | | 6.04 | 112.35 |
| 21 | 8.2 | 58 | 1.71 | 0.05 | 12 | 302 | 80 | 526934 | 30.56 | 0.90 | 0.03 | 6.32 | 159.13 |
| 22 | | | | | 5 | 308 | | 517652 | | | | 2.59 | 159.44 |
| 23 | | | | | 5 | 208 | | 939921 | | | | 4.70 | 195.50 |
| 24 | | | | | 5 | 240 | | 475997 | | | | 2.38 | 114.24 |
| 25 | | | | | 5 | 310 | | 420807 | | | | 2.10 | 130.45 |
| 26 | | | | | 5 | 302 | | 372426 | | | | 1.86 | 112.47 |
| 27 | | | | | 5 | 328 | | 391265 | | | | 1.96 | 128.33 |
| 28 | 8 | 118 | 2.56 | 0.05 | 5 | 283 | 78 | 399226 | 47.11 | 1.02 | 0.02 | 2.00 | 112.98 |
| 29 | | | | | 5 | 294 | | 445622 | | | | 2.23 | 131.01 |
| 30 | | | | | 5 | 272 | | 458204 | | | | 2.29 | 124.63 |
| 31 | | | | | | | | | | | | | |

IS: Insufficient amount of sample due to low flow or sampler malfunction.

**Bord Na Mona Energy Ltd, Derrygreenagh Group, Rochfordsbridge, Co Westmeath**

**Composite Sampler Results Licence 501**

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| October | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2003 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 5 | 280 | | 680897 | | | | 3.40 | 190.65 |
| 2 | | | | | 5 | 280 | | 435232 | | | | 2.18 | 121.86 |
| 3 | | | | | 5 | 270 | | 638996 | | | | 3.19 | 172.53 |
| 4 | | | | | 5 | 270 | | 613388 | | | | 3.07 | 165.61 |
| 5 | 8.2 | 46 | 2.55 | 0.05 | 5 | 260 | 62 | 539049 | 24.80 | 1.37 | 0.03 | 2.70 | 140.15 |
| 6 | | | | | 5 | 226 | | 639485 | | | | 3.20 | 144.52 |
| 7 | | | | | 5 | 274 | | 661503 | | | | 3.31 | 181.25 |
| 8 | | | | | 5 | 242 | | 543380 | | | | 2.72 | 131.50 |
| 9 | | | | | 5 | 232 | | 493554 | | | | 2.47 | 114.50 |
| 10 | | | | | 5 | 244 | | 449797 | | | | 2.25 | 109.75 |
| 11 | | | | | 5 | 270 | | 478011 | | | | 2.39 | 129.06 |
| 12 | 8.5 | 48 | 1.9 | 0.13 | 5 | 290 | 90 | 458761 | 22.02 | 0.87 | 0.06 | 2.29 | 133.04 |
| 13 | | | | | IS | IS | | 488883 | | | | | |
| 14 | | | | | IS | IS | | 368510 | | | | | |
| 15 | | | | | IS | IS | | 300843 | | | | | |
| 16 | | | | | IS | IS | | 320665 | | | | | |
| 17 | | | | | IS | IS | | 400150 | | | | | |
| 18 | | | | | IS | IS | | 452340 | | | | | |
| 19 | 7.9 | 46 | 3.11 | 0.05 | 5 | 178 | 85 | 437491 | 20.12 | 1.36 | 0.02 | 2.19 | 77.87 |
| 20 | | | | | 9 | 274 | | 365781 | | | | 3.29 | 100.22 |
| 21 | | | | | 5 | 274 | | 352005 | | | | 1.76 | 96.45 |
| 22 | | | | | 6 | 258 | | 399766 | | | | 2.40 | 103.14 |
| 23 | | | | | 5 | 252 | | 464221 | | | | 2.32 | 116.98 |
| 24 | | | | | 5 | 232 | | 581754 | | | | 2.91 | 134.97 |
| 25 | | | | | 5 | 270 | | 583514 | | | | 2.92 | 157.55 |
| 26 | | | | | 5 | 270 | | 713912 | | | | 3.57 | 192.76 |
| 27 | 7.9 | 48 | 3.06 | 0.05 | 8 | 270 | 67 | 732498 | 35.16 | 2.24 | 0.04 | 5.86 | 197.77 |
| 28 | | | | | 5 | 218 | | 684513 | | | | 3.42 | 149.22 |
| 29 | | | | | 5 | 222 | | 697046 | | | | 3.49 | 154.74 |
| 30 | | | | | 5 | 230 | | 700701 | | | | 3.50 | 161.16 |
| 31 | | | | | 5 | 204 | | 1435247 | | | | 7.18 | 292.79 |

**IS:** Insufficient amount of sample due to low flow or sampler malfunction.

**Bord Na Mona Energy Ltd, Derrygreenagh Group, Rochfordsbridge, Co Westmeath**

**Composite Sampler Results Licence 501**

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| November 2003 | pH | COD mg/l | Ammonia as N mg/l | Total Phosphorus mg/l | Suspended Solids mg/l | Total Solids mg/l | Colour Pt Co units | Flow Daily Total (litres) | COD Kg/Day | Ammonia as Kg/Day | Total Phospiorus Kg/Day | Suspended Solids Kg/Day | Total Solids Kg/Day |
| 1 | | | | | 5 | 226 | | 2459980 | | | | 12.30 | 555.96 |
| 2 | | | | | 5 | 206 | | 1155416 | | | | 5.78 | 238.02 |
| 3 | 7.6 | 34 | 1.99 | 0.05 | 5 | 212 | 130 | 1234556 | 41.97 | 2.46 | 0.06 | 6.17 | 261.73 |
| 4 | | | | | 5 | 174 | | 1012736 | | | | 5.06 | 176.22 |
| 5 | | | | | 5 | 222 | | 933568 | | | | 4.67 | 207.25 |
| 6 | | | | | 5 | 242 | | 850030 | | | | 4.25 | 205.71 |
| 7 | | | | | 5 | 232 | | 797618 | | | | 3.99 | 185.05 |
| 8 | | | | | 5 | 228 | | 771521 | | | | 3.86 | 175.91 |
| 9 | | | | | 5 | 206 | | 830006 | | | | 4.15 | 170.98 |
| 10 | | | | | 5 | 232 | | 872315 | | | | 4.36 | 202.38 |
| 11 | 8 | 59 | 1.77 | 0.05 | 5 | 184 | 133 | 822127 | 48.51 | 1.46 | 0.04 | 4.11 | 151.27 |
| 12 | | | | | 5 | 260 | | 1416778 | | | | 7.08 | 368.36 |
| 13 | | | | | 5 | 224 | | 1384612 | | | | 6.92 | 310.15 |
| 14 | | | | | 5 | 152 | | 1336359 | | | | 6.68 | 203.13 |
| 15 | | | | | 5 | 228 | | 2540045 | | | | 12.70 | 579.13 |
| 16 | | | | | 5 | 146 | | 1089775 | | | | 5.45 | 159.11 |
| 17 | | | | | 5 | 121 | | 1005376 | | | | 5.03 | 121.65 |
| 18 | 7.9 | 66 | 1.37 | 0.05 | 5 | 176 | 156 | 1036266 | 68.39 | 1.42 | 0.05 | 5.18 | 182.38 |
| 19 | | | | | 5 | 164 | | 1045128 | | | | 5.23 | 171.40 |
| 20 | | | | | 5 | 158 | | 1838792 | | | | 9.19 | 290.53 |
| 21 | | | | | 5 | 136 | | 2886357 | | | | 14.43 | 392.54 |
| 22 | | | | | 9 | 178 | | 2008675 | | | | 18.08 | 357.54 |
| 23 | | | | | 5 | 160 | | 1666931 | | | | 8.33 | 266.71 |
| 24 | | | | | 5 | 160 | | 1515241 | | | | 7.58 | 242.44 |
| 25 | | | | | 5 | 174 | | 1558957 | | | | 7.79 | 271.26 |
| 26 | 7.8 | 74 | 1.51 | 0.05 | 5 | 168 | 161 | 1532837 | 113.43 | 2.31 | 0.08 | 7.66 | 257.52 |
| 27 | | | | | 5 | 218 | | 1674860 | | | | 8.37 | 365.12 |
| 28 | | | | | 5 | 148 | | 1244711 | | | | 6.22 | 184.22 |
| 29 | | | | | 5 | 170 | | 1458541 | | | | 7.29 | 247.95 |
| 30 | | | | | 5 | 136 | | 2889230 | | | | 14.45 | 392.94 |
| 31 | | | | | | | | | | | | | |

**IS:** Insufficient amount of sample due to low flow or sampler malfunction.

**Bord Na Mona Energy Ltd, Derrygreenagh Group, Rochfordsbridge, Co Westmeath**

**Composite Sampler Results Licence 501**

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dec 2003 | pH | COD mg/l | Ammonia as N mg/l | Total Phosphorus mg/l | Suspended Solids mg/l | Total Solids mg/l | Colour Pt Co units | Flow Daily Total (litres) | COD Kg/Day | Ammonia as Kg/Day | Total Phosphorus Kg/Day | Suspended Solids Kg/Day | Total Solids Kg/Day |
| 1 | | | | | 5 | 154 | | 2655902 | | | | 13.28 | 409.01 |
| 2 | 7.3 | 39 | 1.42 | 0.05 | 5 | 170 | 149 | 1710196 | 66.70 | 2.43 | 0.09 | 8.55 | 290.73 |
| 3 | | | | | 5 | 158 | | 2289279 | | | | 11.45 | 361.71 |
| 4 | | | | | 5 | 218 | | 1639936 | | | | 8.20 | 357.51 |
| 5 | | | | | 5 | 170 | | 1282496 | | | | 6.41 | 218.02 |
| 6 | | | | | 5 | 159 | | 1260128 | | | | 6.30 | 200.36 |
| 7 | | | | | 5 | 204 | | 1176520 | | | | 5.88 | 240.01 |
| 8 | 7.5 | 46 | 1.73 | 0.05 | 5 | 208 | 131 | 1129522 | 51.96 | 1.95 | 0.06 | 5.65 | 234.94 |
| 9 | | | | | 5 | 190 | | 1096843 | | | | 5.48 | 208.40 |
| 10 | | | | | 5 | 170 | | 1343472 | | | | 6.72 | 228.39 |
| 11 | | | | | 5 | 188 | | 1282139 | | | | 6.41 | 241.04 |
| 12 | | | | | 5 | 156 | | 2617300 | | | | 13.09 | 408.30 |
| 13 | | | | | 5 | 158 | | 3352626 | | | | 16.76 | 529.71 |
| 14 | | | | | 5 | 168 | | 3279777 | | | | 16.40 | 551.00 |
| 15 | 7.9 | 48 | 1.32 | 0.05 | 5 | 160 | 173 | 3367304 | 161.63 | 4.44 | 0.17 | 16.84 | 538.77 |
| 16 | | | | | 5 | 148 | | 2999588 | | | | 15.00 | 443.94 |
| 17 | | | | | 5 | 156 | | 3589937 | | | | 17.95 | 560.03 |
| 18 | | | | | 5 | 142 | | 1960219 | | | | 9.80 | 278.35 |
| 19 | | | | | 5 | 130 | | 1637459 | | | | 8.19 | 212.87 |
| 20 | | | | | 5 | 140 | | 4235925 | | | | 21.18 | 593.03 |
| 21 | | | | | 5 | 165 | | 2847970 | | | | 14.24 | 469.92 |
| 22 | 7.5 | 91 | 1.76 | 0.05 | 5 | 172 | 128 | 1806098 | 164.35 | 3.18 | 0.09 | 9.03 | 310.65 |
| 23 | | | | | 5 | 144 | | 1248067 | | | | 6.24 | 179.72 |
| 24 | | | | | 11 | 180 | | 1448075 | | | | 15.93 | 260.65 |
| 25 | | | | | 5 | 130 | | 1512514 | | | | 7.56 | 196.63 |
| 26 | | | | | IS | IS | | 2276122 | | | | | |
| 27 | | | | | 5 | 94 | | -11805440 | | | | -59.03 | -1109.71 |
| 28 | | | | | 5 | 188 | | -3516038 | | | | -17.58 | -661.02 |
| 29 | 6.7 | 19 | 2.12 | 0.05 | 5 | 184 | 119 | 1656186 | 31.47 | 3.51 | 0.08 | 8.28 | 304.74 |
| 30 | | | | | IS | IS | | 506681 | | | | | |
| 31 | | | | | IS | IS | | 1121613 | | | | | |

**IS:** Insufficient amount of sample due to low flow or sampler malfunction.

BORD NA MÓNA

BORD NA MÓNA ENERGY LIMITED
Derrygreenagh,Rochfortbridge,Mullingar,Co-Westmeath.

# Annual Environmental Report
# IPC LICENCE 501

**March 2005**

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**Appendix 1:** Composite Sampler Results

## 1.0 Introduction

1.1 IPC Licence Register No **501**

1.2 Name & Location of Site

| | |
|---|---|
| **Name:** | Bord na Mona Energy Limited. |
| **Address:** | Derrygreenagh Group<br>Derrygreenagh Works<br>Rochfortbridge<br>Mullingar<br>Co Westmeath. |
| **Telephone No:** | 044 / 22181 Fax No: 044 / 22344 |
| **Contact Name:** | Paul Riordan |
| **Position:** | Regional Manager. |
| **National Grid Reference:** | E249450 N238140 |

1.3 Description of Activities

The Derrygreenagh Group consists of the Derrygreenagh and Ballivor Groups and Rossan Bog.
The Derrygreenagh group of bogs is located in North Offaly and Southeast Westmeath. The Derrygreenagh group comprises of 3664 acquired hectares, of which there was 644.83 nett hectares in production in the 2004 season. The main catchment of these areas is the River Boyne.

The Ballivor group is made up of the bogs in the Ballivor, Carranstown, Bracklin and Lisclogher areas. There is a total of 274.33 hectares in production and each of these areas are linked by peatland railway to the Bord na Mona horticultural factory, situated between Ballivor and Raharney villages. Drainage from these bogs is to the Deel and Stonyford rivers, tributaries of the Boyne.

Rossan bog is situated one mile from Kinnegad village. There are currently 141 hectares in milled moss production. This bog drains to the Kinnegad River, a tributary of the River Boyne.

The Derrygreenagh Group currently employs 48 permanent and 5 seasonal workers. The Ballivor bogs employing 11 permanant and 3 seasonals, with 3 premanent and 3 seasonals employed in Rossan. Giving a total of 62 permanent and 11 seasonal employees across the licence area.

Transport operations are carried out on a seven day cycle throughout the year. Production operations are typically carried out over a seven day week (weather permitting) for 12 to 15 hours per day.

**Peat Milling Operations.**

For milled peat production the bog is laid out in a series of rectangular fields of varying length and 15m wide with drains located between. There are essentially four operations involved in milled peat production:

- Milling.
- Harrowing.
- Ridging.
- Harvesting.

**Milling.**
Special milling machines work there way along the fields, milling approximately 15mm of peat of the top of the bog in a pass.

**Harrowing**
In the course of drying, the milled peat is turned a number of times to avail of the drying conditions. This is achieved with a machine called a harrow. The milled peat is harrowed until its moisture content is down to approximately 40-50%, which can take up to two to three days, weather depending.

**Ridging**
The dry peat is then scraped into long ridges running down the centre of each field. This is done with a ridger, a machine consisting of a series of blades in the shape of a v that opens the full width of the field.

**Harvesting**
During harvesting every eleventh field is used to stockpile the peat, with this field receiving the milled peat from the five fields either side.

The milled peat is then transported via the existing network of peatland railways to one of the following locations.

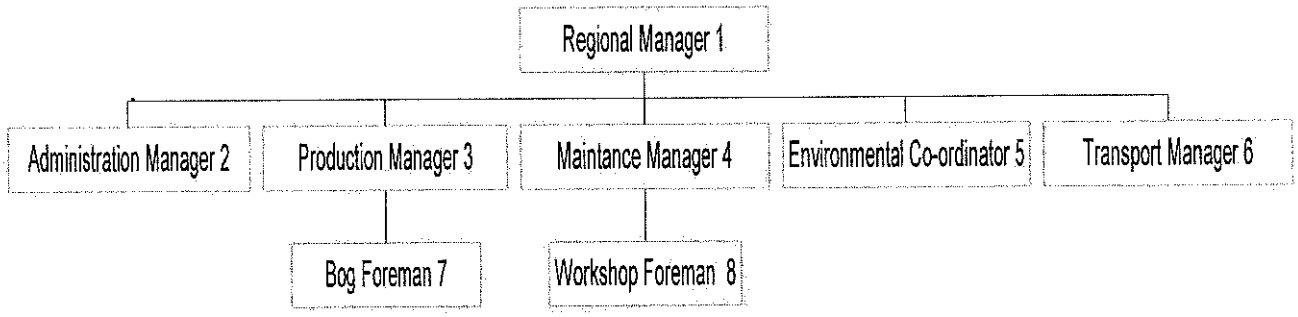
- Power station ( EPL )
- Horticultural Factory.
- Briquette Factory.

1.4 Environmental Management of the Company

The organisational structure within the Derrygreenagh Group is presented in the flow chart below.

# Derrygreenagh Group

## Environmental Responsibilities




(1) Overall environmental responsibilities
(2) Records of complaints and registers
(3) All production related issues
(4) Machine maintenance
(5) Co-ordinating environmental affairs
(6) All peat transportation matters
(7) Silt pond maintenance, tea centres, codes of practice
(8) Fuel loading, oil traps, weekly workshop inspections.

1.5 Environmental Policy

**BORD NA MÓNA**

**BORD NA MÓNA ENERGY LIMITED**
**Derrygreenagh,Rochfortbridge,Mullingar,Co-Westmeath.**

Bord na Mona Energy Limited is a commercial semi-state body with responsibility to develop Irelands peat resources in the national interest.

Bord na Mona Energy Limited is committed to gather and make available information on all aspects of its environmental impact and to help improve understanding among the public generally of its role and the importance of Irish peatlands.

Bord na Mona Energy Limited recognises the importance of peatland conservation.

Bord na Mona Energy Limited will leave behind all areas it owns as either an economically or socially integrated resource of a high environmental value.

Bord na Mona Energy Limited seeks to conduct all aspects of its buisness in an environmentally sensitive value.

Bord na Mona Energy Limited will establish an environmental management system specifically addressing the following impacts.

- Discharges to water.
- Emissions to atmosphere.
- Waste disposal.
- Use of natural resources.
- Noise, vibration, odour, dust and visual effects.
- Natural environment and eco-system.

The environmental management system will be monitored, maintained and continually improved.

A system of regular environmental audits will be put in place.

Bord na Mona Energy Limited will continue research and development into all aspects of its environmental impact.

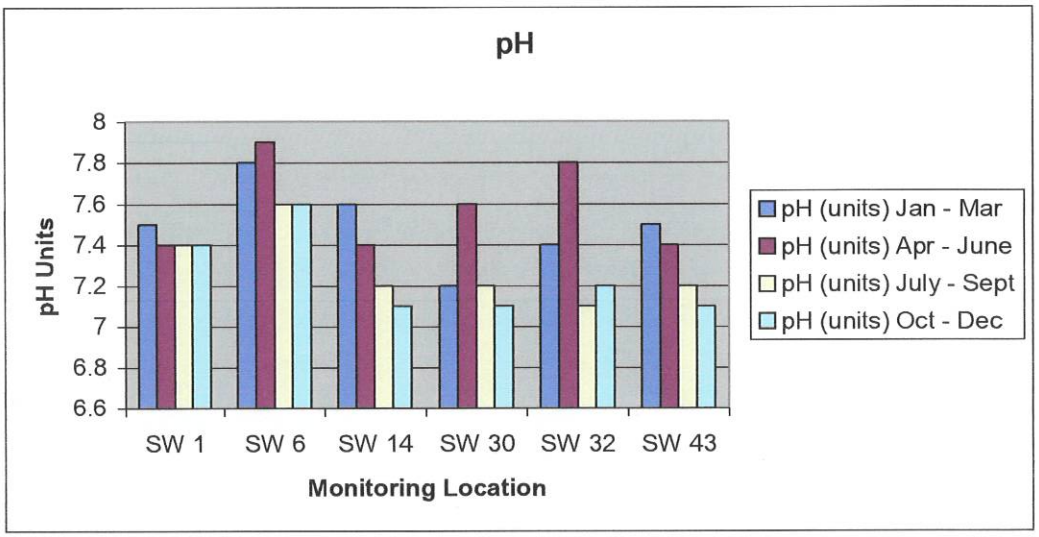
This statement is published and is available at all locations within the division and its contents are brought to the attention of all employees.

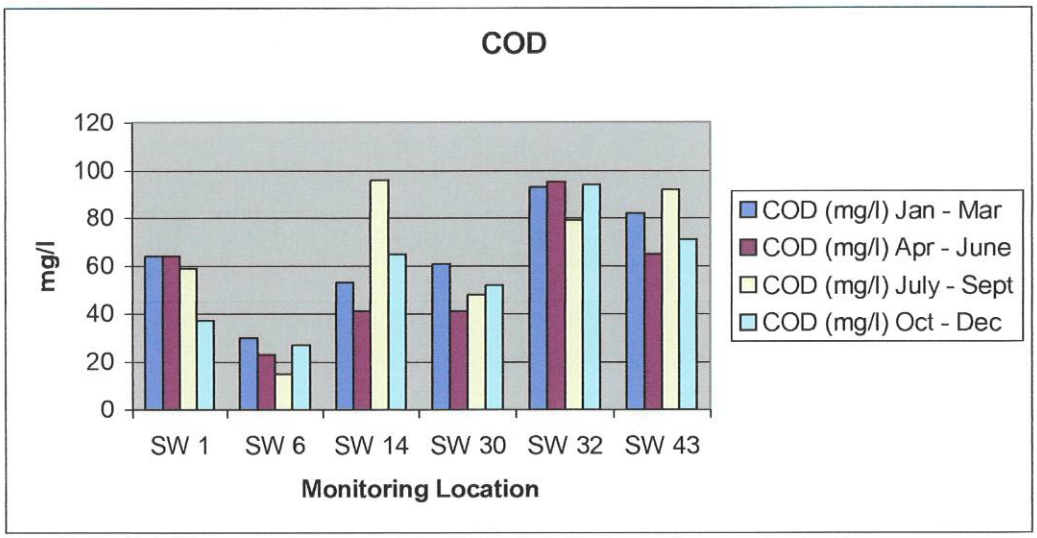
## 2.0 Summary Information

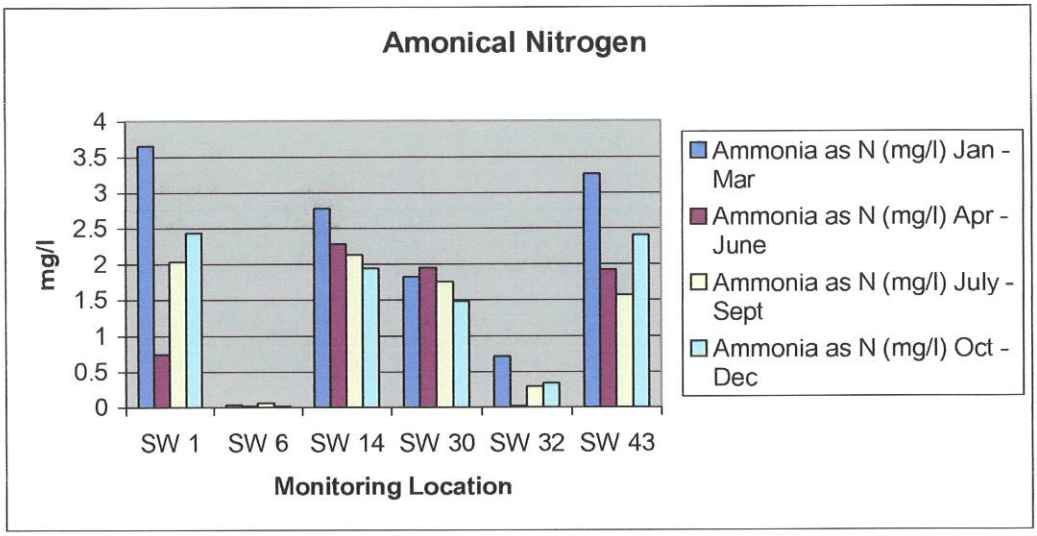
### 2.1 Emissions to Water Summary

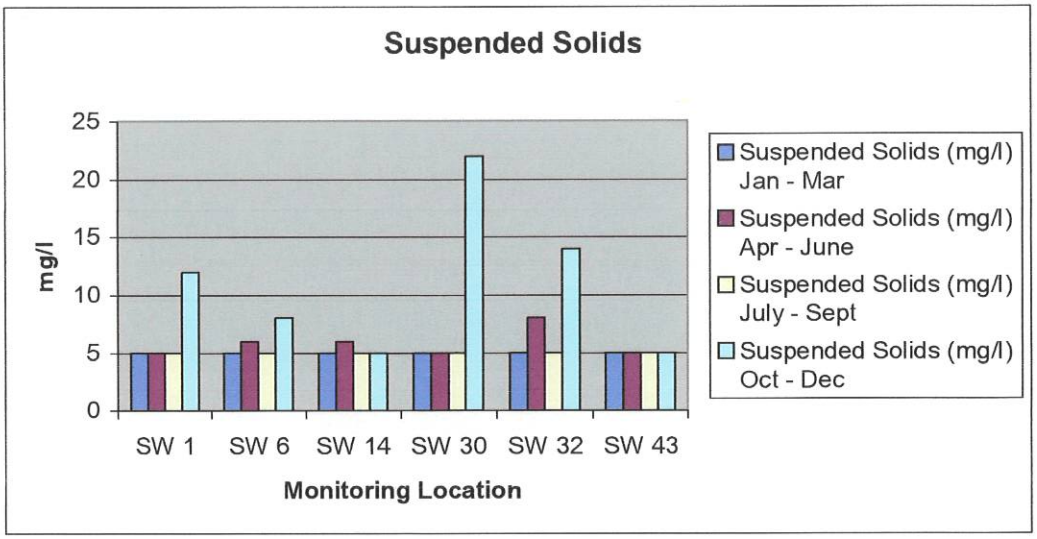
#### 2.1.1 Silt Pond Emissions

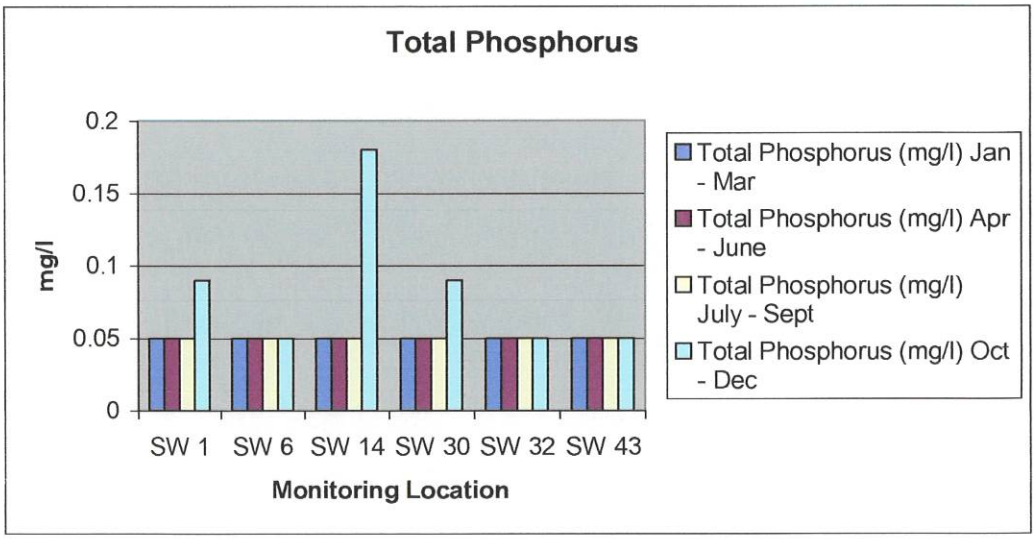
The following graphs compare results obtained during the reporting period at all surface water monitoring points.

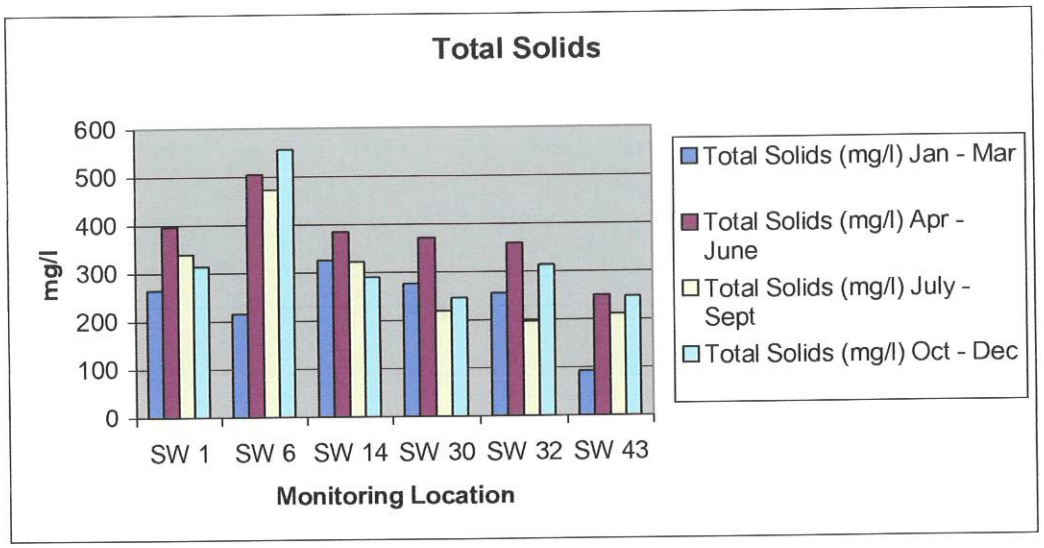


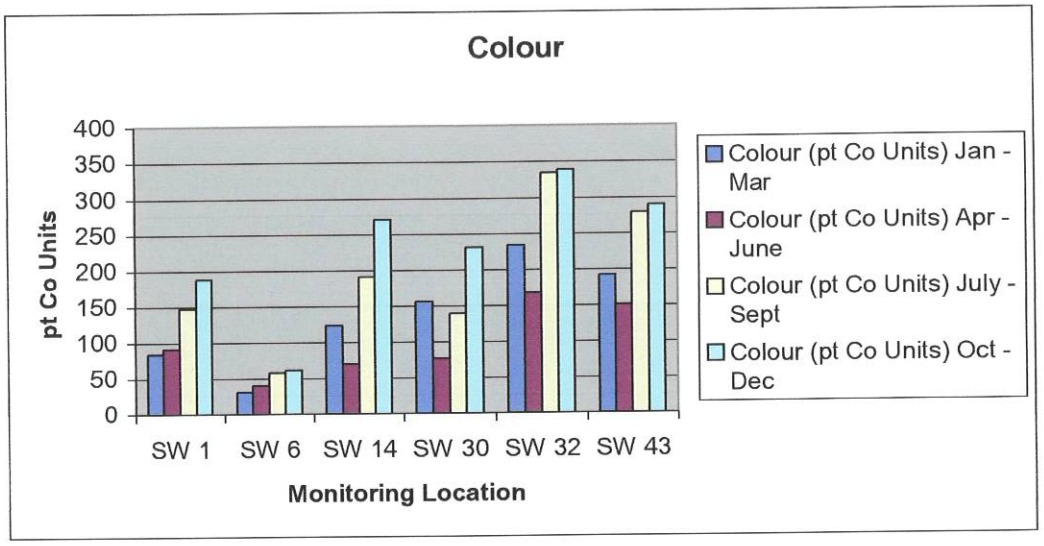



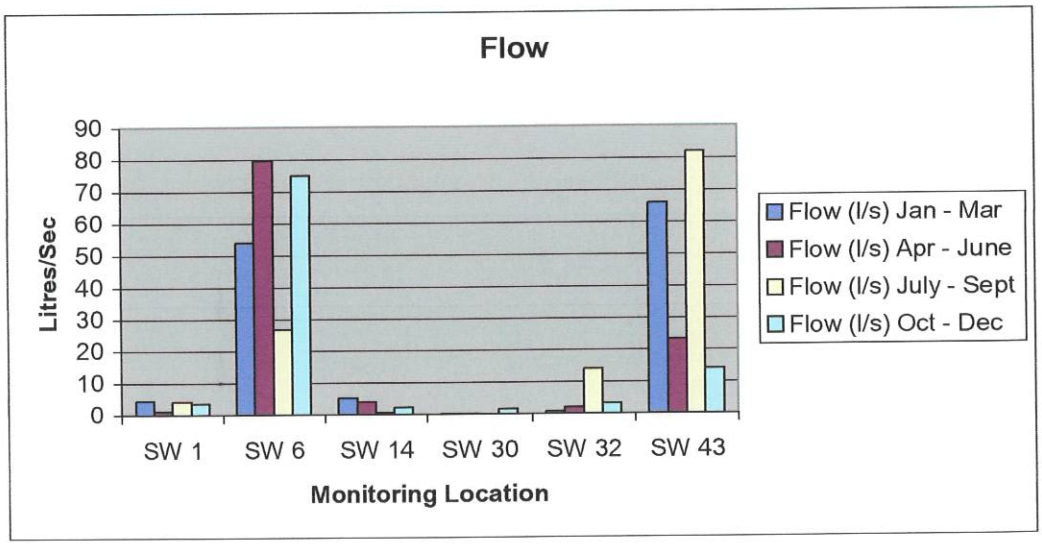

Amonical Nitrogen
4
3.5
3
2.5
2
1.5
1
0.5
0
mg/l
SW 1
SW 6
SW 14
SW 30
SW 32
SW 43
Monitoring Location
Ammonia as N (mg/l) Jan - Mar
Ammonia as N (mg/l) Apr - June
Ammonia as N (mg/l) July - Sept
Ammonia as N (mg/l) Oct - Dec


Suspended Solids
25
20
15
10
5
0
mg/l
SW 1
SW 6
SW 14
SW 30
SW 32
SW 43
Monitoring Location
Suspended Solids (mg/l) Jan - Mar
Suspended Solids (mg/l) Apr - June
Suspended Solids (mg/l) July - Sept
Suspended Solids (mg/l) Oct - Dec


Total Phosphorus
0.2
0.15
0.1
0.05
0
mg/l
SW 1
SW 6
SW 14
SW 30
SW 32
SW 43
Monitoring Location
Total Phosphorus (mg/l) Jan - Mar
Total Phosphorus (mg/l) Apr - June
Total Phosphorus (mg/l) July - Sept
Total Phosphorus (mg/l) Oct - Dec


Total Solids
600
500
400
300
200
100
0
mg/l
SW 1
SW 6
SW 14
SW 30
SW 32
SW 43
Monitoring Location
Total Solids (mg/l) Jan - Mar
Total Solids (mg/l) Apr - June
Total Solids (mg/l) July - Sept
Total Solids (mg/l) Oct - Dec


Colour
400
350
300
250
200
150
100
50
0
pt Co Units
SW 1
SW 6
SW 14
SW 30
SW 32
SW 43
Monitoring Location
Colour (pt Co Units) Jan - Mar
Colour (pt Co Units) Apr - June
Colour (pt Co Units) July - Sept
Colour (pt Co Units) Oct - Dec


Flow
90
80
70
60
50
40
30
20
10
0
Litres/Sec
SW 1
SW 6
SW 14
SW 30
SW 32
SW 43
Monitoring Location
Flow (l/s) Jan - Mar
Flow (l/s) Apr - June
Flow (l/s) July - Sept
Flow (l/s) Oct - Dec

2.1.2 Yard Discharge

The tables below are a summary of the emissions to surface waters from the yard and workshop at the Derrygreenagh Works.

**Derrygreenagh SWE-2**

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COD mg/l | | | 56 | | 38 | 34 | 30 | 23 | 34 | 14 | | 52 |

**Note:** No samples were available on the day of sampling in the months January, February, April & November.

2.1.3 Composite Sampler Report

The composite sampler remains at the same location as last year. In general it is working well and gathers a full contingent of samples every week. Servicing and calibration of the sampler was carried out in April 2004 during which time grab samples were taken every week that the sampler was away. Attached in Appendix 1 are the results of the monitoring carried out using the composite sampler. There was one non-compliance recorded by the sampler during the reporting period.

2.1.4 Non-compliance's

There were no non-compliance's, in relation to silt pond sampling during the reporting period. The composite sampler had one non - compliance. Suspended solids of 91mg/litre were recorded during February this was after a period of heavy rainfall (50mm).

## 2.2Emissions to Air

### 2.2.1 Dust Monitoring

The tables below contain the dust emissions for each dust monitoring location within the Derrygreenagh Group. Monitoring took place on three separate occasions during the period, June and August 2004.

**June - July**

| Emission Point | Parameter | Emission ($mg/m^2$/day) | Emission Limit Value | Compliant |
|---|---|---|---|---|
| DM 01 | Dust | 18 | (350$mg/m^2$/Day) | YES |
| DM 02 | Dust | 258 | (350$mg/m^2$/Day) | YES |
| DM 03 | Dust | 3319 | (350$mg/m^2$/Day) | NO |

**July - July**

| Emission Point | Parameter | Emission ($mg/m^2$/day) | Emission Limit Value | Compliant |
|---|---|---|---|---|
| DM 01 | Dust | 18 | (350$mg/m^2$/Day) | YES |
| DM 02 | Dust | 111 | (350$mg/m^2$/Day) | YES |
| DM 03 | Dust | 123 | (350$mg/m^2$/Day) | YES |

**July - Aug**

| Emission Point | Parameter | Emission ($mg/m^2$/day) | Emission Limit Value | Compliant |
|---|---|---|---|---|
| DM 01 | Dust | 18 | (350$mg/m^2$/Day) | YES |
| DM 02 | Dust | 43 | (350$mg/m^2$/Day) | YES |
| DM 03 | Dust | 31 | (350$mg/m^2$/Day) | YES |

**Note:** DM 01= Toar Bog. DM 02 = Derryhinch Bog. DM 03 = Ballivor Bog.

### 2.2.2 Non-compliance's

There was one non-compliance, in relation to air in the reporting period.
This occurred during the June – July monitoring period. On investigation it transpired that the dust gauge in question was located too close to production activities, where dust generation is both unavoidable and a nuisance to nobody. It was agreed to relocate the gauge closer to the adjacent dust sensitive area in order to give a clearer representation of any dust that may be creating a nuisance. Monitoring will continue at the same locations during production 2005.

## 2.3Waste Arisings

2.3.1 Non-Hazardous Waste

The following table lists the quantities of the wastes generated from January-December 2004 from all of the Derrygreenagh Group.

| Waste Type | Quantity ( Tonnes ) |
|---|---|
| Silt Pond Waste | 464.640 |
| Scrap Metal | 71.880 |
| Polyethylene | 10.130 |
| Mixed Municipal Waste | 12.860 |
| **Total** | **559.51** |

2.3.2 Hazardous Waste

The following table is a record of all the hazardous wastes handled by the Derrygreenagh Group from January - December 2004.

| WASTE DESCRIPTION | EWC CODE | TONNES | NAME OF CONTRACTOR | DESTINATION | DATE | REJECTED CONSIGNMENTS |
|---|---|---|---|---|---|---|
| Waste Oil | 130202 | 4100L | Atlas Waste Oil | Portlaoise | 13/02/04 | NA |
| Nickel Cadium Batteries | 160602 | 1.395 | Returnbatt LTD | Kildare Town | 11/03/04 | NA |
| Oil Filters | 160107 | 660L | Atlas Waste Oil | Portlaoise | 20/04/04 | NA |
| Oily rags | 150201 | 240L | Atlas Waste Oil | Portlaoise | 20/04/04 | NA |
| Oily rags | 150201 | 240L | Atlas Waste Oil | Portlaoise | 20/04/04 | NA |
| Waste Oil | 130202 | 3000L | Atlas Waste Oil | Portlaoise | 26/04/04 | NA |
| Waste Oil | 130202 | 1000L | Atlas Waste Oil | Portlaoise | 06/05/04 | NA |
| Fluorescent Tube | 200121 | 0.026 | Irish Lamp Recycling | Athy Co Kildare | 11/05/04 | NA |
| Waste Oil | 130202 | 3000L | Atlas Waste Oil | Portlaoise | 17/06/04 | NA |
| Waste Oil | 130202 | 1200L | Atlas Waste Oil | Portlaoise | 09/07/04 | NA |
| Lead Acid Batteries | 160601 | 1.00 | Returnbatt LTD | Kildare Town | 16/07/04 | NA |
| Oil Filters | 160107 | 660L | Atlas Waste Oil | Portlaoise | 12/08/04 | NA |
| Fire Extinguishers | | 0.048 | Apex Fire | Harrolds X Dublin | 29/09/04 | NA |
| Waste Oil | 130202 | 5200L | Atlas Waste Oil | Portlaoise | 15/10/04 | NA |
| Oily rags | 150201 | 240L | Atlas Waste Oil | Portlaoise | 26/11/04 | NA |
| | | | | | | |

**Note**: * Approximate weight.

## 2.4 Energy and Water Consumption

### 2.4.1 Energy Consumption

The table below is a summary of the energy consumption for the Derrygreenagh Group, from the dates January – December 2004.
Water is not included, as it is not used as part of the production process. It is only used in offices, canteens and workshops on a domestic scale.

| Fuel | Volume $M^3$ | Tonnes | MW/Hours |
|---|---|---|---|
| **Jan - Dec 2004** | | | |
| Diesel | 335.8 | 278.714 | 3288.82 |
| Electricity | NA | NA | 33.30 |
| Peat Briquettes | NA | 343.30 | 1716.5 |
| **Total** | **335.8** | **622.014** | **5038.62** |

## 2.5 Environmental Incidents & Complaints

### 2.5.1 Incidents

There were no incidents within the Derrygreenagh Group during the reporting period.

| Environmental Incidents | Number of Incidents |
|---|---|
| Incidents | 0 |
| Incidents requiring corrective action | 0 |
| **Categories of Incident** | |
| Odour | |
| Noise | |
| Water | |
| Air | |
| Procedural | |
| Miscellaneous | |

### 2.5.2 Complaints

There was one complaint within the Derrygreenagh Group, in the period January - December 2004. 1 was received from the local authority and was in relation to stockpile covering polyethylene which was being stored for subsequent bailing.

| Environmental Complaints | Number of complaints |
|---|---|
| Complaints received | 1 |
| Complaints requiring corrective action | 1 |
| **Categories of complaint** | |
| Odour | |
| Noise | |
| Water | |
| Air | |
| Procedural | |
| Miscellaneous | √ |

## 3.0 Management of the Activity

## 3.1 Environmental Management Programme Report 2004

| Environmental Management Report for 2004 | |
|---|---|
| **Project** | |
| Project 1. Reduction of fugitive dust emissions. | **Training**<br><br>The Cleaner Production Video was completed in May 2004. The video covers all aspects of the IPC Licence, and in particular, cleaner production methods, good & bad practice, pollution prevention and codes of practice. A quiz on the contents of the video and items relating to the target audience, accompanies the 1 hour training session. During 2004, training with the video occurred at 4 of the IPC licensed sites and targeted management and production personnel.<br><br>An internal audit of all IPC licensed sites also occurred during May and June of 2004. This included an assessment of the dust prevention measures in-place or planned during 2004. A copy of the audit findings is on file at each works. Based on these audits, various projects were put in-place regarding training for personnel at these dust sensitive locations and new machines for targeting dust problems from headland peat.<br>Project works for 2004 includes:<br>**Hydraulic Harrows**<br>As was proposed for 2004, 8 newly fabricated hydraulic harrows were purchased and distributed to Dust Sensitive Locations within the 9 IPC licensed sites. These have proved successful in reducing dust generation at DSL sites.<br>**Headland Peat Collection**<br>BNM recently took delivery of 4 new mechanical bin harvesters. These were manufactured in Finland, and are currently being modified in Ireland. These types of harvesters are specifically for use in lifting dry peat from headlands at DSL's and will be engaged alone in tackling dust sensitive areas in each licence, for the 2005 production season. In addition two Headland Harvester units will be in operation. These units operated in Boora and Mountdillon in 2004, and will continue to operate in these areas. In total, these 6 units will operate specifically at DSL' in Peco bogs, and will be assessed during the 2005 season, as to their effectiveness at reducing headland peat and reducing incidents of dust generation.<br><br>The total expenditure on the additional bin harvesters, hydraulic harrows, and the polyrollers (project 5) for the 2004 season is €670,600, which is €400,000 above what was budgeted. |

| | |
|---|---|
| Project 2. Minimisation of Suspended Solids | This project is on-going and is primarily one of training for all production personnel, and is covered in the Cleaner Production Video, as in Project 1 (Training). |
| Project 3. Effective spill/leak management of mobile fuelling tanks | All of BNM's production bogs now have locations highlighted as being suitable for re-fuelling on the bog, and this is being brought to the attention of all personnel. These locations have been chosen having due regard to location of watercourses and drains. |
| Project 4. Re-use of silt pond waste | There are over 850 silt ponds in operation in the 9 IPC Licensed BNM bogs. These are located in low areas on the bog perimeters, due to drainage requirements. All of these ponds are excavated into the mineral layer, and as a result of this, all silt removed from the ponds have high levels of grit, stones etc. All of these make the peat unsuitable for combustion purposes. In addition, over 95% of the silt excavated is water, which would require it to be spread out on the bog to be allowed to dry to the required moisture content. Given the small volumes of silt excavated, it is therefore not feasible to reuse this silt pond waste. |
| Project 5. Collection, storage and re-use of polythene. | Polythene collection is ongoing in BNM, and volumes collected and recycled are recorded in the Non-hazardous Waste records in the AER.<br><br>The 25 new polystrippers proposed in last years EMP, were delivered in 04' and are currently being used to strip polythene from stockpiles. This new system now produces a roll of polythene which is cleaner, easier to handle, and consequently more attractive for recycling. All bogs now have a hard standing area, where the rolls of polythene are stored for collection and subsequent recycling. In addition to this, procedures have been put in-place, and are highlighted during training, about best practice for stripping, collection and storage.<br><br>There are currently three potential contractors that could take the waste polythene for recycling. All involve shredding, washing and either baling or pelletising the polythene and BNM are currently assessing each contractor to assess their suitability, environmental compliance etc.<br>Once the back-log has been recycled, and BNM have all of the strippers in place, the day to day recycling of the polythene removed each year will be more efficient. |
| Project 6. Condition 2.2.2 (v) *Provision of measures to protect dust sensitive areas.* | All DSL's have been identified within BNM group. Existing shelter belts were maintained were required during the reporting period. |

## 3.2 Environmental Management Programme Proposal for 2005

| Environmental Management Programme Proposal for 2005 | |
|---|---|
| **Project** | |
| Project 1. Reduction of fugitive dust emissions. | **Training**<br><br>Continue with the training programme for 2005. 15 Training sessions have already taken place at 6 of the IPC Licensed works, since January 05' This has targeted management and production personnel (teamleaders) and will be extended to include all seasonal staff to be engaged this year. It is targeted to have all production personnel trained by the commencement of production for 2005.<br><br>**Headland Peat**<br><br>The 6 new headland peat harvester units will be deployed for the 2005 production season. These units are a mixture of the bin harvester system (4 units) and the same field harvester (2 units), and will be operated in dust sensitive locations. The bin harvester units, while having been experimented with previously in BNM, are a relatively new technology in BNM's modern day operations, and so will be monitored closely over the coming season to asses their performance. All trials, observations and tests will be monitored and recorded by the EMP system as to their effectiveness and suitability.<br><br>**Hydraulic harrows**<br><br>14 new hydraulic harrows have been made over 04/05 and will be in operation between now and the end of 2005. In line with BNM's policy to fabricate 40 hydraulic harrows over 5 years, this current no. brings the total to-date to 22 in operation by the end of 05' This is well ahead of what was planned in the 2004 EMP proposal. In addition, 3 new units are budgeted for fabrication by the end of 05. When completed, all DSL's will be equipped with a hydraulic harrow. |
| Project 2. Minimisation of Suspended Solids | This project is on-going and is primarily one of training for all production personnel, and is covered in the Cleaner Production Video, as in Project 1 (Training). It will also include inspections at a number of production units during the 05 production season, to assess compliance with the good practice and codes of practice developed by BNM and communicated through the training programmes and the video. |

| | |
|---|---|
| Project 3. Effective spill/leak management of mobile fuelling tanks | As reported in the 2004 EMP report, all areas have designated areas for re-fuelling. This project is therefore completed. Compliance with the original requirements of this project will however be checked through the inspections as highlighted in project 2 above. Specific training has also been provided for oil spill management and clean-up, as part of the management of oil spill kits and procedures etc. and will continue to be facilitated during 2005. |
| Project 4. Re-use of silt pond waste | This project is also not feasible, as highlighted in the 2004 report, but will be reviewed where necessary, if a use (other than fuel use) emerges. |
| Project 5. Collection, storage and re-use of polythene. | Banner recycling are currently taking BNM's rolled and loose polythene, for recycling to their permitted yards in Co.Clare. Two additional interested parties are also being investigated, one locally in Co Kildare and a potential recycler in Belgium who may be in a position to reuse the polythene to process pellets to be used in the manufacture of new polythene to be used by BNM. An additional order for 22 polyrollers have been placed, to be delivered by the end of March, so that all bog units will have a roller for stripping piles. This will put an end to loose polythene gathering around the bog. |
| Project 6. Condition 2.2.2 (v) *Provision of measures to protect dust sensitive areas.* | This project is on-going. All dust sensitive locations will have bergerhoff dust gauges installed for the 2005 season. Further shelter belts may be planted where no complaints were received but may in time become dust sensitive. |

3.3 Environmental Expenditure

The table below lists the environmental costs incurred by the Derrygreenagh Group between January – December 2004.
In calculating the environmental costs 70% of the total costs were attributed to Licence 503 and 30% to Licence 501.The Ballivor Group costs were then added to the Derrygreenagh totals.

| **Expenditure Related to the Operation of the Derrygreenagh IPC Licence During the Period January – December 2004** | | | |
|---|---|---|---|
| **Description** | **Ballivor Cost** | **D/Green Cost** | **Total Cost (€)** |
| Plant @ €40/hour | 27,200 | 210,360 | 237,560 |
| Labour | 10,000 | 78,519 | 88,519 |
| Materials | NA | 28,686 | 28,686 |
| Overheads (ESB, Phones, Consumables) | 2,000 | 6,000 | 8,000 |
| Laboratory Analysis | NA | 18,960 | 18,960 |
| EPA Fees | NA | 9,873 | 9,873 |
| **Total** | **39,200** | **352,398** | **391,598** |

## 4.0 Licence Specific Reports

4.1 Surface Water Discharge Monitoring Location Programme Review

The surface water discharge monitoring location programme remains the same as was submitted and accepted by the Agency in June 2000.
Pipes have been fitted at each location in order to accommodate flow metering and the provision of safe access is also ongoing.
Emission point signs have been designed and are in place.
Additional work has also being carried out at these locations as part of the ongoing silt pond upgrade programme.
It is proposed to relocate some of the monitoring locations in 2005. A proposal will be forwarded to the agency outlining the reasons for relocation.

4.2 Bunding Programme

The bunding programme for large scale oil storage facilities is complete and the works certified.

4.3 Boiler Combustion Efficiency

Boiler Details
Twin Danstoker solid fuel units each rated at 725KW, fuelled by loose briquettes.
Operating from Oct-Mar approximately at Derrygreenagh Works.

A boiler efficiency test was carried out on the 05/01/05. The results of this test showed the boiler to be operating at an efficiency level of 87.2 %.
A full breakdown of the test is retained on file at the Derrygreenagh office.

4.4 Resource consumption Summary

There was a total of 120,617 tonnes of milled peat produced across the licence area in the production season 2004.
There was also a total of 117,738 tonnes of stock peat sold during the reporting period. Of this total 31,752 tonnes were sold to Edenderry Power Limited, 13,967 tonnes to Derrinlough Briquette Factory, 53,447 tonnes to Ballivor Moss Factory, 40 tonnes to Kilberry Moss Factory, 745 tonnes to Lough Ree Power Station and 17,787 tonnes direct to Dublin Port for export.

4.5 De-silting programme report

**Summary Data Table of Ponds De-Silted From Jan-December 2004**

| Bog | No Silt Ponds | Cleaned Once | Cleaned Twice | Cleaned Three Times | Notes |
|---|---|---|---|---|---|
| Ballivor | 10 | 6 | | | |
| Carranstown | 5 | 3 | 1 | | |
| Bracklin West | 6 | 6 | 6 | 2 | |
| Lisclogher | 7 | 0 | | | * |
| Kinnegad | 6 | 6 | 6 | 6 | |
| D/Hinch | 4 | 4 | 4 | 4 | |
| Drumman | 6 | 6 | 6 | 6 | |
| Ballybeg | 6 | 6 | 3 | | ** |
| Toar | 6 | 6 | | | ** |

*: Bog still under development, no production.
**: No production at this Bog in 2004.
**Note:** Any pond which was not cleaned at least twice, as required by the licence, is due to the fact that inspections showed those ponds not requiring a second cleaning.

4.6 Bog Development and Operational Programme

The bogs in the Derrygreenagh Group are well into their productive lives, therefore there will be no development in the year 2005.
However in the Ballivor Group, Carranstown and Lisclogher West bogs are currently under development, the works involve production field preparation and drainage works such as piping and also some silt control works.

There will be 630.32 nett hectares in production in the 2005 season, yeilding 125,592 tonnes @ 55% moisture content.

Derrygreenagh will account for 47,514 tonnes and 239.44 hectares.
Ballivor will account for 51,480 tonnes and 252.71 hectares and Rossan will account for 26,598 tonnes and 138.17 hectares.

4.7 Bog Rehabilition Report
There was no bog rehabilitation carried out within the Derrygreenagh group during the reporting period.
Management guidelines for the planning and implementation of cutaway bog rehabilitation have been adopted and the document is currently available for inspection on file at the Derrygreenagh office.

## 5.0 Summary

With regard to environmental compliance at the Derrygreenagh Group of Bogs, there were no exceedences in the quarterly grab sampling.
There was one non-compliance in relation to the Composite Sampler during the period January to December 2004. Dust monitoring results at the dust sensitive locations were in general good although as stated in the body of this report there was one exceedence. There was one complaint of an environmental nature received during the reporting period.

The staff awareness through training and involvement in the operation of the licence has also improved immensely. A full programme of training and awareness has been conducted at the works and has targeted all personnel ie. Office, Workshop, Transport and Production.

Bord na Mona are project partners of the South Eastern River Basin District Management, as set up under the Water Framework Directive.
Bord na Mona are also involved in catchment management on the River Barrow.

Bord na Mona Energy Ltd would like to take this opportunity to advise the Environmental Protection Agency of its continued commitment to improving its environmental performance by adopting cleaner production methods and improving its environmental protection measures.

# APPENDIX 1

# Composite Sampler Results

## Bord Na Mona Energy Ltd, Derrygreenagh Group, Rochfordsbridge, Co Westmeath

## Composite Sampler Results Licence 501

| Month | | | Parameters | | | | | | Daily Totals | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2004 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | IS | IS | | 0 | | | | | |
| 2 | | | | | 5 | 166 | | 2072959 | | | | 10.36 | 344.11 |
| 3 | | | | | 5 | 146 | | 0 | | | | 0.00 | 0.00 |
| 4 | | | | | 5 | 196 | | 2616565 | | | | 13.08 | 512.85 |
| 5 | 7.9 | 37 | 1.26 | 0.05 | 5 | 232 | 150 | 2382647 | 88.16 | 3.00 | 0.12 | 11.91 | 552.77 |
| 6 | | | | | 5 | 228 | | 2697902 | | | | 13.49 | 615.12 |
| 7 | | | | | 5 | 214 | | 1069013 | | | | 5.35 | 228.77 |
| 8 | | | | | 5 | 214 | | 489768 | | | | 2.45 | 104.81 |
| 9 | | | | | IS | IS | | 1405856 | | | | | |
| 10 | | | | | IS | IS | | 863380 | | | | | |
| 11 | | | | | IS | IS | | 1505780 | | | | | |
| 12 | | | | | IS | IS | | 1654729 | | | | | |
| 13 | 7.2 | 11 | 1 | 0.05 | 6 | 224 | 137 | 1605066 | 17.66 | 1.61 | 0.08 | 9.63 | 359.53 |
| 14 | | | | | 21 | 190 | | 2644145 | | | | 55.53 | 502.39 |
| 15 | | | | | 31 | 178 | | 4599495 | | | | 142.58 | 818.71 |
| 16 | | | | | 36 | 226 | | 6467866 | | | | 232.84 | 1461.74 |
| 17 | | | | | IS | IS | | 3243822 | | | | | |
| 18 | | | | | IS | IS | | 1973462 | | | | | |
| 19 | | | | | IS | IS | | 1973462 | | | | | |
| 20 | IS | IS | IS | IS | IS | IS | IS | 1973462 | | | | | |
| 21 | | | | | IS | IS | | 1973462 | | | | | |
| 22 | | | | | 6 | 326 | | 1972690 | | | | 11.84 | 643.10 |
| 23 | | | | | 26 | 274 | | 1961433 | | | | 51.00 | 537.43 |
| 24 | | | | | 7 | 252 | | 1949851 | | | | 13.65 | 491.36 |
| 25 | | | | | 5 | 306 | | 1981142 | | | | 9.91 | 606.23 |
| 26 | | | | | IS | IS | | 1972015 | | | | | |
| 27 | | | | | IS | IS | | 1976582 | | | | | |
| 28 | 7.4 | 36 | 2.14 | 0.05 | 5 | 210 | 62 | 2033386 | 73.20 | 4.35 | 0.10 | 10.17 | 427.01 |
| 29 | | | | | IS | IS | | 1935014 | | | | | |
| 30 | | | | | IS | IS | | 2018958 | | | | | |
| 31 | | | | | IS | IS | | 3809406 | | | | | |

**IS:** Insufficient amount of sample due to low flow or sampler malfunction.

**Bord Na Mona Energy Ltd, Derrygreenagh Group, Rochfordsbridge, Co Westmeath**

**Composite Sampler Results Licence 501**

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| February | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2004 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | IS | IS | | 1908948 | | | | | |
| 2 | | | | | IS | IS | | 3806364 | | | | | |
| 3 | | | | | IS | IS | | 5240995 | | | | | |
| 4 | | | | | IS | IS | | 4305142 | | | | | |
| 5 | | | | | 5 | 174 | | 1996517 | | | | 9.98 | 347.39 |
| 6 | | | | | 5 | 204 | | 677601 | | | | 3.39 | 138.23 |
| 7 | | | | | 5 | 186 | | 677601 | | | | 3.39 | 126.03 |
| 8 | | | | | 13 | 202 | | 677601 | | | | 8.81 | 136.88 |
| 9 | | | | | 5 | 314 | | 677601 | | | | 3.39 | 212.77 |
| 10 | | | | | IS | IS | | 677601 | | | | | |
| 11 | 7.7 | 40 | 1.66 | 0.05 | 5 | 292 | 102 | 677601 | 27.10 | 1.12 | 0.03 | 3.39 | 197.86 |
| 12 | | | | | 5 | 250 | | 677601 | | | | 3.39 | 169.40 |
| 13 | | | | | 5 | 266 | | 677601 | | | | 3.39 | 180.24 |
| 14 | | | | | 5 | 298 | | 677601 | | | | 3.39 | 201.93 |
| 15 | | | | | 5 | 198 | | 677601 | | | | 3.39 | 134.16 |
| 16 | | | | | 5 | 280 | | 677601 | | | | 3.39 | 189.73 |
| 17 | | | | | 5 | 198 | | 677601 | | | | 3.39 | 134.16 |
| 18 | 7.5 | 52 | 2.29 | 0.05 | 5 | 266 | 66 | 677601 | 35.24 | 1.55 | 0.03 | 3.39 | 180.24 |
| 19 | | | | | 5 | 198 | | 677601 | | | | 3.39 | 134.16 |
| 20 | | | | | 5 | 276 | | 677601 | | | | 3.39 | 187.02 |
| 21 | | | | | 5 | 250 | | 677601 | | | | 3.39 | 169.40 |
| 22 | | | | | 5 | 276 | | 677601 | | | | 3.39 | 187.02 |
| 23 | | | | | 5 | 182 | | 677601 | | | | 3.39 | 123.32 |
| 24 | | | | | 5 | 326 | | 677601 | | | | 3.39 | 220.90 |
| 25 | 7.6 | 57 | 3.28 | 0.22 | 91 | 258 | 32 | 677601 | 38.62 | 2.22 | 0.15 | 61.66 | 174.82 |
| 26 | | | | | IS | IS | | 677601 | | | | | |
| 27 | | | | | IS | IS | | 677601 | | | | | |
| 28 | | | | | IS | IS | | 677601 | | | | | |
| 29 | | | | | IS | IS | | 677601 | | | | | |
| 30 | | | | | | | | | | | | | |
| 31 | | | | | | | | | | | | | |

**IS:** Insufficient amount of sample due to low flow or sampler malfunction.

**Bord Na Mona Energy Ltd, Derrygreenagh Group, Rochfordsbridge, Co Westmeath**

**Composite Sampler Results Licence 501**

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| March | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2004 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | IS | IS | | 677601 | | | | | |
| 2 | | | | | IS | IS | | 677601 | | | | | |
| 3 | 7.5 | 10 | 3.18 | 0.05 | 5 | 352 | 67 | 677601 | 6.78 | 2.15 | 0.03 | 3.39 | 238.52 |
| 4 | | | | | 5 | 308 | | 677601 | | | | 3.39 | 208.70 |
| 5 | | | | | 5 | 272 | | 677601 | | | | 3.39 | 184.31 |
| 6 | | | | | 5 | 290 | | 677601 | | | | 3.39 | 196.50 |
| 7 | | | | | 5 | 312 | | 677601 | | | | 3.39 | 211.41 |
| 8 | | | | | 5 | 310 | | 677601 | | | | 3.39 | 210.06 |
| 9 | | | | | 5 | 304 | | 677601 | | | | 3.39 | 205.99 |
| 10 | 7.8 | 40 | 3.6 | 0.05 | 5 | 334 | 47 | 677601 | 27.10 | 2.44 | 0.03 | 3.39 | 226.32 |
| 11 | | | | | IS | IS | | 677601 | | | | | |
| 12 | | | | | IS | IS | | 677601 | | | | | |
| 13 | | | | | IS | IS | | 677601 | | | | | |
| 14 | | | | | IS | IS | | 677601 | | | | | |
| 15 | | | | | IS | IS | | 677601 | | | | | |
| 16 | | | | | IS | IS | | 677601 | | | | | |
| 17 | 8.1 | 35 | 2.86 | 0.05 | 5 | 266 | 42 | 677601 | 23.72 | 1.94 | 0.03 | 3.39 | 180.24 |
| 18 | | | | | CAL | CAL | | 677601 | | | | | |
| 19 | | | | | CAL | CAL | | 677601 | | | | | |
| 20 | | | | | CAL | CAL | | 677601 | | | | | |
| 21 | | | | | CAL | CAL | | 677601 | | | | | |
| 22 | | | | | CAL | CAL | | 677601 | | | | | |
| 23 | | | | | CAL | CAL | | 677601 | | | | | |
| 24 | | | | | CAL | CAL | | 677601 | | | | | |
| 25 | | | | | CAL | CAL | | 677601 | | | | | |
| 26 | | | | | CAL | CAL | | 677601 | | | | | |
| 27 | | | | | CAL | CAL | | 677601 | | | | | |
| 28 | | | | | CAL | CAL | | 677601 | | | | | |
| 29 | | | | | CAL | CAL | | 677601 | | | | | |
| 30 | | | | | CAL | CAL | | 677601 | | | | | |
| 31 | 8 | 43 | 0.08 | 0.05 | 14 | 324 | 63 | 677601 | 29.14 | 0.05 | 0.03 | 9.49 | 219.54 |

**IS:** Insufficient amount of sample due to low flow or sampler malfunction.

**CAL:** Sampler away for calibration and service

## Bord Na Mona Energy Ltd, Derrygreenagh Group, Rochfordsbridge, Co Westmeath

## Composite Sampler Results Licence 501

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| April 2004 | pH | COD mg/l | Ammonia as N mg/l | Total Phosphorus mg/l | Suspended Solids mg/l | Total Solids mg/l | Colour Pt Co units | Flow Daily Total (litres) | COD Kg/Day | Ammonia as Kg/Day | Total Phosphorus Kg/Day | Suspended Solids Kg/Day | Total Solids Kg/Day |
| 1 | | | | | IS | IS | | 677601 | | | | | |
| 2 | | | | | IS | IS | | 677601 | | | | | |
| 3 | | | | | IS | IS | | 677601 | | | | | |
| 4 | | | | | IS | IS | | 677601 | | | | | |
| 5 | | | | | IS | IS | | 677601 | | | | | |
| 6 | | | | | IS | IS | | 677601 | | | | | |
| 7 | 7.8 | 31 | 2.47 | 0.05 | 5 | 288 | 63 | 677601 | 21.01 | 1:67 | 0.03 | 3.39 | 195.15 |
| 8 | | | | | IS | IS | | 987925 | | | | | |
| 9 | | | | | IS | IS | | 1484179 | | | | | |
| 10 | | | | | IS | IS | | 1484179 | | | | | |
| 11 | | | | | IS | IS | | 1484179 | | | | | |
| 12 | | | | | IS | IS | | 1484179 | | | | | |
| 13 | | | | | IS | IS | | 1484179 | | | | | |
| 14 | 7.5 | 17 | 2.62 | 0.05 | 10 | 254 | 79 | 1484179 | 25.23 | 3.89 | 0.07 | 14.84 | 376.98 |
| 15 | | | | | 12 | 170 | | 1810574 | | | | 21.73 | 307.80 |
| 16 | | | | | 5 | 124 | | 1563587 | | | | 7.82 | 193.88 |
| 17 | | | | | 5 | 178 | | 1608461 | | | | 8.04 | 286.31 |
| 18 | | | | | 5 | 168 | | 2059953 | | | | 10.30 | 346.07 |
| 19 | | | | | 5 | 178 | | 1768699 | | | | 8.84 | 314.83 |
| 20 | | | | | 5 | 127 | | 1537834 | | | | 7.69 | 195.30 |
| 21 | 7.8 | 48 | 2.69 | 0.06 | 5 | 130 | 81 | 1537834 | 73.82 | 4.14 | 0.09 | 7.69 | 199.92 |
| 22 | | | | | IS | IS | | 1537834 | | | | | |
| 23 | | | | | 5 | 389 | | 1537834 | | | | 7.69 | 598.22 |
| 24 | | | | | 5 | 280 | | 1537834 | | | | 7.69 | 430.59 |
| 25 | | | | | IS | IS | | 1537834 | | | | | |
| 26 | | | | | IS | IS | | 1537834 | | | | | |
| 27 | | | | | IS | IS | | 1537834 | | | | | |
| 28 | | | | | IS | IS | | 1537834 | | | | | |
| 29 | 8 | 46 | 3.11 | 0.05 | 22 | 178 | 48 | 1537834 | 70.74 | 4.78 | 0.08 | 33.83 | 273.73 |
| 30 | | | | | 5 | 290 | | 1537834 | | | | 7.69 | 445.97 |
| 31 | | | | | IS | IS | | | | | | | |

**IS:** Insufficient amount of sample due to low flow or sampler malfunction.

## Bord Na Mona Energy Ltd, Derrygreenagh Group, Rochfordsbridge, Co Westmeath

## Composite Sampler Results Licence 501

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| May | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2004 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 8 | 138 | | 1537834 | | | | 12.30 | 212.22 |
| 2 | | | | | IS | IS | | 1537834 | | | | | |
| 3 | | | | | IS | IS | | 1537834 | | | | | |
| 4 | | | | | 6 | 258 | | 1537834 | | | | 9.23 | 396.76 |
| 5 | 8.3 | 58 | 2.44 | 0.05 | 8 | 220 | 79 | 1537834 | 89.19 | 3.75 | 0.08 | 12.30 | 338.32 |
| 6 | | | | | 5 | 238 | | 1537834 | | | | 7.69 | 366.00 |
| 7 | | | | | 5 | 227 | | 1537834 | | | | 7.69 | 349.09 |
| 8 | | | | | 5 | 256 | | 1355073 | | | | 6.78 | 346.90 |
| 9 | | | | | 5 | 278 | | 1155921 | | | | 5.78 | 321.35 |
| 10 | | | | | 5 | 288 | | 1354425 | | | | 6.77 | 390.07 |
| 11 | | | | | 5 | 274 | | 1364165 | | | | 6.82 | 373.78 |
| 12 | 8.7 | 28 | 3.1 | 0.05 | 5 | 290 | 80 | 1469167 | 41.14 | 4.55 | 0.07 | 7.35 | 426.06 |
| 13 | | | | | 5 | 328 | | 1470513 | | | | 7.35 | 482.33 |
| 14 | | | | | 5 | 256 | | 1061983 | | | | 5.31 | 271.87 |
| 15 | | | | | 5 | 324 | | 871663 | | | | 4.36 | 282.42 |
| 16 | | | | | 5 | 314 | | 797508 | | | | 3.99 | 250.42 |
| 17 | | | | | 5 | 218 | | 602471 | | | | 3.01 | 131.34 |
| 18 | | | | | 5 | 314 | | 1089928 | | | | 5.45 | 342.24 |
| 19 | | | | | 5 | 296 | 67 | 554189 | | | | 2.77 | 164.04 |
| 20 | | | | | IS | IS | | 880809 | | | | | |
| 21 | | | | | IS | IS | | 18210 | | | | | |
| 22 | | | | | IS | IS | | 43032 | | | | | |
| 23 | | | | | IS | IS | | 67819 | | | | | |
| 24 | | | | | IS | IS | | 82546 | | | | | |
| 25 | | | | | IS | IS | | 66129 | | | | | |
| 26 | 7.9 | 57 | 2.91 | 0.05 | 10 | 310 | 56 | 56819 | 3.24 | 0.17 | 0.00 | 0.57 | 17.61 |
| 27 | | | | | IS | IS | | 533203 | | | | | |
| 28 | | | | | IS | IS | | 517638 | | | | | |
| 29 | | | | | IS | IS | | 322333 | | | | | |
| 30 | | | | | IS | IS | | 324398 | | | | | |
| 31 | | | | | IS | IS | | 501537 | | | | | |

**IS:** Insufficient amount of sample due to low flow or sampler malfunction.

**Bord Na Mona Energy Ltd, Derrygreenagh Group, Rochfordsbridge, Co Westmeath**
**Composite Sampler Results Licence 501**

| Month | | | | Parameters | | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| June | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2004 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | IS | IS | | 208355 | | | | | |
| 2 | 7.5 | 56 | 3.68 | 0.07 | 14 | 270 | 119 | 586223 | 32.83 | 2.16 | 0.04 | 8.21 | 158.28 |
| 3 | | | | | IS | IS | | 323607 | | | | | |
| 4 | | | | | IS | IS | | 313327 | | | | | |
| 5 | | | | | IS | IS | | 231814 | | | | | |
| 6 | | | | | IS | IS | | 192747 | | | | | |
| 7 | | | | | IS | IS | | 279855 | | | | | |
| 8 | | | | | IS | IS | | 45440 | | | | | |
| 9 | 7.9 | 48 | 2.9 | 0.12 | 6 | 220 | 85 | 157681 | 7.57 | 0.46 | 0.02 | 0.95 | 34.69 |
| 10 | | | | | IS | IS | | 525410 | | | | | |
| 11 | | | | | IS | IS | | 289846 | | | | | |
| 12 | | | | | IS | IS | | 258180 | | | | | |
| 13 | | | | | IS | IS | | 226278 | | | | | |
| 14 | | | | | IS | IS | | 142002 | | | | | |
| 15 | | | | | IS | IS | | 44842 | | | | | |
| 16 | 7.9 | 33 | 3.54 | 0.05 | 5 | 228 | 94 | 90198 | 2.98 | 0.32 | 0.00 | 0.45 | 20.57 |
| 17 | | | | | 15 | 282 | | 80597 | | | | 1.21 | 22.73 |
| 18 | | | | | 5 | 260 | | | | | | | |
| 19 | | | | | 5 | 314 | | | | | | | |
| 20 | | | | | 8 | 288 | | | | | | | |
| 21 | | | | | 5 | 228 | | | | | | | |
| 22 | | | | | 13 | 50 | | | | | | | |
| 23 | 7.6 | 65 | 3.21 | 0.05 | 9 | 144 | 203 | | | | | | |
| 24 | | | | | IS | IS | | | | | | | |
| 25 | | | | | IS | IS | | | | | | | |
| 26 | | | | | IS | IS | | | | | | | |
| 27 | | | | | IS | IS | | | | | | | |
| 28 | | | | | IS | IS | | | | | | | |
| 29 | | | | | IS | IS | | | | | | | |
| 30 | 7.8 | 50 | 3.15 | 0.05 | 5 | 220 | 126 | | | | | | |
| 31 | | | | | | | | | | | | | |

**IS:** Insufficient amount of sample due to low flow or sampler malfunction.

**Bord Na Mona Energy Ltd, Derrygreenagh Group, Rochfordsbridge, Co Westmeath**
**Composite Sampler Results Licence 501**

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| July | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2004 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | IS | IS | | 206366 | | | | | |
| 2 | | | | | IS | IS | | 206366 | | | | | |
| 3 | | | | | IS | IS | | 228433 | | | | | |
| 4 | | | | | IS | IS | | 572698 | | | | | |
| 5 | | | | | IS | IS | | 252052 | | | | | |
| 6 | | | | | IS | IS | | 532518 | | | | | |
| 7 | 7.9 | 66 | 2.73 | 0.05 | 5 | 248 | 440 | 1195200 | 78.88 | 3.26 | 0.06 | 5.98 | 296.41 |
| 8 | | | | | 5 | 256 | | 837507 | | | | 4.19 | 214.40 |
| 9 | | | | | 5 | 254 | | 467389 | | | | 2.34 | 118.72 |
| 10 | | | | | 5 | 214 | | 389699 | | | | 1.95 | 83.40 |
| 11 | | | | | 5 | 262 | | 630242 | | | | 3.15 | 165.12 |
| 12 | | | | | 5 | 252 | | 502180 | | | | 2.51 | 126.55 |
| 13 | | | | | 5 | 273 | | 448695 | | | | 2.24 | 122.49 |
| 14 | 8 | 37 | 1.8 | 0.05 | 5 | 268 | 99 | 388667 | 14.38 | 0.70 | 0.02 | 1.94 | 104.16 |
| 15 | | | | | 9 | 428 | | 542392 | | | | 4.88 | 232.14 |
| 16 | | | | | 8 | 236 | | 408974 | | | | 3.27 | 96.52 |
| 17 | | | | | IS | IS | | 295874 | | | | | |
| 18 | | | | | IS | IS | | 247217 | | | | | |
| 19 | | | | | 5 | 260 | | 339398 | | | | 1.70 | 88.24 |
| 20 | | | | | 5 | 250 | | 455546 | | | | 2.28 | 113.89 |
| 21 | 7.8 | 4 | 2.89 | 0.06 | 5 | 242 | 90 | 207319 | 0.83 | 0.60 | 0.01 | 1.04 | 50.17 |
| 22 | | | | | IS | IS | | 137186 | | | | | |
| 23 | | | | | IS | IS | | 162969 | | | | | |
| 24 | | | | | IS | IS | | 111579 | | | | | |
| 25 | | | | | IS | IS | | 93919 | | | | | |
| 26 | | | | | IS | IS | | 137430 | | | | | |
| 27 | | | | | IS | IS | | 363003 | | | | | |
| 28 | 7.8 | 26 | 2.51 | 0.05 | 5 | 348 | 82 | 172918 | 4.50 | 0.43 | 0.01 | 0.86 | 60.18 |
| 29 | | | | | 5 | 236 | | 219447 | | | | 1.10 | 51.79 |
| 30 | | | | | 5 | 158 | | 42792 | | | | 0.21 | 6.76 |
| 31 | | | | | 13 | 166 | | 24082 | | | | 0.31 | 4.00 |

**IS:** Insufficient amount of sample due to low flow or sampler malfunction.

**Bord Na Mona Energy Ltd, Derrygreenagh Group, Rochfordsbridge, Co Westmeath**
**Composite Sampler Results Licence 501**

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| August | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2004 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 7 | 206 | | 41908 | | | | 0.29 | 8.63 |
| 2 | | | | | 5 | 182 | | 36422 | | | | 0.18 | 6.63 |
| 3 | | | | | 28 | 248 | | 835137 | | | | 23.38 | 207.11 |
| 4 | | | | | 18 | 166 | | 4545526 | | | | 81.82 | 754.56 |
| 5 | 7.6 | 74 | 1.95 | 0.05 | 5 | 178 | 174 | 1459370 | 107.99 | 2.85 | 0.07 | 7.30 | 259.77 |
| 6 | | | | | 5 | 210 | | 1010377 | | | | 5.05 | 212.18 |
| 7 | | | | | 5 | IS | | 105109 | | | | 0.53 | |
| 8 | | | | | 5 | IS | | 194018 | | | | 0.97 | |
| 9 | | | | | 5 | 200 | | 904361 | | | | 4.52 | 180.87 |
| 10 | | | | | 8 | 160 | | 1242595 | | | | 9.94 | 198.82 |
| 11 | | | | | 5 | 210 | | 1743890 | | | | 8.72 | 366.22 |
| 12 | 7.6 | 74 | 1.6 | 0.05 | 5 | 198 | 202 | 4431888 | 327.96 | 7.09 | 0.22 | 22.16 | 877.51 |
| 13 | | | | | 5 | 198 | | 2824370 | | | | 14.12 | 559.23 |
| 14 | | | | | 5 | 222 | | 1582249 | | | | 7.91 | 351.26 |
| 15 | | | | | 5 | 270 | | 779618 | | | | 3.90 | 210.50 |
| 16 | | | | | 5 | 208 | | 1893017 | | | | 9.47 | 393.75 |
| 17 | | | | | 5 | 216 | | 3258885 | | | | 16.29 | 703.92 |
| 18 | 7.6 | 63 | 0.8 | 0.08 | 5 | 206 | 215 | 2093679 | 131.90 | 1.67 | 0.17 | 10.47 | 431.30 |
| 19 | | | | | 5 | 146 | | 2531998 | | | | 12.66 | 369.67 |
| 20 | | | | | 5 | 150 | | 3086644 | | | | 15.43 | 463.00 |
| 21 | | | | | 5 | 214 | | 1760329 | | | | 8.80 | 376.71 |
| 22 | | | | | 5 | 204 | | 1794887 | | | | 8.97 | 366.16 |
| 23 | | | | | 5 | 154 | | 2730032 | | | | 13.65 | 420.42 |
| 24 | | | | | 5 | 174 | | 1787972 | | | | 8.94 | 311.11 |
| 25 | 7.5 | 38 | 1.12 | 0.05 | 19 | 164 | 266 | 3153584 | 119.84 | 3.53 | 0.16 | 59.92 | 517.19 |
| 26 | | | | | 5 | 28 | | 2021028 | | | | 10.11 | 56.59 |
| 27 | | | | | 5 | 122 | | 3393889 | | | | 16.97 | 414.05 |
| 28 | | | | | 5 | 170 | | 1951918 | | | | 9.76 | 331.83 |
| 29 | | | | | 5 | 168 | | 1298651 | | | | 6.49 | 218.17 |
| 30 | | | | | 5 | 248 | | 962922 | | | | 4.81 | 238.80 |
| 31 | | | | | 5 | 168 | | 757465 | | | | 3.79 | 127.25 |

**IS:** Insufficient amount of sample due to low flow or sampler malfunction.

**Bord Na Mona Energy Ltd, Derrygreenagh Group, Rochfordsbridge, Co Westmeath**
**Composite Sampler Results Licence 501**

| Month | | | | Parameters | | | | | | | Daily Totals | - | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| September | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2004 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | 7.6 | 37 | 1.91 | 0.05 | 5 | 152 | 151 | 805364 | 29.80 | 1.54 | 0.04 | 4.03 | 122.42 |
| 2 | | | | | 5 | 40 | | 861198 | | | | 4.31 | 34.45 |
| 3 | | | | | 14 | 278 | | 783969 | | | | 10.98 | 217.94 |
| 4 | | | | | 5 | 304 | | 782813 | | | | 3.91 | 237.98 |
| 5 | | | | | 10 | 320 | | 855143 | | | | 8.55 | 273.65 |
| 6 | | | | | 5 | 330 | | 823143 | | | | 4.12 | 271.64 |
| 7 | | | | | 5 | 338 | | 718035 | | | | 3.59 | 242.70 |
| 8 | 8.4 | 47 | 1.63 | 0.05 | 5 | 334 | 131 | 897970 | 42.20 | 1.46 | 0.04 | 4.49 | 299.92 |
| 9 | | | | | 5 | 214 | | 960342 | | | | 4.80 | 205.51 |
| 10 | | | | | 5 | 278 | | 1065753 | | | | 5.33 | 296.28 |
| 11 | | | | | 5 | 254 | | 1183867 | | | | 5.92 | 300.70 |
| 12 | | | | | 21 | 272 | | 1201738 | | | | 25.24 | 326.87 |
| 13 | | | | | 5 | 214 | | 1575411 | | | | 7.88 | 337.14 |
| 14 | | | | | 5 | 184 | | 971455 | | | | 4.86 | 178.75 |
| 15 | 7.7 | 53 | 2.74 | 0.05 | 5 | 220 | 158 | 0 | | | | | |
| 16 | | | | | 5 | 174 | | 987103 | | | | 4.94 | 171.76 |
| 17 | | | | | 8 | 198 | | 1608630 | | | | 12.87 | 318.51 |
| 18 | | | | | 6 | 190 | | 1567921 | | | | 9.41 | 297.90 |
| 19 | | | | | 10 | 102 | | 1413734 | | | | 14.14 | 144.20 |
| 20 | | | | | 5 | 158 | | 1756166 | | | | 8.78 | 277.47 |
| 21 | | | | | 5 | 212 | | 1524471 | | | | 7.62 | 323.19 |
| 22 | 8 | 54 | 1.25 | 0.05 | 12 | 212 | 126 | 1549778 | 83.69 | 1.94 | 0.08 | 18.60 | 328.55 |
| 23 | | | | | 5 | 232 | | 1689527 | | | | 8.45 | 391.97 |
| 24 | | | | | 10 | 226 | | 1349982 | | | | 13.50 | 305.10 |
| 25 | | | | | 6 | 230 | | 1129743 | | | | 6.78 | 259.84 |
| 26 | | | | | 5 | 14 | | 1239783 | | | | 6.20 | 17.36 |
| 27 | | | | | 6 | 168 | | 1297166 | | | | 7.78 | 217.92 |
| 28 | | | | | 5 | 172 | | 1113327 | | | | 5.57 | 191.49 |
| 29 | 7.8 | 53 | 2.23 | 0.05 | 9 | 200 | 143 | 1232045 | 65.30 | 2.75 | 0.06 | 11.09 | 246.41 |
| 30 | | | | | 10 | 178 | | 2041551 | | | | 20.42 | 363.40 |

**IS:** Insufficient amount of sample due to low flow or sampler malfunction.

## Bord Na Mona Energy Ltd, Derrygreenagh Group, Rochfordsbridge, Co Westmeath

## Composite Sampler Results Licence 501

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| October | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2004 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 30 | 154 | | 2018918 | | | | 60.57 | 310.91 |
| 2 | | | | | 8 | 200 | | 1974717 | | | | 15.80 | 394.94 |
| 3 | | | | | 12 | 174 | | 1996246 | | | | 23.95 | 347.35 |
| 4 | | | | | 12 | 104 | | 4343268 | | | | 52.12 | 451.70 |
| 5 | | | | | 13 | 126 | | 2729526 | | | | 35.48 | 343.92 |
| 6 | 7.7 | 57 | 1.42 | 0.05 | 6 | 166 | 177 | 1809816 | 103.16 | 2.57 | 0.09 | 10.86 | 300.43 |
| 7 | | | | | 5 | 178 | | 1914141 | | | | 9.57 | 340.72 |
| 8 | | | | | 6 | 174 | | 1685272 | | | | 10.11 | 293.24 |
| 9 | | | | | 10 | 184 | | 1629763 | | | | 16.30 | 299.88 |
| 10 | | | | | 8 | 244 | | 1629763 | | | | 13.04 | 397.66 |
| 11 | | | | | 5 | 236 | | 1629763 | | | | 8.15 | 384.62 |
| 12 | | | | | 5 | 244 | | 1629763 | | | | 8.15 | 397.66 |
| 13 | 8 | 32 | 1.4 | 0.08 | 5 | 244 | 114 | 1541432 | 49.33 | 2.16 | 0.12 | 7.71 | 376.11 |
| 14 | | | | | 5 | 278 | | 1331589 | | | | 6.66 | 370.18 |
| 15 | | | | | 6 | 298 | | 1458497 | | | | 8.75 | 434.63 |
| 16 | | | | | 11 | 310 | | 1728634 | | | | 19.01 | 535.88 |
| 17 | | | | | 14 | 286 | | 1714579 | | | | 24.00 | 490.37 |
| 18 | | | | | 15 | 237 | | 1683925 | | | | 25.26 | 399.09 |
| 19 | | | | | 42 | 232 | | 1909713 | | | | 80.21 | 443.05 |
| 20 | 8 | 71 | 2.73 | 0.08 | 26 | 182 | 101 | 1891196 | 134.27 | 5.16 | 0.15 | 49.17 | 344.20 |
| 21 | | | | | 24 | 146 | | 4185651 | | | | 100.46 | 611.11 |
| 22 | | | | | 14 | 196 | | 2473003 | | | | 34.62 | 484.71 |
| 23 | | | | | 24 | 118 | | 5020948 | | | | 120.50 | 592.47 |
| 24 | | | | | 9 | 106 | | 4929333 | | | | 44.36 | 522.51 |
| 25 | | | | | 29 | 142 | | 2166198 | | | | 62.82 | 307.60 |
| 26 | | | | | 5 | 192 | | 2611376 | | | | 13.06 | 501.38 |
| 27 | 7.9 | 36 | 1.48 | 0.05 | 5 | 196 | 141 | 2515715 | 90.57 | 3.72 | 0.13 | 12.58 | 493.08 |
| 28 | | | | | 5 | 196 | | 3666103 | | | | 18.33 | 718.56 |
| 29 | | | | | 16 | 146 | | 5586871 | | | | 89.39 | 815.68 |
| 30 | | | | | 16 | 116 | | 4485992 | | | | 71.78 | 520.38 |
| 31 | | | | | 21 | 216 | | 2533307 | | | | 53.20 | 547.19 |

**IS:** Insufficient amount of sample due to low flow or sampler malfunction.

**Bord Na Mona Energy Ltd, Derrygreenagh Group, Rochfordsbridge, Co Westmeath**

**Composite Sampler Results Licence 501**

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| November 2004 | pH | COD mg/l | Ammonia as N mg/l | Total Phosphorus mg/l | Suspended Solids mg/l | Total Solids mg/l | Colour Pt Co units | Flow Daily Total (litres) | COD Kg/Day | Ammonia as Kg/Day | Total Phosphorus Kg/Day | Suspended Solids Kg/Day | Total Solids Kg/Day |
| 1 | | | | | 7 | 214 | | 2466950 | | | | 17.27 | 527.93 |
| 2 | | | | | 7 | 232 | | 2413859 | | | | 16.90 | 560.02 |
| 3 | 8 | 83 | 0.94 | 0.05 | 10 | 238 | 125 | 2274971 | 188.82 | 2.14 | 0.11 | 22.75 | 541.44 |
| 4 | | | | | 16 | 112 | | 2213892 | | | | 35.42 | 247.96 |
| 5 | | | | | 10 | 282 | | 2067631 | | | | 20.68 | 583.07 |
| 6 | | | | | 6 | 280 | | 2003990 | | | | 12.02 | 561.12 |
| 7 | | | | | 6 | 308 | | 1912667 | | | | 11.48 | 589.10 |
| 8 | | | | | 12 | 300 | | 1717857 | | | | 20.61 | 515.36 |
| 9 | | | | | 5 | 321 | | 1619880 | | | | 8.10 | 519.98 |
| 10 | 7.7 | 46 | 2.42 | 0.05 | 5 | 334 | 106 | 1649742 | 75.89 | 3.99 | 0.08 | 8.25 | 551.01 |
| 11 | | | | | 20 | 280 | | 1719563 | | | | 34.39 | 481.48 |
| 12 | | | | | 13 | 274 | | 1610898 | | | | 20.94 | 441.39 |
| 13 | | | | | 14 | 224 | | 1400378 | | | | 19.61 | 313.68 |
| 14 | | | | | 8 | 230 | | 1438358 | | | | 11.51 | 330.82 |
| 15 | | | | | 7 | 74 | | 1486272 | | | | 10.40 | 109.98 |
| 16 | | | | | 14 | 282 | | 1473055 | | | | 20.62 | 415.40 |
| 17 | 7.9 | 33 | 2.27 | 0.07 | 8 | 288 | 93 | 1582074 | 52.21 | 3.59 | 0.11 | 12.66 | 455.64 |
| 18 | | | | | 5 | 114 | | 2669851 | | | | 13.35 | 304.36 |
| 19 | | | | | 5 | 127 | | 2858001 | | | | 14.29 | 362.97 |
| 20 | | | | | 5 | 138 | | 4378594 | | | | 21.89 | 604.25 |
| 21 | | | | | 5 | 116 | | 5289471 | | | | 26.45 | 613.58 |
| 22 | | | | | 5 | 56 | | 3384812 | | | | 16.92 | 189.55 |
| 23 | | | | | 5 | 68 | | 2188858 | | | | 10.94 | 148.84 |
| 24 | 7.7 | 28 | 0.94 | 0.05 | 5 | 26 | 122 | 2160200 | 60.49 | 2.03 | 0.11 | 10.80 | 56.17 |
| 25 | | | | | 30 | 198 | | 2184395 | | | | 65.53 | 432.51 |
| 26 | | | | | 6 | 146 | | 3227900 | | | | 19.37 | 471.27 |
| 27 | | | | | 6 | 242 | | 2229344 | | | | 13.38 | 539.50 |
| 28 | | | | | 5 | 232 | | 2184575 | | | | 10.92 | 506.82 |
| 29 | | | | | 8 | 274 | | 2201157 | | | | 17.61 | 603.12 |
| 30 | | | | | 5 | 256 | | 2073302 | | | | 10.37 | 530.77 |
| | | | | | | | | | | | | | |

**IS:** Insufficient amount of sample due to low flow or sampler malfunction.

## Bord Na Mona Energy Ltd, Derrygreenagh Group, Rochfordsbridge, Co Westmeath

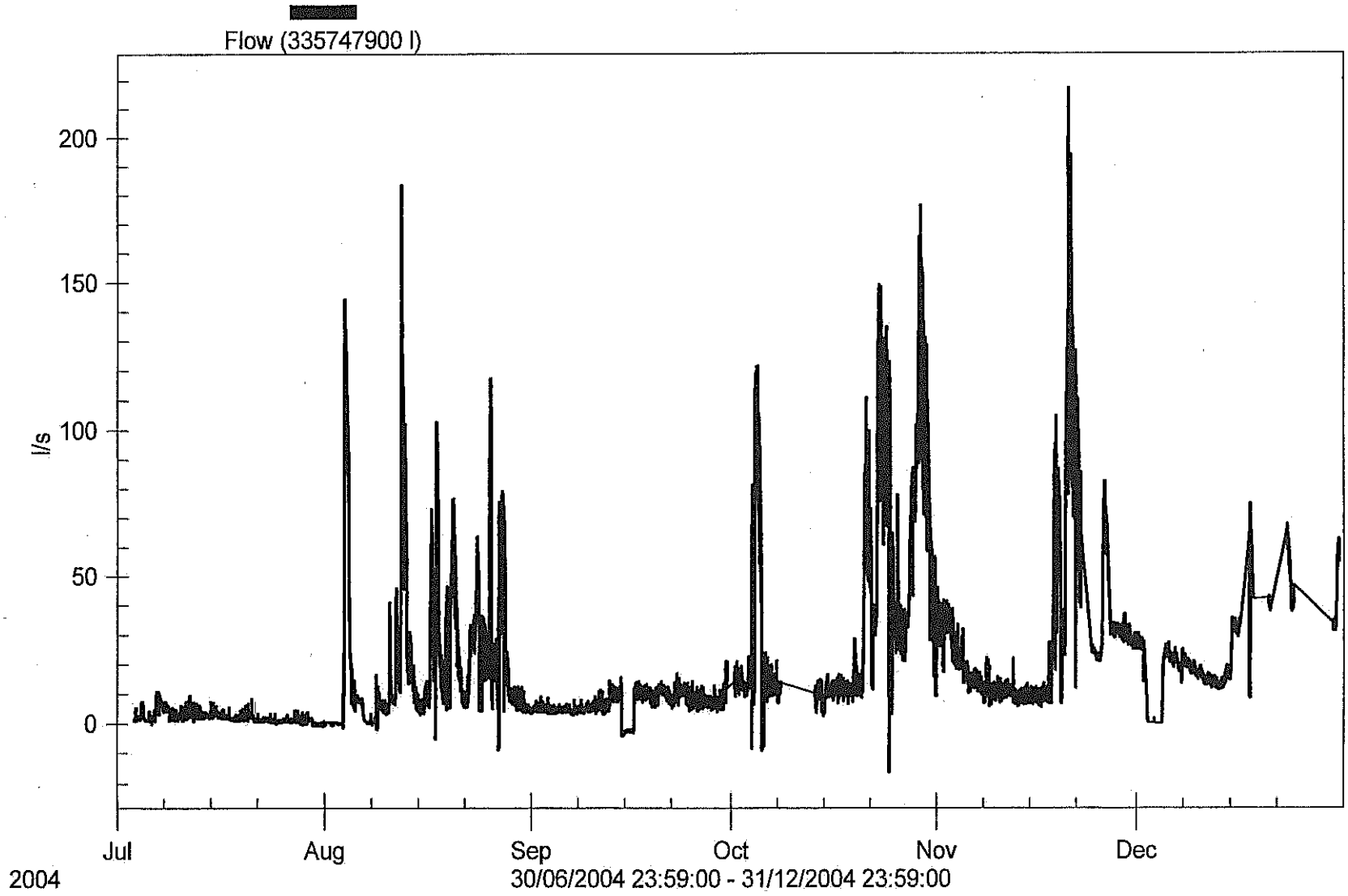
## Composite Sampler Results Licence 501

| Month | | | | Parameters | | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dec | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2004 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | 8 | 28 | 1.44 | 0.09 | 5 | 266 | 99 | 1988299 | 55.67 | 2.86 | 0.18 | 9.94 | 528.89 |
| 2 | | | | | 14 | 182 | | 717305 | | | | 10.04 | 130.55 |
| 3 | | | | | IS | IS | | 47370 | | | | | |
| 4 | | | | | 5 | 198 | | 249618 | | | | 1.25 | 49.42 |
| 5 | | | | | 5 | 120 | | 2088162 | | | | 10.44 | 250.58 |
| 6 | | | | | 10 | 250 | | 2104617 | | | | 21.05 | 526.15 |
| 7 | | | | | 5 | 278 | | 1971759 | | | | 9.86 | 548.15 |
| 8 | 8 | 31 | 1.24 | 0.05 | 6 | 247 | 107 | 1957443 | 60.68 | 2.43 | 0.10 | 11.74 | 483.49 |
| 9 | | | | | 5 | 170 | | 1882776 | | | | 9.41 | 320.07 |
| 10 | | | | | 5 | 178 | | 1861585 | | | | 9.31 | 331.36 |
| 11 | | | | | 5 | 66 | | 1819179 | | | | 9.10 | 120.07 |
| 12 | | | | | 5 | 78 | | 1792956 | | | | 8.96 | 139.85 |
| 13 | | | | | 5 | 140 | | 1795857 | | | | 8.98 | 251.42 |
| 14 | | | | | 5 | 114 | | 1874202 | | | | 9.37 | 213.66 |
| 15 | 8 | 10 | 0.05 | 0.05 | 5 | 116 | 143 | 2201859 | 22.02 | 0.11 | 0.11 | 11.01 | 255.42 |
| 16 | | | | | 8 | 58 | | 2916326 | | | | 23.33 | 169.15 |
| 17 | | | | | 5 | 50 | | 3143279 | | | | 15.72 | 157.16 |
| 18 | | | | | 16 | 130 | | 2609111 | | | | 41.75 | 339.18 |
| 19 | | | | | IS | IS | | 2350080 | | | | | |
| 20 | | | | | 17 | 128 | | 2347246 | | | | 39.90 | 300.45 |
| 21 | | | | | IS | IS | | 3389994 | | | | | |
| 22 | 7.7 | 62 | 1.39 | 0.05 | 12 | 120 | 169 | 3390768 | 210.23 | 4.71 | 0.17 | 40.69 | 406.89 |
| 23 | | | | | 6 | 117 | | 3255124 | | | | 19.53 | 380.85 |
| 24 | | | | | 10 | 138 | | 1266199 | | | | 12.66 | 174.74 |
| 25 | | | | | 20 | 202 | | | | | | | |
| 26 | | | | | 5 | 149 | | | | | | | |
| 27 | | | | | 5 | 166 | | | | | | | |
| 28 | | | | | 5 | 174 | | | | | | | |
| 29 | 7.9 | 10 | 1.74 | 0.05 | 5 | 144 | 150 | | | | | | |
| 30 | | | | | | | | | | | | | |
| 31 | | | | | | | | | | | | | |

**IS:** Insufficient amount of sample due to low flow or sampler malfunction.

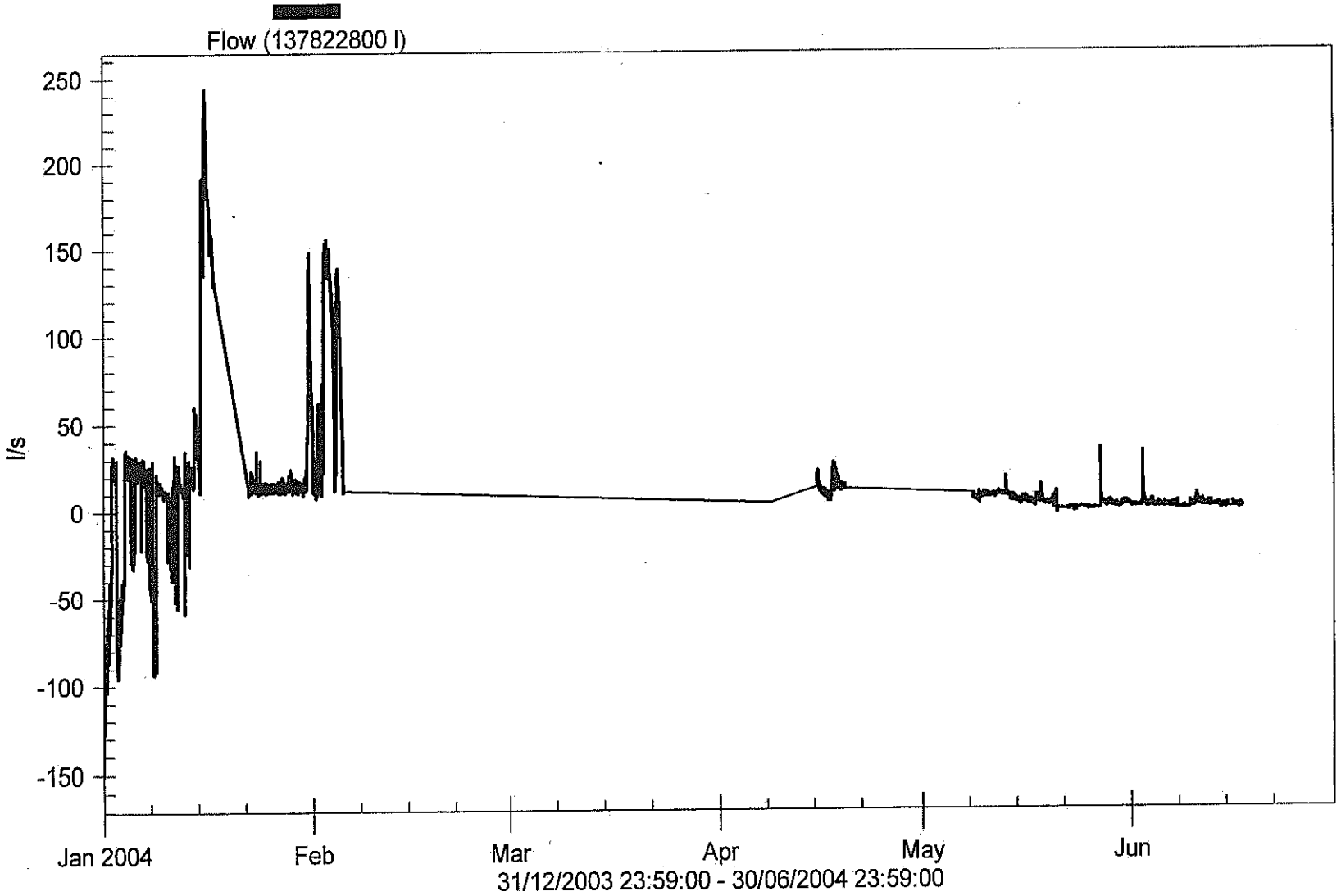
# Derrygreenagh Composite Sampler

July to Dec



# Derrygreenagh Composite Sampler

Jan to June



BORD NA MÓNA

BORD NA MÓNA ENERGY LIMITED

ENVIRONMENTAL PROTECTION AGENCY
03 APR 2006

Office of Environmental Enforcement
South East Region
Environmental Protection Agency
PO Box 3000
Johnstown Castle Estate
Co Wexford

March 31, 2006

Ref: AER/501-006

Dear Sir,

Please find enclosed the **Derrygreenagh Group** Annual Environmental Report, IPC Licence (ref. no. 501).

Yours sincerely

P.P. Eamonn Mulhall
Paul Riordan
Eastern Regional Manager.

EPA
IPC ENFORCEMENT WEXFORD.
Main File ✓
Public File ✓
Evaluation File Team A
Date 3/4/06 EB
For Assessment

DERRYGREENAGH, ROCHFORTBRIDGE, MULLINGAR, CO. WESTMEATH, IRELAND
TELEPHONE: (044) 22181. FAX: (044) 22344

REGISTERED OFFICE: MAIN STREET, NEWBRIDGE, CO. KILDARE
REGISTERED IN IRELAND NUMBER: 303287

BORD NA MÓNA
BORD NA MÓNA ENERGY LIMITED
Derrygreenagh,Rochfortbridge,Mullingar,Co-Westmeath.

ENVIRONMENTAL PROTECTION AGENCY
03 APR 2006

# Annual Environmental Report 2005
# IPC LICENCE 501

**March 2006**

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**Appendix 1:** Composite Sampler Results

## 1.0 Introduction

1.1 IPC Licence Register No **501**

1.2 Name & Location of Site

| | |
|---|---|
| **Name:** | Bord na Mona Energy Limited. |
| **Address:** | Derrygreenagh Group<br>Derrygreenagh Works<br>Rochfortbridge<br>Mullingar<br>Co Westmeath. |
| **Telephone No:** | 044 / 22181 Fax No: 044 / 22344 |
| **Contact Name:** | Paul Riordan |
| **Position:** | Regional Manager. |
| **National Grid Reference:** | E249450 N238140 |

1.3 Description of Activities

The Derrygreenagh Group consists of the Derrygreenagh and Ballivor Groups and Rossan Bog.
The Derrygreenagh group of bogs is located in North Offaly and Southeast Westmeath. The Derrygreenagh group comprises of 3664 acquired hectares, of which there was 629 nett hectares in production in the 2005 season. The main catchment of these areas is the River Boyne.

The Ballivor group is made up of the bogs in the Ballivor, Carranstown, Bracklin and Lisclogher areas. There was a total of 250 hectares in production in the 2005 season and each of these areas are linked by peatland railway to the Bord na Mona horticultural factory, situated between Ballivor and Raharney villages. Drainage from these bogs is to the Deel and Stonyford rivers, tributaries of the Boyne.

Rossan bog is situated one mile from Kinnegad village. There was 140 hectares in milled moss production in the 2005 season. This bog drains to the Kinnegad River, a tributary of the River Boyne.

The Derrygreenagh Group currently employs 59 permanent and 7 seasonal workers. The Ballivor bogs employing 7 permanant and 3 seasonals, with 3 premanent and 4 seasonals employed in Rossan. Giving a total of 69 permanent and 14 seasonal employees across the licence area.

Transport operations are carried out on a seven day cycle throughout the year. Production operations are typically carried out over a seven day week (weather permitting) for 12 to 15 hours per day.

**Peat Milling Operations.**

For milled peat production the bog is laid out in a series of rectangular fields of varying length and 15m wide with drains located between. There are essentially four operations involved in milled peat production:

- Milling.
- Harrowing.
- Ridging.
- Harvesting.

**Milling.**
Special milling machines work there way along the fields, milling approximately 15mm of peat of the top of the bog in a pass.

**Harrowing**
In the course of drying, the milled peat is turned a number of times to avail of the drying conditions. This is achieved with a machine called a harrow. The milled peat is harrowed until its moisture content is down to approximately 40-50%, which can take up to two to three days, weather depending.

**Ridging**
The dry peat is then scraped into long ridges running down the centre of each field. This is done with a ridger, a machine consisting of a series of blades in the shape of a v that opens the full width of the field.

**Harvesting**
During harvesting every eleventh field is used to stockpile the peat, with this field receiving the milled peat from the five fields either side.

The milled peat is then transported via the existing network of peatland railways to one of the following locations.

- Power station ( EPL )
- Horticultural Factory.
- Briquette Factory. ( Via Road )
- Dublin Port ( Via Road )

1.4 Environmental Management of the Company

The organisational structure within the Derrygreenagh Group is presented in the flow chart below.

# Derrygreenagh Group

## Environmental Responsibilities




(1) Overall environmental responsibilities
(2) Records of complaints and registers
(3) All production related issues
(4) Machine maintenance
(5) Co-ordinating environmental affairs
(6) All peat transportation matters
(7) Silt pond maintenance, tea centres, codes of practice
(8) Fuel loading, oil traps, weekly workshop inspections.

1.5 Environmental Policy

**BORD NA MÓNA**

**BORD NA MÓNA ENERGY LIMITED**
**Derrygreenagh,Rochfortbridge,Mullingar,Co-Westmeath.**

Bord na Mona Energy Limited is a commercial semi-state body with responsibility to develop Irelands peat resources in the national interest.

Bord na Mona Energy Limited is committed to gather and make available information on all aspects of its environmental impact and to help improve understanding among the public generally of its role and the importance of Irish peatlands.

Bord na Mona Energy Limited recognises the importance of peatland conservation.

Bord na Mona Energy Limited will leave behind all areas it owns as either an economically or socially integrated resource of a high environmental value.

Bord na Mona Energy Limited seeks to conduct all aspects of its buisness in an environmentally sensitive value.

Bord na Mona Energy Limited will establish an environmental management system specifically addressing the following impacts.

- Discharges to water.
- Emissions to atmosphere.
- Waste disposal.
- Use of natural resources.
- Noise, vibration, odour, dust and visual effects.
- Natural environment and eco-system.

The environmental management system will be monitored, maintained and continually improved.

A system of regular environmental audits will be put in place.

Bord na Mona Energy Limited will continue research and development into all aspects of its environmental impact.

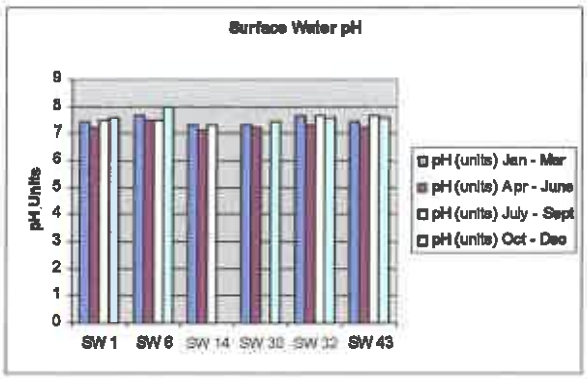
This statement is published and is available at all locations within the division and its contents are brought to the attention of all employees.

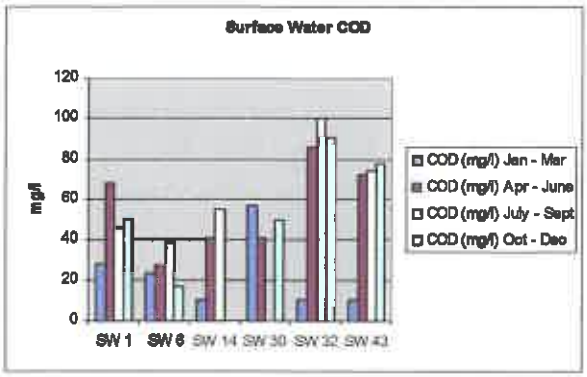
## 2.0 Summary Information

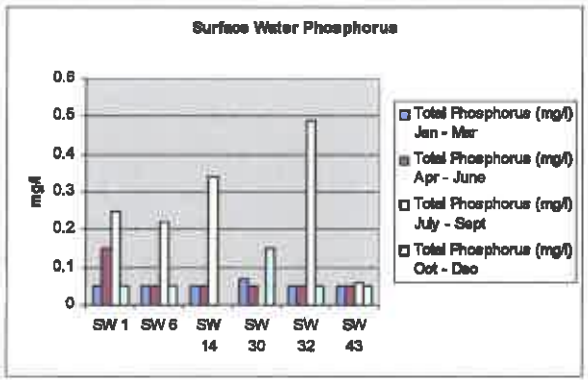
### 2.1 Emissions to Water Summary

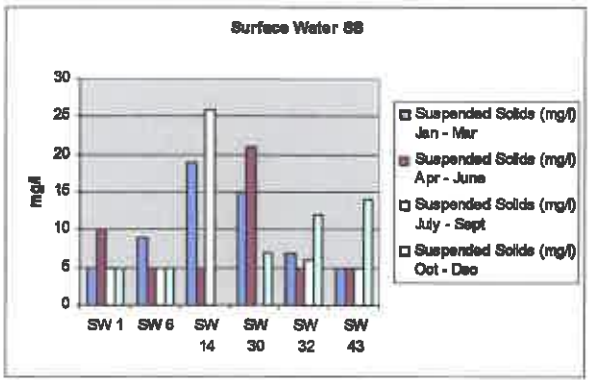
#### 2.1.1 Silt Pond Emissions

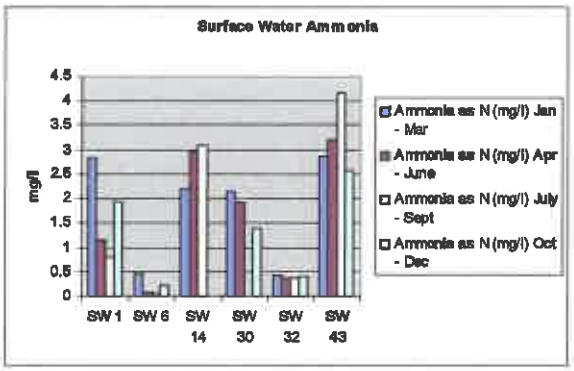
The following graphs compare results obtained during the reporting period at all surface water monitoring points.

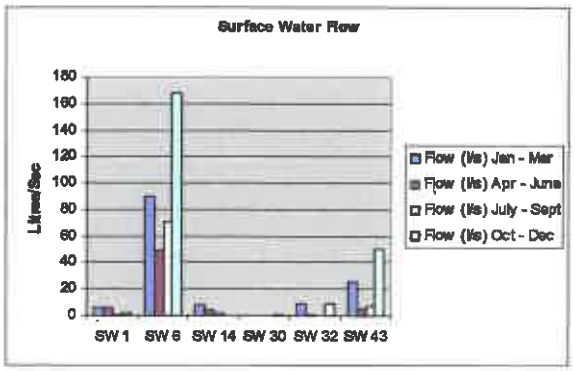



**Comment**

In general results were good on all parameters analysed. Suspended solids were within the emission limit value of 35mg/litre. Elevated ammonia detected at SW 43 can be common in waters emanating from certain peatlands. Due to the fact that 2005 was the fifth driest year since records began in 1956, flow rates during the period were a lot less than in previous years. It is proposed to monitor at the same locations in the upcoming year, except for at SW 14, due to the construction of the new N6 Motorway which will impede access. An alternative location will be selected and the agency informed.

2.1.2 Yard Discharge

The tables below are a summary of the emissions to surface waters from the yard and workshop at the Derrygreenagh Works.

**Derrygreenagh SWE-2**

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COD mg/l | 58 | 47 | 14 | 28 | - | 39 | - | - | 34 | 30 | - | 91 |

**Comment.**
No samples were available on the day of sampling in the months May, July & November. As with the surface water results, flow rates were very low due to the particularly dry year.

2.1.3 Composite Sampler Report

The composite sampler remains at the same location as last year. There was no production in the bog upstream of the sampler during 2005. This was reflected in sample results which returned no non-compliances for the period and would suggest, bogs which are not in production have no great influence on receiving waters in relation to suspended solids.
Attached in Appendix 1 are the results of the monitoring carried out using the composite sampler.

2.1.4 Non-compliance's

There were no non-compliances during the reporting period in relation to surface water monitoring.

**2.2Emissions to Air**

2.2.1 Dust Monitoring

The tables below contain the dust emissions for each dust monitoring location within the Derrygreenagh Group. Monitoring took place on three separate occasions during the period, May and August 2005.

**May - June**

| Emission Point | Parameter | Emission ($mg/m^2$/day) | Emission Limit Value | Compliant |
|---|---|---|---|---|
| DM 01 | Dust | 72 | (350$mg/m^2$/Day) | YES |
| DM 02 | Dust | 78 | (350$mg/m^2$/Day) | YES |
| DM 03 | Dust | 466 | (350$mg/m^2$/Day) | NO |

**June - July**

| Emission Point | Parameter | Emission ($mg/m^2$ /day) | Emission Limit Value | Compliant |
|---|---|---|---|---|
| DM 01 | Dust | 18 | (350mg/$m^2$ /Day) | YES |
| DM 02 | Dust | 42 | (350mg/$m^2$ /Day) | YES |
| DM 03 | Dust | 59 | (350mg/$m^2$ /Day) | YES |

**July - Aug**

| Emission Point | Parameter | Emission ($mg/m^2$ /day) | Emission Limit Value | Compliant |
|---|---|---|---|---|
| DM 01 | Dust | 53 | (350mg/$m^2$ /Day) | YES |
| DM 02 | Dust | 53 | (350mg/$m^2$ /Day) | YES |
| DM 03 | Dust | 53 | (350mg/$m^2$ /Day) | YES |

**Note:** DM 01= Toar Bog. DM 02 = Derryhinch Bog. DM 03 = Ballivor Bog.

2.2.2 Non-compliance's

The emission limit value was exceeded at DM 03 during the first monitoring event. This was reported to the Agency ( Ref D/G 501-CA-005 ). No complaints were received at the time, from adjacent dwellings. Monitoring will take place at this location once production begins in 2006. Operatives have also been reminded of the sensitivity of the location.

## 2.3Waste Arisings

2.3.1 Non-Hazardous Waste

The following table lists the quantities of the wastes generated from January-December 2005.

| Waste Type | Quantity ( Tonnes ) |
|---|---|
| Silt Pond Waste | 412 * |
| Scrap Metal | 163.59 |
| Polyethylene | 237.32 |
| Mixed Municipal Waste | 12.33 |
| **Total** | **825.24** |

**Note:**

* Estimated amount. Scrap metal and Polyethlene are both recycled.

### 2.3.2 Hazardous Waste

The following table is a record of all the hazardous wastes handled by the Derrygreenagh Group from January - December 2005.

| WASTE DESCRIPTION | EWC CODE | TONNES | NAME OF CONTRACTOR | DESTINATION | DATE | LICENCE NR |
|---|---|---|---|---|---|---|
| Waste Oil | 13 02 08 | 3 | Atlas Waste Oil | Portlaoise | 19/01/2005 | 184-1 |
| Lead Acid Batteries | 16 06 01 | 1.684 | Returnbatt Ltd | Kildare Town | 21/02/2005 | 067/OY/11/02 |
| Waste Oil | 13 02 08 | 3.750 | Atlas Waste Oil | Portlaoise | 29/03/2005 | 184-1 |
| Oily Rags | 13 08 99 | 480 L | Atlas Waste Oil | Portlaoise | 12/04/2005 | 184-1 |
| Waste Grease | 13 08 99 | 210 L | Atlas Waste Oil | Portlaoise | 12/04/2005 | 184-1 |
| Lead Acid Batteries | 16 06 01 | 1 | Returnbatt Ltd | Kildare Town | 16/05/2005 | 067/OY/11/02 |
| Waste Oil | 13 02 08 | 4 | Atlas Waste Oil | Portlaoise | 03/06/2005 | 184-1 |
| Parts Wash Kerosene | 11 01 13 | 90 L | Safety Kleen | Dublin | 16/06/2005 | 99-1 |
| Oil/Sludge | 13 05 07 | 10 | Atlas Waste Oil | Portlaoise | 09/08/2005 | 184-1 |
| Waste Oil | 13 02 08 | 2 | Atlas Waste Oil | Portlaoise | 23/08/2005 | 184-1 |
| Waste Oil | 13 02 08 | 5.3 | Atlas Waste Oil | Portlaoise | 24/08/2005 | 184-1 |
| Fire Extinguishers | | 0.06 | Apex Fire | Dublin | 22/09/2005 | |
| Parts Wash Kerosene | 11 01 13 | 90 L | Safety Kleen | Dublin | 04/10/2005 | 99-1 |
| Oily Rags | 13 08 99 | 240 L | Atlas Waste Oil | Portlaoise | 17/11/2005 | 184-1 |
| Waste Grease | 13 08 99 | 205 L | Atlas Waste Oil | Portlaoise | 17/11/2005 | 184-1 |
| Thinners | 08 01 11 | 205 L | Atlas Waste Oil | Portlaoise | 17/11/2005 | 184-1 |
| Lead Acid Batteries | 16 06 01 | 2.434 | Returnbatt Ltd | Kildare Town | 29/11/2005 | 067/OY/11/02 |
| Oil Filters | 15 02 03 | 660 L | Atlas Waste Oil | Portlaoise | 30/11/2005 | 184-1 |
| Waste Oil | 13 02 08 | 4 | Atlas Waste Oil | Portlaoise | 14/12/2005 | 184-1 |

## 2.4 Energy and Water Consumption

### 2.4.1 Energy Consumption

The table below is a summary of the energy consumption for the Derrygreenagh Group, from the dates January – December 2005.
Water is not included, as it is not used as part of the production process. It is only used in offices, canteens and workshops on a domestic scale.

| Fuel | Volume $M^3$ | Tonnes | MW/Hours |
|---|---|---|---|
| **Jan - Dec 2005** | | | |
| Diesel | 325.948 | 270.537 | 3192.34 |
| Electricity | | | 30.754 |
| Peat Briquettes | | 231.26 | 1156.3 |
| **Total** | **325.948** | **501.797** | **4379.394** |

## 2.5 Environmental Incidents & Complaints

### 2.5.1 Incidents

There were no incidents within the Derrygreenagh Group during the reporting period.

| Environmental Incidents | Number of Incidents |
|---|---|
| Incidents | 0 |
| Incidents requiring corrective action | 0 |
| **Categories of Incident** | |
| Odour | |
| Noise | |
| Water | |
| Air | |
| Procedural | |
| Miscellaneous | |

### 2.5.2 Complaints

There were no complaints to the Derrygreenagh Group during the reporting period.

| Environmental Complaints | Number of complaints |
|---|---|
| Complaints received | 0 |
| Complaints requiring corrective action | 0 |
| **Categories of complaint** | |
| Odour | |
| Noise | |
| Water | |
| Air | |
| Procedural | |
| Miscellaneous | |

## 3.0 Management of the Activity

### 3.1 Environmental Management Programme Report 2005

| Environmental Management Report for 2005 | |
|---|---|
| **Project** | |
| Project 1. Reduction of fugitive dust emissions. | **Training**<br><br>All employees both permanent and seasonal were shown the cleaner production and environmental video during the year as part of an ongoing training programme. Each training group were also given a talk on the video by the environmental co-ordinator followed by a questions and answers session. Details of attendants retained on the training file.<br><br>An internal audit of all IPC licensed sites also occurred during 2005. This included an assessment of the dust prevention measures in-place or planned. A copy of the audit findings is on file at each works.<br><br>**Hydraulic Harrows**<br>Hydraulic harrows are currently in operation at appropriate areas / locations<br><br>**Headland Peat Collection**<br>There is one headland peat collector in operation This has proved very successful in reducing headland peat. |
| Project 2. Minimisation of Suspended Solids | This project is on-going and is primarily one of training for all production personnel, and is covered in the Cleaner Production Video, as in Project 1 (Training). |
| Project 3. Effective spill/leak management of mobile fuelling tanks | All of BNM's production bogs now have locations highlighted as being suitable for re-fuelling on the bog.These locations have been chosen having due regard to location of watercourses and drains. Mobile fueling tanks are currently being upgraded on a phased basis with 2 tanks fully overhauled in 2005. |
| Project 4. Re-use of silt pond waste | This project will be kept active should any opportunities for re-using silt pond waste arise. |

| | |
|---|---|
| Project 5. Collection, storage and re-use of polythene. | Polythene collection is ongoing in BNM, and volumes collected and recycled are recorded in the Non-hazardous Waste records in the AER.<br><br>All bogs now have a hard standing area, where the rolls of polythene are stored for collection and subsequent recycling. In addition to this, procedures have been put in-place, and are highlighted during training, about best practice for stripping, collection and storage.<br>All areas have a pollyroller device.<br><br>A total of 237 tonnes of polyethlene was recycled in 2005. |
| Project 6. Condition 2.2.2 (v) *Provision of measures to protect dust sensitive areas.* | DSL's have been identified within the licence area. Existing shelter belts were maintained where required during the reporting period. During production such areas are closely monitored and operatives continually reminded of their responsibilities. |

## .2 Environmental Management Programme Proposal for 2006

| Environmental Management Programme Proposal for 2006 | |
|---|---|
| **Project** | |
| Project 1. Reduction of fugitive dust emissions. | **Training**<br><br>Training of all new operatives will take place in 2006. Any changes in working procedures should they occur, will also be communicated to all personnel.<br><br>**Headland Peat**<br><br>Continue with the practice of lifting headland peat at the various dust sensitive locations on a rotational basis. Identify any potential dust sensitive location before production begins and include same in the roster.<br><br>**Hydraulic harrows**<br><br>Continue using hydraulic harrows in areas of sensitivity and identify any potential dust sensitive locations where additional harrows may be required. |
| Project 2. Minimisation of Suspended Solids | Inspections during 2005 primarily targeted tea centres, oil stores, workshops etc. It is proposed to carry out inspections at production locations during 2006, looking at cleaner production, dust sensitive areas, silt pond maintenance etc. The results of these inspections will be reported to the General Manager and any corrective actions will be maintained on file. |
| Project 3. Effective spill/leak management of mobile fuelling tanks | These areas will also be inspected as part of the proposed inspections under Project 6 above. Compliance with Conditions 9.1.1 to 9.1.14 will be checked and any improvements and corrective actions will be documented and maintained on file. The overhaul of all service trains will continue on a phased basis. The use of designated service areas will continue. |

| | |
|---|---|
| Project 4. Re-use of silt pond waste | This project will be kept active should any opportunities for re-using silt pond waste arise. |
| Project 5. Collection, storage and re-use of polythene. | An invitation to tender for the recycling of BNM's polythene was sent to a number of interested companies in 2005. Six companies expressed in interest, and are currently being assessed as to environmental compliance with permitting regulations, collection methods, waste records transfer etc. It is proposed to select one or two of these companies to contract the recycling of the BNM Polythene in 2006.<br><br>The Polyrollers developed in BNM will be removing and wrapping polythene in the coming months. This year will have a renewed emphasis on the reduction of peat and water presence in the rolls. Derrygreenagh are to receive two more Pollyrollers in 2006. |
| Project 6. Condition 2.2.2 (v)<br>*Provision of measures to protect dust sensitive areas.* | Identify areas where shelter belts may be planted, where no complaints were received but may in time become dust sensitive due to encroaching housing development. |

3.3 Environmental Expenditure

The table below lists the environmental costs incurred by the Derrygreenagh Group between January – December 2005.
In calculating the environmental costs 70% of the total costs were attributed to Licence 503 and 30% to Licence 501.The Ballivor Group costs were then added to the Derrygreenagh totals.

| Expenditure Related to the Operation of the Derrygreenagh IPC Licence During the Period January – December 2005 | | | |
|---|---|---|---|
| Description | Ballivor Cost | D/Green Cost | Total Cost (€) |
| Plant @ €42 / hour | 23,520 | 221,732 | 245,252 |
| Labour | 11,200 | 105,587 | 116,787 |
| Materials | NA | 35,431 | 35,431 |
| Overheads (ESB, Phones, Consumables) | 2,500 | 7,000 | 9,500 |
| Laboratory Analysis | NA | 18,110 | 18,110 |
| EPA Fees | NA | 8,980 | 8,980 |
| Total | €37,220 | €396,840 | €434,060 |

## 4.0 Licence Specific Reports

4.1 Surface Water Discharge Monitoring Location Programme Review

The surface water discharge monitoring location programme remains the same as was submitted and accepted by the Agency in June 2000.
Pipes have been fitted at each location in order to accommodate flow metering and the provision of safe access is also ongoing.
Emission point signs have been designed and are in place.

4.2 Bunding Programme

The bunding programme for large scale oil storage facilities is complete and the works certified.

4.3 Boiler Combustion Efficiency

Boiler Details
A new oil fired burner was installed at Derrygreenagh during the reporting period. It is a Riello RL 70 kerosene burner. The briquette fuelled danstoker is retained as a backup boiler but has not been used to date. An efficiency test was carried out on the new burner the results of which had not been received at the time of submission of this report.

4.4 Resource consumption Summary

There was a total of 120,617 tonnes of milled peat produced across the licence area in the production season 2005.
There was also a total of 192,798 tonnes of stock peat sold during the reporting period.

4.5 De-silting programme report

**Summary Data Table of Ponds De-Silted From Jan-December 2005**

| Bog | No Silt Ponds | Cleaned Once | Cleaned Twice | Cleaned Three Times | Notes |
|---|---|---|---|---|---|
| Ballivor | 10 | 5 | | | |
| Carranstown | 5 | 2 | 1 | | |
| Bracklin West | 6 | 5 | | | |
| Lisclogher | 7 | | | | ** |
| Kinnegad | 6 | 1 | 5 | | |
| D/Hinch | 4 | | | | ** |
| Drumman | 6 | | | | ** |
| Ballybeg | 6 | 5 | 1 | | |
| Toar | 6 | | 6 | | ** |

**: No production at this Bog in 2005.
**Note:** Any pond which was not cleaned at least twice, as required by the licence, is due to the fact that inspections showed those ponds did not require a second cleaning.

4.6 Bog Development and Operational Programme

The bogs in the Derrygreenagh Group are well into their productive lives, therefore there will be no development in the year 2006.
However in the Ballivor Group, Carranstown and Lisclogher West bogs are currently under development, the works involve production field preparation and drainage works such as piping and also some silt control works.

There will be 630.88 nett hectares in production in the 2006 season, yeilding 128,006 tonnes @ 55% moisture content.

Derrygreenagh will account for 49,356 tonnes and 240 hectares.
Ballivor will account for 51,480 tonnes and 252.71 hectares and Rossan will account for 27,170 tonnes and 138.17 hectares.

4.7 Bog Rehabilition Report
There was no bog rehabilitation carried out within the Derrygreenagh group during the reporting period.
Management guidelines for the planning and implementation of cutaway bog rehabilitation have been adopted and the document is currently available for inspection on file at the Derrygreenagh office.

**5.0 Summary**

With regard to environmental compliance at the Derrygreenagh Group of Bogs, there were no exceedences in the quarterly grab sampling.
There was one non-compliance in relation to the Composite Sampler during the period January to December 2005. Dust monitoring results at the dust sensitive locations were in general good although as stated in the body of this report there was one exceedence. There were no complaint of an environmental nature received during the reporting period.

The staff awareness through training and involvement in the operation of the licence has also improved immensely. A full programme of training and awareness has been conducted at the works and has targeted all personnel ie. Office, Workshop, Transport and Production.
Bord na Mona, Derrygreenagh Group, will continue to strive to maintain and improve its level of environmental compliance.

Bord na Mona are project partners of the South Eastern River Basin District Management, as set up under the Water Framework Directive.
Bord na Mona are also involved in catchment management on the River Barrow.

Bord na Mona Energy Ltd would like to take this opportunity to advise the Environmental Protection Agency of its continued commitment to improving its environmental performance by adopting cleaner production methods and improving its environmental protection measures.

# APPENDIX 1

# Composite Sampler Results

**Bord Na Mona Energy Ltd, Derrygreenagh ( oup, Rochfordsbridge, Co Westmea**

**Composite Sampler Results Licence 501**

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Jan | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2005 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | IS | IS | | | | | | | |
| 2 | | | | | IS | IS | | | | | | | |
| 3 | | | | | IS | IS | | | | | | | |
| 4 | | | | | IS | IS | | | | | | | |
| 5 | 7.5 | 25 | 2.04 | 0.05 | 5 | 214 | 133 | | | | | | |
| 6 | | | | | 5 | 202 | | | | | | | |
| 7 | | | | | 5 | 140 | | | | | | | |
| 8 | | | | | 19 | 120 | | | | | | | |
| 9 | | | | | 13 | 142 | | | | | | | |
| 10 | | | | | 18 | 116 | | | | | | | |
| 11 | | | | | 6 | 130 | | | | | | | |
| 12 | 7.6 | 30 | 0.94 | 0.05 | 5 | 182 | 128 | | | | | | |
| 13 | | | | | 7 | 50 | | | | | | | |
| 14 | | | | | 7 | 228 | | | | | | | |
| 15 | | | | | 6 | 232 | | | | | | | |
| 16 | | | | | 5 | 240 | | | | | | | |
| 17 | | | | | 6 | 246 | | | | | | | |
| 18 | | | | | 7 | 228 | | | | | | | |
| 19 | 7.5 | 45 | 0.87 | 0.05 | 13 | 124 | 132 | | | | | | |
| 20 | | | | | 5 | 84 | | | | | | | |
| 21 | | | | | 5 | 87 | | | | | | | |
| 22 | | | | | 5 | 54 | | | | | | | |
| 23 | | | | | 5 | 228 | | | | | | | |
| 24 | | | | | 5 | 224 | | | | | | | |
| 25 | | | | | 5 | 214 | | | | | | | |
| 26 | 7.6 | 35 | 1.74 | 0.05 | 5 | 244 | 84 | | | | | | |
| 27 | | | | | 8 | 198 | | | | | | | |
| 28 | | | | | IS | IS | | | | | | | |
| 29 | | | | | IS | IS | | | | | | | |
| 30 | | | | | IS | IS | | | | | | | |
| 31 | | | | | IS | IS | | | | | | | |

* All flow data up to October 2005 was lost due to a technical fault in the storage of the data.

**IS:** Insufficient amount of sample due to low flow or sampler malfunction.

**Bord Na Mona Energy Ltd, Derrygreenagh Group, Rochfordsbridge, Co Westmeath**

**Composite Sampler Results Licence 501**

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Feb 2005 | pH | COD mg/l | Ammonia as N mg/l | Total Phosphorus mg/l | Suspended Solids mg/l | Total Solids mg/l | Colour Pt Co units | Flow Daily Total (litres) | COD Kg/Day | Ammonia as Kg/Day | Total Phosphorus Kg/Day | Suspended Solids Kg/Day | Total Solids Kg/Day |
| 1 | | | | | 6 | 150 | | | | | | | |
| 2 | 8 | 17 | 1.06 | 0.05 | 5 | 134 | 103 | | | | | | |
| 3 | | | | | 5 | 242 | | | | | | | |
| 4 | | | | | 5 | 182 | | | | | | | |
| 5 | | | | | 5 | 236 | | | | | | | |
| 6 | | | | | 5 | 258 | | | | | | | |
| 7 | | | | | 5 | 210 | | | | | | | |
| 8 | | | | | 5 | 78 | | | | | | | |
| 9 | 8.4 | 57 | 1.12 | 0.05 | 10 | 248 | 90 | | | | | | |
| 10 | | | | | IS | IS | | | | | | | |
| 11 | | | | | IS | IS | | | | | | | |
| 12 | | | | | IS | IS | | | | | | | |
| 13 | | | | | IS | IS | | | | | | | |
| 14 | | | | | IS | IS | | | | | | | |
| 15 | | | | | IS | IS | | | | | | | |
| 16 | 7.6 | 34 | 2.17 | 0.05 | 7 | 302 | 118 | | | | | | |
| 17 | | | | | 8 | 90 | | | | | | | |
| 18 | | | | | 5 | 90 | | | | | | | |
| 19 | | | | | 13 | 50 | | | | | | | |
| 20 | | | | | 8 | 50 | | | | | | | |
| 21 | | | | | 6 | 74 | | | | | | | |
| 22 | | | | | 5 | 308 | | | | | | | |
| 23 | 8.2 | 26 | 1.69 | 0.05 | 7 | 68 | 101 | | | | | | |
| 24 | | | | | 5 | 52 | | | | | | | |
| 25 | | | | | 5 | 166 | | | | | | | |
| 26 | | | | | 5 | 50 | | | | | | | |
| 27 | | | | | 5 | 108 | | | | | | | |
| 28 | | | | | 5 | 56 | | | | | | | |

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**IS:** Insufficient amount of sample due to low flow or sampler malfunction.

**Bord Na Mona Energy Ltd, Derrygreenagh ( )up, Rochfordsbridge, Co Westmeat**

**Composite Sampler Results Licence 501**

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mar | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2005 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 5 | 62 | | | | | | | |
| 2 | 8.2 | 91 | 1.94 | 0.05 | 6 | 50 | 98 | | | | | | |
| 3 | | | | | 5 | 306 | | | | | | | |
| 4 | | | | | 5 | 320 | | | | | | | |
| 5 | | | | | 7 | 334 | | | | | | | |
| 6 | | | | | 21 | 360 | | | | | | | |
| 7 | | | | | 9 | 340 | | | | | | | |
| 8 | | | | | 5 | 318 | | | | | | | |
| 9 | 8 | 39 | 2.04 | 0.05 | 5 | 280 | 74 | | | | | | |
| 10 | | | | | 5 | 291 | | | | | | | |
| 11 | | | | | 5 | 272 | | | | | | | |
| 12 | | | | | 5 | 278 | | | | | | | |
| 13 | | | | | 5 | 288 | | | | | | | |
| 14 | | | | | 5 | 256 | | | | | | | |
| 15 | 7.9 | 28 | 1.35 | 0.05 | 5 | 222 | 102 | | | | | | |
| 16 | | | | | 8 | 263 | | | | | | | |
| 17 | | | | | 5 | 246 | | | | | | | |
| 18 | | | | | 8 | 224 | | | | | | | |
| 19 | | | | | 6 | 194 | | | | | | | |
| 20 | | | | | 5 | 234 | | | | | | | |
| 21 | | | | | 10 | 202 | | | | | | | |
| 22 | | | | | 9 | 156 | | | | | | | |
| 23 | 8.2 | 38 | 0.95 | 0.06 | 5 | 144 | 155 | | | | | | |
| 24 | | | | | 5 | 129 | | | | | | | |
| 25 | | | | | 5 | 166 | | | | | | | |
| 26 | | | | | 5 | 234 | | | | | | | |
| 27 | | | | | 5 | 238 | | | | | | | |
| 28 | | | | | 5 | 253 | | | | | | | |
| 29 | | | | | 5 | 246 | | | | | | | |
| 30 | 8 | 57 | 1.2 | 0.05 | 5 | 198 | 122 | | | | | | |
| 31 | | | | | 3 | 234 | | | | | | | |

* All flow data up to October 2005 was lost due to a technical fault in the storage of the data.

**IS:** Insufficient amount of sample due to low flow or sampler malfunction.

**Bord Na Mona Energy Ltd, Derrygreenagh Group, Rochfordsbridge, Co Westmeath**

**Composite Sampler Results Licence 501**

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Apr | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2005 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 5 | 150 | | | | | | | |
| 2 | | | | | 12 | 166 | | | | | | | |
| 3 | | | | | 5 | 222 | | | | | | | |
| 4 | | | | | 5 | 176 | | | | | | | |
| 5 | | | | | 5 | 216 | | | | | | | |
| 6 | 8.1 | 22 | 1.06 | 0.05 | 5 | 194 | 133 | | | | | | |
| 7 | | | | | 5 | 214 | | | | | | | |
| 8 | | | | | 5 | 196 | | | | | | | |
| 9 | | | | | 5 | 272 | | | | | | | |
| 10 | | | | | 5 | 256 | | | | | | | |
| 11 | | | | | 5 | 274 | | | | | | | |
| 12 | | | | | 5 | 248 | | | | | | | |
| 13 | 8.1 | 33 | 1.16 | 0.05 | 5 | 304 | 60 | | | | | | |
| 14 | | | | | 5 | 284 | | | | | | | |
| 15 | | | | | 5 | 276 | | | | | | | |
| 16 | | | | | 5 | 310 | | | | | | | |
| 17 | | | | | 5 | 248 | | | | | | | |
| 18 | | | | | 5 | 256 | | | | | | | |
| 19 | | | | | 5 | 176 | | | | | | | |
| 20 | 7.9 | 40 | 0.93 | 0.05 | 5 | 222 | 97 | | | | | | |
| 21 | | | | | 5 | 266 | | | | | | | |
| 22 | | | | | 5 | 286 | | | | | | | |
| 23 | | | | | 5 | 294 | | | | | | | |
| 24 | | | | | 5 | 256 | | | | | | | |
| 25 | | | | | 5 | 300 | | | | | | | |
| 26 | | | | | 5 | 274 | | | | | | | |
| 27 | 7.8 | 32 | 2.1 | 0.06 | 6 | 294 | 88 | | | | | | |
| 28 | | | | | 5 | 274 | | | | | | | |
| 29 | | | | | 12 | 312 | | | | | | | |
| 30 | | | | | 7 | 274 | | | | | | | |
| | | | | | | | | | | | | | |

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**IS:** Insufficient amount of sample due to low flow or sampler malfunction.

**Bord Na Mona Energy Ltd, Derrygreenagh ( oup, Rochfordsbridge, Co Westmea**

**Composite Sampler Results Licence 501**

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| May | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2005 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 14 | 292 | | | | | | | |
| 2 | | | | | 5 | 242 | | | | | | | |
| 3 | | | | | 5 | 240 | | | | | | | |
| 4 | 7.7 | 32 | 1.31 | 0.08 | 5 | 276 | 89 | | | | | | |
| 5 | | | | | 5 | 208 | | | | | | | |
| 6 | | | | | 5 | 218 | | | | | | | |
| 7 | | | | | 9 | 230 | | | | | | | |
| 8 | | | | | 7 | 292 | | | | | | | |
| 9 | | | | | 5 | 342 | | | | | | | |
| 10 | | | | | 6 | 290 | | | | | | | |
| 11 | 7.7 | 35 | 1.34 | 0.05 | 5 | 274 | 64 | | | | | | |
| 12 | | | | | 11 | 324 | | | | | | | |
| 13 | | | | | 5 | 360 | | | | | | | |
| 14 | | | | | 6 | 302 | | | | | | | |
| 15 | | | | | 9 | 312 | | | | | | | |
| 16 | | | | | 5 | 344 | | | | | | | |
| 17 | | | | | 11 | 347 | | | | | | | |
| 18 | 7.9 | 28 | 1.18 | 0.05 | 57 | 322 | 57 | | | | | | |
| 19 | | | | | 5 | 210 | | | | | | | |
| 20 | | | | | 6 | 250 | | | | | | | |
| 21 | | | | | 5 | 266 | | | | | | | |
| 22 | | | | | 5 | 330 | | | | | | | |
| 23 | | | | | 5 | 298 | | | | | | | |
| 24 | | | | | 5 | 226 | | | | | | | |
| 25 | 8.1 | 52 | 1.11 | 0.05 | 5 | 182 | 115 | | | | | | |
| 26 | | | | | 5 | 194 | | | | | | | |
| 27 | | | | | 5 | 268 | | | | | | | |
| 28 | | | | | 5 | 240 | | | | | | | |
| 29 | | | | | 5 | 182 | | | | | | | |
| 30 | | | | | 5 | 240 | | | | | | | |
| 31 | | | | | 5 | 272 | | | | | | | |

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**IS:** Insufficient amount of sample due to low flow or sampler malfunction.

**Bord Na Mona Energy Ltd, Derrygreenagh Group, Rochfordsbridge, Co Westmeath**

**Composite Sampler Results Licence 501**

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Jun | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2005 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | 8.1 | 57 | 1.17 | 0.05 | 7 | 240 | 93 | | | | | | |
| 2 | | | | | 5 | 308 | | | | | | | |
| 3 | | | | | 5 | 290 | | | | | | | |
| 4 | | | | | 5 | 358 | | | | | | | |
| 5 | | | | | IS | IS | | | | | | | |
| 6 | | | | | IS | IS | | | | | | | |
| 7 | | | | | IS | IS | | | | | | | |
| 8 | 7.6 | 25 | 2.63 | 0.07 | 5 | 334 | 85 | | | | | | |
| 9 | | | | | IS | IS | | | | | | | |
| 10 | | | | | IS | IS | | | | | | | |
| 11 | | | | | IS | IS | | | | | | | |
| 12 | | | | | IS | IS | | | | | | | |
| 13 | | | | | IS | IS | | | | | | | |
| 14 | | | | | IS | IS | | | | | | | |
| 15 | 7.7 | 55 | 3.1 | 0.05 | 6 | 306 | 71 | | | | | | |
| 16 | | | | | IS | IS | | | | | | | |
| 17 | | | | | IS | IS | | | | | | | |
| 18 | | | | | IS | IS | | | | | | | |
| 19 | | | | | IS | IS | | | | | | | |
| 20 | | | | | IS | IS | | | | | | | |
| 21 | | | | | IS | IS | | | | | | | |
| 22 | 8.1 | 39 | 1.92 | 0.05 | 5 | 282 | 70 | | | | | | |
| 23 | | | | | IS | IS | | | | | | | |
| 24 | | | | | IS | IS | | | | | | | |
| 25 | | | | | IS | IS | | | | | | | |
| 26 | | | | | IS | IS | | | | | | | |
| 27 | | | | | IS | IS | | | | | | | |
| 28 | | | | | IS | IS | | | | | | | |
| 29 | 8.3 | 35 | 2.58 | 0.05 | 5 | 318 | 65 | | | | | | |
| 30 | | | | | IS | IS | | | | | | | |
| | | | | | | | | | | | | | |

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**IS:** Insufficient amount of sample due to low flow or sampler malfunction.

**Bord Na Mona Energy Ltd, Derrygreenagh ( oup, Rochfordsbridge, Co Westmea**

**Composite Sampler Results Licence 501**

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Jul | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2005 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | IS | IS | | | | | | | |
| 2 | | | | | IS | IS | | | | | | | |
| 3 | | | | | IS | IS | | | | | | | |
| 4 | | | | | IS | IS | | | | | | | |
| 5 | | | | | IS | IS | | | | | | | |
| 6 | 8 | 50 | 2.67 | 0.05 | 5 | 286 | 93 | | | | | | |
| 7 | | | | | IS | IS | | | | | | | |
| 8 | | | | | IS | IS | | | | | | | |
| 9 | | | | | IS | IS | | | | | | | |
| 10 | | | | | IS | IS | | | | | | | |
| 11 | | | | | IS | IS | | | | | | | |
| 12 | | | | | IS | IS | | | | | | | |
| 13 | 8 | 67 | 2.34 | 0.08 | 8 | 343 | 87 | | | | | | |
| 14 | | | | | IS | IS | | | | | | | |
| 15 | | | | | IS | IS | | | | | | | |
| 16 | | | | | IS | IS | | | | | | | |
| 17 | | | | | IS | IS | | | | | | | |
| 18 | | | | | IS | IS | | | | | | | |
| 19 | | | | | IS | IS | | | | | | | |
| 20 | 8.1 | 45 | 2.26 | 0.05 | 5 | 333 | 70 | | | | | | |
| 21 | | | | | IS | IS | | | | | | | |
| 22 | | | | | IS | IS | | | | | | | |
| 23 | | | | | IS | IS | | | | | | | |
| 24 | | | | | IS | IS | | | | | | | |
| 25 | | | | | IS | IS | | | | | | | |
| 26 | | | | | 5 | 346 | | | | | | | |
| 27 | 7.8 | 10 | 2.34 | 0.05 | 5 | 338 | 75 | | | | | | |
| 28 | | | | | 5 | 306 | | | | | | | |
| 29 | | | | | 5 | 288 | | | | | | | |
| 30 | | | | | 5 | 264 | | | | | | | |
| 31 | | | | | 10 | 266 | | | | | | | |

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**IS:** Insufficient amount of sample due to low flow or sampler malfunction.

**Bord Na Mona Energy Ltd, Derrygreenagh Group, Rochfordsbridge, Co Westmeath**

**Composite Sampler Results Licence 501**

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Aug | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2005 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | IS | IS | | | | | | | |
| 2 | | | | | IS | IS | | | | | | | |
| 3 | 7.9 | 38 | 2.15 | 0.05 | 5 | 356 | 77 | | | | | | |
| 4 | | | | | 5 | 326 | | | | | | | |
| 5 | | | | | 5 | 320 | | | | | | | |
| 6 | | | | | IS | IS | | | | | | | |
| 7 | | | | | IS | IS | | | | | | | |
| 8 | | | | | IS | IS | | | | | | | |
| 9 | | | | | IS | IS | | | | | | | |
| 10 | 8 | 42 | 1.41 | 0.05 | 5 | 330 | 74 | | | | | | |
| 11 | | | | | IS | IS | | | | | | | |
| 12 | | | | | IS | IS | | | | | | | |
| 13 | | | | | IS | IS | | | | | | | |
| 14 | | | | | IS | IS | | | | | | | |
| 15 | | | | | IS | IS | | | | | | | |
| 16 | | | | | IS | IS | | | | | | | |
| 17 | 7.9 | 115 | 2.35 | 0.06 | 5 | 312 | 87 | | | | | | |
| 18 | | | | | IS | IS | | | | | | | |
| 19 | | | | | IS | IS | | | | | | | |
| 20 | | | | | IS | IS | | | | | | | |
| 21 | | | | | IS | IS | | | | | | | |
| 22 | | | | | IS | IS | | | | | | | |
| 23 | | | | | IS | IS | | | | | | | |
| 24 | 7.8 | 44 | 2.57 | 0.1 | 8 | 280 | 78 | | | | | | |
| 25 | | | | | IS | IS | | | | | | | |
| 26 | | | | | IS | IS | | | | | | | |
| 27 | | | | | IS | IS | | | | | | | |
| 28 | | | | | IS | IS | | | | | | | |
| 29 | | | | | IS | IS | | | | | | | |
| 30 | | | | | IS | IS | | | | | | | |
| 31 | 7.8 | 64 | 2.5 | 0.05 | 6 | 290 | 84 | | | | | | |

* All flow data up to October 2005 was lost due to a technical fault in the storage of the data.

**IS:** Insufficient amount of sample due to low flow or sampler malfunction.

**Bord Na Mona Energy Ltd, Derrygreenagh ( oup, Rochfordsbridge, Co Westmea**

**Composite Sampler Results Licence 501**

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sep | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2005 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | IS | IS | | | | | | | |
| 2 | | | | | IS | IS | | | | | | | |
| 3 | | | | | IS | IS | | | | | | | |
| 4 | | | | | IS | IS | | | | | | | |
| 5 | | | | | IS | IS | | | | | | | |
| 6 | | | | | IS | IS | | | | | | | |
| 7 | 7.8 | 85 | 2.66 | 0.1 | 5 | 326 | 60 | | | | | | |
| 8 | | | | | IS | IS | | | | | | | |
| 9 | | | | | IS | IS | | | | | | | |
| 10 | | | | | IS | IS | | | | | | | |
| 11 | | | | | IS | IS | | | | | | | |
| 12 | | | | | IS | IS | | | | | | | |
| 13 | | | | | IS | IS | | | | | | | |
| 14 | 7.9 | 61 | 2.38 | 0.05 | 8 | 322 | 71 | | | | | | |
| 15 | | | | | 5 | 360 | | | | | | | |
| 16 | | | | | 5 | 272 | | | | | | | |
| 17 | | | | | 19 | 320 | | | | | | | |
| 18 | | | | | 5 | 268 | | | | | | | |
| 19 | | | | | 5 | 266 | | | | | | | |
| 20 | | | | | 5 | 338 | | | | | | | |
| 21 | 7.8 | 50 | 2.41 | 0.05 | 5 | 276 | 74 | | | | | | |
| 22 | | | | | IS | IS | | | | | | | |
| 23 | | | | | IS | IS | | | | | | | |
| 24 | | | | | IS | IS | | | | | | | |
| 25 | | | | | IS | IS | | | | | | | |
| 26 | | | | | 5 | 270 | | | | | | | |
| 27 | | | | | 5 | 258 | | | | | | | |
| 28 | 8.1 | 50 | 1.55 | 0.05 | 5 | 220 | 106 | | | | | | |
| 29 | 8.1 | 62 | 0.02 | 0.05 | 5 | 236 | 122 | | | | | | |
| 30 | | | | | 5 | 234 | | | | | | | |

* All flow data up to October 2005 was lost due to a technical fault in the storage of the data.

IS: Insufficient amount of sample due to low flow or sampler malfunction.

Full suite of analysis carried out on 29/09/05 due to Lab error.

**Bord Na Mona Energy Ltd, Derrygreenagh Group, Rochfordsbridge, Co Westmeath**

**Composite Sampler Results Licence 501**

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2005 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 5 | 240 | | | | | | | |
| 2 | | | | | 5 | 246 | | | | | | | |
| 3 | | | | | 5 | 272 | | | | | | | |
| 4 | | | | | 5 | 278 | | | | | | | |
| 5 | | | | | 5 | 277 | | | | | | | |
| 6 | | | | | 5 | 280 | | | | | | | |
| 7 | | | | | 10 | 284 | | | | | | | |
| 8 | | | | | 5 | 286 | | 928897 | | | | 4.64 | 265.66 |
| 9 | | | | | 5 | 266 | | 683826 | | | | 3.42 | 181.90 |
| 10 | | | | | 5 | 258 | | 847909 | | | | 4.24 | 218.76 |
| 11 | | | | | 5 | 214 | | 1169892 | | | | 5.85 | 250.36 |
| 12 | 8.1 | 51 | 1.58 | 0.05 | 5 | 220 | 104 | 838045 | 42.74 | 1.32 | 0.04 | 4.19 | 184.37 |
| 13 | | | | | 6 | 232 | | 531811 | | | | 3.19 | 123.38 |
| 14 | | | | | 11 | 272 | | 488411 | | | | 5.37 | 132.85 |
| 15 | | | | | 5 | 250 | | 596163 | | | | 2.98 | 149.04 |
| 16 | | | | | 5 | 236 | | 481056 | | | | 2.41 | 113.53 |
| 17 | | | | | 5 | 272 | | 611126 | | | | 3.06 | 166.23 |
| 18 | | | | | 5 | 254 | | 1078330 | | | | 5.39 | 273.90 |
| 19 | 8 | 63 | 2.04 | 0.05 | 5 | 214 | 113 | 3890369 | 245.09 | 7.94 | 0.19 | 19.45 | 832.54 |
| 20 | | | | | 5 | 182 | | 4123757 | | | | 20.62 | 750.52 |
| 21 | | | | | 5 | 182 | | 6252645 | | | | 31.26 | 1137.98 |
| 22 | | | | | 5 | 204 | | 2354259 | | | | 11.77 | 480.27 |
| 23 | | | | | 5 | 218 | | 1407708 | | | | 7.04 | 306.88 |
| 24 | | | | | 5 | 158 | | 16132820 | | | | 80.66 | 2548.99 |
| 25 | | | | | 5 | 180 | | 14599260 | | | | 73.00 | 2627.87 |
| 26 | 7.5 | 69 | 1.08 | 0.05 | 5 | 201 | 205 | 9480260 | 654.14 | 10.24 | 0.47 | 47.40 | 1905.53 |
| 27 | | | | | 5 | 248 | | 2889532 | | | | 14.45 | 716.60 |
| 28 | | | | | 5 | 182 | | 1919287 | | | | 9.60 | 349.31 |
| 29 | | | | | 5 | 228 | | 2088177 | | | | 10.44 | 476.10 |
| 30 | | | | | 5 | 136 | | 3929984 | | | | 19.65 | 534.48 |
| 31 | | | | | 5 | 210 | | 2960499 | | | | 14.80 | 621.70 |

* All flow data up to October 2005 was lost due to a technical fault in the storage of the data.

**IS:** Insufficient amount of sample due to low flow or sampler malfunction.

**Bord Na Mona Energy Ltd, Derrygreenagh ( oup, Rochfordsbridge, Co Westmea**

**Composite Sampler Results Licence 501**

| Month | | | | Parameters | | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nov 2005 | pH | COD mg/l | Ammonia as N mg/l | Total Phosphorus mg/l | Suspended Solids mg/l | Total Solids mg/l | Colour Pt Co units | Flow Daily Total (litres) | COD Kg/Day | Ammonia as Kg/Day | Total Phosphorus Kg/Day | Suspended Solids Kg/Day | Total Solids Kg/Day |
| 1 | | | | | 5 | 164 | | 2179346 | | | | 10.90 | 357.41 |
| 2 | 7.7 | 48 | 1.18 | 0.05 | 5 | 122 | 178 | 8048509 | 386.33 | 9.50 | 0.40 | 40.24 | 981.92 |
| 3 | | | | | IS | IS | | 14496600 | | | | | |
| 4 | | | | | IS | IS | | 6507821 | | | | | |
| 5 | | | | | IS | IS | | 6507821 | | | | | |
| 6 | | | | | IS | IS | | 6507821 | | | | | |
| 7 | | | | | IS | IS | | 6507821 | | | | | |
| 8 | | | | | IS | IS | | 6507821 | | | | | |
| 9 | | | | | IS | IS | | 6507821 | | | | | |
| 10 | 7.6 | 24 | 1.64 | 0.05 | 5 | 188 | 187 | 6507821 | 156.19 | 10.67 | 0.33 | 32.54 | 1223.47 |
| 11 | | | | | IS | IS | | 6507821 | | | | | |
| 12 | | | | | IS | IS | | 6507821 | | | | | |
| 13 | | | | | IS | IS | | 6507821 | | | | | |
| 14 | | | | | IS | IS | | 6507821 | | | | | |
| 15 | | | | | IS | IS | | 6507821 | | | | | |
| 16 | 7.6 | 46 | 1.91 | 0.05 | 5 | 330 | 120 | 6507821 | 299.36 | 12.43 | 0.33 | 32.54 | 2147.58 |
| 17 | | | | | IS | IS | | 6507821 | | | | | |
| 18 | | | | | IS | IS | | 6507821 | | | | | |
| 19 | | | | | IS | IS | | 6507821 | | | | | |
| 20 | | | | | IS | IS | | 6507821 | | | | | |
| 21 | | | | | IS | IS | | 6507821 | | | | | |
| 22 | | | | | IS | IS | | 6507821 | | | | | |
| 23 | 7.6 | 44 | 2.13 | 0.05 | 5 | 240 | 79 | 6507821 | 286.34 | 13.86 | 0.33 | 32.54 | 1561.88 |
| 24 | | | | | IS | IS | | 6507821 | | | | | |
| 25 | | | | | IS | IS | | 6507821 | | | | | |
| 26 | | | | | IS | IS | | 6507821 | | | | | |
| 27 | | | | | IS | IS | | 6507821 | | | | | |
| 28 | | | | | IS | IS | | 6507821 | | | | | |
| 29 | | | | | IS | IS | | 6507821 | | | | | |
| 30 | 7.6 | 42 | 2 | 0.05 | 5 | 190 | 106 | 6507821 | 273.33 | 13.02 | 0.33 | 32.54 | 1236.49 |

**IS:** Insufficient amount of sample due to low flow or sampler malfunction.

**Bord Na Mona Energy Ltd, Derrygreenagh Group, Rochfordsbridge, Co Westmeath**

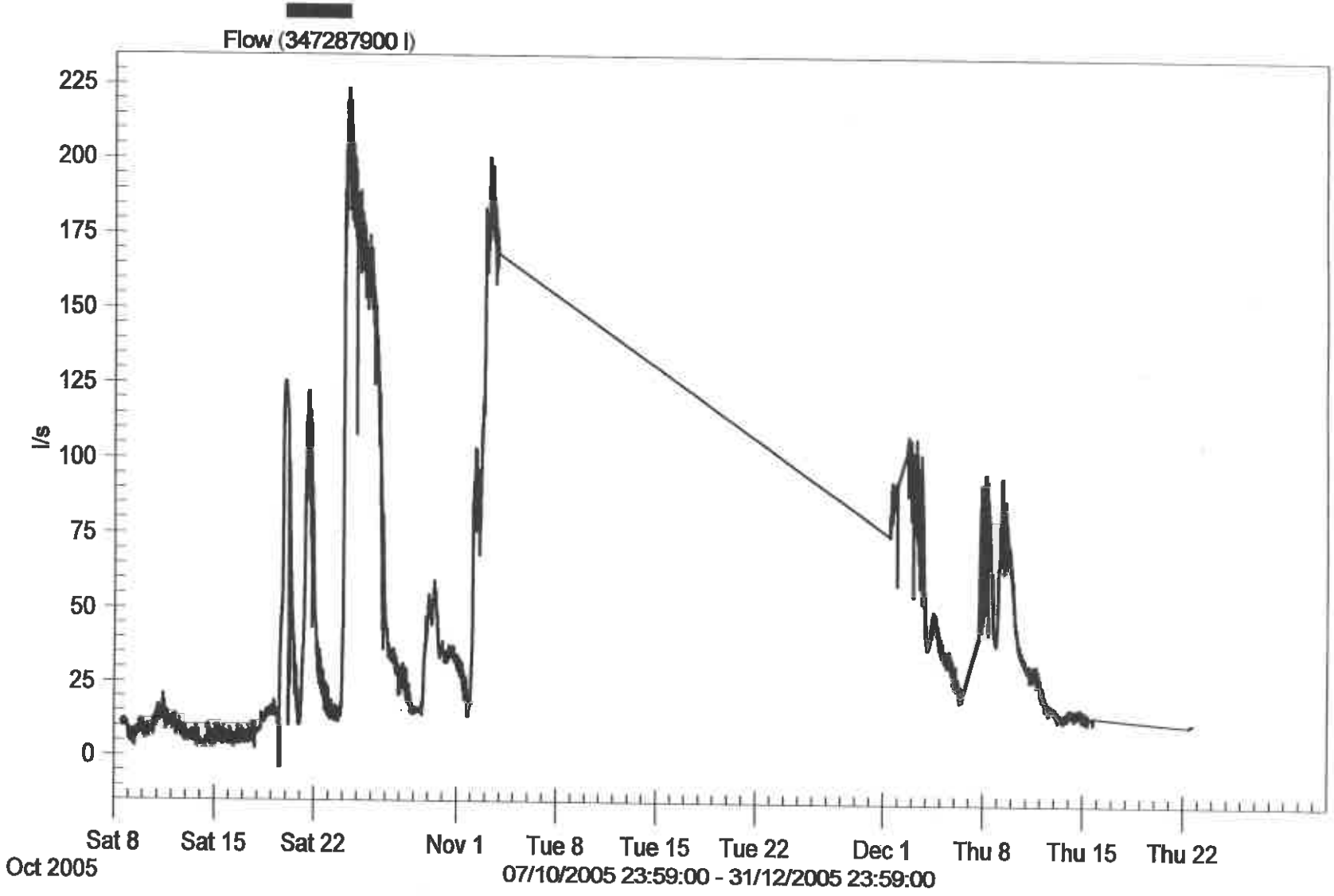
**Composite Sampler Results Licence 501**

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dec | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2005 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 8 | 178 | | 7038953 | | | | 56.31 | 1252.93 |
| 2 | | | | | 5 | 140 | | 8825839 | | | | 44.13 | 1235.62 |
| 3 | | | | | 7 | 142 | | 6962911 | | | | 48.74 | 988.73 |
| 4 | | | | | 5 | 202 | | 3728060 | | | | 18.64 | 753.07 |
| 5 | | | | | 5 | 208 | | 2872848 | | | | 14.36 | 597.55 |
| 6 | | | | | 5 | 214 | | 2877860 | | | | 14.39 | 615.86 |
| 7 | 7.8 | 59 | 1.51 | 0.05 | 5 | 184 | 124 | 4408658 | 260.11 | 6.66 | 0.22 | 22.04 | 811.19 |
| 8 | | | | | 5 | 152 | | 5610001 | | | | 28.05 | 852.72 |
| 9 | | | | | 5 | 140 | | 6207086 | | | | 31.04 | 868.99 |
| 10 | | | | | 11 | 126 | | 3515521 | | | | 38.67 | 442.96 |
| 11 | | | | | 5 | 218 | | 2506661 | | | | 12.53 | 546.45 |
| 12 | | | | | 5 | 228 | | 1693547 | | | | 8.47 | 386.13 |
| 13 | | | | | 15 | 190 | | 1323796 | | | | 19.86 | 251.52 |
| 14 | 7.7 | 41 | 1.95 | 0.24 | 14 | 226 | 99 | 1367149 | 56.05 | 2.67 | 0.33 | 19.14 | 308.98 |
| 15 | | | | | IS | IS | | 1188751 | | | | | |
| 16 | | | | | IS | IS | | 1035677 | | | | | |
| 17 | | | | | IS | IS | | 1035677 | | | | | |
| 18 | | | | | IS | IS | | 1035677 | | | | | |
| 19 | | | | | IS | IS | | 1035677 | | | | | |
| 20 | | | | | IS | IS | | 1035677 | | | | | |
| 21 | 7.5 | 29 | 2.2 | 0.05 | 8 | 270 | 73 | 1035677 | 30.03 | 2.28 | 0.05 | 8.29 | 279.63 |
| 22 | | | | | IS | IS | | 697975 | | | | | |
| 23 | | | | | IS | IS | | TF | | | | | |
| 24 | | | | | IS | IS | | TF | | | | | |
| 25 | | | | | IS | IS | | TF | | | | | |
| 26 | | | | | IS | IS | | TF | | | | | |
| 27 | | | | | IS | IS | | TF | | | | | |
| 28 | 7.7 | 39 | 2.43 | 0.05 | 5 | 268 | 83 | TF | | | | | |
| 29 | | | | | IS | IS | | TF | | | | | |
| 30 | | | | | IS | IS | | TF | | | | | |
| 31 | | | | | IS | IS | | TF | | | | | |

**IS:** Insufficient amount of sample due to low flow or sampler malfunction. **TF:** No flow data due to technical fault

# Derryhinch Composite Flow Rates 2005

Flowlink 4 for Windows



BORD NA MÓNA

BORD NA MÓNA ENERGY LIMITED

# Annual Environmental Report 2006
# P0501-01

**March 2007**

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## 1.0 Introduction

1.1 IPPC Licence No PO501-01

1.2 Name & Location of Site

| | |
|---|---|
| **Name:** | Bord na Mona Energy Limited. |
| **Address:** | Derrygreenagh Works,<br>Rochfortbridge,<br>Mullingar,<br>Co. Westmeath. |
| **Telephone No:** | 044 9222181 Fax No. 044 9222344 |
| **Contact Name:** | Paul Riordan |
| **Position:** | General Manager |
| **National Grid Reference:** | E249450 N238140 |

1.3 Description of Activities

**Peat Milling Operations.**

For milled peat production the bog is laid out in a series of rectangular fields of varying length and 15m wide with drains located between. There are essentially four operations involved in milled peat production:
Milling.
Harrowing.
Ridging.
Harvesting.

**Milling.**
Special milling machines work their way along the fields, milling approximately 15mm of peat of the top of the bog in a pass.

**Harrowing**
In the course of drying, the milled peat is turned a number of times to avail of the drying conditions. This is achieved with a machine called a harrow. The milled peat is harrowed until its moisture content is down to approximately 40-50%, which can take up to two to three days, weather depending.

**Ridging**
The dry peat is then scraped into long ridges running down the centre of each field. This is done with a ridger, a machine consisting of a series of blades in the shape of a v that opens the full width of the field.

**Harvesting**
During harvesting every eleventh field is used to stockpile the peat, with this field receiving the milled peat from the five fields either side.

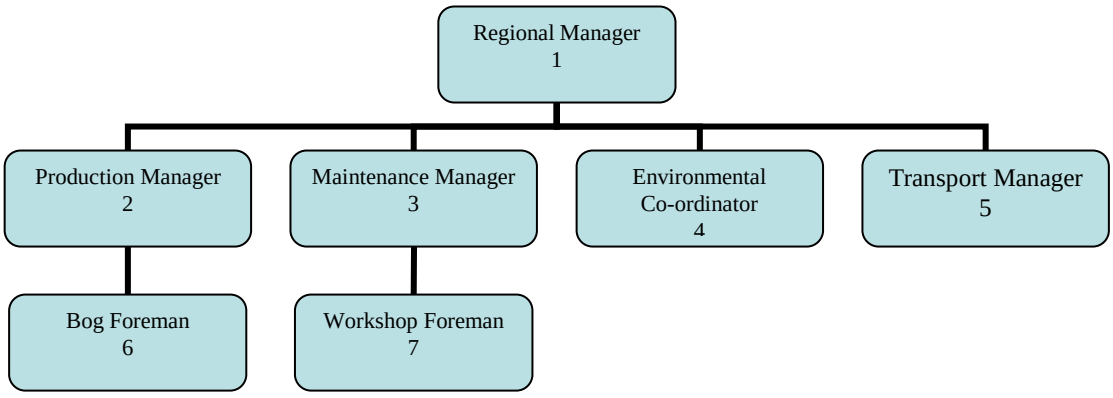
The milled peat is then transported via the existing network of peatland railways or via road to one of the following locations.
Power station
Horticultural Factory.
Briquette Factory.

1.4 Environmental Management of the Company

The organisational structure within the Derrygreenagh Group is presented in the flow chart below.

# Group

## Environmental Responsibilities




(1) Overall environmental responsibilities
(2) All production related issues
(3) Machine maintenance
(4) Co-ordinating environmental affairs
(5) All peat transportation matters
(6) Environmental issues relating to peatlands.
(7) Environmental issues relating to Workshops.

## 1.5 Environmental Policy

**BORD NA MÓNA**

**BORD NA MÓNA ENERGY LIMITED**
**Derrygreenagh,Rochfortbridge,Mullingar,Co-Westmeath.**

Bord na Mona Energy Limited is a commercial semi-state body with responsibility to develop Irelands peat resources in the national interest.

Bord na Mona Energy Limited is committed to gather and make available information on all aspects of its environmental impact and to help improve understanding among the public generally of its role and the importance of Irish peatlands.

Bord na Mona Energy Limited recognises the importance of peatland conservation.

Bord na Mona Energy Limited will leave behind all areas it owns as either an economically or socially integrated resource of a high environmental value.

Bord na Mona Energy Limited seeks to conduct all aspects of its business in an environmentally sensitive value.

Bord na Mona Energy Limited will establish an environmental management system specifically addressing the following impacts.

Discharges to water.
Emissions to atmosphere.
Waste disposal.
Use of natural resources.
Noise, vibration, odour, dust and visual effects.
Natural environment and eco-system.

The environmental management system will be monitored, maintained and continually improved.

A system of regular environmental audits will be put in place.

Bord na Mona Energy Limited will continue research and development into all aspects of its environmental impact.

This statement is published and is available at all locations within the division and its contents are brought to the attention of all employees.

## 2.0 Summary Information

## 2.1 Emissions to Water Summary

### 2.1.1 Silt Pond Emissions

Comment
Surface water monitoring was carried out four times during the reporting period. In total analysis was carried out at five different locations. These locations are as follows, Derryhinch @ SW1, Drumman @ SW6, Bracklin @ SW30, Carranstown @ SW32 and Rossan @ SW43. The parameters measured during each sampling event were as follows.
Total Phosphorus, Total Solids, Suspended Solids, pH, Ammonia, Colour and COD.
In general results were constant across all parameters at each monitoring location.
May was the wettest month of 2006 with rainfall of 151mm being recorded, while June was the driest with 13.2mm recorded.
The quarterly grab sampling programme proved to be 100% compliant for the year as was the 2005 regime.

**pH** values were between 6.4 and 8.3, with normal emission limit values being of the range 6 and 9. The graph clearly shows consistent trends for the period.
**Suspended solids** varied from 5mg/l to 56mg/l and would depend on activities ( piping, ditching ) etc in the catchments at the time of sampling. Increased flow is noted at the time of the most elevated result during the 3rd quarter monitoring event. All other location results are within the licence limit of 35mg/l.
**Ammonia** levels were slightly elevated during the 1st quarter monitoring event at SW1, 30 and 43. This is not unusual for waters discharging from peatlands.
**COD** readings were slightly elevated during 2nd quarter monitoring event. This can be attributed to reduced flow rates and increased temperature during that time.
**Flow** rates were far greater during the 4th quarter sampling event. This is to be expected as the year ended with unusually inclement weather.
**Total Phosphorus** results are slightly elevated at SW32 3rd quarter. Future trends will be monitored to establish whether this is typical of that location.
Sampling will continue at the same locations during 2007.

Surface Water Results are attached in Appendix 1.

### 2.1.2 Yard Discharges

Comment
Yard runoff monitoring took place at one location during the reporting period. Sampling frequency was monthly and COD was the parameter requiring analysis. As is evident from the graph, on several occasions no sample was available on the day of sampling. This was due to no flow at the emission point as the catchments are quite small. Sampling will continue at the same locations during 2007.

Yard Emission Results are attached in Appendix 2.

### 2.1.3 Composite Sampler Report

Comment
The composite sampler has been operating at Derryhinch SW3 during the reporting period.
The parameters measured were Total Phosphorus, Total Solids, Suspended Solids, pH, Ammonia, Colour and COD, with Suspended solids being the only parameter with an emission limit value ( 35mg/l ). May was the wettest month of 2006 with rainfall of 151mm being recorded, while June was the driest with 13.2mm recorded. In general results were satisfactory with no non-compliances being recorded for the period. The internal battery was replaced on the sampler during the period, there were also some technical difficulties addressed which led to some missing data. A proposal to relocate the composite sampler during 2007 will be submitted to the agency, as a suitable site has been identified at Toar bog SW15. This site because of its nature has the potential to give more accurate flow data when it becomes operational.

Composite Sampler Results are contained in Appendix 3.

### 2.1.4 Emissions to Water Non-compliance's

**Emissions to Water Non-Compliances**

**Licence: P0501-01**
**Works: Derrygreenagh**

| Type | Non-Compliances | Location / SW Nr |
|---|---|---|
| Composite | 0 | |
| Quarterly Grab | 0 | |
| Monthly Yard | NA | |
| **Totals** | 0 | |

## 2.2 Emissions to Air

2.2.1 Dust Monitoring
Comment
Dust monitoring was carried out on three occasions between May and August. Each monitoring event lasted between 28 and 32 days and the Bergerhoff method of collection was used.
The monitoring locations were as follows, Toar DM01, Derryhinch DM02 and Ballivor DM03. The emission limit value was not exceeded during the period and no complaints of a dust nature were received.
Sampling will continue at the same locations during 2007.

Dust Monitoring Results are attached in Appendix 4.

### 2.2.2 Emissions to Air Non-compliance's

| **Dust Non-Compliances** | |
|---|---|
| **Licence:P0501-01** | |
| **Works: Derrygreenagh** | |
| **Location / DM Nr** | **Non-Compliances** |
| | 0 |
| **Total** | 0 |

## 2.3 Waste Arisings

2.3.1 Non-Hazardous Waste

**Non Hazardous Waste Data**

**Licence: P0501-01**

**Works: Derrygreenagh**

| Type | Tonnes | EWC Code | Contractor | Licence Nr |
|---|---|---|---|---|
| Skips | 12.04 | 20 03 01 | Wallace Recycling | 031/OY/76/03 |
| Wheelie Bins | 11.20 | 20 03 01 | AES | 053/OY/39/02 |
| Polyethylene | 144.06 | 02 01 04 | APEC PLASTICS | 205/2005 |
| Scrap Steel | 55.45 | 17 04 07 | Hammond Lane | 050/OY/162/04 |
| Timber Pallets | 15.51 | 15 01 02 | Kiawah Ltd | WP/TN/24 |
| Silt Pond Cleanings | 155.17 | 01 01 02 | Bord na Mona | IPPC P 0501 |
| Peat Screenings | 0.00 | 01 01 02 | Bord na Mona | IPPC P 0501 |
| **Totals** | **386.39** | | | |

2.3.2 Hazardous Waste

**Hazardous Waste Data**

**Licence:P0501-01**

**Works:Derrygreenagh**

| Type | Tonnes | EWC Code | Contractor | Licence Nr | Destination |
|---|---|---|---|---|---|
| Waste Oil | 9.90 | 13 02 05 | Enva Ireland Ltd Portlaoise | 184-1 | Portlaoise |
| Oil Filters | 0.66 | 16 01 07 | Enva Ireland Ltd Portlaoise | 184-1 | Portlaoise |
| Oily Rags | 0.72 | 15 02 02 | Enva Ireland Ltd Portlaoise | 184-1 | Portlaoise |
| Waste Grease | 0.00 | 13 08 99 | Enva Ireland Ltd Portlaoise | 184-1 | Portlaoise |
| Lead Acid Batt | 1.80 | 16 06 01 | Enva Ireland Ltd Portlaoise | 184-1 | Portlaoise |
| Fluorescent Tubes | 0.08 | 20 02 21 | Enva Ireland Ltd Portlaoise | 184-1 | Portlaoise |
| Parts Wash | 0.56 | 11 01 13 | Safety Kleen, Tallaght, Dublin | 99-1 | Dublin |
| Asbestos | 6.92 | 17 06 05 | KTK Landfill | 81-3 | Kilcock |
| Asbestos | 1.32 | 17 06 05 | Rialta Environmentals | 192-1 | Dublin |
| **Total** | **21.96** | | | | |

## 2.4 Energy and Water Consumption

2.4.1 Energy

The table below shows energy consumption for the year. Water is not included, as it is only used in offices, canteens and workshops on a domestic scale. It is not used as part of the production process.

**Energy Consumption**

**Licence: P0501-01**

**Works: Derrygreenagh**

| Units | Diesel ( Litres ) | Petrol (Litres) | Electricity (Units) | Peat Briquettes (Tonnes) |
|---|---|---|---|---|
| **Totals** | 242054.1 | 750 | 442.193 | 0 |
| **MW Hours** | 2370.3 | 6.779967 | 0.442193 | 0 |
| **Total MW Hours** | **2377.5** | | | |

## 2.5 Environmental Incidents and Complaints

### 2.5.1 Incidents

There were four incidents during the year two relating to dust nuisance and two due to bog fires. In all cases the agency was informed and corrective action taken.

| Environmental Incidents | |
|---|---|
| **Licence: P0501-01** | |
| **Works: Derrygreenagh** | |
| | **Number** |
| Incidents | 4 |
| Requiring corrective action | 4 |
| **Category** | |
| Water | |
| Air | 4 |
| Procedural | |
| Miscellaneous | |
| **Total** | **4** |

### 2.5.2 Complaints.

There were two complaints during the year both relating to dust nuisance, corrective action was taken and the agency informed.

| Environmental Complaints | |
|---|---|
| **Licence:P0501-01** | |
| **Works: Derrygreenagh** | |
| | **Number** |
| Complaints | 2 |
| Requiring corrective action | 2 |
| **Category** | |
| Water | |
| Air | 2 |
| Procedural | |
| Miscellaneous | |
| **Total** | **2** |

## 3.0 Management of the Activity

3.1 Environmental Management Programme Report 2006

| Project | Description & Status |
|---|---|
| **Project 1:**<br><br>Reduction of fugitive dust emissions. | **Training.**<br>Achieved. All new employees received environmental training during the year, 33 in all.<br><br>**Hydraulic Harrows.**<br>Ongoing. There was one new hydraulic harrow introduced during the to Ballybeg Bog which seems to be having a positive effect on dust control.<br><br>**Headland Peat Collection.**<br>Ongoing. Headland peat was collected in all bogs by our harvesters as required and deposited further down the bog fields. |
| **Project 2:**<br><br>Minimisation of suspended solids | **On Site Inspections.**<br>Project didn't materialise. Will commence at start of production 2007. |
| **Project 3:**<br><br>Effective spill leak management of mobile fuelling units. | **On Site Inspections.**<br>Project didn't materialise. Will commence at start of production 2007. Service trains are inspected continuously a number have been overhauled and records kept on file. |
| **Project 4:**<br><br>Reuse of silt pond waste. | **Trials.**<br>Trials in the past proved unsuccessful. For peat silt to be reused, it must be available on the production bog for transfer into the piles. 99 % of all silt ponds are located on the outfall. Another factor is contamination, as these ponds are excavated into the mineral soil to achieve gravity drainage, and as such the silt excavated from the pond is contaminated with mineral soil. Should suitable bog come into production in the future, this project will be considered. |
| **Project 5:**<br><br>Collection storage and reuse of polyethylene. | **Identify Recyclers.**<br>Ongoing<br>During the year 144 tonnes of polythene has been sent for recycling to Apec Plastics Co. Kildare Waste Permit No. 205/2005. |
| **Project 6:**<br><br>Provision of measures to protect Dust Sensitive Areas. | **Planting.**<br>Ongoing.<br>A shelter belt was planted at Daingean Bog during the year and we plan to plant more there during 2007. |

3.2 Environmental Management Programme Proposal for 2007

| Project | Description & Status |
|---|---|
| **Project 1:**<br><br>Reduction of fugitive dust emissions. | **Training.**<br>Continue to train all new employees in environmental matters. Copy environmental video to disk and distribute more widely. All new employees will be trained during the year.<br><br>**Hydraulic Harrows.**<br>Continue to supply hydraulic harrows. Prioritising dust sensitive locations. There is one Hydraulic Harrow in operation at the moment we will continue to monitor the situation regarding introducing any more.<br><br>**Headland Peat Collection.**<br>Continue with the collection of headland peat, particularly at dust sensitive locations. Supply more headland peat collection machinery as required and research efficient ways of collecting such peat for use as a saleable product. |
| **Project 2:**<br><br>Minimisation of suspended solids | **On Site Inspections.**<br>A full programme of internal audits will be carried out as soon as production commences. Particular emphasis will be put on cleaner production procedures, milling, harrowing, ridging, harvesting and loading. |
| **Project 3:**<br><br>Effective spill leak management of mobile fuelling units. | **On Site Inspections.**<br>As part of the above project, service trains will also be prioritised with a fitter accompanying the auditor during inspections to highlight any risks or potential risks that may occur. |
| **Project 4:**<br><br>Fire Prevention. | **Fire Patrols.**<br>There will be extra emphasis on fire patrols this coming production season. Research on improved fire fighting techniques will also be investigated. The newly adopted Fire and Environmental Plan will be communicated to all personnel. |
| **Project 5:**<br><br>Collection storage and reuse of polyethylene. | **Identify Recyclers.**<br>Continue with the recycling of polyethylene. The sourcing of more recycling contractors will be ongoing. |

| | |
|---|---|
| **Project 6:**<br><br>Provision of measures to protect Dust Sensitive Areas. | **Planting.**<br>Ongoing<br>Planting is ongoing as required, with areas in the periphery of production bogs that are being developed for housing being prioritised. A shelter belt will be planted at Daingean again this year. |

### 3.3 Environmental Expenditure

| **Environmental Expenditure** |
|---|

| **Licence:P0501-01** |
|---|
| **Works: Derrygreenagh** |

| Description | Cost € |
|---|---|
| Capital Costs | €10,000 |
| Silt Control | €101,680.17 |
| Analytical & Consultancy Costs | €8,991.25 |
| EPA Fees | €8,535.75 |
| Bog Rehabilitation, | 0 |
| | |
| **Total** | **€129,207.17** |

### 4.0 Licence Specific Reports

4.1 Surface Water Discharge Monitoring Location Programme Review

A proposal to relocate some of the quarterly sampling locations will be sent to the Agency for approval during 2007. A proposal to relocate the composite sampler was sent for approval prior to the submission of this report. The new location is much better suited to collecting flow data and should make for a more accurate sampling regime in the forthcoming year. The new location is SW15 at Toar Bog.

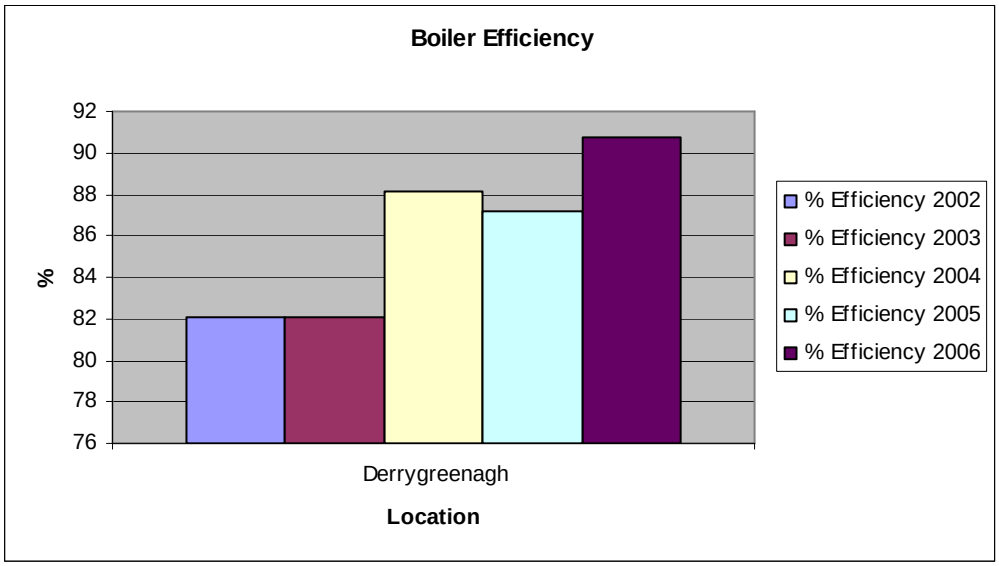
### 4.2 Bunding Programme

We have recently carried a Bund Integrity Tests on all bunds in our licence. All bunds in the 501 licence area passed and results are kept on file.

## 4.3 Boiler Combustion Efficiency

**Works: Derrygreenagh**

| Boiler Location | % Efficiency 2002 | % Efficiency 2003 | % Efficiency 2004 | % Efficiency 2005 | % Efficiency 2006 |
|---|---|---|---|---|---|
| Derrygreenagh | 82.1 | 82.1 | 88.1 | 87.2 | 90.71 |




Note: Copies of the actual test results are contained in Appendix 5.

## 4.4 Resource consumption summary

We produced just over 152,000 tonnes of peat and sold 194,000 tonnes in 2006 and a minimal amount of turf to private individuals. This year we hope to produce just over 171,000 tonnes of peat and sell near what we sold last year of turf. See table below.

**Resource Consumption**

**Licence: P0501-01**

**Works: Derrygreenagh**

| Product | Tonnes Produced | Tonnes Sold | Customer |
|---|---|---|---|
| Milled Peat | 59,686 | 109,373 | ESB |
| Moss | 93,000 | 84,633 | Horticulture |
| Turf | 251 | 251 | Private |
| Other | 0 | 0 | N/A |
| **Totals** | 152,937 | 194,257 | N/A |

| Proposed Production 2007 | |
|---|---|
| **Licence: P0501-01** | |
| **Works: Derrygreenagh** | |
| **Product** | **Proposed Target** |
| Milled Peat | 91,743 |
| Moss | 80,000 |
| Turf | 250 |
| Other | 0 |
| **Totals** | 171993 |

## 4.5 De-Silting Report

Where possible ponds were cleaned at least twice during the year, however where there was no production some ponds didn't need to be cleaned as often as there was no silt present when inspected.

Silt Pond Cleaning Review attached in Appendix 6.

## 4.6 Bog Development and Operational Programme

There was no development in the licence area during the year.

## 4.7 Bog Rehabilitation Report

No bog rehabilitation took place in this licence during the year.

## 4.8 Archaeological Report

DERRGREENAGH GROUP

Thirty three sites in Toar Bog were excavated under 20 licences during the 2006 field season in the southern part of the bog. This was the second of two field seasons in Toar Bog. Five sites were excavated in 2005 which were located in the northern part of the bog on the periphery of the main cluster of sites. The sites were all relatively small brushwood and roundwood structures (eight platforms, three toghers and nine archaeological wood) and were excavated over the course of a six week period. The Toar Bog sites were, in most cases, very fragmentary in nature. There are several possible reasons for this. The majority of the sites were composed of light brushwood elements and were already partially exposed on the field surface.

## 5.0 Summary

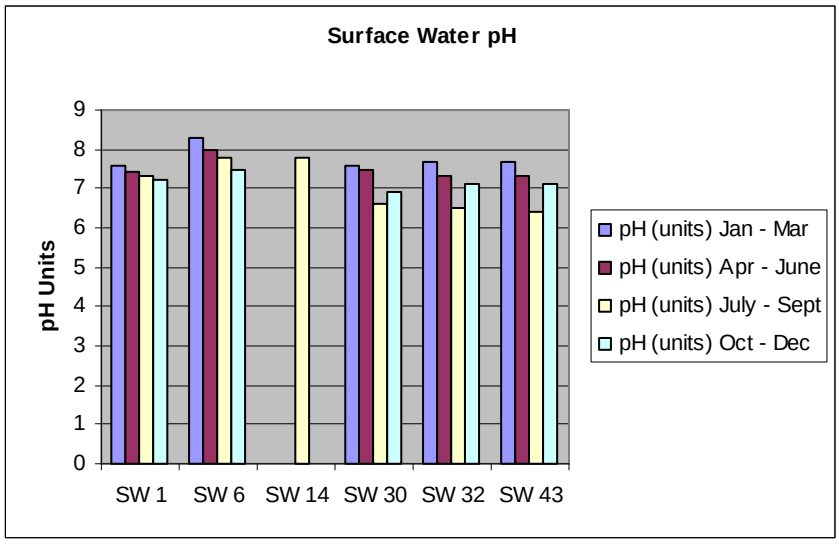
With regard to environmental compliance at the Derrygreenagh Group of Bogs, there was no exceedence of the emission limit value in relation to suspended solids from grab sampling of the silt ponds in the Surface Water Discharge Monitoring Location Programme.
There was no non-compliances in relation to the Composite Sampler during the monitoring period January to December. Dust monitoring results showed no non-compliance. There was no complaints of an environmental nature received during the reporting period.
Bord na Mona, Derrygreenagh Group, will continue to strive to maintain and improve its level of environmental compliance.

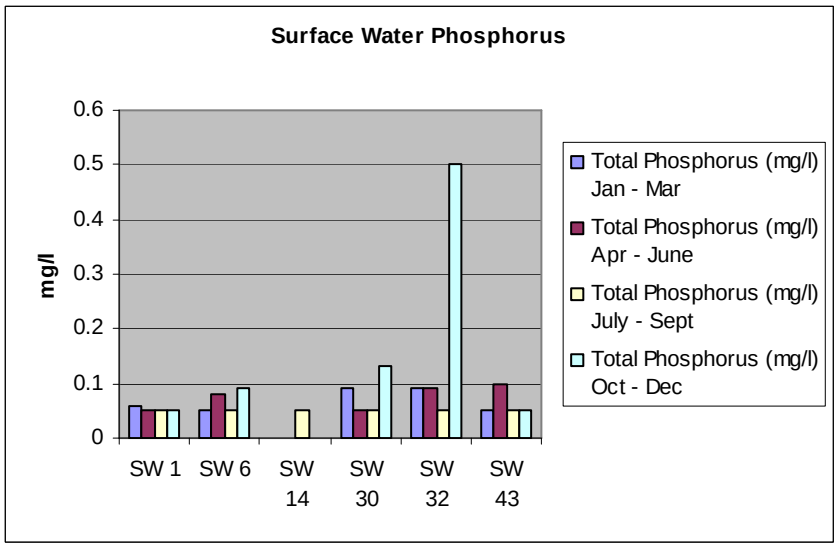
The staff awareness through training and involvement in the operation of the licence has also improved immensely. A full programme of training and awareness has been conducted at the works and has targeted all personnel ie. Office, Workshop, Transport and Production.

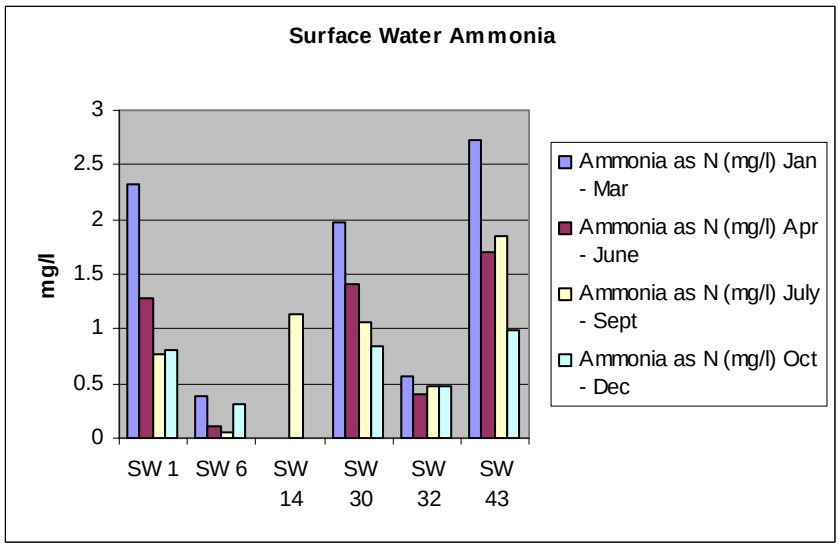
Bord na Mona Energy Ltd would like to take this opportunity to advise the Environmental Protection Agency of its continued commitment to improving its environmental performance by adopting cleaner production methods and improving its environmental protection measures.

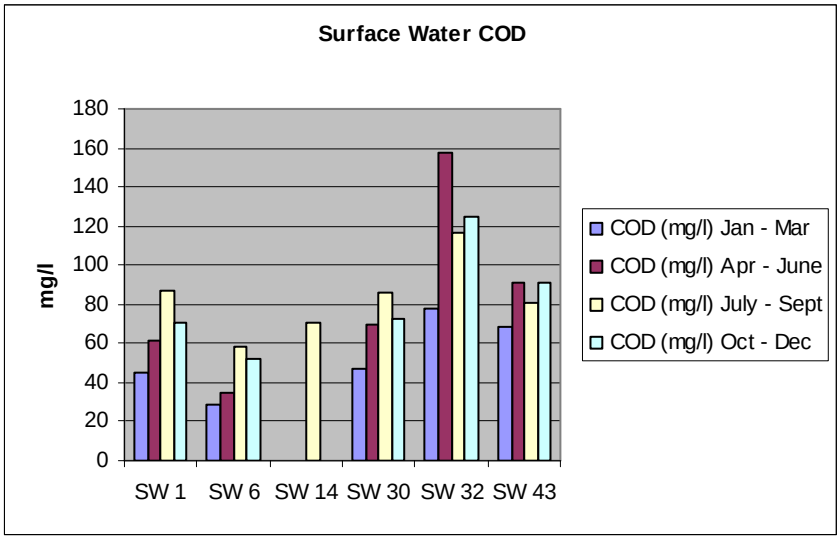
# APPENDIX 1

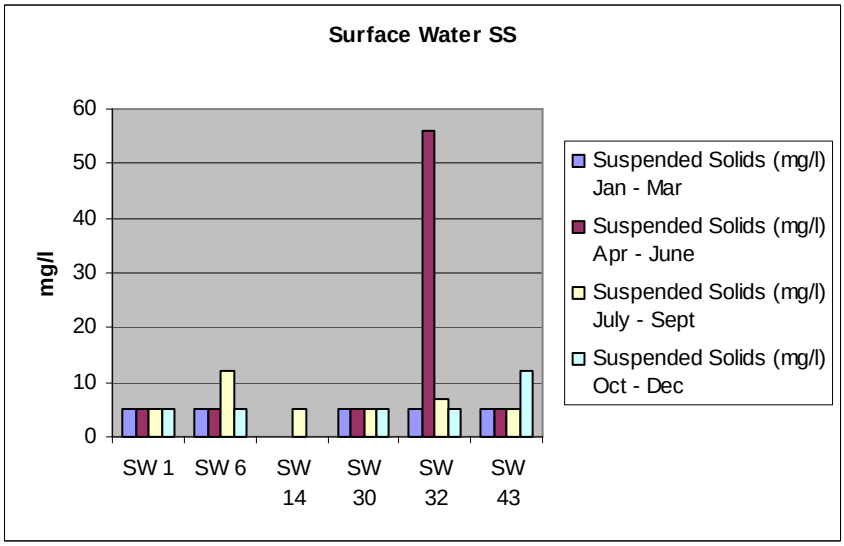
## Surface Water Discharge
## Monitoring Results
## Bogs

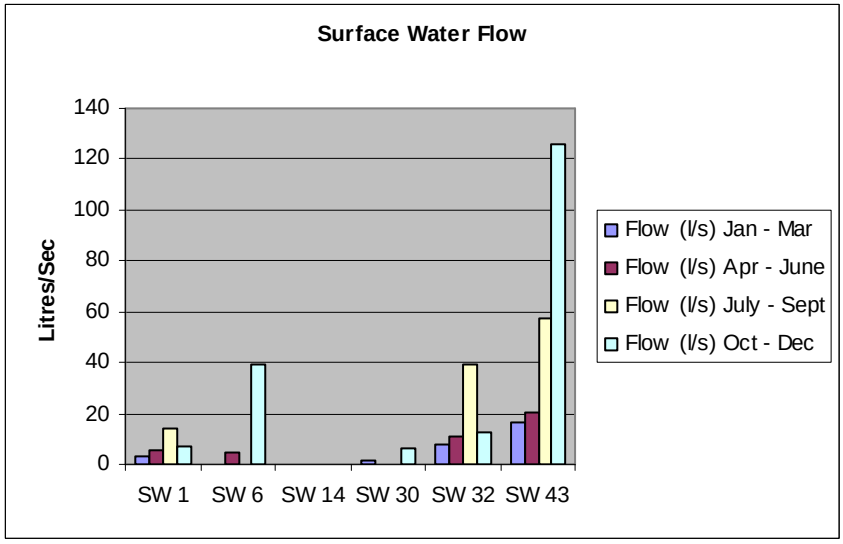

Surface Water pH
pH Units
9
8
7
6
5
4
3
2
1
0
SW 1
SW 6
SW 14
SW 30
SW 32
SW 43
pH (units) Jan - Mar
pH (units) Apr - June
pH (units) July - Sept
pH (units) Oct - Dec


Surface Water Phosphorus
mg/l
0.6
0.5
0.4
0.3
0.2
0.1
0
SW 1
SW 6
SW 14
SW 30
SW 32
SW 43
Total Phosphorus (mg/l) Jan - Mar
Total Phosphorus (mg/l) Apr - June
Total Phosphorus (mg/l) July - Sept
Total Phosphorus (mg/l) Oct - Dec


Surface Water Ammonia
mg/l
3
2.5
2
1.5
1
0.5
0
SW 1
SW 6
SW 14
SW 30
SW 32
SW 43
Ammonia as N (mg/l) Jan - Mar
Ammonia as N (mg/l) Apr - June
Ammonia as N (mg/l) July - Sept
Ammonia as N (mg/l) Oct - Dec


Surface Water COD
mg/l
180
160
140
120
100
80
60
40
20
0
SW 1
SW 6
SW 14
SW 30
SW 32
SW 43
COD (mg/l) Jan - Mar
COD (mg/l) Apr - June
COD (mg/l) July - Sept
COD (mg/l) Oct - Dec

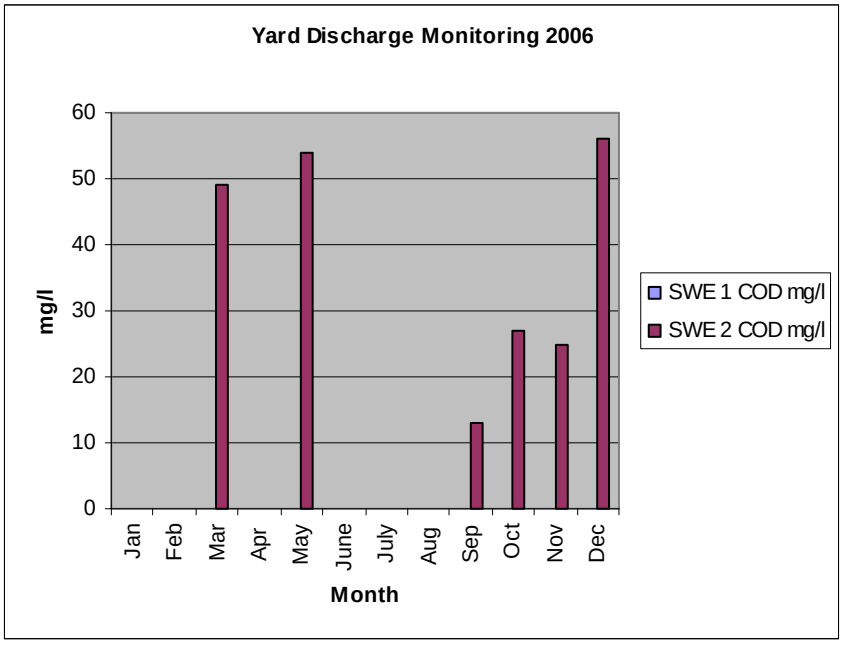

Surface Water SS
mg/l
60
50
40
30
20
10
0
SW 1
SW 6
SW 14
SW 30
SW 32
SW 43
Suspended Solids (mg/l) Jan - Mar
Suspended Solids (mg/l) Apr - June
Suspended Solids (mg/l) July - Sept
Suspended Solids (mg/l) Oct - Dec


Surface Water Flow
Litres/Sec
140
120
100
80
60
40
20
0
SW 1
SW 6
SW 14
SW 30
SW 32
SW 43
Flow (l/s) Jan - Mar
Flow (l/s) Apr - June
Flow (l/s) July - Sept
Flow (l/s) Oct - Dec

# APPENDIX 2

## Surface Water Discharge Monitoring Results Yards

| Yard Discharge Results | | | |
|---|---|---|---|
| | | | |
| Licence: P0501-01 | | | |
| Works: Derrygreenagh | | | |
| **Month** | **SWE 1 COD mg/l** | **SWE 2 COD mg/l** | |
| Jan | NF | NF | |
| Feb | NF | NF | |
| Mar | NF | 49 | |
| Apr | NF | NF | |
| May | NF | 54 | |
| June | NF | NF | |
| July | NF | NF | |
| Aug | NF | NF | |
| Sep | NF | 13 | |
| Oct | NF | 27 | |
| Nov | NF | 25 | |
| Dec | NF | 56 | |
| | | | |



# APPENDIX 3

## Surface Water Discharge Monitoring Results Composite

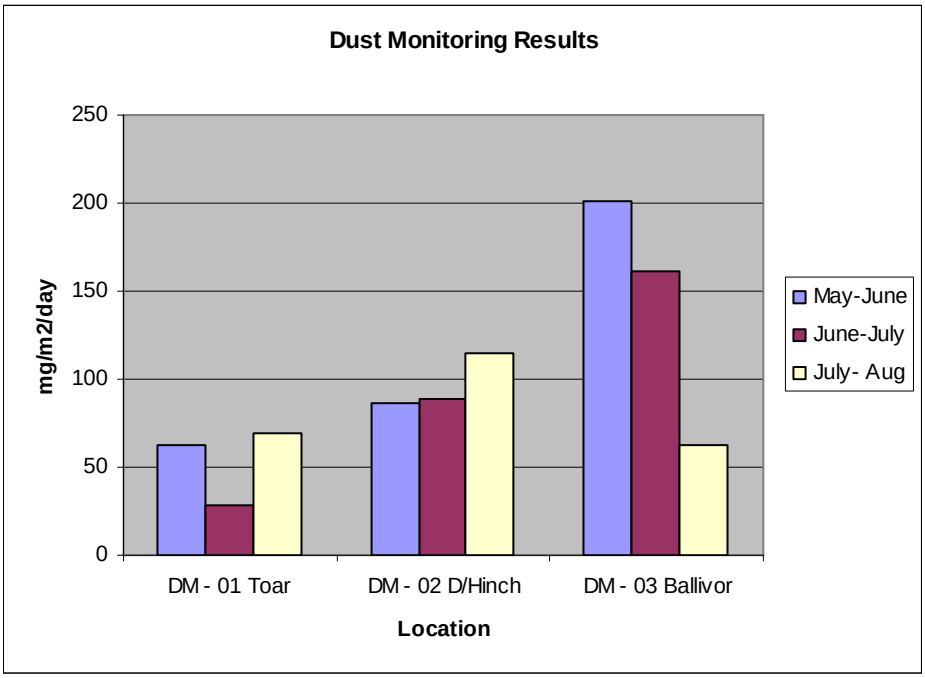
# APPENDIX 4

## Dust Monitoring Results.

## Dust Monitoring Results

**Licence:P0501-01**
**Works: Derrygreenagh**

| Sample Period | DM - 01 Toar | DM - 02 D/Hinch | DM - 03 Ballivor |
|---|---|---|---|
| May-June | 63 | 86 | 201 |
| June-July | 28 | 89 | 161 |
| July- Aug | 69 | 115 | 63 |



# APPENDIX 5

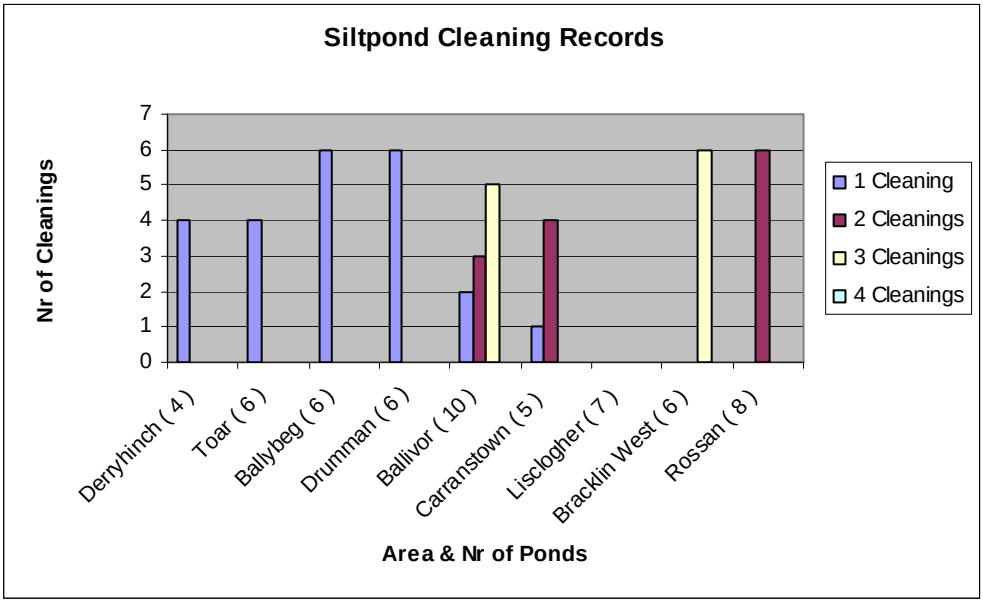
## Boiler Efficiency Results

# APPENDIX 6

## De-silting Programme Review.

**Works: Derrygreenagh**

| Bog Area & Nr Ponds | 1 Cleaning | 2 Cleanings | 3 Cleanings | 4 Cleanings |
|---|---|---|---|---|
| Derryhinch ( 4 ) | 4 | | | |
| Toar ( 6 ) | 4 | | | |
| Ballybeg ( 6 ) | 6 | | | |
| Drumman ( 6 ) | 6 | | | |
| Ballivor ( 10 ) | 2 | 3 | 5 | |
| Carranstown ( 5 ) | 1 | 4 | | |
| Lisclogher ( 7 ) | | | | |
| Bracklin West ( 6 ) | | | 6 | |
| Rossan ( 8 ) | | 6 | | |
| | | | | |



BORD NA MÓNA

BORD NA MÓNA ENERGY LIMITED

# Annual Environmental Report 2007
# P0506-01

**March 2008**

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**Appendix 1:** Emissions to Water Monitoring Results. (Bogs)

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**Appendix 3:** Emissions to Air Monitoring Results.

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**Appendix 5:** AER, PRTR Data

## 1.0 Introduction

1.1 IPPC Licence No **P0506-01**

1.2 Name & Location of Site

| | |
|---|---|
| **Name:** | **Bord na Mona Energy Limited.** |
| **Address:** | **Kilberry Group of Bogs**<br>**C/O Bord na Mona**<br>**Ballivor**<br>**Navan**<br>**Co Meath** |
| **Telephone No:** | **046/9546003** |
| **Fax No** | **046/9546394** |
| **Contact Name** | **Terence Bracken** |
| **Position** | **General Manager** |
| **National Grid Reference** | **E266310 N199810** |

1.3 Description of Activities

.

**Peat Milling Operations.**

For milled peat production the bog is laid out in a series of rectangular fields of varying length and 15m wide with drains located between. There are essentially four operations involved in milled peat production:
Milling.
Harrowing.
Ridging.
Harvesting.

**Milling.**
Special milling machines work there way along the fields, milling approximately 15mm of peat of the top of the bog in a pass.

**Harrowing**
In the course of drying, the milled peat is turned a number of times to avail of the drying conditions. This is achieved with a machine called a harrow. The milled peat is harrowed until its moisture content is down to approximately 40-50%, which can take up to two to three days, weather depending.

**Ridging**
The dry peat is then scraped into long ridges running down the centre of each field. This is done with a ridger, a machine consisting of a series of blades in the shape of a v that opens the full width of the field.

**Harvesting**
During harvesting every eleventh field is used to stockpile the peat, with this field receiving the milled peat from the five fields either side.

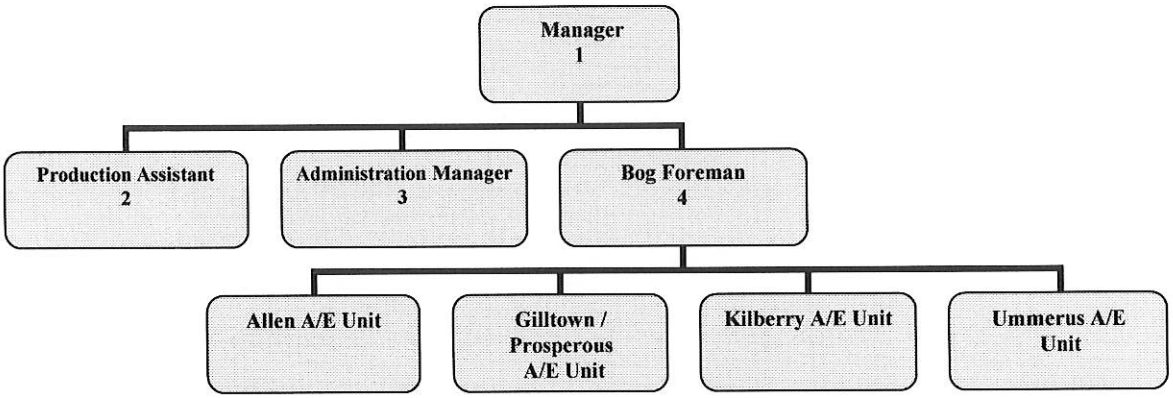
The milled peat is then transported via the existing network of peatland railways or via road to one of the following locations.
Power station
Horticultural Factory.
Dublin Port for Export

1.4 Environmental Management of the Company

The organisational structure within the Kilberry Group is presented in the flow chart below.

# Kilberry Group

## Environmental Responsibilities




(1) Overall environmental responsibilities
(2) All production related issues
(3) Co-ordinating environmental affairs
(4) Production / Environmental Compliance

## 1.5 Environmental Policy

**BORD NA MÓNA**

**BORD NA MÓNA ENERGY LIMITED**
**Kilberry Group**

Bord na Mona Energy Limited is a commercial semi-state body with responsibility to develop Irelands peat resources in the national interest.

Bord na Mona Energy Limited is committed to gather and make available information on all aspects of its environmental impact and to help improve understanding among the public generally of its role and the importance of Irish peatlands.

Bord na Mona Energy Limited recognises the importance of peatland conservation.

Bord na Mona Energy Limited will leave behind all areas it owns as either an economically or socially integrated resource of a high environmental value.

Bord na Mona Energy Limited seeks to conduct all aspects of its buisness in an environmentally sensitive value.

Bord na Mona Energy Limited will establish an environmental management system specifically addressing the following impacts.

Discharges to water.
Emissions to atmosphere.
Waste disposal.
Use of natural resources.
Noise, vibration, odour, dust and visual effects.
Natural environment and eco-system.

The environmental management system will be monitored, maintained and continually improved.

A system of regular environmental audits will be put in place.

Bord na Mona Energy Limited will continue research and development into all aspects of its environmental impact.

This statement is published and is available at all locations within the division and its contents are brought to the attention of all employees.

## 2.0 Summary Information

### 2.1.1 Emissions to Water Summary

2.1.1 Silt Pond Emissions

**Surface Waters**

Comment

Surface water monitoring was carried out four times during the reporting period. In total analysis was carried out at 4 different locations. These locations are as follows, Kilberry @ SW3, Ummerus @ SW4, Gilltown @ SW7 and Allen @ SW13. The parameters measured during each sampling event were as follows.

Total Phosphorus, Total Solids, Suspended Solids, pH, Ammonia, Colour and COD.

In general results were constant across all parameters at each monitoring location.

**pH** values were between 7.2 and 8, with normal emission limit values being of the range 6 and 9. In general there was no great variation in results for the period.

**Suspended solids** varied from 5mg/l to 106mg/l and would depend on activities ( piping, ditching ) etc in the catchments at the time of sampling. All quarterly grab sampling was fully compliant in relation to suspended solids. Although the 106 result was above the 35mg/l threshold it was just above the 75% below 52.5 mg/l, no sample above 105 mg/l rule. As all other results were so low this is considered a once off abnormality.

Slightly elevated **ammonia** levels were detected at Ummerus SW4, Gilltown SW7 and Allen SW13. The I/PV for A3 waters is of the range 4mg/l. It is however not unusual for surface waters emanating from production peatlands, to be slightly elevated.

**COD** readings at Kilberry SW3 were elevated in the 2nd & 3rd quarter monitoring events. Subsequent results showed a slight reduction. Results for all future sampling events at the locations will be closely monitored for any elevated or abnormal results and investigations carried out if necessary. Elevated results at SW13 during 2006 seem to have reduced.

Sampling will continue at the same locations during 2008.

Surface Water Monitoring Results are contained in appendix 1.

2.1.2 Yard Discharges

Comment

The maintenance areas at each bog have a small concrete apron and give limited opportunities for sampling. All yard areas are inspected and oil interceptors have been maintained during the year. During an inspection by the Agency an oily sheen was detected at the interceptor outlet, in Ummerus, the source of the sheen was unknown and follow-up actions included cleaning the unit, cleaning of the yard area and outlet drain. Further to this hydro carbon digesting pillows were installed at the interceptor, which already show a marked reduction in COD results at the location.

2.1.3 Composite Sampler Report

**Composite Sampling**
Comment
The composite sampler has been operating at SW8 Ummerus Bog during the reporting period. The parameters measured were Total Phosphorus, Total Solids, Suspended Solids, pH, Nitrogen, Colour and COD, with Suspended solids being the only parameter with an emission limit value ( 35mg/l ). In general results were satisfactory, with one non-compliance being recorded for the period. A suspended solids result of 63 mg/l was recorded on the 10/12/2007 and the Agency was informed.
Problems in relation to flow were experienced during the reporting period which subsequently led to no samples being available for extended periods. A survey of the outfall leading from the sampler was carried out and levels showed the possibility of a slight improvement in flow rates if the outfall was cleaned and deepened. Following on from this work a slight improvement was noticed, however during extended dry periods the availability of a constant flow cannot be guaranteed at the site.
The COD reading is higher from this location than previous which may be caused by the oily sheen found in the outlet from the yard oil interceptor referred to above. This unit was cleaned by the approved contractor during the year and pillows fitted to the interceptor see above.

Composite Sampler Results are contained in appendix 2.

2.1.4 Emissions to Water Non-compliance's

**Emissions to Water Non-Compliances**

**IPPC Licence: P0506-01**

**Works: Kilberry**

| Type | Non-Compliances | Location / SW Nr |
|---|---|---|
| Composite | 1 | Ummerus SW8 |
| Quarterly Grab | 0 | |
| Monthly Yard | NA | |
| **Totals** | **1** | |

**Note**: Emission Limit Value = 35mg/litre

## 2.2Emissions to Air

2.2.1 Dust Monitoring

**Dust**
Comment
Dust monitoring was carried out on a monthly basis at DM01 Gilltown Bog. Each monitoring event lasted between 28 and 32 days and the Bergerhoff method of analysis was used.
Slightly elevated results were detected during the August monitoring event. It should also be noted that all results were below the emission value of 350 mg/m²/day set out in the licence.
Due to human error, sampling was not carried out on five occasions during the reporting period; however no dust complaints were received at any time.

Sampling will continue at the same location during 2008.

Dust Monitoring Results are contained in appendix 3

2.2.2 Emissions to Air Non-compliance's

**Dust Non-compliance**

**IPPC Licence: P0506-01**

**Works: Kilberry 2007**

| Location / DM Nr | Non-Compliances |
|---|---|
| Gilltown / DM01 | 0 |
| **Total** | **0** |

## 2.3 Waste Arisings

### 2.3.1 Non-Hazardous Waste

**Non Hazardous Waste Data**

**Licence: P0502-01**

**Works: Kilberry**

| Type | Tonnes | EWC Code | Contractor | Licence Nr |
|---|---|---|---|---|
| Skips | 8.00 | 20 03 01 | AES | 053/OY/39/02 |
| Wheelie Bins | 4.72 | 20 03 01 | AES | 053/OY/39/02 |
| Polyethlene | 174.16 | 02 01 04 | Leinster Environmentals | WP 2004/30 |
| Scrap Steel | 5.20 | 17 04 07 | Hammond Lane | 050/OY/162/04 |
| Timber Pallets | 0.00 | 15 01 02 | Kiawa Ltd | WP/TN/24 |
| Silt Pond Cleanings | 148.75 | 01 01 02 | Bord na Mona | IPPC P 0499 |
| Peat Screenings | 12.00 | 01 04 99 | Bord na Mona | IPPC P 0499 |
| **Totals** | **352.83** | | | |

**Note:** Polyethylene, Steel and Peat Screenings are all recycled. All polythene removed from stockpiles is now baled using the tractor attachment in each bog area.

### 2.3.2 Hazardous Waste

**Hazardous Waste Data**

**Licence:P0506-01**

**Works: Kilberry 2007**

| Type | Tonnes | EWC Code | Contractor | Licence Nr | Destination |
|---|---|---|---|---|---|
| Waste Oil | 0.50 | 13 02 05 | Enva Ireland Ltd Portlaoise | 184-1 | Portlaoise |
| Oil Filters | 0.56 | 16 01 07 | Enva Ireland Ltd Portlaoise | 184-1 | Portlaoise |
| Oily Rags | 0.00 | 15 02 02 | Enva Ireland Ltd Portlaoise | 184-1 | Portlaoise |
| Waste Grease | 0.00 | 13 08 99 | Enva Ireland Ltd Portlaoise | 184-1 | Portlaoise |
| Lead Acid Batt | 0.70 | 16 06 01 | Returnbatt Ltd | 067/OY/280/05 | Kill Co Kildare |
| Fluorescent Tubes | 0.00 | 20 02 21 | Enva Ireland Ltd Portlaoise | 184-1 | Portlaoise |
| Parts Wash | 0.00 | 11 01 13 | Safety Kleen, Tallaght, Dublin | 99-1 | Dublin |
| Primary Battery | 0.00 | 16 06 04 | Returnbatt Ltd | 067/OY/280/05 | Kill Co Kildare |
| Asbestos | 0.00 | 17 06 05 | Cullen Env Services | 81-3 | KTK Landfill |
| **Total** | **1.76** | | | | |

## 2.4 Energy and Water Consumption

2.4.1 Energy

| Energy Consumption | | | | |
|---|---|---|---|---|
| Licence: P0506-01 | | | | |
| Works: Kilberry | | | | |
| Units | Diesel ( Litres ) | Petrol (Litres) | Electricity (Units) | Peat Briquettes (Tonnes) |
| Totals | 184525 | 0 | 203516 | 0 |
| MW Hours | 1806.9 | 0 | 203.516 | 0 |
| Total MW Hours | 2010.5 | | | |

Water is not used as part of the production process.

## 2.5 Environmental Incidents and Complaints

2.5.1 Incidents

| Environmental Incidents | |
|---|---|
| IPPC Licence: P0506-01 | |
| Works: Kilberry | Number |
| Incidents | 0 |
| Requiring corrective action | 0 |
| Category | |
| Water | |
| Air | |
| Procedural | |
| Miscellaneous | |
| Total | 0 |

2.5.2 Complaints

| Environmental Complaints | |
|---|---|
| IPPC Licence: P0506-01 | |
| Works: Kilberry | |
| | Number |
| Complaints | 1 |
| Requiring corrective action | 0 |
| Category | |
| Water | |
| Air | 1 |
| Procedural | |
| Miscellaneous | |
| Total | 1 |

One dust complaint was received during May 2007 and a corrective action report forwarded to the Agency.

## 3.0 Management of the Activity

### 3.1 Achievement of Objectives & Targets 2007

| Project | Description & Status |
|---|---|
| **Project 1:**<br><br>Reduction of fugitive dust emissions. | **Training.**<br>Continue to train all new employees in environmental matters. Copy environmental video to disk and distribute more widely. All new employees will be trained during the year.<br>**Status**<br>The training video was successfully transferred onto DVD and distributed to all Licence holders. The DVD was also edited to include new improved poly stripping and rolling techniques. In total 7 personnel received training in 2007.<br>**Hydraulic Harrows.**<br>Continue to supply hydraulic harrows. Prioritising dust sensitive locations. There is one Hydraulic Harrow in operation at the moment we will continue to monitor the situation regarding introducing any more.<br>**Status**<br>No hydraulic harrows were introduced in 2007.<br>**Headland Peat Collection.**<br>Continue with the collection of headland peat, particularly at dust sensitive locations. Supply more headland peat collection machinery as required and research efficient ways of collecting such peat for use as a saleable product.<br>**Status**<br>As the production season was greatly hampered by inclement weather, July 114.9mm and August 119.6mm of rainfall, headland peat dust was not an issue. However in areas where dust has been an issue, headland dust was controlled by ridging up and sprinkling with a water bauser. |
| **Project 2:**<br><br>Minimisation of suspended solids | **On Site Inspections.**<br>A full programme of internal audits will be carried out as soon as production commences. Particular emphasis will be put on cleaner production procedures, milling, harrowing, ridging, harvesting and loading.<br>**Status**<br>A comprehensive internal audit took place, which proved very successful. Follow up audits were subsequently carried out to ensure that initial findings were addressed and closed out. |

| | |
|---|---|
| **Project 3:**<br><br>Effective spill leak management of mobile fuelling units. | **On Site Inspections.**<br>As part of the above project, service trains will also be prioritised with a fitter accompanying the auditor during inspections to highlight any risks or potential risks that may occur.<br>**Status**<br>In conjunction with the above, the fitter at each location audited was present to inspect the service train. Any repairs that were required were identified and rectified. |
| **Project 4:**<br><br>Fire Prevention. | **Fire Patrols.**<br>There will be extra emphasis on fire patrols this coming production season. Research on improved fire fighting techniques will also be investigated. The newly adopted Fire and Environmental Plan will be communicated to all personnel.<br>**Status**<br>The fire prevention plan was communicated to all personnel |
| **Project 5:**<br>Collection storage and reuse of polyethylene. | **Identify Recyclers.**<br>Continue with the recycling of polyethylene. The sourcing of more recycling contractors will be ongoing.<br>**Status**<br>During the year a total of 174 tonnes of polythene has been sent for recycling to Apec Plastics Co. Kildare and Leinster Environmentals, Dundalk. |
| **Project 6:**<br>Provision of measures to protect Dust Sensitive Areas. | **Planting.**<br>Planting is ongoing as required, with areas in the periphery of production bogs that are being developed for housing being prioritised.<br>**Status**<br>No planting took place in 2007. |

## 3.2 Environmental Management Programme Proposal for 2008

| Project | Description & Status |
|---|---|
| **Project 1:**<br><br>Reduction of fugitive dust emissions. | **Training.**<br>Train all employees in environmental matters. Training will be by means of the screening of an environmental DVD, followed by a power point presentation.<br><br>**Hydraulic Harrows.**<br>There is one new Hydraulic Harrow programmed for delivery for 2008 to be used in Dust Sensitive Locations.<br><br>**Headland Peat.**<br>Continue with the control of headland peat, particularly at dust sensitive locations. This will be by means of headland ridging and subsequent sprinkling with water bauser. |
| **Project 2:**<br><br>Waste Management | **On Site Inspections.**<br>A full programme of internal audits will be carried out as soon as production commences. This will be an annual exercise with the 2008 audit placing more emphasis on waste management. |
| **Project 3:**<br><br>Minimisation of Suspended Solids. | **Training.**<br>Train all employees in environmental matters. Training will be by means of the screening of an environmental DVD, followed by a power point presentation. |
| **Project 4:**<br><br>Effective spill leak management of mobile fuelling units. | **Research and Development.**<br>The identification and ultimately the introduction of mobile fuelling units which will enhance the spill / leak management of fuel oils. Increased bund provisions are planned for 2008, as well as one new fuel service wheeled wagon which contains bunded tanks. |
| **Project 5:**<br><br>Collection storage and reuse of polyethylene. | **Identify Recyclers.**<br>Continue with the recycling of polyethylene. The sourcing of more recycling contractors will be ongoing. |
| **Project 6:**<br><br>Provision of measures to protect Dust Sensitive Areas. | **Planting.**<br>Ongoing<br>Planting is ongoing as required, with areas in the periphery of production bogs that are being developed for housing being prioritised. |

### 3.3 Environmental Expenditure

| Environmental Expenditure |
|---|

| Licence:P0506-01 |
|---|
| Works: Kilberry 2007 |

| Description | Cost € |
|---|---|
| Capital Costs | 41735 |
| Silt Control | 37579 |
| Analytical & Consultancy Costs | 9750 |
| EPA Fees | 6340 |
| Bog Rehabilitation | 0 |
| **Total** | **€95,404.00** |

### 4.0 Licence Specific Reports

4.1 Surface Water Discharge Monitoring Location Programme Review

It is not proposed to change the quarterly grab sampling locations as they are the primary drainage outlets from each bog.

4.2 Bunding Programme

The bunds at Ummerus, Allen, Giltown and at Kilberry were all tested during the reporting period and all passed.

4.3 Boiler Combustion Efficiency

There are no boilers in use in the Kilberry Group of bogs and therefore no efficiency tests were required.

4.4 Resource consumption summary

| Resource Consumption | | | |
|---|---|---|---|
| Licence: P0506-01 | | | |
| Works: Kilberry | | | |
| **Product** | **Tonnes Produced** | **Tonnes Sold** | **Customer** |
| Milled Moss | 140723 | 165692 | Hort Factory |
| **Totals** | **140723** | **165692** | |

| Proposed Production 2008 | |
|---|---|
| Licence: P0506-01 | |
| Works: Kilberry | |
| **Product** | **Proposed Target** |
| Milled Moss | 146000 |
| **Totals** | **146000** |

4.5 De-Silting Report

The cleaning of silt ponds was dictated by the inspection logs. In some instances ponds were required to be cleaned up to 3 times in the year with most ponds cleaned twice.

The De-silting Programme Review is contained in appendix 4.

4.6 Bog Development and Operational Programme

There was no additional development carried out during 2008 in this group of bogs.

4.7 Bog Rehabilitation Report

No bog rehabilitation took place during 2007. As the bogs are all active, rehabilitation is not envisaged for the foreseeable future.

4.8 Archaeological Report

**Kilberry** – Excavation of 2 sites in Gilltown.

## 5.0 Summary

This report is the seventh submitted for this licence and it covers the calendar year 2007.

In terms of compliance, there was one non-compliance in the area of composite sampling.

There were no non-compliances at the dust sensitive location.

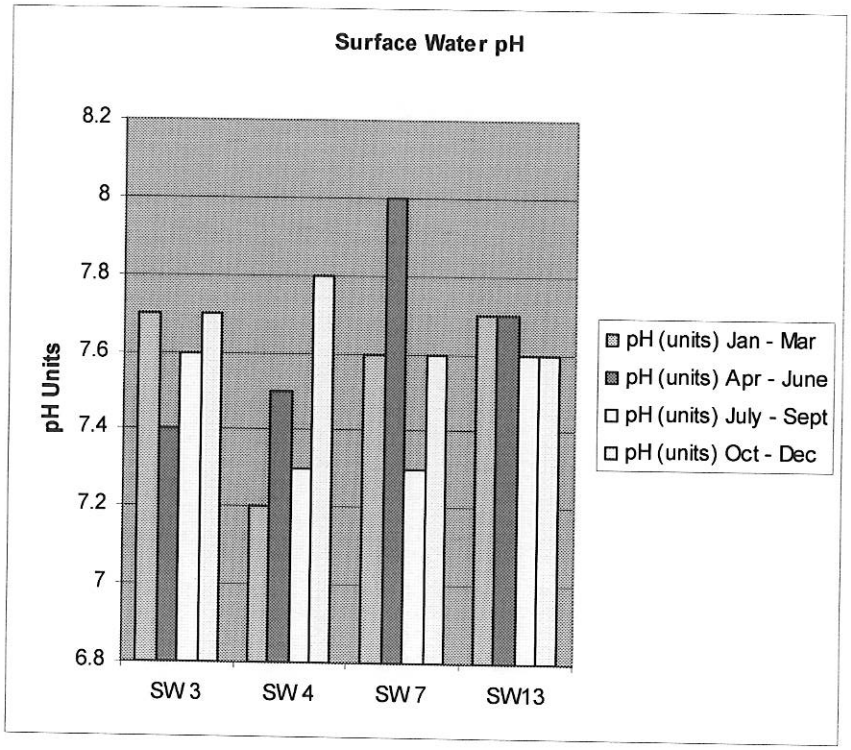
One complaint was received in relation to dust emissions from production operations. This was dealt with and the Agency was informed.

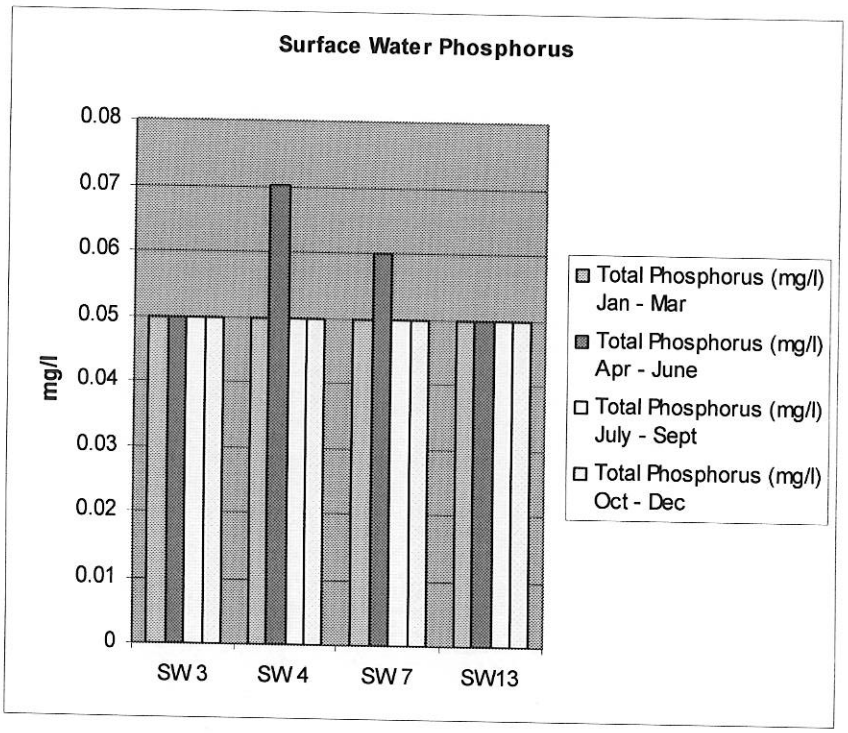
Bord na Mona Energy Ltd are represented on the Management Group of both the Shannon River and Eastern River Basin District Management Systems, set up under the Water Framework Directive, and on the Steering Group of the Catchment Management on the River Barrow.

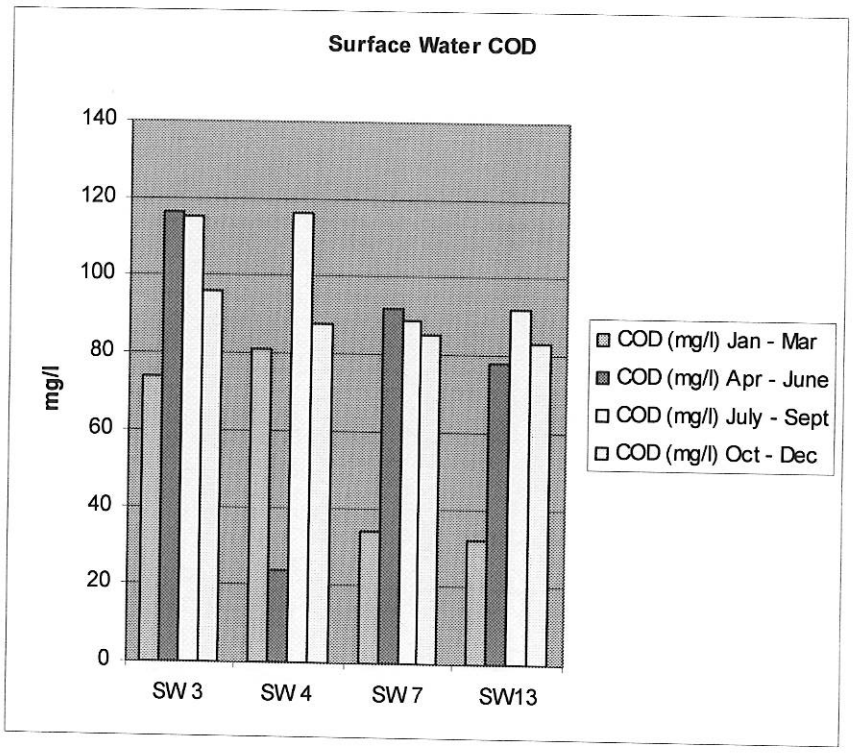
Bord Na Mona wishes to advise the Environmental Protection Agency of our continued commitment towards improvement in our environmental performance.

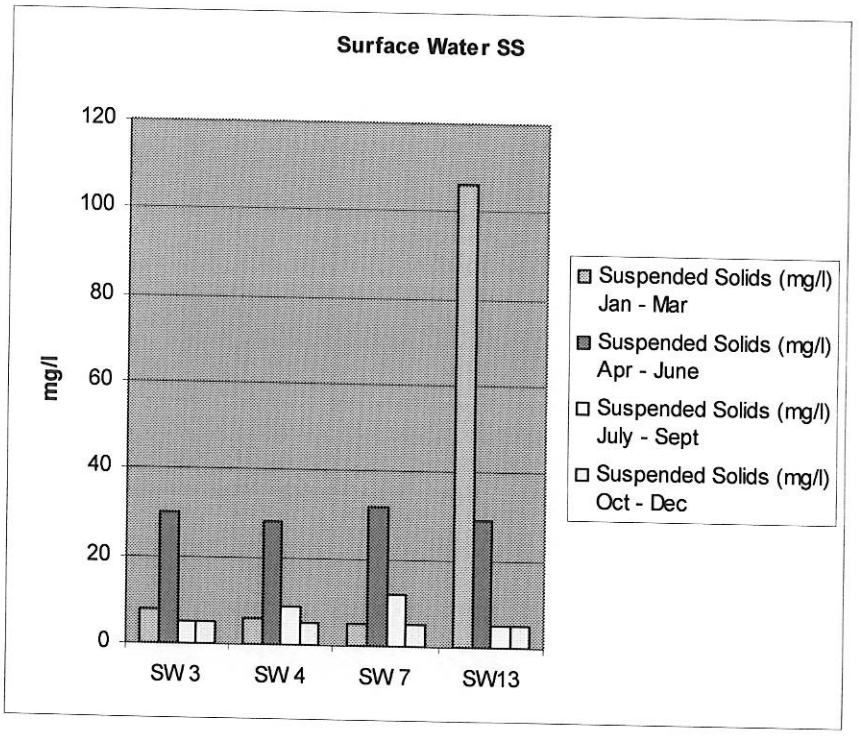
# APPENDIX 1

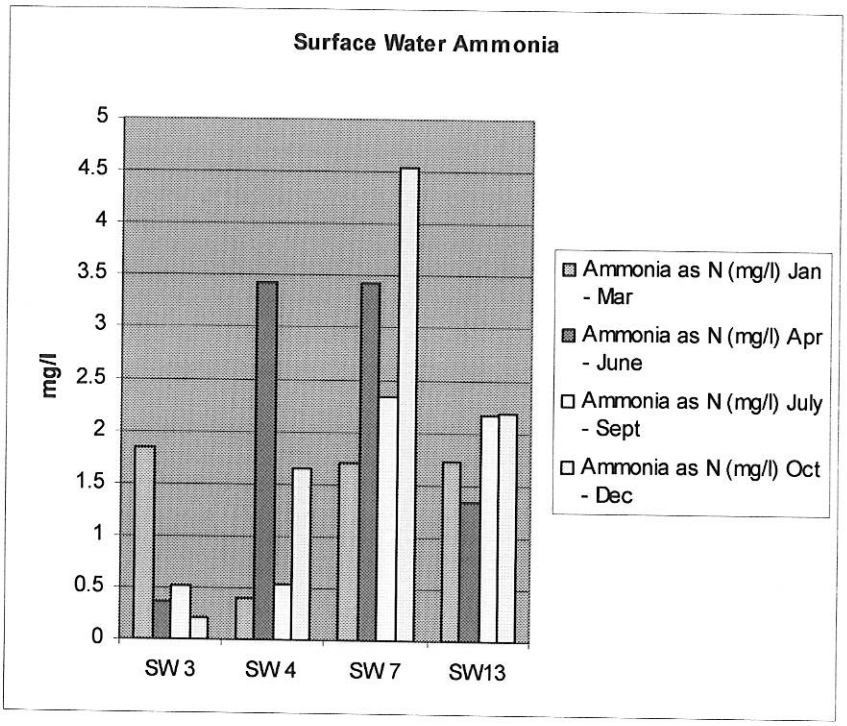
## Surface Water Discharge Monitoring Results Bogs

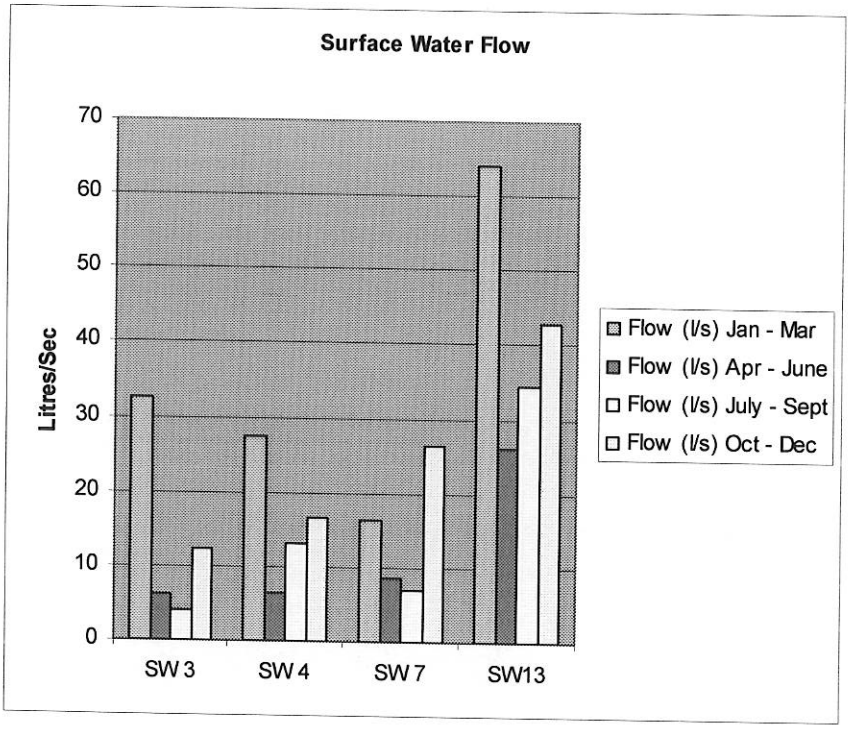

Surface Water pH
8.2
8
7.8
7.6
7.4
7.2
7
6.8
pH Units
SW 3
SW 4
SW 7
SW13
pH (units) Jan - Mar
pH (units) Apr - June
pH (units) July - Sept
pH (units) Oct - Dec


Surface Water Phosphorus
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
mg/l
SW 3
SW 4
SW 7
SW13
Total Phosphorus (mg/l) Jan - Mar
Total Phosphorus (mg/l) Apr - June
Total Phosphorus (mg/l) July - Sept
Total Phosphorus (mg/l) Oct - Dec


Surface Water COD
140
120
100
80
60
40
20
0
mg/l
SW 3
SW 4
SW 7
SW13
COD (mg/l) Jan - Mar
COD (mg/l) Apr - June
COD (mg/l) July - Sept
COD (mg/l) Oct - Dec


Surface Water SS
120
100
80
60
40
20
0
mg/l
SW 3
SW 4
SW 7
SW13
Suspended Solids (mg/l) Jan - Mar
Suspended Solids (mg/l) Apr - June
Suspended Solids (mg/l) July - Sept
Suspended Solids (mg/l) Oct - Dec


Surface Water Ammonia
mg/l
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
SW 3
SW 4
SW 7
SW13
Ammonia as N (mg/l) Jan - Mar
Ammonia as N (mg/l) Apr - June
Ammonia as N (mg/l) July - Sept
Ammonia as N (mg/l) Oct - Dec


Surface Water Flow
Litres/Sec
70
60
50
40
30
20
10
0
SW 3
SW 4
SW 7
SW13
Flow (l/s) Jan - Mar
Flow (l/s) Apr - June
Flow (l/s) July - Sept
Flow (l/s) Oct - Dec

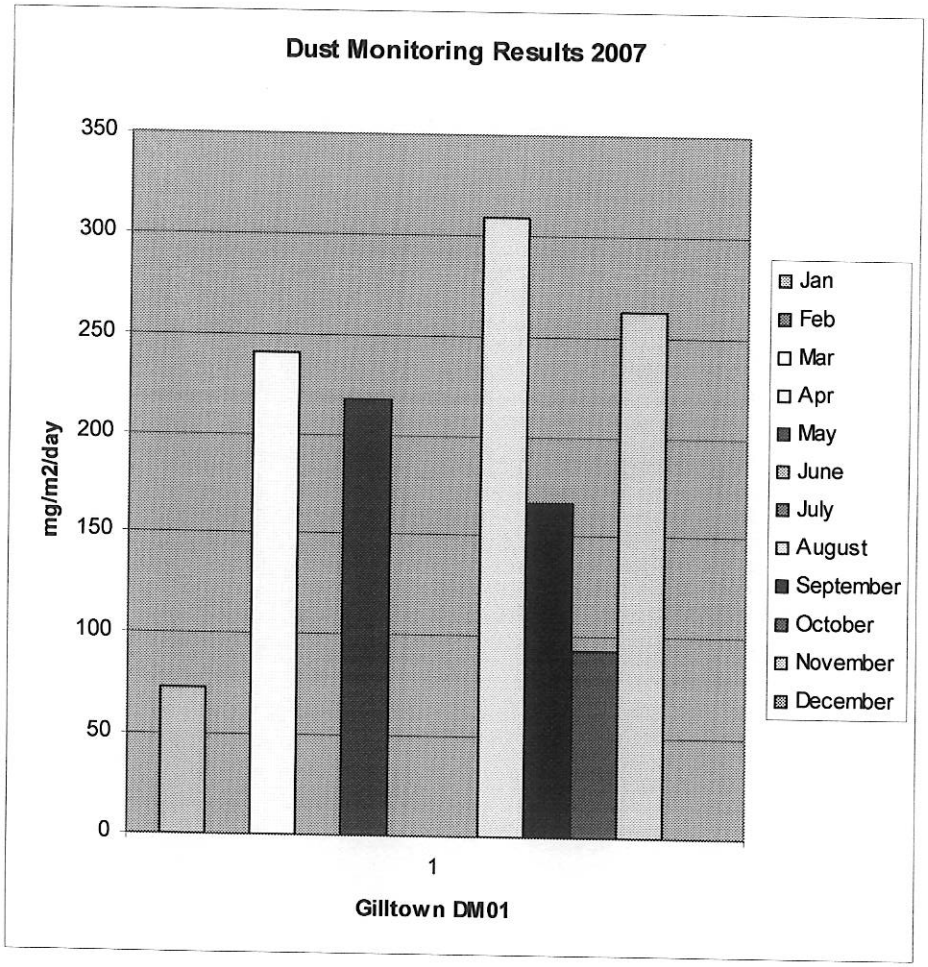
# APPENDIX 2

## Composite Sampler Monitoring Results

# APPENDIX 3

## Dust Monitoring Results

| Dust Monitoring Results | |
|---|---|
| IPPC Licence: P0506-01 | |
| Works: Kilberry | 2007 |
| Sample Period | DM-01 Gilltown |
| Jan | 73 |
| Feb | 0 |
| Mar | 241 |
| Apr | 0 |
| May | 218 |
| June | 0 |
| July | 0 |
| August | 309 |
| September | 166 |
| October | 93 |
| November | 263 |
| December | 0 |



# APPENDIX 4

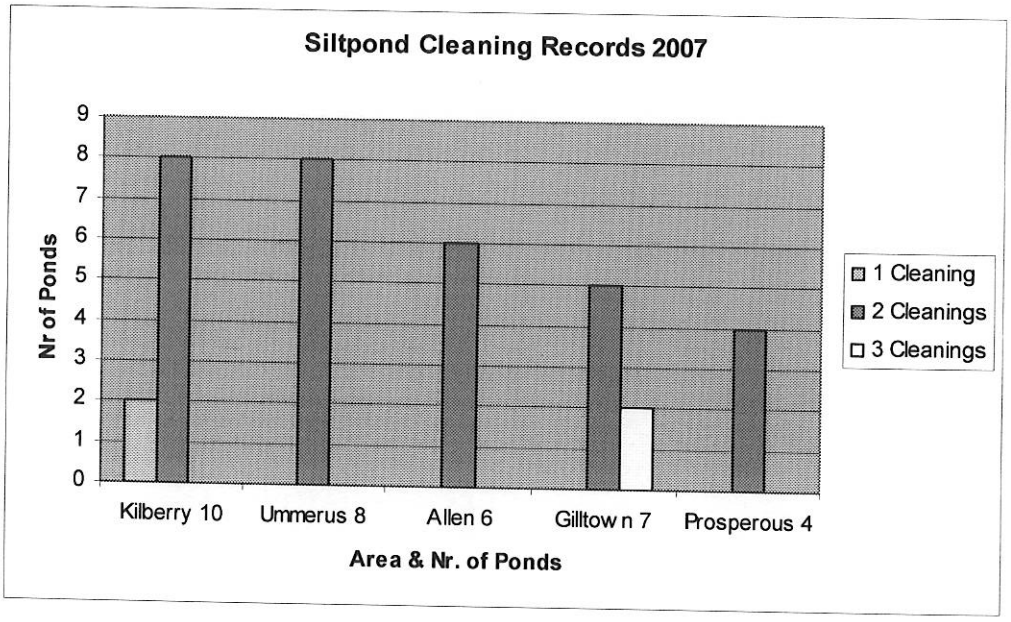
## De Silting Programme Review

## Siltpond Cleaning Programme 2007

**IPPC Licence: P0506-01**

**Works: Kilberry**

| Bog Area & No. of Ponds | 1 Cleaning | 2 Cleanings | 3 Cleanings |
|---|---|---|---|
| Kilberry 10 | 2 | 8 | |
| Ummerus 8 | | 8 | |
| Allen 6 | | 6 | |
| Gilltown 7 | | 5 | 2 |
| Prosperous 4 | | 4 | |



# APPENDIX 5

## AER, PRTR DATA

BORD NA MÓNA

BORD NA MÓNA ENERGY LIMITED

# Annual Environmental Report 2008
# P0501-01

**March 2009**

Bord na Móna today operates 5 main subsidiary companies in more than 20 locations throughout Ireland, the UK and USA. The principal businesses are in the Energy, Resource Recovery, Horticulture, Home Heating and Wastewater Treatment and Air Pollution Abatement markets. The company also engages in an extensive rehabilitation program to develop its peat lands in an environmentally sustainable manner. The company turnover for 2007/8 was €370m.




Bord na Móna has long recognised the need to diversify its activities in order to secure a sustainable future. In this context we identified the energy and resource recovery sectors as appropriate areas of growth and development, given our assets, strengths and skills. Significant challenges face Ireland in meeting the country's needs to provide secure sustainable energy and manage waste while minimising the impact on the environment.

Bord na Móna is in a strong position to contribute to dealing with these challenges. We have a unique mixture of assets, experience and innovation which will enable us to cross-link our activities in energy, water and resource recovery to provide products and services which will meet Ireland's needs. We also have the capacity to become an exemplar for others to follow in these fields.
With this background we have scoped out a new vision for the future sustainable development of Bord na Móna.

Following on from our vision, we have developed a new mission for Bord na Móna which the Company is committed to achieving.
In 1934 the Turf Development Board was formed to ‘develop and improve the turf industry.' The experience of fuel shortages during the war re-enforced the Irish State's commitment to developing the country's bogs. In 1944 the TDB was asked to devise and submit a comprehensive programme, the outcome was the transformation in 1946 of the TDB into Bord na Móna. The Board was given a mandate to increase the use of peat as a fuel and in energy production. Markets for the use of moss peat in horticulture were also developed.
In 1990 Bord na Móna implemented a divisionalised and decentralised structure, designed to delegate responsibility downwards ensuring a sharper focus on each profit centre and a greater spirit of enterprise.

# *Group Vision*




The vision statement defines the Company's purpose, in terms of its values.
Values are guiding beliefs about how things should be done.
The vision statement communicates both the purpose and values of Bord na Móna.
For employees, it gives direction about how they are expected to behave and inspires them to give their best. Shared with customers, it shapes the customers' understanding of why they should work with Bord na Móna.

Bord na Móna will seek solutions that optimise the creative energy and potential of the organisation, driven by long term goals and the organisation's vision and mission.
In this context our devolved business units will align their vision and strategic planning with the global direction provided.

Consistent with our vision, innovation will once again return to the core of everything we do. We will capitalise on opportunities to cross fertilise our unique range of skills and technologies that add value and are socially and environmentally sustainable.
Greater focus will be placed on managing and developing our land assets in a responsible and sustainable manner. Our award winning initiatives at Lough Boora (Co. Offaly) and Oweninny (Co Mayo), provide shining examples of what can be achieved

# *Group Mission*

We conduct our affairs with openness, honesty and integrity.
We are Ireland's leading environmentally responsible integrated utility service provider encompassing electricity, heating solutions, resource recovery, water, horticulture and related services.
We capitalise on international opportunities where we have a competitive advantage.
We achieve continuing growth through superior customer service, outstanding quality and innovation delivered through the excellence and commitment of our people.
We engage in sustainable profitable business in the communities we serve, which is rewarding and challenging for employees and other stakeholders.

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**Appendix 1:** Emissions to Water Monitoring Results. (Bogs)

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**Appendix 5:** De-silting Programme Review

**Appendix 6:** AER & PRTR Data

# 1.0 Introduction

## 1.1 IPPC Licence No 501-01

## 1.2 Name & Location of Site

**Name:** Bord na Mona Energy Limited.

**Address:** Derrygreenagh Works, Rochfortbridge, Mullingar, Co. Westmeath

**Telephone No:** 044 9222181

**Contact Name:** Eamonn Mulhall

**Position**: Resource Manager

**National Grid Reference**: E249450 N 238140

## 1.3 Description of Activities

**Peat Milling Operations.**

For milled peat production the bog is laid out in a series of rectangular fields of varying length and 15m wide with drains located between. There are essentially four operations involved in milled peat production:
Milling.
Harrowing.
Ridging.
Harvesting.

**Milling.**
Special milling machines work there way along the fields, milling approximately 15mm of peat of the top of the bog in a pass.

**Harrowing**
In the course of drying, the milled peat is turned a number of times to avail of the drying conditions. This is achieved with a machine called a harrow. The milled peat is harrowed until its moisture content is down to approximately 40-50%, which can take up to two to three days, weather depending.

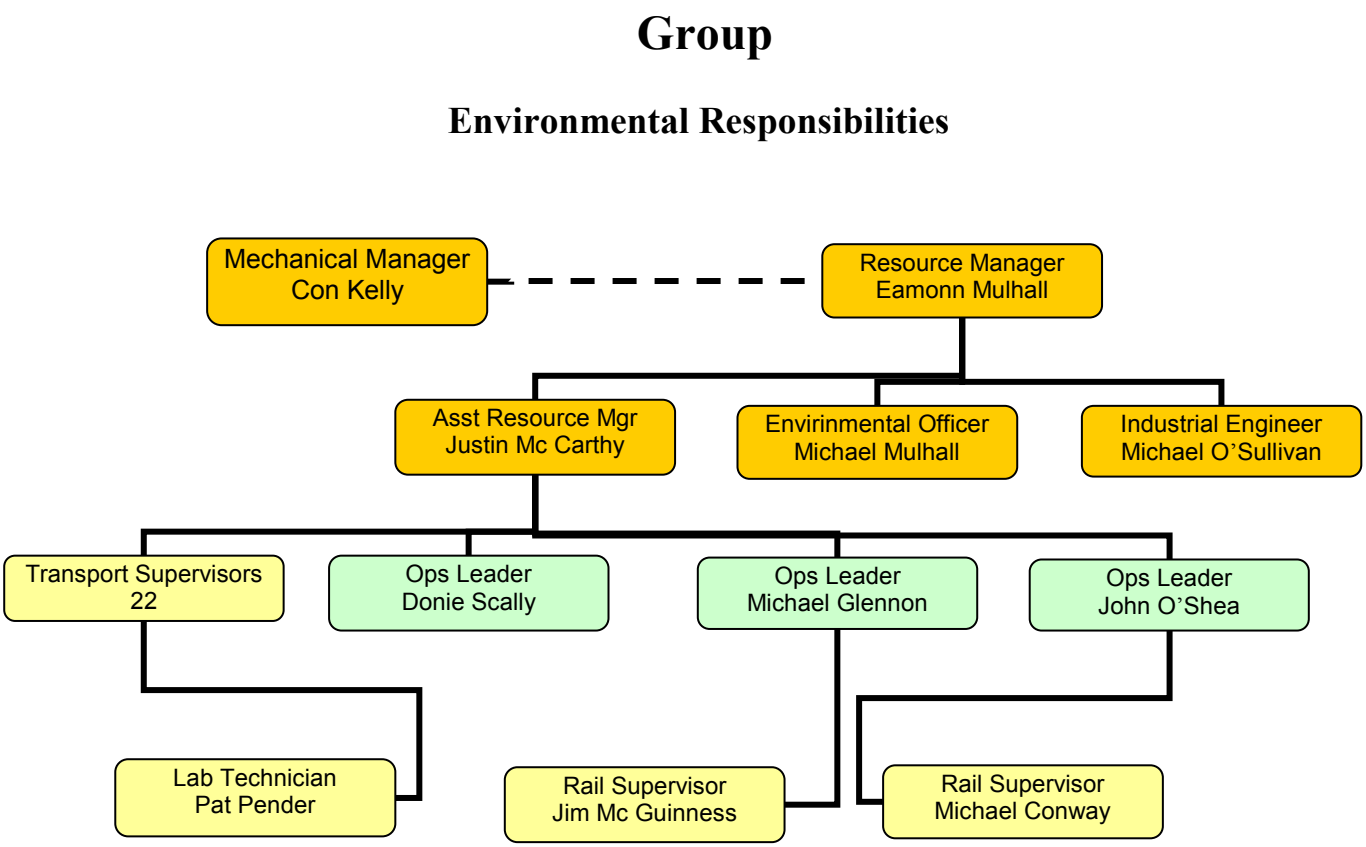
**Ridging**
The dry peat is then scraped into long ridges running down the centre of each field. This is done with a ridger, a machine consisting of a series of blades in the shape of a v that opens the full width of the field.

**Harvesting**
During harvesting every eleventh field is used to stockpile the peat, with this field receiving the milled peat from the five fields either side.

The milled peat is then transported via the existing network of peatland railways or via road to one of the following locations.
Power station
Horticultural Factory.
Briquette Factory.

### 1.4 Environmental Management of the Company

The organisational structure within the Derrygreenagh Group is presented in the flow chart below.



## 1.5 Environmental Policy

**BORD NA MÓNA**

**BORD NA MÓNA ENERGY LIMITED**
**Derrygreenagh,Rochfortbridge,Mullingar,Co-Westmeath.**

Bord na Mona Energy Limited is a commercial semi-state body with responsibility to develop Ireland's peat resources in the national interest.

Bord na Mona Energy Limited is committed to gather and make available information on all aspects of its environmental impact and to help improve understanding among the public generally of its role and the importance of Irish peatlands.

Bord na Mona Energy Limited recognises the importance of peatland conservation.

Bord na Mona Energy Limited will leave behind all areas it owns as either an economically or socially integrated resource of a high environmental value.

Bord na Mona Energy Limited seeks to conduct all aspects of its business in an environmentally sensitive value.

Bord na Mona Energy Limited will establish an environmental management system specifically addressing the following impacts.

Discharge to water.
Emissions to atmosphere.
Waste disposal.
Use of natural resources.
Noise, vibration, odour, dust and visual effects.
Natural environment and eco-system.

The environmental management system will be monitored, maintained and continually improved.

A system of regular environmental audits will be put in place.

Bord na Mona Energy Limited will continue research and development into all aspects of its environmental impact.

This statement is published and is available at all locations within the division and its Contents are brought to the attention of all employees.

## 2.0 Summary Information

### 2.1 Emissions to Water Summary

2.1.1 Silt Pond Emissions

**Surface Waters**

Comment

Surface water monitoring was carried out four times during the reporting period. In total analysis was carried out at six different locations. These locations are as follows, Derryhinch @ SW1, Drumman @ SW6, Toar @ SW14, Bracklin @ SW30, Carranstown @ SW32 and Rossan @ SW43. The parameters measured during each sampling event were as follows.
Total Phosphorus, Total Solids, Suspended Solids, pH, Ammonia, Colour and COD.
In general results were constant across all parameters at each monitoring location.
August was the wettest month with 210.7mm of rainfall recorded and May the driest with 14.6mm recorded. Flow rates appear to have had no adverse effect on suspended solids results.
The quarterly grab sampling programme proved to be 100% compliant for the year as was the 2005, 2006 & 2007 regimes.

**pH** values were between 7.0 and 8.2, with emission limit values being of the range 6 and 9. The graph clearly shows consistent trends for the period.

**Suspended solids** varied from 5mg/l to 34mg/l and would depend on activities (piping, ditching) etc in the catchments at the time of sampling. All results were within the licence limit of 35mg/l.

**Ammonia** values ranged from 0.04 mg/l and 2.82 mg/l.The I/PV for A3 waters is of the range 4mg/l. It is however not unusual for surface waters emanating from production peatlands to be slightly elevated. Overall ammonia was slightly down on 2007 figures.

**COD** readings were slightly elevated during the reporting period, at SW32. This was the case in 2007 also. The I/PV for A3 waters is of the range 40mg/l. Further investigation of probable causes is being investigated. The first quarter results 2009 will be watched closely.

**Flow** rates were as expected during the reporting period with the exception of SW6 Drumman, where no flow was recorded during each of the monitoring events. The 1st quarter had the most elevated flow.
It is proposed to change all the monitoring locations post the first quarter monitoring event of 2009.

**Total Phosphorus** results were consistent across all locations during the monitoring period.

As mentioned, new sampling locations are being assessed for suitability. Once finalised, a proposal to change sampling locations will be submitted to the Agency for approval.

Surface Water Results are attached in Appendix 1.

2.1.2 Yard Discharges

**Yard Runoff**

Comment

Yard runoff monitoring took place at two locations during the reporting period. Sampling frequency was monthly and COD was the parameter requiring analysis. Results were very satisfactory for the period.

Sampling will continue at the same locations during 2009.

Yard Emission Results are attached in Appendix 2.

2.1.3 Composite Sampler Report

**Composite Sampling**

Comment

The composite sampler has been operating at Toar Bog SW15 during the reporting period.
The parameters measured were Total Phosphorus, Total Solids, Suspended Solids, pH, Ammonia, Colour and COD, with Suspended solids being the only parameter with an emission limit value of ( 35mg/l ). Due to some technical faults flow records for the first two quarters were not recorded. Following some repairs, the sampler has being operating successfully since July 2008.
In general results were satisfactory with two non-compliance's being recorded for the period, of which the Agency was informed.
The composite sampler will remain at this location for the foreseeable future.

Composite Sampler Results are contained in Appendix 3.

2.1.4 Emissions to Water Non-compliance's

**Emissions to Water Non-Compliances 2008**

**Licence: P0501-01**

**Works: Derrygreenagh**

| Type | Non-Compliances | Location / SW Nr |
|---|---|---|
| Composite | 2 | Toar SW 15 |
| Quarterly Grab | 0 | |
| Monthly Yard | N/A | |
| **Totals** | 2 | |

There were two non-compliance's at our composite sampler at Toar Bog. The Agency was informed.

## 2.2 Emissions to Air

### 2.2.1 Dust Monitoring

Comment

Dust monitoring was carried out on three occasions between May and August. Each monitoring event lasted between 28 and 32 days and the Bergerhoff method of collection was used.
The monitoring locations were as follows, Toar DM01, Derryhinch DM02 and Ballivor DM03.
All monitoring results were within the emission limit value of 350mg/$m^2$/day.
Sampling will continue at the same locations during 2009.

Dust monitoring results are contained in appendix 4.

### 2.2.2 Emissions to Air Non-compliance's

| Dust Non-Compliances 2008 | |
|---|---|
| **Licence:P0501-01** | |
| **Works: Derrygreenagh** | |
| **Location / DM Nr** | **Non-Compliances** |
| | 0 |
| **Total** | **0** |

There were no non-compliance's in relation to dust.

## 2.3 Waste Arisings

### 2.3.1 Non-Hazardous Waste

**Non Hazardous Waste Data 2008**

**Licence: P0501-01**

**Works: Derrygreenagh**

| Type | Tonnes | EWC Code | Contractor | Licence Nr |
|---|---|---|---|---|
| Skips | 8.88 | 20 03 01 | AES | 053/OY/39/02 |
| Wheelie Bins | 6.78 | 20 03 01 | AES | 053/OY/39/02 |
| Polyethylene | 175.60 | 02 01 04 | Apec Plastic | 205/2005 |
| Scrap Steel | 148.64 | 17 04 07 | AES | 053/OY/39/02 |
| Timber Pallets | 0.00 | 15 01 02 | Kiawa Ltd | WP/TN/24 |
| Silt Pond Cleanings | 134.72 | 01 01 02 | Bord na Mona | IPPC P0501-01 |
| Peat Screenings | 0.00 | 01 01 02 | Bord na Mona | IPPC P0501-01 |
| **Totals** | **474.62** | | | |

**Note:** Polyethylene and Steel are recycled. Skips go to an AES, Mixed Recycling Facility.

### 2.3.2 Hazardous Waste

**Hazardous Waste Data 2008**

**Licence:P0501-01**

**Works:Derrygreenagh**

| Type | Tonnes | EWC Code | Contractor | Licence Nr | Destination |
|---|---|---|---|---|---|
| Waste Oil | 21.10 | 13 02 05 | Enva Ireland Ltd Portlaoise | 184-1 | Portlaoise |
| Oil Filters | 1.15 | 16 01 07 | Enva Ireland Ltd Portlaoise | 184-1 | Portlaoise |
| Oily Rags | 1.60 | 15 02 02 | Enva Ireland Ltd Portlaoise | 184-1 | Portlaoise |
| Waste Grease | 0.00 | 13 08 99 | Enva Ireland Ltd Portlaoise | 184-1 | Portlaoise |
| Lead Acid Batt | 2.00 | 16 06 01 | Enva Ireland Ltd Portlaoise | 184-1 | Portlaoise |
| Contaminated Soil | 4.52 | 15 02 02 | Enva Ireland Ltd Portlaoise | 184-1 | Portlaoise |
| Parts Wash | 2.22 | 11 01 13 | Safety Kleen, Tallaght, Dublin | 99-1 | Dublin |
| Asbestos | 125.47 | 17 06 05 | KTK Landfill Limited | 81-3 | Kildare |
| **Total** | **158.06** | | | | |

**Note:** The large amount of waste oil can be attributed to the clean up of an oil spill. This involved the removal of a large amount of water which had become contaminated with a smaller proportion of spilled fuel oil. The contaminated soil relates to the same incident.

## 2.4 Energy and Water Consumption

### 2.4.1 Energy

The table below shows energy consumption for the year. It does not include water as it is only used in offices, canteens and workshops on a domestic basis. It is not used as part of the production process.

**Energy Consumption 2008**

**Licence: P0501-01**

**Works: Derrygreenagh**

| Units | Diesel ( Litres ) | Petrol (Litres) | Electricity (Units) | Peat Briquettes (Tonnes) |
|---|---|---|---|---|
| **Totals** | 615250 | 0 | 219938 | 10 |
| **MW Hours** | 6024.8 | 0 | 219.938 | 50 |
| **Total MW Hours** | **6294.7** | | | |

**Note:** The electricity consumption figure was extracted from ESB on line information systems. Some of the consumption figures relate to estimated readings which do not reflect on the exact amount of consumption. Going forward/ Bord na Mona are liaising with the supplier, to try and eliminate all estimated readings. This will give a more precise figure in relation to consumption in the future.

## 2.5 Environmental Incidents and Complaints

### 2.5.1 Incidents

| Environmental Incidents 2008 | |
|---|---|
| **Licence: P0501-01** | |
| **Works: Derrygreenagh** | |
| | **Number** |
| Incidents | 3 |
| Requiring corrective action | 3 |
| **Category** | |
| Water | 1 |
| Air | 2 |
| Procedural | 0 |
| Miscellaneous | |
| **Total** | **3** |

There were three environmental incidents. Two related to bog fires and one related to an oil spill. In all cases the Agency was informed and corrective actions taken.

### 2.5.2 Complaints

| Environmental Complaints 2008 | |
|---|---|
| **Licence:P0501-01** | |
| **Works: Derrygreenagh** | |
| | **Number** |
| Complaints | 0 |
| Requiring corrective action | 0 |
| **Category** | |
| Water | 0 |
| Air | 0 |
| Procedural | 0 |
| Miscellaneous | 0 |
| **Total** | **0** |

No complaints of an environmental nature were received during the reporting period.

## 3.0 Management of the Activity

### 3.1 Achievement of Objectives & Targets 2008

| Project | Description & Status |
|---|---|
| **Project 1:**<br><br>Reduction of fugitive dust emissions. | **Training.**<br>Train all employees in environmental matters. Training will be by means of the screening of an environmental DVD, followed by a power point presentation.<br><br>**Status**<br>In total 230 employees received environmental training.<br><br>**Hydraulic Harrows.**<br>Hydraulic harrows will be deployed at dust sensitive locations during the 2008 production season.<br><br>**Status**<br>One hydraulic harrow was deployed at Ballybeg bog in 2008.<br><br>**Headland Peat Collection.**<br>Continue with the collection of headland peat, particularly at dust sensitive locations.<br><br>**Status**<br>Headland peat was collected as part of the peat lifting process and included in general peat return figures. |
| **Project 2:**<br><br>Waste Management | **On Site Inspections.**<br>A full programme of internal audits will be carried out as soon as production commences. Particular emphasis will be put on cleaner production procedures, milling, harrowing, ridging, harvesting and loading.<br><br>**Status**<br>Due to unforeseen circumstances, this project did not materialise. |
| **Project 3:**<br><br>Minimisation of Suspended Solids. | **On Site Inspections.**<br>Train all employees in environmental matters. Training will be by means of the screening of an environmental DVD, followed by a power point presentation.<br><br>**Status**<br>In total 230 employees received environmental training. Derrygreenagh also took delivery of one new silt control excavator. |

| | |
|---|---|
| **Project 4:**<br><br>Effective spill leak management of mobile fuelling units. | **Research and Development.**<br>The identification and ultimately the introduction of mobile fuelling units which will enhance the spill / leak management of fuel oils. Increased bund provisions are planned for 2008, as well as one new fuel service wheeled wagon which contain bunded tanks. In addition to this, one new rail operated Fuel Service Wagon will be introduced in Derrygreenagh<br><br>**Status**<br>Derrygreenagh took delivery of one rail operated Fuel Service Wagon, this machine is currently waiting commissioning. The delivery of Wheeled Fuel Service Wagons was deferred due to design issues. |
| **Project 5:**<br><br>Collection storage and reuse of polyethylene. | **Identify Recyclers.**<br>Continue with the recycling of polyethylene. The sourcing of more recycling contractors will be ongoing.<br><br>**Status**<br>In total 175.6 tonnes of polyethylene was sent for recycling in 2008. |
| **Project 6:**<br><br>Provision of measures to protect Dust Sensitive Areas. | **Planting.**<br>Ongoing<br>Planting is ongoing as required, with areas in the periphery of production bogs that are being developed for housing being prioritised.<br><br>**Status**<br>No planting took place in 2008. |

### 3.2 Environmental Management Programme Proposal 2009

| Project | Description & Status |
|---|---|
| **Project 1:**<br><br>Reduction of fugitive dust emissions. | **Training.**<br>Continue to train all employees in environmental matters. Training will be by means of the screening of an environmental DVD, followed by a power point presentation.<br><br>**Hydraulic Harrows.**<br>Hydraulic harrows will be deployed at dust sensitive locations during the 2009 production season, with an additional hydraulic harrow budgeted for in the five year plan.<br><br>**Headland Peat Collection.**<br>Continue with the collection of headland peat, particularly at dust sensitive locations. |
| **Project 2:**<br><br>Waste Management | **Waste Streamlining.**<br>Following the purchase by Bord na Mona of AES Ltd, meetings with that company's management will be ongoing to see how best Bord na Mona's needs can be catered for. Key account managers dedicated to Bord na Mona have been requested and are due to be in place in 2009. |
| **Project 3:**<br><br>Minimisation of Suspended Solids. | **Training.**<br>Continue to train all employees in environmental matters. Training will be by means of the screening of an environmental DVD, followed by a power point presentation. |
| **Project 4:**<br><br>Effective spill leak management of mobile fuelling units. | **Research and Development.**<br>Continue to introduce rail operated fuel service wagons on a phased basis, with Derrygreenagh works budgeted to receive one wagon during 2009. Increased bund provisions where required, will be provided, in 2009. |
| **Project 5:**<br><br>Collection storage and reuse of polyethylene. | **Identify Recyclers.**<br><br>Continue with the recycling of polyethylene. The sourcing of more recycling contractors will be ongoing. |
| **Project 6:**<br><br>PCB Directive | **Survey.**<br>Carry out a comprehensive survey of all PCB suspect appliances. Following this, liaise with EPA in deciding a plan of action once a definitive amount of suspect PCB holdings are agreed. |

### 3.3 Environmental Expenditure

| Environmental Expenditure 2008 |
|---|

| Licence:P0501-01 |
|---|
| Works: Derrygreenagh |

| Description | Cost € |
|---|---|
| Capital Costs | 80,600.00 |
| Silt Control | 80,145.33 |
| Analytical & Consultancy Costs | 8,627.65 |
| EPA Fees | 7,995.00 |
| Bog Rehabilitation | 66,863.96 |
| Waste Management | 58,840.00 |
| **Total** | **303,071.94** |

## 4.0 Licence Specific Reports

### 4.1 Surface Water Discharge Monitoring Location Programme Review

The Monitoring Locations will be changed; post the first quarter monitoring event 2009 and the Agency will be informed.

### 4.2 Bunding Programme

Integrity testing was carried out in 2007, with retesting scheduled for 2009.

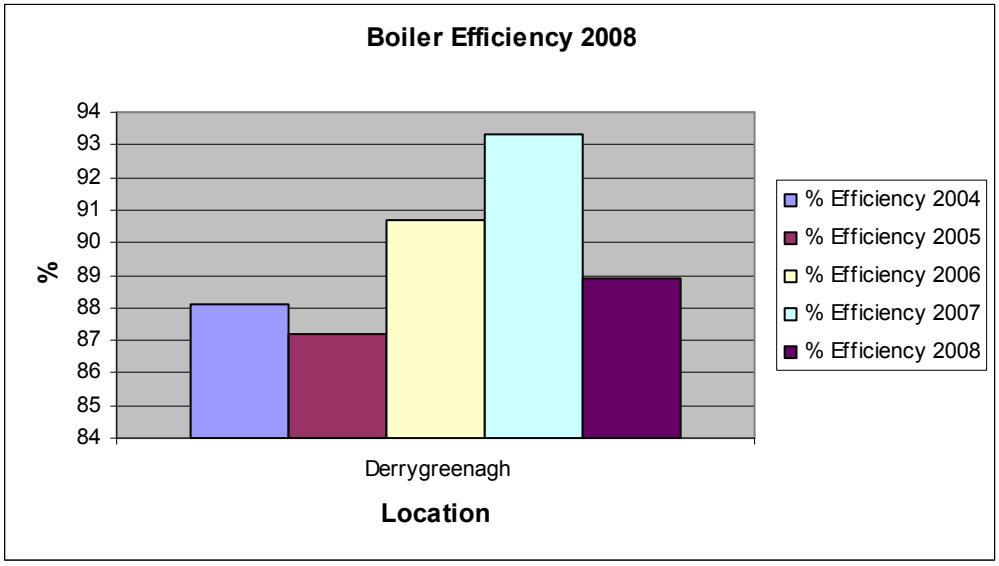
### 4.3 Boiler Combustion Efficiency

In accordance with Condition 5.1 of the licence a boiler efficiency test was carried out on the only boiler in the licence area, Derrygreenagh. The results of which are retained on file.

**Boiler Emissions 2008**

**Licence: P0501-01**
**Works: Derrygreenagh**

| Boiler Location | % Efficiency 2004 | % Efficiency 2005 | % Efficiency 2006 | % Efficiency 2007 | % Efficiency 2008 |
|---|---|---|---|---|---|
| Derrygreenagh | 88.1 | 87.2 | 90.71 | 93.3 | 88.9 |




**Note:** All boilers are serviced at the time of efficiency testing.

### 4.4 Resource consumption summary

| Resource Consumption 2008 | | | |
|---|---|---|---|
| **Licence: P0501-01** | | | |
| **Works: Derrygreenagh** | | | |
| **Product** | **Tonnes Produced** | **Tonnes Sold** | **Customer** |
| Milled Peat | 82,993 | 96,372 | ESB |
| Moss | 74,094 | 66,000 | Horticulture |
| Turf | 0 | 0 | Private |
| Other | 0 | 0 | N/A |
| **Totals** | 157,087 | 162,372 | N/A |

| Proposed Production 2009 | |
|---|---|
| **Licence: P0501-01** | |
| **Works: Derrygreenagh** | |
| **Product** | **Proposed Target** |
| Milled Peat | 86,646 |
| Moss | 77,000 |
| Turf | 0 |
| Other | 0 |
| **Totals** | 163,646 |

### 4.5 De-Silting Report

Silt pond cleaning went well during the reporting period with all ponds being cleaned a minimum of two times.

A table and graph of the cleaning schedule is attached in appendix 5.

### 4.6 Bog Development and Operational Programme

There was no bog development in 2008.

### 4.7 Bog Rehabilitation Report

At Ballivor Works, the old turf out loading facility was dismantled. Works included the dismantling of old sheds, loading hoppers and associated plant.

Following consultation with the National Parks and Wildlife Service ( Local and Regional Managers ), a group was established to identify potential areas within the Licence area, that may be suitable for management with a biodiversity focus. Following on from an initial baseline survey, key areas were identified.
Further consultation with the NPWS will continue in 2009.
All bogs have been mapped, distinguishing current and future cutaway rehabilitation plans and will feed into a specific cutaway rehabilitation plan for Derrygreenagh, in accordance with condition 10.2

### 4.8 Archaeological Report

**Derrygreenagh** – No surveys or excavations took place in 2008.

## 5.0 Summary

The Derrygreenagh Group of Bogs endeavour to comply with all environmental issues. In 2008 we had two non-compliance regarding suspended solids at our composite sampler at Toar bog, mainly due to exceptional heavy rainfall.
There was no non-compliance at the silt pond quarterly sampling events. Silt pond cleaning went very well during the year and every effort will be made to continue this trend into 2009.

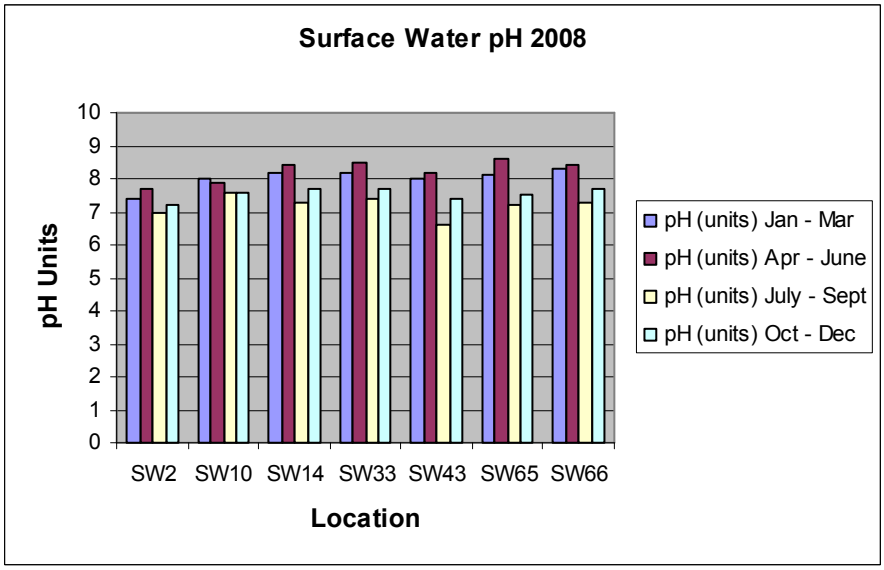
All staff both permanent and seasonal were trained in 2008 and new staff will be trained as they join the company.

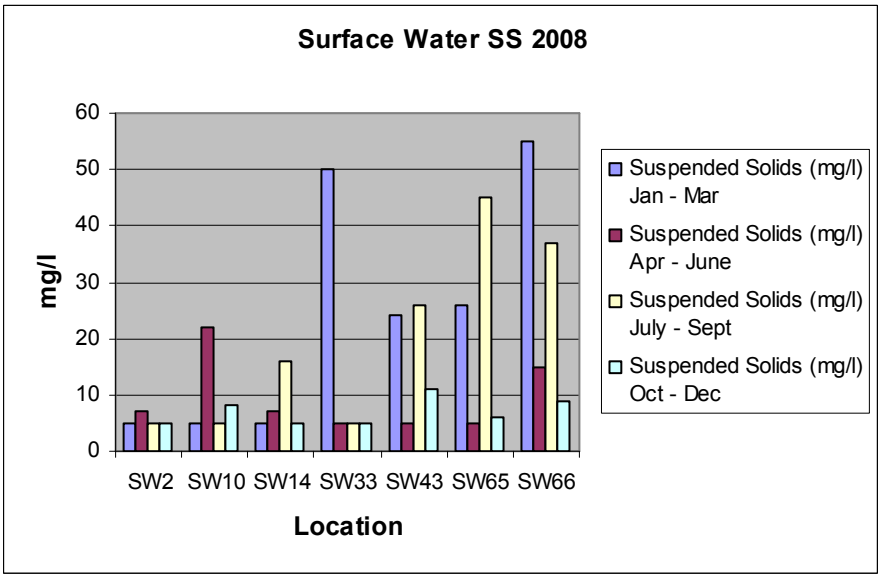
Bord na Mona would like to take this opportunity to advise the Environmental Protection Agency of its continued commitment to improving its environmental performance by adopting cleaner production methods and improving its environmental protection methods.
This will be communicated to all staff through the ongoing training programme.

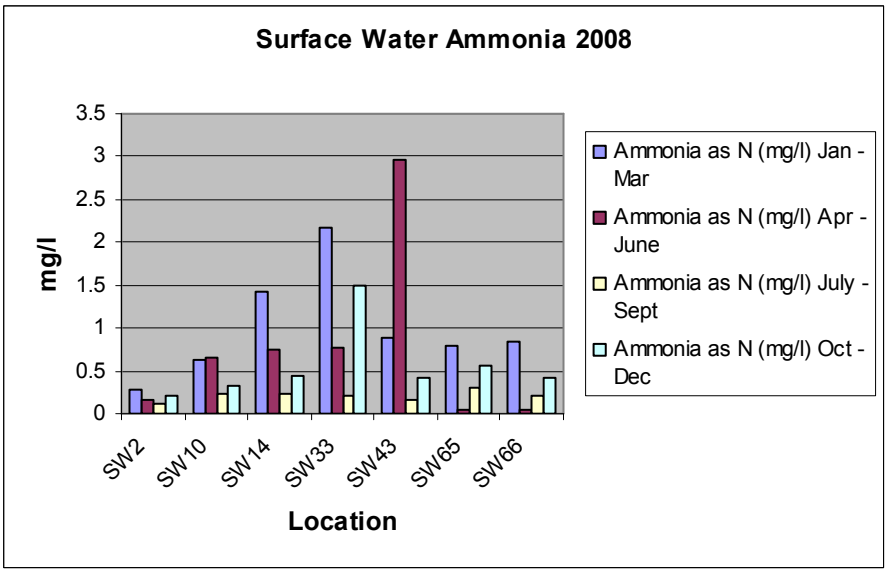
Bord na Mona Energy Ltd are represented on the Management Group of both the Shannon River and Eastern River Basin District Management Systems, set up under the Water Framework Directive, and on the Steering Group of the Catchment Management of the River Barrow.

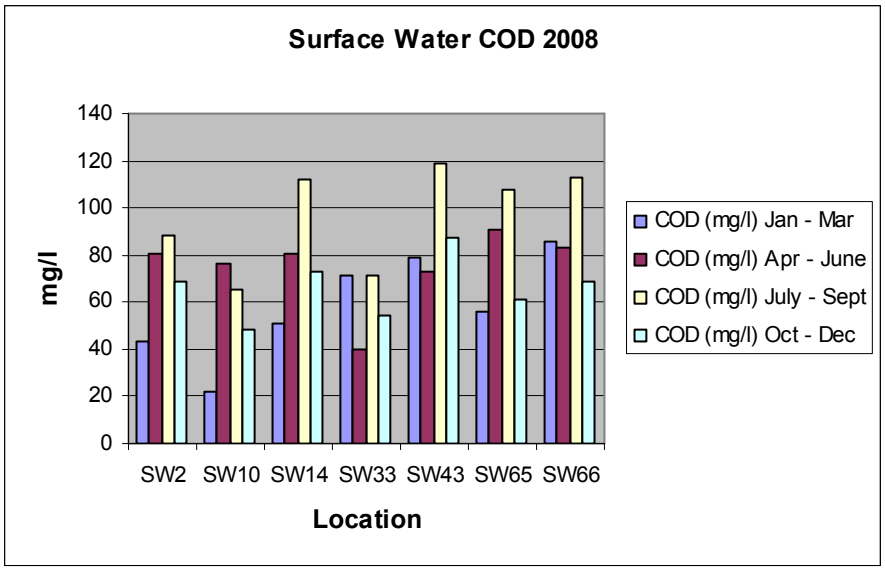
# APPENDIX 1

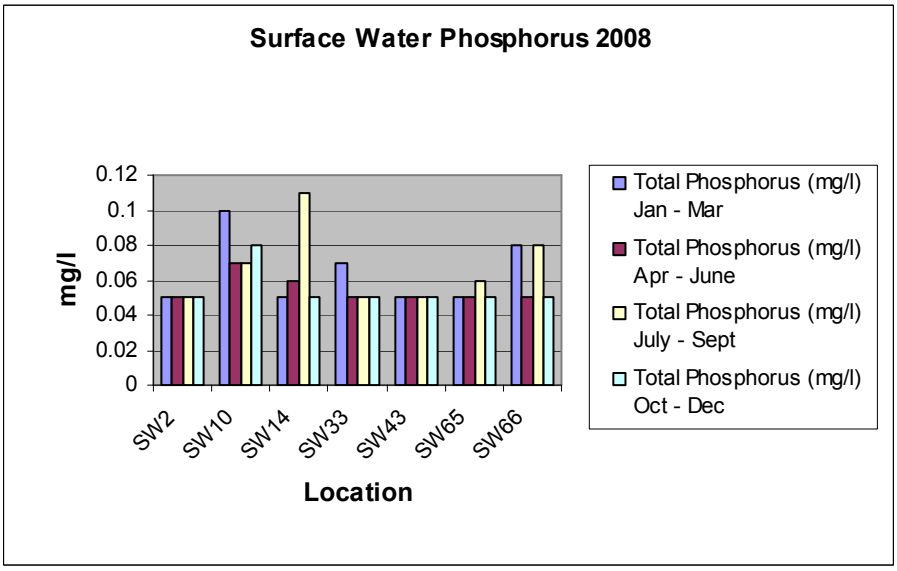
## Surface Water Discharge
## Monitoring Results
## Bogs

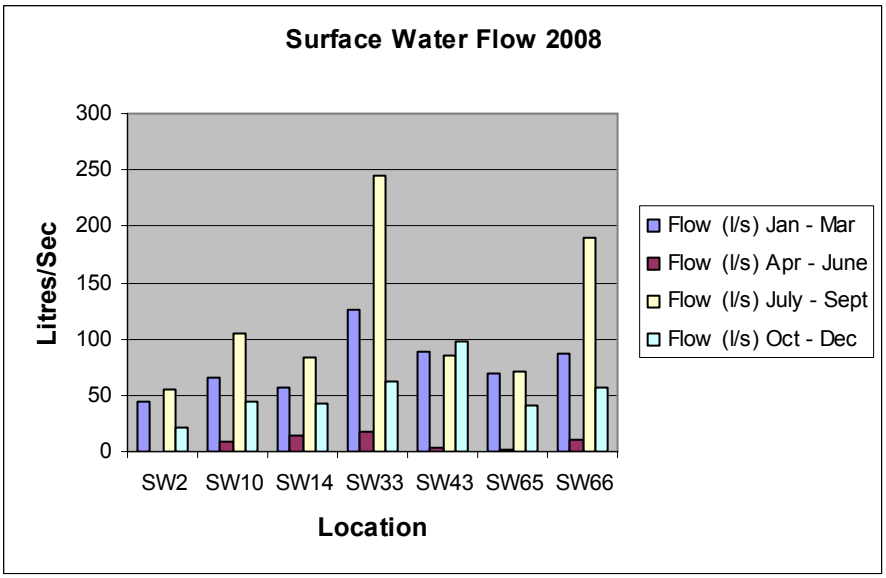

Surface Water pH 2008
pH Units
10
9
8
7
6
5
4
3
2
1
0
SW2
SW10
SW14
SW33
SW43
SW65
SW66
Location
pH (units) Jan - Mar
pH (units) Apr - June
pH (units) July - Sept
pH (units) Oct - Dec


Surface Water SS 2008
mg/l
60
50
40
30
20
10
0
SW2
SW10
SW14
SW33
SW43
SW65
SW66
Location
Suspended Solids (mg/l) Jan - Mar
Suspended Solids (mg/l) Apr - June
Suspended Solids (mg/l) July - Sept
Suspended Solids (mg/l) Oct - Dec


Surface Water Ammonia 2008
mg/l
3.5
3
2.5
2
1.5
1
0.5
0
SW2
SW10
SW14
SW33
SW43
SW65
SW66
Location
Ammonia as N (mg/l) Jan - Mar
Ammonia as N (mg/l) Apr - June
Ammonia as N (mg/l) July - Sept
Ammonia as N (mg/l) Oct - Dec


Surface Water COD 2008
mg/l
140
120
100
80
60
40
20
0
SW2
SW10
SW14
SW33
SW43
SW65
SW66
Location
COD (mg/l) Jan - Mar
COD (mg/l) Apr - June
COD (mg/l) July - Sept
COD (mg/l) Oct - Dec


Surface Water Phosphorus 2008
mg/l
0.12
0.1
0.08
0.06
0.04
0.02
0
SW2
SW10
SW14
SW33
SW43
SW65
SW66
Location
Total Phosphorus (mg/l) Jan - Mar
Total Phosphorus (mg/l) Apr - June
Total Phosphorus (mg/l) July - Sept
Total Phosphorus (mg/l) Oct - Dec


Surface Water Flow 2008
Litres/Sec
300
250
200
150
100
50
0
SW2
SW10
SW14
SW33
SW43
SW65
SW66
Location
Flow (l/s) Jan - Mar
Flow (l/s) Apr - June
Flow (l/s) July - Sept
Flow (l/s) Oct - Dec

# APPENDIX 2

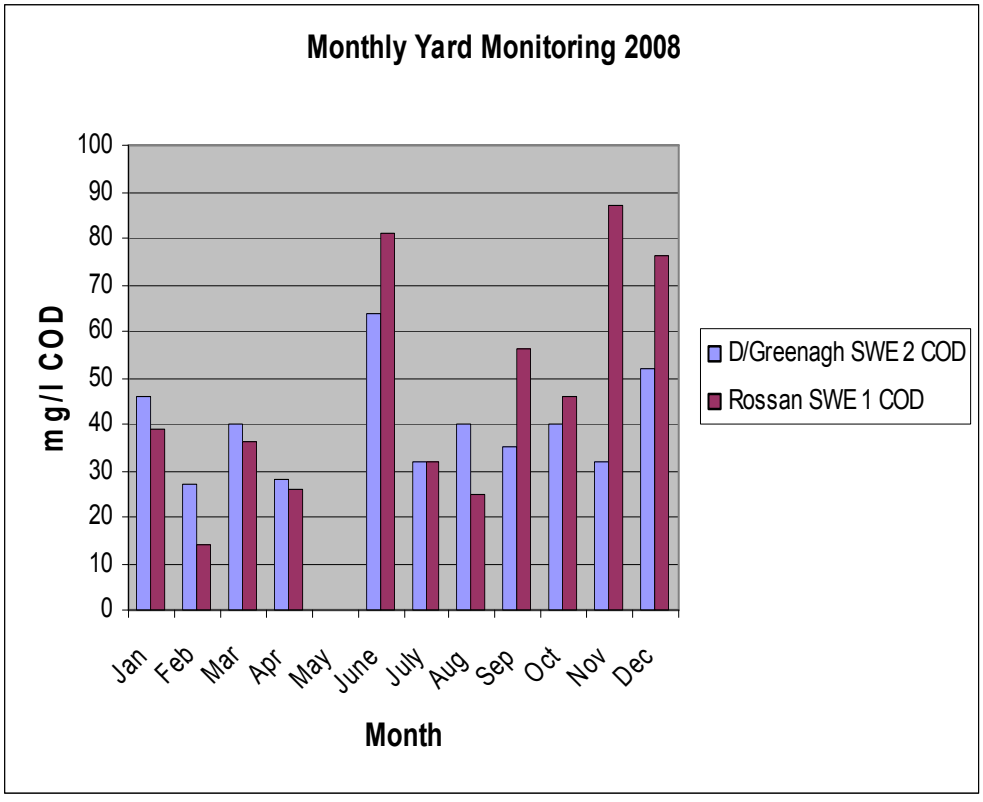
## Surface Water Discharge
## Monitoring Results
## Yards

**Yard Discharge Results 2008**

**Licence: P0501-01**

**Works: Derrygreenagh**

| Month | D/Greenagh SWE 2 COD | Rossan SWE 1 COD |
|---|---|---|
| Jan | 46 | 39 |
| Feb | 27 | 14 |
| Mar | 40 | 36 |
| Apr | 28 | 26 |
| May | 0 | 0 |
| June | 64 | 81 |
| July | 32 | 32 |
| Aug | 40 | 25 |
| Sep | 35 | 56 |
| Oct | 40 | 46 |
| Nov | 32 | 87 |
| Dec | 52 | 76 |



# APPENDIX 3

## Surface Water Discharge Monitoring Results Composite

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2008 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 2 | 7.9 | 63 | 0.03 | 0.06 | 11 | 162 | 154 | 0 | | | | 0.00 | 0.00 |
| 3 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 4 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 5 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 6 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 7 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 8 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 9 | 7.4 | 125 | 0.41 | 0.14 | 63 | 366 | 128 | 0 | | | | 0.00 | 0.00 |
| 10 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 11 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 12 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 13 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 14 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 15 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 16 | 7.4 | 56 | 0.77 | 0.05 | 6 | 382 | 107 | 0 | | | | 0.00 | 0.00 |
| 17 | | | | | 5 | 222 | | 0 | | | | 0.00 | 0.00 |
| 18 | | | | | 5 | 304 | | 0 | | | | 0.00 | 0.00 |
| 19 | | | | | 23 | 326 | | 0 | | | | 0.00 | 0.00 |
| 20 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 21 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 22 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 23 | 7.3 | 66 | 0.64 | 0.05 | 25 | 326 | 162 | 0 | | | | 0.00 | 0.00 |
| 24 | | | | | 5 | 346 | | 0 | | | | 0.00 | 0.00 |
| 25 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 26 | | | | | 5 | 206 | | 0 | | | | 0.00 | 0.00 |
| 27 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 28 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 29 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 30 | 7.7 | 75 | 0.74 | 0.14 | 78 | 407 | 103 | 0 | | | | 0.00 | 0.00 |
| 31 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Feb | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2008 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 2 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 3 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 4 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 5 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 6 | 7.6 | 59 | 0.6 | 0.06 | 5 | 328 | 151 | 0 | | | | 0.00 | 0.00 |
| 7 | | | | | 5 | 380 | | 0 | | | | 0.00 | 0.00 |
| 8 | | | | | 5 | 380 | | 0 | | | | 0.00 | 0.00 |
| 9 | | | | | 7 | 402 | | 0 | | | | 0.00 | 0.00 |
| 10 | | | | | 6 | 436 | | 0 | | | | 0.00 | 0.00 |
| 11 | | | | | 7 | 440 | | 0 | | | | 0.00 | 0.00 |
| 12 | | | | | 5 | 430 | | 0 | | | | 0.00 | 0.00 |
| 13 | 8 | 61 | 0.78 | 0.05 | 5 | 446 | 83 | 0 | | | | 0.00 | 0.00 |
| 14 | | | | | 5 | 442 | | 0 | | | | 0.00 | 0.00 |
| 15 | | | | | 11 | 446 | | 0 | | | | 0.00 | 0.00 |
| 16 | | | | | 14 | 444 | | 0 | | | | 0.00 | 0.00 |
| 17 | | | | | 13 | 430 | | 0 | | | | 0.00 | 0.00 |
| 18 | | | | | 11 | 424 | | 0 | | | | 0.00 | 0.00 |
| 19 | | | | | 5 | 448 | | 0 | | | | 0.00 | 0.00 |
| 20 | 8.1 | 46 | 0.93 | 0.05 | 12 | 74 | 78 | 0 | | | | 0.00 | 0.00 |
| 21 | | | | | 5 | 454 | | 0 | | | | 0.00 | 0.00 |
| 22 | | | | | 5 | 450 | | 0 | | | | 0.00 | 0.00 |
| 23 | | | | | 18 | 454 | | 0 | | | | 0.00 | 0.00 |
| 24 | | | | | 5 | 438 | | 0 | | | | 0.00 | 0.00 |
| 25 | | | | | 7 | 448 | | 0 | | | | 0.00 | 0.00 |
| 26 | | | | | 5 | 444 | | 0 | | | | 0.00 | 0.00 |
| 27 | 8.2 | 78 | 1.76 | 0.06 | 5 | 308 | 170 | 0 | | | | 0.00 | 0.00 |
| 28 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 29 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| March | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2008 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 2 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 3 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 4 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 5 | 7.6 | 65 | 0.95 | 0.05 | 5 | 432 | 92 | 0 | | | | 0.00 | 0.00 |
| 6 | | | | | 5 | 456 | | 0 | | | | 0.00 | 0.00 |
| 7 | | | | | 5 | 445 | | 0 | | | | 0.00 | 0.00 |
| 8 | | | | | 5 | 440 | | 0 | | | | 0.00 | 0.00 |
| 9 | | | | | 5 | 412 | | 0 | | | | 0.00 | 0.00 |
| 10 | | | | | 5 | 436 | | 0 | | | | 0.00 | 0.00 |
| 11 | | | | | 5 | 292 | | 0 | | | | 0.00 | 0.00 |
| 12 | 8.1 | 48 | 0.77 | 0.05 | 5 | 320 | 149 | 0 | | | | 0.00 | 0.00 |
| 13 | | | | | 5 | 370 | | 0 | | | | 0.00 | 0.00 |
| 14 | | | | | 5 | 350 | | 0 | | | | 0.00 | 0.00 |
| 15 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 16 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 17 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 18 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 19 | 7.9 | 45 | 0.84 | 0.05 | 5 | 430 | 107 | 0 | | | | 0.00 | 0.00 |
| 20 | | | | | | 0 | | 0 | | | | 0.00 | 0.00 |
| 21 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 22 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 23 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 24 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 25 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 26 | 7.9 | 41 | 0.83 | 0.05 | 9 | 428 | 72 | 0 | | | | 0.00 | 0.00 |
| 27 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 28 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 29 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 30 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 31 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| April | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2008 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 2 | 7.6 | 42 | 0.7 | 0.05 | 5 | 410 | 90 | 0 | | | | 0.00 | 0.00 |
| 3 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 4 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 5 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 6 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 7 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 8 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 9 | 7.7 | 31 | 0.85 | 0.06 | 5 | 476 | 64 | 0 | | | | 0.00 | 0.00 |
| 10 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 11 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 12 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 13 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 14 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 15 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 16 | 7.9 | 51 | 0.88 | 0.1 | 7 | 468 | 51 | 0 | | | | 0.00 | 0.00 |
| 17 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 18 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 19 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 20 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 21 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 22 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 23 | 7.8 | 51 | 0.83 | 0.05 | 5 | 454 | 54 | 0 | | | | 0.00 | 0.00 |
| 24 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 25 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 26 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 27 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 28 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 29 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 30 | 8 | 42 | 0.8 | 0.05 | 6 | 470 | 61 | 0 | | | | 0.00 | 0.00 |

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| May | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2008 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 6 | 462 | | 0 | | | | 0.00 | 0.00 |
| 2 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 3 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 4 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 5 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 6 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 7 | 7.8 | 14 | 0.83 | 0.05 | 5 | 494 | 49 | 0 | | | | 0.00 | 0.00 |
| 8 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 9 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 10 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 11 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 12 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 13 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 14 | 7.8 | 47 | 0.76 | 0.05 | 5 | 484 | 51 | 0 | | | | 0.00 | 0.00 |
| 15 | | | | | 8 | 478 | | 0 | | | | 0.00 | 0.00 |
| 16 | | | | | 8 | 484 | | 0 | | | | 0.00 | 0.00 |
| 17 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 18 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 19 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 20 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 21 | 7.8 | 45 | 0.8 | 0.05 | 9 | 484 | 48 | 0 | | | | 0.00 | 0.00 |
| 22 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 23 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 24 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 25 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 26 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 27 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 28 | 7.6 | 40 | 0.85 | 0.05 | 6 | 458 | 56 | 0 | | | | 0.00 | 0.00 |
| 29 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 30 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 31 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| June | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2008 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 2 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 3 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 4 | 7.6 | 43 | 0.79 | 0.05 | 6 | 492 | 55 | 0 | | | | 0.00 | 0.00 |
| 5 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 6 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 7 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 8 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 9 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 10 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 11 | 7.7 | 34 | 0.71 | 0.05 | 5 | 506 | 51 | 0 | | | | 0.00 | 0.00 |
| 12 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 13 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 14 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 15 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 16 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 17 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 18 | 7.7 | 45 | 0.79 | 0.06 | 6 | 510 | 57 | 0 | | | | 0.00 | 0.00 |
| 19 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 20 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 21 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 22 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 23 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 24 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 25 | 7.7 | 37 | 0.88 | 0.05 | 11 | 445 | 128 | 0 | | | | 0.00 | 0.00 |
| 26 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 27 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 28 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 29 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 30 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| July | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2008 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 2 | 7.5 | 34 | 0.74 | 0.05 | 5 | 380 | 138 | 0 | | | | 0.00 | 0.00 |
| 3 | | | | | 5 | 440 | | 0 | | | | 0.00 | 0.00 |
| 4 | | | | | 0 | 0 | | 1120608 | | | | 0.00 | 0.00 |
| 5 | | | | | 5 | 136 | | 366569 | | | | 1.83 | 49.85 |
| 6 | | | | | 5 | 170 | | 1780704 | | | | 8.90 | 302.72 |
| 7 | | | | | 0 | 0 | | -972950 | | | | 0.00 | 0.00 |
| 8 | | | | | 0 | 0 | | 372151 | | | | 0.00 | 0.00 |
| 9 | | | | | 0 | 0 | | 1352678 | | | | 0.00 | 0.00 |
| 10 | | | | | 5 | 426 | 132 | 513760 | | | | 2.57 | 218.86 |
| 11 | | | | | 0 | 0 | | 551370 | | | | 0.00 | 0.00 |
| 12 | | | | | 0 | 0 | | 1257293 | | | | 0.00 | 0.00 |
| 13 | | | | | 0 | 0 | | 279141 | | | | 0.00 | 0.00 |
| 14 | | | | | 0 | 0 | | 220225 | | | | 0.00 | 0.00 |
| 15 | | | | | 0 | 0 | | 63210 | | | | 0.00 | 0.00 |
| 16 | 7.5 | 41 | 0.77 | 0.05 | 5 | 482 | 71 | 449643 | 18.44 | 0.35 | 0.02 | 2.25 | 216.73 |
| 17 | | | | | 0 | 0 | | 13738 | | | | 0.00 | 0.00 |
| 18 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 19 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 20 | | | | | 0 | 0 | | 7258 | | | | 0.00 | 0.00 |
| 21 | | | | | 0 | 0 | | 640751 | | | | 0.00 | 0.00 |
| 22 | | | | | 0 | 0 | | 597732 | | | | 0.00 | 0.00 |
| 23 | 7.6 | 34 | 0.75 | 0.05 | 5 | 468 | 57 | 147 | | | | 0.00 | 0.07 |
| 24 | | | | | 5 | 482 | | 33713 | | | | 0.17 | 16.25 |
| 25 | | | | | 5 | 476 | | 0 | | | | 0.00 | 0.00 |
| 26 | | | | | 5 | 478 | | 910224 | | | | 4.55 | 435.09 |
| 27 | | | | | 5 | 514 | | 5460739 | | | | 27.30 | 2806.82 |
| 28 | | | | | 5 | 444 | | 5774458 | | | | 28.87 | 2563.86 |
| 29 | | | | | 7 | 484 | | 6599232 | | | | 46.19 | 3194.03 |
| 30 | 7.5 | 89 | 0.75 | 0.05 | 9 | 198 | 306 | 6290784 | 559.88 | 4.72 | 0.31 | 56.62 | 1245.58 |
| 31 | | | | | 0 | 0 | | 10465630 | | | | 0.00 | 0.00 |

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| August | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2008 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 5 | 307 | | 15497570 | | | | 77.49 | 4757.75 |
| 2 | | | | | 5 | 444 | | 14747620 | | | | 73.74 | 6547.94 |
| 3 | | | | | 5 | 404 | | 12766460 | | | | 63.83 | 5157.65 |
| 4 | | | | | 5 | 302 | | 9846144 | | | | 49.23 | 2973.54 |
| 5 | | | | | 5 | 444 | | 10649660 | | | | 53.25 | 4728.45 |
| 6 | 7.9 | 34 | 0.58 | 0.05 | 5 | 448 | 111 | 10136450 | 344.64 | 5.88 | 0.51 | 50.68 | 4541.13 |
| 7 | | | | | 6 | 280 | | 9986976 | | | | 59.92 | 2796.35 |
| 8 | | | | | 5 | 398 | | 11891230 | | | | 59.46 | 4732.71 |
| 9 | | | | | 5 | 267 | | 10463900 | | | | 52.32 | 2793.86 |
| 10 | | | | | 5 | 210 | | 13351390 | | | | 66.76 | 2803.79 |
| 11 | | | | | 5 | 312 | | 20601220 | | | | 103.01 | 6427.58 |
| 12 | | | | | 5 | 202 | | 14118620 | | | | 70.59 | 2851.96 |
| 13 | 7.7 | 61 | 0.37 | 0.13 | 5 | 304 | 220 | 34271420 | 2090.56 | 12.68 | 4.46 | 171.36 | 10418.51 |
| 14 | | | | | 0 | 0 | | 37278140 | | | | 0.00 | 0.00 |
| 15 | | | | | 5 | 388 | | 36426240 | | | | 182.13 | 14133.38 |
| 16 | | | | | 6 | 182 | | 27656640 | | | | 165.94 | 5033.51 |
| 17 | | | | | 5 | 272 | | 45598470 | | | | 227.99 | 12402.78 |
| 18 | | | | | 5 | 394 | | 43219010 | | | | 216.10 | 17028.29 |
| 19 | | | | | 5 | 364 | | 34852030 | | | | 174.26 | 12686.14 |
| 20 | 7.7 | 38 | 0.51 | 0.05 | 5 | 452 | 139 | 34177250 | 1298.74 | 17.43 | 1.71 | 170.89 | 15448.12 |
| 21 | | | | | 5 | 479 | | 23145700 | | | | 115.73 | 11086.79 |
| 22 | | | | | 5 | 462 | | 21283780 | | | | 106.42 | 9833.11 |
| 23 | | | | | 5 | 482 | | 21225890 | | | | 106.13 | 10230.88 |
| 24 | | | | | 12 | 446 | | 18050690 | | | | 216.61 | 8050.61 |
| 25 | | | | | 5 | 486 | | 16625950 | | | | 83.13 | 8080.21 |
| 26 | | | | | 5 | 500 | | 19783010 | | | | 98.92 | 9891.51 |
| 27 | 7.9 | 40 | 0.4 | 0.05 | 5 | 484 | 91 | 22033730 | 881.35 | 8.81 | 1.10 | 110.17 | 10664.33 |
| 28 | | | | | 0 | 0 | | 21666530 | | | | 0.00 | 0.00 |
| 29 | | | | | 0 | 0 | | 20207230 | | | | 0.00 | 0.00 |
| 30 | | | | | 0 | 0 | | 18766080 | | | | 0.00 | 0.00 |
| 31 | | | | | 0 | 0 | | 19082300 | | | | 0.00 | 0.00 |

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sept | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2008 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 0 | 0 | | 19068480 | | | | 0.00 | 0.00 |
| 2 | | | | | 0 | 0 | | 19068480 | | | | 0.00 | 0.00 |
| 3 | 7.5 | 36 | 0.64 | 0.15 | 5 | 448 | 148 | 19068480 | 686.47 | 12.20 | 2.86 | 95.34 | 8542.68 |
| 4 | | | | | 0 | 0 | | 19068480 | | | | 0.00 | 0.00 |
| 5 | | | | | 0 | 0 | | 19068480 | | | | 0.00 | 0.00 |
| 6 | | | | | 0 | 0 | | 19068480 | | | | 0.00 | 0.00 |
| 7 | | | | | 0 | 0 | | 19068480 | | | | 0.00 | 0.00 |
| 8 | | | | | 0 | 0 | | 19068480 | | | | 0.00 | 0.00 |
| 9 | | | | | 0 | 0 | | 19068480 | | | | 0.00 | 0.00 |
| 10 | 7.5 | 79 | 0.55 | 0.05 | 8 | 312 | 182 | 19068480 | 1506.41 | 10.49 | 0.95 | 152.55 | 5949.37 |
| 11 | | | | | 5 | 310 | | 19068480 | | | | 95.34 | 5911.23 |
| 12 | | | | | 5 | 378 | | 20390400 | | | | 101.95 | 7707.57 |
| 13 | | | | | 5 | 408 | | 24368260 | | | | 121.84 | 9942.25 |
| 14 | | | | | 5 | 246 | | 22717150 | | | | 113.59 | 5588.42 |
| 15 | | | | | 5 | 306 | | 26777950 | | | | 133.89 | 8194.05 |
| 16 | | | | | 5 | 380 | | 33215620 | | | | 166.08 | 12621.94 |
| 17 | 7.8 | 58 | 0.7 | 0.1 | 5 | 366 | 120 | 26395200 | 1530.92 | 18.48 | 2.64 | 131.98 | 9660.64 |
| 18 | | | | | 5 | 450 | | 23877500 | | | | 119.39 | 10744.88 |
| 19 | | | | | 5 | 476 | | 17934050 | | | | 89.67 | 8536.61 |
| 20 | | | | | 5 | 460 | | 15965860 | | | | 79.83 | 7344.30 |
| 21 | | | | | 5 | 432 | | 15931300 | | | | 79.66 | 6882.32 |
| 22 | | | | | 5 | 462 | | 16224190 | | | | 81.12 | 7495.58 |
| 23 | | | | | 5 | 460 | | 17862340 | | | | 89.31 | 8216.68 |
| 24 | 7.9 | 38 | 0.76 | 0.05 | 5 | 452 | 77 | 17383680 | 660.58 | 13.21 | 0.87 | 86.92 | 7857.42 |
| 25 | | | | | 5 | 468 | | 4192301 | | | | 20.96 | 1962.00 |
| 26 | | | | | 5 | 473 | | 4835894 | | | | 24.18 | 2287.38 |
| 27 | | | | | 5 | 468 | | 4687805 | | | | 23.44 | 2193.89 |
| 28 | | | | | 5 | 478 | | 658238 | | | | 3.29 | 314.64 |
| 29 | | | | | 5 | 478 | | 830140 | | | | 4.15 | 396.81 |
| 30 | | | | | 5 | 452 | | 812908 | | | | 4.06 | 367.43 |

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2008 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | 8 | 43 | 0.46 | 0.05 | 5 | 448 | 80 | 6091978 | 261.96 | 2.80 | 0.30 | 30.46 | 2729.21 |
| 2 | | | | | 5 | 478 | | 8754912 | | | | 43.77 | 4184.85 |
| 3 | | | | | 5 | 476 | | 12936670 | | | | 64.68 | 6157.85 |
| 4 | | | | | 5 | 212 | | 13692670 | | | | 68.46 | 2902.85 |
| 5 | | | | | 5 | 316 | | 6732720 | | | | 33.66 | 2127.54 |
| 6 | | | | | 5 | 380 | | 19927300 | | | | 99.64 | 7572.37 |
| 7 | | | | | 5 | 330 | | 14079740 | | | | 70.40 | 4646.31 |
| 8 | 8 | 53 | 0.61 | 0.08 | 5 | 374 | 175 | 14538530 | 770.54 | 8.87 | 1.16 | 72.69 | 5437.41 |
| 9 | | | | | 3 | 315 | | 19195490 | | | | 57.59 | 6046.58 |
| 10 | | | | | 5 | 280 | | 14367460 | | | | 71.84 | 4022.89 |
| 11 | | | | | 5 | 422 | | 19511710 | | | | 97.56 | 8233.94 |
| 12 | | | | | 5 | 356 | | 26411620 | | | | 132.06 | 9402.54 |
| 13 | | | | | 5 | 406 | | 21846240 | | | | 109.23 | 8869.57 |
| 14 | | | | | 8 | 228 | | 17695580 | | | | 141.56 | 4034.59 |
| 15 | 7.8 | 58 | 0.56 | 0.05 | 5 | 277 | 166 | 26214620 | 1520.45 | 14.68 | 1.31 | 131.07 | 7261.45 |
| 16 | | | | | 5 | 394 | | 23126690 | | | | 115.63 | 9111.92 |
| 17 | | | | | 5 | 414 | | 23325410 | | | | 116.63 | 9656.72 |
| 18 | | | | | 5 | 416 | | 22367230 | | | | 111.84 | 9304.77 |
| 19 | | | | | 5 | 426 | | 19728580 | | | | 98.64 | 8404.38 |
| 20 | | | | | 5 | 370 | | 14862530 | | | | 74.31 | 5499.14 |
| 21 | | | | | 5 | 406 | | 12807940 | | | | 64.04 | 5200.02 |
| 22 | 7.9 | 47 | 0.69 | 0.05 | 5 | 422 | 114 | 19338050 | 908.89 | 13.34 | 0.97 | 96.69 | 8160.66 |
| 23 | | | | | 5 | 238 | | 20763650 | | | | 103.82 | 4941.75 |
| 24 | | | | | 0 | 0 | | 24671520 | | | | 0.00 | 0.00 |
| 25 | | | | | 5 | 135 | | 20383490 | | | | 101.92 | 2751.77 |
| 26 | | | | | 5 | 320 | | 24066720 | | | | 120.33 | 7701.35 |
| 27 | | | | | 5 | 384 | | 26296700 | | | | 131.48 | 10097.93 |
| 28 | | | | | 5 | 382 | | 22864030 | | | | 114.32 | 8734.06 |
| 29 | 7.4 | 64 | 0.51 | 0.05 | 5 | 210 | 210 | 22244540 | 1423.65 | 11.34 | 1.11 | 111.22 | 4671.35 |
| 30 | | | | | 5 | 322 | | 25005890 | | | | 125.03 | 8051.90 |
| 31 | | | | | 5 | 382 | | 22142590 | | | | 110.71 | 8458.47 |

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nov | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2008 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 5 | 438 | | 22825150 | | | | 114.13 | 9997.42 |
| 2 | | | | | 5 | 430 | | 20832770 | | | | 104.16 | 8958.09 |
| 3 | | | | | 5 | 450 | | 20489760 | | | | 102.45 | 9220.39 |
| 4 | | | | | 5 | 446 | | 18984670 | | | | 94.92 | 8467.16 |
| 5 | 7.9 | 62 | 0.61 | 0.05 | 5 | 458 | 84 | 18653760 | 1156.53 | 11.38 | 0.93 | 93.27 | 8543.42 |
| 6 | | | | | 0 | 0 | | 17241980 | | | | 0.00 | 0.00 |
| 7 | | | | | 0 | 0 | | 13118980 | | | | 0.00 | 0.00 |
| 8 | | | | | 0 | 0 | | 11704610 | | | | 0.00 | 0.00 |
| 9 | | | | | 0 | 0 | | 15496700 | | | | 0.00 | 0.00 |
| 10 | | | | | 0 | 0 | | 28270950 | | | | 0.00 | 0.00 |
| 11 | | | | | 0 | 0 | | 25072420 | | | | 0.00 | 0.00 |
| 12 | 7.5 | 51 | 0.59 | 0.05 | 9 | 260 | 197 | 28772060 | 1467.38 | 16.98 | 1.44 | 258.95 | 7480.74 |
| 13 | | | | | 5 | 80 | | 25129440 | | | | 125.65 | 2010.36 |
| 14 | | | | | 5 | 266 | | 22465730 | | | | 112.33 | 5975.88 |
| 15 | | | | | 5 | 362 | | 19172160 | | | | 95.86 | 6940.32 |
| 16 | | | | | 5 | 232 | | 23727170 | | | | 118.64 | 5504.70 |
| 17 | | | | | 5 | 319 | | 27406080 | | | | 137.03 | 8742.54 |
| 18 | | | | | 5 | 376 | | 26125630 | | | | 130.63 | 9823.24 |
| 19 | 7.8 | 41 | 0.53 | 0.07 | 5 | 404 | 127 | 26568860 | 1089.32 | 14.08 | 1.86 | 132.84 | 10733.82 |
| 20 | | | | | 0 | 0 | | 25160540 | | | | 0.00 | 0.00 |
| 21 | | | | | 5 | 378 | | 21066910 | | | | 105.33 | 7963.29 |
| 22 | | | | | 5 | 304 | | 21897220 | | | | 109.49 | 6656.75 |
| 23 | | | | | 5 | 248 | | 22629890 | | | | 113.15 | 5612.21 |
| 24 | | | | | 5 | 282 | | 22014720 | | | | 110.07 | 6208.15 |
| 25 | | | | | 5 | 354 | | 26317440 | | | | 131.59 | 9316.37 |
| 26 | 7.7 | 45 | 0.57 | 0.05 | 5 | 362 | 126 | 23692610 | 1066.17 | 13.50 | 1.18 | 118.46 | 8576.72 |
| 27 | | | | | 5 | 384 | | 22896860 | | | | 114.48 | 8792.39 |
| 28 | | | | | 5 | 370 | | 14167010 | | | | 70.84 | 5241.79 |
| 29 | | | | | 5 | 444 | | 8286624 | | | | 41.43 | 3679.26 |
| 30 | | | | | 5 | 446 | | 8312371 | | | | 41.56 | 3707.32 |

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dec | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2008 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 5 | 450 | | 13605410 | | | | 68.03 | 6122.43 |
| 2 | | | | | 5 | 440 | | 16498940 | | | | 82.49 | 7259.53 |
| 3 | 7.8 | 52 | 0.62 | 0.05 | 5 | 434 | 77 | 14498780 | 753.94 | 8.99 | 0.72 | 72.49 | 6292.47 |
| 4 | | | | | 7 | 292 | | 14383010 | | | | 100.68 | 4199.84 |
| 5 | | | | | 5 | 204 | | 23753090 | | | | 118.77 | 4845.63 |
| 6 | | | | | 5 | 342 | | 16056580 | | | | 80.28 | 5491.35 |
| 7 | | | | | 5 | 460 | | 23091260 | | | | 115.46 | 10621.98 |
| 8 | | | | | 5 | 470 | | 21281180 | | | | 106.41 | 10002.15 |
| 9 | | | | | 5 | 262 | | 23352190 | | | | 116.76 | 6118.27 |
| 10 | 7.7 | 53 | 0.68 | 0.05 | 8 | 424 | 103 | 22392290 | 1186.79 | 15.23 | 1.12 | 179.14 | 9494.33 |
| 11 | | | | | 0 | 0 | | 20888930 | | | | 0.00 | 0.00 |
| 12 | | | | | 6 | 122 | | 21048770 | | | | 126.29 | 2567.95 |
| 13 | | | | | 5 | 192 | | 30432670 | | | | 152.16 | 5843.07 |
| 14 | | | | | 5 | 386 | | 31702750 | | | | 158.51 | 12237.26 |
| 15 | | | | | 5 | 364 | | 28144800 | | | | 140.72 | 10244.71 |
| 16 | | | | | 5 | 393 | | 24983430 | | | | 124.92 | 9818.49 |
| 17 | 7.4 | 71 | 0.67 | 0.05 | 5 | 394 | 115 | 24205830 | 1718.61 | 16.22 | 1.21 | 121.03 | 9537.10 |
| 18 | | | | | 5 | 378 | | 23683100 | | | | 118.42 | 8952.21 |
| 19 | | | | | 5 | 344 | | 24808900 | | | | 124.04 | 8534.26 |
| 20 | | | | | 5 | 290 | | 23981180 | | | | 119.91 | 6954.54 |
| 21 | | | | | 5 | 122 | | 25607230 | | | | 128.04 | 3124.08 |
| 22 | 7.7 | 34 | 0.44 | 0.05 | 5 | 266 | 138 | 25671170 | 872.82 | 11.30 | 1.28 | 128.36 | 6828.53 |
| 23 | | | | | 5 | 486 | | 25512190 | | | | 127.56 | 12398.92 |
| 24 | | | | | 5 | 498 | | 23836030 | | | | 119.18 | 11870.34 |
| 25 | | | | | 0 | 0 | | 22821700 | | | | 0.00 | 0.00 |
| 26 | | | | | 5 | 514 | | 22345630 | | | | 111.73 | 11485.65 |
| 27 | | | | | 5 | 537 | | 19186850 | | | | 95.93 | 10303.34 |
| 28 | | | | | 5 | 548 | | 8465213 | | | | 42.33 | 4638.94 |
| 29 | 7.8 | 51 | 0.18 | 0.05 | 5 | 450 | 125 | 21423740 | 1092.61 | 3.86 | 1.07 | 107.12 | 9640.68 |
| 30 | | | | | 0 | 0 | | 20276350 | | | | 0.00 | 0.00 |
| 31 | | | | | 0 | 0 | | 19760640 | | | | 0.00 | 0.00 |

# APPENDIX 4

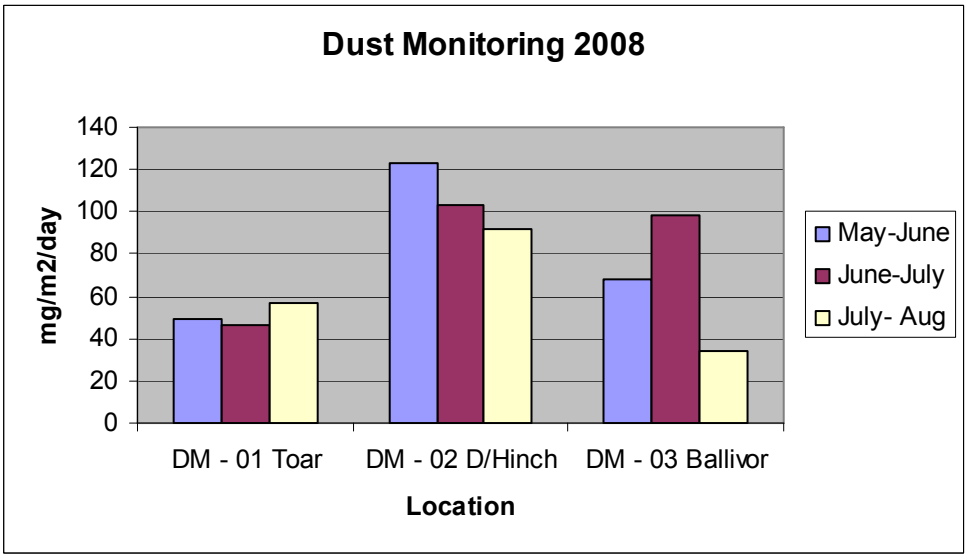
## Dust Monitoring Results.

**Dust Monitoring Results 2008**

**Licence:P0501-01**

**Works: Derrygreenagh**

| Sample Period | DM - 01 Toar | DM - 02 D/Hinch | DM - 03 Ballivor |
|---|---|---|---|
| May-June | 49 | 123 | 68 |
| June-July | 46 | 103 | 98 |
| July- Aug | 57 | 92 | 34 |



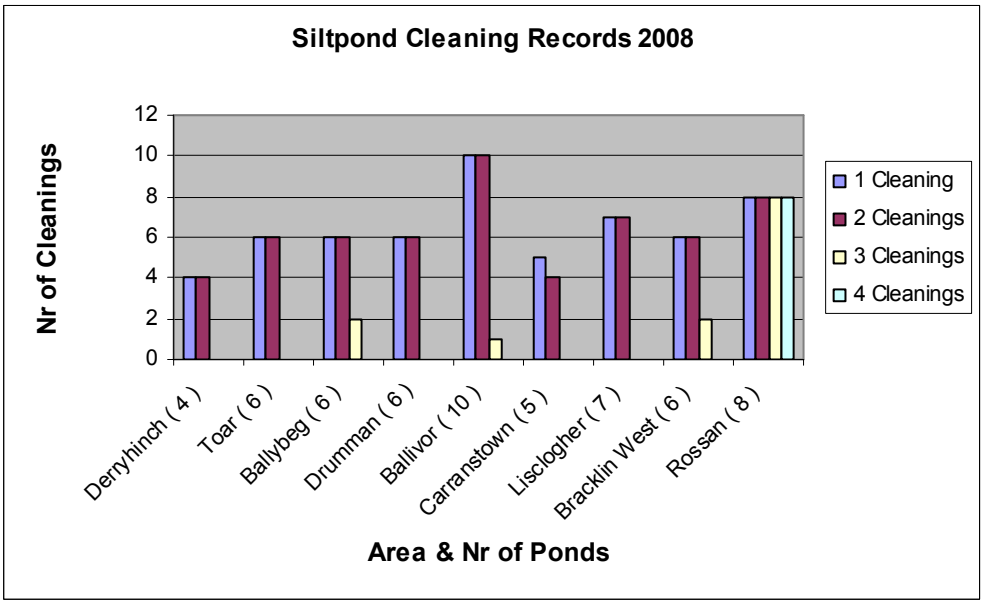
# APPENDIX 5

## De-silting Programme Review.

## Siltpond Cleaning Programme 2008

**IPPC Licence: P0501-01**
**Works: Derrygreenagh**

| Bog Area & Nr Ponds | 1 Cleaning | 2 Cleanings | 3 Cleanings | 4 Cleanings |
|---|---|---|---|---|
| Derryhinch ( 4 ) | 4 | 4 | | |
| Toar ( 6 ) | 6 | 6 | | |
| Ballybeg ( 6 ) | 6 | 6 | 2 | |
| Drumman ( 6 ) | 6 | 6 | | |
| Ballivor ( 10 ) | 10 | 10 | 1 | |
| Carranstown ( 5 ) | 5 | 4 | | |
| Lisclogher ( 7 ) | 7 | 7 | | |
| Bracklin West ( 6 ) | 6 | 6 | 2 | |
| Rossan ( 8 ) | 8 | 8 | 8 | 8 |



# APPENDIX 6

## AER & PRTR Data

BORD NA MÓNA

BORD NA MÓNA ENERGY LIMITED

# Annual Environmental Report 2009
# P0501-01

**March 2010**

Bord na Móna today operates 5 main subsidiary companies in more than 20 locations throughout Ireland, the UK and USA. The principal businesses are in the Energy, Resource Recovery, Horticulture, Home Heating and Wastewater Treatment and Air Pollution Abatement markets. The company also engages in an extensive rehabilitation program to develop its peat lands in an environmentally sustainable manner.




Bord na Móna has long recognised the need to diversify its activities in order to secure a sustainable future. In this context we identified the energy and resource recovery sectors as appropriate areas of growth and development, given our assets, strengths and skills. Significant challenges face Ireland in meeting the country's needs to provide secure sustainable energy and manage waste while minimising the impact on the environment.

Bord na Móna is in a strong position to contribute to dealing with these challenges. We have a unique mixture of assets, experience and innovation which will enable us to cross-link our activities in energy, water and resource recovery to provide products and services which will meet Ireland's needs. We also have the capacity to become an exemplar for others to follow in these fields.
With this background we have scoped out a new vision for the future sustainable development of Bord na Móna.

Following on from our vision, we have developed a new mission for Bord na Móna which the Company is committed to achieving.
In 1934 the Turf Development Board was formed to ‘develop and improve the turf industry.' The experience of fuel shortages during the war re-enforced the Irish State's commitment to developing the country's bogs. In 1944 the TDB was asked to devise and submit a comprehensive programme, the outcome was the transformation in 1946 of the TDB into Bord na Móna. The Board was given a mandate to increase the use of peat as a fuel and in energy production. Markets for the use of moss peat in horticulture were also developed.
In 1990 Bord na Móna implemented a divisionalised and decentralised structure, designed to delegate responsibility downwards ensuring a sharper focus on each profit centre and a greater spirit of enterprise.

# *Group Vision*




The vision statement defines the Company's purpose, in terms of its values.
Values are guiding beliefs about how things should be done.
The vision statement communicates both the purpose and values of Bord na Móna.
For employees, it gives direction about how they are expected to behave and inspires them to give their best. Shared with customers, it shapes the customers' understanding of why they should work with Bord na Móna.

Bord na Móna will seek solutions that optimise the creative energy and potential of the organisation, driven by long term goals and the organisation's vision and mission.
In this context our devolved business units will align their vision and strategic planning with the global direction provided.

Consistent with our vision, innovation will once again return to the core of everything we do. We will capitalise on opportunities to cross fertilise our unique range of skills and technologies that add value and are socially and environmentally sustainable.
Greater focus will be placed on managing and developing our land assets in a responsible and sustainable manner. Our award winning initiatives at Lough Boora (Co. Offaly) and Oweninny (Co Mayo), provide shining examples of what can be achieved

# *Group Mission*

We conduct our affairs with openness, honesty and integrity.
We are Ireland's leading environmentally responsible integrated utility service provider encompassing electricity, heating solutions, resource recovery, water, horticulture and related services.
We capitalise on international opportunities where we have a competitive advantage.
We achieve continuing growth through superior customer service, outstanding quality and innovation delivered through the excellence and commitment of our people.
We engage in sustainable profitable business in the communities we serve, which is rewarding and challenging for employees and other stakeholders.

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## 1.0 Introduction

### 1.1 IPPC Licence No 501-01

### 1.2 Name & Location of Site

| | |
|---|---|
| **Name:** | Bord na Mona Energy Limited. |
| **Address:** | Derrygreenagh Works, Rochfortbridge, Mullingar, Co. Westmeath |
| **Telephone No:** | 044 9222181 |
| **Contact Name:** | Eamonn Mulhall |
| **Position**: | Resource Manager |
| **National Grid Reference**: | E249450 N 238140 |

## 1.3 Description of Activities

**Peat Milling Operations.**

For milled peat production the bog is laid out in a series of rectangular fields of varying length and 15m wide with drains located between. There are essentially four operations involved in milled peat production:
Milling.
Harrowing.
Ridging.
Harvesting.

**Milling.**
Special milling machines work there way along the fields, milling approximately 15mm of peat of the top of the bog in a pass.

**Harrowing**
In the course of drying, the milled peat is turned a number of times to avail of the drying conditions. This is achieved with a machine called a harrow. The milled peat is harrowed until its moisture content is down to approximately 40-50%, which can take up to two to three days, weather depending.

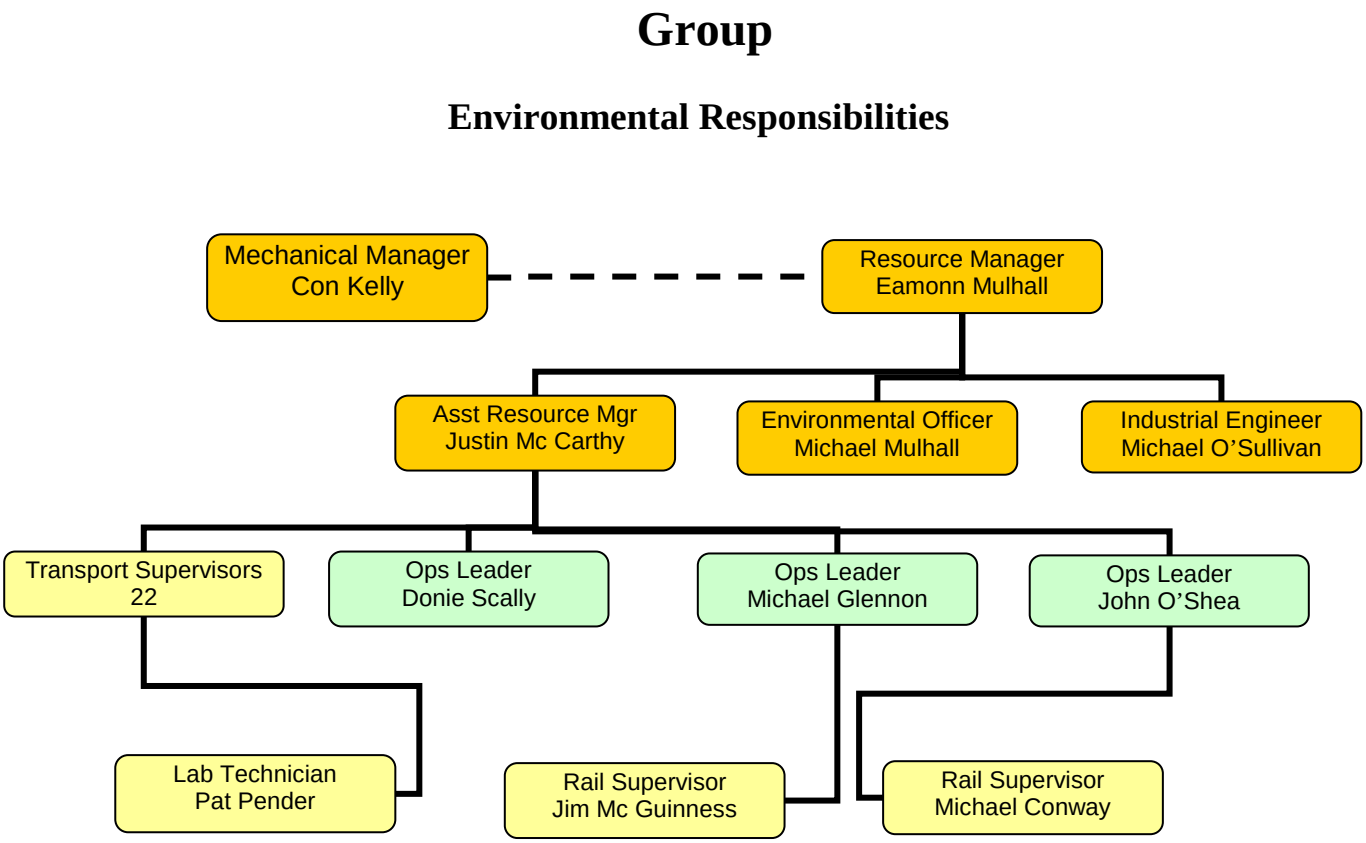
**Ridging**
The dry peat is then scraped into long ridges running down the centre of each field. This is done with a ridger, a machine consisting of a series of blades in the shape of a v that opens the full width of the field.

**Harvesting**
During harvesting every eleventh field is used to stockpile the peat, with this field receiving the milled peat from the five fields either side.

The milled peat is then transported via the existing network of peatland railways or via road to one of the following locations.
Power station
Horticultural Factory.
Briquette Factory.

## 1.4 Environmental Management of the Company

The organisational structure within the Derrygreenagh Group is presented in the flow chart below.



## 1.5 Environmental Policy

**BORD NA MÓNA**

**BORD NA MÓNA ENERGY LIMITED**
**Derrygreenagh,Rochfortbridge,Mullingar,Co-Westmeath.**

Bord na Mona Energy Limited is a commercial semi-state body with responsibility to develop Ireland's peat resources in the national interest.

Bord na Mona Energy Limited is committed to gather and make available information on all aspects of its environmental impact and to help improve understanding among the public generally of its role and the importance of Irish peatlands.

Bord na Mona Energy Limited recognises the importance of peatland conservation.

Bord na Mona Energy Limited will leave behind all areas it owns as either an economically or socially integrated resource of a high environmental value.

Bord na Mona Energy Limited seeks to conduct all aspects of its business in an environmentally sensitive value.

Bord na Mona Energy Limited will establish an environmental management system specifically addressing the following impacts.

Discharge to water.
Emissions to atmosphere.
Waste disposal.
Use of natural resources.
Noise, vibration, odour, dust and visual effects.
Natural environment and eco-system.

The environmental management system will be monitored, maintained and continually improved.

A system of regular environmental audits will be put in place.

Bord na Mona Energy Limited will continue research and development into all aspects of its environmental impact.

This statement is published and is available at all locations within the division and its Contents are brought to the attention of all employees.

## 2.0 Summary Information

## 2.1 Emissions to Water Summary

### 2.1.1 Silt Pond Emissions

**Surface Waters**

Comment

Surface water monitoring was carried out four times during the reporting period. In total analysis was carried out at twelve different locations. As the locations were changed after the first quarter monitoring event, monitoring occurred initially at the original six locations of, Derryhinch @ SW1, Drumman @ SW6, Toar @ SW14, Bracklin @ SW30, Carranstown @ SW32 and Rossan @ SW43. These were subsequently changed to six new locations, some within the same bog but at different emission points. The new locations are as follows, Derryhinch @ SW4, Ballybeg @ SW12, Bracklin @ SW26, Carranstown @ SW31, Rossan @ SW46 and Carrick @ SWA. As the latter is a comparatively new pond it was given a letter as opposed to a number for identification purposes. The parameters measured during each sampling event were as follows.
Total Phosphorus, Total Solids, Suspended Solids, pH, Ammonia, Colour and COD.
In general results were constant across all parameters at each monitoring location. November was the wettest month with 175.7mm of rainfall recorded and February the driest with 22.9 mm recorded. Flow rates appear to have had no adverse effect on suspended solids results.
The quarterly grab sampling programme proved to be 100% compliant for the year as was the 2006, 2007 & 2008 regimes.

**pH** values were between 8.3 and 6, with emission limit values being of the range 6 and 9. The graph clearly shows the newly selected monitoring locations being of a lower pH base than those previously being monitored.

**Suspended solids** varied from 5mg/l to 52mg/l and would depend on activities (piping, ditching) etc in the catchments at the time of sampling. Although above the ELV of 35mg/l, the 52mg/l result is allowed under condition 3.2.1 (ii) and does not constitute a non-compliance.

**Ammonia** values ranged from 0.04 mg/l and 2.32 mg/l.The I/PV for A3 waters is of the range 4mg/l. It is however not unusual for surface waters emanating from production peatlands to be slightly elevated. Overall ammonia levels are slightly down on 2008 figures. It is too soon as to speculate if the new locations are areas of lower ammonia.

**COD** values ranged from 32 mg/l to 148 mg/l. With the exception of SW15 trends appear to be indicating a downward pattern. The I/PV for A3 waters is of the range 40mg/l. As with ammonia future results and trends will be analysed, with the trigger level of 100 mg/l set to initiate investigation. Reduced flow and increased temperature most definitely impinge on COD results.

**Flow** rates at the new monitoring locations showed a marked increase from the previous locations. This was part of the justification for changing the monitoring points as the previous location at times proved difficult to get a flow record. As expected flow rates were elevated in the last two quarters due to exceptionally high and prolonged periods of rainfall.

**Total Phosphorus** results were consistent across all locations during the monitoring period.

As mentioned in the 2008 AER, a proposal for the changing of the sampling locations was submitted to the Agency for approval during the reporting period. This proposal was accepted and the sampling locations were changed post the first quarter monitoring event.
At the request of the Agency, analysis trends are now demonstrated graphically with results from 2006 to the present included in the graphs.

Surface Water Results are attached in Appendix 1.

### 2.1.2 Yard Discharges

**Yard Runoff**

Comment

Yard runoff monitoring took place at two locations during the reporting period. Derrygreenagh @ SWE 2 and Rossan @ SWE 1. Sampling frequency was monthly and COD was the parameter requiring analysis. Results were very satisfactory for the period at Derrygreenagh, with results consistently well below trigger levels. At Rossan following a particularly elevated result of 941 mg/l, cleaning of the interceptor took place. This led to a marked improvement in COD results, with the final two monitoring results being very satisfactory.
Although not having a specific licence emission limit value, a trigger level of 100 mg/l has been set in relation to COD results, along with the weekly visual inspections.

Sampling will continue at the same locations during 2010.

Yard Emission Results are attached in Appendix 2.

### 2.1.3 Composite Sampler Report

**Composite Sampling**

Comment

The composite sampler has been operating at Toar Bog SW15 during the reporting period.
The parameters measured were Total Phosphorus, Total Solids, Suspended Solids, pH, Ammonia, Colour and COD, with Suspended solids being the only parameter with an emission limit value of ( 35mg/l ). The sampler has been operating reasonably well during the reporting period, with the exception of a brief period between early November and mid December, when due to serious flooding the flow data component of the sampler became dislodged and washed away. This was subsequently replaced and flow data recording is operational again.
In general results were satisfactory with no non-compliance's being recorded for the period.
The composite sampler will remain at this location for the foreseeable future.

Composite Sampler Results are contained in Appendix 3.

### 2.1.4 Emissions to Water Non-compliance's

**Emissions to Water Non-Compliances 2009**

**Licence: P0501-01**

**Works: Derrygreenagh**

| Type | Non-Compliances | Location / SW Nr |
|---|---|---|
| Composite | 0 | |
| Quarterly Grab | 0 | |
| Monthly Yard | 1 | |
| **Totals** | **1** | |

There was one non-compliance's in relation to elevated COD emanating from yard runoff at Rossan Workshop. This non compliance was issued by the Agency on foot of a licence audit, as there is no specific licence emission limit value in relation to COD. As mentioned earlier trigger levels of 100 mg/l have been set.

## 2.2 Emissions to Air

### 2.2.1 Dust Monitoring

Comment

Dust monitoring was carried out on five occasions between April and August. Each monitoring event lasted between 28 and 32 days and the Bergerhoff method of collection was used.
The monitoring locations were as follows, Toar DM01, Derryhinch DM02 and Ballivor DM03.
All monitoring results were within the emission limit value of 350mg/$m^2$/day.
Sampling will continue at the same locations during 2010.

Dust monitoring results are contained in appendix 4.

### 2.2.2 Emissions to Air Non-compliance's

| **Dust Non-Compliances 2009** | |
|---|---|
| **Licence:P0501-01** | |
| **Works: Derrygreenagh** | |
| **Location / DM Nr** | **Non-Compliances** |
| N/A | 0 |
| **Total** | **0** |

Dust results for 2009 were compliant.

## 2.3 Waste Arisings

### 2.3.1 Non-Hazardous Waste

| **Non Hazardous Waste Data 2009** | | | | |
|---|---|---|---|---|
| **Licence: P0501-01** | | | | |
| **Works: Derrygreenagh** | | | | |
| **Type** | **Tonnes** | **EWC Code** | **Contractor** | **Licence Nr** |
| Skips | 22.51 | 20 03 01 | AES | 053/OY/39/02 |
| Wheelie Bins | 6.78 | 20 03 01 | AES | 053/OY/39/02 |
| Polyethlene | 32.06 | 02 01 04 | Eco Plastics | WFP-CE-08-0005-01 |
| Polyethlene | 173.88 | 02 01 04 | Leinster Environmentals | 2008/06 |
| Scrap Steel | 36.14 | 17 04 07 | AES | 053/OY/39/02 |
| Timber Pallets | 13.92 | 15 01 03 | AES | 053/OY/39/02 |
| Silt Pond Cleanings | 151.30 | 01 01 02 | Bord na Mona | IPPC P0501-01 |
| **Totals** | **436.59** | | | |

**Note:** Polyethylene and Steel are recycled. Skips go to an AES Mixed Recycling Facility.

### 2.3.2 Hazardous Waste

| Hazardous Waste Data 2009 | | | | | |
|---|---|---|---|---|---|
| Licence:P0501-01 | | | | | |
| Works:Derrygreenagh | | | | | |
| **Type** | **Tonnes** | **EWC Code** | **Contractor** | **Licence Nr** | **Destination** |
| Waste Oil | 32.95 | 13 02 05 | Enva Ireland Ltd Portlaoise | 184-1 | Portlaoise |
| Oil Filters | 0.77 | 16 01 07 | Enva Ireland Ltd Portlaoise | 184-1 | Portlaoise |
| Oily Rags | 1.01 | 15 02 02 | Enva Ireland Ltd Portlaoise | 184-1 | Portlaoise |
| Lead Acid Batt | 3.58 | 16 06 01 | Enva Ireland Ltd Portlaoise | 184-1 | Portlaoise |
| Parts Wash | 1.92 | 11 01 13 | Safety Kleen, Tallaght, Dublin | 99-1 | Dublin |
| **Total** | **40.23** | | | | |

## 2.4 Energy and Water Consumption

### 2.4.1 Energy

The table below shows energy consumption for the year. It does not include water as it is only used in offices, canteens and workshops on a domestic basis. It is not used as part of the production process.

| Energy Consumption 2009 | | | | |
|---|---|---|---|---|
| Licence: P0501-01 | | | | |
| Works: Derrygreenagh | | | | |
| **Units** | **Diesel ( Litres )** | **Petrol (Litres)** | **Electricity (Units)** | **Peat Briquettes (Tonnes)** |
| **Totals** | 581403 | 0 | 424311 | 20 |
| **MW Hours** | 5693.3 | 0 | 424.311 | 100 |
| **Total MW Hours** | **6217.6** | | | |

**Note:** The electricity consumption figure was extracted from ESB on line information systems. Some of the consumption figures relate to estimated readings which do not reflect on the exact amount of consumption. Going forward, Bord na Mona are liaising with the supplier, to try and eliminate all estimated readings. This will give a more precise figure in relation to consumption in the future.

## 2.5 Environmental Incidents and Complaints

### 2.5.1 Incidents

| Environmental Incidents 2009 | |
|---|---|
| **Licence: P0501-01** | |
| **Works: Derrygreenagh** | |
| | **Number** |
| Incidents | 1 |
| Requiring corrective action | 1 |
| **Category** | |
| Water | 1 |
| Air | |
| Procedural | |
| Miscellaneous | |
| **Total** | **1** |

There was one environmental incident. This related to the aforementioned elevated COD result at Rossan Oil Interceptor. A corrective action was instigated and the interceptor cleaned out by a licenced contractor. Subsequent results proved to be quite satisfactory.

### 2.5.2 Complaints

| Environmental Complaints 2009 | |
|---|---|
| **Licence:P0501-01** | |
| **Works: Derrygreenagh** | |
| | **Number** |
| Complaints | 0 |
| Requiring corrective action | |
| **Category** | |
| Water | |
| Air | |
| Procedural | |
| Miscellaneous | |
| **Total** | **0** |

No complaints of an environmental nature were received during the reporting period.

## 3.0 Management of the Activity

### 3.1 Achievement of Objectives & Targets 2009

| Project | Description & Status |
|---|---|
| **Project 1:**<br><br><br><br><br><br><br><br>Reduction of fugitive dust emissions. | **Training.**<br>Train all employees in environmental matters. Training will be by means of the screening of an environmental DVD, followed by a power point presentation.<br>**Status**<br>In total 50 employees received environmental training.<br><br>**Hydraulic Harrows.**<br>Hydraulic harrows will be deployed at dust sensitive locations during the 2009 production season.<br>**Status**<br>No new Hydraulic Harrows were deployed during the 2009 production season. This was due in part to the exceptionally wet weather which curtailed production activity and mitigated against the need for such equipment.<br><br>**Headland Peat Collection.**<br>Continue with the collection of headland peat, particularly at dust sensitive locations.<br>**Status**<br>Headland peat was collected as part of the peat lifting process and included in general peat return figures. |
| **Project 2:**<br><br><br><br>Waste Management | **Waste Streamlining.**<br>Following the purchase by Bord na Mona of AES Ltd, meetings with that company's management will be ongoing to see how best Bord na Mona's needs can be catered for. Key account managers dedicated to Bord na Mona have been requested and are due to be in place in 2009.<br>**Status**<br>A pilot programme has been put in place at Bord na Mona Boora works. Should this prove successful it will be extended to all Bord na Mona works. The service promises to include the issuing of quarterly reports on waste quantities and types. |
| **Project 3:**<br><br><br>Minimisation of Suspended Solids. | **On Site Inspections.**<br>Train all employees in environmental matters. Training will be by means of the screening of an environmental DVD, followed by a power point presentation. |

| | |
|---|---|
| | **Status**<br>In total 50 employees received environmental training. |
| **Project 4:**<br><br>Effective spill leak management of mobile fuelling units. | **Research and Development.**<br>Continue to introduce rail operated fuel service wagons on a phased basis, with Derrygreenagh works budgeted to receive one wagon during 2009. Increased bund provisions where required, will be provided, in 2009.<br>**Status**<br>One new rail operated fuel service wagon was introduced in 2009. In addition to this two self bunded lock up containers were introduced in 2009. A new self bunded waste oil tank was also commissioned during the reporting period. |
| **Project 5:**<br><br>Collection storage and reuse of polyethylene. | **Identify Recyclers.**<br>Continue with the recycling of polyethylene. The sourcing of more recycling contractors will be ongoing.<br>**Status**<br>In total 205.94 tonnes of polyethylene was sent for recycling in 2009. |
| **Project 6:**<br><br>PCB Directive | **PCB Survey.**<br>Carry out a comprehensive survey of all PCB suspect appliances. Following this, liaise with EPA in deciding a plan of action once a definitive amount of suspect PCB holdings are agreed.<br>**Status**<br>As of December 2009, 75% of all potential Derrygreenagh PCB contained appliances have been sampled, with results indicating no PCB's present to date. |

### 3.2 Environmental Management Programme Proposal 2010

| Project | Description & Status |
|---|---|
| **Project 1:**<br><br>Reduction of fugitive dust emissions. | **Training.**<br>Continue to train all employees in environmental matters. Training will be by means of the screening of an environmental DVD, followed by a power point presentation.<br><br>**Hydraulic Harrows.**<br>One Hydraulic harrow will be deployed at Derryhinch bog during the 2010 production season.<br><br>**Headland Peat Collection.**<br>Continue with the collection of headland peat, particularly at dust sensitive locations. |
| **Project 2:**<br><br>Waste Management | **Waste Streamlining.**<br>Following the setting up of a pilot project at Boora works in relation to waste management. The extension of the project to other works including Derrygreenagh is planned. |
| **Project 3:**<br><br>Minimisation of Suspended Solids. | **Training.**<br>Continue to train all employees in environmental matters. Training will be by means of the screening of an environmental DVD, followed by a power point presentation. |
| **Project 4:**<br>Effective spill leak management of mobile fuelling units. | **Research and Development.**<br>Increased bund provisions where required, will be provided, in 2010. |
| **Project 5:**<br>Collection storage and reuse of polyethylene. | **Identify Recyclers.**<br>Continue with the recycling of polyethylene. The sourcing of more recycling contractors will be ongoing. |
| **Project 6:**<br><br>Mini Sod Project | **Carry out Trial.**<br>On a trial basis switch from milled peat to mini sod production at a portion of Drumman bog. Part of this project is to mitigate against dust nuisance, as the area is potentially dust sensitive. |
| **Progect 7:**<br><br>Energy Management | **Internal Meter Reading.**<br>As part of an energy management process a programme of internal meter readings will commence in 2010. The purpose of this exercise is to establish accurate energy consumption as to date a high percentage of electricity bills have been estimated by the supplier. |

### 3.3 Environmental Expenditure

| Environmental Expenditure 2009 | |
|---|---|
| Licence:P0501-01 | |
| Works: Derrygreenagh | |
| **Description** | **Cost €** |
| Capital Costs | 15,767.00 |
| Silt Control | 73,988.50 |
| Analytical & Consultancy Costs | 10,656.50 |
| EPA Fees | 8,070.00 |
| Bog Rehabilitation | 33,696.00 |
| Waste Management | 44,238.60 |
| **Total** | **186,416.60** |

## 4.0 Licence Specific Reports

### 4.1 Surface Water Discharge Monitoring Location Programme Review

The Monitoring Locations were changed; post the first quarter monitoring event 2009 and the Agency was informed. The new surface water discharge monitoring locations are now as follows; Derryhinch @ SW4, Ballybeg @ SW15, Bracklin @ SW26, Carranstown @ SW31, Rossan @ SW46 and Carrick @ SWA. As the latter is a comparatively new pond it was given a letter as opposed to a number for identification purposes.

### 4.2 Bunding Programme

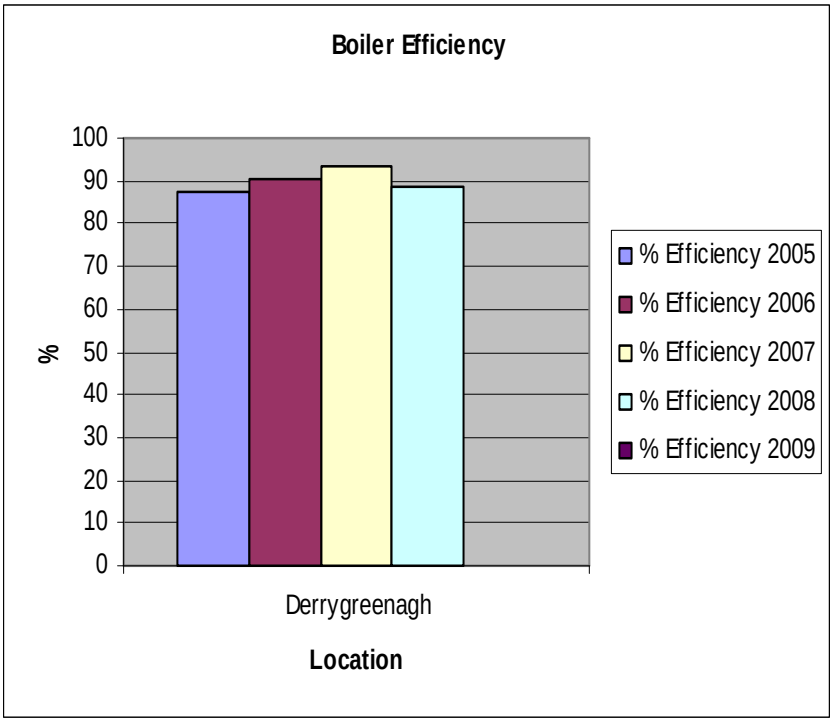
| Bund Locations & Numbers Derrygreenagh Works | | | | | | |
|---|---|---|---|---|---|---|
| IPPC Licence: P0501-01 | | | | | | |
| **Location** | **Bund Number** | **Last Tested** | **Status Pass/Fail** | **Next Test Due** | **Last Tested** | **Status Pass/Fail** |
| Derrygreenagh Main Bund | 501-37-01 | Dec-06 | Pass | Dec-08 | Jan-09 | Pass |
| Derrygreenagh Waste Oil Bund | 501-37-02 | Sep-09 | Pass | Sep-11 | | |
| Ballivor Factory Bund | 501-08-03 | Mar-07 | Pass | Mar-09 | Nov-09 | Pass |
| Rossan Tippler Bund | 501-07-04 | Feb-07 | Pass | Feb-09 | Mar-09 | Fail |

The table above is an overview of the bund testing carried out during 2009. As is evident the Rossan Bund failed its integrity test and remediation works have just been completed in early 2010. Following these repairs a retest was successful.

### 4.3 Boiler Combustion Efficiency

There is one boiler in the licence area, which is located at Derrygreenagh Workshop. During the reporting period it was replaced with a new boiler. An efficiency test was not carried out due to the fact that the boiler was new. A test will be carried out in 2010 and submitted in that years AER. The table and graph below show previous year's efficiency results.

| Boiler Emissions 2009 | | | | | |
|---|---|---|---|---|---|
| Licence: P0501-01 | | | | | |
| Works: Derrygreenagh | | | | | |
| **Boiler Location** | **% Efficiency 2005** | **% Efficiency 2006** | **% Efficiency 2007** | **% Efficiency 2008** | **% Efficiency 2009** |
| Derrygreenagh | 87.2 | 90.71 | 93.3 | 88.9 | New Boiler fitted |



### 4.4 Resource consumption summary

| Resource Consumption 2009 | | | |
|---|---|---|---|
| **Licence: P0501-01** | | | |
| **Works: Derrygreenagh** | | | |
| **Product** | **Tonnes Produced** | **Tonnes Sold** | **Customer** |
| Milled Peat | 64,528 | 140,778 | ESB |
| Moss | 37,131 | 76,331 | Horticulture |
| Turf | 120 | 120 | Private |
| Other | 0 | 0 | N/A |
| **Totals** | **101,779** | **217,229** | |

| Proposed Production 2010 | |
|---|---|
| **Licence: P0501-01** | |
| **Works: Derrygreenagh** | |
| **Product** | **Proposed Target** |
| Milled Peat | 152,975 |
| Moss | 70,000 |
| Turf Private | 200 |
| Turf EPL | 30,000 |
| **Totals** | **253,175** |

### 4.5 De-Silting Report

As there was no production in Derryhinch, Drumman and Lisclogher Bogs, peat silt generation was at a minimum. Further to this fortnightly inspections indicated that no pond in these areas ever exceeded the half full stage. Further to this inspections at Ballivor and Carranstown dictated that only the ponds actually cleaned twice warranted such cleaning.

A table and graph of the cleaning schedule is attached in appendix 5.

### 4.6 Bog Development and Operational Programme

There was some small scale development at Rossan Bog, wich included the preparation of an area of approximately 35 hectares for inclusion in the 2010 production season. An additional silt pond site was constructed to service this additional area.
In Ballivor Bog an area of 30 hectares which had been previously developed but not intensively produced on, was fully reinstated to production status and produced on towards the end of the production season.

## 4.7 Bog Rehabilitation Report

A clean up of historical polyethylene took place in Rossan Bog. This work involved the bailing for recycling of 141 tonnes of polyethylene cover material. It is proposed to continue with this work during the summer months of 2010.

2008: Following consultation with the National Parks and Wildlife Service, an exercise was carried out, to identify potential areas within the Licence area that may be suitable for management with a biodiversity focus. Following from the initial desktop survey and mapping exercise, key areas of potential biodiversity areas within the Derrygreenagh Bogs were identified. These include Derryarkin wetlands, and Drumman and Ballybeg cutaway areas.

2009: In September 2009, a large-scale baseline ecological survey of all of the Bord na Mona bogs commenced. The survey will target those areas identified during the mapping project in 2008 and will form the basis for development of *Rehabilitation Plans* for all bog areas, while also identifying areas considered as being rich biodiversity. To date, Derryhinch, Drumman and Derryarkin Bogs have been surveyed and mapped and there are selected sites ear-marked for further survey in 2010. Possible rehabilitation measures were outlined and will be further developed as these areas are removed from the peat production process.

Further consultation with the NPWS was carried out in 2009, including a meeting with Padraic Comerford and Val Swann, Regional Management Staff. The outline long-term rehabilitation plans for the Derrygreenagh bogs were discussed and it was agreed to notify the NPWS when potential Biodiversity Areas are identified and more site specific rehabilitation plans drawn up.

## 4.8 Archaeological Report

There was no archaeology work carried during the reporting period.

## 5.0 Summary

The Derrygreenagh Group of Bogs endeavour to comply with all environmental issues. In 2009 we were compliant regarding suspended solids at our composite sampler at Toar bog. We were also compliant for the silt pond quarterly sampling events. Silt pond cleaning went reasonable well during the year, most areas were cleaned at least twice and those that weren't were not in production so silt runoff was minimal. Every effort will be made to continue this trend into 2010. Dust sampling was conducted on five occasions during 2009, two more than our licence requires, with no sample over the limit. This was done to help us identify any problems that might occur.

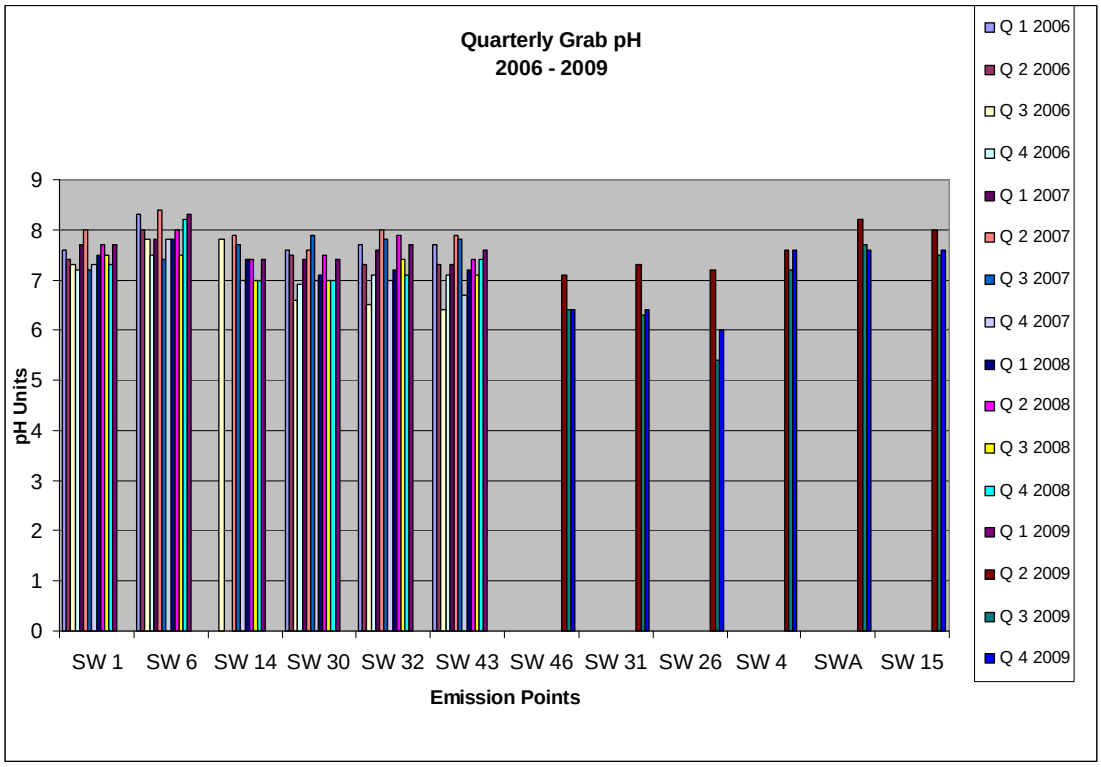
All new seasonal staff were trained in 2009, and this will be repeated in 2010 in relation to any new staff joining the company.

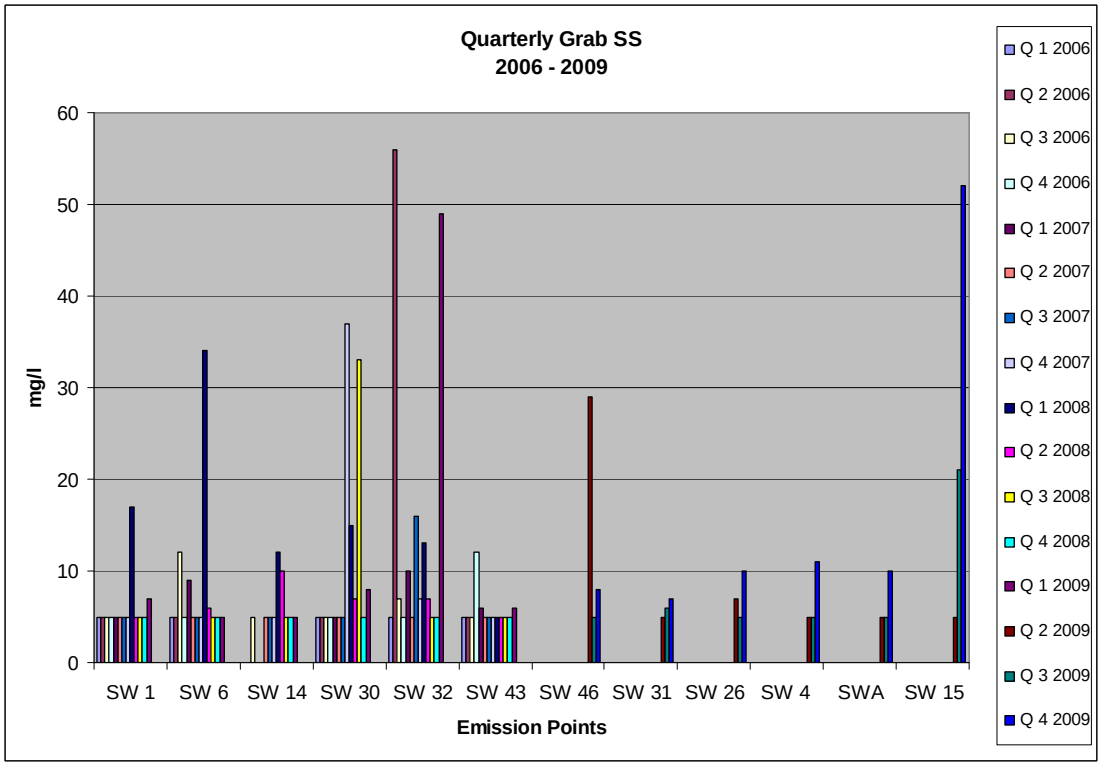
Bord na Mona Energy Ltd are represented on the Management Group of both the Shannon River and Eastern River Basin District Management Systems, set up under the Water Framework Directive, and on the Steering Group of the Catchment Management of the River Barrow.

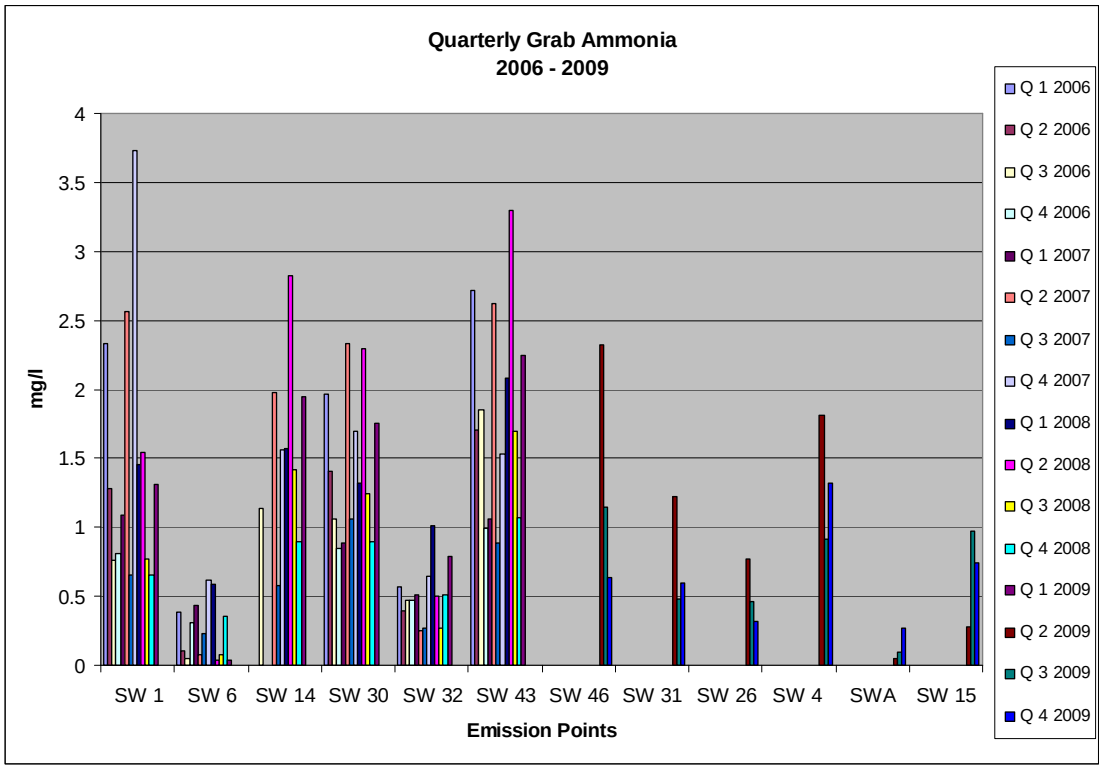
Bord na Mona would like to take this opportunity to advise the Environmental Protection Agency of its continued commitment to improving its environmental performance by adopting cleaner production methods and improving its environmental protection methods.

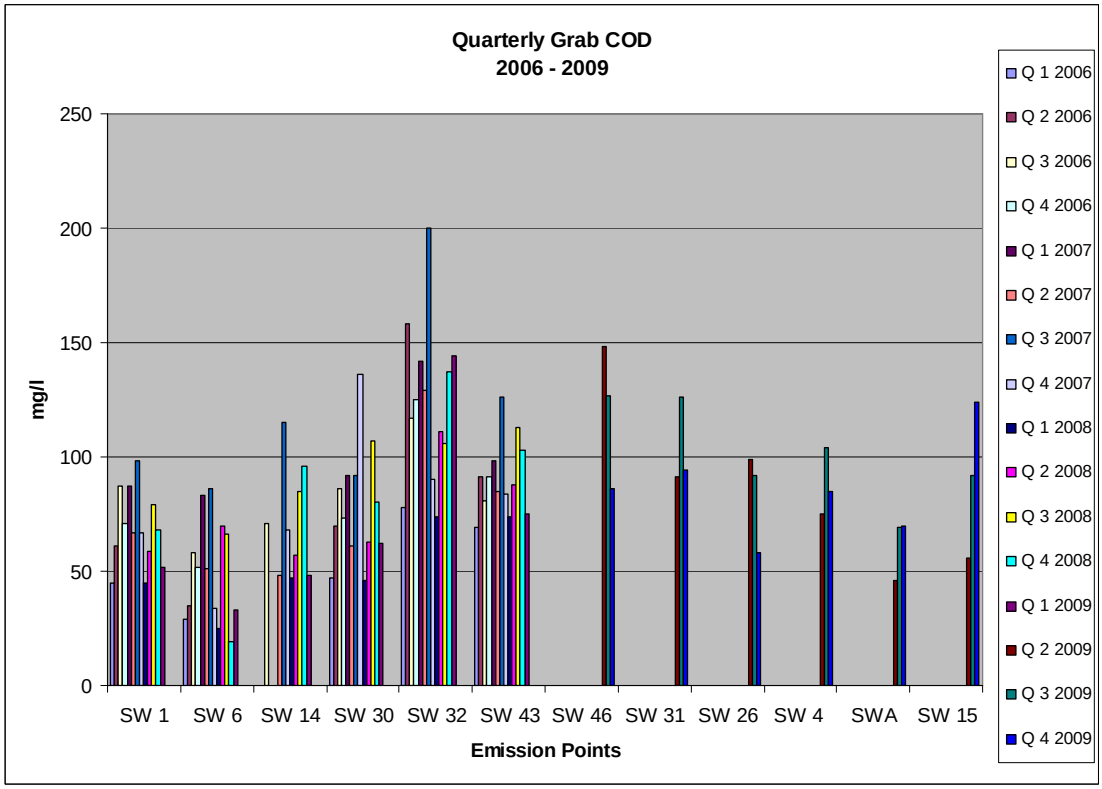
# APPENDIX 1

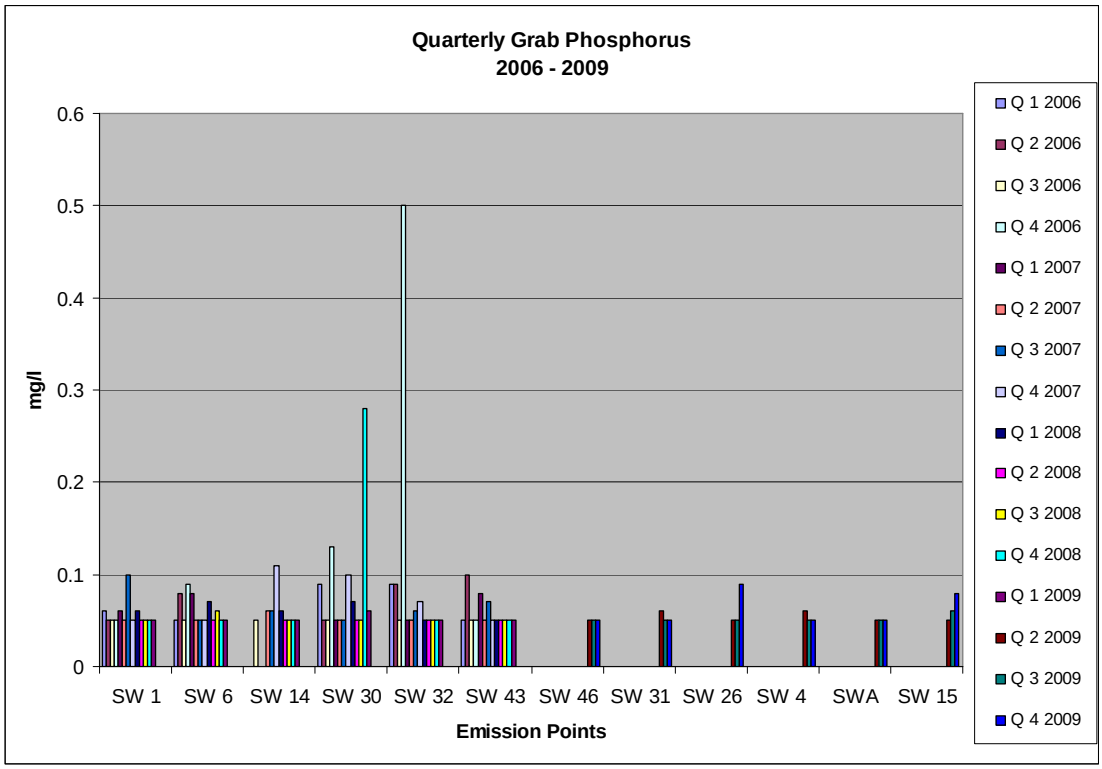
## Surface Water Discharge
## Monitoring Results
## Bogs

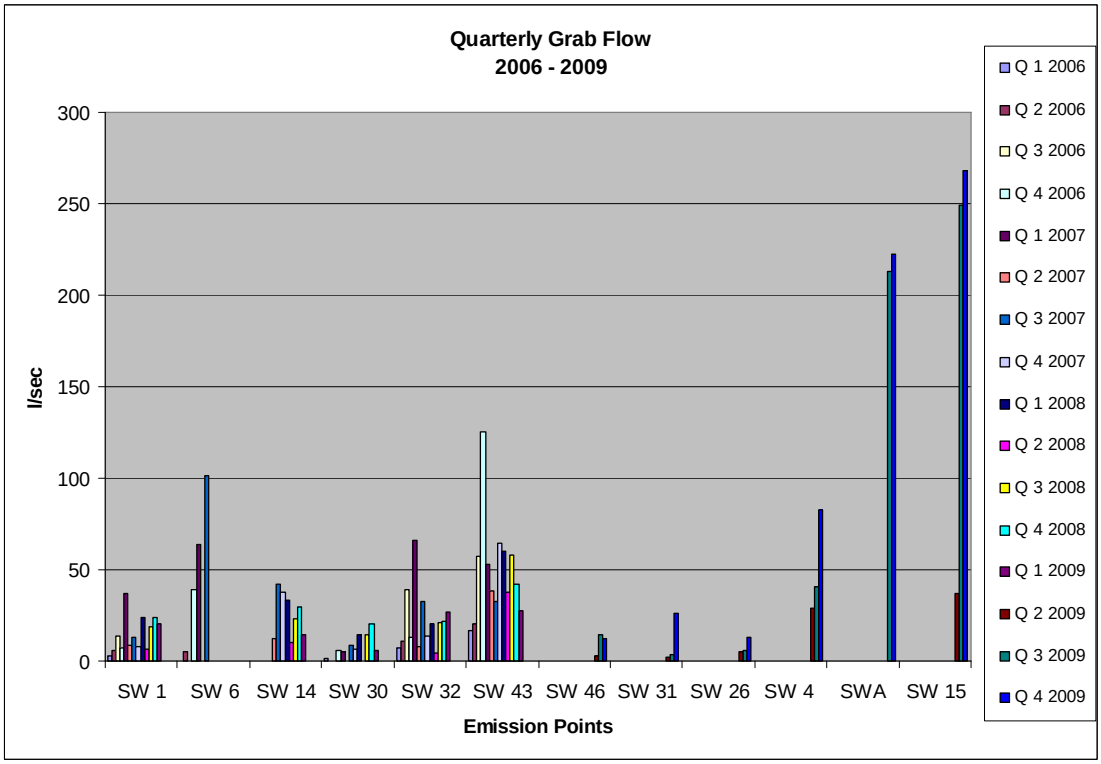

Quarterly Grab pH
2006 - 2009
pH Units
0
1
2
3
4
5
6
7
8
9
SW 1
SW 6
SW 14
SW 30
SW 32
SW 43
SW 46
SW 31
SW 26
SW 4
SWA
SW 15
Emission Points
Q 1 2006
Q 2 2006
Q 3 2006
Q 4 2006
Q 1 2007
Q 2 2007
Q 3 2007
Q 4 2007
Q 1 2008
Q 2 2008
Q 3 2008
Q 4 2008
Q 1 2009
Q 2 2009
Q 3 2009
Q 4 2009


Quarterly Grab SS
2006 - 2009
mg/l
0
10
20
30
40
50
60
SW 1
SW 6
SW 14
SW 30
SW 32
SW 43
SW 46
SW 31
SW 26
SW 4
SWA
SW 15
Emission Points
Q 1 2006
Q 2 2006
Q 3 2006
Q 4 2006
Q 1 2007
Q 2 2007
Q 3 2007
Q 4 2007
Q 1 2008
Q 2 2008
Q 3 2008
Q 4 2008
Q 1 2009
Q 2 2009
Q 3 2009
Q 4 2009


Quarterly Grab Ammonia
2006 - 2009
mg/l
4
3.5
3
2.5
2
1.5
1
0.5
0
SW 1
SW 6
SW 14
SW 30
SW 32
SW 43
SW 46
SW 31
SW 26
SW 4
SWA
SW 15
Emission Points
Q 1 2006
Q 2 2006
Q 3 2006
Q 4 2006
Q 1 2007
Q 2 2007
Q 3 2007
Q 4 2007
Q 1 2008
Q 2 2008
Q 3 2008
Q 4 2008
Q 1 2009
Q 2 2009
Q 3 2009
Q 4 2009

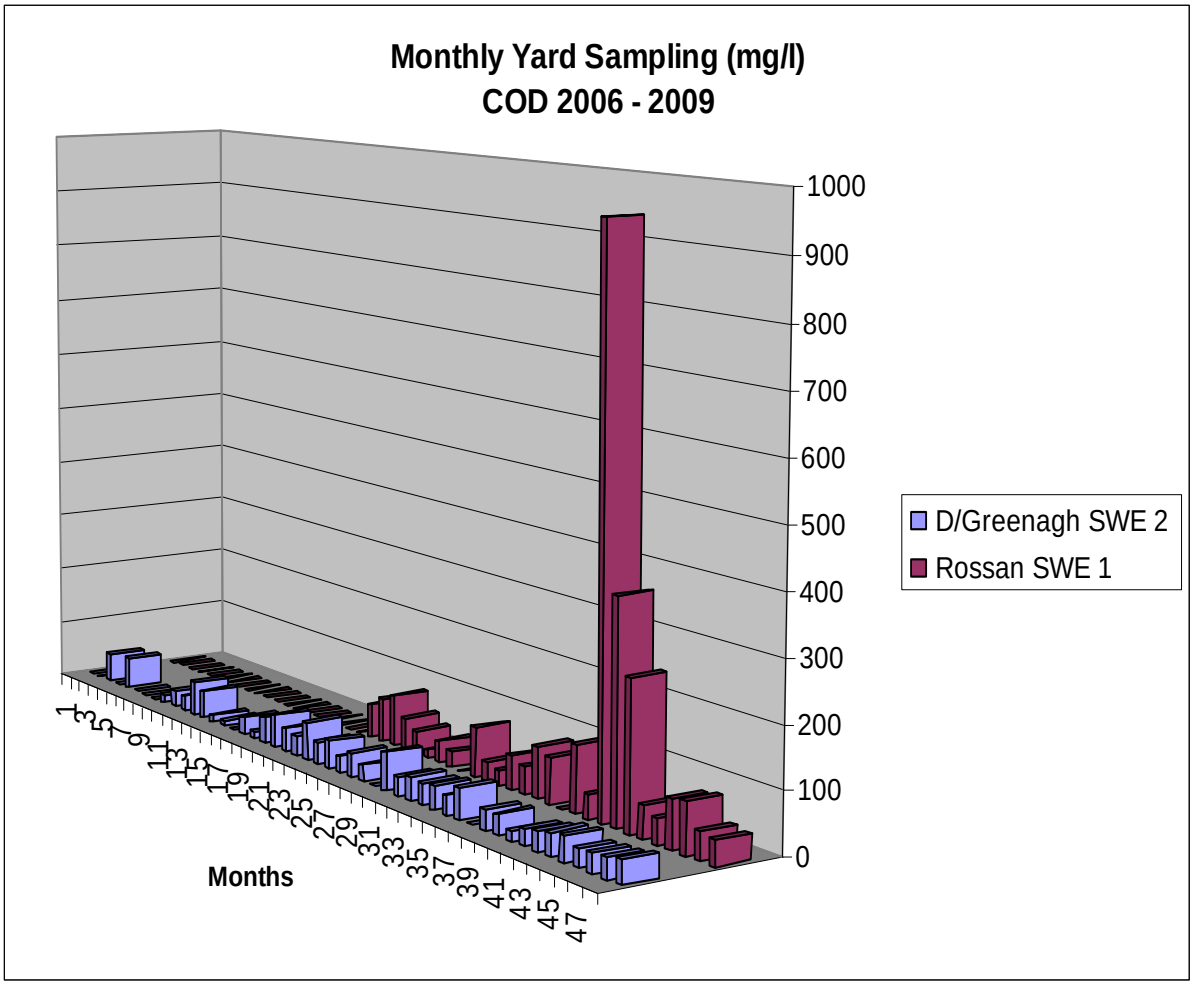

Quarterly Grab COD
2006 - 2009
mg/l
250
200
150
100
50
0
SW 1
SW 6
SW 14
SW 30
SW 32
SW 43
SW 46
SW 31
SW 26
SW 4
SWA
SW 15
Emission Points
Q 1 2006
Q 2 2006
Q 3 2006
Q 4 2006
Q 1 2007
Q 2 2007
Q 3 2007
Q 4 2007
Q 1 2008
Q 2 2008
Q 3 2008
Q 4 2008
Q 1 2009
Q 2 2009
Q 3 2009
Q 4 2009


Quarterly Grab Phosphorus
2006 - 2009
mg/l
0.6
0.5
0.4
0.3
0.2
0.1
0
SW 1
SW 6
SW 14
SW 30
SW 32
SW 43
SW 46
SW 31
SW 26
SW 4
SWA
SW 15
Emission Points
Q 1 2006
Q 2 2006
Q 3 2006
Q 4 2006
Q 1 2007
Q 2 2007
Q 3 2007
Q 4 2007
Q 1 2008
Q 2 2008
Q 3 2008
Q 4 2008
Q 1 2009
Q 2 2009
Q 3 2009
Q 4 2009


Quarterly Grab Flow
2006 - 2009
l/sec
300
250
200
150
100
50
0
SW 1
SW 6
SW 14
SW 30
SW 32
SW 43
SW 46
SW 31
SW 26
SW 4
SWA
SW 15
Emission Points
Q 1 2006
Q 2 2006
Q 3 2006
Q 4 2006
Q 1 2007
Q 2 2007
Q 3 2007
Q 4 2007
Q 1 2008
Q 2 2008
Q 3 2008
Q 4 2008
Q 1 2009
Q 2 2009
Q 3 2009
Q 4 2009

# APPENDIX 2

## Surface Water Discharge Monitoring Results
### Yards


Monthly Yard Sampling (mg/l)
COD 2006 - 2009
1000
900
800
700
600
500
400
300
200
100
0
D/Greenagh SWE 2
Rossan SWE 1
Months
1
3
5
7
9
11
13
15
17
19
21
23
25
27
29
31
33
35
37
39
41
43
45
47

# APPENDIX 3

## Surface Water Discharge
## Monitoring Results
## Composite

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2009 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 0 | 0 | | 19807200 | | | | 0.00 | 0.00 |
| 2 | | | | | 0 | 0 | | 18888770 | | | | 0.00 | 0.00 |
| 3 | | | | | 0 | 0 | | 9992160 | | | | 0.00 | 0.00 |
| 4 | | | | | 0 | 0 | | 2688682 | | | | 0.00 | 0.00 |
| 5 | | | | | 0 | 0 | | 6724426 | | | | 0.00 | 0.00 |
| 6 | | | | | 0 | 0 | | 8456140 | | | | 0.00 | 0.00 |
| 7 | 7.4 | 74 | 2.83 | 0.11 | 5 | 326 | 107 | 12890020 | 953.86 | 36.48 | 1.42 | 64.45 | 4202.15 |
| 8 | | | | | 0 | 0 | | 10586590 | | | | 0.00 | 0.00 |
| 9 | | | | | 0 | 0 | | 10094980 | | | | 0.00 | 0.00 |
| 10 | | | | | 5 | 252 | | 8063193 | | | | 40.32 | 2031.92 |
| 11 | | | | | 5 | 310 | | 10679900 | | | | 53.40 | 3310.77 |
| 12 | | | | | 5 | 100 | | 9847872 | | | | 49.24 | 984.79 |
| 13 | | | | | 5 | 224 | | 17974660 | | | | 89.87 | 4026.32 |
| 14 | 8.1 | 74 | 0.49 | 0.05 | 5 | 288 | 144 | 27919300 | 2066.03 | 13.68 | 1.40 | 139.60 | 8040.76 |
| 15 | | | | | 5 | 172 | | 21292420 | | | | 106.46 | 3662.30 |
| 16 | | | | | 5 | 326 | | 25657340 | | | | 128.29 | 8364.29 |
| 17 | | | | | 5 | 222 | | 24496130 | | | | 122.48 | 5438.14 |
| 18 | | | | | 5 | 204 | | 24701760 | | | | 123.51 | 5039.16 |
| 19 | | | | | 5 | 262 | | 33987170 | | | | 169.94 | 8904.64 |
| 20 | | | | | 5 | 316 | | 35074080 | | | | 175.37 | 11083.41 |
| 21 | | 56 | 0.54 | 0.05 | 5 | 256 | 165 | 30346270 | 1699.39 | 16.39 | 1.52 | 151.73 | 7768.65 |
| 22 | | | | | 5 | 268 | | 28616540 | | | | 143.08 | 7669.23 |
| 23 | | | | | 5 | 348 | | 33217340 | | | | 166.09 | 11559.63 |
| 24 | | | | | 5 | 358 | | 30554500 | | | | 152.77 | 10938.51 |
| 25 | | | | | 5 | 358 | | 27012960 | | | | 135.06 | 9670.64 |
| 26 | | | | | 5 | 372 | | 28058400 | | | | 140.29 | 10437.72 |
| 27 | | | | | 5 | 358 | | 26838430 | | | | 134.19 | 9608.16 |
| 28 | 7.9 | 23 | 0.48 | 0.05 | 5 | 370 | 103 | 26319170 | 605.34 | 12.63 | 1.32 | 131.60 | 9738.09 |
| 29 | | | | | 0 | 0 | | 25103520 | | | | 0.00 | 0.00 |
| 30 | | | | | 0 | 0 | | 26730430 | | | | 0.00 | 0.00 |
| 31 | | | | | 0 | 0 | | 36112610 | | | | 0.00 | 0.00 |

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Feb | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2009 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 0 | 0 | | 36112610 | | | | 0.00 | 0.00 |
| 2 | | | | | 0 | 0 | | 36112610 | | | | 0.00 | 0.00 |
| 3 | | | | | 0 | 0 | | 36112610 | | | | 0.00 | 0.00 |
| 4 | 7.5 | 49 | 0.43 | 0.06 | 5 | 188 | 144 | 36112610 | 1769.52 | 15.53 | 2.17 | 180.56 | 6789.17 |
| 5 | | | | | 5 | 388 | | 35453380 | | | | 177.27 | 13755.91 |
| 6 | | | | | 5 | 414 | | 30137180 | | | | 150.69 | 12476.79 |
| 7 | | | | | 5 | 350 | | 27485570 | | | | 137.43 | 9619.95 |
| 8 | | | | | 5 | 394 | | 25702270 | | | | 128.51 | 10126.69 |
| 9 | | | | | 6 | 428 | | 24951460 | | | | 149.71 | 10679.22 |
| 10 | | | | | 5 | 412 | | 24989470 | | | | 124.95 | 10295.66 |
| 11 | 7.8 | 44 | 0.61 | 0.05 | 5 | 278 | 80 | 24426140 | 1074.75 | 14.90 | 1.22 | 122.13 | 6790.47 |
| 12 | | | | | 5 | 348 | | 23729760 | | | | 118.65 | 8257.96 |
| 13 | | | | | 5 | 352 | | 23762590 | | | | 118.81 | 8364.43 |
| 14 | | | | | 5 | 407 | | 23531040 | | | | 117.66 | 9577.13 |
| 15 | | | | | 5 | 426 | | 22973760 | | | | 114.87 | 9786.82 |
| 16 | | | | | 5 | 374 | | 22401790 | | | | 112.01 | 8378.27 |
| 17 | | | | | 5 | 438 | | 21934370 | | | | 109.67 | 9607.25 |
| 18 | 8 | 17 | 0.68 | 0.05 | 5 | 408 | 68 | 21571490 | 366.72 | 14.67 | 1.08 | 107.86 | 8801.17 |
| 19 | | | | | 5 | 433 | | 21106660 | | | | 105.53 | 9139.18 |
| 20 | | | | | 5 | 456 | | 20802530 | | | | 104.01 | 9485.95 |
| 21 | | | | | 5 | 468 | | 20290180 | | | | 101.45 | 9495.80 |
| 22 | | | | | 5 | 446 | | 19974820 | | | | 99.87 | 8908.77 |
| 23 | | | | | 5 | 454 | | 19696610 | | | | 98.48 | 8942.26 |
| 24 | | | | | 5 | 438 | | 19573920 | | | | 97.87 | 8573.38 |
| 25 | 7.1 | 40 | 0.72 | 0.05 | 5 | 450 | 77 | 19471970 | 778.88 | 14.02 | 0.97 | 97.36 | 8762.39 |
| 26 | | | | | 5 | 462 | | 19131550 | | | | 95.66 | 8838.78 |
| 27 | | | | | 5 | 458 | | 19097860 | | | | 95.49 | 8746.82 |
| 28 | | | | | 5 | 454 | | 18988990 | | | | 94.94 | 8621.00 |

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| March | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2009 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 5 | 454 | | 19027870 | | | | 95.14 | 8638.65 |
| 2 | | | | | 5 | 446 | | 17681760 | | | | 88.41 | 7886.06 |
| 3 | | | | | 5 | 454 | | 16505860 | | | | 82.53 | 7493.66 |
| 4 | 7.6 | 49 | 0.73 | 0.05 | 5 | 452 | 71 | 18988130 | 930.42 | 13.86 | 0.95 | 94.94 | 8582.63 |
| 5 | | | | | 10 | 256 | | 16026340 | | | | 160.26 | 4102.74 |
| 6 | | | | | 12 | 496 | | 13211420 | | | | 158.54 | 6552.86 |
| 7 | | | | | 9 | 504 | | 6115133 | | | | 55.04 | 3082.03 |
| 8 | | | | | 12 | 472 | | 6082387 | | | | 72.99 | 2870.89 |
| 9 | | | | | 7 | 398 | | 6150298 | | | | 43.05 | 2447.82 |
| 10 | | | | | 10 | 488 | | 6041347 | | | | 60.41 | 2948.18 |
| 11 | 7.8 | 59 | 0.57 | 0.06 | 13 | 536 | 57 | 6090768 | 359.36 | 3.47 | 0.37 | 79.18 | 3264.65 |
| 12 | | | | | 0 | 0 | | 6051974 | | | | 0.00 | 0.00 |
| 13 | | | | | 0 | 0 | | 6027350 | | | | 0.00 | 0.00 |
| 14 | | | | | 0 | 0 | | 3681158 | | | | 0.00 | 0.00 |
| 15 | | | | | 0 | 0 | | 5863795 | | | | 0.00 | 0.00 |
| 16 | | | | | 0 | 0 | | 9554976 | | | | 0.00 | 0.00 |
| 17 | | | | | 0 | 0 | | 5179248 | | | | 0.00 | 0.00 |
| 18 | 7.4 | 43 | 0.84 | 0.05 | 13 | 526 | 63 | 4839869 | 208.11 | 4.07 | 0.24 | 62.92 | 2545.77 |
| 19 | | | | | 9 | 468 | | 4839869 | | | | 43.56 | 2265.06 |
| 20 | | | | | 0 | 0 | | 5185382 | | | | 0.00 | 0.00 |
| 21 | | | | | 0 | 0 | | 8219577 | | | | 0.00 | 0.00 |
| 22 | | | | | 0 | 0 | | 7461504 | | | | 0.00 | 0.00 |
| 23 | | | | | 12 | 442 | | 7544534 | | | | 90.53 | 3334.68 |
| 24 | | | | | 10 | 500 | | 6689693 | | | | 66.90 | 3344.85 |
| 25 | 8.1 | 47 | 0.67 | 0.05 | 18 | 464 | 60 | 6317050 | 296.90 | 4.23 | 0.32 | 113.71 | 2931.11 |
| 26 | | | | | 0 | 0 | | 4775155 | | | | 0.00 | 0.00 |
| 27 | | | | | 0 | 0 | | 6236179 | | | | 0.00 | 0.00 |
| 28 | | | | | 0 | 0 | | 6136646 | | | | 0.00 | 0.00 |
| 29 | | | | | 0 | 0 | | 5055264 | | | | 0.00 | 0.00 |
| 30 | | | | | 0 | 0 | | 4968518 | | | | 0.00 | 0.00 |
| 31 | | | | | 0 | 0 | | 5664163 | | | | 0.00 | 0.00 |

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| April | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2009 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | 8.3 | 55 | 0.45 | 0.05 | 7 | 510 | 69 | 5212166 | 286.67 | 2.35 | 0.26 | 36.49 | 2658.20 |
| 2 | | | | | 13 | 480 | | 10041410 | | | | 130.54 | 4819.88 |
| 3 | | | | | 5 | 444 | | 16293310 | | | | 81.47 | 7234.23 |
| 4 | | | | | 5 | 452 | | 17354300 | | | | 86.77 | 7844.14 |
| 5 | | | | | 5 | 466 | | 17604860 | | | | 88.02 | 8203.86 |
| 6 | | | | | 5 | 478 | | 16959460 | | | | 84.80 | 8106.62 |
| 7 | | | | | 9 | 378 | | 15972770 | | | | 143.75 | 6037.71 |
| 8 | 8.4 | 28 | 0.46 | 0.05 | 5 | 433 | 66 | 17197060 | 481.52 | 7.91 | 0.86 | 85.99 | 7446.33 |
| 9 | | | | | 5 | 435 | | 16924030 | | | | 84.62 | 7361.95 |
| 10 | | | | | 6 | 388 | | 17343940 | | | | 104.06 | 6729.45 |
| 11 | | | | | 5 | 452 | | 18168190 | | | | 90.84 | 8212.02 |
| 12 | | | | | 5 | 440 | | 17236800 | | | | 86.18 | 7584.19 |
| 13 | | | | | 5 | 490 | | 16993150 | | | | 84.97 | 8326.64 |
| 14 | | | | | 5 | 484 | | 17600540 | | | | 88.00 | 8518.66 |
| 15 | 8.1 | 47 | 0.62 | 0.05 | 5 | 450 | 70 | 17407010 | 818.13 | 10.79 | 0.87 | 87.04 | 7833.15 |
| 16 | | | | | 5 | 460 | | 17292960 | | | | 86.46 | 7954.76 |
| 17 | | | | | 5 | 440 | | 17325790 | | | | 86.63 | 7623.35 |
| 18 | | | | | 5 | 454 | | 17276540 | | | | 86.38 | 7843.55 |
| 19 | | | | | 5 | 465 | | 16980190 | | | | 84.90 | 7895.79 |
| 20 | | | | | 5 | 462 | | 16823810 | | | | 84.12 | 7772.60 |
| 21 | | | | | 5 | 504 | | 16535230 | | | | 82.68 | 8333.76 |
| 22 | 8.3 | 20 | 0.49 | 0.05 | 5 | 464 | 60 | 16350340 | 327.01 | 8.01 | 0.82 | 81.75 | 7586.56 |
| 23 | | | | | 5 | 478 | | 16251840 | | | | 81.26 | 7768.38 |
| 24 | | | | | 5 | 248 | | 16919710 | | | | 84.60 | 4196.09 |
| 25 | | | | | 0 | 0 | | 21053950 | | | | 0.00 | 0.00 |
| 26 | | | | | 0 | 0 | | 34028640 | | | | 0.00 | 0.00 |
| 27 | | | | | 0 | 0 | | 35293540 | | | | 0.00 | 0.00 |
| 28 | | | | | 0 | 0 | | 35293540 | | | | 0.00 | 0.00 |
| 29 | 7.3 | 75 | 0.57 | 0.05 | 16 | 212 | 211 | 35293540 | 2647.02 | 20.12 | 1.76 | 564.70 | 7482.23 |
| 30 | | | | | 5 | 332 | | 28766020 | | | | 143.83 | 9550.32 |

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| May | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2009 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 5 | 430 | | 29016580 | | | | 145.08 | 12477.13 |
| 2 | | | | | 5 | 470 | | 23944030 | | | | 119.72 | 11253.69 |
| 3 | | | | | 5 | 498 | | 22856260 | | | | 114.28 | 11382.42 |
| 4 | | | | | 5 | 452 | | 21973250 | | | | 109.87 | 9931.91 |
| 5 | | | | | 5 | 483 | | 21526560 | | | | 107.63 | 10397.33 |
| 6 | 7.9 | 41 | 0.39 | 0.05 | 6 | 486 | 69 | 20966690 | 859.63 | 8.18 | 1.05 | 125.80 | 10189.81 |
| 7 | | | | | 5 | 456 | | 20938180 | | | | 104.69 | 9547.81 |
| 8 | | | | | 5 | 485 | | 20627140 | | | | 103.14 | 10004.16 |
| 9 | | | | | 5 | 504 | | 20696260 | | | | 103.48 | 10430.92 |
| 10 | | | | | 8 | 508 | | 19916060 | | | | 159.33 | 10117.36 |
| 11 | | | | | 5 | 510 | | 19302620 | | | | 96.51 | 9844.34 |
| 12 | | | | | 13 | 496 | | 19420990 | | | | 252.47 | 9632.81 |
| 13 | 7.5 | 46 | 0.61 | 0.05 | 7 | 482 | 65 | 19598980 | 901.55 | 11.96 | 0.98 | 137.19 | 9446.71 |
| 14 | | | | | 12 | 360 | | 18965660 | | | | 227.59 | 6827.64 |
| 15 | | | | | 6 | 390 | | 16855780 | | | | 101.13 | 6573.75 |
| 16 | | | | | 5 | 392 | | 19098720 | | | | 95.49 | 7486.70 |
| 17 | | | | | 6 | 440 | | 20417180 | | | | 122.50 | 8983.56 |
| 18 | | | | | 6 | 324 | | 20624540 | | | | 123.75 | 6682.35 |
| 19 | | | | | 6 | 324 | | 21052220 | | | | 126.31 | 6820.92 |
| 20 | 7.7 | 41 | 0.38 | 0.06 | 7 | 398 | 123 | 22673950 | 929.63 | 8.62 | 1.36 | 158.72 | 9024.23 |
| 21 | | | | | 5 | 402 | | 23228640 | | | | 116.14 | 9337.91 |
| 22 | | | | | 5 | 410 | | 21741700 | | | | 108.71 | 8914.10 |
| 23 | | | | | 5 | 416 | | 21457440 | | | | 107.29 | 8926.30 |
| 24 | | | | | 5 | 444 | | 21172320 | | | | 105.86 | 9400.51 |
| 25 | | | | | 5 | 450 | | 20539870 | | | | 102.70 | 9242.94 |
| 26 | | | | | 5 | 438 | | 20329920 | | | | 101.65 | 8904.50 |
| 27 | 7.7 | 48 | 0.51 | 0.05 | 5 | 432 | 72 | 20272900 | 973.10 | 10.34 | 1.01 | 101.36 | 8757.89 |
| 28 | | | | | 22 | 364 | | 19947170 | | | | 438.84 | 7260.77 |
| 29 | | | | | 0 | 0 | | 19798560 | | | | 0.00 | 0.00 |
| 30 | | | | | 0 | 0 | | 19127230 | | | | 0.00 | 0.00 |
| 31 | | | | | 0 | 0 | | 18500830 | | | | 0.00 | 0.00 |

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| June | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2009 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 0 | 0 | | 19087490 | | | | 0.00 | 0.00 |
| 2 | | | | | 0 | 0 | | 1575590 | | | | 0.00 | 0.00 |
| 3 | 7.5 | 39 | 0.68 | 0.05 | 5 | 464 | 61 | 7412515 | 289.09 | 5.04 | 0.37 | 37.06 | 3439.41 |
| 4 | | | | | 0 | 0 | | 7375363 | | | | 0.00 | 0.00 |
| 5 | | | | | 0 | 0 | | 11495520 | | | | 0.00 | 0.00 |
| 6 | | | | | 0 | 0 | | 250232 | | | | 0.00 | 0.00 |
| 7 | | | | | 0 | 0 | | 98220 | | | | 0.00 | 0.00 |
| 8 | | | | | 0 | 0 | | 117685 | | | | 0.00 | 0.00 |
| 9 | | | | | 0 | 0 | | 3641242 | | | | 0.00 | 0.00 |
| 10 | 8.2 | 42 | 0.19 | 0.06 | 11 | 448 | 63 | 3661546 | 153.78 | 0.70 | 0.22 | 40.28 | 1640.37 |
| 11 | | | | | 10 | 378 | | 8377171 | | | | 83.77 | 3166.57 |
| 12 | | | | | 18 | 406 | | 9494496 | | | | 170.90 | 3854.77 |
| 13 | | | | | 5 | 446 | | 5988643 | | | | 29.94 | 2670.93 |
| 14 | | | | | 15 | 416 | | 17199650 | | | | 257.99 | 7155.05 |
| 15 | | | | | 17 | 460 | | 17935780 | | | | 304.91 | 8250.46 |
| 16 | | | | | 10 | 460 | | 16256160 | | | | 162.56 | 7477.83 |
| 17 | 7.9 | 73 | 0.44 | 0.05 | 20 | 222 | 186 | 16898110 | 1233.56 | 7.44 | 0.84 | 337.96 | 3751.38 |
| 18 | | | | | 10 | 484 | | 31408130 | | | | 314.08 | 15201.53 |
| 19 | | | | | 13 | 423 | | 23865410 | | | | 310.25 | 10095.07 |
| 20 | | | | | 15 | 442 | | 385603 | | | | 5.78 | 170.44 |
| 21 | | | | | 11 | 464 | | 10267780 | | | | 112.95 | 4764.25 |
| 22 | | | | | 18 | 456 | | 13151810 | | | | 236.73 | 5997.23 |
| 23 | | | | | 17 | 462 | | 17915040 | | | | 304.56 | 8276.75 |
| 24 | | | | | 6 | 460 | | 17534880 | | | | 105.21 | 8066.04 |
| 25 | 8.3 | 45 | 0.04 | 0.05 | 9 | 354 | 80 | 17831230 | 802.41 | 0.71 | 0.89 | 160.48 | 6312.26 |
| 26 | | | | | 9 | 290 | | 15675550 | | | | 141.08 | 4545.91 |
| 27 | | | | | 6 | 386 | | 19761410 | | | | 118.57 | 7627.90 |
| 28 | | | | | 6 | 448 | | 15929570 | | | | 95.58 | 7136.45 |
| 29 | | | | | 0 | 0 | | 10069920 | | | | 0.00 | 0.00 |
| 30 | | | | | 0 | 0 | | 5593363 | | | | 0.00 | 0.00 |

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| July | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2009 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | 7.7 | 47 | 0.48 | 0.05 | 12 | 408 | 99 | 846608 | 39.79 | 0.41 | 0.04 | 10.16 | 345.42 |
| 2 | | | | | 0 | 0 | | 100915 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 3 | | | | | 0 | 0 | | 3909600 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 4 | | | | | 0 | 0 | | 2975357 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 5 | | | | | 0 | 0 | | 8443267 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 6 | | | | | 0 | 0 | | 3855600 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 7 | | | | | 0 | 0 | | 4476730 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 8 | 7.5 | 54 | 0.73 | 0.05 | 6 | 444 | 123 | 1489536 | 80.43 | 1.09 | 0.07 | 8.94 | 661.35 |
| 9 | | | | | 0 | 0 | | 4684867 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 10 | | | | | 0 | 0 | | 3573590 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 11 | | | | | 0 | 0 | | 24097 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 12 | | | | | 0 | 0 | | 74416 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 13 | | | | | 10 | 308 | | 11213860 | 0.00 | 0.00 | 0.00 | 112.14 | 3453.87 |
| 14 | | | | | 13 | 237 | | 2850077 | 0.00 | 0.00 | 0.00 | 37.05 | 675.47 |
| 15 | 7.8 | 64 | 0.69 | 0.05 | 12 | 289 | 199 | 16186180 | 1035.92 | 11.17 | 0.81 | 194.23 | 4677.81 |
| 16 | | | | | 0 | 0 | | 19868540 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 17 | | | | | 0 | 0 | | 884045 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 18 | | | | | 0 | 0 | | 180559 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 19 | | | | | 0 | 0 | | 105805 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 20 | | | | | 0 | 0 | | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 21 | | | | | 0 | 0 | | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 22 | 7.5 | 51 | 0.74 | 0.11 | 6 | 434 | 125 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 23 | | | | | 0 | 0 | | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 24 | | | | | 0 | 0 | | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 25 | | | | | 0 | 0 | | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 26 | | | | | 0 | 0 | | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 27 | | | | | 0 | 0 | | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 28 | | | | | 0 | 0 | | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 29 | 7.4 | 61 | 0.6 | 0.05 | 6 | 334 | 177 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 30 | | | | | 0 | 314 | | 45809 | 0.00 | 0.00 | 0.00 | 0.00 | 14.38 |
| 31 | | | | | 0 | 404 | | 884822 | 0.00 | 0.00 | 0.00 | 0.00 | 357.47 |

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| August | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2009 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 0 | 246 | | 0 | | | | 0.00 | 0.00 |
| 2 | | | | | 0 | 328 | | 10230 | | | | 0.00 | 3.36 |
| 3 | | | | | 0 | 302 | | 5737 | | | | 0.00 | 1.73 |
| 4 | | | | | 0 | 312 | | 17 | | | | 0.00 | 0.01 |
| 5 | 7.6 | 52 | 0.57 | 0.05 | 0 | 464 | 76 | 0 | | | | 0.00 | 0.00 |
| 6 | | | | | 12 | 458 | | 4009 | | | | 0.05 | 1.84 |
| 7 | | | | | 6 | 482 | | 1734307 | | | | 10.41 | 835.94 |
| 8 | | | | | 5 | 482 | | 3782333 | | | | 18.91 | 1823.08 |
| 9 | | | | | 5 | 462 | | 3532637 | | | | 17.66 | 1632.08 |
| 10 | | | | | 8 | 442 | | 3432326 | | | | 27.46 | 1517.09 |
| 11 | | | | | 10 | 442 | | 3483475 | | | | 34.83 | 1539.70 |
| 12 | 8.3 | 35 | 0.16 | 0.05 | 12 | 442 | 73 | 2948919 | 103.21 | 0.47 | 0.15 | 35.39 | 1303.42 |
| 13 | | | | | 16 | 674 | | 3166992 | | | | 50.67 | 2134.55 |
| 14 | | | | | 13 | 590 | | 2866407 | | | | 37.26 | 1691.18 |
| 15 | | | | | 5 | 596 | | 2886624 | | | | 14.43 | 1720.43 |
| 16 | | | | | 9 | 474 | | 3590266 | | | | 32.31 | 1701.79 |
| 17 | | | | | 11 | 494 | | 3067545 | | | | 33.74 | 1515.37 |
| 18 | | | | | 0 | 0 | | 2910730 | | | | 0.00 | 0.00 |
| 19 | 7.4 | 85 | 0.5 | 0.05 | 28 | 272 | 239 | 2842906 | 241.65 | 1.42 | 0.14 | 79.60 | 773.27 |
| 20 | | | | | 0 | 0 | | 3632256 | | | | 0.00 | 0.00 |
| 21 | | | | | 5 | 186 | | 3113942 | | | | 15.57 | 579.19 |
| 22 | | | | | 5 | 356 | | -1850342 | | | | -9.25 | -658.72 |
| 23 | | | | | 5 | 345 | | -3810326 | | | | -19.05 | -1314.56 |
| 24 | | | | | 6 | 344 | | -2212704 | | | | -13.28 | -761.17 |
| 25 | 7.6 | 67 | 0.6 | 0.05 | 5 | 386 | 142 | -2512944 | -168.37 | -1.51 | -0.13 | -12.56 | -970.00 |
| 26 | | | | | 0 | 0 | | 4658170 | | | | 0.00 | 0.00 |
| 27 | | | | | 0 | 0 | | 8894016 | | | | 0.00 | 0.00 |
| 28 | | | | | 0 | 0 | | 9174816 | | | | 0.00 | 0.00 |
| 29 | | | | | 0 | 0 | | 6564413 | | | | 0.00 | 0.00 |
| 30 | | | | | 0 | 0 | | 4133203 | | | | 0.00 | 0.00 |
| 31 | | | | | 0 | 0 | | 5488819 | | | | 0.00 | 0.00 |

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sept | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2009 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 0 | 0 | | 9474624 | | | | 0.00 | 0.00 |
| 2 | 7.2 | 61 | 0.48 | 0.05 | 6 | 280 | 242 | 9474624 | 577.95 | 4.55 | 0.47 | 56.85 | 2652.89 |
| 3 | | | | | 5 | 384 | | 9474624 | | | | 47.37 | 3638.26 |
| 4 | | | | | 5 | 410 | | 10221980 | | | | 51.11 | 4191.01 |
| 5 | | | | | 7 | 396 | | 8439207 | | | | 59.07 | 3341.93 |
| 6 | | | | | 5 | 414 | | 6922887 | | | | 34.61 | 2866.08 |
| 7 | | | | | 9 | 444 | | 4624128 | | | | 41.62 | 2053.11 |
| 8 | | | | | 22 | 450 | | 5170176 | | | | 113.74 | 2326.58 |
| 9 | 7.5 | 51 | 0.55 | 0.05 | 12 | 446 | 93 | 3861734 | 196.95 | 2.12 | 0.19 | 46.34 | 1722.33 |
| 10 | | | | | 12 | 424 | | 3976042 | | | | 47.71 | 1685.84 |
| 11 | | | | | 17 | 418 | | 3575578 | | | | 60.78 | 1494.59 |
| 12 | | | | | 0 | 0 | | 2514240 | | | | 0.00 | 0.00 |
| 13 | | | | | 0 | 0 | | 1834790 | | | | 0.00 | 0.00 |
| 14 | | | | | 0 | 0 | | -480635 | | | | 0.00 | 0.00 |
| 15 | | | | | 0 | 0 | | 158864 | | | | 0.00 | 0.00 |
| 16 | 7.4 | 43 | 0.66 | 0.05 | 5 | 472 | 73 | 1110154 | 47.74 | 0.73 | 0.06 | 5.55 | 523.99 |
| 17 | | | | | 0 | 0 | | 692470 | | | | 0.00 | 0.00 |
| 18 | | | | | 0 | 0 | | 123025 | | | | 0.00 | 0.00 |
| 19 | | | | | 0 | 0 | | -206574 | | | | 0.00 | 0.00 |
| 20 | | | | | 0 | 0 | | 1608941 | | | | 0.00 | 0.00 |
| 21 | | | | | 0 | 0 | | 2206742 | | | | 0.00 | 0.00 |
| 22 | | | | | 0 | 0 | | 1573603 | | | | 0.00 | 0.00 |
| 23 | 7.5 | 31 | 0.64 | 0.05 | 7 | 494 | 174 | 417139 | 12.93 | 0.27 | 0.02 | 2.92 | 206.07 |
| 24 | | | | | 0 | 0 | | 1423181 | | | | 0.00 | 0.00 |
| 25 | | | | | 0 | 0 | | 634116 | | | | 0.00 | 0.00 |
| 26 | | | | | 0 | 0 | | 261256 | | | | 0.00 | 0.00 |
| 27 | | | | | 0 | 0 | | 224199 | | | | 0.00 | 0.00 |
| 28 | | | | | 0 | 0 | | 276998 | | | | 0.00 | 0.00 |
| 29 | | | | | 0 | 0 | | 403998 | | | | 0.00 | 0.00 |
| 30 | 7.5 | 53 | 0.64 | 0.05 | 7 | 528 | 68 | 292261 | 15.49 | 0.19 | 0.01 | 2.05 | 154.31 |

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2009 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 0 | 0 | | 449107 | | | | 0.00 | 0.00 |
| 2 | | | | | 0 | 0 | | 804444 | | | | 0.00 | 0.00 |
| 3 | | | | | 0 | 0 | | 495020 | | | | 0.00 | 0.00 |
| 4 | | | | | 9 | 478 | | 110376 | | | | 0.99 | 52.76 |
| 5 | | | | | 5 | 486 | | 1337472 | | | | 6.69 | 650.01 |
| 6 | | | | | 5 | 426 | | 682301 | | | | 3.41 | 290.66 |
| 7 | 8.1 | 38 | 0.31 | 0.06 | 9 | 464 | 71 | 1518739 | 57.71 | 0.47 | 0.09 | 13.67 | 704.69 |
| 8 | | | | | 12 | 434 | | 1595462 | | | | 19.15 | 692.43 |
| 9 | | | | | 8 | 412 | | 1190678 | | | | 9.53 | 490.56 |
| 10 | | | | | 9 | 418 | | 1963440 | | | | 17.67 | 820.72 |
| 11 | | | | | 7 | 396 | | 2331245 | | | | 16.32 | 923.17 |
| 12 | | | | | 6 | 444 | | 2438208 | | | | 14.63 | 1082.56 |
| 13 | | | | | 5 | 450 | | 2074291 | | | | 10.37 | 933.43 |
| 14 | 8.1 | 51 | 0.34 | 0.05 | 10 | 456 | 80 | 1823213 | 92.98 | 0.62 | 0.09 | 18.23 | 831.39 |
| 15 | | | | | 9 | 440 | | 1887322 | | | | 16.99 | 830.42 |
| 16 | | | | | 5 | 430 | | 1817942 | | | | 9.09 | 781.72 |
| 17 | | | | | 11 | 464 | | 1599091 | | | | 17.59 | 741.98 |
| 18 | | | | | 9 | 472 | | 1849478 | | | | 16.65 | 872.95 |
| 19 | | | | | 10 | 470 | | 1824509 | | | | 18.25 | 857.52 |
| 20 | 8.1 | 54 | 0.48 | 0.05 | 11 | 452 | 80 | 1993075 | 107.63 | 0.96 | 0.10 | 21.92 | 900.87 |
| 21 | | | | | 7 | 326 | | 2195856 | | | | 15.37 | 715.85 |
| 22 | | | | | 8 | 350 | | 2470435 | | | | 19.76 | 864.65 |
| 23 | | | | | 5 | 226 | | 8542195 | | | | 42.71 | 1930.54 |
| 24 | | | | | 5 | 328 | | 4823280 | | | | 24.12 | 1582.04 |
| 25 | | | | | 5 | 316 | | 4615661 | | | | 23.08 | 1458.55 |
| 26 | | | | | 7 | 193 | | 5988643 | | | | 41.92 | 1155.81 |
| 27 | | | | | 5 | 346 | | 3555792 | | | | 17.78 | 1230.30 |
| 28 | 7.4 | 53 | 0.59 | 0.05 | 7 | 334 | 139 | 2762035 | 146.39 | 1.63 | 0.14 | 19.33 | 922.52 |
| 29 | | | | | 16 | 320 | | 4285613 | | | | 68.57 | 1371.40 |
| 30 | | | | | 7 | 312 | | 792668 | | | | 5.55 | 247.31 |
| 31 | | | | | 27 | 204 | | 3723322 | | | | 100.53 | 759.56 |

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nov | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2009 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 0 | 0 | | 5273251 | | | | 0.00 | 0.00 |
| 2 | | | | | 0 | 0 | | 2009059 | | | | 0.00 | 0.00 |
| 3 | | | | | 0 | 0 | | -2008454 | | | | 0.00 | 0.00 |
| 4 | 7.3 | 72 | 0.66 | 0.05 | 18 | 192 | 153 | -5835801 | -420.18 | -3.85 | -0.29 | -105.04 | -1120.47 |
| 5 | | | | | 0 | 0 | | -6501254 | | | | 0.00 | 0.00 |
| 6 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 7 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 8 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 9 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 10 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 11 | 7.2 | 59 | 0.45 | 0.05 | 28 | 266 | 164 | 0 | | | | 0.00 | 0.00 |
| 12 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 13 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 14 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 15 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 16 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 17 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 18 | 7.1 | 80 | 0.7 | 0.05 | 5 | 174 | 189 | 0 | | | | 0.00 | 0.00 |
| 19 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 20 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 21 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 22 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 23 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 24 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 25 | 7.3 | 73 | 0.44 | 0.05 | 12 | 266 | 168 | 0 | | | | 0.00 | 0.00 |
| 26 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 27 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 28 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 29 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 30 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |

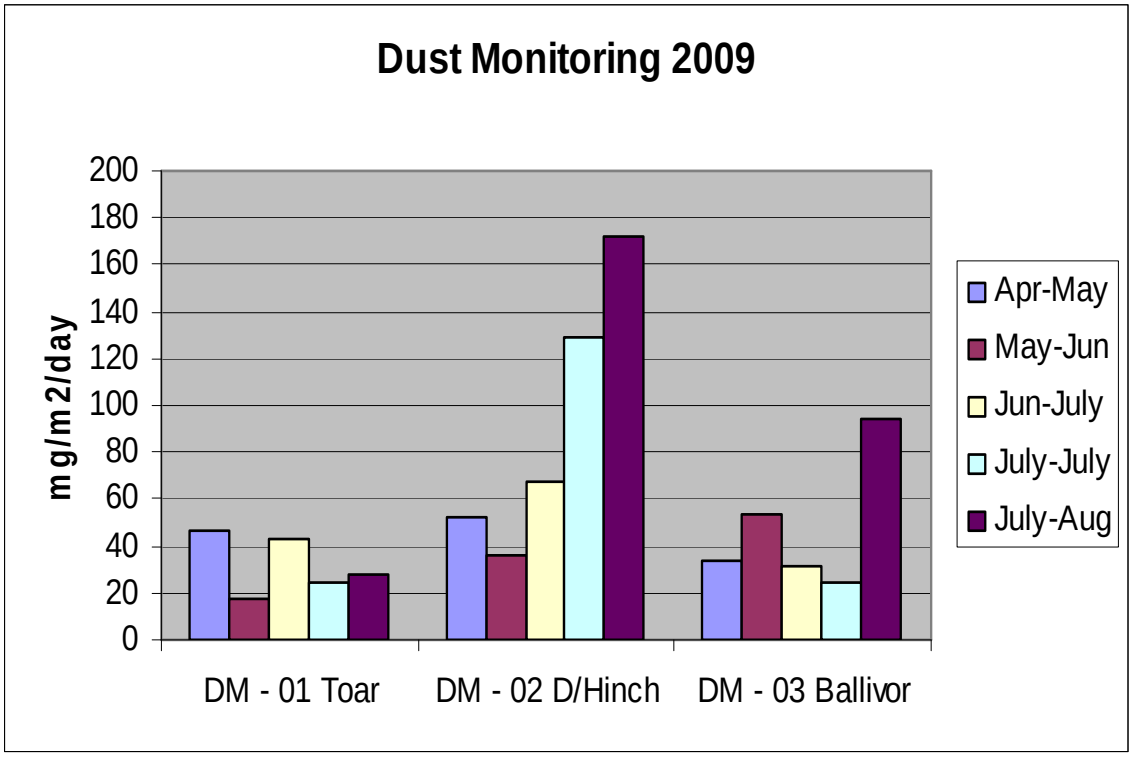
| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dec | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2009 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 2 | 7.3 | 50 | 0.62 | 0.05 | 5 | 408 | 109 | 0 | | | | 0.00 | 0.00 |
| 3 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 4 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 5 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 6 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 7 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 8 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 9 | 7.4 | 44 | 0.58 | 0.05 | 5 | 426 | 114 | 0 | | | | 0.00 | 0.00 |
| 10 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 11 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 12 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 13 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 14 | | | | | 0 | 0 | | 0 | | | | 0.00 | 0.00 |
| 15 | | | | | 6 | 310 | | 0 | | | | 0.00 | 0.00 |
| 16 | 7.4 | 54 | 0.68 | 0.05 | 5 | 136 | 102 | 2563661 | 138.44 | 1.74 | 0.13 | 12.82 | 348.66 |
| 17 | | | | | 0 | 0 | | 3629750 | | | | 0.00 | 0.00 |
| 18 | | | | | 0 | 0 | | 3421181 | | | | 0.00 | 0.00 |
| 19 | | | | | 0 | 0 | | 1210291 | | | | 0.00 | 0.00 |
| 20 | | | | | 0 | 0 | | 749123 | | | | 0.00 | 0.00 |
| 21 | | | | | 0 | 0 | | 769219 | | | | 0.00 | 0.00 |
| 22 | | | | | 0 | 0 | | 976752 | | | | 0.00 | 0.00 |
| 23 | 7.4 | 46 | 0.76 | 0.05 | 5 | 464 | 73 | 352313 | 16.21 | 0.27 | 0.02 | 1.76 | 163.47 |
| 24 | | | | | 0 | 0 | | -47434 | | | | 0.00 | 0.00 |
| 25 | | | | | 0 | 0 | | -45576 | | | | 0.00 | 0.00 |
| 26 | | | | | 0 | 0 | | -48436 | | | | 0.00 | 0.00 |
| 27 | | | | | 0 | 0 | | -40003 | | | | 0.00 | 0.00 |
| 28 | | | | | 0 | 0 | | -44142 | | | | 0.00 | 0.00 |
| 29 | | | | | 0 | 0 | | -37437 | | | | 0.00 | 0.00 |
| 30 | 7.1 | 49 | 0.25 | 0.05 | 23 | 204 | 136 | -29756 | -1.46 | -0.01 | 0.00 | -0.68 | -6.07 |
| 31 | | | | | 0 | 0 | | 1060342 | | | | 0.00 | 0.00 |

# APPENDIX 4

## Dust Monitoring Results.

| Dust Monitoring Results 2009 |
|---|
| Licence:P0501-01 |
| Works: Derrygreenagh |

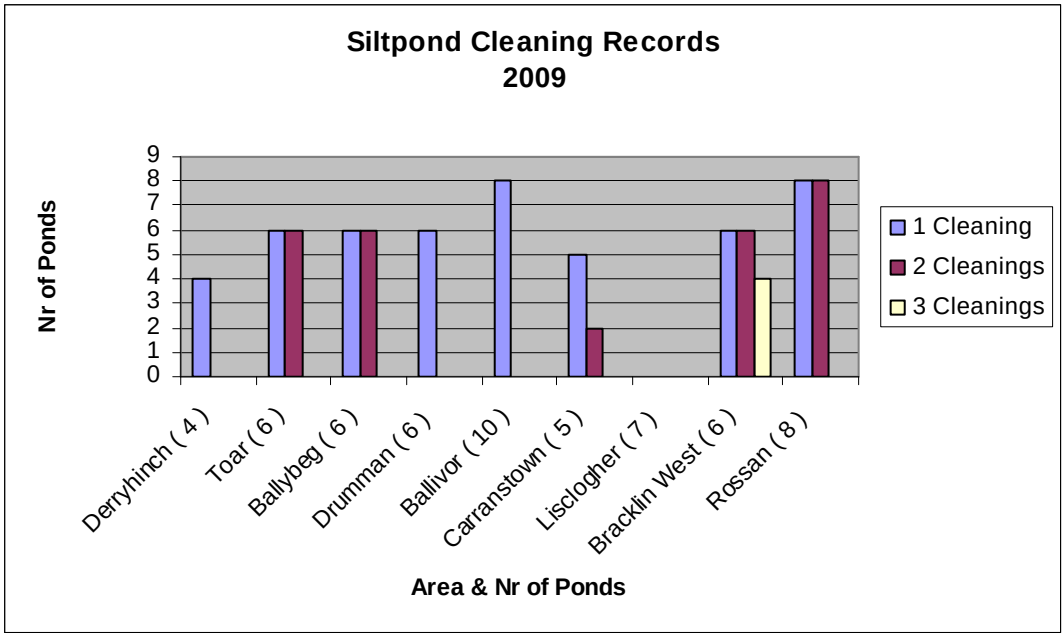
| Sample Period | DM - 01 Toar | DM - 02 D/Hinch | DM - 03 Ballivor |
|---|---|---|---|
| Apr-May | 46 | 52 | 34 |
| May-Jun | 18 | 36 | 53 |
| Jun-July | 43 | 68 | 31 |
| July-July | 25 | 129 | 25 |
| July-Aug | 28 | 172 | 94 |



# APPENDIX 5

## De-silting Programme Review.

| Siltpond Cleaning Programme | | | | |
|---|---|---|---|---|
| IPPC Licence: P0501-01 | | | | |
| Works: Derrygreenagh | | | | |
| **Bog Area & Nr Ponds** | **1 Cleaning** | **2 Cleanings** | **3 Cleanings** | **4 Cleanings** |
| Derryhinch ( 4 ) | 4 | | | |
| Toar ( 6 ) | 6 | 6 | | |
| Ballybeg ( 6 ) | 6 | 6 | | |
| Drumman ( 6 ) | 6 | | | |
| Ballivor ( 10 ) | 8 | | | |
| Carranstown ( 5 ) | 5 | 2 | | |
| Lisclogher ( 7 ) | 0 | | | |
| Bracklin West ( 6 ) | 6 | 6 | 4 | |
| Rossan ( 8 ) | 8 | 8 | | |



# APPENDIX 6

## AER & PRTR Data

BORD NA MÓNA

BORD NA MÓNA ENERGY LIMITED

# Annual Environmental Report 2010
# P0501-01

**March 2011**

Bord na Móna today operates 5 main subsidiary companies in more than 20 locations throughout Ireland, the UK and USA. The principal businesses are in the Energy, Resource Recovery, Horticulture, Home Heating and Wastewater Treatment and Air Pollution Abatement markets. The company also engages in an extensive rehabilitation program to develop its peat lands in an environmentally sustainable manner.




Bord na Móna has long recognised the need to diversify its activities in order to secure a sustainable future. In this context we identified the energy and resource recovery sectors as appropriate areas of growth and development, given our assets, strengths and skills. Significant challenges face Ireland in meeting the country's needs to provide secure sustainable energy and manage waste while minimising the impact on the environment.

Bord na Móna is in a strong position to contribute to dealing with these challenges. We have a unique mixture of assets, experience and innovation which will enable us to cross-link our activities in energy, water and resource recovery to provide products and services which will meet Ireland's needs. We also have the capacity to become an exemplar for others to follow in these fields.
With this background we have scoped out a new vision for the future sustainable development of Bord na Móna.

Following on from our vision, we have developed a new mission for Bord na Móna which the Company is committed to achieving.
In 1934 the Turf Development Board was formed to ‘develop and improve the turf industry.' The experience of fuel shortages during the war re-enforced the Irish State's commitment to developing the country's bogs. In 1944 the TDB was asked to devise and submit a comprehensive programme, the outcome was the transformation in 1946 of the TDB into Bord na Móna. The Board was given a mandate to increase the use of peat as a fuel and in energy production. Markets for the use of moss peat in horticulture were also developed.
In 1990 Bord na Móna implemented a divisionalised and decentralised structure, designed to delegate responsibility downwards ensuring a sharper focus on each profit centre and a greater spirit of enterprise.

# *Group Vision*




The vision statement defines the Company's purpose, in terms of its values.
Values are guiding beliefs about how things should be done.
The vision statement communicates both the purpose and values of Bord na Móna.
For employees, it gives direction about how they are expected to behave and inspires them to give their best. Shared with customers, it shapes the customers' understanding of why they should work with Bord na Móna.

Bord na Móna will seek solutions that optimise the creative energy and potential of the organisation, driven by long term goals and the organisation's vision and mission.
In this context our devolved business units will align their vision and strategic planning with the global direction provided.

Consistent with our vision, innovation will once again return to the core of everything we do. We will capitalise on opportunities to cross fertilise our unique range of skills and technologies that add value and are socially and environmentally sustainable.
Greater focus will be placed on managing and developing our land assets in a responsible and sustainable manner. Our award winning initiatives at Lough Boora (Co. Offaly) and Oweninny (Co Mayo), provide shining examples of what can be achieved

# *Group Mission*

We conduct our affairs with openness, honesty and integrity.
We are Ireland's leading environmentally responsible integrated utility service provider encompassing electricity, heating solutions, resource recovery, water, horticulture and related services.
We capitalise on international opportunities where we have a competitive advantage.
We achieve continuing growth through superior customer service, outstanding quality and innovation delivered through the excellence and commitment of our people.
We engage in sustainable profitable business in the communities we serve, which is rewarding and challenging for employees and other stakeholders.

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**Appendix 5:** De-silting Programme Review

## 1.0 Introduction

### 1.1 IPPC Licence No 501-01

### 1.2 Name & Location of Site

| | |
|---|---|
| **Name:** | Bord na Mona Energy Limited. |
| **Address:** | Derrygreenagh Works, Rochfortbridge, Mullingar, Co. Westmeath |
| **Telephone No:** | 044 9222181 |
| **Contact Name:** | Eamonn Mulhall |
| **Position**: | Resource Manager |
| **National Grid Reference**: | E249450 N 238140 |

## 1.3 Description of Activities

**Peat Milling Operations.**

For milled peat production the bog is laid out in a series of rectangular fields of varying length and 15m wide with drains located between. There are essentially four operations involved in milled peat production:
Milling.
Harrowing.
Ridging.
Harvesting.

**Milling.**
Special milling machines work there way along the fields, milling approximately 15mm of peat of the top of the bog in a pass.

**Harrowing**
In the course of drying, the milled peat is turned a number of times to avail of the drying conditions. This is achieved with a machine called a harrow. The milled peat is harrowed until its moisture content is down to approximately 40-50%, which can take up to two to three days, weather depending.

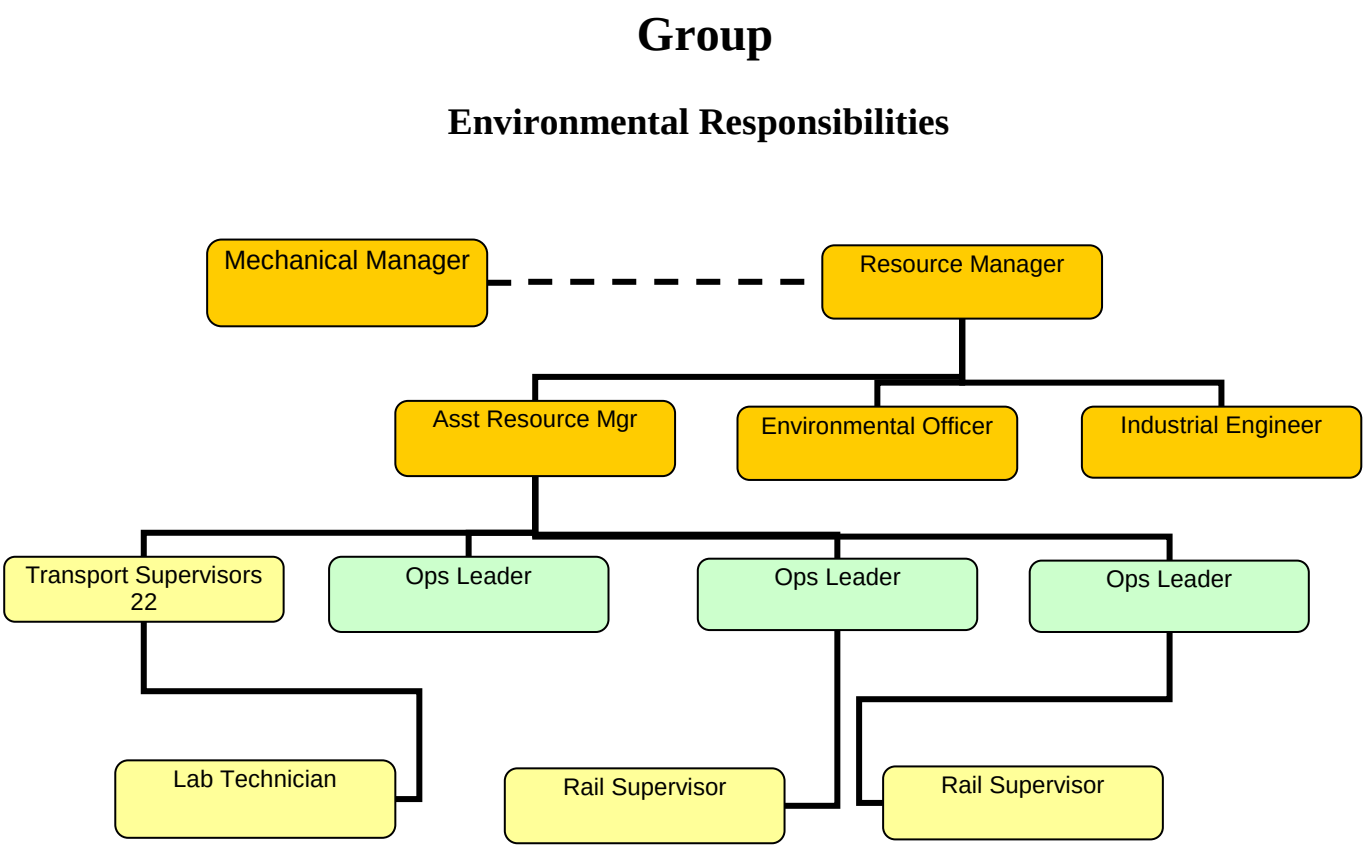
**Ridging**
The dry peat is then scraped into long ridges running down the centre of each field. This is done with a ridger, a machine consisting of a series of blades in the shape of a v that opens the full width of the field.

**Harvesting**
During harvesting every eleventh field is used to stockpile the peat, with this field receiving the milled peat from the five fields either side.

The milled peat is then transported via the existing network of peatland railways or via road to one of the following locations.
Power station
Horticultural Factory.
Briquette Factory.

### 1.4 Environmental Management of the Company

The organisational structure within the Derrygreenagh Group is presented in the flow chart below.



## 1.5 Environmental Policy

**BORD NA MÓNA**

**BORD NA MÓNA ENERGY LIMITED**
**Derrygreenagh,Rochfortbridge,Mullingar,Co-Westmeath.**

Bord na Mona Energy Limited is a commercial semi-state body with responsibility to develop Ireland's peat resources in the national interest.

Bord na Mona Energy Limited is committed to gather and make available information on all aspects of its environmental impact and to help improve understanding among the public generally of its role and the importance of Irish peatlands.

Bord na Mona Energy Limited recognises the importance of peatland conservation.

Bord na Mona Energy Limited will leave behind all areas it owns as either an economically or socially integrated resource of a high environmental value.

Bord na Mona Energy Limited seeks to conduct all aspects of its business in an environmentally sensitive value.

Bord na Mona Energy Limited operates an environmental management system specifically addressing the following impacts.

Discharge to water.
Emissions to atmosphere.
Waste disposal.
Use of natural resources.
Noise, vibration, odour, dust and visual effects.
Natural environment and eco-system.

The environmental management system will be monitored, maintained and continually improved.

A system of regular environmental audits will be put in place.

Bord na Mona Energy Limited will continue research and development into all aspects of its environmental impact.

This statement is published and is available at all locations within the division and its Contents are brought to the attention of all employees.

## 2.0 Summary Information

### 2.1 Emissions to Water Summary

2.1.1 Silt Pond Emissions

**Surface Waters**

Comment

Surface water monitoring was carried out four times during the reporting period. In total analysis was carried out at six different locations. The locations are as follows, Derryhinch @ SW4, Ballybeg @ SW15, Bracklin @ SW26, Carranstown @ SW31, Rossan @ SW46 and Carrick @ SWA. As the latter is a comparatively new pond it was given a letter as opposed to a number for identification purposes. The parameters measured during each sampling event were as follows.
Total Phosphorus, Total Solids, Suspended Solids, pH, Ammonia, Colour and COD.
In general results were constant across all parameters at each monitoring location. September was the wettest month with 169.3mm of rainfall recorded and April the driest with 37.3 mm recorded. Flow rates appear to have had no adverse effect on suspended solids results.
The quarterly grab sampling programme was 96% compliant for the year, which is down on previous years which were fully compliant. This was due to one non-compliance discussed below.

**pH** values were between 6.5 and 8.1, with emission limit values being of the range 6 and 9. pH values of waters emanating from production peatlands appear to remain constant and in line with background levels. On average pH values were 0.1 pH units below 2009 levels.

**Suspended solids** varied from 5mg/l to 115mg/l and would depend on activities (piping, ditching) etc in the catchments at the time of sampling. As mentioned above the 115 mg/l result did constitute a non-compliance and was reported to the Agency. Investigations showed that drainage works were being carried out upstream of the sample point at the time of sampling. Although there was one non-compliance in 2010 in relation to suspended solids, the average figure was down on 2009.

**Ammonia** values ranged from 0.07 mg/l and 2.4 mg/l.The I/PV for A3 waters is of the range 4mg/l. It is however not unusual for surface waters emanating from production peatlands to be slightly elevated. Overall ammonia levels are slightly up on 2009 figures. With the average being 1.6 mg/l in 2010 as opposed to 0.93 mg/l in 2009.

**COD** values ranged from 37 mg/l to 135 mg/l. Results at SW15 indicate an overall reduction, with the average COD level below 2009 levels. Overall COD results were below 2009 levels also. The I/PV for A3 waters is of the range 40mg/l. Four results were above the Bord na Mona set trigger level of 100 mg/l, however investigations should no evidence of any contributory factors causing such results. Reduced flow and increased temperature most definitely impinge on COD results.

**Flow** rates were well down on 2009 sampling events. This in part is dependent on the climatic conditions on the chosen day of sampling. Also 2010 was a dryer year overall with 875 mm of rainfall recorded as opposed to 1052 mm in 2009. April was the driest month with 37.3mm and September the wettest with 169.3mm of rainfall recorded.

**Total Phosphorus** results were consistently low and ranged from 0.05 mg/l to 0.16 mg/l. On average the total phosphorus result was higher than 2009, the difference being minute ( 0.014 mg/l ).

The sampling locations will remain the same during 2011.
At the request of the Agency, analysis results are now demonstrated in both tabular and graphical format.

Surface Water Results are attached in Appendix 1.

### 2.1.2 Yard Discharges

**Yard Runoff**

Comment

Yard runoff monitoring took place at two locations during the reporting period. Derrygreenagh @ SWE 2 and Rossan @ SWE 1. Sampling frequency was monthly and COD was the parameter requiring analysis. Results were very satisfactory for the period at both locations; with results consistently well below trigger levels with the exception of the September result at Derrygreenagh which exceeded trigger levels. Investigations found machinery had been washed down immediately prior to sampling, subsequent results were very satisfactory. Overall the average result at each location was well below those of 2009.
Although not having a specific licence emission limit value, a trigger level of 100 mg/l has been set in relation to COD results, along with the weekly visual inspections.

Sampling will continue at the same locations during 2011.

Yard Emission Results are attached in Appendix 2.

### 2.1.3 Composite Sampler Report

**Composite Sampling**

Comment

The composite sampler has been operating at Toar Bog SW15 during the reporting period.The parameters measured were Total Phosphorus, Total Solids, Suspended Solids, pH, Ammonia, Colour and COD, with Suspended solids being the only parameter with an emission limit value of ( 35mg/l ). The sampler worked well during the reporting period. At the direction of the Agency the sampler was calibrated by an independent contractor. Due to extremely low temperatures the sampler and indeed the outfall on which the sampler is situated became frozen during parts of November

and December. In general results were satisfactory with no non-compliance's being recorded for the period. Analysis of the 2009 results compared with the 2010 results indicate no great difference in results in relation to pH, Ammonia and Phosphorus, with slightly lower COD and higher Suspended Solids in 2010.
The composite sampler will remain at this location for the foreseeable future.

Composite Sampler Results are contained in Appendix 3.

2.1.4 Emissions to Water Non-compliance's

| **Emissions to Water Non-Compliances 2010** | | |
|---|---|---|
| **Licence: P0501-01** | | |
| **Works: Derrygreenagh** | | |
| **Type** | **Non-Compliances** | **Location / SW Nr** |
| Composite | 0 | |
| Quarterly Grab | 1 | Ballybeg SW 15 |
| Monthly Yard | 0 | |
| **Totals** | **1** | |

There was one non-compliance's in relation to elevated suspended solids as a result of quarterly grab sampling. A corrective action was submitted and was to the satisfaction of the Agency.

## 2.2 Emissions to Air

2.2.1 Dust Monitoring

Comment

Dust monitoring was carried out on five occasions between April and September. Each monitoring event lasted between 28 and 32 days and the Bergerhoff method of collection was used.
The monitoring locations were as follows, Toar DM01, Derryhinch DM02 and Ballivor DM03.
All monitoring results were within the emission limit value of 350mg/$m^2$/day.
Sampling will continue at the same locations during 2011.

Dust monitoring results are contained in appendix 4.

2.2.2 Emissions to Air Non-compliance's

| **Dust Non-Compliances 2010** | |
|---|---|
| **Licence:P0501-01** | |
| **Works: Derrygreenagh** | |
| **Location / DM Nr** | **Non-Compliances** |
| N/A | |
| **Total** | **0** |

Dust results for 2010 were fully compliant.

## 2.3 Waste Arisings

### 2.3.1 Non-Hazardous Waste

**Non Hazardous Waste Data 2010**

**Licence: P0501-01**

**Works: Derrygreenagh**

| Type | Tonnes | EWC Code | Contractor | Licence Nr |
|---|---|---|---|---|
| Skips | 17.46 | 20 03 01 | AES | 053/OY/39/02 |
| Wheelie Bins | 6.27 | 20 03 01 | AES | 053/OY/39/02 |
| Polyethlene | 122.78 | 02 01 04 | Eco Plastics | WFP-CE-08-0005-01 |
| Polyethlene | 60.00 | 02 01 04 | Leinster Environmentals | 205/2005 |
| Scrap Steel | 28.02 | 17 04 07 | AES | 053/OY/39/02 |
| Timber Pallets | 7.12 | 15 01 03 | AES | 053/OY/39/02 |
| Silt Pond Cleanings | 222.46 | 01 01 02 | Bord na Mona | IPPC P0501-01 |
| Peat Screenings | 0.00 | 01 01 02 | Bord na Mona | IPPC P0501-01 |
| **Totals** | **464.11** | | | |

**Note:** Polyethylene and Steel are recycled. Skips go to an AES Mixed Recycling Facility.

### 2.3.2 Hazardous Waste

**Hazardous Waste Data 2010**

**Licence: P0501-01**

**Works: Derrygreenagh**

| Type | Tonnes | EWC Code | Contractor | Licence Nr | Destination |
|---|---|---|---|---|---|
| Waste Oil | 11.60 | 13 02 05 | Enva Ireland Ltd Portlaoise | 184-1 | Portlaoise |
| Oil Filters | 0.91 | 16 01 07 | Enva Ireland Ltd Portlaoise | 184-1 | Portlaoise |
| Oily Rags | 0.39 | 15 02 02 | Enva Ireland Ltd Portlaoise | 184-1 | Portlaoise |
| Waste Grease | 0.40 | 13 08 99 | Enva Ireland Ltd Portlaoise | 184-1 | Portlaoise |
| Lead Acid Batt | 2.97 | 16 06 01 | Enva Ireland Ltd Portlaoise | 184-1 | Portlaoise |
| Parts Wash | 1.51 | 11 01 13 | Safety Kleen, Tallaght, Dublin | 99-1 | Dublin |
| Waste Paint | 1.56 | 15 01 10 | Enva Ireland Ltd Portlaoise | 184-1 | Portlaoise |
| **Total** | **19.34** | | | | |

## 2.4 Energy and Water Consumption

### 2.4.1 Energy

The table below shows energy consumption for the year. It does not include water as it is only used in offices, canteens and workshops on a domestic basis. It is not used as part of the production process.

| Energy Consumption 2010 | | | | |
|---|---|---|---|---|
| Licence: P0501-01 | | | | |
| Works: Derrygreenagh | | | | |
| **Units** | **Diesel ( Litres )** | **Petrol (Litres)** | **Electricity (Units)** | **Peat Briquettes (Tonnes)** |
| **Totals** | 827357.03 | 0 | 421733 | 20 |
| **MW Hours** | 8142.5 | 0 | 421.733 | 100 |
| **Total MW Hours** | **8664.2** | | | |

**Note:** Bord na Mona have in the reporting period, established an Energy Management Team. The goal of the team is to reduce overall energy consumption by implementing an array of energy saving initiatives. Bord na Mona Mountdillon, P0504-01 has been selected as a location where the energy standard EN 16001 is to be implemented. Should this prove successful, the standard will be introduced at all Bord na Mona facilities.

## 2.5 Environmental Incidents and Complaints

### 2.5.1 Incidents

| Environmental Incidents 2010 | |
|---|---|
| Licence: P0501-01 | |
| Works: Derrygreenagh | |
| | **Number** |
| Incidents | 1 |
| Requiring corrective action | 1 |
| **Category** | |
| Water | 1 |
| Air | |
| Procedural | 0 |
| Miscellaneous | 0 |
| **Total** | **1** |

There was one environmental incident. This related to a bog fire at Derryarkin bog, the Agency was informed.

2.5.2 Complaints

| Environmental Complaints 2010 | |
|---|---|
| **Licence:P0501-01** | |
| **Works: Derrygreenagh** | |
| | **Number** |
| Complaints | 0 |
| Requiring corrective action | 0 |
| **Category** | |
| Water | 0 |
| Air | 0 |
| Procedural | 0 |
| Miscellaneous | |
| **Total** | **0** |

No complaints of an environmental nature were received during the reporting period.

## 3.0 Management of the Activity

### 3.1 Achievement of Objectives & Targets 2010

| Project | Description & Status |
|---|---|
| **Project 1:**<br><br>Reduction of fugitive dust emissions. | **Training.**<br>Train all employees in environmental matters. Training will be by means of the screening of an environmental DVD, followed by a power point presentation.<br>**Status**<br>In total 82 employees received environmental training.<br><br>**Hydraulic Harrows.**<br>One Hydraulic harrow will be deployed at Derryhinch bog during the 2010 production season.<br>**Status**<br>No new Hydraulic Harrows were deployed during the 2010 production season.<br><br>**Headland Peat Collection.**<br>Continue with the collection of headland peat, particularly at dust sensitive locations.<br>**Status**<br>Headland peat was collected as part of the peat lifting process and included in general peat return figures. |

| | |
|---|---|
| **Project 2:**<br><br>Waste Management | **Waste Streamlining.**<br>Following the purchase by Bord na Mona of AES Ltd, meetings with that company's management will be ongoing to see how best Bord na Mona's needs can be catered for. Key account managers dedicated to Bord na Mona have been requested and are due to be in place in 2010.<br>**Status**<br>Ongoing<br>The service included the co-ordination of all waste streams ensuring the correct waste stream was dealt with by the appropriate waste provider. The service also included the issuing of quarterly reports. |
| **Project 3:**<br><br>Minimisation of Suspended Solids. | **On Site Inspections.**<br>Train all employees in environmental matters. Training will be by means of the screening of an environmental DVD, followed by a power point presentation.<br>**Status**<br>In total 82 employees received environmental training. |
| **Project 4:**<br><br>Effective spill leak management of mobile fuelling units. | **Research and Development.**<br>Increased bund provisions where required, will be provided, in 2010.<br>**Status**<br>A new bunded lockup oil store was provided at Derryhinch Bog. An oil spill kit was provided at Ballivor Bog. In addition to this additional containment booms were purchased and are held in storage as backup to existing stocks. |
| **Project 5:**<br><br>Collection storage and reuse of polyethylene. | **Identify Recyclers.**<br>Continue with the recycling of polyethylene. The sourcing of more recycling contractors will be ongoing.<br>**Status**<br>In total 182.78 tonnes of polyethylene was sent for recycling in 2010. |
| **Project 6:**<br><br>Mini Sod Project | **Carry out Trial.**<br>On a trial basis switch from milled peat to mini sod production at a portion of Drumman bog. Part of this project is to mitigate against dust nuisance, as the area is potentially dust sensitive.<br>**Status**<br>This project didn't take place as the location proved to be unsuitable. |

### 3.2 Environmental Management Programme Proposal 2011

| Project | Description & Status |
|---|---|
| **Project 1:**<br><br>Reduction of fugitive dust emissions. | **Training.**<br>Continue to train all employees in environmental matters. Training will be by means of the screening of an environmental DVD, followed by a power point presentation. The training programme will be revised in 2011.<br><br>**Hydraulic Harrows.**<br>Hydraulic harrows will be deployed at Derryhinch, Ballivor and Rossan bog during the 2011 production season.<br><br>**Headland Peat Collection.**<br>Continue with the collection of headland peat, particularly at dust sensitive locations. |
| **Project 2:**<br><br>Waste Management | **Waste Streamlining.**<br>Waste streamlining is a project we are particularly interested in pursuing and hope to reduce wastes in the future and be more efficient in dealing with all aspects of waste management |
| **Project 3:**<br><br>Minimisation of Suspended Solids. | **Training.**<br>Continue to train all employees in environmental matters. Training will be by means of the screening of an environmental DVD, followed by a power point presentation. The training programme will be revised in 2011. |
| **Project 4:**<br>Effective spill leak management of mobile fuelling units. | **Research and Development.**<br><br>Increased bund provisions where required, will be provided, in 2011. |
| **Project 5:**<br><br>Collection storage and reuse of polyethylene. | **Identify Recyclers.**<br>Continue with the recycling of polyethylene. The sourcing of more recycling contractors will be ongoing. |
| **Progect 6:**<br><br>Energy Management | **Review of Energy Aspects**<br>As part of an energy management process, a review of energy aspects will take place identifying the significant energy users of the licensee. |

### 3.3 Environmental Expenditure

| Environmental Expenditure 2010 | |
|---|---|
| Licence:P0501-01 | |
| Works: Derrygreenagh | |
| **Description** | **Cost €** |
| Capital Costs | 26,720.00 |
| Silt Control | 91,420.00 |
| Analytical & Consultancy Costs | 9,553.00 |
| EPA Fees | 12,584.00 |
| Bog Rehabilitation | 84,528.00 |
| Waste Management | 36,353.00 |
| **Total** | **261,158.00** |

## 4.0 Licence Specific Reports

### 4.1 Surface Water Discharge Monitoring Location Programme Review

It is proposed to continue monitoring at the same locations in 2011 as were monitored in 2010. Should it be deemed necessary for any reason during the coming year additional monitoring will be initiated. Safe access to all monitoring locations will be maintained. Currently Bord na Mona are reviewing all silt ponds for upgrade, installation of weirs, flap valves etc in line with the requirements of the South Eastern & Eastern River Basin Management Plans.

### 4.2 Bunding Programme

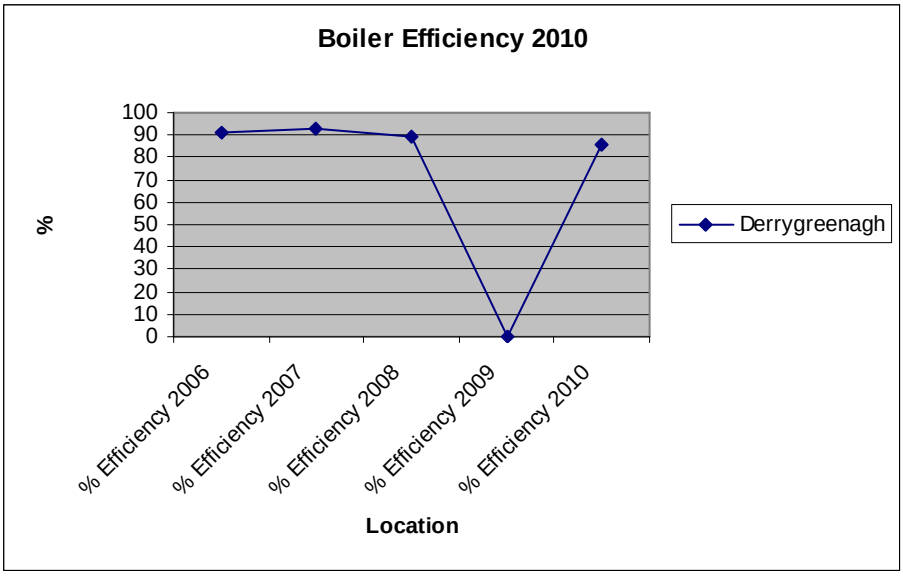
| Bund Locations & Numbers Derrygreenagh Works | | | | | |
|---|---|---|---|---|---|
| IPPC Licence: P0501-01 | | | | | |
| **Location** | **Bund Number** | **Last Tested** | **Status Pass/Fail** | **Repair Date** | **Next Test Due** |
| Derrygreenagh Main Bund | 501-37-01 | Jan-11 | Pass | N/A | Jan-13 |
| Derrygreenagh Waste Oil Bund | 501-37-02 | Jan-11 | Pass | N/A | Jan-13 |
| Ballivor Factory Bund | 501-08-03 | Nov-09 | Pass | N/A | Nov-11 |
| Rossan Tippler Bund | 501-07-04 | Feb-10 | Pass | N/A | Feb-12 |

As is evident from the table, no bunds in the licence area required testing during 2010. The next due date for testing is November 2011 at Balivor Factory Bund.

### 4.3 Boiler Combustion Efficiency

As mentioned in the 2009 AER a new boiler had been fitted at Derrygreenagh which was not tested. A test was carried out in 2010 the results of which are included in the table below along with results from the boiler that was previously at the site.

| Boiler Efficiency Test 2010 | | | | | |
|---|---|---|---|---|---|
| Licence: P0501-01 | | | | | |
| Works: Derrygreenagh | | | | | |
| **Boiler Location** | **% Efficiency 2006** | **% Efficiency 2007** | **% Efficiency 2008** | **% Efficiency 2009** | **% Efficiency 2010** |
| Derrygreenagh | 90.71 | 93.3 | 88.9 | New Boiler fitted | 86 |




### 4.4 Resource consumption summary

| Resource Consumption 2010 | | | |
|---|---|---|---|
| Licence: P0501-01 | | | |
| Works: Derrygreenagh | | | |
| **Product** | **Tonnes Produced** | **Tonnes Sold** | **Customer** |
| Milled Peat | 190,896 | 124,718 | ESB |
| Moss | 84,853 | 65,634 | Horticulture |
| Turf | 5000 | 1000 | Fuels |
| Turf | 66 | 66 | Private |
| **Totals** | **280,815** | **191,418** | N/A |

| Proposed Production 2011 | |
|---|---|
| Licence: P0501-01 | |
| Works: Derrygreenagh | |
| **Product** | **Proposed Target** |
| Milled Peat | 128,246 |
| Moss | 70,000 |
| Turf Private | 66 |
| Turf Fuels | 0 |
| **Totals** | **198,312** |

### 4.5 De-Silting Report

Silt pond cleaning went well during the reporting period with all ponds being cleaned twice with the exception of Lisclogher where the ponds were cleaned once. This was due to the fact that there is no activity at the location and fortnightly inspections demonstrated the ponds there to be continuously empty.
The inspections would also have dictated which ponds required additional cleanings.

A table and graph of the cleaning schedule is attached in appendix 5.

### 4.6 Bog Development and Operational Programme

There was some small scale development in Carranstown Bog ( Ballivor Group ). Works included the reinstatement of production bog which had been out of production for 15 years. Existing silt ponds are servicing the area which extends to approximately 35 hectares. This work will continue during 2011 with production planned for the back end of the 2011 season.

### 4.7 Bog Rehabilitation Report

2010: Sites surveyed in the Derrygreenagh Group include Derryhinch, Drumman, Derryarkin and Ballybeg. Habitat maps and reports have been outlined for all sites and draft rehabilitation plans will be developed in 2011 for all bog areas surveyed to date. Rehabilitation trials to determine the effectiveness of seeding and fertilisers were established on Drumman Bog. These will be monitored over the coming years. The ecology survey will continue for Derrygreenagh in 2011. Consultation with local community groups, NPWS and Offaly Heritage Forum is ongoing.
The clearance of historical polyethylene continued at Rossan bog. A total of 50.6 tonnes was removed for recycling. Clearance works will continue during summer 2011. It is estimated that the site will be cleared of historic polyethylene by the years end.

## 4.8 Archaeological Report

There was no archaeology work carried during the reporting period.

## 5.0 Summary

The Derrygreenagh Group of Bogs endeavour to comply with all environmental issues. In 2010 we had no non-compliance regarding suspended solids at our composite sampler at Toar bog. Although we had a non compliance during a quarterly grab sampling event in Ballybeg, silt pond cleaning went reasonable well this year. All areas were cleaned at least twice except for Lisclogher which is not in production so silt runoff was minimal. Every effort will be made to continue this trend into 2011. Dust sampling was conducted on five occasions again this year, two more than our licence requires, with no sample over the limit. This along with the provision of specialist machinery in the coming year should further aid us in our endeavours to minimise dust emissions. Staff training in Environmental Management took place this year with 82 people trained. This will continue in the coming year, with the current training programme being revised.

There were no complaints received during 2010. Waste streamlining is a project we are particularly interested in pursuing and hope to reduce wastes in the future and be more efficient in dealing with all aspects of waste management.Bord na Mona Energy Ltd are represented on the Management Group of both the Shannon River and Eastern River Basin District Management Systems, set up under the Water Framework Directive, and on the Steering Group of the Catchment Management of the River Barrow.

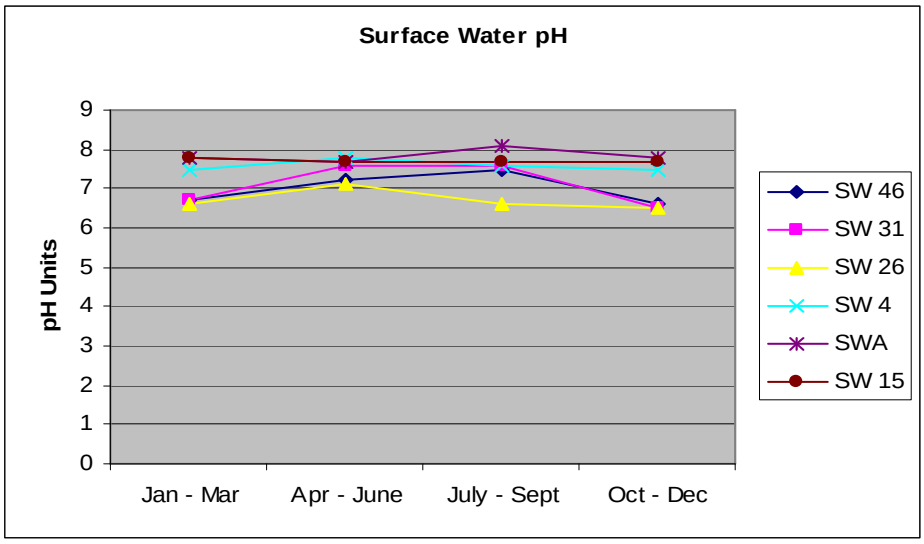
Bord na Mona would like to take this opportunity to advise the Environmental Protection Agency of its continued commitment to improving its environmental performance by adopting cleaner production methods and improving its environmental protection methods.

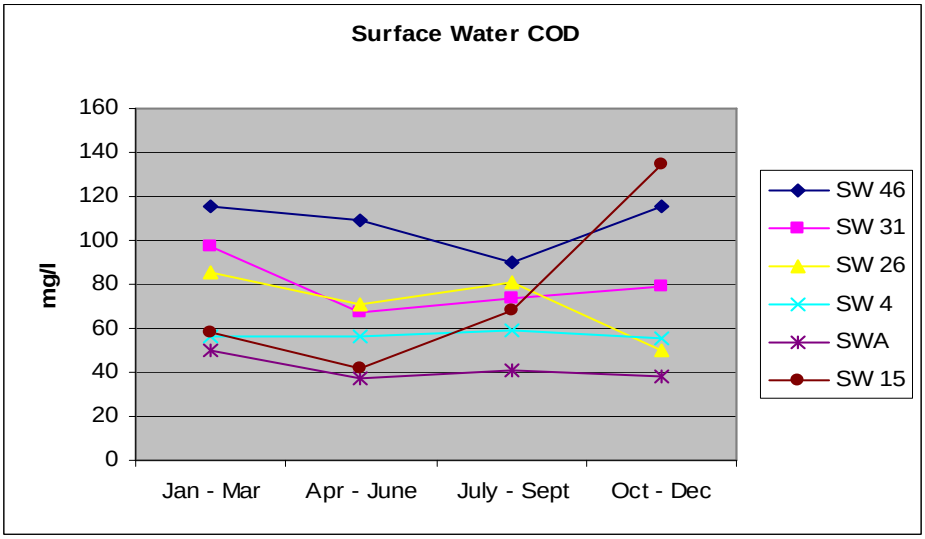
# APPENDIX 1

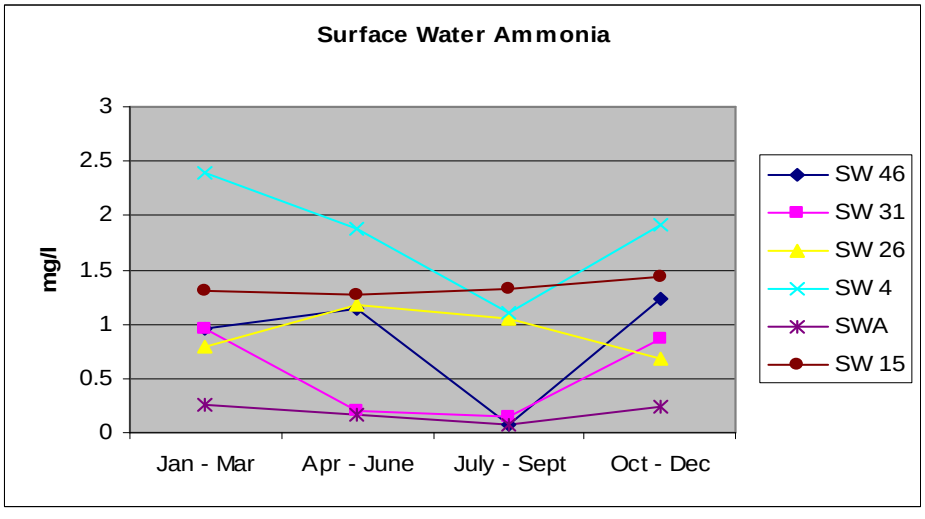
## Surface Water Discharge
## Monitoring Results
## Bogs

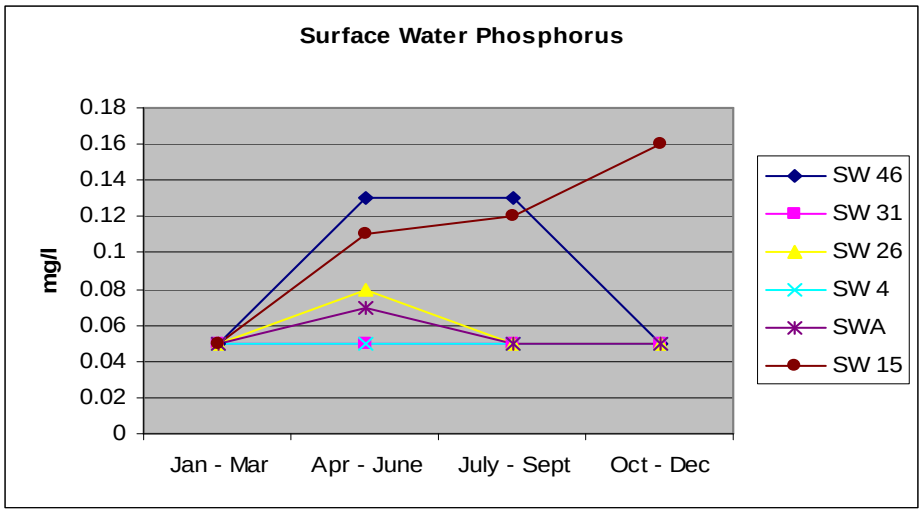
| BNM Group: | Derrygreenagh | | 2010 | |
|---|---|---|---|---|
| IPC Licence No. | 501 | | | |
| | | | | |
| pH (units) | | | | |
| | Jan - Mar | Apr - June | July - Sept | Oct - Dec |
| SW 46 | 6.7 | 7.2 | 7.5 | 6.6 |
| SW 31 | 6.7 | 7.6 | 7.6 | 6.5 |
| SW 26 | 6.6 | 7.1 | 6.6 | 6.5 |
| SW 4 | 7.5 | 7.8 | 7.6 | 7.5 |
| SWA | 7.8 | 7.7 | 8.1 | 7.8 |
| SW 15 | 7.8 | 7.7 | 7.7 | 7.7 |
| COD (mg/l) | | | | |
| | Jan - Mar | Apr - June | July - Sept | Oct - Dec |
| SW 46 | 115 | 109 | 90 | 115 |
| SW 31 | 97 | 67 | 74 | 79 |
| SW 26 | 85 | 71 | 81 | 50 |
| SW 4 | 56 | 56 | 59 | 55 |
| SWA | 50 | 37 | 41 | 38 |
| SW 15 | 58 | 42 | 68 | 135 |
| Ammonia as N (mg/l) | | | | |
| | Jan - Mar | Apr - June | July - Sept | Oct - Dec |
| SW 46 | 0.96 | 1.14 | 0.07 | 1.24 |
| SW 31 | 0.95 | 0.21 | 0.14 | 0.87 |
| SW 26 | 0.8 | 1.17 | 1.05 | 0.69 |
| SW 4 | 2.4 | 1.87 | 1.11 | 1.91 |
| SWA | 0.26 | 0.16 | 0.08 | 0.24 |
| SW 15 | 1.31 | 1.27 | 1.32 | 1.44 |
| Total Phosphorus (mg/l) | | | | |
| | Jan - Mar | Apr - June | July - Sept | Oct - Dec |
| SW 46 | 0.05 | 0.13 | 0.13 | 0.05 |
| SW 31 | 0.05 | 0.05 | 0.05 | 0.05 |
| SW 26 | 0.05 | 0.08 | 0.05 | 0.05 |
| SW 4 | 0.05 | 0.05 | 0.05 | 0.05 |
| SWA | 0.05 | 0.07 | 0.05 | 0.05 |
| SW 15 | 0.05 | 0.11 | 0.12 | 0.16 |

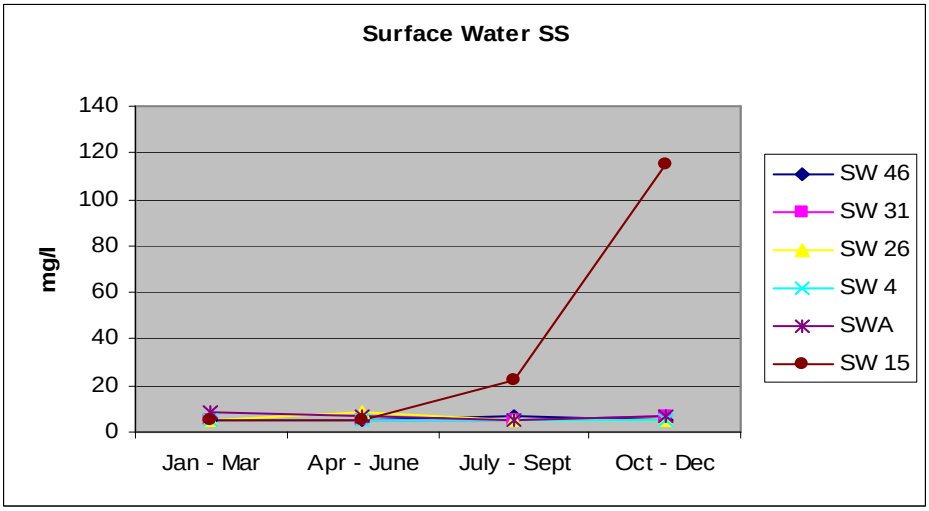
| Suspended Solids (mg/l) | | | | |
|---|---|---|---|---|
| | Jan - Mar | Apr - June | July - Sept | Oct - Dec |
| SW 46 | 5 | 5 | 7 | 5 |
| SW 31 | 5 | 5 | 5 | 7 |
| SW 26 | 5 | 9 | 5 | 5 |
| SW 4 | 5 | 5 | 5 | 5 |
| SWA | 9 | 7 | 5 | 7 |
| SW 15 | 5 | 5 | 22 | 115 |
| Total Solids (mg/l) | | | | |
| | Jan - Mar | Apr - June | July - Sept | Oct - Dec |
| SW 46 | 192 | 290 | 328 | 162 |
| SW 31 | 220 | 202 | 154 | 68 |
| SW 26 | 115 | 332 | 214 | 96 |
| SW 4 | 398 | 274 | 374 | 350 |
| SWA | 470 | 544 | 420 | 418 |
| SW 15 | 436 | 514 | 492 | 500 |
| Colour (pt Co Units) | | | | |
| | Jan - Mar | Apr - June | July - Sept | Oct - Dec |
| SW 46 | 337 | 338 | 212 | 415 |
| SW 31 | 367 | 165 | 207 | 330 |
| SW 26 | 241 | 158 | 325 | 199 |
| SW 4 | 160 | 113 | 140 | 143 |
| SWA | 95 | 66 | 56 | 80 |
| SW 15 | 85 | 72 | 89 | 71 |
| Flow (l/s) | | | | |
| | Jan - Mar | Apr - June | July - Sept | Oct - Dec |
| SW 46 | 10 | 2.6 | 4.6 | 7.5 |
| SW 31 | 1.5 | 1.9 | 1.5 | 6.3 |
| SW 26 | 6.2 | 2.6 | 3.4 | 9.5 |
| SW 4 | 16.1 | 6.1 | 2.6 | 14.5 |
| SWA | 0 | 1.7 | 2.2 | 6.2 |
| SW 15 | 37 | 24.4 | 22.6 | 10.3 |

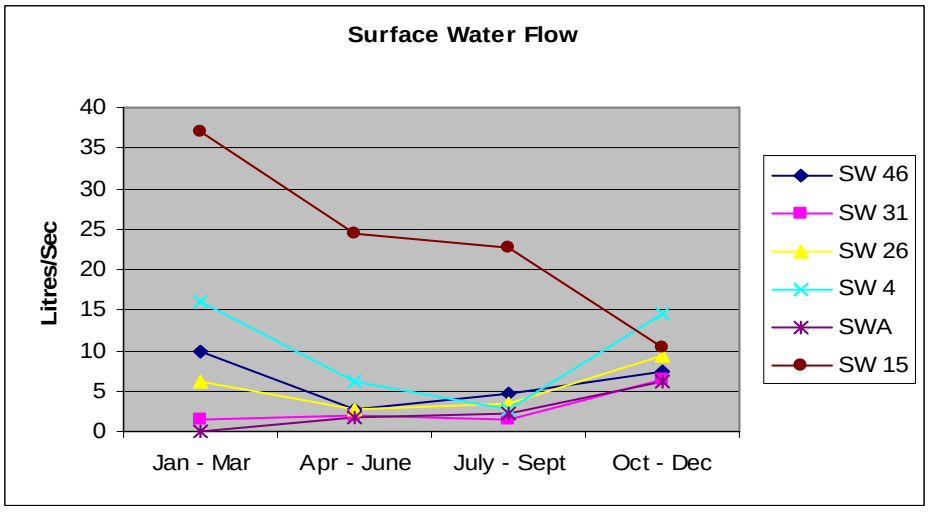

Surface Water pH
pH Units
9
8
7
6
5
4
3
2
1
0
Jan - Mar
Apr - June
July - Sept
Oct - Dec
SW 46
SW 31
SW 26
SW 4
SWA
SW 15


Surface Water COD
mg/l
160
140
120
100
80
60
40
20
0
Jan - Mar
Apr - June
July - Sept
Oct - Dec
SW 46
SW 31
SW 26
SW 4
SWA
SW 15


Surface Water Ammonia
mg/l
3
2.5
2
1.5
1
0.5
0
Jan - Mar
Apr - June
July - Sept
Oct - Dec
SW 46
SW 31
SW 26
SW 4
SWA
SW 15


Surface Water Phosphorus
mg/l
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan - Mar
Apr - June
July - Sept
Oct - Dec
SW 46
SW 31
SW 26
SW 4
SWA
SW 15


Surface Water SS
mg/l
140
120
100
80
60
40
20
0
Jan - Mar
Apr - June
July - Sept
Oct - Dec
SW 46
SW 31
SW 26
SW 4
SWA
SW 15

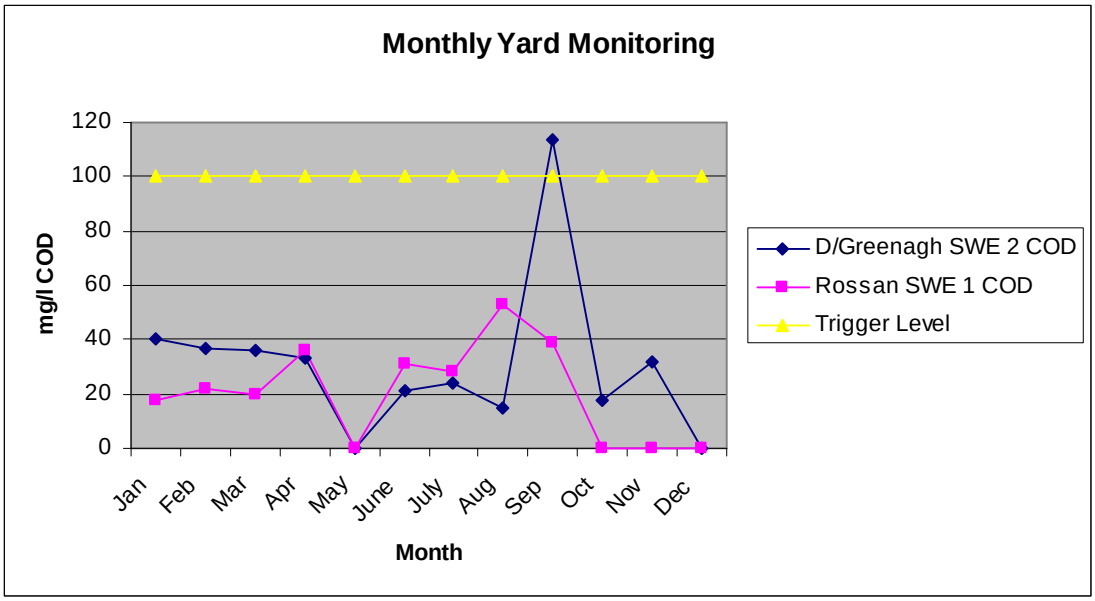

Surface Water Flow
Litres/Sec
40
35
30
25
20
15
10
5
0
Jan - Mar
Apr - June
July - Sept
Oct - Dec
SW 46
SW 31
SW 26
SW 4
SWA
SW 15

# APPENDIX 2

## Surface Water Discharge
## Monitoring Results
### Yards

| Yard Discharge Results 2010 | | |
|---|---|---|
| Licence: P0501-01 | | |
| Works: Derrygreenagh | | |
| **Month** | **D/Greenagh SWE 2 COD** | **Rossan SWE 1 COD** |
| Jan | 40 | 18 |
| Feb | 37 | 22 |
| Mar | 36 | 20 |
| Apr | 33 | 36 |
| May | 0 | 0 |
| June | 21 | 31 |
| July | 24 | 28 |
| Aug | 15 | 53 |
| Sep | 114 | 39 |
| Oct | 18 | 0 |
| Nov | 32 | 0 |
| Dec | 0 | 0 |

**Note: 0** denotes no flow at emission point on day of sampling



# APPENDIX 3

## Surface Water Discharge
## Monitoring Results
## Composite

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2010 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 0 | 0 | | 3072211 | | | | 0.00 | 0.00 |
| 2 | | | | | 0 | 0 | | 1883434 | | | | 0.00 | 0.00 |
| 3 | | | | | 0 | 0 | | 1427846 | | | | 0.00 | 0.00 |
| 4 | | | | | 0 | 0 | | 1292717 | | | | 0.00 | 0.00 |
| 5 | | | | | 0 | 0 | | 1190851 | | | | 0.00 | 0.00 |
| 6 | 7.6 | 73 | 0.78 | 0.05 | 5 | 463 | 71 | 1180742 | 86.19 | 0.92 | 0.06 | 5.90 | 546.68 |
| 7 | | | | | 0 | 0 | | 1128816 | | | | 0.00 | 0.00 |
| 8 | | | | | 0 | 0 | | 1042675 | | | | 0.00 | 0.00 |
| 9 | | | | | 0 | 0 | | 993341 | | | | 0.00 | 0.00 |
| 10 | | | | | 0 | 0 | | 968285 | | | | 0.00 | 0.00 |
| 11 | | | | | 0 | 0 | | 902794 | | | | 0.00 | 0.00 |
| 12 | | | | | 0 | 0 | | 798103 | | | | 0.00 | 0.00 |
| 13 | 7.3 | 44 | 0.56 | 0.06 | 5 | 212 | 108 | 867110 | 38.15 | 0.49 | 0.05 | 4.34 | 183.83 |
| 14 | | | | | 19 | 206 | | 1688170 | | | | 32.08 | 347.76 |
| 15 | | | | | 5 | 188 | | 3035232 | | | | 15.18 | 570.62 |
| 16 | | | | | 12 | 192 | | 4706554 | | | | 56.48 | 903.66 |
| 17 | | | | | 5 | 154 | | 7739366 | | | | 38.70 | 1191.86 |
| 18 | | | | | 5 | 170 | | 1796256 | | | | 8.98 | 305.36 |
| 19 | | | | | 5 | 174 | | 1671840 | | | | 8.36 | 290.90 |
| 20 | 7.8 | 55 | 1.82 | 0.05 | 5 | 196 | 130 | 1442794 | 79.35 | 2.63 | 0.07 | 7.21 | 282.79 |
| 21 | | | | | 24 | 194 | | 1520640 | | | | 36.50 | 295.00 |
| 22 | | | | | 5 | 176 | | 3463085 | | | | 17.32 | 609.50 |
| 23 | | | | | 5 | 316 | | 10881220 | | | | 54.41 | 3438.47 |
| 24 | | | | | 5 | 356 | | 8046346 | | | | 40.23 | 2864.50 |
| 25 | | | | | 14 | 322 | | 7047821 | | | | 98.67 | 2269.40 |
| 26 | | | | | 5 | 368 | | 6588259 | | | | 32.94 | 2424.48 |
| 27 | 7.8 | 52 | 0.69 | 0.05 | 5 | 276 | 89 | 6201273 | 322.47 | 4.28 | 0.31 | 31.01 | 1711.55 |
| 28 | | | | | 5 | 368 | | 5983459 | | | | 29.92 | 2201.91 |
| 29 | | | | | 5 | 358 | | 5950541 | | | | 29.75 | 2130.29 |
| 30 | | | | | 6 | 410 | | 5771779 | | | | 34.63 | 2366.43 |
| 31 | | | | | 10 | 320 | | 5286125 | | | | 52.86 | 1691.56 |

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Feb | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2010 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 24 | 404 | | 4960483 | | | | 119.05 | 2004.04 |
| 2 | | | | | 22 | 414 | | 4914000 | | | | 108.11 | 2034.40 |
| 3 | 7.5 | 57 | 0.65 | 0.05 | 5 | 338 | 153 | 5378832 | 306.59 | 3.50 | 0.27 | 26.89 | 1818.05 |
| 4 | | | | | 5 | 328 | | 6936969 | | | | 34.68 | 2275.33 |
| 5 | | | | | 12 | 181 | | 7537363 | | | | 90.45 | 1364.26 |
| 6 | | | | | 18 | 378 | | 12522820 | | | | 225.41 | 4733.63 |
| 7 | | | | | 18 | 442 | | 7610544 | | | | 136.99 | 3363.86 |
| 8 | | | | | 16 | 426 | | 6567264 | | | | 105.08 | 2797.65 |
| 9 | | | | | 5 | 424 | | 6219158 | | | | 31.10 | 2636.92 |
| 10 | 7.4 | 41 | 0.72 | 0.05 | 6 | 428 | 77 | 6087312 | 249.58 | 4.38 | 0.30 | 36.52 | 2605.37 |
| 11 | | | | | 11 | 468 | | 5337533 | | | | 58.71 | 2497.97 |
| 12 | | | | | 7 | 400 | | 5087491 | | | | 35.61 | 2035.00 |
| 13 | | | | | 6 | 400 | | 5012928 | | | | 30.08 | 2005.17 |
| 14 | | | | | 7 | 454 | | 4893523 | | | | 34.25 | 2221.66 |
| 15 | | | | | 5 | 442 | | 4706813 | | | | 23.53 | 2080.41 |
| 16 | | | | | 7 | 414 | | 4756406 | | | | 33.29 | 1969.15 |
| 17 | 7.6 | 37 | 0.75 | 0.05 | 6 | 458 | 71 | 4669834 | 172.78 | 3.50 | 0.23 | 28.02 | 2138.78 |
| 18 | | | | | 6 | 434 | | 4519238 | | | | 27.12 | 1961.35 |
| 19 | | | | | 17 | 468 | | 5850317 | | | | 99.46 | 2737.95 |
| 20 | | | | | 18 | 412 | | 7057498 | | | | 127.03 | 2907.69 |
| 21 | | | | | 11 | 452 | | 6229008 | | | | 68.52 | 2815.51 |
| 22 | | | | | 34 | 440 | | 6349018 | | | | 215.87 | 2793.57 |
| 23 | | | | | 10 | 442 | | 6096557 | | | | 60.97 | 2694.68 |
| 24 | 7.5 | 51 | 0.76 | 0.05 | 8 | 353 | 106 | 6028474 | 307.45 | 4.58 | 0.30 | 48.23 | 2128.05 |
| 25 | | | | | 8 | 414 | | 6713367 | | | | 53.71 | 2779.33 |
| 26 | | | | | 10 | 380 | | 7066656 | | | | 70.67 | 2685.33 |
| 27 | | | | | 11 | 396 | | 7119619 | | | | 78.32 | 2819.37 |
| 28 | | | | | 9 | 440 | | 6810480 | | | | 61.29 | 2996.61 |

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| March | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2010 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 9 | 416 | | 6506957 | | | | 58.56 | 2706.89 |
| 2 | | | | | 8 | 396 | | 6040311 | | | | 48.32 | 2391.96 |
| 3 | 7.6 | 47 | 0.8 | 0.05 | 8 | 406 | 77 | 5247936 | 246.65 | 4.20 | 0.26 | 41.98 | 2130.66 |
| 4 | | | | | 12 | 106 | | 5190999 | | | | 62.29 | 550.25 |
| 5 | | | | | 10 | 94 | | 3606163 | | | | 36.06 | 338.98 |
| 6 | | | | | 10 | 92 | | 4808247 | | | | 48.08 | 442.36 |
| 7 | | | | | 9 | 456 | | 3561322 | | | | 32.05 | 1623.96 |
| 8 | | | | | 23 | 460 | | 4427309 | | | | 101.83 | 2036.56 |
| 9 | | | | | 13 | 430 | | 3826656 | | | | 49.75 | 1645.46 |
| 10 | 7.8 | 48 | 0.78 | 0.05 | 12 | 430 | 73 | 3337286 | 160.19 | 2.60 | 0.17 | 40.05 | 1435.03 |
| 11 | | | | | 8 | 216 | | 2819923 | | | | 22.56 | 609.10 |
| 12 | | | | | 7 | 451 | | 3992544 | | | | 27.95 | 1800.64 |
| 13 | | | | | 7 | 448 | | 4841424 | | | | 33.89 | 2168.96 |
| 14 | | | | | 8 | 484 | | 4899830 | | | | 39.20 | 2371.52 |
| 15 | | | | | 7 | 426 | | 4744137 | | | | 33.21 | 2021.00 |
| 16 | | | | | 6 | 454 | | 5473267 | | | | 32.84 | 2484.86 |
| 17 | 7.5 | 27 | 0.79 | 0.05 | 9 | 440 | 60 | 4841078 | 130.71 | 3.82 | 0.24 | 43.57 | 2130.07 |
| 18 | | | | | 7 | 448 | | 5467910 | | | | 38.28 | 2449.62 |
| 19 | | | | | 8 | 448 | | 5438448 | | | | 43.51 | 2436.42 |
| 20 | | | | | 11 | 460 | | 5194886 | | | | 57.14 | 2389.65 |
| 21 | | | | | 11 | 451 | | 6386429 | | | | 70.25 | 2880.28 |
| 22 | | | | | 9 | 464 | | 5281459 | | | | 47.53 | 2450.60 |
| 23 | | | | | 8 | 474 | | 5101315 | | | | 40.81 | 2418.02 |
| 24 | 7.4 | 55 | 0.7 | 0.05 | 10 | 442 | 86 | 4601319 | 253.07 | 3.22 | 0.23 | 46.01 | 2033.78 |
| 25 | | | | | 8 | 244 | | 5588093 | | | | 44.70 | 1363.49 |
| 26 | | | | | 11 | 50 | | 5579280 | | | | 61.37 | 278.96 |
| 27 | | | | | 8 | 304 | | 6741274 | | | | 53.93 | 2049.35 |
| 28 | | | | | 10 | 98 | | 6500563 | | | | 65.01 | 637.06 |
| 29 | | | | | 8 | 346 | | 6574090 | | | | 52.59 | 2274.64 |
| 30 | | | | | 6 | 50 | | 7700400 | | | | 46.20 | 385.02 |
| 31 | 7.2 | 60 | 0.57 | 0.06 | 6 | 68 | 155 | 10964320 | 657.86 | 6.25 | 0.66 | 65.79 | 745.57 |

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| April | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2010 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 8 | 244 | | 8590061 | | | | 68.72 | 2095.97 |
| 2 | | | | | 11 | 50 | | 8698752 | | | | 95.69 | 434.94 |
| 3 | | | | | 8 | 304 | | 9655200 | | | | 77.24 | 2935.18 |
| 4 | | | | | 10 | 98 | | 8973504 | | | | 89.74 | 879.40 |
| 5 | | | | | 8 | 346 | | 7971264 | | | | 63.77 | 2758.06 |
| 6 | | | | | 6 | 50 | | 7479821 | | | | 44.88 | 373.99 |
| 7 | 7.2 | 60 | 0.57 | 0.06 | 6 | 68 | 155 | 8503747 | 510.22 | 4.85 | 0.51 | 51.02 | 578.25 |
| 8 | | | | | 7 | 446 | | 4274986 | | | | 29.92 | 1906.64 |
| 9 | | | | | 5 | 460 | | 6481210 | | | | 32.41 | 2981.36 |
| 10 | | | | | 5 | 468 | | 7791379 | | | | 38.96 | 3646.37 |
| 11 | | | | | 5 | 460 | | 7266499 | | | | 36.33 | 3342.59 |
| 12 | | | | | 5 | 498 | | 6659971 | | | | 33.30 | 3316.67 |
| 13 | 7.5 | 32 | 0.68 | 0.05 | 5 | 500 | 67 | 6386083 | 204.35 | 4.34 | 0.32 | 31.93 | 3193.04 |
| 14 | | | | | 7 | 466 | | 6411225 | | | | 44.88 | 2987.63 |
| 15 | | | | | 6 | 462 | | 6082819 | | | | 36.50 | 2810.26 |
| 16 | | | | | 8 | 462 | | 5815411 | | | | 46.52 | 2686.72 |
| 17 | | | | | 6 | 458 | | 5459098 | | | | 32.75 | 2500.27 |
| 18 | | | | | 5 | 462 | | 5361639 | | | | 26.81 | 2477.08 |
| 19 | | | | | 6 | 478 | | 5175619 | | | | 31.05 | 2473.95 |
| 20 | | | | | 7 | 454 | | 5030467 | | | | 35.21 | 2283.83 |
| 21 | 8.1 | 40 | 0.08 | 0.05 | 5 | 460 | 63 | 4872787 | 194.91 | 0.39 | 0.24 | 24.36 | 2241.48 |
| 22 | | | | | 8 | 490 | | 4610909 | | | | 36.89 | 2259.35 |
| 23 | | | | | 8 | 375 | | 4511808 | | | | 36.09 | 1691.93 |
| 24 | | | | | 7 | 478 | | 4835808 | | | | 33.85 | 2311.52 |
| 25 | | | | | 6 | 468 | | 5255712 | | | | 31.53 | 2459.67 |
| 26 | | | | | 5 | 474 | | 4911667 | | | | 24.56 | 2328.13 |
| 27 | | | | | 7 | 482 | | 4568918 | | | | 31.98 | 2202.22 |
| 28 | 7.9 | 39 | 0.47 | 0.05 | 8 | 456 | 67 | 4344883 | 169.45 | 2.04 | 0.22 | 34.76 | 1981.27 |
| 29 | | | | | 7 | 456 | | 4460746 | | | | 31.23 | 2034.10 |
| 30 | | | | | 6 | 466 | | 4350931 | | | | 26.11 | 2027.53 |

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| May | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2010 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 6 | 462 | | 4458240 | | | | 26.75 | 2059.71 |
| 2 | | | | | 7 | 449 | | 4487443 | | | | 31.41 | 2014.86 |
| 3 | | | | | 7 | 436 | | 4373914 | | | | 30.62 | 1907.03 |
| 4 | | | | | 7 | 464 | | 4157050 | | | | 29.10 | 1928.87 |
| 5 | 7.8 | 43 | 0.65 | 0.06 | 7 | 460 | 62 | 3992458 | 171.68 | 2.60 | 0.24 | 27.95 | 1836.53 |
| 6 | | | | | 6 | 454 | | 4035312 | | | | 24.21 | 1832.03 |
| 7 | | | | | 5 | 464 | | 4276368 | | | | 21.38 | 1984.23 |
| 8 | | | | | 6 | 466 | | 4203273 | | | | 25.22 | 1958.73 |
| 9 | | | | | 5 | 456 | | 3935520 | | | | 19.68 | 1794.60 |
| 10 | | | | | 7 | 456 | | 3995568 | | | | 27.97 | 1821.98 |
| 11 | | | | | 5 | 444 | | 3906663 | | | | 19.53 | 1734.56 |
| 12 | 7.8 | 35 | 0.5 | 0.05 | 6 | 462 | 69 | 3991853 | 139.71 | 2.00 | 0.20 | 23.95 | 1844.24 |
| 13 | | | | | 6 | 462 | | 3973277 | | | | 23.84 | 1835.65 |
| 14 | | | | | 7 | 457 | | 3748982 | | | | 26.24 | 1713.28 |
| 15 | | | | | 0 | 0 | | 2103926 | | | | 0.00 | 0.00 |
| 16 | | | | | 6 | 472 | | 536466 | | | | 3.22 | 253.21 |
| 17 | | | | | 7 | 480 | | 815970 | | | | 5.71 | 391.67 |
| 18 | | | | | 7 | 462 | | 1655078 | | | | 11.59 | 764.65 |
| 19 | 7.9 | 39 | 0.33 | 0.06 | 5 | 454 | 66 | 2643926 | 103.11 | 0.87 | 0.16 | 13.22 | 1200.34 |
| 20 | | | | | 5 | 398 | | 2117923 | | | | 10.59 | 842.93 |
| 21 | | | | | 6 | 396 | | 1929917 | | | | 11.58 | 764.25 |
| 22 | | | | | 5 | 408 | | 2107469 | | | | 10.54 | 859.85 |
| 23 | | | | | 9 | 420 | | 3206045 | | | | 28.85 | 1346.54 |
| 24 | | | | | 6 | 444 | | 3114893 | | | | 18.69 | 1383.01 |
| 25 | | | | | 7 | 450 | | 2869344 | | | | 20.09 | 1291.20 |
| 26 | 7.6 | 41 | 0.74 | 0.05 | 8 | 470 | 61 | 2910125 | 119.32 | 2.15 | 0.15 | 23.28 | 1367.76 |
| 27 | | | | | 9 | 418 | | 2838758 | | | | 25.55 | 1186.60 |
| 28 | | | | | 15 | 452 | | 3715114 | | | | 55.73 | 1679.23 |
| 29 | | | | | 8 | 434 | | 3002314 | | | | 24.02 | 1303.00 |
| 30 | | | | | 5 | 434 | | 1467418 | | | | 7.34 | 636.86 |
| 31 | | | | | 8 | 444 | | 2765750 | | | | 22.13 | 1227.99 |

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| June | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2010 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 10 | 348 | | 2313187 | | | | 23.13 | 804.99 |
| 2 | 7.5 | 42 | 0.61 | 0.05 | 10 | 468 | 67 | 3894480 | 163.57 | 2.38 | 0.19 | 38.94 | 1822.62 |
| 3 | | | | | 11 | 408 | | 3318192 | | | | 36.50 | 1353.82 |
| 4 | | | | | 12 | 390 | | 3221165 | | | | 38.65 | 1256.25 |
| 5 | | | | | 16 | 258 | | 2731968 | | | | 43.71 | 704.85 |
| 6 | | | | | 14 | 466 | | 3358455 | | | | 47.02 | 1565.04 |
| 7 | | | | | 14 | 466 | | 3291494 | | | | 46.08 | 1533.84 |
| 8 | | | | | 16 | 162 | | 2365286 | | | | 37.84 | 383.18 |
| 9 | 7.5 | 46 | 0.22 | 0.12 | 15 | 454 | 80 | 1080173 | 49.69 | 0.24 | 0.13 | 16.20 | 490.40 |
| 10 | | | | | 13 | 430 | | 2000160 | | | | 26.00 | 860.07 |
| 11 | | | | | 16 | 428 | | 4040842 | | | | 64.65 | 1729.48 |
| 12 | | | | | 16 | 420 | | 3961958 | | | | 63.39 | 1664.02 |
| 13 | | | | | 12 | 420 | | 3348778 | | | | 40.19 | 1406.49 |
| 14 | | | | | 12 | 416 | | 3462393 | | | | 41.55 | 1440.36 |
| 15 | | | | | 8 | 441 | | 3265920 | | | | 26.13 | 1440.27 |
| 16 | 7.5 | 38 | 0.56 | 0.05 | 5 | 470 | 76 | 3197664 | 121.51 | 1.79 | 0.16 | 15.99 | 1502.90 |
| 17 | | | | | 16 | 426 | | 3412800 | | | | 54.60 | 1453.85 |
| 18 | | | | | 14 | 440 | | 4103222 | | | | 57.45 | 1805.42 |
| 19 | | | | | 15 | 430 | | 4451155 | | | | 66.77 | 1914.00 |
| 20 | | | | | 13 | 422 | | 3968266 | | | | 51.59 | 1674.61 |
| 21 | | | | | 11 | 430 | | 3710621 | | | | 40.82 | 1595.57 |
| 22 | 8.1 | 44 | 0.15 | 0.05 | 15 | 430 | 69 | 3634762 | 159.93 | 0.55 | 0.18 | 54.52 | 1562.95 |
| 23 | | | | | 10 | 416 | | 3399322 | | | | 33.99 | 1414.12 |
| 24 | | | | | 15 | 428 | | 3054845 | | | | 45.82 | 1307.47 |
| 25 | | | | | 16 | 441 | | 3147466 | | | | 50.36 | 1388.03 |
| 26 | | | | | 12 | 440 | | 3234298 | | | | 38.81 | 1423.09 |
| 27 | | | | | 8 | 438 | | 3167597 | | | | 25.34 | 1387.41 |
| 28 | | | | | 7 | 462 | | 2543184 | | | | 17.80 | 1174.95 |
| 29 | | | | | 13 | 468 | | 2281478 | | | | 29.66 | 1067.73 |
| 30 | 8.2 | 44 | 0.55 | 0.05 | 7 | 390 | 54 | 2626549 | 115.57 | 1.44 | 0.13 | 18.39 | 1024.35 |

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| July | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2010 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 15 | 383 | | 2114381 | | | | 31.72 | 809.81 |
| 2 | | | | | 0 | 0 | | -348399 | | | | 0.00 | 0.00 |
| 3 | | | | | 0 | 0 | | -1084406 | | | | 0.00 | 0.00 |
| 4 | | | | | 0 | 0 | | -604083 | | | | 0.00 | 0.00 |
| 5 | | | | | 0 | 0 | | -610986 | | | | 0.00 | 0.00 |
| 6 | | | | | 0 | 0 | | -1053043 | | | | 0.00 | 0.00 |
| 7 | 7.6 | 29 | 0.49 | 0.05 | 5 | 494 | 67 | -765573 | -22.20 | -0.38 | -0.04 | -3.83 | -378.19 |
| 8 | | | | | 12 | 406 | | 1702685 | | | | 20.43 | 691.29 |
| 9 | | | | | 10 | 402 | | 3183235 | | | | 31.83 | 1279.66 |
| 10 | | | | | 5 | 257 | | 3230237 | | | | 16.15 | 830.17 |
| 11 | | | | | 6 | 288 | | 6631373 | | | | 39.79 | 1909.84 |
| 12 | | | | | 5 | 380 | | -16967230 | | | | -84.84 | -6447.5 |
| 13 | | | | | 7 | 420 | | 5030899 | | | | 35.22 | 2112.98 |
| 14 | 8.1 | 50 | 0.68 | 0.05 | 5 | 442 | 81 | 4573670 | 228.68 | 3.11 | 0.23 | 22.87 | 2021.56 |
| 15 | | | | | 10 | 415 | | 3065040 | | | | 30.65 | 1271.99 |
| 16 | | | | | 8 | 252 | | 6737299 | | | | 53.90 | 1697.80 |
| 17 | | | | | 11 | 350 | | 16458340 | | | | 181.04 | 5760.42 |
| 18 | | | | | 5 | 342 | | 6092237 | | | | 30.46 | 2083.55 |
| 19 | | | | | 8 | 254 | | 7724419 | | | | 61.80 | 1962.00 |
| 20 | | | | | 0 | 0 | | 8428147 | | | | 0.00 | 0.00 |
| 21 | 7.2 | 60 | 0.5 | 0.05 | 13 | 246 | 168 | 3539376 | 212.36 | 1.77 | 0.18 | 46.01 | 870.69 |
| 22 | | | | | 5 | 276 | | 5096909 | | | | 25.48 | 1406.75 |
| 23 | | | | | 9 | 386 | | 7327843 | | | | 65.95 | 2828.55 |
| 24 | | | | | 11 | 422 | | 7350221 | | | | 80.85 | 3101.79 |
| 25 | | | | | 14 | 442 | | 6579619 | | | | 92.11 | 2908.19 |
| 26 | | | | | 13 | 462 | | 5022864 | | | | 65.30 | 2320.56 |
| 27 | | | | | 12 | 166 | | 4217011 | | | | 50.60 | 700.02 |
| 28 | 7.3 | 44 | 0.76 | 0.05 | 7 | 480 | 71 | 4680202 | 205.93 | 3.56 | 0.23 | 32.76 | 2246.50 |
| 29 | | | | | 22 | 428 | | 3943987 | | | | 86.77 | 1688.03 |
| 30 | | | | | 20 | 440 | | 4808247 | | | | 96.16 | 2115.63 |
| 31 | | | | | 8 | 434 | | 4408906 | | | | 35.27 | 1913.47 |

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| August | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2010 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 24 | 454 | | 4366742 | | | | 104.80 | 1982.50 |
| 2 | | | | | 9 | 447 | | 4352314 | | | | 39.17 | 1945.48 |
| 3 | | | | | 7 | 466 | | 4210618 | | | | 29.47 | 1962.15 |
| 4 | 7.5 | 38 | 0.77 | 0.05 | 8 | 448 | 91 | 4282675 | 162.74 | 3.30 | 0.21 | 34.26 | 1918.64 |
| 5 | | | | | 9 | 426 | | 5701622 | | | | 51.31 | 2428.89 |
| 6 | | | | | 12 | 480 | | 2292710 | | | | 27.51 | 1100.50 |
| 7 | | | | | 11 | 474 | | 274571 | | | | 3.02 | 130.15 |
| 8 | | | | | 11 | 470 | | 298927 | | | | 3.29 | 140.50 |
| 9 | | | | | 9 | 494 | | 290511 | | | | 2.61 | 143.51 |
| 10 | | | | | 10 | 504 | | 280860 | | | | 2.81 | 141.55 |
| 11 | 7.5 | 51 | 0.45 | 0.05 | 9 | 506 | 66 | 205788 | 10.50 | 0.09 | 0.01 | 1.85 | 104.13 |
| 12 | | | | | 16 | 422 | | -2389133 | | | | -38.23 | -1008.2 |
| 13 | | | | | 21 | 414 | | 158613 | | | | 3.33 | 65.67 |
| 14 | | | | | 20 | 414 | | 251640 | | | | 5.03 | 104.18 |
| 15 | | | | | 14 | 412 | | 255891 | | | | 3.58 | 105.43 |
| 16 | | | | | 8 | 428 | | 275322 | | | | 2.20 | 117.84 |
| 17 | | | | | 9 | 423 | | 100647 | | | | 0.91 | 42.57 |
| 18 | 7.5 | 46 | 0.45 | 0.05 | 8 | 460 | 66 | 236183 | 10.86 | 0.11 | 0.01 | 1.89 | 108.64 |
| 19 | | | | | 6 | 442 | | -235889 | | | | -1.42 | -104.26 |
| 20 | | | | | 9 | 448 | | 12882 | | | | 0.12 | 5.77 |
| 21 | | | | | 6 | 462 | | 2373926 | | | | 14.24 | 1096.75 |
| 22 | | | | | 6 | 468 | | 1528502 | | | | 9.17 | 715.34 |
| 23 | | | | | 6 | 446 | | 2064960 | | | | 12.39 | 920.97 |
| 24 | | | | | 7 | 430 | | 1594685 | | | | 11.16 | 685.71 |
| 25 | 7.5 | 39 | 0.59 | 0.05 | 7 | 454 | 72 | 506434 | 19.75 | 0.30 | 0.03 | 3.55 | 229.92 |
| 26 | | | | | 12 | 444 | | -182174 | | | | -2.19 | -80.89 |
| 27 | | | | | 5 | 460 | | 1427069 | | | | 7.14 | 656.45 |
| 28 | | | | | 6 | 456 | | 2436048 | | | | 14.62 | 1110.84 |
| 29 | | | | | 10 | 453 | | 2444688 | | | | 24.45 | 1107.44 |
| 30 | | | | | 5 | 462 | | 1444867 | | | | 7.22 | 667.53 |
| 31 | | | | | 7 | 462 | | 2181168 | | | | 15.27 | 1007.70 |

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sept | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2010 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | 8 | 38 | 0.41 | 0.05 | 5 | 474 | 72 | 1266883 | 48.14 | 0.52 | 0.06 | 6.33 | 600.50 |
| 2 | | | | | 8 | 462 | | 1700870 | | | | 13.61 | 785.80 |
| 3 | | | | | 11 | 130 | | 1415837 | | | | 15.57 | 184.06 |
| 4 | | | | | 5 | 158 | | 1198195 | | | | 5.99 | 189.31 |
| 5 | | | | | 5 | 269 | | 711565 | | | | 3.56 | 191.41 |
| 6 | | | | | 6 | 276 | | 1419379 | | | | 8.52 | 391.75 |
| 7 | | | | | 16 | 422 | | 37552900 | | | | 600.85 | 15847.32 |
| 8 | 8.2 | 30 | 0.41 | 0.05 | 7 | 436 | 60 | 33387550 | 1001.63 | 13.69 | 1.67 | 233.71 | 14556.97 |
| 9 | | | | | 5 | 280 | | 18648580 | | | | 93.24 | 5221.60 |
| 10 | | | | | 5 | 234 | | 15991780 | | | | 79.96 | 3742.08 |
| 11 | | | | | 5 | 314 | | 19771780 | | | | 98.86 | 6208.34 |
| 12 | | | | | 5 | 328 | | 15556320 | | | | 77.78 | 5102.47 |
| 13 | | | | | 5 | 412 | | 13430880 | | | | 67.15 | 5533.52 |
| 14 | | | | | 5 | 150 | | 11521440 | | | | 57.61 | 1728.22 |
| 15 | 7.6 | 49 | 0.49 | 0.05 | 5 | 340 | 154 | 22928830 | 1123.51 | 11.24 | 1.15 | 114.64 | 7795.80 |
| 16 | | | | | 6 | 452 | | 14360540 | | | | 86.16 | 6490.96 |
| 17 | | | | | 5 | 458 | | 10394780 | | | | 51.97 | 4760.81 |
| 18 | | | | | 6 | 456 | | 8677152 | | | | 52.06 | 3956.78 |
| 19 | | | | | 6 | 414 | | 8817120 | | | | 52.90 | 3650.29 |
| 20 | | | | | 5 | 392 | | 10446620 | | | | 52.23 | 4095.08 |
| 21 | | | | | 6 | 436 | | 9265536 | | | | 55.59 | 4039.77 |
| 22 | 7.9 | 50 | 0.06 | 0.05 | 6 | 346 | 140 | 8697024 | 434.85 | 0.52 | 0.43 | 52.18 | 3009.17 |
| 23 | | | | | 0 | 0 | | 11979360 | | | | 0.00 | 0.00 |
| 24 | | | | | 0 | 0 | | 9977472 | | | | 0.00 | 0.00 |
| 25 | | | | | 0 | 0 | | -558706 | | | | 0.00 | 0.00 |
| 26 | | | | | 0 | 0 | | -448286 | | | | 0.00 | 0.00 |
| 27 | | | | | 0 | 0 | | 413925 | | | | 0.00 | 0.00 |
| 28 | | | | | 0 | 0 | | 399038 | | | | 0.00 | 0.00 |
| 29 | 7.4 | 32 | 0.56 | 0.05 | 5 | 452 | 74 | 386156 | 12.36 | 0.22 | 0.02 | 1.93 | 174.54 |
| 30 | | | | | 5 | 436 | | 2022256 | | | | 10.11 | 881.70 |

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2010 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 5 | 444 | | 7140442 | | | | 35.70 | 3170.36 |
| 2 | | | | | 6 | 440 | | 7127568 | | | | 42.77 | 3136.13 |
| 3 | | | | | 7 | 428 | | 4063910 | | | | 28.45 | 1739.35 |
| 4 | | | | | 8 | 406 | | 3730320 | | | | 29.84 | 1514.51 |
| 5 | | | | | 11 | 410 | | -456564 | | | | -5.02 | -187.19 |
| 6 | 7.4 | 34 | 0.31 | 0.05 | 5 | 442 | 73 | -418971 | -14.25 | -0.13 | -0.02 | -2.09 | -185.19 |
| 7 | | | | | 5 | 456 | | -443828 | | | | -2.22 | -202.39 |
| 8 | | | | | 6 | 412 | | 1457741 | | | | 8.75 | 600.59 |
| 9 | | | | | 8 | 434 | | 4285785 | | | | 34.29 | 1860.03 |
| 10 | | | | | 6 | 452 | | 5835283 | | | | 35.01 | 2637.55 |
| 11 | | | | | 5 | 470 | | 4584730 | | | | 22.92 | 2154.82 |
| 12 | | | | | 9 | 460 | | 2824935 | | | | 25.42 | 1299.47 |
| 13 | 7.4 | 51 | 0.56 | 0.05 | 6 | 466 | 65 | 4158346 | 212.08 | 2.33 | 0.21 | 24.95 | 1937.79 |
| 14 | | | | | 11 | 478 | | 5248281 | | | | 57.73 | 2508.68 |
| 15 | | | | | 10 | 480 | | 3395779 | | | | 33.96 | 1629.97 |
| 16 | | | | | 0 | 0 | | 3357763 | | | | 0.00 | 0.00 |
| 17 | | | | | 0 | 0 | | 674637 | | | | 0.00 | 0.00 |
| 18 | | | | | 0 | 0 | | 30655 | | | | 0.00 | 0.00 |
| 19 | | | | | 0 | 0 | | 160324 | | | | 0.00 | 0.00 |
| 20 | 7.5 | 46 | 0.56 | 0.05 | 6 | 484 | 69 | 96310 | 4.43 | 0.05 | 0.00 | 0.58 | 46.61 |
| 21 | | | | | 5 | 400 | | -234455 | | | | -1.17 | -93.78 |
| 22 | | | | | 7 | 380 | | 550748 | | | | 3.86 | 209.28 |
| 23 | | | | | 5 | 354 | | 1156723 | | | | 5.78 | 409.48 |
| 24 | | | | | 7 | 352 | | 2747002 | | | | 19.23 | 966.94 |
| 25 | | | | | 7 | 310 | | 2025216 | | | | 14.18 | 627.82 |
| 26 | | | | | 7 | 311 | | 2068934 | | | | 14.48 | 643.44 |
| 27 | 7.4 | 51 | 0.5 | 0.05 | 5 | 320 | 139 | 3316205 | 169.13 | 1.66 | 0.17 | 16.58 | 1061.19 |
| 28 | | | | | 22 | 206 | | 3948566 | | | | 86.87 | 813.40 |
| 29 | | | | | 17 | 210 | | 2597443 | | | | 44.16 | 545.46 |
| 30 | | | | | 28 | 208 | | 15665180 | | | | 438.63 | 3258.36 |
| 31 | | | | | 0 | 0 | | 10242720 | | | | 0.00 | 0.00 |

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nov | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2010 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 0 | 0 | | -381335 | | | | 0.00 | 0.00 |
| 2 | | | | | 0 | 0 | | 973987 | | | | 0.00 | 0.00 |
| 3 | 7.2 | 61 | 0.42 | 0.05 | 12 | 196 | 223 | -399298 | -24.36 | -0.17 | -0.02 | -4.79 | -78.26 |
| 4 | | | | | 0 | 0 | | -652942 | | | | 0.00 | 0.00 |
| 5 | | | | | 0 | 0 | | -384100 | | | | 0.00 | 0.00 |
| 6 | | | | | 0 | 0 | | -501803 | | | | 0.00 | 0.00 |
| 7 | | | | | 0 | 0 | | -465627 | | | | 0.00 | 0.00 |
| 8 | | | | | 0 | 0 | | -404352 | | | | 0.00 | 0.00 |
| 9 | | | | | 0 | 0 | | -555276 | | | | 0.00 | 0.00 |
| 10 | 7.3 | 62 | 0.54 | 0.05 | 5 | 320 | 158 | -460927 | -28.58 | -0.25 | -0.02 | -2.30 | -147.50 |
| 11 | | | | | 0 | 0 | | -379028 | | | | 0.00 | 0.00 |
| 12 | | | | | 0 | 0 | | -466387 | | | | 0.00 | 0.00 |
| 13 | | | | | 0 | 0 | | -449479 | | | | 0.00 | 0.00 |
| 14 | | | | | 0 | 0 | | -496325 | | | | 0.00 | 0.00 |
| 15 | | | | | 0 | 0 | | -382674 | | | | 0.00 | 0.00 |
| 16 | | | | | 0 | 0 | | -320250 | | | | 0.00 | 0.00 |
| 17 | 7.4 | 48 | 0.59 | 0.05 | 7 | 244 | 136 | -302435 | -14.52 | -0.18 | -0.02 | -2.12 | -73.79 |
| 18 | | | | | 0 | 0 | | -515506 | | | | 0.00 | 0.00 |
| 19 | | | | | 0 | 0 | | -473204 | | | | 0.00 | 0.00 |
| 20 | | | | | 0 | 0 | | -406391 | | | | 0.00 | 0.00 |
| 21 | | | | | 0 | 0 | | -328000 | | | | 0.00 | 0.00 |
| 22 | | | | | 0 | 0 | | -300059 | | | | 0.00 | 0.00 |
| 23 | | | | | 0 | 0 | | -284144 | | | | 0.00 | 0.00 |
| 24 | 7.5 | 40 | 0.58 | 0.05 | 5 | 408 | 80 | -274026 | -10.96 | -0.16 | -0.01 | -1.37 | -111.80 |
| 25 | | | | | 0 | 0 | | -260876 | | | | 0.00 | 0.00 |
| 26 | | | | | 0 | 0 | | -245419 | | | | 0.00 | 0.00 |
| 27 | | | | | 0 | 0 | | -239423 | | | | 0.00 | 0.00 |
| 28 | | | | | 0 | 0 | | -230740 | | | | 0.00 | 0.00 |
| 29 | | | | | 0 | 0 | | -221054 | | | | 0.00 | 0.00 |
| 30 | | | | | 0 | 0 | | -209183 | | | | 0.00 | 0.00 |

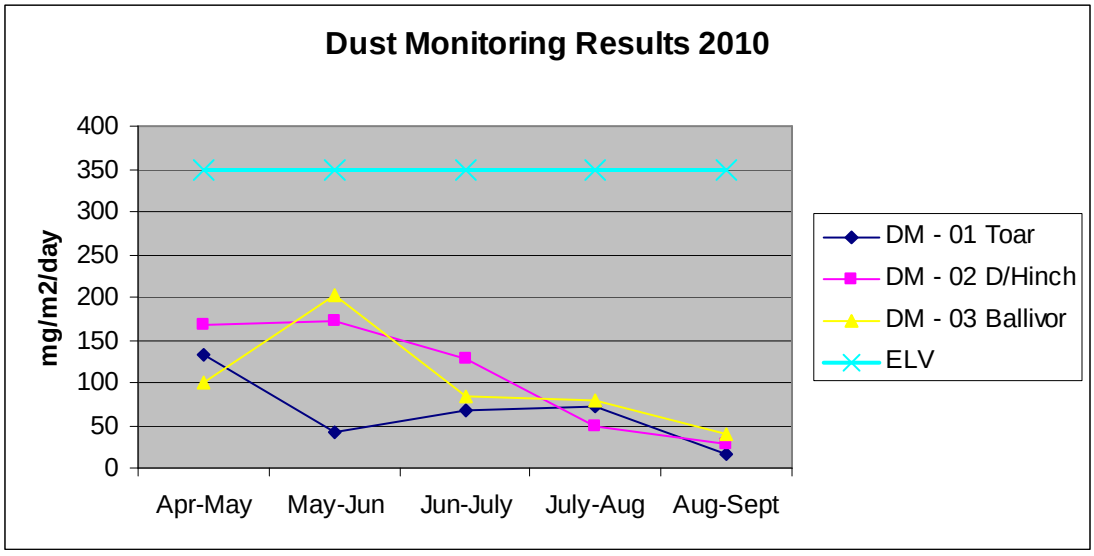
| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dec | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2010 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | 7.6 | 40 | 0.49 | 0.05 | 5 | 466 | 70 | -211429 | -8.46 | -0.10 | -0.01 | -1.06 | -98.53 |
| 2 | | | | | 0 | 0 | | -202712 | | | | 0.00 | 0.00 |
| 3 | | | | | 0 | 0 | | -197052 | | | | 0.00 | 0.00 |
| 4 | | | | | 0 | 0 | | -193683 | | | | 0.00 | 0.00 |
| 5 | | | | | 0 | 0 | | -194530 | | | | 0.00 | 0.00 |
| 6 | | | | | 0 | 0 | | -189890 | | | | 0.00 | 0.00 |
| 7 | | | | | 0 | 0 | | -186244 | | | | 0.00 | 0.00 |
| 8 | | | | | 0 | 0 | | -182736 | | | | 0.00 | 0.00 |
| 9 | 7.4 | 52 | 0.69 | 0.05 | 5 | 412 | 75 | -180317 | -9.38 | -0.12 | -0.01 | -0.90 | -74.29 |
| 10 | | | | | 0 | 0 | | -174632 | | | | 0.00 | 0.00 |
| 11 | | | | | 0 | 0 | | 2428186 | | | | 0.00 | 0.00 |
| 12 | | | | | 0 | 0 | | 5484327 | | | | 0.00 | 0.00 |
| 13 | | | | | 0 | 0 | | 4083350 | | | | 0.00 | 0.00 |
| 14 | | | | | 0 | 0 | | 3161117 | | | | 0.00 | 0.00 |
| 15 | 7.4 | 35 | 0.56 | 0.05 | 5 | 326 | 69 | 2871590 | 100.51 | 1.61 | 0.14 | 14.36 | 936.14 |
| 16 | | | | | 0 | 0 | | 2817418 | | | | 0.00 | 0.00 |
| 17 | | | | | 0 | 0 | | 5963846 | | | | 0.00 | 0.00 |
| 18 | | | | | 0 | 0 | | 7921411 | | | | 0.00 | 0.00 |
| 19 | | | | | 0 | 0 | | 6719846 | | | | 0.00 | 0.00 |
| 20 | | | | | 0 | 0 | | 2852841 | | | | 0.00 | 0.00 |
| 21 | | | | | 0 | 0 | | 1303690 | | | | 0.00 | 0.00 |
| 22 | | | | | 0 | 0 | | 4183920 | | | | 0.00 | 0.00 |
| 23 | 7.4 | 36 | 0.63 | 0.05 | 6 | 315 | 73 | 4125859 | 148.53 | 2.60 | 0.21 | 24.76 | 1299.65 |
| 24 | | | | | 5 | 390 | | 4124995 | | | | 20.62 | 1608.75 |
| 25 | | | | | 5 | 418 | | 4515005 | | | | 22.58 | 1887.27 |
| 26 | | | | | 5 | 396 | | 5090169 | | | | 25.45 | 2015.71 |
| 27 | | | | | 6 | 386 | | 5104253 | | | | 30.63 | 1970.24 |
| 28 | | | | | 6 | 402 | | 27202180 | | | | 163.21 | 10935.28 |
| 29 | 7.2 | 49 | 0.52 | 0.06 | 6 | 398 | 129 | 23855900 | 1168.94 | 12.41 | 1.43 | 143.14 | 9494.65 |
| 30 | | | | | 5 | 278 | | 16781470 | | | | 83.91 | 4665.25 |
| 31 | | | | | 5 | 296 | | 13734970 | | | | 68.67 | 4065.55 |

**0:** Insufficient amount of sample due to low flow or technical fault.

# APPENDIX 4

## Dust Monitoring Results.

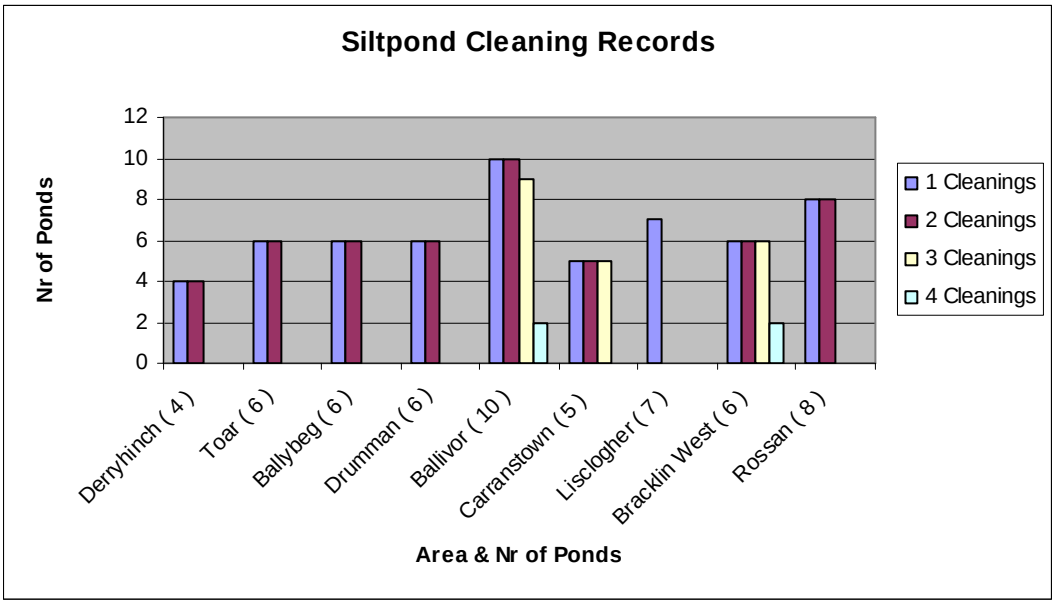
| Dust Monitoring Results 2010 | | | |
|---|---|---|---|
| Licence:P0501-01 | | | |
| Works: Derrygreenagh | | | |
| **Sample Period** | **DM - 01 Toar** | **DM - 02 D/Hinch** | **DM - 03 Ballivor** |
| Apr-May | 133 | 167 | 100 |
| May-Jun | 42 | 172 | 202 |
| Jun-July | 67 | 128 | 83 |
| July-Aug | 72 | 50 | 78 |
| Aug-Sept | 17 | 28 | 39 |



# APPENDIX 5

## De-silting Programme Review.

| Siltpond Cleaning Programme 2010 | | | | |
|---|---|---|---|---|
| IPPC Licence: P0501-01 | | | | |
| Works: Derrygreenagh | | | | |
| **Bog Area & Nr Ponds** | **1 Cleanings** | **2 Cleanings** | **3 Cleanings** | **4 Cleanings** |
| Derryhinch ( 4 ) | 4 | 4 | | |
| Toar ( 6 ) | 6 | 6 | | |
| Ballybeg ( 6 ) | 6 | 6 | | |
| Drumman ( 6 ) | 6 | 6 | | |
| Ballivor ( 10 ) | 10 | 10 | 9 | 2 |
| Carranstown ( 5 ) | 5 | 5 | 5 | |
| Lisclogher ( 7 ) | 7 | | | |
| Bracklin West ( 6 ) | 6 | 6 | 6 | 2 |
| Rossan ( 8 ) | 8 | 8 | | |



BORD NA MÓNA

BORD NA MÓNA ENERGY LIMITED

# Annual Environmental Report 2011
# P0501-01

**March 2012**

Bord na Móna today operates 5 main subsidiary companies in more than 20 locations throughout Ireland, the UK and USA. The principal businesses are in the Energy, Resource Recovery, Horticulture, Home Heating and Wastewater Treatment and Air Pollution Abatement markets. The company also engages in an extensive rehabilitation program to develop its peat lands in an environmentally sustainable manner.




Bord na Móna has long recognised the need to diversify its activities in order to secure a sustainable future. In this context we identified the energy and resource recovery sectors as appropriate areas of growth and development, given our assets, strengths and skills. Significant challenges face Ireland in meeting the country's needs to provide secure sustainable energy and manage waste while minimising the impact on the environment.

Bord na Móna is in a strong position to contribute to dealing with these challenges. We have a unique mixture of assets, experience and innovation which will enable us to cross-link our activities in energy, water and resource recovery to provide products and services which will meet Ireland's needs. We also have the capacity to become an exemplar for others to follow in these fields.
With this background we have scoped out a new vision for the future sustainable development of Bord na Móna.

Following on from our vision, we have developed a new mission for Bord na Móna which the Company is committed to achieving.
In 1934 the Turf Development Board was formed to ‘develop and improve the turf industry.' The experience of fuel shortages during the war re-enforced the Irish State's commitment to developing the country's bogs. In 1944 the TDB was asked to devise and submit a comprehensive programme, the outcome was the transformation in 1946 of the TDB into Bord na Móna. The Board was given a mandate to increase the use of peat as a fuel and in energy production. Markets for the use of moss peat in horticulture were also developed.
In 1990 Bord na Móna implemented a divisionalised and decentralised structure, designed to delegate responsibility downwards ensuring a sharper focus on each profit centre and a greater spirit of enterprise.

## *Group Vision*




The vision statement defines the Company's purpose, in terms of its values.
Values are guiding beliefs about how things should be done.
The vision statement communicates both the purpose and values of Bord na Móna.
For employees, it gives direction about how they are expected to behave and inspires them to give their best. Shared with customers, it shapes the customers' understanding of why they should work with Bord na Móna.

Bord na Móna will seek solutions that optimise the creative energy and potential of the organisation, driven by long term goals and the organisation's vision and mission.
In this context our devolved business units will align their vision and strategic planning with the global direction provided.

Consistent with our vision, innovation will once again return to the core of everything we do. We will capitalise on opportunities to cross fertilise our unique range of skills and technologies that add value and are socially and environmentally sustainable.
Greater focus will be placed on managing and developing our land assets in a responsible and sustainable manner. Our award winning initiatives at Lough Boora (Co. Offaly) and Oweninny (Co Mayo), provide shining examples of what can be achieved

## *Group Mission*

We conduct our affairs with openness, honesty and integrity.
We are Ireland's leading environmentally responsible integrated utility service provider encompassing electricity, heating solutions, resource recovery, water, horticulture and related services.
We capitalise on international opportunities where we have a competitive advantage.
We achieve continuing growth through superior customer service, outstanding quality and innovation delivered through the excellence and commitment of our people.
We engage in sustainable profitable business in the communities we serve, which is rewarding and challenging for employees and other stakeholders.

## Contents

**1.0 Introduction**

1.1 IPPC Licence Register No

1.2 Name & Location of Site

1.3 Brief Description of Activities

1.4 Environmental Management of the Company

1.5 Environmental Policy Statement

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**Appendix 1:** Emissions to Water Monitoring Results. (Bogs)

**Appendix 2:** Emissions to Water Monitoring Results. (Yards)

**Appendix 3:** Emissions to Water Monitoring Results. (Composite)

**Appendix 4:** Emissions to Air Monitoring Results.

**Appendix 5:** De-silting Programme Review

## 1.0 Introduction

## 1.1 IPPC Licence No 501-01

## 1.2 Name & Location of Site

| | |
|---|---|
| **Name:** | Bord na Mona Energy Limited. |
| **Address:** | Derrygreenagh Works, Rochfortbridge, Mullingar, Co. Westmeath |
| **Telephone No:** | 044 9222181 |
| **Contact Name:** | Eamonn Mulhall |
| **Position**: | Resource Manager |
| **National Grid Reference**: | E249450 N 238140 |

## 1.3 Description of Activities

**Peat Milling Operations.**

For milled peat production the bog is laid out in a series of rectangular fields of varying length and 15m wide with drains located between. There are essentially four operations involved in milled peat production:
Milling.
Harrowing.
Ridging.
Harvesting.

**Milling.**
Special milling machines work there way along the fields, milling approximately 15mm of peat of the top of the bog in a pass.

**Harrowing**
In the course of drying, the milled peat is turned a number of times to avail of the drying conditions. This is achieved with a machine called a harrow. The milled peat is harrowed until its moisture content is down to approximately 40-50%, which can take up to two to three days, weather depending.

**Ridging**
The dry peat is then scraped into long ridges running down the centre of each field. This is done with a ridger, a machine consisting of a series of blades in the shape of a v that opens the full width of the field.

**Harvesting**
During harvesting every eleventh field is used to stockpile the peat, with this field receiving the milled peat from the five fields either side.

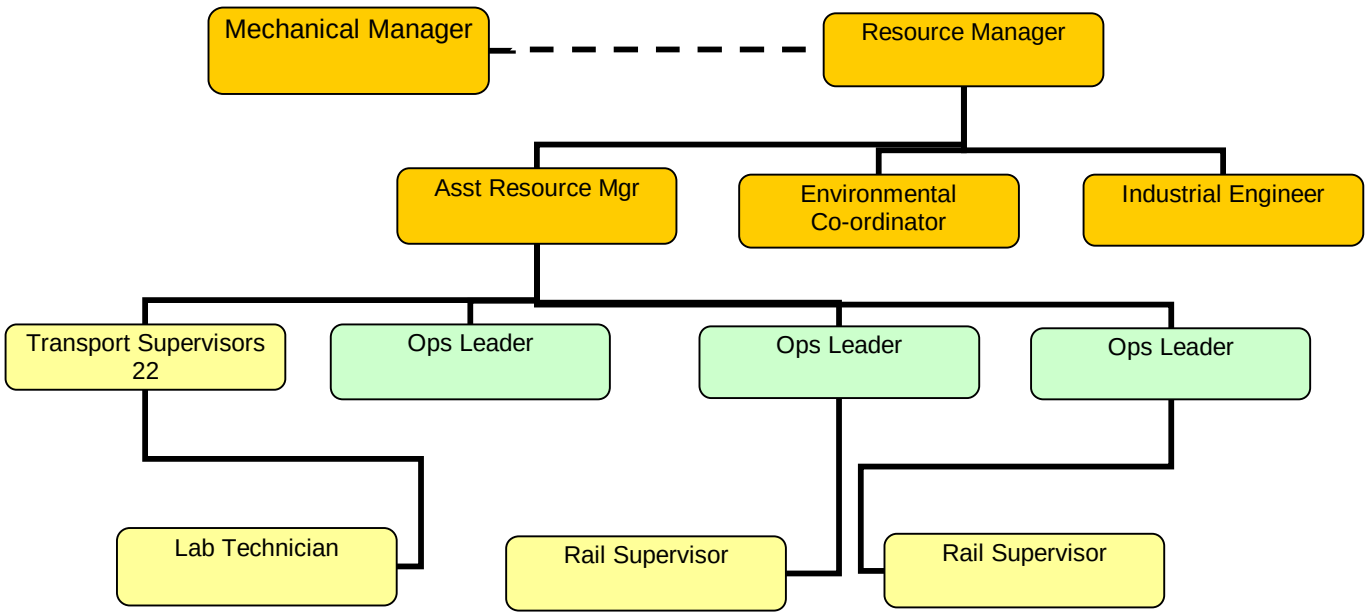
The milled peat is then transported via the existing network of peatland railways or via road to one of the following locations.
Power station
Horticultural Factory.
Briquette Factory.

## 1.4 Environmental Management of the Company

The organisational structure within the Derrygreenagh Group is presented in the flow chart below.

# Group

## Environmental Responsibilities




### 1.5 Environmental Policy

# BORD NA MÓNA

**BORD NA MÓNA ENERGY LIMITED**
**Derrygreenagh,Rochfortbridge,Mullingar,Co-Westmeath.**

Bord na Mona Energy Limited is a commercial semi-state body with responsibility to develop Ireland's peat resources in the national interest.

Bord na Mona Energy Limited is committed to gather and make available information on all aspects of its environmental impact and to help improve understanding among the public generally of its role and the importance of Irish peatlands.

Bord na Mona Energy Limited recognises the importance of peatland conservation.

Bord na Mona Energy Limited will leave behind all areas it owns as either an economically or socially integrated resource of a high environmental value.

Bord na Mona Energy Limited seeks to conduct all aspects of its business in an environmentally sensitive value.

Bord na Mona Energy Limited operates an environmental management system specifically addressing the following impacts.

Discharge to water.
Emissions to atmosphere.
Waste disposal.
Use of natural resources.
Noise, vibration, odour, dust and visual effects.
Natural environment and eco-system.

The environmental management system will be monitored, maintained and continually improved.

A system of regular environmental audits will be put in place.

Bord na Mona Energy Limited will continue research and development into all aspects of its environmental impact.

This statement is published and is available at all locations within the division and its Contents are brought to the attention of all employees.

## 2.0 Summary Information

### 2.1 Emissions to Water Summary

2.1.1 Silt Pond Emissions

**Surface Waters**

Comment

Surface water monitoring was carried out four times during the reporting period. In total analysis was carried out at six different locations. The locations are as follows, Derryhinch @ SW4, Ballybeg @ SW13, Bracklin @ SW26, Carranstown @ SW31, Rossan @ SW46 and Carrick @ SW4A. The parameters measured during each sampling event were as follows.
Total Phosphorus, Total Solids, Suspended Solids, pH, Ammonia, Colour and COD.
In general results were constant across all parameters at each monitoring location. October was the wettest month with 123.5 mm of rainfall recorded and March the driest with 29.4 mm recorded. Flow rates appear to have had no adverse effect on suspended solids results.
The quarterly grab sampling programme was 100% compliant for the year, which is an improvement on 2010 which was 96% compliant.

**pH** values were between 6.6 and 8.1, with emission limit values being of the range 6 and 9. pH values of waters emanating from production peatlands appear to remain constant and in line with background levels. On average pH values were 0.05 pH units higher than 2010 levels.

**Suspended solids** varied from 5mg/l to 24mg/l and would depend on activities (piping, ditching) etc in the catchments at the time of sampling. The average range for suspended solids was 6.2mg/l which was down on the 2010 average.

**Ammonia** values ranged from 0.04 mg/l and 2.48 mg/l.The I/PV for A3 waters is of the range 4mg/l. It is however not unusual for surface waters emanating from production peatlands to be slightly elevated. Overall ammonia levels are slightly down on 2010 figures with the average being 1.16 mg/l in 2011 as opposed to 1.6 mg/l in 2010.

**COD** values ranged from 30 mg/l to 123 mg/l. Overall COD results were below 2010 levels. The I/PV for A3 waters is of the range 40mg/l. Only one result was above the Bord na Mona set trigger level of 100 mg/l, however investigations showed no evidence of any contributory factors causing such result. That particular result was identified during the third quarter monitoring event in August, when reduced flow and increased temperature impinge on COD results.

**Flow** rates were slightly up on 2010 sampling events. This in part is dependent on the climatic conditions on the chosen day of sampling. However total rainfall for 2011 only varied by 9mm compared with 2010. March was the driest month with 29.4mm and October the wettest with 123.5mm of rainfall recorded.

**Total Phosphorus** results were consistently low and ranged from 0.05 mg/l to 0.49 mg/l. On average the total phosphorus result was higher than 2010, the difference being minute (0.00375 mg/l).

The sampling locations will remain the same during 2012.
At the request of the Agency, analysis results are now demonstrated in both tabular and graphical format.

Surface Water Results are attached in Appendix 1.

### 2.1.2 Yard Discharges

**Yard Runoff**

Comment

Yard runoff monitoring took place at two locations during the reporting period. Derrygreenagh @ SWE 2 and Rossan @ SWE 1. Sampling frequency was monthly and COD was the parameter requiring analysis. Results were very satisfactory for the period at both locations; with results consistently well below trigger levels with the exception of the February and August result at Rossan which exceeded trigger levels. Investigations found machinery had been washed down immediately prior to the February sampling event and rainwater had been evacuated from the main bund prior to the August sampling event, subsequent results were very satisfactory. Overall the average result at each location was slightly above those of 2010.
Although not having a specific licence emission limit value, a trigger level of 100 mg/l has been set in relation to COD results, along with the weekly visual inspections. Sampling will continue at the same locations during 2012.

Yard Emission Results are attached in Appendix 2.

### 2.1.3 Composite Sampler Report

**Composite Sampling**

Comment

The composite sampler has been operating at Toar Bog SW15 during the reporting period. The parameters measured were Total Phosphorus, Total Solids, Suspended Solids, pH, Ammonia, Colour and COD, with Suspended solids being the only parameter with an emission limit value of ( 35mg/l ). The sampler worked well during the reporting period and was calibrated by an Water Technology Ltd during the reporting period. In general results were satisfactory with no non-compliance's being recorded for the period. Analysis of the 2010 results compared with the 2011 results indicate no great difference in results in relation to pH, Ammonia, Phosphorus, COD and Suspended Solids. The composite sampler was to be relocated during 2012 to another area as suggested by the Agency. A proposal outlining same was to be submitted to the Agency for approval, however this may change as intensive production is due to recommence at its current location.
Composite Sampler Results are contained in Appendix 3.

2.1.4 Emissions to Water Non-compliance's

| Emissions to Water Non-Compliances 2011 | | |
|---|---|---|
| Licence: P0501-01 | | |
| Works: Derrygreenagh | | |
| **Type** | **Non-Compliances** | **Location / SW Nr** |
| Composite | 0 | N/A |
| Quarterly Grab | 0 | N/A |
| Monthly Yard | 0 | N/A |
| **Totals** | **0** | |

There were no non-compliance's in relation to emissions to water during the reporting period.

## 2.2 Emissions to Air

2.2.1 Dust Monitoring

Comment

Dust monitoring was carried out on five occasions between April and September. Each monitoring event lasted between 28 and 32 days and the Bergerhoff method of collection was used.
The monitoring locations were as follows: Toar DM01, Derryhinch DM02 and Ballivor DM03. There was one non-compliance during the May-June monitoring event at DM02 and the Agency was informed. That particular result being 406mg/$m^2$/day against a licence limit of 350mg/$m^2$/day.

Sampling will continue at the same locations during 2012.

Dust monitoring results are contained in appendix 4.

2.2.2 Emissions to Air Non-compliance's

| Dust Non-Compliances 2011 | |
|---|---|
| Licence:P0501-01 | |
| Works: Derrygreenagh | |
| **Location / DM Nr** | **Non-Compliances** |
| DM-02 | 1 |
| **Total** | **1** |

There was one dust non-compliance during the reporting period and the Agency was informed. No complaints of a dust nature were received at the time.

## 2.3 Waste Arisings

### 2.3.1 Non-Hazardous Waste

**Non Hazardous Waste Data 2011**

**Licence: P0501-01**

**Works: Derrygreenagh**

| Type | Tonnes | EWC Code | Contractor | Licence Nr |
|---|---|---|---|---|
| Skips | 73.59 | 20 03 01 | AES | WP-OY-08-601-01 |
| Wheelie Bins | 6.27 | 20 03 01 | AES | WP-OY-08-601-01 |
| Polyethlene | 120.10 | 02 01 04 | Leinster Environmentals | WP 2008/06 |
| Scrap Steel | 64.92 | 17 04 07 | AES | WP-OY-08-601-01 |
| Timber Pallets | 10.20 | 15 01 03 | AES | WP-OY-08-601-01 |
| Silt Pond Cleanings | 228.84 | 01 01 02 | Bord na Mona | IPPC P0501-01 |
| **Totals** | **503.92** | | | |

**Note:** Polyethylene and Steel are recycled. Skips go to an AES Mixed Recycling Facility.

### 2.3.2 Hazardous Waste

**Hazardous Waste Data 2011**

**Licence: P0501-01**

**Works: Derrygreenagh**

| Type | Tonnes | EWC Code | Contractor | Licence Nr | Destination |
|---|---|---|---|---|---|
| Waste Oil | 40.22 | 13 02 05 | Enva Ireland Ltd Portlaoise | 184-1 | Portlaoise |
| Oil Filters | 1.15 | 16 01 07 | Enva Ireland Ltd Portlaoise | 184-1 | Portlaoise |
| Oily Rags | 1.50 | 15 02 02 | Enva Ireland Ltd Portlaoise | 184-1 | Portlaoise |
| Lead Acid Batt | 0.77 | 16 06 01 | Enva Ireland Ltd Portlaoise | 184-1 | Portlaoise |
| Alkaline Batteries | 0.045 | 20 01 33 | KMK Metals Tullamore | W0113-03 | Tullamore |
| Dry Solid Oily Waste | 0.580 | 15 02 02 | Enva Ireland Ltd Portlaoise | 184-1 | Portlaoise |
| Parts Wash | 1.38 | 11 01 13 | Safety Kleen, Tallaght, Dublin | 99-1 | Dublin |
| Waste Paint | 0.31 | 08 01 11 | Enva Ireland Ltd Portlaoise | 184-1 | Portlaoise |
| **Total** | **45.95** | | | | |

## 2.4 Energy and Water Consumption

### 2.4.1 Energy

| Energy Consumption 2011 | | | | |
|---|---|---|---|---|
| Licence: P0501-01 | | | | |
| Works: Derrygreenagh | | | | |
| **Units** | **Diesel ( Litres )** | **Petrol (Litres)** | **Electricity (Units)** | **Peat Briquettes (Tonnes)** |
| **Totals** | 904218.4 | 0 | 0 | 20 |
| **MW Hours** | 9187.8 | 0 | 0 | 103 |
| **Total MW Hours** | **9290.8** | | | |

**Note:** Due to issues with Electric Ireland's web site which is outside Bord Na Mona's control, accurate electrical consumption figures were not available. We are informed that this will be resolved in the coming weeks.

## 2.5 Environmental Incidents and Complaints

### 2.5.1 Incidents

| Environmental Incidents 2011 | |
|---|---|
| Licence: P0501-01 | |
| Works: Derrygreenagh | |
| | **Number** |
| Incidents | 2 |
| Requiring corrective action | 2 |
| **Category** | |
| Water | |
| Air | 2 |
| Procedural | |
| Miscellaneous | |
| **Total** | **2** |

There were two environmental incidents during the reporting period. One related to a dust complaint at Ballybeg bog in April and the other was the above mentioned dust non-compliance in June. On both occasions the Agency was informed.

2.5.2 Complaints

| Environmental Complaints 2011 | |
|---|---|
| Licence:P0501-01 | |
| Works: Derrygreenagh | |
| | Number |
| Complaints | 1 |
| Requiring corrective action | 1 |
| Category | |
| Water | 0 |
| Air | 1 |
| Procedural | 0 |
| Miscellaneous | |
| Total | 1 |

There was one complaint of an environmental nature during the reporting period and the Agency was informed.

## 3.0 Management of the Activity

### 3.1 Achievement of Objectives & Targets 2011

| Project | Description & Status |
|---|---|
| **Project 1:**<br><br>Reduction of fugitive dust emissions. | **Training.**<br>Train all employees in environmental matters. Training will be by means of the screening of an environmental DVD, followed by a power point presentation.<br><br>**Status**<br>In total 165 employees received environmental training.<br><br>**Hydraulic Harrows.**<br>One Hydraulic harrow will be deployed at Derryhinch bog during the 2011 production season.<br><br>**Status**<br>New Hydraulic harrows were deployed at Derryhinch and Ballivor bogs during the 2011 production season.<br><br>**Headland Peat Collection.**<br>Continue with the collection of headland peat, particularly at dust sensitive locations.<br><br>**Status**<br>Headland peat was collected as part of the peat lifting process and included in general peat return figures. |
| **Project 2:** | **Waste Streamlining.** |

| | |
|---|---|
| Waste Management | AES Ltd, a subsidiary of Bord na Mona handles all elements of Bord na Mona's waste.<br>Key account managers dedicated to Bord na Mona are in place.<br><br>**Status**<br>Ongoing<br>The service included the co-ordination of all waste streams ensuring the correct waste stream was dealt with by the appropriate waste provider. The service also included the issuing of quarterly reports. |
| **Project 3:**<br><br>Minimisation of Suspended Solids. | **On Site Inspections.**<br>Train all employees in environmental matters. Training will be by means of the screening of an environmental DVD, followed by a power point presentation.<br>**Status**<br>In total 165 employees received environmental training. |
| **Project 4:**<br><br>Effective spill leak management of mobile fuelling units. | **Research and Development.**<br>Increased bund provisions where required, will be provided, in 2011.<br>**Status**<br>Addition barrel bunds were purchased and deployed at the waste oil tank in Derrygreenagh.<br>In addition to this additional containment booms were purchased and are held in storage as backup to existing stocks. |
| **Project 5:**<br><br>Collection storage and reuse of polyethylene. | **Identify Recyclers.**<br>Continue with the recycling of polyethylene. The sourcing of more recycling contractors will be ongoing.<br>**Status**<br>In total 120.1 tonnes of polyethylene was sent for recycling in 2011. |
| **Project 6:**<br><br>Energy Management | **Review of Energy Aspects**<br>As part of an energy management process, a review of energy aspects will continue to take place identifying the significant energy users of the licensee.<br>**Status**<br>Energy management is ongoing with the energy standard EN 50001 currently being implemented at Bord na Mona Mountdillon. Should this be successful it will be extended to all Bord na Mona locations. |

### 3.2 Environmental Management Programme Proposal 2012

| Project | Description & Status |
|---|---|
| **Project 1:**<br><br>Reduction of fugitive dust emissions. | **Training.**<br>Continue to train all employees in environmental matters. Training will be by means of a new four module training programme delivered by dedicated Bord na Mona Training Specialists. This new training programme includes Environmental Compliance _ IPPC, Biodiversity, Archaeology and Energy Management.<br><br>**Hydraulic Harrows.**<br>Hydraulic harrows will be deployed at Derryhinch, Ballivor and Rossan bog during the 2011 production season.<br><br>**Headland Peat Collection.**<br>Continue with the collection of headland peat, particularly at dust sensitive locations. |
| **Project 2:**<br><br>Waste Management | **Waste Streamlining.**<br>Waste streamlining is a project we are particularly interested in pursuing and hope to reduce wastes in the future and be more efficient in dealing with all aspects of waste management |
| **Project 3:**<br><br>Minimisation of Suspended Solids. | **Training.**<br>Continue to train all employees in environmental matters. Training will be by means of a new four module training programme delivered by dedicated Bord na Mona Training Specialists. This new training programme includes Environmental Compliance - IPPC, Biodiversity, Archaeology and Energy Management. |
| **Project 4:**<br>Effective spill leak management of mobile fuelling units. | **Research and Development.**<br><br>Increased bund provisions where required will be provided in 2012. |
| **Project 5:**<br><br>Collection storage and reuse of polyethylene. | **Identify Recyclers.**<br>Continue with the recycling of polyethylene. The sourcing of more recycling contractors will be ongoing. |
| **Project 6:**<br><br>Energy Management | **Review of Energy Aspects**<br>As part of an energy management process, a review of energy aspects will take place identifying the significant energy users of the licensee. |

### 3.3 Environmental Expenditure

| Environmental Expenditure 2011 | |
|---|---|
| Licence:P0501-01 | |
| Works: Derrygreenagh | |
| **Description** | **Cost €** |
| Capital Costs | 27,356.02 |
| Silt Control | 90,303.92 |
| Analytical & Consultancy Costs | 10,584.00 |
| EPA Fees | 11,473.60 |
| Bog Rehabilitation | 108,663.02 |
| Waste Management | 42,003.76 |
| **Total** | **290,384.32** |

## 4.0 Licence Specific Reports

### 4.1 Surface Water Discharge Monitoring Location Programme Review

It is proposed to continue monitoring at the same locations in 2012 as monitored in 2011. Should it be deemed necessary for any reason during the coming year additional monitoring will be initiated. Safe access to all monitoring locations will be maintained. Currently Bord na Mona are reviewing all silt ponds for upgrade, installation of weirs, flap valves etc in line with the requirements of the South Eastern & Eastern River Basin Management Plans.

### 4.2 Bunding Programme

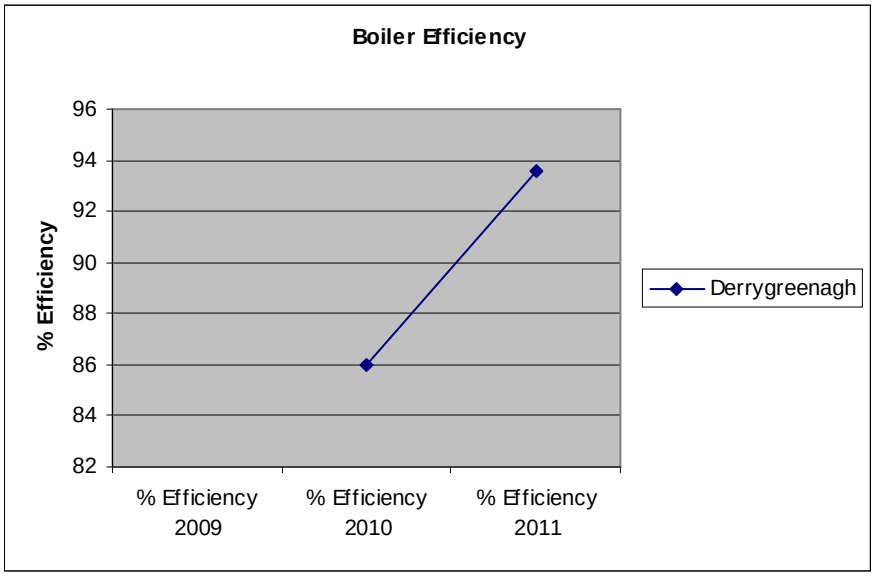
| Bund Locations & Numbers Derrygreenagh Works | | | | | |
|---|---|---|---|---|---|
| IPPC Licence: P0501-01 | | | | | |
| **Location** | **Bund Number** | **Last Tested** | **Status Pass/Fail** | **Repair Date** | **Next Test Due** |
| Derrygreenagh Main Bund | 501-37-01 | Jan-11 | Pass | N/A | Jan-13 |
| Derrygreenagh Waste Oil Bund | 501-37-02 | Jan-11 | Pass | N/A | Jan-13 |
| Ballivor Factory Bund | 501-08-03 | Sep-11 | Pass | N/A | Sep-13 |
| Rossan Tippler Bund | 501-07-04 | Nov-11 | Pass | N/A | Nov-13 |

Bund integrity testing took place at all bund locations during the reporting period. As is evident from the table all bund structures passed.

### 4.3 Boiler Combustion Efficiency

As mentioned in the 2009 AER a new boiler had been fitted at Derrygreenagh which was not tested. Efficiency testing was subsequently carried out in 2010 and 2011, the results of which are attached below.

| Boiler Efficiency 2011 | | | |
|---|---|---|---|
| Licence: P0501-01 | | | |
| Works: Derrygreenagh | | | |
| **Boiler Location** | **% Efficiency 2009** | **% Efficiency 2010** | **% Efficiency 2011** |
| Derrygreenagh | New Boiler fitted | 86 | 93.6 |




## 4.4 Resource consumption summary

| Resource Consumption 2011 | | | |
|---|---|---|---|
| Licence: P0501-01 | | | |
| Works: Derrygreenagh | | | |
| **Product** | **Tonnes Produced** | **Tonnes Sold** | **Customer** |
| Milled Peat | 153,721 | 143,587 | ESB |
| Moss | 68,533 | 77,175 | Horticulture |
| Turf | 0 | 0 | Fuels |
| Turf | 81 | 0 | Private |
| **Totals** | **222,335** | **220,762** | N/A |

| Proposed Production 2012 | |
|---|---|
| Licence: P0501-01 | |
| Works: Derrygreenagh | |
| **Product** | **Proposed Target** |
| Milled Peat | 192,559 |
| Moss | 65,000 |
| Turf Private | 81 |
| Turf Fuels | 0 |
| **Totals** | **257,640** |

### 4.5 De-Silting Report

Silt pond cleaning went well during the reporting period with all ponds being cleaned twice.
A table and graph of the cleaning schedule is attached in appendix 5.

### 4.6 Bog Development and Operational Programme

35 hectares of former sod bog were brought into production in Ballivor bog during the reporting period with a further 35 hectares scheduled to be brought in for the 2012 production season. There was 22 hectares of bog brought into production in Carranstown in 2011 and an additional 15 hectares in Rossan bog.

### Bog Rehabilitation Report

- There are large areas of cutaway within the Derrygreenagh group. Derryarkin, parts of Drumman and Ballybeg that are largely cutaway although still with aspects of peat production and transport.
- The ecology survey of the Derrygreenagh Bogs is complete and habitat maps, ecology reports and draft rehabilitation plans for each of the sites have been developed.
- The Roadstone sand and gravel site takes up considerable parts of Drumman and Derryarkin bogs.
- Peat production ceased in Cavemount Bog in 2011 and the rehabilitation plan for the site will be reviewed in 2012.
- Consultation with Heritage groups, NPWS is ongoing.

The above is an overview of the ongoing rehabilitation plan associated with this licence. There is a fully prepared plan retained at the licence site office, which includes Land Use maps for each licensed area updated in January 2012 and the habitat maps, future maps and ecology reports for each site.

### 4.8 Archaeological Report

There was no archaeology work carried during the reporting period.

## 5.0 Summary

The Derrygreenagh Group of Bogs endeavour to comply with all environmental issues. In 2011 we had one non-compliance regarding dust. We also had a dust complaint in the Ballybeg area. Trees have been purchased to grow a shelter belt in this area to try and alleviate the problem It is envisaged that a new Hydraulic Harrow will be purchased in the coming year.
There was no non-compliance from silt pond quarterly sampling events or from our composite sampler. Silt ponds were cleaned twice during the year, with more emphasis being put in ensuring silt ponds are cleaned regularly in the coming years. A new four module training programme delivered by dedicated Bord na Mona Training Specialists has also been developed during 2011/2012 and will be rolled out in the coming weeks. This new training programme includes Environmental Compliance - IPPC, Biodiversity, Archaeology and Energy Management.

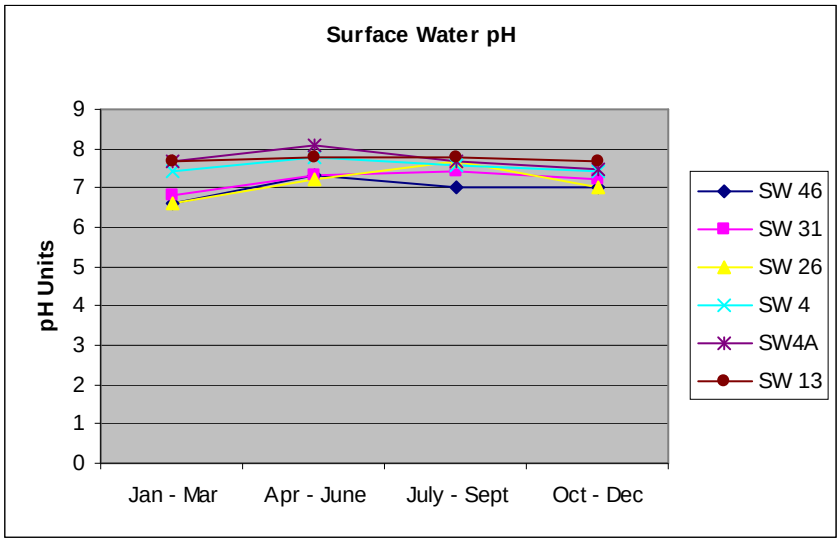
A total of 165 staff, both permanent and seasonal were trained in 2011, with this being an ongoing process.
Bord na Mona Energy Ltd are represented as stakeholders on the Management Group of both the Shannon River and Eastern River Basin District Management Systems, set up under the Water Framework Directive, and on the Steering Group of the Catchment Management of the River Barrow.

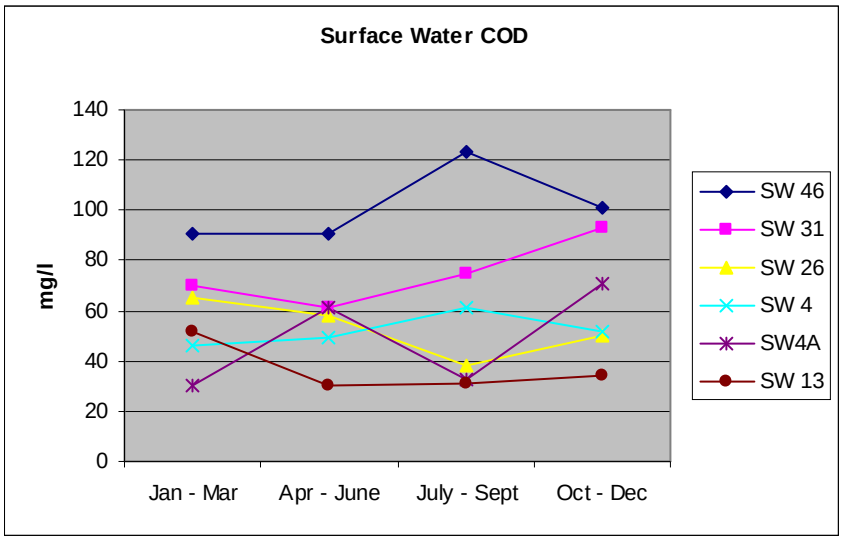
Bord na Mona would like to take this opportunity to advise the Environmental Protection Agency of its continued commitment to improving its environmental performance by adopting cleaner production methods and improving its environmental protection methods.

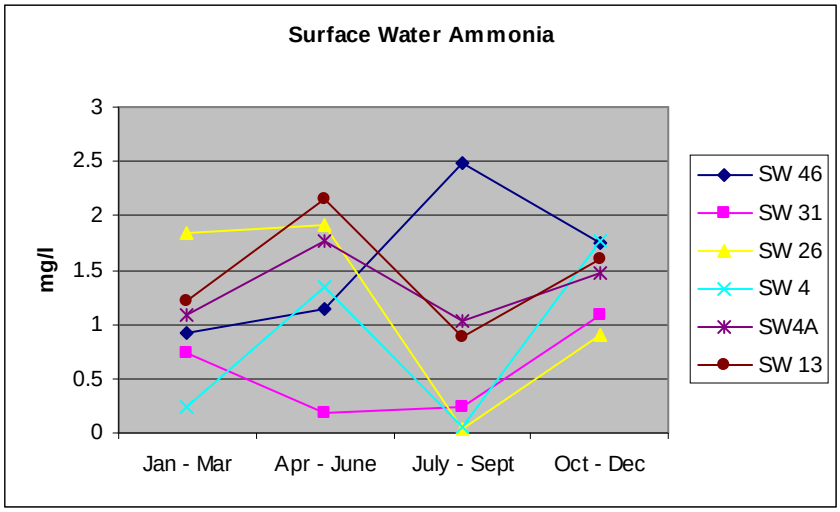
# APPENDIX 1

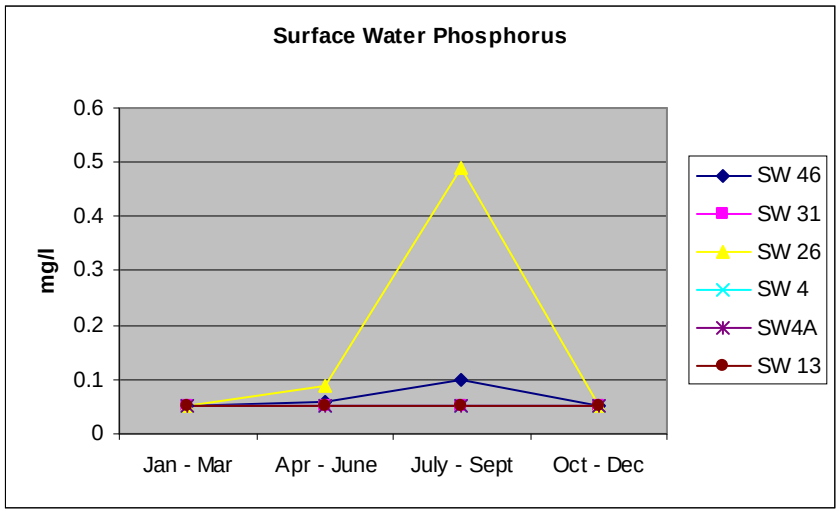
## Surface Water Discharge
## Monitoring Results
## Bogs

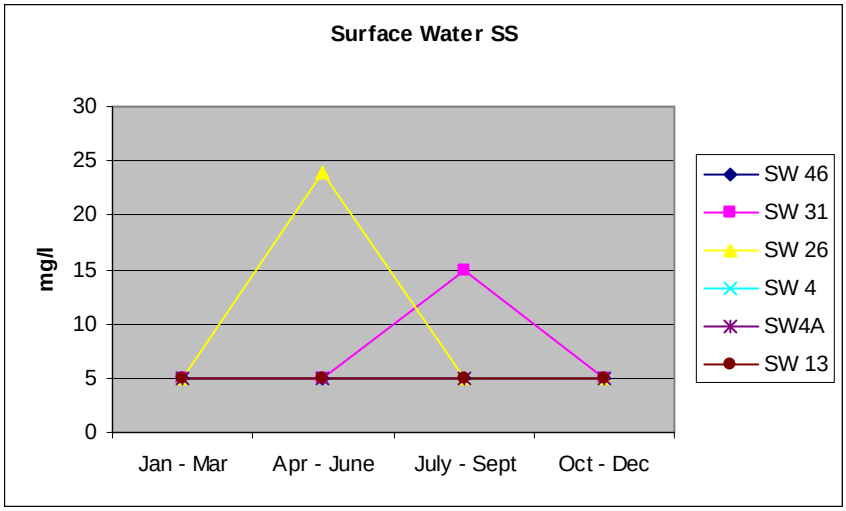
| BNM Group: | Derrygreenagh | | 2011 | |
|---|---|---|---|---|
| IPC Licence No. | 501 | | | |
| | | | | |
| pH (units) | | | | |
| | Jan - Mar | Apr - June | July - Sept | Oct - Dec |
| SW 46 | 6.6 | 7.3 | 7 | 7 |
| SW 31 | 6.8 | 7.3 | 7.4 | 7.2 |
| SW 26 | 6.6 | 7.2 | 7.7 | 7 |
| SW 4 | 7.4 | 7.8 | 7.6 | 7.4 |
| SW4A | 7.7 | 8.1 | 7.7 | 7.5 |
| SW 13 | 7.7 | 7.8 | 7.8 | 7.7 |
| COD (mg/l) | | | | |
| | Jan - Mar | Apr - June | July - Sept | Oct - Dec |
| SW 46 | 91 | 91 | 123 | 101 |
| SW 31 | 70 | 61 | 75 | 93 |
| SW 26 | 65 | 58 | 38 | 50 |
| SW 4 | 46 | 49 | 61 | 52 |
| SW4A | 30 | 61 | 33 | 71 |
| SW 13 | 52 | 30 | 31 | 34 |
| Ammonia as N (mg/l) | | | | |
| | Jan - Mar | Apr - June | July - Sept | Oct - Dec |
| SW 46 | 0.92 | 1.14 | 2.48 | 1.75 |
| SW 31 | 0.74 | 0.19 | 0.24 | 1.08 |
| SW 26 | 1.84 | 1.91 | 0.04 | 0.9 |
| SW 4 | 0.24 | 1.35 | 0.06 | 1.76 |
| SW4A | 1.09 | 1.76 | 1.03 | 1.48 |
| SW 13 | 1.22 | 2.16 | 0.88 | 1.6 |
| Total Phosphorus (mg/l) | | | | |
| | Jan - Mar | Apr - June | July - Sept | Oct - Dec |
| SW 46 | 0.05 | 0.06 | 0.1 | 0.05 |
| SW 31 | 0.05 | 0.05 | 0.05 | 0.05 |
| SW 26 | 0.05 | 0.09 | 0.49 | 0.05 |
| SW 4 | 0.05 | 0.05 | 0.05 | 0.05 |
| SW4A | 0.05 | 0.05 | 0.05 | 0.05 |
| SW 13 | 0.05 | 0.05 | 0.05 | 0.05 |
| Suspended Solids (mg/l) | | | | |
| | Jan - Mar | Apr - June | July - Sept | Oct - Dec |
| SW 46 | 5 | 5 | 5 | 5 |
| SW 31 | 5 | 5 | 15 | 5 |
| SW 26 | 5 | 24 | 5 | 5 |
| SW 4 | 5 | 5 | 5 | 5 |
| SW4A | 5 | 5 | 5 | 5 |
| SW 13 | 5 | 5 | 5 | 5 |
| Flow (l/s) | | | | |
| | Jan - Mar | Apr - June | July - Sept | Oct - Dec |
| SW 46 | 19.8 | 2.2 | 5.8 | 5.6 |
| SW 31 | 8.5 | 1.3 | 2.3 | 6.7 |
| SW 26 | 10.2 | 1.6 | 4.3 | 6.7 |
| SW 4 | 22.7 | 6.8 | 11.4 | 10.3 |
| SW4A | 29.2 | 3.2 | 9.6 | 6.3 |
| SW 13 | 34.6 | 19.7 | 25.7 | 31.3 |

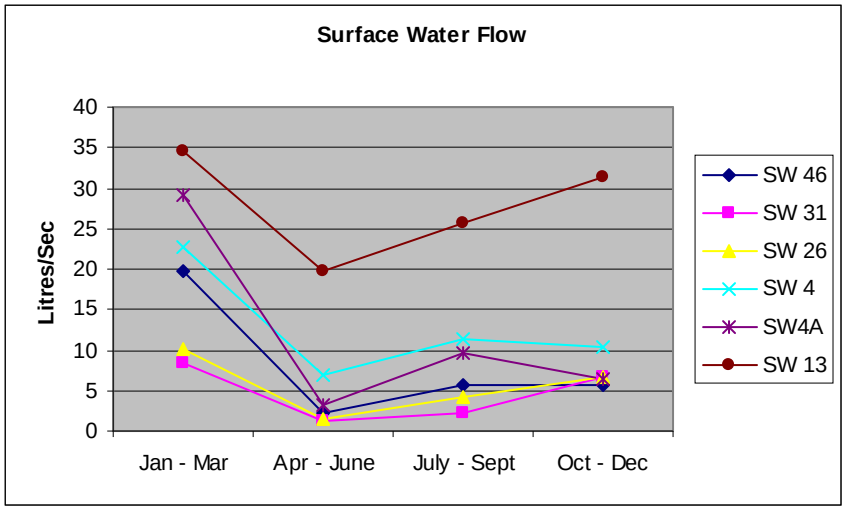

Surface Water pH
pH Units
9
8
7
6
5
4
3
2
1
0
Jan - Mar
Apr - June
July - Sept
Oct - Dec
SW 46
SW 31
SW 26
SW 4
SW4A
SW 13


Surface Water COD
mg/l
140
120
100
80
60
40
20
0
Jan - Mar
Apr - June
July - Sept
Oct - Dec
SW 46
SW 31
SW 26
SW 4
SW4A
SW 13


Surface Water Ammonia
mg/l
3
2.5
2
1.5
1
0.5
0
Jan - Mar
Apr - June
July - Sept
Oct - Dec
SW 46
SW 31
SW 26
SW 4
SW4A
SW 13


Surface Water Phosphorus
mg/l
0.6
0.5
0.4
0.3
0.2
0.1
0
Jan - Mar
Apr - June
July - Sept
Oct - Dec
SW 46
SW 31
SW 26
SW 4
SW4A
SW 13


Surface Water SS
mg/l
30
25
20
15
10
5
0
Jan - Mar
Apr - June
July - Sept
Oct - Dec
SW 46
SW 31
SW 26
SW 4
SW4A
SW 13

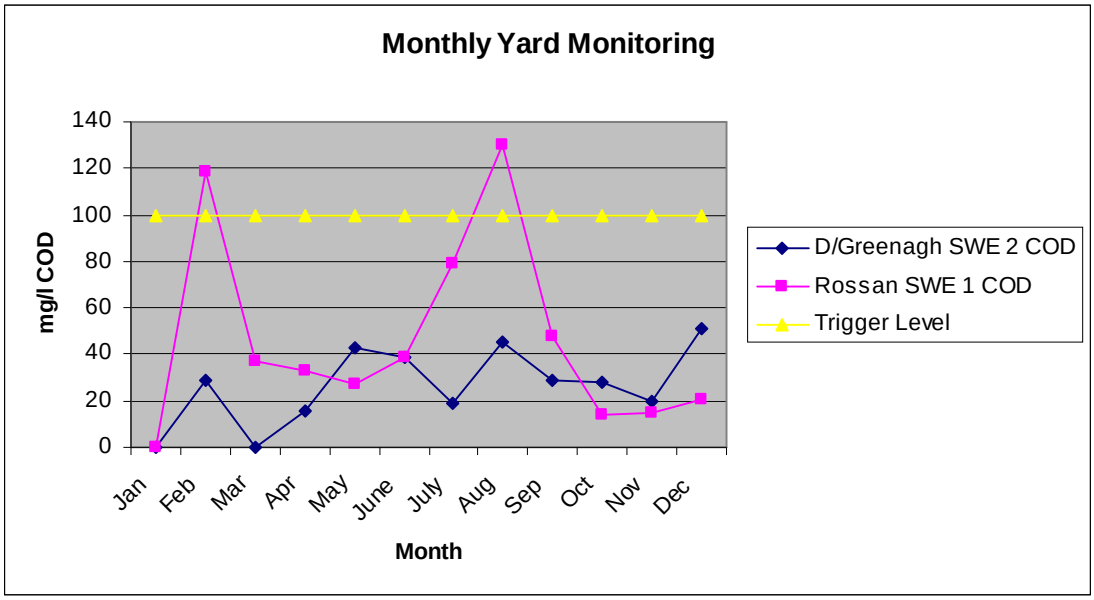

Surface Water Flow
Litres/Sec
40
35
30
25
20
15
10
5
0
Jan - Mar
Apr - June
July - Sept
Oct - Dec
SW 46
SW 31
SW 26
SW 4
SW4A
SW 13

# APPENDIX 2

## Surface Water Discharge Monitoring Results
### Yards

| Yard Discharge Results 2011 | | |
|---|---|---|
| Licence: P0501-01 | | |
| Works: Derrygreenagh | | |
| **Month** | **D/Greenagh SWE 2 COD** | **Rossan SWE 1 COD** |
| Jan | 0 | 0 |
| Feb | 29 | 119 |
| Mar | 0 | 37 |
| Apr | 16 | 33 |
| May | 43 | 27 |
| June | 39 | 39 |
| July | 19 | 79 |
| Aug | 45 | 130 |
| Sep | 29 | 48 |
| Oct | 28 | 14 |
| Nov | 20 | 15 |
| Dec | 51 | 21 |

**Note: 0** denotes no flow at emission point on day of sampling



# APPENDIX 3

## Surface Water Discharge
## Monitoring Results
## Composite

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2011 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 5 | 316 | | 11779780 | | | | 58.90 | 3722.41 |
| 2 | | | | | 5 | 306 | | 10217660 | | | | 51.09 | 3126.60 |
| 3 | | | | | 5 | 328 | | 9478944 | | | | 47.39 | 3109.09 |
| 4 | | | | | 5 | 340 | | 7448285 | | | | 37.24 | 2532.42 |
| 5 | 7.4 | 33 | 0.61 | 0.05 | 5 | 370 | 83 | 8228649 | 271.55 | 5.02 | 0.41 | 41.14 | 3044.60 |
| 6 | | | | | 7 | 410 | | 7963834 | | | | 55.75 | 3265.17 |
| 7 | | | | | 6 | 434 | | 6921677 | | | | 41.53 | 3004.01 |
| 8 | | | | | 5 | 410 | | 6938352 | | | | 34.69 | 2844.72 |
| 9 | | | | | 5 | 430 | | 6672154 | | | | 33.36 | 2869.03 |
| 10 | | | | | 5 | 418 | | 6052147 | | | | 30.26 | 2529.80 |
| 11 | | | | | 5 | 430 | | 8666784 | | | | 43.33 | 3726.72 |
| 12 | 7.7 | 56 | 0.56 | 0.05 | 5 | 452 | 211 | 11410850 | 639.01 | 6.39 | 0.57 | 57.05 | 5157.70 |
| 13 | | | | | 0 | 0 | | 16435870 | | | | 0.00 | 0.00 |
| 14 | | | | | 0 | 0 | | 6440601 | | | | 0.00 | 0.00 |
| 15 | | | | | 0 | 0 | | 1144886 | | | | 0.00 | 0.00 |
| 16 | | | | | 0 | 0 | | -275927 | | | | 0.00 | 0.00 |
| 17 | | | | | 15 | 444 | | -226662 | | | | -3.40 | -100.64 |
| 18 | | | | | 5 | 404 | | 4362768 | | | | 21.81 | 1762.56 |
| 19 | 7.5 | 42 | 0.61 | 0.05 | 7 | 416 | 86 | 9548928 | 401.05 | 5.82 | 0.48 | 66.84 | 3972.35 |
| 20 | | | | | 0 | 0 | | 8086003 | | | | 0.00 | 0.00 |
| 21 | | | | | 0 | 0 | | 8082720 | | | | 0.00 | 0.00 |
| 22 | | | | | 0 | 0 | | 8125402 | | | | 0.00 | 0.00 |
| 23 | | | | | 5 | 398 | | 7788614 | | | | 38.94 | 3099.87 |
| 24 | | | | | 5 | 404 | | 7652189 | | | | 38.26 | 3091.48 |
| 25 | | | | | 5 | 408 | | 7532871 | | | | 37.66 | 3073.41 |
| 26 | 7.3 | 47 | 0.61 | 0.05 | 5 | 408 | 91 | 7774186 | 365.39 | 4.74 | 0.39 | 38.87 | 3171.87 |
| 27 | | | | | 5 | 388 | | 8005737 | | | | 40.03 | 3106.23 |
| 28 | | | | | 5 | 298 | | 8265715 | | | | 41.33 | 2463.18 |
| 29 | | | | | 5 | 394 | | 7026998 | | | | 35.13 | 2768.64 |
| 30 | | | | | 6 | 392 | | 8159875 | | | | 48.96 | 3198.67 |
| 31 | | | | | 5 | 290 | | 7740403 | | | | 38.70 | 2244.72 |

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Feb | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2011 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | 7.7 | 40 | 0.65 | 0.05 | 5 | 206 | 96 | 7269869 | 290.79 | 4.73 | 0.36 | 36.35 | 1497.59 |
| 2 | | | | | 5 | 383 | | 7266845 | | | | 36.33 | 2783.20 |
| 3 | | | | | 5 | 388 | | 7106918 | | | | 35.53 | 2757.48 |
| 4 | | | | | 5 | 246 | | 7190813 | | | | 35.95 | 1768.94 |
| 5 | | | | | 5 | 142 | | 12196220 | | | | 60.98 | 1731.86 |
| 6 | | | | | 5 | 136 | | 26520480 | | | | 132.60 | 3606.79 |
| 7 | | | | | 5 | 140 | | 40569120 | | | | 202.85 | 5679.68 |
| 8 | 7.5 | 55 | 0.74 | 0.05 | 5 | 294 | 143 | 37895040 | 2084.23 | 28.04 | 1.89 | 189.48 | 11141.14 |
| 9 | | | | | 5 | 292 | | 23066210 | | | | 115.33 | 6735.33 |
| 10 | | | | | 5 | 284 | | 20525180 | | | | 102.63 | 5829.15 |
| 11 | | | | | 5 | 288 | | 21639740 | | | | 108.20 | 6232.25 |
| 12 | | | | | 5 | 282 | | 17693860 | | | | 88.47 | 4989.67 |
| 13 | | | | | 5 | 304 | | 15472510 | | | | 77.36 | 4703.64 |
| 14 | | | | | 5 | 286 | | 19069340 | | | | 95.35 | 5453.83 |
| 15 | 7.2 | 54 | 0.51 | 0.05 | 5 | 294 | 179 | 16541280 | 893.23 | 8.44 | 0.83 | 82.71 | 4863.14 |
| 16 | | | | | 5 | 352 | | 13547520 | | | | 67.74 | 4768.73 |
| 17 | | | | | 5 | 364 | | 16079040 | | | | 80.40 | 5852.77 |
| 18 | | | | | 5 | 356 | | 10399970 | | | | 52.00 | 3702.39 |
| 19 | | | | | 5 | 356 | | 8914752 | | | | 44.57 | 3173.65 |
| 20 | | | | | 5 | 354 | | 9082368 | | | | 45.41 | 3215.16 |
| 21 | | | | | 5 | 346 | | 8568288 | | | | 42.84 | 2964.63 |
| 22 | 7.3 | 44 | 0.5 | 0.05 | 5 | 344 | 111 | 7771248 | 341.93 | 3.89 | 0.39 | 38.86 | 2673.31 |
| 23 | | | | | 5 | 378 | | 7252589 | | | | 36.26 | 2741.48 |
| 24 | | | | | 5 | 390 | | 8240486 | | | | 41.20 | 3213.79 |
| 25 | | | | | 5 | 409 | | 8678880 | | | | 43.39 | 3549.66 |
| 26 | | | | | 5 | 412 | | 8107257 | | | | 40.54 | 3340.19 |
| 27 | | | | | 5 | 418 | | 7238160 | | | | 36.19 | 3025.55 |
| 28 | | | | | 5 | 422 | | 7080826 | | | | 35.40 | 2988.11 |

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| March | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2011 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | 7.4 | 45 | 0.61 | 0.05 | 5 | 432 | 77 | 4987872 | 224.45 | 3.04 | 0.25 | 24.94 | 2154.76 |
| 2 | | | | | 5 | 430 | | 5139245 | | | | 25.70 | 2209.88 |
| 3 | | | | | 5 | 425 | | 3986410 | | | | 19.93 | 1694.22 |
| 4 | | | | | 5 | 428 | | 598916 | | | | 2.99 | 256.34 |
| 5 | | | | | 5 | 391 | | 3210451 | | | | 16.05 | 1255.29 |
| 6 | | | | | 5 | 266 | | 2498774 | | | | 12.49 | 664.67 |
| 7 | | | | | 5 | 348 | | 1932682 | | | | 9.66 | 672.57 |
| 8 | 7.7 | 49 | 0.56 | 0.05 | 5 | 428 | 75 | 5785603 | 283.49 | 3.24 | 0.29 | 28.93 | 2476.24 |
| 9 | | | | | 5 | 450 | | 5756573 | | | | 28.78 | 2590.46 |
| 10 | | | | | 5 | 448 | | 4499712 | | | | 22.50 | 2015.87 |
| 11 | | | | | 5 | 428 | | 821258 | | | | 4.11 | 351.50 |
| 12 | | | | | 5 | 416 | | 1788480 | | | | 8.94 | 744.01 |
| 13 | | | | | 5 | 414 | | 2399587 | | | | 12.00 | 993.43 |
| 14 | | | | | 5 | 390 | | 5142010 | | | | 25.71 | 2005.38 |
| 15 | 7.4 | 34 | 0.6 | 0.05 | 5 | 416 | 81 | 5141750 | 174.82 | 3.09 | 0.26 | 25.71 | 2138.97 |
| 16 | | | | | 5 | 430 | | 4633459 | | | | 23.17 | 1992.39 |
| 17 | | | | | 5 | 434 | | 5016643 | | | | 25.08 | 2177.22 |
| 18 | | | | | 5 | 430 | | 4450637 | | | | 22.25 | 1913.77 |
| 19 | | | | | 5 | 350 | | 3035318 | | | | 15.18 | 1062.36 |
| 20 | | | | | 5 | 416 | | 2011997 | | | | 10.06 | 836.99 |
| 21 | | | | | 5 | 422 | | 3503520 | | | | 17.52 | 1478.49 |
| 22 | 7.9 | 40 | 0.43 | 0.05 | 5 | 438 | 16 | 3936730 | 157.47 | 1.69 | 0.20 | 19.68 | 1724.29 |
| 23 | | | | | 15 | 421 | | 3473885 | | | | 52.11 | 1462.51 |
| 24 | | | | | 14 | 446 | | 1040083 | | | | 14.56 | 463.88 |
| 25 | | | | | 15 | 438 | | -2070749 | | | | -31.06 | -906.99 |
| 26 | | | | | 13 | 430 | | -1402358 | | | | -18.23 | -603.01 |
| 27 | | | | | 15 | 436 | | -1154909 | | | | -17.32 | -503.54 |
| 28 | | | | | 8 | 450 | | -3638477 | | | | -29.11 | -1637.31 |
| 29 | | | | | 14 | 456 | | -2557786 | | | | -35.81 | -1166.35 |
| 30 | 7.7 | 52 | 0.56 | 0.05 | 12 | 440 | 69 | -1333757 | -69.36 | -0.75 | -0.07 | -16.01 | -586.85 |
| 31 | | | | | 7 | 440 | | -3433483 | | | | -24.03 | -1510.73 |

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| April | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2011 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 5 | 470 | | 2437070 | | | | 12.19 | 1145.42 |
| 2 | | | | | 5 | 462 | | 3119550 | | | | 15.60 | 1441.23 |
| 3 | | | | | 6 | 454 | | 3121140 | | | | 18.73 | 1417.00 |
| 4 | | | | | 5 | 459 | | 3012130 | | | | 15.06 | 1382.57 |
| 5 | | | | | 6 | 434 | | 3524190 | | | | 21.15 | 1529.50 |
| 6 | 7.5 | 35 | 0.45 | 0.05 | 6 | 410 | 44 | 4117100 | 144.10 | 1.85 | 0.21 | 24.70 | 1688.01 |
| 7 | | | | | 8 | 392 | | 2846110 | | | | 22.77 | 1115.68 |
| 8 | | | | | 5 | 418 | | 2092610 | | | | 10.46 | 874.71 |
| 9 | | | | | 6 | 430 | | 2012110 | | | | 12.07 | 865.21 |
| 10 | | | | | 5 | 456 | | 2772460 | | | | 13.86 | 1264.24 |
| 11 | | | | | 5 | 432 | | 2089760 | | | | 10.45 | 902.78 |
| 12 | | | | | 5 | 428 | | 2207600 | | | | 11.04 | 944.85 |
| 13 | 7.6 | 43 | 0.48 | 0.05 | 5 | 440 | 66 | 2116490 | 91.01 | 1.02 | 0.11 | 10.58 | 931.26 |
| 14 | | | | | 14 | 436 | | 576143 | | | | 8.07 | 251.20 |
| 15 | | | | | 14 | 392 | | 244135 | | | | 3.42 | 95.70 |
| 16 | | | | | 9 | 0 | | -137564 | | | | -1.24 | 0.00 |
| 17 | | | | | 15 | 372 | | -69660.5 | | | | -1.04 | -25.91 |
| 18 | | | | | 6 | 448 | | -51669.5 | | | | -0.31 | -23.15 |
| 19 | | | | | 6 | 448 | | -48087.9 | | | | -0.29 | -21.54 |
| 20 | 7.6 | 39 | 0.45 | 0.05 | 6 | 660 | 66 | 1939220 | 75.63 | 0.87 | 0.10 | 11.64 | 1279.89 |
| 21 | | | | | 6 | 442 | | 2313840 | | | | 13.88 | 1022.72 |
| 22 | | | | | 11 | 464 | | 2124570 | | | | 23.37 | 985.80 |
| 23 | | | | | 12 | 466 | | 2834870 | | | | 34.02 | 1321.05 |
| 24 | | | | | 8 | 428 | | 2185310 | | | | 17.48 | 935.31 |
| 25 | | | | | 5 | 470 | | 1664080 | | | | 8.32 | 782.12 |
| 26 | | | | | 5 | 476 | | 1193240 | | | | 5.97 | 567.98 |
| 27 | | | | | 6 | 472 | | 1668040 | | | | 10.01 | 787.31 |
| 28 | 8.1 | 26 | 0.42 | 0.05 | 7 | 476 | 43 | 1900310 | 49.41 | 0.80 | 0.10 | 13.30 | 904.55 |
| 29 | | | | | 12 | 456 | | 1750330 | | | | 21.00 | 798.15 |
| 30 | | | | | 8 | 460 | | 1670220 | | | | 13.36 | 768.30 |

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| May | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2011 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 7 | 456 | | 446580 | | | | 3.13 | 203.64 |
| 2 | | | | | 7 | 452 | | 1111560 | | | | 7.78 | 502.43 |
| 3 | | | | | 5 | 468 | | 847955 | | | | 4.24 | 396.84 |
| 4 | 7.5 | 26 | 0.53 | 0.05 | 5 | 460 | 30 | 891464 | 23.18 | 0.47 | 0.04 | 4.46 | 410.07 |
| 5 | | | | | 13 | 418 | | 1693780 | | | | 22.02 | 708.00 |
| 6 | | | | | 12 | 434 | | 2135880 | | | | 25.63 | 926.97 |
| 7 | | | | | 9 | 460 | | 1297860 | | | | 11.68 | 597.02 |
| 8 | | | | | 8 | 444 | | 1625230 | | | | 13.00 | 721.60 |
| 9 | | | | | 6 | 458 | | 1880530 | | | | 11.28 | 861.28 |
| 10 | | | | | 5 | 440 | | 2091810 | | | | 10.46 | 920.40 |
| 11 | 7.6 | 35 | 0.5 | 0.05 | 5 | 444 | 60 | 2241950 | 78.47 | 1.12 | 0.11 | 11.21 | 995.43 |
| 12 | | | | | 8 | 438 | | 2148590 | | | | 17.19 | 941.08 |
| 13 | | | | | 7 | 436 | | 2591380 | | | | 18.14 | 1129.84 |
| 14 | | | | | 5 | 340 | | 2189170 | | | | 10.95 | 744.32 |
| 15 | | | | | 5 | 436 | | 1941720 | | | | 9.71 | 846.59 |
| 16 | | | | | 5 | 448 | | 1886410 | | | | 9.43 | 845.11 |
| 17 | | | | | 5 | 414 | | 1950660 | | | | 9.75 | 807.57 |
| 18 | 7.6 | 36 | 0.5 | 0.05 | 5 | 454 | 63 | 1824530 | 65.68 | 0.91 | 0.09 | 9.12 | 828.34 |
| 19 | | | | | 13 | 442 | | 1906250 | | | | 24.78 | 842.56 |
| 20 | | | | | 11 | 452 | | 1303210 | | | | 14.34 | 589.05 |
| 21 | | | | | 5 | 382 | | 1386430 | | | | 6.93 | 529.62 |
| 22 | | | | | 7 | 408 | | 1715100 | | | | 12.01 | 699.76 |
| 23 | | | | | 7 | 420 | | 1839470 | | | | 12.88 | 772.58 |
| 24 | | | | | 8 | 448 | | 1126590 | | | | 9.01 | 504.71 |
| 25 | 7.6 | 35 | 0.37 | 0.05 | 5 | 466 | 63 | 925257 | 32.38 | 0.34 | 0.05 | 4.63 | 431.17 |
| 26 | | | | | 10 | 436 | | 2276140 | | | | 22.76 | 992.40 |
| 27 | | | | | 7 | 342 | | 1327070 | | | | 9.29 | 453.86 |
| 28 | | | | | 12 | 440 | | 2441250 | | | | 29.30 | 1074.15 |
| 29 | | | | | 8 | 408 | | 2303740 | | | | 18.43 | 939.93 |
| 30 | | | | | 8 | 426 | | 1982940 | | | | 15.86 | 844.73 |
| 31 | | | | | 5 | 446 | | 1854080 | | | | 9.27 | 826.92 |

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| June | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2011 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | 8.1 | 29 | 0.47 | 0.05 | 6 | 390 | 72 | 1266970 | 36.74 | 0.60 | 0.06 | 7.60 | 494.12 |
| 2 | | | | | 19 | 416 | | 1214150 | | | | 23.07 | 505.09 |
| 3 | | | | | 20 | 438 | | 1727790 | | | | 34.56 | 756.77 |
| 4 | | | | | 17 | 426 | | 501399 | | | | 8.52 | 213.60 |
| 5 | | | | | 9 | 434 | | 740966 | | | | 6.67 | 321.58 |
| 6 | | | | | 5 | 454 | | 1070410 | | | | 5.35 | 485.97 |
| 7 | | | | | 6 | 454 | | 2141970 | | | | 12.85 | 972.45 |
| 8 | 8.2 | 26 | 0.5 | 0.05 | 23 | 409 | 62 | 1705130 | 44.33 | 0.85 | 0.09 | 39.22 | 697.40 |
| 9 | | | | | 13 | 420 | | 1531950 | | | | 19.92 | 643.42 |
| 10 | | | | | 12 | 386 | | 1470190 | | | | 17.64 | 567.49 |
| 11 | | | | | 7 | 424 | | 1974750 | | | | 13.82 | 837.29 |
| 12 | | | | | 9 | 420 | | 1122580 | | | | 10.10 | 471.48 |
| 13 | | | | | 16 | 412 | | 1595330 | | | | 25.53 | 657.28 |
| 14 | | | | | 10 | 428 | | 1906410 | | | | 19.06 | 815.94 |
| 15 | 7.6 | 22 | 0.46 | 0.07 | 6 | 452 | 63 | 1770210 | 38.94 | 0.81 | 0.12 | 10.62 | 800.13 |
| 16 | | | | | 9 | 424 | | 1625280 | | | | 14.63 | 689.12 |
| 17 | | | | | 14 | 436 | | 2169480 | | | | 30.37 | 945.89 |
| 18 | | | | | 7 | 414 | | 2141070 | | | | 14.99 | 886.40 |
| 19 | | | | | 6 | 438 | | 1836020 | | | | 11.02 | 804.18 |
| 20 | | | | | 5 | 418 | | 1488750 | | | | 7.44 | 622.30 |
| 21 | | | | | 6 | 372 | | 1706090 | | | | 10.24 | 634.67 |
| 22 | 7.4 | 48 | 0.43 | 0.05 | 5 | 442 | 68 | 1868730 | 89.70 | 0.80 | 0.09 | 9.34 | 825.98 |
| 23 | | | | | 16 | 348 | | 1624900 | | | | 26.00 | 565.47 |
| 24 | | | | | 9 | 426 | | 2037080 | | | | 18.33 | 867.80 |
| 25 | | | | | 10 | 426 | | 2648960 | | | | 26.49 | 1128.46 |
| 26 | | | | | 5 | 372 | | 2188430 | | | | 10.94 | 814.10 |
| 27 | | | | | 5 | 428 | | 383030 | | | | 1.92 | 163.94 |
| 28 | | | | | 5 | 436 | | 1161360 | | | | 5.81 | 506.35 |
| 29 | 8.1 | 23 | 0.55 | 0.05 | 5 | 436 | 60 | 1104720 | 25.41 | 0.61 | 0.06 | 5.52 | 481.66 |
| 30 | | | | | 9 | 409 | | 672282 | | | | 6.05 | 274.96 |

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| July | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2011 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 12 | 398 | | 1123220 | | | | 13.48 | 447.04 |
| 2 | | | | | 10 | 426 | | 1766710 | | | | 17.67 | 752.62 |
| 3 | | | | | 12 | 402 | | 1462630 | | | | 17.55 | 587.98 |
| 4 | | | | | 10 | 430 | | 917997 | | | | 9.18 | 394.74 |
| 5 | | | | | 6 | 460 | | 1310990 | | | | 7.87 | 603.06 |
| 6 | 7.4 | 78 | 0.21 | 2.08 | 5 | 454 | 78 | 1446910 | 112.86 | 0.30 | 3.01 | 7.23 | 656.90 |
| 7 | | | | | 17 | 432 | | 2543650 | | | | 43.24 | 1098.86 |
| 8 | | | | | 5 | 382 | | 2655860 | | | | 13.28 | 1014.54 |
| 9 | | | | | 5 | 364 | | 4545750 | | | | 22.73 | 1654.65 |
| 10 | | | | | 5 | 297 | | 3490840 | | | | 17.45 | 1036.78 |
| 11 | | | | | 6 | 390 | | 2360970 | | | | 14.17 | 920.78 |
| 12 | | | | | 5 | 424 | | 1139790 | | | | 5.70 | 483.27 |
| 13 | 7.4 | 30 | 0.4 | 0.12 | 5 | 470 | 86 | 2287870 | 68.64 | 0.92 | 0.27 | 11.44 | 1075.30 |
| 14 | | | | | 15 | 420 | | 2458940 | | | | 36.88 | 1032.75 |
| 15 | | | | | 13 | 440 | | 2324850 | | | | 30.22 | 1022.93 |
| 16 | | | | | 7 | 452 | | 2282300 | | | | 15.98 | 1031.60 |
| 17 | | | | | 5 | 466 | | 2032970 | | | | 10.16 | 947.36 |
| 18 | | | | | 5 | 374 | | 3245930 | | | | 16.23 | 1213.98 |
| 19 | | | | | 5 | 368 | | 2809420 | | | | 14.05 | 1033.87 |
| 20 | 7.5 | 31 | 0.43 | 0.13 | 5 | 388 | 163 | 2303670 | 71.41 | 0.99 | 0.30 | 11.52 | 893.82 |
| 21 | | | | | 5 | 468 | | 1790810 | | | | 8.95 | 838.10 |
| 22 | | | | | 5 | 412 | | 2416770 | | | | 12.08 | 995.71 |
| 23 | | | | | 14 | 426 | | 2293360 | | | | 32.11 | 976.97 |
| 24 | | | | | 19 | 414 | | 2128830 | | | | 40.45 | 881.34 |
| 25 | | | | | 16 | 450 | | 1795880 | | | | 28.73 | 808.15 |
| 26 | | | | | 8 | 424 | | 2079170 | | | | 16.63 | 881.57 |
| 27 | | | | | 5 | 440 | | 2255700 | | | | 11.28 | 992.51 |
| 28 | 7.5 | 42 | 0.21 | 0.05 | 5 | 466 | 66 | 1774940 | 74.55 | 0.37 | 0.09 | 8.87 | 827.12 |
| 29 | | | | | 14 | 378 | | 1594450 | | | | 22.32 | 602.70 |
| 30 | | | | | 13 | 406 | | 1760270 | | | | 22.88 | 714.67 |
| 31 | | | | | 6 | 426 | | 1838290 | | | | 11.03 | 783.11 |

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| August | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2011 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 8 | 430 | | 1913380 | | | | 15.31 | 822.75 |
| 2 | | | | | 5 | 433 | | 1952780 | | | | 9.76 | 845.55 |
| 3 | 7.4 | 19 | 0.49 | 0.06 | 5 | 450 | 66 | 1725540 | 32.79 | 0.85 | 0.10 | 8.63 | 776.49 |
| 4 | | | | | 11 | 406 | | 2119570 | | | | 23.32 | 860.55 |
| 5 | | | | | 11 | 400 | | 1794870 | | | | 19.74 | 717.95 |
| 6 | | | | | 11 | 406 | | 2072010 | | | | 22.79 | 841.24 |
| 7 | | | | | 10 | 422 | | 1862130 | | | | 18.62 | 785.82 |
| 8 | | | | | 6 | 418 | | 2244460 | | | | 13.47 | 938.18 |
| 9 | | | | | 5 | 412 | | 1656900 | | | | 8.28 | 682.64 |
| 10 | | | | | 6 | 436 | | 2261680 | | | | 13.57 | 986.09 |
| 11 | 8.1 | 33 | 0.58 | 0.07 | 5 | 420 | 67 | 1936870 | 63.92 | 1.12 | 0.14 | 9.68 | 813.49 |
| 12 | | | | | 12 | 352 | | 1786240 | | | | 21.43 | 628.76 |
| 13 | | | | | 7 | 386 | | 1603950 | | | | 11.23 | 619.12 |
| 14 | | | | | 8 | 392 | | 1336100 | | | | 10.69 | 523.75 |
| 15 | | | | | 9 | 399 | | 1572450 | | | | 14.15 | 627.41 |
| 16 | | | | | 7 | 432 | | 1835740 | | | | 12.85 | 793.04 |
| 17 | 7.5 | 35 | 0.04 | 0.1 | 7 | 428 | 68 | 1369660 | 47.94 | 0.05 | 0.14 | 9.59 | 586.21 |
| 18 | | | | | 0 | 0 | | 1330990 | | | | 0.00 | 0.00 |
| 19 | | | | | 0 | 0 | | 1695350 | | | | 0.00 | 0.00 |
| 20 | | | | | 0 | 0 | | 1467510 | | | | 0.00 | 0.00 |
| 21 | | | | | 0 | 0 | | 2265670 | | | | 0.00 | 0.00 |
| 22 | | | | | 0 | 0 | | 1628020 | | | | 0.00 | 0.00 |
| 23 | | | | | 0 | 0 | | 1006970 | | | | 0.00 | 0.00 |
| 24 | 7.4 | 41 | 0.15 | 0.05 | 5 | 434 | 60 | 1642310 | 67.33 | 0.25 | 0.08 | 8.21 | 712.76 |
| 25 | | | | | 13 | 358 | | 731310 | | | | 9.51 | 261.81 |
| 26 | | | | | 14 | 414 | | 1133700 | | | | 15.87 | 469.35 |
| 27 | | | | | 13 | 434 | | 465915 | | | | 6.06 | 202.21 |
| 28 | | | | | 8 | 428 | | 647576 | | | | 5.18 | 277.16 |
| 29 | | | | | 7 | 434 | | 593550 | | | | 4.15 | 257.60 |
| 30 | | | | | 9 | 448 | | 582564 | | | | 5.24 | 260.99 |
| 31 | 7.5 | 90 | 0.46 | 0.05 | 7 | 450 | 60 | 847504 | 76.28 | 0.39 | 0.04 | 5.93 | 381.38 |

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sept | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2011 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 17 | 422 | | 1112040 | | | | 18.90 | 469.28 |
| 2 | | | | | 16 | 424 | | 1527150 | | | | 24.43 | 647.51 |
| 3 | | | | | 7 | 428 | | 1237520 | | | | 8.66 | 529.66 |
| 4 | | | | | 5 | 408 | | 1266270 | | | | 6.33 | 516.64 |
| 5 | | | | | 5 | 410 | | 1441460 | | | | 7.21 | 591.00 |
| 6 | | | | | 5 | 412 | | 1692160 | | | | 8.46 | 697.17 |
| 7 | 7.6 | 29 | 0.23 | 0.05 | 5 | 402 | 111 | 1975250 | 57.28 | 0.45 | 0.10 | 9.88 | 794.05 |
| 8 | | | | | 9 | 354 | | 1793090 | | | | 16.14 | 634.75 |
| 9 | | | | | 12 | 410 | | 1600840 | | | | 19.21 | 656.34 |
| 10 | | | | | 5 | 374 | | 508183 | | | | 2.54 | 190.06 |
| 11 | | | | | 0 | 0 | | 132266 | | | | 0.00 | 0.00 |
| 12 | | | | | 0 | 0 | | 113692 | | | | 0.00 | 0.00 |
| 13 | | | | | 0 | 0 | | 55529.1 | | | | 0.00 | 0.00 |
| 14 | 7.6 | 16 | 0.17 | 0.1 | 5 | 472 | 74 | 65406.3 | 1.05 | 0.01 | 0.01 | 0.33 | 30.87 |
| 15 | | | | | 0 | 0 | | 111824 | | | | 0.00 | 0.00 |
| 16 | | | | | 0 | 0 | | 759483 | | | | 0.00 | 0.00 |
| 17 | | | | | 12 | 442 | | 1137670 | | | | 13.65 | 502.85 |
| 18 | | | | | 7 | 420 | | 675703 | | | | 4.73 | 283.80 |
| 19 | | | | | 6 | 436 | | 704495 | | | | 4.23 | 307.16 |
| 20 | | | | | 5 | 414 | | 536334 | | | | 2.68 | 222.04 |
| 21 | 7.6 | 27 | 0.12 | 0.05 | 5 | 444 | 78 | 1357050 | 36.64 | 0.16 | 0.07 | 6.79 | 602.53 |
| 22 | | | | | 0 | 0 | | -511568 | | | | 0.00 | 0.00 |
| 23 | | | | | 0 | 0 | | -398958 | | | | 0.00 | 0.00 |
| 24 | | | | | 0 | 0 | | -383828 | | | | 0.00 | 0.00 |
| 25 | | | | | 0 | 0 | | -249091 | | | | 0.00 | 0.00 |
| 26 | | | | | 0 | 0 | | -288078 | | | | 0.00 | 0.00 |
| 27 | 7.4 | 59 | 0.41 | 0.05 | 5 | 443 | 91 | 525807 | 31.02 | 0.22 | 0.03 | 2.63 | 232.93 |
| 28 | | | | | 5 | 370 | | 744232 | | | | 3.72 | 275.37 |
| 29 | | | | | 0 | 0 | | 990233 | | | | 0.00 | 0.00 |
| 30 | | | | | 0 | 0 | | 1504500 | | | | 0.00 | 0.00 |

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2011 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 5 | 210 | | 1391470 | 0.00 | 0.00 | 0.00 | 6.96 | 292.21 |
| 2 | | | | | 5 | 174 | | 1391470 | 0.00 | 0.00 | 0.00 | 6.96 | 242.12 |
| 3 | | | | | 5 | 264 | | 1391470 | 0.00 | 0.00 | 0.00 | 6.96 | 367.35 |
| 4 | | | | | 5 | 350 | | 1391470 | 0.00 | 0.00 | 0.00 | 6.96 | 487.01 |
| 5 | 7.5 | 43 | 0.5 | 0.05 | 5 | 386 | 122 | 1391470 | 59.83 | 0.70 | 0.07 | 6.96 | 537.11 |
| 6 | | | | | 5 | 292 | | 1391470 | 0.00 | 0.00 | 0.00 | 6.96 | 406.31 |
| 7 | | | | | 5 | 366 | | 1391470 | 0.00 | 0.00 | 0.00 | 6.96 | 509.28 |
| 8 | | | | | 5 | 394 | | 1391470 | 0.00 | 0.00 | 0.00 | 6.96 | 548.24 |
| 9 | | | | | 5 | 418 | | 1391470 | 0.00 | 0.00 | 0.00 | 6.96 | 581.63 |
| 10 | | | | | 5 | 426 | | 1391470 | 0.00 | 0.00 | 0.00 | 6.96 | 592.77 |
| 11 | | | | | 5 | 372 | | 1391470 | 0.00 | 0.00 | 0.00 | 6.96 | 517.63 |
| 12 | 7.3 | 52 | 0.45 | 0.05 | 5 | 272 | 186 | 1391470 | 72.36 | 0.63 | 0.07 | 6.96 | 378.48 |
| 13 | | | | | 5 | 296 | | 1391470 | 0.00 | 0.00 | 0.00 | 6.96 | 411.88 |
| 14 | | | | | 5 | 366 | | 1391470 | 0.00 | 0.00 | 0.00 | 6.96 | 509.28 |
| 15 | | | | | 5 | 378 | | 1391470 | 0.00 | 0.00 | 0.00 | 6.96 | 525.98 |
| 16 | | | | | 5 | 372 | | 1391470 | 0.00 | 0.00 | 0.00 | 6.96 | 517.63 |
| 17 | | | | | 5 | 416 | | 1391470 | 0.00 | 0.00 | 0.00 | 6.96 | 578.85 |
| 18 | | | | | 5 | 378 | | 1391470 | 0.00 | 0.00 | 0.00 | 6.96 | 525.98 |
| 19 | 7.4 | 10 | 0.39 | 0.07 | 5 | 390 | 108 | 1391470 | 13.91 | 0.54 | 0.10 | 6.96 | 542.67 |
| 20 | | | | | 5 | 391 | | 1391470 | 0.00 | 0.00 | 0.00 | 6.96 | 544.06 |
| 21 | | | | | 5 | 406 | | 1391470 | 0.00 | 0.00 | 0.00 | 6.96 | 564.94 |
| 22 | | | | | 5 | 400 | | 2916520 | 0.00 | 0.00 | 0.00 | 14.58 | 1166.61 |
| 23 | | | | | 5 | 416 | | 8454410 | 0.00 | 0.00 | 0.00 | 42.27 | 3517.03 |
| 24 | | | | | 5 | 382 | | 1629160 | 0.00 | 0.00 | 0.00 | 8.15 | 622.34 |
| 25 | | | | | 5 | 184 | | 1100130 | 0.00 | 0.00 | 0.00 | 5.50 | 202.42 |
| 26 | 7.6 | 32 | 0.66 | 0.05 | 5 | 464 | 80 | 2403650 | 76.92 | 1.59 | 0.12 | 12.02 | 1115.29 |
| 27 | | | | | 5 | 474 | | 2139180 | 0.00 | 0.00 | 0.00 | 10.70 | 1013.97 |
| 28 | | | | | 5 | 392 | | 1994720 | 0.00 | 0.00 | 0.00 | 9.97 | 781.93 |
| 29 | | | | | 5 | 367 | | 1927500 | 0.00 | 0.00 | 0.00 | 9.64 | 707.39 |
| 30 | | | | | 5 | 444 | | 3294260 | 0.00 | 0.00 | 0.00 | 16.47 | 1462.65 |
| 31 | | | | | 5 | 440 | | 3861990 | 0.00 | 0.00 | 0.00 | 19.31 | 1699.28 |

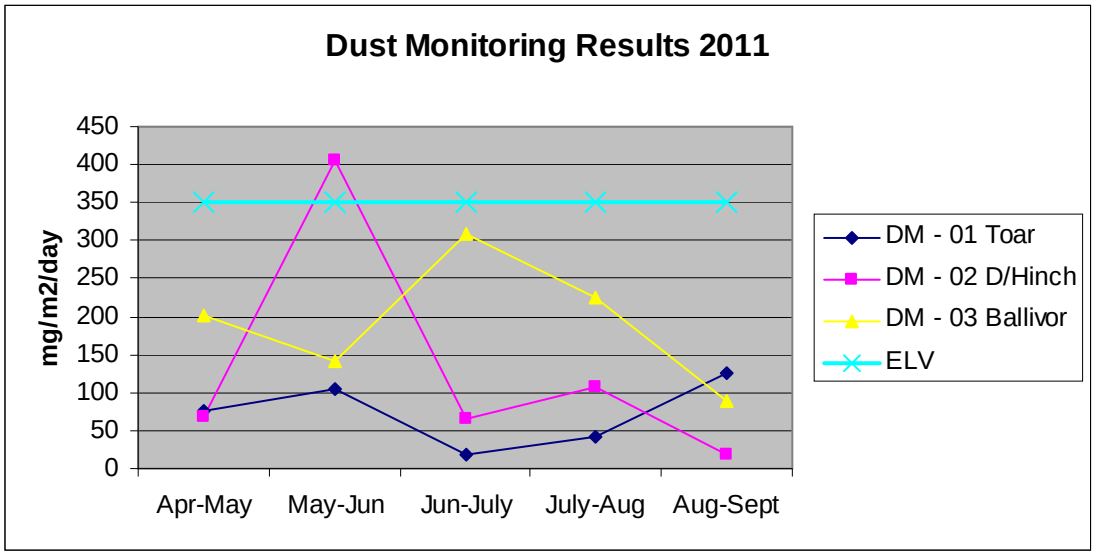
| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nov | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2011 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | | | | | 5 | 278 | | 2078870 | 0.00 | 0.00 | 0.00 | 10.39 | 577.93 |
| 2 | 8.3 | 30 | 0.36 | 0.05 | 5 | 374 | 80 | 3456690 | 103.70 | 1.24 | 0.17 | 17.28 | 1292.80 |
| 3 | | | | | 5 | 282 | | 5900770 | 0.00 | 0.00 | 0.00 | 29.50 | 1664.02 |
| 4 | | | | | 5 | 306 | | 3257970 | 0.00 | 0.00 | 0.00 | 16.29 | 996.94 |
| 5 | | | | | 5 | 390 | | 2537480 | 0.00 | 0.00 | 0.00 | 12.69 | 989.62 |
| 6 | | | | | 5 | 422 | | 1969920 | 0.00 | 0.00 | 0.00 | 9.85 | 831.31 |
| 7 | | | | | 5 | 446 | | 1739490 | 0.00 | 0.00 | 0.00 | 8.70 | 775.81 |
| 8 | | | | | 5 | 418 | | 1864860 | 0.00 | 0.00 | 0.00 | 9.32 | 779.51 |
| 9 | 7.2 | 24 | 0.38 | 0.05 | 5 | 440 | 97 | 1626390 | 39.03 | 0.62 | 0.08 | 8.13 | 715.61 |
| 10 | | | | | 5 | 442 | | 1996100 | 0.00 | 0.00 | 0.00 | 9.98 | 882.28 |
| 11 | | | | | 5 | 446 | | 3091050 | 0.00 | 0.00 | 0.00 | 15.46 | 1378.61 |
| 12 | | | | | 5 | 410 | | 2243640 | 0.00 | 0.00 | 0.00 | 11.22 | 919.89 |
| 13 | | | | | 5 | 426 | | 1760050 | 0.00 | 0.00 | 0.00 | 8.80 | 749.78 |
| 14 | | | | | 5 | 440 | | 1549670 | 0.00 | 0.00 | 0.00 | 7.75 | 681.85 |
| 15 | | | | | 5 | 444 | | 1480460 | 0.00 | 0.00 | 0.00 | 7.40 | 657.32 |
| 16 | | | | | 5 | 322 | | 2414710 | 0.00 | 0.00 | 0.00 | 12.07 | 777.54 |
| 17 | 7.3 | 55 | 0.43 | 0.05 | 6 | 424 | 106 | 2650920 | 145.80 | 1.14 | 0.13 | 15.91 | 1123.99 |
| 18 | | | | | 5 | 384 | | 2944250 | 0.00 | 0.00 | 0.00 | 14.72 | 1130.59 |
| 19 | | | | | 5 | 306 | | 3397160 | 0.00 | 0.00 | 0.00 | 16.99 | 1039.53 |
| 20 | | | | | 5 | 356 | | 3317330 | 0.00 | 0.00 | 0.00 | 16.59 | 1180.97 |
| 21 | | | | | 5 | 298 | | 3256680 | 0.00 | 0.00 | 0.00 | 16.28 | 970.49 |
| 22 | | | | | 5 | 354 | | 2678570 | 0.00 | 0.00 | 0.00 | 13.39 | 948.21 |
| 23 | | | | | 5 | 344 | | 2289690 | 0.00 | 0.00 | 0.00 | 11.45 | 787.65 |
| 24 | 7.2 | 447 | 0.42 | 0.05 | 5 | 392 | 121 | 5395680 | 2411.87 | 2.27 | 0.27 | 26.98 | 2115.11 |
| 25 | | | | | 0 | 0 | | 2690670 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 26 | | | | | 5 | 388 | | 2925940 | 0.00 | 0.00 | 0.00 | 14.63 | 1135.26 |
| 27 | | | | | 5 | 220 | | 2841700 | 0.00 | 0.00 | 0.00 | 14.21 | 625.17 |
| 28 | | | | | 5 | 312 | | 5777050 | 0.00 | 0.00 | 0.00 | 28.89 | 1802.44 |
| 29 | | | | | 0 | 0 | | -1280360 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 30 | | | | | 0 | 0 | | -1039820 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

| Month | | | | Parameters | | | | | | | Daily Totals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dec | pH | COD | Ammonia as | Total | Suspended | Total | Colour | Flow | COD | Ammonia as | Total | Suspended | Total |
| 2011 | | mg/l | N mg/l | Phosphorus | Solids | Solids | Pt Co | Daily | Kg/Day | Kg/Day | Phosphorus | Solids | Solids |
| SW15 | | | | mg/l | mg/l | mg/l | units | Total (litres) | | | Kg/Day | Kg/Day | Kg/Day |
| 1 | 7.2 | 24 | 0.62 | 0.05 | 5 | 272 | 166 | -840758 | -20.18 | -0.52 | -0.04 | -4.20 | -228.69 |
| 2 | | | | | 0 | 0 | | -866592 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 3 | | | | | 0 | 0 | | -749952 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 4 | | | | | 0 | 0 | | -677808 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 5 | | | | | 0 | 0 | | -196560 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 6 | | | | | 0 | 0 | | 1502580 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 7 | | | | | 0 | 0 | | 4469210 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 8 | 7.4 | 52 | 0.46 | 0.05 | 5 | 372 | 129 | 4490810 | 233.52 | 2.07 | 0.22 | 22.45 | 1670.58 |
| 9 | | | | | 5 | 368 | | 3645480 | 0.00 | 0.00 | 0.00 | 18.23 | 1341.54 |
| 10 | | | | | 5 | 370 | | 3849470 | 0.00 | 0.00 | 0.00 | 19.25 | 1424.30 |
| 11 | | | | | 5 | 366 | | 4305570 | 0.00 | 0.00 | 0.00 | 21.53 | 1575.84 |
| 12 | | | | | 5 | 390 | | 6471270 | 0.00 | 0.00 | 0.00 | 32.36 | 2523.80 |
| 13 | | | | | 5 | 390 | | 5691430 | 0.00 | 0.00 | 0.00 | 28.46 | 2219.66 |
| 14 | | | | | 5 | 366 | | 5086450 | 0.00 | 0.00 | 0.00 | 25.43 | 1861.64 |
| 15 | 7.8 | 56 | 0.53 | 0.05 | 5 | 318 | 132 | 4001620 | 224.09 | 2.12 | 0.20 | 20.01 | 1272.52 |
| 16 | | | | | 5 | 224 | | 3671910 | 0.00 | 0.00 | 0.00 | 18.36 | 822.51 |
| 17 | | | | | 5 | 346 | | 3446150 | 0.00 | 0.00 | 0.00 | 17.23 | 1192.37 |
| 18 | | | | | 11 | 372 | | 5619720 | 0.00 | 0.00 | 0.00 | 61.82 | 2090.54 |
| 19 | | | | | 5 | 419 | | 6989760 | 0.00 | 0.00 | 0.00 | 34.95 | 2928.71 |
| 20 | | | | | 5 | 432 | | 2728770 | 0.00 | 0.00 | 0.00 | 13.64 | 1178.83 |
| 21 | | | | | 5 | 414 | | 446515 | 0.00 | 0.00 | 0.00 | 2.23 | 184.86 |
| 22 | 7.6 | 28 | 0.59 | 0.09 | 5 | 284 | 133 | -21772.8 | -0.61 | -0.01 | 0.00 | -0.11 | -6.18 |
| 23 | | | | | 0 | 0 | | -397440 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 24 | | | | | 0 | 0 | | -60134.4 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 25 | | | | | 0 | 0 | | 42076.8 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 26 | | | | | 10 | 339 | | 2885850 | 0.00 | 0.00 | 0.00 | 28.86 | 978.30 |
| 27 | | | | | 5 | 370 | | 157766 | 0.00 | 0.00 | 0.00 | 0.79 | 58.37 |
| 28 | | | | | 5 | 350 | | 1574290 | 0.00 | 0.00 | 0.00 | 7.87 | 551.00 |
| 29 | | | | | 5 | 360 | | 1208300 | 0.00 | 0.00 | 0.00 | 6.04 | 434.99 |
| 30 | 7.4 | 34 | 0.54 | 0.05 | 5 | 256 | 128 | 1795390 | 61.04 | 0.97 | 0.09 | 8.98 | 459.62 |
| 31 | | | | | 5 | 310 | | 1277299 | 0.00 | 0.00 | 0.00 | 6.39 | 395.96 |

# APPENDIX 4

## Dust Monitoring Results.

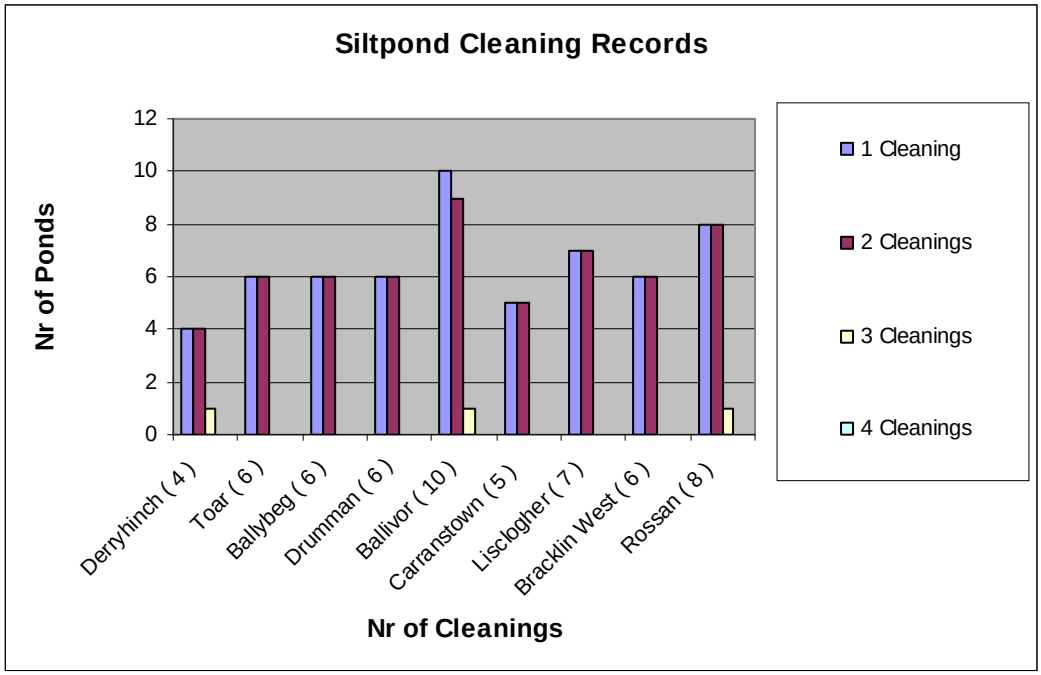
| Dust Monitoring Results 2011 | | | |
|---|---|---|---|
| Licence:P0501-01 | | | |
| Works: Derrygreenagh | | | |
| **Sample Period** | **DM - 01 Toar** | **DM - 02 D/Hinch** | **DM - 03 Ballivor** |
| Apr-May | 75 | 69 | 201 |
| May-Jun | 105 | 406 | 141 |
| Jun-July | 18 | 65 | 309 |
| July-Aug | 42 | 107 | 226 |
| Aug-Sep | 125 | 18 | 89 |



# APPENDIX 5

## De-silting Programme Review.

| Siltpond Cleaning Programme 2011 | | | | |
|---|---|---|---|---|
| IPPC Licence: P0501-01 | | | | |
| Works: Derrygreenagh | | | | |
| **Bog Area & Nr Ponds** | **1 Cleaning** | **2 Cleanings** | **3 Cleanings** | **4 Cleanings** |
| Derryhinch ( 4 ) | 4 | 4 | 1 | |
| Toar ( 6 ) | 6 | 6 | | |
| Ballybeg ( 6 ) | 6 | 6 | | |
| Drumman ( 6 ) | 6 | 6 | | |
| Ballivor ( 10 ) | 10 | 9 | 1 | |
| Carranstown ( 5 ) | 5 | 5 | | |
| Lisclogher ( 7 ) | 7 | 7 | | |
| Bracklin West ( 6 ) | 6 | 6 | | |
| Rossan ( 8 ) | 8 | 8 | 1 | |



| Facility Information Summary | |
|---|---|
| AER Reporting Year | 2012 |
| Licence Register Number | P0501-01 |
| Name of site | Bord na Mona Derrygreenagh |
| Site Location | Derrygreenagh, Rochfortbridge, Co Westmeath |
| NACE Code | 0892 |
| Class/Classes of Activity | 1.4 |
| National Grid Reference (6E, 6 N) | 249450, 238140 |

| | |
|---|---|
| A description of the activities/processes at the site for the reporting year. This should include information such as production increases or decreases on site, any infrastructural changes, environmental performance which was measured during the reporting year **and an overview of compliance with your licence** listing all exceedances of licence limits (where applicable) and what they relate to e.g. air, water, noise. | Activities on site can be divided into two components, firstly the milling, harrowing, ridiging and harvesting of peat into stockpiles and secondly the transportation of that peat via an internal rail network to the Power Station and lorry outloading facilities. Due to the unprecedented inclement weather experienced during the 2012 production season. 22.2% of production target was achieved. This equates to approximately 57638 tonnes which is a reduction of 78% of the 2011 production achieved. Infrastructurally, there was no bog development. From an environmental perspective silt pond capacity was increased by 1300m³. There were three non-compliances, two related to an Agency audit and one was an exceedence of the ELV as a result of emissions to surface water composite sampling at SW15 Toar bog. The quarterly grab sampling was 100% compliant, There were no environmental complaints received during the reporting period. In relation to silt pond cleaning, 72.5% of ponds received two cleanings, inspections dictating cleaning schedules. Decommissioning and Rehabilitation works are described in an attachment. |

**Declaration:**

All the data and information presented in this report has been checked and certified as being accurate. The quality of the information is assured to meet licence requirements.

| | |
|---|---|
| Signature<br>Group/Facility manager<br>(or nominated, suitably qualified and experienced deputy) | Date |

**AIR-summary template** | Lic No: P0501-01 | Year 2012

**Answer all questions and complete all tables where relevant**

| | | | Additional information |
|---|---|---|---|
| 1 | Does your site have licensed air emissions? If yes please complete table A1 and A2 below for the current reporting year and answer further questions. If **you do not have** licenced emissions and **do not complete a solvent management plan** (table A4 and A5) you do not need to complete the tables | No | |

## Periodic/Non-Continuous Monitoring

| | | | | |
|---|---|---|---|---|
| 2 | Are there any results in breach of licence requirements? If yes please provide brief details in the comment section of TableA1 below | | No | |
| 3 | Was all monitoring carried out in accordance with EPA guidance note AG2 and using the basic air monitoring checklist? | Basic air monitoring checklist | Yes | |

### Table A1: Licensed Mass Emissions/Ambient data-periodic monitoring (non-continuous)

| Emission reference no: | Parameter/ Substance | Frequency of Monitoring | ELV in licence or any revision therof | Licence Compliance criteria | Measured value | Unit of measurement | Compliant with licence limit | Method of analysis | Annual mass load (kg) | Comments - reason for change in % mass load from previous year if applicable |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | SELECT | | | SELECT | | SELECT | yes | OTH | | |

Note 1: Volumetric flow shall be included as a reportable parameter

| AIR-summary template | Lic No: | P0501-01 | Year | 2012 |
|---|---|---|---|---|
| **Continuous Monitoring** | | | | |

| | | | |
|---|---|---|---|
| 4 | Does your site carry out continuous air emissions monitoring? | No | |
| | If yes please review your continuous monitoring data and report the required fields below in Table 3 and compare it to its relevant Emission Limit Value (ELV) | | |
| 5 | Did continuous monitoring equipment experience downtime? If yes please record downtime in table 3 below | No | |
| 6 | Do you have a proactive service agreement for each piece of continuous monitoring equipment? | No | |
| 7 | Did your site experience any abatement system bypasses? If yes please detail them in table 4 below | No | |

**Table A2: Summary of average emissions -continuous monitoring**

| Emission reference no: | Parameter/ Substance | ELV in licence or any revision therof | Averaging Period | Compliance Criteria | Units of measurement | Annual Emission | Annual maximum | Monitoring Equipment downtime (hours) | Number of ELV exceedences in current reporting year | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| DM-01 | Total Particulates | 350 | 140 DAYS | Daily average < ELV | mg/m2/day | 8904 | 142 | 0 | 0 | Dust monitioring took place on 5 occasions for 28 days each time between April and September |
| DM-02 | Total Particulates | 350 | 140 Days | Daily average < ELV | mg/m2/day | 14084 | 234 | 0 | 0 | Ditto |
| DM-03 | Total Particulates | 350 | 140 Days | Daily average < ELV | mg/m2/day | 17864 | 211 | 0 | 0 | Ditto |

note 1: Volumetric flow shall be included as a reportable parameter.

**Table A3: Abatement system bypass reporting table** Bypass protocol

| Date* | Duration** (hours) | Location | Reason for bypass | Impact magnitude | Corrective action |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

* this should include all dates that an abatement system bypass occurred

** an accurate record of time bypass beginning and end should be logged on site and maintained for future Agency inspections please refer to bypass protocol link

| AIR-summary template | Lic No: | P0501-01 | Year | 2012 |
|---|---|---|---|---|

## Solvent use and management on site

8 Do you have a total Emission Limit Value of direct and fugitive emissions on site? if yes please fill out tables A4 and A5

SELECT

**Table A4: Solvent Management Plan Summary**
**Total VOC Emission limit value**

Solvent regulations — Please refer to linked solvent regulations to complete table 5 and 6

| Reporting year | Total solvent input on site (kg) | Total VOC emissions to Air from entire site | Total VOC emissions as %of solvent | Total Emission Limit Value (ELV) in licence or any revision therof | Compliance |
|---|---|---|---|---|---|
| | | | | | SELECT |
| | | | | | SELECT |

**Table A5: Solvent Mass Balance summary**

| | (I) Inputs (kg) | (O) Outputs (kg) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Solvent | (I) Inputs (kg) | Organic solvent emission in | Solvents lost in water (kg) | Collected waste solvent (kg) | Fugitive Organic Solvent (kg) | Solvent released in other ways e.g. by- | Solvents destroyed onsite through | Total emission of Solvent to air (kg) |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | Total | |

**AER Monitoring returns summary template-WATER/WASTEWATER(SEWER)** Lic No: P0501-01 Year 2012

| | | | Additional information |
|---|---|---|---|
| 1 | Does your site have licensed emissions direct to surface water or direct to sewer? If yes please complete table W2 and W3 below for the current reporting year and answer further questions. If **you do not have** licenced emissions you only need to complete table W1 and or W2 for surface water analysis and visual inspections | Yes | |
| 2 | Was it a requirement of your licence to carry out visual inspections on any surface water discharges or watercourses on or near your site? If yes please complete table W2 below summarising only any evidence of contamination noted during visual inspections | Yes | Monthly COD of yard run-off is attached. |

**Table W1 Surface water monitoring**

| Location reference | Location relative to site activities | PRTR Parameter | Licenced Parameter | Monitoring date | ELV or trigger level in licence or any revision thereof* | Licence Compliance criteria | Measured value | Unit of measurement | Compliant with licence | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| | SELECT | SELECT | SELECT | | | SELECT | | SELECT | SELECT | |
| | SELECT | SELECT | SELECT | | | SELECT | | SELECT | SELECT | |

*trigger values may be agreed by the Agency outside of licence conditions

**Table W2 Visual inspections-Please only enter details where contamination was observed.**

| Location Reference | Date of inspection | Description of contamination | Source of contamination | Corrective action | Comments |
|---|---|---|---|---|---|
| | | | SELECT | | |
| | | | SELECT | | |

**Licensed Emissions to water and /or wastewater(sewer)-periodic monitoring (non-continuous)**

| | | | | Additional information |
|---|---|---|---|---|
| 3 | Was there any result in breach of licence requirements? If yes please provide brief details in the comment section of Table W3 below | | No | |
| 4 | Was all monitoring carried out in accordance with EPA guidance and checklists for Quality of Aqueous Monitoring Data Reported to the EPA? If no please detail what areas require improvement in additional information box | External /Internal Lab Quality checklist / Assessment of results checklist | Yes | Surface water monitoring was carried out on a quarterly basis. The results of which are attached. |

**Table W3: Licensed Emissions to water and /or wastewater (sewer)-periodic monitoring (non-continuous)**

| Emission reference no: | Emission released to | Parameter/ SubstanceNote 1 | Type of sample | Frequency of monitoring | Averaging period | ELV or trigger values in licence or any revision therof[Note 2] | Licence Compliance criteria | Measured value | Unit of measurement | Compliant with licence | Method of analysis | Procedural reference source | Procedural reference standard number | Annual mass load (kg) | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | SELECT | | None | | SELECT | SELECT | SELECT | SELECT | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

Note 1: Volumetric flow shall be included as a reportable parameter

Note 2: Where Emission Limit Values (ELV) do not apply to your licence please compare results against EQS for Surface water or relevant receptor quality standards

**AER Monitoring returns summary template-WATER/WASTEWATER(SEWER)** Lic No: P0501-01 Year 2012

## Continuous monitoring

| | | | Additional Information |
|---|---|---|---|
| 5 | Does your site carry out continuous emissions to water/sewer monitoring? | Yes | See note above |

**If yes please summarise your continuous monitoring data below in Table W4 and compare it to its relevant Emission Limit Value (ELV)**

| | | | |
|---|---|---|---|
| 6 | Did continuous monitoring equipment experience downtime? **If yes please record downtime in table W4 below** | Yes | Total of twenty days over 365 days |
| 7 | Do you have a proactive service contract for each piece of continuous monitoring equipment on site? | Yes | Annual calibration schedule and trouble shooting service |
| 8 | Did abatement system bypass occur during the reporting year? **If yes please complete table W5 below** | No | |

## Table W4: Summary of average emissions -continuous monitoring

| Emission reference no: | Emission released to | Parameter/ Substance | ELV or trigger values in licence or any revision thereof | Averaging Period | Compliance Criteria | Units of measurement | Annual Emission for current reporting year (kg) | % change +/- from previous reporting year | Monitoring Equipment downtime (hours) | Number of ELV exceedences in reporting year | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SW15 | Water | Suspended Solids | 35 | 24 hour | Not Listed | mg/L | 9075 | 37.64% | 480 | 1 | Down time was primarily due to battery changes and periods of no flow. |
| SW15 | Water | Ammonia (as N) | NA | Weekly | NA | mg/L | 84.68 | -21.50% | 0 | NA | Down time was primarily due to battery changes and periods of no flow. |
| SW15 | Water | Total phosphorus | NA | Weekly | NA | mg/L | 10.38 | -22.00% | 0 | NA | Down time was primarily due to battery changes and periods of no flow. |
| SW15 | Water | COD | NA | Weekly | NA | mg/L | 9934 | -10.80% | 0 | NA | Down time was primarily due to battery changes and periods of no flow. |
| SW15 | Water | volumetric flow | NA | 24 hour | NA | m3/day | 1396631085 | 16.00% | 0 | NA | Down time was primarily due to battery changes and periods of no flow. |
| SW15 | Water | Total Dissolved Solids | NA | Weekly | NA | mg/L | 508131 | 24.00% | 0 | NA | Down time was primarily due to battery changes and periods of no flow. |

note 1: Volumetric flow shall be included as a reportable parameter.

## Table W5: Abatement system bypass reporting table

| Date | Duration (hours) | Location | Resultant emissions | Reason for bypass | Corrective action* | Was a report submitted to the EPA? | When was this report submitted? |
|---|---|---|---|---|---|---|---|
| | | | | | | SELECT | |
| | | | | | | | |
| | | | | | | | |

*Measures taken or proposed to reduce or limit bypass frequency

## Bund/Pipeline testing template

Lic No: P0501-01 Year 2012

**Bund testing** dropdown menu click to see options

| | | | Additional information |
|---|---|---|---|
| 1 | Are you required by your licence to undertake integrity testing on bunds and containment structures ? if yes please fill out table B1 below listing all **new bunds and containment structures** on site, **in addition to all bunds which failed** the integrity test-**all bunding structures which failed including mobile bunds must be listed in the table below** | Yes | Included are details of bund test results, however going forward only new and failed bunds will be included. |
| 2 | Please provide integrity testing frequency period | 2 Yearly | |
| 3 | Does the site maintain a register of bunds, underground pipelines (including stormwater and foul), Tanks, sumps and containers? (containers refers to "Chemstore" type units and mobile bunds) | Yes | |
| 4 | How many bunds are on site? | 4 | |
| 5 | How many of these bunds have been tested witin the required test schedule? | 4 | |
| 6 | How many mobile bunds are on site? | 6 | |
| 7 | Are the mobile bunds included in the bund test schedule? | No | |
| 8 | How many of these mobile bunds have been tested witin the required test schedule? | 0 | |
| 9 | How many sumps on site are included in the integrity test schedule? | 0 | |
| 10 | How many of these sumps are integrity tested within the test schedule? | 0 | |
| | **Please list any sump integrity failures in table B1** | | |
| 11 | Do all sumps and chambers have high level liquid alarms? | NA | |
| 12 | If yes to Q11 are these failsafe systems included in a maintenance and testing programme? | NA | |

**Table B1:** Summary details of bund /containment structure integrity test

| Bund/Containment structure ID | Type | Specify Other type | Product containment | Actual capacity | Capacity required* | Type of integrity test | Other test type | Test date | Integrity reports maintained on site? | Results of test | Integrity test failure explanation <50 words | Corrective action taken | Scheduled date for retest | Results of retest(if in current reporting year) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 501-07-04 | reinforced concrete | | Gas Oil | 62040 | 11000 | Hydraulic test | | Feb-12 | Yes | Fail | The bund at Rossan bog failed its hydraulic test | Repaired crack | Mar-13 | NA |
| 501-37-01 | reinforced concrete | | Gas Oil | 110592 | 49500 | Hydraulic test | | Jan-11 | Yes | Pass | | NA | Mar-13 | |
| 501-08-03 | reinforced concrete | | Gas Oil | 70380 | 49500 | Hydraulic test | | Sep-11 | Yes | Pass | | NA | Mar-13 | |

| | | | Commentary |
|---|---|---|---|
| 14 | Has integrity testing been carried out in accordance with licence requirements and are all structures tested in line with BS8007/EPA Guidance? bunding and storage guidelines | Yes | |
| 15 | Are channels/transfer systems to remote containment systems tested? | NA | |
| 16 | Are channels/transfer systems compliant in both integrity and available volume? | NA | |

**Pipeline/underground structure testing**

| | | | |
|---|---|---|---|
| 1 | Are you required by your licence to undertake integrity testing on underground structures e.g. pipelines or sumps etc ? if yes please fill out table 2 below listing all underground structures and pipelines on site **which failed the integrity test** | No | |
| 2 | Please provide integrity testing frequency period | NA | |

**Table B2:** Summary details of pipeline/underground structures integrity test

| Structure ID | Type system | Material of construction: | Does this structure have Secondary containment? | Type of secondary containment | Type integrity testing | Integrity reports maintained on site? | Results of test | Integrity test failure explanation <50 words | Corrective action taken | Scheduled date for retest | Results of retest(if in current reporting year) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | SELECT | SELECT | SELECT | SELECT | SELECT | SELECT | SELECT | | | | SELECT |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

Please use commentary for additional details not answered by tables/ questions above

| Groundwater/Soil monitoring template | Lic No: | P0501-01 | Year | 2012 |
|---|---|---|---|---|

| | | | Comments |
|---|---|---|---|
| 1 | Are you required to carry out groundwater monitoring as part of your licence requirements? | no | |
| 2 | Are you required to carry out soil monitoring as part of your licence requirements? | no | |
| 3 | Do you extract groundwater for use on site? If yes please specify use in comment section | yes | Domestic use |
| 4 | Is there contaminated land and /or groundwater on site? If yes please answer q's 5-12 | yes | |
| 5 | Is the contamination related to operations at the facility (either current and/or historic) | yes | Historic |
| 6 | Have actions been taken to address contamination issues?If yes please summarise remediation strategies proposed/undertaken for the site | yes | We plan to correlate all historical groundwater results and trend them comparing them to IGV'S and 2010 groundwater regs. Based on the trends we will suggest possible further groundwater monitoring. |
| 7 | Please specify the proposed time frame for the remediation strategy | N/A | |
| 8 | Is there a licence condition to carry out/update ELRA for the site? | N/A | |
| 9 | Has any type of risk assesment been carried out for the site? | yes | |
| 10 | Has a Conceptual Site Model been developed for the site? | no | |
| 11 | Have potential receptors been identified on and off site? | yes | |
| 12 | Is there evidence that contamination is migrating offsite? | no | |

**Table 1: Upgradient Groundwater monitoring results**

| Date of sampling | Sample location reference | Parameter/ Substance | Methodology | Monitoring frequency | Maximum Concentration++ | Average Concentration+ | unit | GTV's* | SELECT** | % change in average concentration previous year +/- | Upward trend in pollutant concentration over last 5 years of monitoring data |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | SELECT | | | | SELECT |
| | | | | | | | SELECT | | | | SELECT |

.+ where average indicates arithmetic mean

.++ maximum concentration indicates the maximum measured concentration from all monitoring results produced during the reporting year

**Table 2: Downgradient Groundwater monitoring results**

| Date of sampling | Sample location reference | Parameter/ Substance | Methodology | Monitoring frequency | Maximum Concentration | Average Concentration | unit | GTV's* | SELECT** | % change in average concentration previous year +/- | Upward trend in yearly average pollutant concentration over last 5 years of monitoring data |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | SELECT | | | | SELECT |

| Groundwater/Soil monitoring template | | | | | Lic No: | P0501-01 | | Year | 2012 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | SELECT | | | | SELECT |

* please note exceedance of a relevant Groundwater threshold value (GTV) at a representative monitoring point does not indicate non compliance, an exceedance triggers further investigation to confirm whether the criteria for poor groundwater chemical status are being met.

**Depending on location of the site and proximity to other sensitive receptors alternative Receptor based Water Quality standards should be used in addition to the GTV e.g. if the site is close to surface water compare to Surface Water Environmental Quality Standards (SWEQS), If the site is close to a drinking water supply compare results to the Drinking Water Standards (DWS)

Surface water EQS | Groundwater regulations GTV's | Drinking water (private supply) standards | Drinking water (public supply) standards | Interim Guideline Values (IGV)

**Groundwater/Soil monitoring template** Lic No: P0501-01 Year 2012

**Table 3: Soil results**

| Date of sampling | Sample location reference | Parameter/ Substance | Methodology | Monitoring frequency | Maximum Concentration | Average Concentration | unit |
|---|---|---|---|---|---|---|---|
| | | | | | | | SELECT |
| | | | | | | | SELECT |

Where additional detail is required please enter it here in 200 words or less

| Environmental Liabilities template | Lic No: | P0501-01 | Year | 2012 |
|---|---|---|---|---|

Click here to access EPA guidance on Environmental Liabilities and Financial provision

| | | | Commentary |
|---|---|---|---|
| 1 | ELRA initial agreement status | Not a licence requirement | |
| 2 | ELRA review status | NA | |
| 3 | Amount of Financial Provision cover required as determined by the latest ELRA | NA | |
| 4 | Financial Provision for ELRA status | NA | |
| 5 | Financial Provision for ELRA - amount of cover | NA | |
| 6 | Financial Provision for ELRA - type | NA | |
| 7 | Financial provision for ELRA expiry date | NA | |
| 8 | Closure plan initial agreement status | Required but not submitted | |
| 9 | Closure plan review status | Review required and completed | |
| 10 | Financial Provision for Closure status | Required but not submitted | |
| 11 | Financial Provision for Closure - amount of cover | NA | Internal Budget Provision |
| 12 | Financial Provision for Closure - type | Other please specify | Budgeted Financial Provision |
| 13 | Financial provision for Closure expiry date | 2030 | |

## Environmental Management Programme/Continuous Improvement Programme template

Lic No: P0501-01 Year 2012

Highlighted cells contain dropdown menu click to view

| | | | Additional Information |
|---|---|---|---|
| 1 | Do you maintain an Environmental Mangement System (EMS) for the site. If yes, please detail in additional information | Yes | Internal unaccredited EMS. |
| 2 | Does the EMS reference the most significant environmental aspects and associated impacts on-site | Yes | |
| 3 | Does the EMS maintain an Environmental Management Programme (EMP) as required in accordance with the licence requirements | Yes | |
| 4 | Do you maintain an environmental documentation/communication system to inform the public on environmental performance of the facility, as required by the licence | Yes | |

### Environmental Management Programme (EMP) report

| Objective Category | Target | Status (% completed) | How target was progressed | Responsibility | Intermediate outcomes |
|---|---|---|---|---|---|
| Reduction of emissions to Air | Continue to train all employees in environmental matters. Training will be by means of a new four module training programme delivered by dedicated Bord na Mona | 70 | In total 30 Personnel received training in 2012. There was one haydraulic harrows deployed at Derryhinch bog. | Individual | Reduced emissions |
| Waste reduction/Raw material usage efficiency | Waste streamlining is a project we are particularly interested in pursuing and hope to reduce wastes in the future and be more efficient in dealing with all aspects of waste management | 100 | Installed a waste management system. Quarterly waste reports are returned for records/filing and waste streams are segrated on site to maximise recycling potential. | Section Head | Improved Environmental Management Practices |
| Materials Handling/Storage/Bunding | Increased bund provisions will be provided where required during 2012 | 100 | A new waste oil handling process was adopted. The former self bunded waste oil tank is not used anymore. Instead a new bunded waste oil container was fabricated and waste oil is now stored in more manageable barrels and stored in the structure while awaiting collection. | Individual | Reduced emissions |
| Waste reduction/Raw material usage efficiency | Continue with the recycling of polyethylene. The sourcing of more recycling contractors will be ongoing. | 100 | In total 133.88 tonnes were sent off site for recycling. Procurement also exploring the possibility of securing further recyclers. | Individual | Improved Environmental Management Practices |

| Environmental Management Programme/Continuous Improvement Programme template | | | Lic No: | P0501-01 | Year 2012 |
|---|---|---|---|---|---|
| Energy Management | As part of an energy management process, a review of energy aspects will take place idenfifying the significant energy users of the licensee. | 60 | As expected gas oil used in the production and transportation of peat is the most significant energy user followed by electrical consumption at workshops and bog pumps. | Section Head | Improved Environmental Management Practices |
| Reduction of emissions to Water | Continue to train all employees in environmental matters. Training will be by means of a new four module training programme delivered by dedicated Bord na Mona Training Specialists. This new training programme includes Environmental Compliance _ IPPC, Biodiversity, Archaeology and Energy Management. Hydraulic harrows will be deployed at Derryhinch, Ballivor and Rossan bog during the 2012 production season. Continue with the collection of headland peat, particularly at dust sensitive locations. | 70 | In total 30 Personnel received training in 2012. There was one haydraulic harrows deployed at Derryhinch bog. | Individual | Improved Environmental Management Practices |

| Noise monitoring summary report | Lic No: | P0501-01 | Year | 2012 |
|---|---|---|---|---|

| | | |
|---|---|---|
| 1 | Was noise monitoring a licence requirement for the AER period?<br>If yes please fill in table N1 noise summary below | No |
| 2 | Was noise monitoring carried out using the EPA Guidance note including completion of the "Checklist for noise measurement report" included in the guidance note as table 6? (Noise Guidance note NG4) | NA |
| 3 | Does your site have a noise reduction plan | NA |
| 4 | When was the noise reduction plan last updated? | |
| 5 | Have there been changes relevant to site noise emissions (e.g. plant or operational changes) since the last noise survey? | NA |

**Table N1: Noise monitoring summary**

| Date of monitoring | Time period | Noise location (on site) | Noise sensitive location -NSL (if applicable) | $LA_{eq}$ | $LA_{90}$ | $LA_{10}$ | $LA_{max}$ | Tonal or Impulsive noise* (Y/N) | If tonal /impulsive noise was identified was 5dB penalty applied? | Comments (ex. main noise sources on site, & extraneous noise ex. road traffic) | Is site compliant with noise limits (day/evening/night)? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | SELECT | SELECT | | SELECT |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
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| | | | | | | | | | | | |
| | | | | | | | | | | | |

*Please ensure that a tonal analysis has been carried out as per guidance note NG4. These records must be maintained onsite for future inspection

If noise limits exceeded as a result of noise attributed to site activities, please choose the corrective action from the following options? SELECT

| |
|---|
| ** please explain the reason for not taking action/resolution of noise issues? |
| Any additional comments? (less than 200 words) |

## Resource Usage/Energy efficiency summary

Lic No: P0501-01 Year 2012

| | | | Additional information |
|---|---|---|---|
| 1 | When did the site carry out the most recent energy efficiency audit? Please list the recommendations in table 3 below | | |
| 2 | Is the site a member of any accredited programmes for reducing energy usage/water conservation such as the SEAI programme linked to the right? If yes please list them in additional information | SEAI - Large Industry Energy Network (LIEN) | yes |
| 3 | Where Fuel Oil is used in boilers on site is the sulphur content compliant with licence conditions? Please state percentage in additional information | NA | Not a licence requirement |

Table R1 Energy usage on site

| Energy Use | Previous year | Current year | Production +/- % compared to previous reporting year** | Energy Consumption +/- % vs overall site production* |
|---|---|---|---|---|
| Total Energy Used (MWHrs) | 9596 | 6631 | -74% | -31% |
| Total Energy Generated (MWHrs) | | | | |
| Total Renewable Energy Generated (MWHrs) | | | | |
| Electricity Consumption (MWHrs) | 306 | 367 | -74% | 16.60% |
| Fossil Fuels Consumption: | | | | |
| Heavy Fuel Oil (m3) | | | | |
| Light Fuel Oil (m3) | 904.218 | 606.371 | -74% | -33% |
| Natural gas (CMN) | | | | |
| Coal/Solid fuel (metric tonnes) | 20 | 20 | -74% | 0% |
| Peat (metric tonnes) | | | | |
| Renewable Biomass | | | | |
| Renewable energy generated on site | | | | |

* where consumption of energy can be compared to overall site production please enter this information as percentage increase or decrease compared to the previous reporting year.

** where site production information is available please enter percentage increase or decrease compared to previous year

Table R2 Water usage on site

| | | | | | Water Emissions | Water Consumption | |
|---|---|---|---|---|---|---|---|
| Water use | Water extracted Previous year m3/yr. | Water extracted Current year m3/yr. | Production +/- % compared to previous reporting year** | Energy Consumption +/- % vs overall site production* | Volume Discharged back to environment($m^3$yr): | Volume used i.e not discharged to environment e.g. released as steam m3/yr | Unaccounted for Water: |
| Groundwater | | | | | | | |
| Surface water | | | | | | | |
| Public supply | | | | | | | |
| Recycled water | | | | | | | |
| Total | | | | | | | |

* where consumption of water can be compared to overall site production please enter this information as percentage increase or decrease compared to the previous reporting year.

** where site production information is available please enter percentage increase or decrease compared to previous year

Table R3 Waste Stream Summary

| | Total | Landfill | Incineration | Recycled | Other |
|---|---|---|---|---|---|
| Hazardous (Tonnes) | 32.85 | | 3.15 | 29.7 | |
| Non-Hazardous (Tonnes) | 479.68 | 23.31 | | 233.98 | 222.39 |

**Resource Usage/Energy efficiency summary** Lic No: P0501-01 Year 2012

Table R4: Energy Audit finding recommendations

| Date of audit | Recommendations | Description of Measures proposed | Origin of measures | Predicted energy savings % | Implementation date | Responsibility | Completion date | Status and comments |
|---|---|---|---|---|---|---|---|---|
| | | | SELECT | | | | | |
| | | | SELECT | | | | | |
| | | | SELECT | | | | | |

Table R5: Power Generation: Where power is generated onsite (e.g. power generation facilities/food and drink industry)please complete the following information

| | Unit ID | Unit ID | Unit ID | Unit ID | Station Total |
|---|---|---|---|---|---|
| Technology | | | | | |
| Primary Fuel | | | | | |
| Thermal Efficiency | | | | | |
| Unit Date of Commission | | | | | |
| Total Starts for year | | | | | |
| Total Running Time | | | | | |
| Total Electricity Generated (GWH) | | | | | |
| House Load (GWH) | | | | | |
| KWH per Litre of Process Water | | | | | |
| KWH per Litre of Total Water used on Site | | | | | |

## Complaints and Incidents summary template

Lic No: P0501-01 Year 2012

### Complaints

| Have you received any environmental complaints in the current reporting year? If yes please complete summary details of complaints received on site in table 1 below | No | Additional information |
|---|---|---|

Table 1 Complaints summary

| Date | Category | Other type (please specify) | Brief description of complaint (Free txt <20 words) | Corrective action< 20 words | Resolution status | Resolution date | Further information |
|---|---|---|---|---|---|---|---|
| | SELECT | | | | SELECT | | |
| | SELECT | | | | SELECT | | |
| | SELECT | | | | SELECT | | |
| | SELECT | | | | SELECT | | |
| | SELECT | | | | SELECT | | |

| | |
|---|---|
| Total complaints open at start of reporting year | |
| Total new complaints received during reporting year | |
| Total complaints closed during reporting year | |
| Balance of complaints end of reporting year | |

### Incidents

| Have any incidents occurred on site in the current reporting year? Please list all incidents for current reporting year in Table 2 below | Yes | Additional information |
|---|---|---|

| *For information on how to report and what constitutes an incident | What is an incident |
|---|---|

Table 2 Incidents summary

| Date of occurrence | Incident nature | Location of occurrence | Incident category*please refer to guidance | Receptor | Cause of incident | Other cause(please specify) | Activity in progress at time of incident | Communication | Occurrence | Corrective action<20 words | Preventative action <20 words | Resolution status | Resolution date | Liklihood of reoccurence |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16/07/2012 | Breach of ELV | Licenced discharge point (SW15) | 1. Minor | Water | Adverse weather | | Normal activities | EPA | New | Compared results prior to and after event, all of which were within elv's. | Ensure silt pond is maintained as per licence condition. | Complete | Jul-12 | Low |
| 11/10/2012 | Other(EPA audit findings) | Waste records incomplete | 1. Minor | NA | Other (add details) | Missing paperwork | Normal activities | EPA | New | Waste management provider informed of importance of returning all required paperwork. | Ensure quarterly reports contain all required paperwork | Complete | Nov-12 | Low |
| 11/10/2012 | Other(EPA Audit findings) | Licenced discharge point (DN 6,SW6) | 1. Minor | Water | Operational controls | | Normal activities | EPA | New | Silt pond desilted the following week | Ensure all ponds are cleaned when required | Complete | Oct-12 | Low |
| | SELECT | SELECT | SELECT | SELECT | SELECT | | SELECT | SELECT | SELECT | | | SELECT | | SELECT |
| | SELECT | SELECT | SELECT | SELECT | SELECT | | SELECT | SELECT | SELECT | | | SELECT | | SELECT |

**Complaints and Incidents summary template** Lic No: P0501-01 Year 2012

| | |
|---|---|
| Total number of incidents current year | 3 |
| Total number of incidents previous year | 2 |
| % reduction/ increase | 33% increase |

**WASTE SUMMARY** Lic No: P0501-01 Year 2012

**SECTION A-PRTR ON SITE WASTE TREATMENT AND WASTE TRANSFERS TAB- TO BE COMPLETED BY ALL IPPC AND WASTE FACILITIES** PRTR facility logon dropdown list click to see options

**SECTION B- WASTE ACCEPTED ONTO SITE-TO BE COMPLETED BY ALL IPPC AND WASTE FACILITIES**

| | | | Additional Information |
|---|---|---|---|
| 1 | Were any wastes accepted onto your site for recovery or disposal or treatment prior to recovery or disposal within the boundaries of your facility ?; (waste generated within your boundaries is to be captured through PRTR reporting) If yes please enter details in table 1 below | No | |
| 2 | Did your site have any rejected consignments of waste in the current reporting year? If yes please give a brief explanation in the additional information | N/A | |
| 3 | Was waste accepted onto your site that was generated outside the Republic of Ireland? If yes please state the quantity in tonnes in additional information | N/A | |

**Table 1 Details of waste accepted onto your site for recovery, disposal or treatment (do not include wastes generated at your site, as these will have been reported in your PRTR workbook)**

| Licenced annual tonnage limit for your site (total tonnes/annum) | EWC code<br>European Waste Catalogue EWC codes | Source of waste accepted | Description of waste accepted **Please enter an accurate and detailed description which applies to** European Waste Catalogue EWC codes | Quantity of waste accepted in current reporting year (tonnes) | Quantity of waste accepted in previous reporting year (tonnes) | Reduction/Increase over previous year +/ - % | Reason for reduction/increase from previous reporting year | Packaging Content (%)- only applies if the waste has a packaging component | Disposal/Recovery or treatment operation carried out at your site and the description of this operation | Quantity of waste remaining on site at the end of reporting year (tonnes) | Comments - |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**SECTION C-TO BE COMPLETED BY ALL WASTE FACILITIES (waste transfer stations, Composters, Material recovery facilities etc) EXCEPT LANDFILL SITES**

| | | | |
|---|---|---|---|
| 4 | Is all waste processing infrastructure as required by your licence and approved by the Agency in place? If no please list waste processing infrastructure required onsite | SELECT | |
| 5 | Is all waste storage infrastructure as required by your licence and approved by the Agency in place? If no please list waste storage infrastructure required on site | SELECT | |
| 6 | Does your facility have relevant nuisance controls in place? | SELECT | |
| 7 | Do you have an odour management system in place for your facility? If no why? | SELECT | |
| 8 | Do you maintain a sludge register on site? | SELECT | |

**SECTION D-TO BE COMPLETED BY LANDFILL SITES ONLY**

**Table 2 Waste type and tonnage-landfill only**

| Waste types permitted for disposal | Authorised/licenced annual intake for disposal (tpa) | Actual intake for disposal in reporting year (tpa) | Remaining licensed capacity at end of reporting year (m3) | Comments |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**Table 3 General information-Landfill only**

| Area ID | Date landfilling commenced | Date landfilling ceased | Currently landfilling | Private or Public Operated | Inert or non-hazardous | Predicted date to cease landfilling | Licence permits asbestos | Is there a separate cell for asbestos? | Accepted asbestos in reporting year | Total disposal area occupied by waste<br>SELECT UNIT | Lined disposal area occupied by waste<br>SELECT UNIT | Unlined area<br>SELECT UNIT | Comments on liner type |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cell 8 | | | | | | | | | | | | | |

**WASTE SUMMARY** Lic No: P0501-01 Year 2012

**Table 4 Environmental monitoring-landfill only** Landfill Manual-Monitoring Standards

| Was meterological monitoring in compliance with Landfill Directive (LD) standard in reporting year + | Was leachate monitored in compliance with LD standard in reporting year | Was Landfill Gas monitored in compliance with LD standard in reporting year | Was SW monitored in compliance with LD standard in reporting year | Have GW trigger levels been established | Were emission limit values agreed with the Agency (ELVs) | Was topography of the site surveyed in reporting year | Has the statement under S53(A)(5) of WMA been submitted in reporting year | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

.+ please refer to Landfill Manual linked above for relevant Landfill Directive monitoring standards

**Table 5 Capping-Landfill only**

| Area uncapped* | Area with temporary cap | Area with final cap to LD Standard m2 ha, a | Area capped other | Area with waste that should be permanently capped to date under licence | What materials are used in the cap | Comments |
|---|---|---|---|---|---|---|
| SELECT UNIT | SELECT UNIT | | | | | |
| | | | | | | |

*please note this includes daily cover area

**Table 6 Leachate-Landfill only**

| | | |
|---|---|---|
| 9 | Is leachate from your site treated in a Waste Water Treatment Plant? | SELECT |
| 10 | Is leachate released to surface water? If yes please complete leachate mass load information below | SELECT |

| Volume of leachate in reporting year(m3) | Leachate (BOD) mass load (kg/annum) | Leachate (COD) mass load (kg/annum) | Leachate (NH4) mass load (kg/annum) | Leachate (Chloride) mass load kg/annum | Leachate treatment on-site | Specify type of leachate treatment | Comments |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

Please ensure that all information reported in the landfill gas section is consistent with the Landfill Gas Survey submitted in conjunction with PRTR returns

**Table 7 Landfill Gas-Landfill only**

| Gas Captured&Treated by LFG System m3 | Power generated (MW / KWh) | Used on-site or to national grid | Was surface emissions monitoring performed during the reporting year? | Comments |
|---|---|---|---|---|
| | | | SELECT | |

**Derrygreenagh**
**Decommissioning and Rehabilitation**
**AER Overview 2012.**

Decommissioning work extended to the lifting, removal and recycling of obsolete rail line in Derryarkin bog. A shelter belt was also planted at Ballybeg bog in response to a historical dust issue. In relation to rehabilitation, draft rehabilitation plans have been drawn up for all licensed areas and are available on file with the local environmental co-ordinators. The plans will be submitted to the EPA for review in April 2013. Consultation with statutory and non-statutory consultee's is ongoing as part of Bord na Mona rehabilitation planning under its Biodiversity Objective. A review day of the Bord na Mona Biodiversity Action Plan 2010-2015 for the period 2012 was held in January 2013 and attended by up to 90 interest groups including members of the NPWS, BWI, EPA, Bord na Mona, Coillte, ESBi, IPCC, Golden Eagle Trust, Butterfly Conservation Ireland, NARGC, local game councils, Midland Regional Planning Authority as well as a range of local community groups and Heritage Officers from counties Laois, Offaly, Kildare, Roscommon, Longford, Meath, Galway, Westmeath and Dublin.

| BNM Group: | Derrygreenagh | | 2012 | |
|---|---|---|---|---|
| IPC Licence No. | 501 | | | |
| | | | | |
| pH (units) | | | | |
| | Jan - Mar | Apr - June | July - Sept | Oct - Dec |
| SW 46 | 6.8 | 7.2 | 6.7 | 6.5 |
| SW 31 | 6.8 | 7.1 | 6.8 | 6.7 |
| SW 26 | 6.6 | 7.1 | 7.7 | 6.9 |
| SW 4 | 7.5 | 7.7 | 7.5 | 7.4 |
| SW4A | 7.4 | 7.7 | 7.4 | 7.3 |
| SW 13 | 7.6 | 8 | 7.7 | 7.6 |
| COD (mg/l) | | | | |
| | Jan - Mar | Apr - June | July - Sept | Oct - Dec |
| SW 46 | 94 | 105 | 123 | 112 |
| SW 31 | 83 | 74 | 94 | 106 |
| SW 26 | 46 | 56 | 64 | 125 |
| SW 4 | 60 | 54 | 64 | 63 |
| SW4A | 68 | 62 | 71 | 75 |
| SW 13 | 46 | 41 | 32 | 49 |
| Ammonia as N (mg/l) | | | | |
| | Jan - Mar | Apr - June | July - Sept | Oct - Dec |
| SW 46 | 1 | 0.99 | 1.1 | 0.81 |
| SW 31 | 0.6 | 0.26 | 0.48 | 0.43 |
| SW 26 | 0.68 | 1.03 | 0.04 | 0.27 |
| SW 4 | 1.81 | 1.43 | 0.68 | 1.9 |
| SW4A | 1.12 | 1.33 | 1.5 | 1.3 |
| SW 13 | 1.27 | 1.02 | 0.51 | 1.1 |
| Total Phosphorus (mg/l) | | | | |
| | Jan - Mar | Apr - June | July - Sept | Oct - Dec |
| SW 46 | 0.05 | 0.05 | 0.05 | 0.05 |
| SW 31 | 0.05 | 0.05 | 0.05 | 0.05 |
| SW 26 | 0.05 | 0.05 | 0.05 | 0.13 |
| SW 4 | 0.05 | 0.05 | 0.05 | 0.05 |
| SW4A | 0.05 | 0.05 | 0.05 | 0.05 |
| SW 13 | 0.05 | 0.05 | 0.05 | 0.05 |
| Suspended Solids (mg/l) | | | | |
| | Jan - Mar | Apr - June | July - Sept | Oct - Dec |
| SW 46 | 5 | 5 | 7 | 5 |
| SW 31 | 5 | 5 | 5 | 5 |
| SW 26 | 5 | 5 | 5 | 5 |
| SW 4 | 10 | 5 | 5 | 5 |
| SW4A | 5 | 5 | 5 | 5 |
| SW 13 | 7 | 5 | 5 | 5 |
| Total Solids (mg/l) | | | | |
| | Jan - Mar | Apr - June | July - Sept | Oct - Dec |
| SW 46 | 172 | 240 | 172 | 152 |
| SW 31 | 160 | 190 | 140 | 170 |
| SW 26 | 141 | 194 | 302 | 269 |
| SW 4 | 154 | 410 | 365 | 340 |
| SW4A | 230 | 296 | 292 | 212 |
| SW 13 | 456 | 526 | 478 | 456 |

| Colour (pt Co Units) | | | | |
|---|---|---|---|---|
| | Jan - Mar | Apr - June | July - Sept | Oct - Dec |
| SW 46 | 326 | 394 | 502 | 426 |
| SW 31 | 369 | 378 | 421 | 454 |
| SW 26 | 189 | 247 | 191 | 393 |
| SW 4 | 158 | 162 | 211 | 156 |
| SW4A | 300 | 254 | 329 | 296 |
| SW 13 | 94 | 88 | 118 | 80 |
| Flow (l/s) | | | | |
| | Jan - Mar | Apr - June | July - Sept | Oct - Dec |
| SW 46 | 8 | 12 | 4 | 12 |
| SW 31 | 7 | 15 | 11 | 28 |
| SW 26 | 5 | 4 | 7 | 18 |
| SW 4 | 10 | 11 | 12 | 20 |
| SW4A | 3 | 6 | 3 | 5 |
| SW 13 | 22 | 38 | 22 | 25 |

| Yard Discharge Results 2012 | | |
|---|---|---|
| **Licence: P0501-01** | | |
| **Works: Derrygreenagh** | | |
| **Month** | **D/Greenagh SWE 2 COD** | **Rossan SWE 1 COD** |
| Jan | 49 | 97 |
| Feb | 18 | 13 |
| Mar | 25 | NF |
| Apr | 35 | 28 |
| May | 20 | 23 |
| June | 13 | 122 |
| July | 32 | 16 |
| Aug | 43 | 34 |
| Sep | 28 | 19 |
| Oct | 32 | 80 |
| Nov | 49 | 20 |
| Dec | 54 | 35 |

**Note: NF** denotes no flow at emission point on day of sampling




| PRTR# : P0501 | Facility Name : Bord na Mona Energy Limited | Filename : P0501_2012(1).xls | Return Year : 2012 |

Guidance to completing the PRTR workbook

# AER Returns Workbook

Version 1.1.15

| | |
|---|---|
| **REFERENCE YEAR** | 2012 |

**1. FACILITY IDENTIFICATION**

| | |
|---|---|
| Parent Company Name | Bord na Mona Energy Limited |
| Facility Name | Bord na Mona Energy Limited |
| PRTR Identification Number | P0501 |
| Licence Number | P0501-01 |

Waste or IPPC Classes of Activity

| No. | class_name |
|---|---|
| 1.4 | The extraction of peat in the course of business which involves an area exceeding 50 hectares. |

| | |
|---|---|
| Address 1 | Derrygreenagh |
| Address 2 | Rockfordbridge |
| Address 3 | Mullingar |
| Address 4 | Co Westmeath |
| | |
| | Westmeath |
| Country | Ireland |
| Coordinates of Location | -7.25676 53.3910 |
| River Basin District | IEEA |
| NACE Code | 0892 |
| Main Economic Activity | Extraction of peat |
| **AER Returns Contact Name** | Enda Mc Donagh |
| **AER Returns Contact Email Address** | enda.mcdonagh@bnm.ie |
| **AER Returns Contact Position** | Head of Environment |
| **AER Returns Contact Telephone Number** | 0579345911 |
| **AER Returns Contact Mobile Phone Number** | 0862370816 |
| **AER Returns Contact Fax Number** | 0579345160 |
| **Production Volume** | 63364.0 |
| **Production Volume Units** | Tonnes |
| **Number of Installations** | 6 |
| **Number of Operating Hours in Year** | 2216 |
| **Number of Employees** | 60 |
| **User Feedback/Comments** | |
| **Web Address** | www.bnm.ie |

**2. PRTR CLASS ACTIVITIES**

| Activity Number | Activity Name |
|---|---|
| 50.1 | General |

**3. SOLVENTS REGULATIONS (S.I. No. 543 of 2002)**

| | |
|---|---|
| Is it applicable? | No |
| Have you been granted an exemption ? | |
| If applicable which activity class applies (as per Schedule 2 of the regulations) ? | |
| Is the reduction scheme compliance route being used ? | |

**4. WASTE IMPORTED/ACCEPTED ONTO SITE** Guidance on waste imported/accepted onto site

| | |
|---|---|
| Do you import/accept waste onto your site for on-site treatment (either recovery or disposal activities) ? | No |

**4.1 RELEASES TO AIR** Link to previous years emissions data | PRTR# : P0501 | Facility Name : Bord na Mona Energy Limited | Filename : P0501_2012(1).xls | Return Year : 2012 | 26/03/2013 15:09

**SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS**

| RELEASES TO AIR | | | | | Please enter all quantities in this section in KGs | | | |
|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | QUANTITY | | | |
| | | | Method Used | | | | | |
| No. Annex II | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

**SECTION B : REMAINING PRTR POLLUTANTS**

| RELEASES TO AIR | | | | | Please enter all quantities in this section in KGs | | | |
|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | QUANTITY | | | |
| | | | Method Used | | | | | |
| No. Annex II | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

**SECTION C : REMAINING POLLUTANT EMISSIONS (As required in your Licence)**

| RELEASES TO AIR | | | | | Please enter all quantities in this section in KGs | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | QUANTITY | | | | | |
| | | | Method Used | | DM-01 | DM-02 | DM-03 | | | |
| Pollutant No. | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | Emission Point 2 | Emission Point 3 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| 210 | Dust | E | OTH | VDI 2119 Blatt 2/Part 2 | 0.0 | 0.0 | 0.0 | 0.04 | 0.0 | 0.04 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

## Additional Data Requested from Landfill operators

**For the purposes of the National Inventory on Greenhouse Gases, landfill operators are requested to provide summary data on landfill gas (Methane) flared or utilised on their facilities to accompany the figures for total methane generated. Operators should only report their Net methane (CH4) emission to the environment under T(total) KG/yr for Section A: Sector specific PRTR pollutants above. Please complete the table below:**

**Landfill:** Bord na Mona Energy Limited

| **Please enter summary data on the quantities of methane flared and / or utilised** | | | Method Used | | | |
|---|---|---|---|---|---|---|
| | **T (Total) kg/Year** | **M/C/E** | **Method Code** | **Designation or Description** | **Facility Total Capacity m3 per hour** | |
| Total estimated methane generation (as per site model) | 0.0 | | | | N/A | |
| Methane flared | 0.0 | | | | 0.0 | (Total Flaring Capacity) |
| Methane utilised in engine/s | 0.0 | | | | 0.0 | (Total Utilising Capacity) |
| Net methane emission (as reported in Section A above) | 0.0 | | | | N/A | |

## 4.2 RELEASES TO WATERS

Link to previous years emissions data



### SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

**Data on ambient monitoring of storm/surface water or groundwater, conducted as part of your licence requirements, should NOT be submitted under AER / PRTR Reporting as this only concerns Releases from your facility**

| RELEASES TO WATERS | | | | | Please enter all quantities in this section in KGs | | | |
|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | | | | QUANTITY | | | |
| | | | Method Used | | | | | |
| No. Annex II | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

### SECTION B : REMAINING PRTR POLLUTANTS

| RELEASES TO WATERS | | | | | Please enter all quantities in this section in KGs | | | |
|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | | | | QUANTITY | | | |
| | | | Method Used | | | | | |
| No. Annex II | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

### SECTION C : REMAINING POLLUTANT EMISSIONS (as required in your Licence)

| RELEASES TO WATERS | | | | | Please enter all quantities in this section in KGs | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | | | | | | | | | | | | QUANTITY | |
| | | | Method Used | | SW46 | SW31 | SW26 | SW4 | SW4A | SW13 | SW15 | | | |
| Pollutant No. | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | Emission Point 2 | Emission Point 3 | Emission Point 4 | Emission Point 5 | Emission Point 6 | Emission Point 7 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| **240** | **Suspended Solids** | E | OTH | G/19 Based on ALPHA,1998,20th Edition, Method 2540D | 1561.0 | 2404.0 | 1340.0 | 2611.0 | 670.0 | 4639.0 | 9053.0 | 22278.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

## 4.3 RELEASES TO WASTEWATER OR SEWER

Link to previous years emissions data



### SECTION A : PRTR POLLUTANTS

| OFFSITE TRANSFER OF POLLUTANTS DESTINED FOR WASTE-WATER TREATMENT OR SEWER | | | | | Please enter all quantities in this section in KGs | | | |
|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | QUANTITY | | | |
| | | | Method Used | | | | | |
| No. Annex II | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

### SECTION B : REMAINING POLLUTANT EMISSIONS (as required in your Licence)

| OFFSITE TRANSFER OF POLLUTANTS DESTINED FOR WASTE-WATER TREATMENT OR SEWER | | | | | Please enter all quantities in this section in KGs | | | |
|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | QUANTITY | | | |
| | | | Method Used | | | | | |
| Pollutant No. | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

## 4.4 RELEASES TO LAND

Link to previous years emissions data



### SECTION A : PRTR POLLUTANTS

| RELEASES TO LAND | | | | | Please enter all quantities in this section in KGs | | |
|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | QUANTITY | | |
| | | | Method Used | | | | |
| No. Annex II | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

### SECTION B : REMAINING POLLUTANT EMISSIONS (as required in your Licence)

| RELEASES TO LAND | | | | | Please enter all quantities in this section in KGs | | |
|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | QUANTITY | | |
| | | | Method Used | | | | |
| Pollutant No. | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

## 5. ONSITE TREATMENT & OFFSITE TRANSFERS OF WASTE



**Please enter all quantities on this sheet in Tonnes**



| Transfer Destination | European Waste Code | Hazardous | Quantity (Tonnes per Year) | Description of Waste | Waste Treatment Operation | Method Used | | Location of Treatment | Haz Waste : Name and Licence/Permit No of Next Destination Facility<br>Non Haz Waste: Name and Licence/Permit No of Recover/Disposer | Haz Waste : Address of Next Destination Facility<br>Non Haz Waste: Address of Recover/Disposer | Name and License / Permit No. and Address of Final Recoverer / Disposer (HAZARDOUS WASTE ONLY) | Actual Address of Final Destination i.e. Final Recovery / Disposal Site (HAZARDOUS WASTE ONLY) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | M/C/E | Method Used | | | | | |
| Within the Country | 01 01 02 | No | 222.39 | wastes from mineral non-metalliferous excavation | D1 | E | Volume Calculation | Onsite of generatic | Bord na Mona Energy Ltd,P0501-01 | Derrygreenagh,Rochfortbridge,Mullingar,Co Westmeath,Ireland | | |
| Within the Country | 02 01 04 | No | 133.88 | waste plastics (except packaging) | R5 | M | Weighed | Offsite in Ireland | Leinster Environmentals Ltd,WP 2008/06 | Haggardstown,Dundalk,Co Louth,,Ireland | | |
| To Other Countries | 08 01 11 | Yes | 0.0 | waste paint and varnish containing organic solvents or other dangerous substances | R1 | C | Volume Calculation | Abroad | Enva Ireland Ltd,184-1 | Clonminam Ind Estate,Portlaoise,Co Laois,,Ireland | Nehlsen,D33300040,Hehlsen,,,,,,Germany | Hehlsen,,,,,,Germany |
| To Other Countries | 11 01 13 | Yes | 0.0 | degreasing wastes containing dangerous substances | R11 | C | Volume Calculation | Abroad | Safety Kleen Ltd,99-1 | Tallaght,,,,,,Ireland | Solvent Recovery Management,PP33345F,Wheeland Rd,Knottingly,West Yorks,WF11 8DZ,United Kingdom | Wheeland Rd,Knottingly,West Yorks,WF11 8DZ,United Kingdom |
| Within the Country | 13 02 05 | Yes | 28.3 | mineral-based non-chlorinated engine, gear and lubricating oils | R1 | C | Volume Calculation | Offsite in Ireland | Enva Ireland Ltd,184-1 | Clonminam Ind Estate,Portlaoise,Co Laois,,Ireland | Enva Ltd,184-1,Clonminam Industrial Estate,Portlaoise,Laois,,,Ireland | Clonminam Industrial Estate,Portlaoise,Laois,,Ireland |
| Within the Country | 15 01 03 | No | 7.68 | wooden packaging | R1 | M | Weighed | Offsite in Ireland | AES Ltd,WP-OY-08-061-01 | Cappincur,Tullamore,Co Offaly,,Iceland | | |
| To Other Countries | 15 02 02 | Yes | 1.95 | absorbents, filter materials (including oil filters not otherwise specified), wiping cloths, protective clothing contaminated by dangerous substances | R1 | C | Volume Calculation | Abroad | Enva Ireland Ltd,184-1 | Clonminam Ind Estate,Portlaoise,Co Laois,,Ireland | Lindenschmidt,Reg no E97095037,IINDENSCHMIDT,Kreuztal,,,,Germany | IINDENSCHMIDT,Kreuztal,,,,Germany |
| To Other Countries | 15 02 02 | Yes | 1.2 | absorbents, filter materials (including oil filters not otherwise specified), wiping cloths, protective clothing contaminated by dangerous substances | D10 | M | Weighed | Abroad | Enva Ireland Ltd,184-1 | Clonminam Ind Estate,Portlaoise,Co Laois,,Ireland | KWA,Reg no E17012100,Lintfort,,,,,Germany | Lintfort,,,,,,Germany |
| To Other Countries | 16 01 07 | Yes | 1.4 | oil filters | R4 | C | Volume Calculation | Abroad | Enva Ireland Ltd,184-1 | Clonminam Ind Estate,Portlaoise,Co Laois,,Ireland | R.D. Recycling,Reg no 51727/1/KD,Houthalen,,,,,,Belgium | Houthalen,,,,,,Belgium |
| To Other Countries | 16 06 01 | Yes | 0.0 | lead batteries | R6 | M | Weighed | Abroad | Enva Ireland Ltd,184-1 | Clonminam Ind Estate,Portlaoise,Co Laois,,Ireland | Campine Recycling,MLAV/05-173/GVDA,Beerse,,,,,,Belgium | Beerse,,,,,,Belgium |
| Within the Country | 17 04 07 | No | 92.42 | mixed metals | R4 | M | Weighed | Offsite in Ireland | AES Ltd,WP-OY-08-061-01 | Cappincur,Tullamore,Co Offaly,,Iceland | | |
| To Other Countries | 20 01 33 | Yes | 0.0 | batteries and accumulators included in 16 06 01, 16 06 02 or 16 06 03 and unsorted batteries and accumulators containing these batteries | R4 | M | Weighed | Abroad | KMK Metals,W0113-03 | Tullamore,Co Offaly,,,,Ireland | KMK Metals Ltd,W0113-03,Tullamore,,,,Offaly,Ireland | Tullamore,,,,Offaly,Ireland |
| Within the Country | 20 03 01 | No | 17.04 | mixed municipal waste | D1 | M | Weighed | Offsite in Ireland | AES Ltd,WP-OY-08-061-01 | Cappincur,Tullamore,Co Offaly,,Iceland | | |
| Within the Country | 20 03 01 | No | 6.27 | mixed municipal waste | D1 | C | Volume Calculation | Offsite in Ireland | AES Ltd,WP-OY-08-061-01 | Cappincur,Tullamore,Co Offaly,,Iceland | | |

* Select a row by double-clicking the Description of Waste then click the delete button

| Facility Information Summary | |
|---|---|
| AER Reporting Year | 2013 |
| Licence Register Number | P0501-01 |
| Name of site | Bord na Mona Derrygreenagh |
| Site Location | Derrygreenagh, Rochfortbridge, Co Westmeath |
| NACE Code | 0892 |
| Class/Classes of Activity | 1.4 |
| National Grid Reference (6E, 6 N) | 249450, 238140 |
| A description of the activities/processes at the site for the reporting year. This should include information such as production increases or decreases on site, any infrastructural changes, environmental performance which was measured during the reporting year **and an overview of compliance with your licence** listing all exceedances of licence limits (where applicable) and what they relate to e.g. air, water, noise. | Activities on site can be divided into two components, firstly the milling, harrowing, ridiging and harvesting of peat into stockpiles and secondly the transportation of that peat via an internal rail network to the Power Station and lorry outloading facilities. Due to the exceptionally good weather experienced during the 2013 production season, production increased to approximately 338,330 tonnes which equates to more than a five fold increase of the 2012 production achieved. Infrastructurally, there was no bog development. From an environmental perspective silt pond capacity was increased by 6943m$^3$. The quarterly grab sampling was 100% compliant. There were 3 environmental complaints received during the reporting period. In relation to silt pond cleaning, 86% of ponds received two cleanings, inspections dictating cleaning schedules. Decommissioning and Rehabilitation works are described in an attachment. |

**Declaration:**

All the data and information presented in this report has been checked and certified as being accurate. The quality

| E. Mulhall | 25-3-14 |
|---|---|
| Signature<br>Group/Facility manager<br>(or nominated, suitably qualified and | Date |

| AIR-summary template | Lic No: | P0501-01 | Year | 2013 |
|---|---|---|---|---|

**Answer all questions and complete all tables where relevant**

| | | | Additional information |
|---|---|---|---|
| 1 | Does your site have licensed air emissions? If yes please complete table A1 and A2 below for the current reporting year and answer further questions. If **you do not have** licenced emissions and **do not complete a solvent management plan** (table A4 and A5) you do not need to complete the tables | No | Fugitive emissions only |

## Periodic/Non-Continuous Monitoring

| | | | |
|---|---|---|---|
| 2 | Are there any results in breach of licence requirements? If yes please provide brief details in the comment section of TableA1 below | No | |
| 3 | Was all monitoring carried out in accordance with EPA guidance note AG2 and using the basic air monitoring checklist? Basic air monitoring checklist AGN2 | Yes | |

### Table A1: Licensed Mass Emissions/Ambient data-periodic monitoring (non-continuous)

| Emission reference no: | Parameter/ Substance | Frequency of Monitoring | ELV in licence or any revision therof | Licence Compliance criteria | Measured value | Unit of measurement | Compliant with licence limit | Method of analysis | Annual mass load (kg) | Comments - reason for change in % mass load from previous year if applicable |
|---|---|---|---|---|---|---|---|---|---|---|
| | SELECT | | | SELECT | | SELECT | SELECT | SELECT | | |
| | SELECT | | | SELECT | | SELECT | SELECT | SELECT | | |
| | SELECT | | | SELECT | | SELECT | SELECT | SELECT | | |
| | SELECT | | | SELECT | | SELECT | SELECT | SELECT | | |

Note 1: Volumetric flow shall be included as a reportable parameter

| AIR-summary template | Lic No: | P0501-01 | Year | 2013 |
|---|---|---|---|---|

## Continuous Monitoring

| | | | |
|---|---|---|---|
| 4 | Does your site carry out continuous air emissions monitoring? | No | |
| | If yes please review your continuous monitoring data and report the required fields below in Table A2 and compare it to its relevant Emission Limit Value (ELV) | | |
| 5 | Did continuous monitoring equipment experience downtime? If yes please record downtime in table A2 below | No | |
| 6 | Do you have a proactive service agreement for each piece of continuous monitoring equipment? | No | |
| 7 | Did your site experience any abatement system bypasses? If yes please detail them in table A3 below | No | |

**Table A2: Summary of average emissions -continuous monitoring**

| Emission reference no: | Parameter/ Substance | ELV in licence or any revision therof | Averaging Period | Compliance Criteria | Units of measurement | Annual Emission | Annual maximum | Monitoring Equipment downtime (hours) | Number of ELV exceedences in current reporting year | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| DM-01 | Total Particulates | 350 | 140 DAYS | Daily average < ELV | mg/m2/day | 6412 | 80 | 0 | 0 | Dust monitioring took place on 5 occasions for 28 days each time between April and September |
| DM-02 | Total Particulates | 350 | 140 DAYS | Daily average < ELV | mg/m2/day | 12516 | 155 | 0 | 0 | |
| DM-03 | Total Particulates | 350 | 140 DAYS | Daily average < ELV | mg/m2/day | 14336 | 131 | 0 | 0 | |
| DM-04 | Total Particulates | 350 | 140 DAYS | Daily average < ELV | mg/m2/day | 9436 | 184 | 0 | 0 | |
| | SELECT | | | | SELECT | | | | | |

note 1: Volumetric flow shall be included as a reportable parameter.

**Table A3: Abatement system bypass reporting table** Bypass protocol

| Date* | Duration** (hours) | Location | Reason for bypass | Impact magnitude | Corrective action |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

* this should include all dates that an abatement system bypass occurred

** an accurate record of time bypass beginning and end should be logged on site and maintained for future Agency inspections please refer to bypass protocol link

| AIR-summary template | Lic No: | P0501-01 | Year | 2013 |
|---|---|---|---|---|

## Solvent use and management on site

8 Do you have a total Emission Limit Value of direct and fugitive emissions on site? if yes please fill out tables A4 and A5

SELECT

**Table A4: Solvent Management Plan Summary**
**Total VOC Emission limit value**

Solvent regulations — Please refer to linked solvent regulations to complete table 5 and 6

| Reporting year | Total solvent input on site (kg) | Total VOC emissions to Air from entire site (direct and fugitive) | Total VOC emissions as %of solvent input | Total Emission Limit Value (ELV) in licence or any revision therof | Compliance |
|---|---|---|---|---|---|
| | | | | | SELECT |
| | | | | | SELECT |

**Table A5: Solvent Mass Balance summary**

| | (I) Inputs (kg) | (O) Outputs (kg) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Solvent | (I) Inputs (kg) | Organic solvent emission in waste | Solvents lost in water (kg) | Collected waste solvent (kg) | Fugitive Organic Solvent (kg) | Solvent released in other ways e.g. by- | Solvents destroyed onsite through | Total emission of Solvent to air (kg) |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | Total | |

**AER Monitoring returns summary template-WATER/WASTEWATER(SEWER)** Lic No: P0501-01 Year 2013

| | | | Additional information |
|---|---|---|---|
| 1 | Does your site have licensed emissions direct to surface water or direct to sewer? If yes please complete table W2 and W3 below for the current reporting year and answer further questions. If **you do not have** licenced emissions you only need to complete table W1 and or W2 for storm water analysis and visual inspections | Yes | |
| 2 | Was it a requirement of your licence to carry out visual inspections on any surface water discharges or watercourses on or near your site? If yes please complete table W2 below summarising only any evidence of contamination noted during visual inspections | Yes | Monthly COD of yard run-off is attached. |

**Table W1 Storm water monitoring**

| Location reference | Location relative to site activities | PRTR Parameter | Licenced Parameter | Monitoring date | ELV or trigger level in licence or any revision thereof* | Licence Compliance criteria | Measured value | Unit of measurement | Compliant with licence | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| | SELECT | SELECT | SELECT | | | SELECT | | SELECT | SELECT | |
| | SELECT | SELECT | SELECT | | | SELECT | | SELECT | SELECT | |

*trigger values may be agreed by the Agency outside of licence conditions

**Table W2 Visual inspections-Please only enter details where contamination was observed.**

| Location Reference | Date of inspection | Description of contamination | Source of contamination | Corrective action | Comments |
|---|---|---|---|---|---|
| | | | SELECT | | |
| | | | SELECT | | |

**Licensed Emissions to water and /or wastewater(sewer)-periodic monitoring (non-continuous)**

| | | | Additional information |
|---|---|---|---|
| 3 | Was there any result in breach of licence requirements? If yes please provide brief details in the comment section of Table W3 below | No | |
| 4 | Was all monitoring carried out in accordance with EPA guidance and checklists for Quality of Aqueous Monitoring Data Reported to the EPA? If no please detail what areas require improvement in additional information box (External /Internal Lab Quality checklist; Assessment of results checklist) | Yes | Surface water monitoring was carried out on a quarterly basis. The results of which are attached. |

**Table W3: Licensed Emissions to water and /or wastewater (sewer)-periodic monitoring (non-continuous)**

| Emission reference no: | Emission released to | Parameter/ SubstanceNote 1 | Type of sample | Frequency of monitoring | Averaging period | ELV or trigger values in licence or any revision thereof[Note 2] | Licence Compliance criteria | Measured value | Unit of measurement | Compliant with licence | Method of analysis | Procedural reference source | Procedural reference standard number | Annual mass load (kg) | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

Note 1: Volumetric flow shall be included as a reportable parameter

Note 2: Where Emission Limit Values (ELV) do not apply to your licence please compare results against EQS for Surface water or relevant receptor quality standards

**AER Monitoring returns summary template-WATER/WASTEWATER(SEWER)** Lic No: P0501-01 Year 2013

## Continuous monitoring

| | | | Additional Information |
|---|---|---|---|
| 5 | Does your site carry out continuous emissions to water/sewer monitoring? | Yes | See note above |

**If yes please summarise your continuous monitoring data below in Table W4 and compare it to its relevant Emission Limit Value (ELV)**

| | | | |
|---|---|---|---|
| 6 | Did continuous monitoring equipment experience downtime? **If yes please record downtime in table W4 below** | Yes | Total of 85 days over 365 days |
| 7 | Do you have a proactive service contract for each piece of continuous monitoring equipment on site? | Yes | Annual calibration schedule and trouble shooting service |
| 8 | Did abatement system bypass occur during the reporting year? **If yes please complete table W5 below** | No | |

## Table W4: Summary of average emissions -continuous monitoring

| Emission reference no: | Emission released to | Parameter/ Substance | ELV or trigger values in licence or any revision thereof | Averaging Period | Compliance Criteria | Units of measurement | Annual Emission for current reporting year (kg) | % change +/- from previous reporting year | Monitoring Equipment downtime (hours) | Number of ELV exceedences in reporting year | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SW15 | Water | Suspended Solids | 35 | 24 hour | All results < 1.5 times ELV, plus 8 from ten results must be < ELV | mg/L | 21058 | 56% | 2040 | 0 | Down time was primarily due to battery changes and periods of no flow. |
| SW15 | Water | Ammonia (as N) | 2.78 | Weekly | NA | mg/L | 383 | 63% | 0 | 0 | Down time was primarily due to battery changes and periods of no flow. |
| SW15 | Water | Total phosphorus | NA | Weekly | NA | mg/L | 29.85 | 77% | 0 | 0 | Down time was primarily due to battery changes and periods of no flow. |
| SW15 | Water | COD | 100 | Weekly | NA | mg/L | 26894 | 65% | 0 | 0 | Down time was primarily due to battery changes and periods of no flow. |
| SW15 | Water | volumetric flow | NA | 24 hour | NA | m3/day | 11397 | 56% | 96 | 0 | Down time was primarily due to battery changes and periods of no flow. |
| SW15 | Water | Total Dissolved Solids | NA | Weekly | NA | mg/L | 1158977 | 62% | 0 | 0 | Down time was primarily due to battery changes and periods of no flow. |

note 1: Volumetric flow shall be included as a reportable parameter.

## Table W5: Abatement system bypass reporting table

| Date | Duration (hours) | Location | Resultant emissions | Reason for bypass | Corrective action* | Was a report submitted to the EPA? | When was this report submitted? |
|---|---|---|---|---|---|---|---|
| | | | | | | SELECT | |
| | | | | | | | |
| | | | | | | | |

*Measures taken or proposed to reduce or limit bypass frequency

## Bund/Pipeline testing template

Lic No: P0501-01 Year 2013

### Bund testing

dropdown menu click to see options

| | | | Additional information |
|---|---|---|---|
| 1 | Are you required by your licence to undertake integrity testing on bunds and containment structures ? if yes please fill out table B1 below listing all **new bunds and containment structures** on site, in addition to **all bunds which failed** the integrity test-**all bunding structures which failed including mobile bunds must be listed in the table below, please include all bunds outside the licenced testing period** (mobile bunds and chemstore included) | Yes | One bund required testing during the reporting period.This was missed due to an oversight and is currently being addressed. |
| 2 | Please provide integrity testing frequency period | 2 Yearly | |
| 3 | Does the site maintain a register of bunds, underground pipelines (including stormwater and foul), Tanks, sumps and containers? (containers refers to "Chemstore" type units and mobile bunds) | Yes | |
| 4 | How many bunds are on site? | 3 | |
| 5 | How many of these bunds have been tested within the required test schedule? | 2 | |
| 6 | How many mobile bunds are on site? | 6 | |
| 7 | Are the mobile bunds included in the bund test schedule? | No | |
| 8 | How many of these mobile bunds have been tested within the required test schedule? | 0 | |
| 9 | How many sumps on site are included in the integrity test schedule? | 0 | |
| 10 | How many of these sumps are integrity tested within the test schedule? | 0 | |
| | **Please list any sump integrity failures in table B1** | | |
| 11 | Do all sumps and chambers have high level liquid alarms? | NA | |
| 12 | If yes to Q11 are these failsafe systems included in a maintenance and testing programme? | NA | |
| 13 | Is the Fire Water Retention Pond included in your integrity test programme? | N/A | |

**Table B1:** Summary details of bund /containment structure integrity test

| Bund/Containment structure ID | Type | Specify Other type | Product containment | Actual capacity | Capacity required* | Type of integrity test | Other test type | Test date | Integrity reports maintained on site? | Results of test | Integrity test failure explanation <50 words | Corrective action taken | Scheduled date for retest | Results of retest(if in current reporting year) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SELECT | | | | | SELECT | | | SELECT | SELECT | | SELECT | | |
| | SELECT | | | | | SELECT | | | SELECT | SELECT | | SELECT | | |

* Capacity required should comply with 25% or 110% containment rule as detailed in your licence

| | | | Commentary |
|---|---|---|---|
| 15 | Has integrity testing been carried out in accordance with licence requirements and are all structures tested in line with BS8007/EPA Guidance? | bunding and storage guidelines | SELECT | |
| 16 | Are channels/transfer systems to remote containment systems tested? | | SELECT | |
| 17 | Are channels/transfer systems compliant in both integrity and available volume? | | SELECT | |

### Pipeline/underground structure testing

| | | | |
|---|---|---|---|
| 1 | Are you required by your licence to undertake integrity testing* on underground structures e.g. pipelines or sumps etc ? if yes please fill out table 2 below listing all underground structures and pipelines on site **which failed the integrity test and all which have not been tested withing the integrity test period as specified** | Yes | No underground tanks or pipelines on site. |
| 2 | Please provide integrity testing frequency period | SELECT | |

*please note integrity testing means water tightness testing for process and foul pipelines (as required under your licence)

**Table B2:** Summary details of pipeline/underground structures integrity test

| Structure ID | Type system | Material of construction: | Does this structure have Secondary containment? | Type of secondary containment | Type integrity testing | Integrity reports maintained on site? | Results of test | Integrity test failure explanation <50 words | Corrective action taken | Scheduled date for retest | Results of retest(if in current reporting year) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | SELECT | SELECT | SELECT | SELECT | SELECT | SELECT | SELECT | | | | SELECT |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

Please use commentary for additional details not answered by tables/ questions above

| Groundwater/Soil monitoring template | Lic No: | P0501-01 | Year | 2013 |
|---|---|---|---|---|

| | | | Comments | |
|---|---|---|---|---|
| 1 | Are you required to carry out groundwater monitoring as part of your licence requirements? | no | | Please provide an interpretation of groundwater monitoring data in the interpretation box below or if you require additional space please include a groundwater/contaminated land monitoring results interpretaion as an additional section in this AER |
| 2 | Are you required to carry out soil monitoring as part of your licence requirements? | no | | |
| 3 | Do you extract groundwater for use on site? If yes please specify use in comment section | yes | Drinking water well | |
| 4 | Do monitoring results show that groundwater generic assessment criteria such as GTVs or IGVs are exceeded or is there an upward trend in results for a substance? If yes, please complete the Groundwater Monitoring Guideline Template Report (link in cell G8) and submit separately through ALDER as a licensee return AND answer questions 5-12 below. Groundwater monitoring template | no | | |
| 5 | Is the contamination related to operations at the facility (either current and/or historic) | no | | |
| 6 | Have actions been taken to address contamination issues?If yes please summarise remediation strategies proposed/undertaken for the site | N/A | | |
| 7 | Please specify the proposed time frame for the remediation strategy | N/A | | |
| 8 | Is there a licence condition to carry out/update ELRA for the site? | N/A | | |
| 9 | Has any type of risk assesment been carried out for the site? | N/A | | |
| 10 | Has a Conceptual Site Model been developed for the site? | N/A | | |
| 11 | Have potential receptors been identified on and off site? | N/A | | |
| 12 | Is there evidence that contamination is migrating offsite? | N/A | | Please enter interpretation of data here |

**Table 1: Upgradient Groundwater monitoring results**

| Date of sampling | Sample location reference | Parameter/ Substance | Methodology | Monitoring frequency | Maximum Concentration++ | Average Concentration+ | unit | GTV's* | SELECT** | Upward trend in pollutant concentration over last 5 years of monitoring data |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | SELECT | | | SELECT |
| | | | | | | | SELECT | | | SELECT |

.+ where average indicates arithmetic mean

.++ maximum concentration indicates the maximum measured concentration from all monitoring results produced during the reporting year

**Table 2: Downgradient Groundwater monitoring results**

| Date of sampling | Sample location reference | Parameter/ Substance | Methodology | Monitoring frequency | Maximum Concentration | Average Concentration | unit | GTV's* | SELECT** | Upward trend in yearly average pollutant concentration over last 5 years of monitoring data |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | SELECT | | | SELECT |
| | | | | | | | SELECT | | | SELECT |

| Groundwater/Soil monitoring template | Lic No: | P0501-01 | Year | 2013 |
|---|---|---|---|---|

| | |
|---|---|
| *please note exceedance of generic assessment criteria (GAC) such as a Groundwater Threshold Value (GTV) or an Interim Guideline Value (IGV) or an upward trend in results for a substance indicates that further interpretation of monitoring results is required. In addition to completing the above table, please complete the Groundwater Monitoring Guideline Template Report at the link provided and submit separately through ALDER as a licensee return or as otherwise instructed by the EPA. | Groundwater monitoring template |
| More information on the use of soil and groundwater standards/ generic assessment criteria (GAC) and risk assessment tools is available in the EPA published guidance (see the link in G31) | Guidance on the Management of Contaminated Land and Groundwater at EPA Licensed Sites (EPA 2013). |

| | | | | | |
|---|---|---|---|---|---|
| **Depending on location of the site and proximity to other sensitive receptors alternative Receptor based Water Quality standards should be used in addition to the GTV e.g. if the site is close to surface water compare to Surface Water Environmental Quality Standards (SWEQS), If the site is close to a drinking water supply compare results to the Drinking Water Standards (DWS) | Surface water EQS | Groundwater regulations GTV's | Drinking water (private supply) standards | Drinking water (public supply) standards | Interim Guideline Values (IGV) |

| **Groundwater/Soil monitoring template** | Lic No: | P0501-01 | Year | 2013 |
|---|---|---|---|---|

**Table 3: Soil results**

| Date of sampling | Sample location reference | Parameter/ Substance | Methodology | Monitoring frequency | Maximum Concentration | Average Concentration | unit |
|---|---|---|---|---|---|---|---|
| | | | | | | | SELECT |
| | | | | | | | SELECT |

Where additional detail is required please enter it here in 200 words or less

| | Environmental Liabilities template | Lic No: | P0501-01 | Year | 2013 |
|---|---|---|---|---|---|

Click here to access EPA guidance on Environmental Liabilities and Financial provision

| | | | Commentary |
|---|---|---|---|
| 1 | ELRA initial agreement status | Not a licence requirement | |
| 2 | ELRA review status | NA | |
| 3 | Amount of Financial Provision cover required as determined by the latest ELRA | NA | |
| 4 | Financial Provision for ELRA status | NA | |
| 5 | Financial Provision for ELRA - amount of cover | NA | |
| 6 | Financial Provision for ELRA - type | NA | |
| 7 | Financial provision for ELRA expiry date | NA | |
| 8 | Closure plan initial agreement status | NA | Internal Budget Provision |
| 9 | Closure plan review status | NA | Internal Budget Provision |
| 10 | Financial Provision for Closure status | NA | Internal Budget Provision |
| 11 | Financial Provision for Closure - amount of cover | NA | Internal Budget Provision |
| 12 | Financial Provision for Closure - type | NA | Internal Budget Provision |
| 13 | Financial provision for Closure expiry date | NA | |

## Environmental Management Programme/Continuous Improvement Programme template

Lic No: P0501-01 Year 2013

Highlighted cells contain dropdown menu click to view

| | | | Additional Information |
|---|---|---|---|
| 1 | Do you maintain an Environmental Mangement System (EMS) for the site. If yes, please detail in additional information | Yes | Internal unaccredited EMS. |
| 2 | Does the EMS reference the most significant environmental aspects and associated impacts on-site | Yes | |
| 3 | Does the EMS maintain an Environmental Management Programme (EMP) as required in accordance with the licence requirements | Yes | |
| 4 | Do you maintain an environmental documentation/communication system to inform the public on environmental performance of the facility, as required by the licence | Yes | |

### Environmental Management Programme (EMP) report

| Objective Category | Target | Status (% completed) | How target was progressed | Responsibility | Intermediate outcomes |
|---|---|---|---|---|---|
| Reduction of emissions to Air | Continue to train all employees in environmental matters. Training will be by means of a new four module training programme delivered by dedicated Bord na Mona | 90 | In total 59 Personnel received training in 2013. There were 4 haydraulic harrows deployed across the licence area.. | Individual | Reduced emissions |
| Waste reduction/Raw material usage efficiency | Waste streamlining is a project we are particularly interested in continuine and hope to reduce wastes further in the future and be more efficient in dealing with all aspects of waste management | 100 | Installed a waste management system. Quarterly waste reports are returned for records/filing and waste streams are segrated on site to maximise recycling potential. | Section Head | Improved Environmental Management Practices |
| Waste reduction/Raw material usage efficiency | Continue with the recycling of polyethylene. The sourcing of more recycling contractors will be ongoing. | 100 | In total 100.6 tonnes were sent off site for recycling. Procurement also exploring the possibility of securing further recyclers | Individual | Improved Environmental Management Practices |
| Energy Management | As part of an energy management process, workshop energy audits were carried out with the assistance of SEAI. | 70 | Workshop audit findings in relation to the utilisation of natural light were implemented reducing the dependence on artifical lighting. | Section Head | Improved Environmental Management Practices |

| Environmental Management Programme/Continuous Improvement Programme template | | | Lic No: | P0501-01 | Year 2013 |
|---|---|---|---|---|---|
| Reduction of emissions to water | Continue to train all employees in environmental matters. Training will be by means of a new four module training programme delivered by dedicated Bord na Mona Training Specialists. This new training programme includes Environmental Compliance _ IPPC, Biodiversity, Archaeology and Energy Management. Hydraulic harrows were deployed at 4 locations during the 2013 production season. Continue with the collection of headland peat, particularly at dust sensitive locations. | 90 | In total 59 Personnel received training in 2013. There were 4 haydraulic harrows deployed across the licence area. Headland peat was collected at all locations and included as part of overall peat returns. | Individual | Improved Environmental Management Practices |
| | | | | | |

| Noise monitoring summary report | Lic No: | P0501-01 | Year | 2013 |
|---|---|---|---|---|

| | | |
|---|---|---|
| 1 | Was noise monitoring a licence requirement for the AER period?<br>If yes please fill in table N1 noise summary below | No |
| 2 | Was noise monitoring carried out using the EPA Guidance note, including completion of the "Checklist for noise measurement report" included in the guidance note as table 6? (Noise Guidance note NG4) | NA |
| 3 | Does your site have a noise reduction plan | NA |
| 4 | When was the noise reduction plan last updated? | Enter date |
| 5 | Have there been changes relevant to site noise emissions (e.g. plant or operational changes) since the last noise survey? | NA |

**Table N1: Noise monitoring summary**

| Date of monitoring | Time period | Noise location (on site) | Noise sensitive location -NSL (if applicable) | $LA_{eq}$ | $LA_{90}$ | $LA_{10}$ | $LA_{max}$ | Tonal or Impulsive noise* (Y/N) | If tonal /impulsive noise was identified was 5dB penalty applied? | Comments (ex. main noise sources on site, & extraneous noise ex. road traffic) | Is site compliant with noise limits (day/evening/night)? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | SELECT | SELECT | | SELECT |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

*Please ensure that a tonal analysis has been carried out as per guidance note NG4. These records must be maintained onsite for future inspection

If noise limits exceeded as a result of noise attributed to site activities, please choose the corrective action from the following options? SELECT

| |
|---|
| ** please explain the reason for not taking action/resolution of noise issues? |
| Any additional comments? (less than 200 words) |

## Resource Usage/Energy efficiency summary

Lic No: P0501-01 Year 2013

| | | | Additional information |
|---|---|---|---|
| 1 | When did the site carry out the most recent energy efficiency audit? Please list the recommendations in table 3 below | Nov-12 | Report on file |
| 2 | Is the site a member of any accredited programmes for reducing energy usage/water conservation such as the SEAI programme linked to the right? If yes please list them in additional information | SEAI - Large Industry Energy Network (LIEN) / Yes | |
| 3 | Where Fuel Oil is used in boilers on site is the sulphur content compliant with licence conditions? Please state percentage in additional information | NA | Not a Licence requirement |

Table R1 Energy usage on site

| Energy Use | Previous year | Current year | Production +/- % compared to previous reporting year** | Energy Consumption +/- % vs overall site production* |
|---|---|---|---|---|
| Total Energy Used (MWHrs) | 4376 | 8169 | 433 | 46.44 |
| Total Energy Generated (MWHrs) | | | | |
| Total Renewable Energy Generated (MWHrs) | | | | |
| Electricity Consumption (MWHrs) | 367 | 309 | 433 | -15.8 |
| Fossil Fuels Consumption: | | | | |
| Heavy Fuel Oil (m3) | | | | |
| Light Fuel Oil (m3) | 394.609 | 773.563 | 433 | 96 |
| Natural gas (m3) | | | | |
| Coal/Solid fuel (metric tonnes) | 20 | | | |
| Peat (metric tonnes) | | | | |
| Renewable Biomass | | | | |
| Renewable energy generated on site | | | | |

* where consumption of energy can be compared to overall site production please enter this information as percentage increase or decrease compared to the previous reporting year.

** where site production information is available please enter percentage increase or decrease compared to previous year

Table R2 Water usage on site

| | | | | | Water Emissions | Water Consumption | |
|---|---|---|---|---|---|---|---|
| Water use | Water extracted Previous year m3/yr. | Water extracted Current year m3/yr. | Production +/- % compared to previous reporting year** | Energy Consumption +/- % vs overall site production* | Volume Discharged back to environment($m^3$yr): | Volume used i.e not discharged to environment e.g. released as steam m3/yr | Unaccounted for Water: |
| Groundwater | | | | | | | |
| Surface water | | | | | | | |
| Public supply | | | | | | | |
| Recycled water | | | | | | | |
| Total | | | | | | | |

* where consumption of water can be compared to overall site production please enter this information as percentage increase or decrease compared to the previous reporting year.

** where site production information is available please enter percentage increase or decrease compared to previous year

Table R3 Waste Stream Summary

| | Total | Landfill | Incineration | Recycled | Other |
|---|---|---|---|---|---|
| Hazardous (Tonnes) | 37.79 | 12.12 | 4.74 | 20.93 | |
| Non-Hazardous (Tonnes) | 347.67 | 30.97 | 0 | 157.6 | 159.1 |

**Resource Usage/Energy efficiency summary** Lic No: P0501-01 Year 2013

Table R4: Energy Audit finding recommendations

| Date of audit | Recommendations | Description of Measures proposed | Origin of measures | Predicted energy savings % | Implementation date | Responsibility | Completion date | Status and comments |
|---|---|---|---|---|---|---|---|---|
| | | | SELECT | | | | | |
| | | | SELECT | | | | | |
| | | | SELECT | | | | | |

Table R5: Power Generation: Where power is generated onsite (e.g. power generation facilities/food and drink industry)please complete the following information

| | Unit ID | Unit ID | Unit ID | Unit ID | Station Total |
|---|---|---|---|---|---|
| Technology | | | | | |
| Primary Fuel | | | | | |
| Thermal Efficiency | | | | | |
| Unit Date of Commission | | | | | |
| Total Starts for year | | | | | |
| Total Running Time | | | | | |
| Total Electricity Generated (GWH) | | | | | |
| House Load (GWH) | | | | | |
| KWH per Litre of Process Water | | | | | |
| KWH per Litre of Total Water used on Site | | | | | |

## Complaints and Incidents summary template

Lic No: P0501-01 Year 2013

### Complaints

| | | Additional information |
|---|---|---|
| Have you received any environmental complaints in the current reporting year? If yes please complete summary details of complaints received on site in table 1 below | Yes | |

Table 1 Complaints summary

| Date | Category | Other type (please specify) | Brief description of complaint (Free txt <20 words) | Corrective action< 20 words | Resolution status | Resolution date | Further information |
|---|---|---|---|---|---|---|---|
| 24/05/2013 | Air | | Dust Complaint | Stopped production durin | Complete | 24/05/2013 | |
| 11/07/2013 | Air | | Dust Complaint | Stopped production durin | Complete | 11/07/2013 | |
| 16/07/2013 | Air | | Dust Complaint | Stopped production durin | Complete | 16/07/2013 | |
| | SELECT | | | | SELECT | | |
| | SELECT | | | | SELECT | | |

| | |
|---|---|
| Total complaints open at start of reporting year | 0 |
| Total new complaints received during reporting year | 3 |
| Total complaints closed during reporting year | 3 |
| Balance of complaints end of reporting year | 0 |

### Incidents

| | | Additional information |
|---|---|---|
| Have any incidents occurred on site in the current reporting year? Please list all incidents for current reporting year in Table 2 below | Yes | |

| | |
|---|---|
| *For information on how to report and what constitutes an incident | What is an incident |

Table 2 Incidents summary

| Date of occurrence | Incident nature | Location of occurrence | Incident category*please refer to guidance | Receptor | Cause of incident | Other cause(please specify) | Activity in progress at time of incident | Communication | Occurrence | Corrective action<20 words | Preventative action <20 words | Resolution status | Resolution date | Likelihood of reoccurence |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 08/04/2013 | Fire | Drumman Bog | 1. Minor | Air | Other (add details | Quad bike trespass | Normal activities | EPA | New | Fire was extinguished | Boundaries Se | Complete | 17/04/2013 | Low |
| 03/10/2013 | Trigger level reached | Derrygreenagh SWE2 | 1. Minor | Water | Plant or equipment issues | | Normal activities | EPA | New | Investigation | None required | Complete | 15/10/2013 | Low |
| | SELECT | SELECT | SELECT | SELECT | SELECT | | SELECT | SELECT | SELECT | | | SELECT | | SELECT |
| | SELECT | SELECT | SELECT | SELECT | SELECT | | SELECT | SELECT | SELECT | | | SELECT | | SELECT |
| | SELECT | SELECT | SELECT | SELECT | SELECT | | SELECT | SELECT | SELECT | | | SELECT | | SELECT |

| | |
|---|---|
| Total number of incidents current year | 2 |
| Total number of incidents previous year | 3 |
| % reduction/ increase | -33% |

**WASTE SUMMARY** Lic No: P0501-01 Year 2013

**SECTION A-PRTR ON SITE WASTE TREATMENT AND WASTE TRANSFERS TAB- TO BE COMPLETED BY ALL IPPC AND WASTE FACILITIES**

PRTR facility logon — dropdown list click to see options

**SECTION B- WASTE ACCEPTED ONTO SITE-TO BE COMPLETED BY ALL IPPC AND WASTE FACILITIES**

| | | | Additional Information |
|---|---|---|---|
| 1 | Were any wastes accepted onto your site for recovery or disposal or treatment prior to recovery or disposal within the boundaries of your facility ?; (waste generated within your boundaries is to be captured through PRTR reporting) If yes please enter details in table 1 below | SELECT | |
| 2 | Did your site have any rejected consignments of waste in the current reporting year? If yes please give a brief explanation in the additional information | SELECT | |
| 3 | Was waste accepted onto your site that was generated outside the Republic of Ireland? If yes please state the quantity in tonnes in additional information | SELECT | |

**Table 1 Details of waste accepted onto your site for recovery, disposal or treatment (do not include wastes generated at your site, as these will have been reported in your PRTR workbook)**

| Licenced annual tonnage limit for your site (total tonnes/annum) | EWC code (European Waste Catalogue EWC codes) | Source of waste accepted | Description of waste accepted **Please enter an accurate and detailed description - which applies to relevant EWC code** (European Waste Catalogue EWC codes) | Quantity of waste accepted in current reporting year (tonnes) | Quantity of waste accepted in previous reporting year (tonnes) | Reduction/ Increase over previous year +/ - % | Reason for reduction/ increase from previous reporting year | Packaging Content (%)- only applies if the waste has a packaging component | Disposal/Recovery or treatment operation carried out at your site and the description of this operation | Quantity of waste remaining on site at the end of reporting year (tonnes) | Comments - |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**SECTION C-TO BE COMPLETED BY ALL WASTE FACILITIES (waste transfer stations, Composters, Material recovery facilities etc) EXCEPT LANDFILL SITES**

| | | |
|---|---|---|
| 4 | Is all waste processing infrastructure as required by your licence and approved by the Agency in place? If no please list waste processing infrastructure required onsite | SELECT |
| 5 | Is all waste storage infrastructure as required by your licence and approved by the Agency in place? If no please list waste storage infrastructure required on site | SELECT |
| 6 | Does your facility have relevant nuisance controls in place? | SELECT |
| 7 | Do you have an odour management system in place for your facility? If no why? | SELECT |
| 8 | Do you maintain a sludge register on site? | SELECT |

**SECTION D-TO BE COMPLETED BY LANDFILL SITES ONLY**

**Table 2 Waste type and tonnage-landfill only**

| Waste types permitted for disposal | Authorised/licenced annual intake for disposal (tpa) | Actual intake for disposal in reporting year (tpa) | Remaining licensed capacity at end of reporting year (m3) | Comments |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**Table 3 General information-Landfill only**

| Area ID | Date landfilling commenced | Date landfilling ceased | Currently landfilling | Private or Public Operated | Inert or non-hazardous | Predicted date to cease landfilling | Licence permits asbestos | Is there a separate cell for asbestos? | Accepted asbestos in reporting year | Total disposal area occupied by waste | Lined disposal area occupied by waste | Unlined area |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | SELECT UNIT | SELECT UNIT | SELECT UNIT |
| Cell 8 | | | | | | | | | | | | |

| WASTE SUMMARY | Lic No: | P0501-01 | Year | 2013 |
|---|---|---|---|---|

## Table 4 Environmental monitoring-landfill only

Landfill Manual-Monitoring Standards

| Was meterological monitoring in compliance with Landfill Directive (LD) standard in reporting year + | Was leachate monitored in compliance with LD standard in reporting year | Was Landfill Gas monitored in compliance with LD standard in reporting year | Was SW monitored in compliance with LD standard in reporting year | Have GW trigger levels been established | Were emission limit values agreed with the Agency (ELVs) | Was topography of the site surveyed in reporting year | Has the statement under S53(A)(5) of WMA been submitted in reporting year | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

.+ please refer to Landfill Manual linked above for relevant Landfill Directive monitoring standards

## Table 5 Capping-Landfill only

| Area uncapped* | Area with temporary cap | Area with final cap to LD Standard m2 ha, a | Area capped other | Area with waste that should be permanently capped to date under licence | What materials are used in the cap | Comments |
|---|---|---|---|---|---|---|
| SELECT UNIT | SELECT UNIT | | | | | |
| | | | | | | |

*please note this includes daily cover area

## Table 6 Leachate-Landfill only

| | | |
|---|---|---|
| 9 | Is leachate from your site treated in a Waste Water Treatment Plant? | SELECT |
| 10 | Is leachate released to surface water? If yes please complete leachate mass load information below | SELECT |

| Volume of leachate in reporting year(m3) | Leachate (BOD) mass load (kg/annum) | Leachate (COD) mass load (kg/annum) | Leachate (NH4) mass load (kg/annum) | Leachate (Chloride) mass load kg/annum | Leachate treatment on-site | Specify type of leachate treatment | Comments |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

Please ensure that all information reported in the landfill gas section is consistent with the Landfill Gas Survey submitted in conjunction with PRTR returns

## Table 7 Landfill Gas-Landfill only

| Gas Captured&Treated by LFG System m3 | Power generated (MW / KWh) | Used on-site or to national grid | Was surface emissions monitoring performed during the reporting year? | Comments |
|---|---|---|---|---|
| | | | SELECT | |

| Comments on liner type |
| --- |
| |

**Derrygreenagh**

**Decommissioning and Rehabilitation**

**AER Overview 2013.**

Within the Derrygreenagh licensed area (P0501-01) there were no bogs available for rehabilitation in 2013. Ongoing monitoring of cutaway within the Derrygreenagh licensing area included the monitoring of rehabilitation trials in Drumman Bog. Consultation was carried out with a local community group from Ballivor regarding Bracklin Bog draft rehabilitation plan.

Draft rehabilitation plans for the Derrygreenagh bogs licensed area, including more detailed draft plans for each component bog unit were submitted to the EPA in 2013. The plans will be reviewed in Winter 2014/2015 and updated accordingly. The BNM Ecology Team (who plan and manage rehabilitation) met with the EPA inspectorate in 2013 to outline the general content and a review process was agreed. This will involve a biannual review and update of plans as well as more detail and finalisation of plans for sites that have been taken out of production.

The annual Biodiversity Action Plan review day was held in December 2013 and this included an update on progress of this plan, bog restoration and cutaway rehabilitation for a wide range on statutory and non-statutory consultees including members of the NPWS, BWI, Bord na Mona, Coillte, Inland Fisheries Ireland, An Taisce, IPCC, Irish Red Grouse Association, Irish Wildlife Trust, NARGC, local game councils, Midland Regional Planning Authority as well as a range of local community groups and Heritage Officers from counties Laois, Offaly, Kildare, Roscommon, Longford, Meath, Galway, Westmeath and Dublin.

The Restoration and Aftercare Plans for the Derrygreenagh Group of Bogs was submitted to the Agency in April 2013.

A copy of our Biodiversity Action Plan is available to view and download at http://www.bordnamona.ie/our-company/biodiversity/

**Bord na Mona Derrygreenagh**

**IPPC Licence P0501-01**

## Siltpond Monitoring Frequency & Results

| X | Y | Bog | SW | Monitoring | Sampled | pH | SS | TS | Ammonia | TP | COD | Colour |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 252468.68 | 240919.32 | Carrick | SW-5 | Q1 13 | 27/03/2013 | 7.8 | 5 | 454 | 0.23 | 0.05 | 36 | 80 |
| 251880.60 | 234593.13 | Ballybeg | SW-13 | Q1 13 | 27/03/2013 | 7.9 | 11 | 222 | 1.4 | 0.06 | 38 | 80 |
| 240425.65 | 234997.32 | Toar | SW-17 | Q1 13 | 27/03/2013 | 7.1 | 5 | 278 | 1.1 | 0.05 | 44 | 177 |
| 266022.62 | 259613.57 | Lisclogher | SW-25 | Q1 13 | 27/03/2013 | 7.8 | 5 | 290 | 0.18 | 0.05 | 63 | 190 |
| 260583.98 | 256514.28 | Lisclogher | SW-26 | Q1 13 | 27/03/2013 | 6.6 | 5 | 192 | 1.2 | 0.05 | 77 | 160 |
| 254528.83 | 242354.28 | Derryhinch | SW-2 | Q2 13 | 23/05/2013 | 7.8 | 8 | 218 | 2.3 | 0.05 | 65 | 100 |
| 253369.19 | 242417.94 | Derryhinch | SW-3 | Q2 13 | 23/05/2013 | 7.8 | 7 | 332 | 2.7 | 0.06 | 41 | 83 |
| 252468.68 | 240919.32 | Carrick | SW-5 | Q2 13 | 23/05/2013 | 7.9 | 5 | 472 | 0.32 | 0.05 | 40 | 80 |
| 252409.71 | 241163.33 | Carrick | SW-6 | Q2 13 | 23/05/2013 | 7.9 | 5 | 432 | 0.06 | 0.06 | 32 | 51 |
| 252473.21 | 241162.01 | Carrick | SW-7 | Q2 13 | 23/05/2013 | 7.9 | 5 | 492 | 0.06 | 0.08 | 39 | 52 |
| 252275.61 | 239871.62 | Drumman | SW-8 | Q3 13 | 22/08/2013 | 7.8 | 5 | 290 | 0.02 | 0.05 | 40 | 51 |
| 252602.78 | 242540.17 | Derryhinch | SW-4 | Q3 13 | 22/08/2013 | 7.6 | 5 | 344 | 0.05 | 0.05 | 83 | 161 |
| 255381.16 | 243606.05 | Derryhinch | SW-1 | Q3 13 | 22/08/2013 | 7.5 | 12 | 237 | 1.9 | 0.13 | 108 | 125 |
| 252623.61 | 241470.16 | Carrick | SW-4A | Q3 13 | 22/08/2013 | 7.7 | 5 | 336 | 0.82 | 0.05 | 85 | 284 |
| 252950.37 | 238421.69 | Drumman | SW-9 | Q3 13 | 22/08/2013 | 7.6 | 5 | 354 | 0.02 | 0.05 | 82 | 244 |
| 252206.09 | 235207.02 | Ballybeg | SW-12 | Q4 13 | 14/11/2013 | 7.1 | 5 | 306 | 0.11 | 0.05 | 79 | 263 |
| 251880.60 | 234593.13 | Ballybeg | SW-13 | Q4 13 | 14/11/2013 | 7.6 | 13 | 318 | 1.5 | 0.05 | 54 | 124 |
| 252250.49 | 235061.45 | Ballybeg | SW-13A | Q4 13 | 14/11/2013 | 7.6 | 17 | 342 | 0.88 | 0.08 | 46 | 103 |
| 260583.98 | 256514.28 | Bracklin | SW-26 | Q4 13 | 14/11/2013 | 6.6 | 5 | 50 | 0.91 | 0.05 | 68 | 206 |
| 260609.41 | 256526.33 | Bracklin | SW-27 | Q4 13 | 14/11/2013 | 6.7 | 5 | 138 | 1 | 0.05 | 60 | 319 |

| Yard Discharge Results 2013 | | |
|---|---|---|
| **Licence: P0501-01** | | |
| **Works: Derrygreenagh** | | |
| **Month** | **D/Greenagh SWE 2 COD** | **Rossan SWE 1 COD** |
| Jan | 44 | 31 |
| Feb | 31 | 0 |
| Mar | 33 | 69 |
| Apr | 50 | 49 |
| May | 23 | 78 |
| June | 26 | 35 |
| July | 0 | 0 |
| Aug | 0 | 0 |
| Sep | 0 | 0 |
| Oct | 112 | 30 |
| Nov | 37 | 22 |
| Dec | 42 | 12 |

**Note: 0** denotes no flow at emission point on day of sampling




| PRTR# : P0501 | Facility Name : Bord na Mona Energy Limited | Filename : P0501_2013(1).xls | Return Year : 2013 |

Guidance to completing the PRTR workbook

# AER Returns Workbook

Version 1.1.18

| | |
|---|---|
| **REFERENCE YEAR** | 2013 |

## 1. FACILITY IDENTIFICATION

| | |
|---|---|
| Parent Company Name | Bord na Mona Energy Limited |
| Facility Name | Bord na Mona Energy Limited |
| PRTR Identification Number | P0501 |
| Licence Number | P0501-01 |

Waste or IPPC Classes of Activity

| No. | class_name |
|---|---|
| 1.4 | The extraction of peat in the course of business which involves an area exceeding 50 hectares. |

| | |
|---|---|
| Address 1 | Derrygreenagh |
| Address 2 | Rockfordbridge |
| Address 3 | Mullingar |
| Address 4 | Co Westmeath |
| | |
| | Westmeath |
| Country | Ireland |
| Coordinates of Location | -7.25676 53.3910 |
| River Basin District | IEEA |
| NACE Code | 0892 |
| Main Economic Activity | Extraction of peat |
| **AER Returns Contact Name** | Enda Mc Donagh |
| **AER Returns Contact Email Address** | enda.mcdonagh@bnm.ie |
| **AER Returns Contact Position** | Head of Environment |
| **AER Returns Contact Telephone Number** | 0579345911 |
| **AER Returns Contact Mobile Phone Number** | 0862370816 |
| **AER Returns Contact Fax Number** | 0579345160 |
| **Production Volume** | 338330.0 |
| **Production Volume Units** | Tonnes |
| **Number of Installations** | 6 |
| **Number of Operating Hours in Year** | 2216 |
| **Number of Employees** | 60 |
| **User Feedback/Comments** | In accordance with licence condition 6.2 of Technical Amendment A, quarterly sampling is now rotated every quarter and therefore suspended solids results are not factored into loading. |
| **Web Address** | www.bnm.ie |

## 2. PRTR CLASS ACTIVITIES

| Activity Number | Activity Name |
|---|---|
| 50.1 | General |

## 3. SOLVENTS REGULATIONS (S.I. No. 543 of 2002)

| | |
|---|---|
| Is it applicable? | No |
| Have you been granted an exemption ? | |
| If applicable which activity class applies (as per Schedule 2 of the regulations) ? | |
| Is the reduction scheme compliance route being used ? | |

**4. WASTE IMPORTED/ACCEPTED ONTO SITE** Guidance on waste imported/accepted onto site

| | |
|---|---|
| Do you import/accept waste onto your site for on-site treatment (either recovery or disposal activities) ? | No |

**4.1 RELEASES TO AIR** Link to previous years emissions data | PRTR# : P0501 | Facility Name : Bord na Mona Energy Limited | Filename : P0501_2013(1).xls | Return Year : 2013 | 31/03/2014 14:39

**SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS**

| RELEASES TO AIR | | | | | Please enter all quantities in this section in KGs | | | |
|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | QUANTITY | | | |
| | | | Method Used | | | | | |
| No. Annex II | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

**SECTION B : REMAINING PRTR POLLUTANTS**

| RELEASES TO AIR | | | | | Please enter all quantities in this section in KGs | | | |
|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | QUANTITY | | | |
| | | | Method Used | | | | | |
| No. Annex II | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

**SECTION C : REMAINING POLLUTANT EMISSIONS (As required in your Licence)**

| RELEASES TO AIR | | | | | Please enter all quantities in this section in KGs | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | QUANTITY | | | | | |
| | | | Method Used | | DM-01 | DM -02 | DM-03 | | | |
| Pollutant No. | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | Emission Point 2 | Emission Point 3 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| 210 | Dust | E | OTH | VDI 2119 Blatt 2/Part 2 | 0.0 | 0.0 | 0.0 | 0.0427 | 0.0 | 0.0427 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

## Additional Data Requested from Landfill operators

**For the purposes of the National Inventory on Greenhouse Gases, landfill operators are requested to provide summary data on landfill gas (Methane) flared or utilised on their facilities to accompany the figures for total methane generated. Operators should only report their Net methane (CH4) emission to the environment under T(total) KG/yr for Section A: Sector specific PRTR pollutants above. Please complete the table below:**

**Landfill:** Bord na Mona Energy Limited

| **Please enter summary data on the quantities of methane flared and / or utilised** | | | Method Used | | | |
|---|---|---|---|---|---|---|
| | **T (Total) kg/Year** | **M/C/E** | **Method Code** | **Designation or Description** | **Facility Total Capacity m3 per hour** | |
| Total estimated methane generation (as per site model) | 0.0 | | | | N/A | |
| Methane flared | 0.0 | | | | 0.0 | (Total Flaring Capacity) |
| Methane utilised in engine/s | 0.0 | | | | 0.0 | (Total Utilising Capacity) |
| Net methane emission (as reported in Section A above) | 0.0 | | | | N/A | |

## 4.2 RELEASES TO WATERS

Link to previous years emissions data



### SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

Data on ambient monitoring of storm/surface water or groundwater, conducted as part of your licence requirements, should NOT be submitted under AER / PRTR Reporting as this only co

| RELEASES TO WATERS | | | | | Please enter all quantities in this section in KGs | | | |
|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | | | | QUANTITY | | | |
| | | | Method Used | | | | | |
| No. Annex II | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

### SECTION B : REMAINING PRTR POLLUTANTS

| RELEASES TO WATERS | | | | | Please enter all quantities in this section in KGs | | | |
|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | | | | QUANTITY | | | |
| | | | Method Used | | | | | |
| No. Annex II | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

### SECTION C : REMAINING POLLUTANT EMISSIONS (as required in your Licence)

| RELEASES TO WATERS | | | | | Please enter all quantities in this section in KGs | | | |
|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | | | | QUANTITY | | | |
| | | | Method Used | | SW 15 | | | |
| Pollutant No. | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| **240** | **Suspended Solids** | E | OTH | G/19 Based on ALPHA,1998,20th Edition, Method 2540D | 5062.46 | 5062.46 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

## 4.3 RELEASES TO WASTEWATER OR SEWER

Link to previous years emissions data



### SECTION A : PRTR POLLUTANTS

| OFFSITE TRANSFER OF POLLUTANTS DESTINED FOR WASTE-WATER TREATMENT OR SEWER | | | | | Please enter all quantities in this section in KGs | | | |
|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | QUANTITY | | | |
| | | | Method Used | | | | | |
| No. Annex II | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

### SECTION B : REMAINING POLLUTANT EMISSIONS (as required in your Licence)

| OFFSITE TRANSFER OF POLLUTANTS DESTINED FOR WASTE-WATER TREATMENT OR SEWER | | | | | Please enter all quantities in this section in KGs | | | |
|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | QUANTITY | | | |
| | | | Method Used | | | | | |
| Pollutant No. | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

## 4.4 RELEASES TO LAND

Link to previous years emissions data



### SECTION A : PRTR POLLUTANTS

| RELEASES TO LAND | | | | | Please enter all quantities in this section in KGs | | |
|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | QUANTITY | | |
| | | | Method Used | | | | |
| No. Annex II | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

### SECTION B : REMAINING POLLUTANT EMISSIONS (as required in your Licence)

| RELEASES TO LAND | | | | | Please enter all quantities in this section in KGs | | |
|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | QUANTITY | | |
| | | | Method Used | | | | |
| Pollutant No. | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

## 5. ONSITE TREATMENT & OFFSITE TRANSFERS OF WASTE

| PRTR# : P0501 | Facility Name : Bord na Mona Energy Limited | Filename : P0501_2013(1).xls | Return Year : 2013 | 31/03/2014 14:43

**Please enter all quantities on this sheet in Tonnes** 0

| Transfer Destination | European Waste Code | Hazardous | Quantity (Tonnes per Year) | Description of Waste | Waste Treatment Operation | Method Used | | Location of Treatment | Haz Waste : Name and Licence/Permit No of Next Destination Facility Non Haz Waste: Name and Licence/Permit No of Recover/Disposer | Haz Waste : Address of Next Destination Facility Non Haz Waste: Address of Recover/Disposer | Name and License / Permit No. and Address of Final Recoverer / Disposer (HAZARDOUS WASTE ONLY) | Actual Address of Final Destination i.e. Final Recovery / Disposal Site (HAZARDOUS WASTE ONLY) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | M/C/E | Method Used | | | | | |
| Within the Country | 01 01 02 | No | 159.1 | wastes from mineral non-metalliferous excavation | D1 | E | Volume Calculation | Onsite of generatic | Bord na Mona Energy Ltd,P0501-01 | Derrygreenagh,Rochfortbridge,Mullingar,Co Westmeath,Ireland | | |
| Within the Country | 02 01 04 | No | 100.6 | waste plastics (except packaging) | R5 | M | Weighed | Offsite in Ireland | Leinster Environmentals Ltd,WP 2008/06 | Haggardstown,Dundalk,Co Louth,,Ireland | | |
| To Other Countries | 11 01 13 | Yes | 0.14 | degreasing wastes containing dangerous substances | R11 | C | Volume Calculation | Abroad | Safety Kleen Ltd,99-1 | Tallaght,,.,.,,Ireland | Solvent Recovery Management,PP33345F,Wheeland Rd,Knottingly,West Yorks,WF11 8DZ,United Kingdom | Wheeland Rd,Knottingly,West Yorks,WF11 8DZ,United Kingdom |
| Within the Country | 13 02 05 | Yes | 16.6 | mineral-based non-chlorinated engine, gear and lubricating oils | R1 | C | Volume Calculation | Offsite in Ireland | Enva Ireland Ltd,184-1 | Clonminam Ind Estate,Portlaoise,Co Laois,,Ireland | Enva Ltd,184-1,Clonminam Industrial Estate,Portlaoise,Laois,,,Ireland | Clonminam Industrial Estate,Portlaoise,Laois,,Ireland |
| Within the Country | 15 01 03 | No | 6.44 | wooden packaging | R1 | M | Weighed | Offsite in Ireland | AES Ltd,WP-OY-08-061-01 | Cappincur,Tullamore,Co Offaly,,Iceland | | |
| To Other Countries | 15 02 02 | Yes | 4.74 | absorbents, filter materials (including oil filters not otherwise specified), wiping cloths, protective clothing contaminated by dangerous substances | R1 | C | Volume Calculation | Abroad | Enva Ireland Ltd,184-1 | Clonminam Ind Estate,Portlaoise,Co Laois,,Ireland | Lindenschmidt,Reg no E97095037,IINDENSCHMIDT,Kreuztal,...,Germany | IINDENSCHMIDT,Kreuztal,,.,Germany |
| To Other Countries | 16 01 07 | Yes | 2.5 | oil filters | R4 | C | Volume Calculation | Abroad | Enva Ireland Ltd,184-1 | Clonminam Ind Estate,Portlaoise,Co Laois,,Ireland | R.D. Recycling,Reg no 51727/1/KD,Houthalen,.,.,.,Belgium | Houthalen,.,.,.,Belgium |
| To Other Countries | 16 06 01 | Yes | 1.69 | lead batteries | R6 | M | Weighed | Abroad | Enva Ireland Ltd,184-1 | Clonminam Ind Estate,Portlaoise,Co Laois,,Ireland | Campine Recycling,MLAV/05-173/GVDA,Beerse,.,.,.,Belgium | Beerse,.,.,.,Belgium |
| Within the Country | 17 04 07 | No | 50.56 | mixed metals | R4 | M | Weighed | Offsite in Ireland | AES Ltd,WP-OY-08-061-01 | Cappincur,Tullamore,Co Offaly,,Iceland | | |
| Within the Country | 20 03 01 | No | 23.93 | mixed municipal waste | D1 | M | Weighed | Offsite in Ireland | AES Ltd,WP-OY-08-061-01 | Cappincur,Tullamore,Co Offaly,,Iceland | | |
| Within the Country | 20 03 01 | No | 7.04 | mixed municipal waste | D1 | M | Volume Calculation | Offsite in Ireland | AES Ltd,WP-OY-08-061-01 | Cappincur,Tullamore,Co Offaly,,Iceland | | |
| To Other Countries | 17 06 05 | Yes | 12.12 | construction materials containing asbestos (18) | D1 | M | Weighed | Abroad | Rialta Environmental Ltd,WCP-DC-09-1192-01 | Block 402 Grants Drive,Greenogue Business Park,Rathcoole,Dublin,Ireland | Grobenasper Entsorgungsgesellschaft & co,A60100507,Bimohler Strabe,5724623,Grobenasper ,.,Germany | Bimohler Strabe,5724623,Grobenasper ,.,Germany |

* Select a row by double-clicking the Description of Waste then click the delete button

| Facility Information Summary | |
|---|---|
| AER Reporting Year | 2014 |
| Licence Register Number | P0501-01 |
| Name of site | Bord na Mona Derrygreenagh |
| Site Location | Derrygreenagh, Rochfortbridge, Co Westmeath |
| NACE Code | 0892 |
| Class/Classes of Activity | 1.4 |
| National Grid Reference (6E, 6 N) | 249450, 238140 |

A description of the activities/processes at the site for the reporting year. This should include information such as production increases or decreases on site, any infrastructural changes, environmental performance which was measured during the reporting year **and an overview of compliance with your licence** listing all exceedances of licence limits (where applicable) and what they relate to e.g. air, water, noise.

Activities on site can be divided into two components, firstly the milling, harrowing, ridiging and harvesting of peat into stockpiles and secondly the transportation of that peat via an internal rail network to the Power Station and lorry outloading facilities. Production achieved was approximately 292,439 tonnes which was down on the 2013 figure. Infrastructurally, there was no bog development. From an environmental perspective silt pond capacity was increased by 1800m$^3$. There was also 1.7 km of shelter belt planted adjacent to the M6 motorway at Derryhinch Bog and 210 metres at Ballybeg Bog. The quarterly grab sampling was 100% compliant, with the continuous composite sampling returning one non-compliance for suspended solids. There were no environmental complaints received during the reporting period. In relation to silt pond cleaning, 86% of ponds received two cleanings, inspections dictating cleaning schedules. Decommissioning and Rehabilitation works are described in an attachment.

**Declaration:**

All the data and information presented in this report has been checked and certified as being accurate. The quality of the information is assured to meet licence requirements.

| E. Mulhall. | 24-3-15 |
|---|---|
| Signature<br>Group/Facility manager<br>(or nominated, suitably qualified and experienced deputy) | Date |

## AIR-summary template

Lic No: #REF! Year #REF!

**Answer all questions and complete all tables where relevant**

| | | | Additional information |
|---|---|---|---|
| 1 | Does your site have licensed air emissions? If yes please complete table A1 and A2 below for the current reporting year and answer further questions. If **you do not have** licenced emissions and **do not complete a solvent management plan** (table A4 and A5) you do not need to complete the tables | No | Fugitive emissions only |

## Periodic/Non-Continuous Monitoring

| | | | |
|---|---|---|---|
| 2 | Are there any results in breach of licence requirements? If yes please provide brief details in the comment section of TableA1 below | No | |
| 3 | Was all monitoring carried out in accordance with EPA guidance note AG2 and using the basic air monitoring checklist? Basic air monitoring checklist AGN2 | Yes | |

### Table A1: Licensed Mass Emissions/Ambient data-periodic monitoring (non-continuous)

| Emission reference no: | Parameter/ Substance | Frequency of Monitoring | ELV in licence or any revision therof | Licence Compliance criteria | Measured value | Unit of measurement | Compliant with licence limit | Method of analysis | Annual mass load (kg) | Comments - reason for change in % mass load from previous year if applicable |
|---|---|---|---|---|---|---|---|---|---|---|
| | SELECT | | | SELECT | | SELECT | SELECT | SELECT | | |
| | SELECT | | | SELECT | | SELECT | SELECT | SELECT | | |
| | SELECT | | | SELECT | | SELECT | SELECT | SELECT | | |
| | SELECT | | | SELECT | | SELECT | SELECT | SELECT | | |

Note 1: Volumetric flow shall be included as a reportable parameter

| AIR-summary template | Lic No: | #REF! | Year | #REF! |
|---|---|---|---|---|

## Continuous Monitoring

| | | | |
|---|---|---|---|
| 4 | Does your site carry out continuous air emissions monitoring? | No | |
| | If yes please review your continuous monitoring data and report the required fields below in Table A2 and compare it to its relevant Emission Limit Value (ELV) | | |
| 5 | Did continuous monitoring equipment experience downtime? If yes please record downtime in table A2 below | No | |
| 6 | Do you have a proactive service agreement for each piece of continuous monitoring equipment? | No | |
| 7 | Did your site experience any abatement system bypasses? If yes please detail them in table A3 below | No | |

**Table A2: Summary of average emissions -continuous monitoring**

| Emission reference no: | Parameter/ Substance | ELV in licence or any revision therof | Averaging Period | Compliance Criteria | Units of measurement | Annual Emission | Annual maximum | Monitoring Equipment downtime (hours) | Number of ELV exceedences in current reporting year | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| DM-01 | Total Particulates | 350 | 140 DAYS | Daily average < ELV | mg/m2/day | 4228 | 46 | 0 | 0 | Dust monitioring took place on 5 occasions for 28 days each time between April and September |
| DM-02 | Total Particulates | 350 | 140 DAYS | Daily average < ELV | mg/m2/day | 15204 | 258 | 0 | 0 | |
| DM-03 | Total Particulates | 350 | 140 DAYS | Daily average < ELV | mg/m2/day | 16660 | 205 | 0 | 0 | |
| DM-04 | Total Particulates | 350 | 140 DAYS | Daily average < ELV | mg/m2/day | 11676 | 150 | 0 | 0 | |
| | SELECT | | | | SELECT | | | | | |

note 1: Volumetric flow shall be included as a reportable parameter.

**Table A3: Abatement system bypass reporting table** Bypass protocol

| Date* | Duration** (hours) | Location | Reason for bypass | Impact magnitude | Corrective action |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

* this should include all dates that an abatement system bypass occurred

** an accurate record of time bypass beginning and end should be logged on site and maintained for future Agency inspections please refer to bypass protocol link

| AIR-summary template | Lic No: | #REF! | Year | #REF! |
|---|---|---|---|---|

## Solvent use and management on site

8 Do you have a total Emission Limit Value of direct and fugitive emissions on site? if yes please fill out tables A4 and A5

SELECT

**Table A4: Solvent Management Plan Summary**
**Total VOC Emission limit value**

Solvent regulations — Please refer to linked solvent regulations to complete table 5 and 6

| Reporting year | Total solvent input on site (kg) | Total VOC emissions to Air from entire site (direct and fugitive) | Total VOC emissions as %of solvent input | Total Emission Limit Value (ELV) in licence or any revision therof | Compliance |
|---|---|---|---|---|---|
| | | | | | SELECT |
| | | | | | SELECT |

**Table A5: Solvent Mass Balance summary**

| | (I) Inputs (kg) | (O) Outputs (kg) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Solvent | (I) Inputs (kg) | Organic solvent emission in waste | Solvents lost in water (kg) | Collected waste solvent (kg) | Fugitive Organic Solvent (kg) | Solvent released in other ways e.g. by- | Solvents destroyed onsite through | Total emission of Solvent to air (kg) |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | Total | |

**AER Monitoring returns summary template-WATER/WASTEWATER(SEWER)** Lic No: #REF! Year #REF!

| | | | Additional information |
|---|---|---|---|
| 1 | Does your site have licensed emissions direct to surface water or direct to sewer? If yes please complete table W2 and W3 below for the current reporting year and answer further questions. If **you do not have** licenced emissions you only need to complete table W1 and or W2 for storm water analysis and visual inspections | Yes | |
| 2 | Was it a requirement of your licence to carry out visual inspections on any surface water discharges or watercourses on or near your site? If yes please complete table W2 below summarising only any evidence of contamination noted during visual inspections | Yes | Monthly COD of yard run-off is attached. |

**Table W1 Storm water monitoring**

| Location reference | Location relative to site activities | PRTR Parameter | Licenced Parameter | Monitoring date | ELV or trigger level in licence or any revision thereof* | Licence Compliance criteria | Measured value | Unit of measurement | Compliant with licence | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| | SELECT | SELECT | SELECT | | | SELECT | | SELECT | SELECT | |
| | SELECT | SELECT | SELECT | | | SELECT | | SELECT | SELECT | |

*trigger values may be agreed by the Agency outside of licence conditions

**Table W2 Visual inspections-Please only enter details where contamination was observed.**

| Location Reference | Date of inspection | Description of contamination | Source of contamination | Corrective action | Comments |
|---|---|---|---|---|---|
| | | | SELECT | | |
| | | | SELECT | | |

**Licensed Emissions to water and /or wastewater(sewer)-periodic monitoring (non-continuous)**

| | | | | |
|---|---|---|---|---|
| 3 | Was there any result in breach of licence requirements? If yes please provide brief details in the comment section of Table W3 below | | No | |
| 4 | Was all monitoring carried out in accordance with EPA guidance and checklists for Quality of Aqueous Monitoring Data Reported to the EPA? If no please detail what areas require improvement in additional information box | External /Internal Lab Quality checklist / Assessment of results checklist | Yes | Surface water monitoring was carried out on a quarterly basis. The results of which are attached. |

**Table W3: Licensed Emissions to water and /or wastewater (sewer)-periodic monitoring (non-continuous)**

| Emission reference no: | Emission released to | Parameter/ SubstanceNote 1 | Type of sample | Frequency of monitoring | Averaging period | ELV or trigger values in licence or any revision thereof[Note 2] | Licence Compliance criteria | Measured value | Unit of measurement | Compliant with licence | Method of analysis | Procedural reference source | Procedural reference standard number | Annual mass load (kg) | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

Note 1: Volumetric flow shall be included as a reportable parameter

Note 2: Where Emission Limit Values (ELV) do not apply to your licence please compare results against EQS for Surface water or relevant receptor quality standards

**AER Monitoring returns summary template-WATER/WASTEWATER(SEWER)** Lic No: #REF! Year #REF!

## Continuous monitoring

| | | | Additional Information |
|---|---|---|---|
| 5 | Does your site carry out continuous emissions to water/sewer monitoring? | Yes | Flow proportionate composite sampling |

**If yes please summarise your continuous monitoring data below in Table W4 and compare it to its relevant Emission Limit Value (ELV)**

| | | | |
|---|---|---|---|
| 6 | Did continuous monitoring equipment experience downtime? **If yes please record downtime in table W4 below** | Yes | Total of 47 days over 365 days |
| 7 | Do you have a proactive service contract for each piece of continuous monitoring equipment on site? | Yes | |
| 8 | Did abatement system bypass occur during the reporting year? **If yes please complete table W5 below** | No | |

### Table W4: Summary of average emissions -continuous monitoring

| Emission reference no: | Emission released to | Parameter/ Substance | ELV or trigger values in licence or any revision thereof | Averaging Period | Compliance Criteria | Units of measurement | Annual Emission for current reporting year (kg) | % change +/- from previous reporting year | Monitoring Equipment downtime (hours) | Number of ELV exceedences in reporting year | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SW15 | Water | Suspended Solids | 35 | 24 hour | All results < 1.5 times ELV, plus 8 from ten results must be < ELV | mg/L | 13633 | -35% | 1128 | 1 | 54 mg/l on 02/08/2014. Due to 74mm of rainfall during preceeding 48 hours. Down time primarily due to battery changes and periods of no flow. |
| SW15 | Water | Ammonia (as N) | 2.78 | Weekly | NA | mg/L | 203.63 | -46.88% | | | The % reduction can be attributed to 50% less down time on 2013. |
| SW15 | Water | Total phosphorus | NA | Weekly | NA | mg/L | 17.23 | -42.27% | | | The % reduction can be attributed to 50% less down time on 2013. |
| SW15 | Water | COD | 100 | Weekly | NA | mg/L | 15020 | -44.15% | | | The % reduction can be attributed to 50% less down time on 2013. |
| SW15 | Water | volumetric flow | NA | 24 hour | NA | m3/day | 2472279 | -33.25% | 1128 | | Down time primarily due to battery changes and periods of no flow |
| SW15 | Water | Total Dissolved Solids | NA | Weekly | NA | mg/L | 760052 | -34.42% | | | The % reduction can be attributed to 50% less down time on 2013. |

note 1: Volumetric flow shall be included as a reportable parameter.

### Table W5: Abatement system bypass reporting table

| Date | Duration (hours) | Location | Resultant emissions | Reason for bypass | Corrective action* | Was a report submitted to the EPA? | When was this report submitted? |
|---|---|---|---|---|---|---|---|
| | | | | | | SELECT | |
| | | | | | | | |
| | | | | | | | |

*Measures taken or proposed to reduce or limit bypass frequency

## Bund/Pipeline testing template

Lic No: #REF! Year #REF!

### Bund testing

dropdown menu click to see options

| | | | Additional information |
|---|---|---|---|
| 1 | Are you required by your licence to undertake integrity testing on bunds and containment structures ? if yes please fill out table B1 below listing all **new bunds and containment structures** on site, in addition to **all bunds which failed** the integrity test-**all bunding structures which failed including mobile bunds must be listed in the table below, please include all bunds outside the licenced testing period** (mobile bunds and chemstore included) | Yes | |
| 2 | Please provide integrity testing frequency period | Other (2 Yearly) | |
| 3 | Does the site maintain a register of bunds, underground pipelines (including stormwater and foul), Tanks, sumps and containers? (containers refers to "Chemstore" type units and mobile bunds) | Yes | |
| 4 | How many bunds are on site? | 3 | |
| 5 | How many of these bunds have been tested within the required test schedule? | 1 | Passed |
| 6 | How many mobile bunds are on site? | 6 | |
| 7 | Are the mobile bunds included in the bund test schedule? | No | |
| 8 | How many of these mobile bunds have been tested within the required test schedule? | 0 | |
| 9 | How many sumps on site are included in the integrity test schedule? | 0 | |
| 10 | How many of these sumps are integrity tested within the test schedule? | 0 | |
| | **Please list any sump integrity failures in table B1** | | |
| 11 | Do all sumps and chambers have high level liquid alarms? | N/A | |
| 12 | If yes to Q11 are these failsafe systems included in a maintenance and testing programme? | N/A | |
| 13 | Is the Fire Water Retention Pond included in your integrity test programme? | N/A | |

**Table B1:** Summary details of bund /containment structure integrity test

| Bund/Containment structure ID | Type | Specify Other type | Product containment | Actual capacity | Capacity required* | Type of integrity test | Other test type | Test date | Integrity reports maintained on site? | Results of test | Integrity test failure explanation <50 words | Corrective action taken | Scheduled date for retest | Results of retest(if in current reporting year) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SELECT | | | | | SELECT | | | SELECT | SELECT | | SELECT | | |
| | SELECT | | | | | SELECT | | | SELECT | SELECT | | SELECT | | |

* Capacity required should comply with 25% or 110% containment rule as detailed in your licence

| | | | Commentary |
|---|---|---|---|
| 15 | Has integrity testing been carried out in accordance with licence requirements and are all structures tested in line with BS8007/EPA Guidance? | bunding and storage guidelines | SELECT | |
| 16 | Are channels/transfer systems to remote containment systems tested? | | SELECT | |
| 17 | Are channels/transfer systems compliant in both integrity and available volume? | | SELECT | |

### Pipeline/underground structure testing

| | | | |
|---|---|---|---|
| 1 | Are you required by your licence to undertake integrity testing* on underground structures e.g. pipelines or sumps etc ? if yes please fill out table 2 below listing all underground structures and pipelines on site **which failed the integrity test and all which have not been tested withing the integrity test period as specified** | Yes | No underground tanks or pipelines on site |
| 2 | Please provide integrity testing frequency period | SELECT | |

*please note integrity testing means water tightness testing for process and foul pipelines (as required under your licence)

**Table B2:** Summary details of pipeline/underground structures integrity test

| Structure ID | Type system | Material of construction: | Does this structure have Secondary containment? | Type of secondary containment | Type integrity testing | Integrity reports maintained on site? | Results of test | Integrity test failure explanation <50 words | Corrective action taken | Scheduled date for retest | Results of retest(if in current reporting year) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | SELECT | SELECT | SELECT | SELECT | SELECT | SELECT | SELECT | | | | SELECT |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

Please use commentary for additional details not answered by tables/ questions above

| Groundwater/Soil monitoring template | Lic No: | #REF! | Year | #REF! |
|---|---|---|---|---|

| | | | Comments | |
|---|---|---|---|---|
| 1 | Are you required to carry out groundwater monitoring as part of your licence requirements? | no | | Please provide an interpretation of groundwater monitoring data in the interpretation box below or if you require additional space please include a groundwater/contaminated land monitoring results interpretaion as an additional section in this AER |
| 2 | Are you required to carry out soil monitoring as part of your licence requirements? | no | | |
| 3 | Do you extract groundwater for use on site? If yes please specify use in comment section | yes | Drinking water well | |
| 4 | Do monitoring results show that groundwater generic assessment criteria such as GTVs or IGVs are exceeded or is there an upward trend in results for a substance? If yes, please complete the Groundwater Monitoring Guideline Template Report (link in cell G8) and submit separately through ALDER as a licensee return AND answer questions 5-12 below. Groundwater monitoring template | no | | |
| 5 | Is the contamination related to operations at the facility (either current and/or historic) | no | | |
| 6 | Have actions been taken to address contamination issues?If yes please summarise remediation strategies proposed/undertaken for the site | N/A | | |
| 7 | Please specify the proposed time frame for the remediation strategy | N/A | | |
| 8 | Is there a licence condition to carry out/update ELRA for the site? | N/A | | |
| 9 | Has any type of risk assesment been carried out for the site? | N/A | | |
| 10 | Has a Conceptual Site Model been developed for the site? | N/A | | |
| 11 | Have potential receptors been identified on and off site? | N/A | | |
| 12 | Is there evidence that contamination is migrating offsite? | N/A | | Please enter interpretation of data here |

**Table 1: Upgradient Groundwater monitoring results**

| Date of sampling | Sample location reference | Parameter/ Substance | Methodology | Monitoring frequency | Maximum Concentration++ | Average Concentration+ | unit | GTV's* | SELECT** | Upward trend in pollutant concentration over last 5 years of monitoring data |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | SELECT | | | SELECT |
| | | | | | | | SELECT | | | SELECT |

.+ where average indicates arithmetic mean

.++ maximum concentration indicates the maximum measured concentration from all monitoring results produced during the reporting year

**Table 2: Downgradient Groundwater monitoring results**

| Date of sampling | Sample location reference | Parameter/ Substance | Methodology | Monitoring frequency | Maximum Concentration | Average Concentration | unit | GTV's* | SELECT** | Upward trend in yearly average pollutant concentration over last 5 years of monitoring data |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | SELECT | | | SELECT |
| | | | | | | | SELECT | | | SELECT |

| **Groundwater/Soil monitoring template** | Lic No: | #REF! | Year | #REF! |
|---|---|---|---|---|

| | |
|---|---|
| *please note exceedance of generic assessment criteria (GAC) such as a Groundwater Threshold Value (GTV) or an Interim Guideline Value (IGV) or an upward trend in results for a substance indicates that further interpretation of monitoring results is required. In addition to completing the above table, please complete the Groundwater Monitoring Guideline Template Report at the link provided and submit separately through ALDER as a licensee return or as otherwise instructed by the EPA. | Groundwater monitoring template |
| More information on the use of soil and groundwater standards/ generic assessment criteria (GAC) and risk assessment tools is available in the EPA published guidance (see the link in G31) | Guidance on the Management of Contaminated Land and Groundwater at EPA Licensed Sites (EPA 2013). |

| | | | | | |
|---|---|---|---|---|---|
| **Depending on location of the site and proximity to other sensitive receptors alternative Receptor based Water Quality standards should be used in addition to the GTV e.g. if the site is close to surface water compare to Surface Water Environmental Quality Standards (SWEQS), If the site is close to a drinking water supply compare results to the Drinking Water Standards (DWS) | Surface water EQS | Groundwater regulations GTV's | Drinking water (private supply) standards | Drinking water (public supply) standards | Interim Guideline Values (IGV) |

**Groundwater/Soil monitoring template** Lic No: #REF! Year #REF!

**Table 3: Soil results**

| Date of sampling | Sample location reference | Parameter/ Substance | Methodology | Monitoring frequency | Maximum Concentration | Average Concentration | unit |
|---|---|---|---|---|---|---|---|
| | | | | | | | SELECT |
| | | | | | | | SELECT |

Where additional detail is required please enter it here in 200 words or less

| Environmental Liabilities template | Lic No: | #REF! | Year | #REF! |
|---|---|---|---|---|

Click here to access EPA guidance on Environmental Liabilities and Financial provision

| | | | Commentary |
|---|---|---|---|
| 1 | ELRA initial agreement status | Not a licence requirement | |
| 2 | ELRA review status | NA | |
| 3 | Amount of Financial Provision cover required as determined by the latest ELRA | NA | |
| 4 | Financial Provision for ELRA status | NA | |
| 5 | Financial Provision for ELRA - amount of cover | NA | |
| 6 | Financial Provision for ELRA - type | NA | |
| 7 | Financial provision for ELRA expiry date | NA | |
| 8 | Closure plan initial agreement status | NA | Internal budget provision |
| 9 | Closure plan review status | NA | Internal budget provision |
| 10 | Financial Provision for Closure status | NA | Internal budget provision |
| 11 | Financial Provision for Closure - amount of cover | NA | Internal budget provision |
| 12 | Financial Provision for Closure - type | NA | Internal budget provision |
| 13 | Financial provision for Closure expiry date | NA | |

## Environmental Management Programme/Continuous Improvement Programme template

Lic No: #REF! Year #REF!

Highlighted cells contain dropdown menu click to view

| | | | Additional Information |
|---|---|---|---|
| 1 | Do you maintain an Environmental Mangement System (EMS) for the site. If yes, please detail in additional information | Yes | Internal unaccredited EMS. |
| 2 | Does the EMS reference the most significant environmental aspects and associated impacts on-site | Yes | |
| 3 | Does the EMS maintain an Environmental Management Programme (EMP) as required in accordance with the licence requirements | Yes | |
| 4 | Do you maintain an environmental documentation/communication system to inform the public on environmental performance of the facility, as required by the licence | Yes | |

**Environmental Management Programme (EMP) report**

| Objective Category | Target | Status (% completed) | How target was progressed | Responsibility | Intermediate outcomes |
|---|---|---|---|---|---|
| Reduction of emissions to Air | Continue to train all employees in environmental matters. Training will be by means of a new four module training programme delivered by dedicated Bord na Mona training specialists. This new training programme includes environmental compliance-IPPC, Biodiversity, Archaeology and Energy management. Hydraulic harrows will be deployed at dust sensitive locations. Continue with the collection of headland peat. | 90 | In total 115 personnel received training during 2014. At Derryhinch 1.7 km of shelter belt planted with 210 metres planted at Ballybeg. Hydraulic harrows were depolyed at 4 locations. Headland peat was collected at all locations and returned with production figures. | Individual | Reduced emissions |
| Waste reduction/Raw material usage efficiency | Waste streamlining is a project we are particularly interested in continuing and hope to reduce wastes further in the future and be more efficient in dealing with all aspects of waste management | 80 | Installed a waste management system. Quarterly waste reports are returned for records/filing and waste streams are segrated on site to maximise recycling potential. | Section Head | Improved Environmental Management Practices |

| Environmental Management Programme/Continuous Improvement Programme template | | | | Lic No: | #REF! | Year | #REF! |
|---|---|---|---|---|---|---|---|
| Waste reduction/Raw material usage efficiency | Continue with the recycling of polyethylene. The sourcing of more recycling contractors will be ongoing. | 100 | In total 117.06 tonnes were sent off site for recycling. Procurement also exploring the possibility of securing further recyclers. | Individual | Improved Environmental Management Practices | | |
| Energy Management | As part of an Energy Awareness campaign all aspects of energy consumption will be communicated to personnel with the intention of reducing consumption through awareness | 100 | A launch event took place where the various energy aspects of the process was communicated, with a breakdown of individuals consumption across all areas of operation. | Section Head | Reduce overall energy output while maintaining productivity. | | |
| Reduction of emissions to Water | Continue to train all employees in environmental matters. Training will be by means of a new four module training programme delivered by dedicated Bord na Mona training specialists. This new training programme includes environmental compliance-IPPC, Biodiversity, Archaeology and Energy management. Continue with the collection of headland peat. | 90 | In total 115 Personnel received training in 2014. Headland peat was collected at all locations and included as part of overall peat returns. | Individual | Improved Environmental Management Practices | | |

| Noise monitoring summary report | Lic No: | #REF! | Year | #REF! |
|---|---|---|---|---|

| | | |
|---|---|---|
| 1 | Was noise monitoring a licence requirement for the AER period?<br>If yes please fill in table N1 noise summary below | No |
| 2 | Was noise monitoring carried out using the EPA Guidance note, including completion of the "Checklist for noise measurement report" included in the guidance note as table 6? (Noise Guidance note NG4) | NA |
| 3 | Does your site have a noise reduction plan | NA |
| 4 | When was the noise reduction plan last updated? | Enter date |
| 5 | Have there been changes relevant to site noise emissions (e.g. plant or operational changes) since the last noise survey? | NA |

**Table N1: Noise monitoring summary**

| Date of monitoring | Time period | Noise location (on site) | Noise sensitive location -NSL (if applicable) | $LA_{eq}$ | $LA_{90}$ | $LA_{10}$ | $LA_{max}$ | Tonal or Impulsive noise* (Y/N) | If tonal /impulsive noise was identified was 5dB penalty applied? | Comments (ex. main noise sources on site, & extraneous noise ex. road traffic) | Is site compliant with noise limits (day/evening/night)? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | SELECT | SELECT | | SELECT |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

*Please ensure that a tonal analysis has been carried out as per guidance note NG4. These records must be maintained onsite for future inspection

If noise limits exceeded as a result of noise attributed to site activities, please choose the corrective action from the following options? SELECT

| |
|---|
| ** please explain the reason for not taking action/resolution of noise issues? |
| Any additional comments? (less than 200 words) |

## Resource Usage/Energy efficiency summary

Lic No: #REF! Year #REF!

| | | | Additional information |
|---|---|---|---|
| 1 | When did the site carry out the most recent energy efficiency audit? Please list the recommendations in table 3 below | Nov-12 | Report on file |
| 2 | Is the site a member of any accredited programmes for reducing energy usage/water conservation such as the SEAI programme linked to the right? If yes please list them in additional information | SEAI - Large Industry Energy Network (LIEN) Yes | |
| 3 | Where Fuel Oil is used in boilers on site is the sulphur content compliant with licence conditions? Please state percentage in additional information | NA | Not a Licence requirement |

Table R1 Energy usage on site

| Energy Use | Previous year | Current year | Production +/- % compared to previous reporting year** | Energy Consumption +/- % vs overall site production* |
|---|---|---|---|---|
| Total Energy Used (MWHrs) | 8169 | 7343 | -13.56% | +10.1% |
| Total Energy Generated (MWHrs) | | | | |
| Total Renewable Energy Generated (MWHrs) | | | | |
| Electricity Consumption (MWHrs) | 309 | 360 | -13.56% | +16.5% |
| Fossil Fuels Consumption: | | | | |
| Heavy Fuel Oil (m3) | | | | |
| Light Fuel Oil (m3) | 773.563 | 687.266 | -13.56% | -11.12% |
| Natural gas (m3) | | | | |
| Coal/Solid fuel (metric tonnes) | | | | |
| Peat (metric tonnes) | | | | |
| Renewable Biomass | | | | |
| Renewable energy generated on site | | | | |

* where consumption of energy can be compared to overall site production please enter this information as percentage increase or decrease compared to the previous reporting year.

** where site production information is available please enter percentage increase or decrease compared to previous year

Table R2 Water usage on site

| | | | | | Water Emissions | Water Consumption | |
|---|---|---|---|---|---|---|---|
| Water use | Water extracted Previous year m3/yr. | Water extracted Current year m3/yr. | Production +/- % compared to previous reporting year** | Energy Consumption +/- % vs overall site production* | Volume Discharged back to environment($m^3$yr): | Volume used i.e not discharged to environment e.g. released as steam m3/yr | Unaccounted for Water: |
| Groundwater | | | | | | | |
| Surface water | | | | | | | |
| Public supply | | | | | | | |
| Recycled water | | | | | | | |
| Total | | | | | | | |

* where consumption of water can be compared to overall site production please enter this information as percentage increase or decrease compared to the previous reporting year.

** where site production information is available please enter percentage increase or decrease compared to previous year

Table R3 Waste Stream Summary

| | Total | Landfill | Incineration | Recycled | Other |
|---|---|---|---|---|---|
| Hazardous (Tonnes) | 44.64 | 0 | 0 | 44.64 | 0 |
| Non-Hazardous (Tonnes) | 396.91 | 60.37 | 0 | 135.33 | 201.21 |

**Resource Usage/Energy efficiency summary** Lic No: #REF! Year #REF!

Table R4: Energy Audit finding recommendations

| Date of audit | Recommendations | Description of Measures proposed | Origin of measures | Predicted energy savings % | Implementation date | Responsibility | Completion date | Status and comments |
|---|---|---|---|---|---|---|---|---|
| | | | SELECT | | | | | |
| | | | SELECT | | | | | |
| | | | SELECT | | | | | |

Table R5: Power Generation: Where power is generated onsite (e.g. power generation facilities/food and drink industry)please complete the following information

| | Unit ID | Unit ID | Unit ID | Unit ID | Station Total |
|---|---|---|---|---|---|
| Technology | | | | | |
| Primary Fuel | | | | | |
| Thermal Efficiency | | | | | |
| Unit Date of Commission | | | | | |
| Total Starts for year | | | | | |
| Total Running Time | | | | | |
| Total Electricity Generated (GWH) | | | | | |
| House Load (GWH) | | | | | |
| KWH per Litre of Process Water | | | | | |
| KWH per Litre of Total Water used on Site | | | | | |

## Complaints and Incidents summary template

Lic No: #REF! Year #REF!

### Complaints

| Have you received any environmental complaints in the current reporting year? If yes please complete summary details of complaints received on site in table 1 below | No | Additional information |
|---|---|---|

Table 1 Complaints summary

| Date | Category | Other type (please specify) | Brief description of complaint (Free txt <20 words) | Corrective action< 20 words | Resolution status | Resolution date | Further information |
|---|---|---|---|---|---|---|---|
| | SELECT | | | | SELECT | | |
| | SELECT | | | | SELECT | | |
| | SELECT | | | | SELECT | | |
| | SELECT | | | | SELECT | | |
| | SELECT | | | | SELECT | | |

| | |
|---|---|
| Total complaints open at start of reporting year | 0 |
| Total new complaints received during reporting year | 0 |
| Total complaints closed during reporting year | 0 |
| Balance of complaints end of reporting year | 0 |

### Incidents

| Have any incidents occurred on site in the current reporting year? Please list all incidents for current reporting year in Table 2 below | Yes | Additional information |
|---|---|---|

| *For information on how to report and what constitutes an incident | What is an incident |
|---|---|

Table 2 Incidents summary

| Date of occurrence | Incident nature | Location of occurrence | Incident category*please refer to guidance | Receptor | Cause of incident | Other cause(please specify) | Activity in progress at time of incident | Communication | Occurrence | Corrective action<20 words | Preventative action <20 words | Resolution status | Resolution date | Likelihood of reoccurence |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19/03/2014 | Trigger level reached | SW34 Carranstown | 1. Minor | Water | Other (add details | Naturally occurring | Normal activities | EPA | New | Investigate | None Required | Complete | 17/04/2014 | Medium |
| 13/06/2014 | Trigger level reached | SW25 Lisclogher | 1. Minor | Water | Other (add details | Naturally occurring | Normal activities | EPA | New | Investigate | None Required | Complete | 20/06/2014 | Medium |
| 13/06/2014 | Trigger level reached | SW36 Ballivor | 1. Minor | Water | Other (add details | Naturally occurring | Normal activities | EPA | New | Investigate | None Required | Complete | 20/06/2014 | Medium |
| 24/07/2014 | Trigger level reached | SW42/43 Rossan | 1. Minor | Water | Other (add details | Naturally occurring | Normal activities | EPA | New | Investigate | None Required | Complete | 18/08/2014 | Low |
| 02/08/2014 | Breach of ELV | SW15 Toar | 1. Minor | Water | Adverse weather | | Normal activities | EPA | New | Cleaned upstream silt | Clean pond to | Complete | 25/08/2014 | Medium |
| 15/10/2014 | Trigger level reached | SW44/47 Rossan | 1. Minor | Water | Other (add details | Naturally occurring | Normal activities | EPA | New | Investigate | None Required | Complete | 29/10/2014 | Medium |
| 04/12/2014 | Trigger level reached | SWE1 Rossan | 1. Minor | Water | Adverse weather | | Normal activities | EPA | New | Investigate | None Required | Complete | 22/12/2014 | Low |

| | |
|---|---|
| Total number of incidents current year | 7 |
| Total number of incidents previous year | 2 |
| % reduction/ increase | +250% |

**WASTE SUMMARY** Lic No: #REF! Year #REF!

**SECTION A-PRTR ON SITE WASTE TREATMENT AND WASTE TRANSFERS TAB- TO BE COMPLETED BY ALL IPPC AND WASTE FACILITIES** PRTR facility logon dropdown list click to see options

**SECTION B- WASTE ACCEPTED ONTO SITE-TO BE COMPLETED BY ALL IPPC AND WASTE FACILITIES**

| | | | Additional Information |
|---|---|---|---|
| 1 | Were any wastes accepted onto your site for recovery or disposal or treatment prior to recovery or disposal within the boundaries of your facility ?; (waste generated within your boundaries is to be captured through PRTR reporting) If yes please enter details in table 1 below | N/A | |
| 2 | Did your site have any rejected consignments of waste in the current reporting year? If yes please give a brief explanation in the additional information | N/A | |
| 3 | Was waste accepted onto your site that was generated outside the Republic of Ireland? If yes please state the quantity in tonnes in additional information | N/A | |

**Table 1 Details of waste accepted onto your site for recovery, disposal or treatment (do not include wastes generated at your site, as these will have been reported in your PRTR workbook)**

| Licenced annual tonnage limit for your site (total tonnes/annum) | EWC code<br>European Waste Catalogue EWC codes | Source of waste accepted | Description of waste accepted **Please enter an accurate and detailed description - which applies to relevant EWC code**<br>European Waste Catalogue EWC codes | Quantity of waste accepted in current reporting year (tonnes) | Quantity of waste accepted in previous reporting year (tonnes) | Reduction/ Increase over previous year +/ - % | Reason for reduction/ increase from previous reporting year | Packaging Content (%)- only applies if the waste has a packaging component | Disposal/Recovery or treatment operation carried out at your site and the description of this operation | Quantity of waste remaining on site at the end of reporting year (tonnes) | Comments - |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**SECTION C-TO BE COMPLETED BY ALL WASTE FACILITIES (waste transfer stations, Composters, Material recovery facilities etc) EXCEPT LANDFILL SITES**

| | | | |
|---|---|---|---|
| 4 | Is all waste processing infrastructure as required by your licence and approved by the Agency in place? If no please list waste processing infrastructure required onsite | SELECT | |
| 5 | Is all waste storage infrastructure as required by your licence and approved by the Agency in place? If no please list waste storage infrastructure required on site | SELECT | |
| 6 | Does your facility have relevant nuisance controls in place? | SELECT | |
| 7 | Do you have an odour management system in place for your facility? If no why? | SELECT | |
| 8 | Do you maintain a sludge register on site? | SELECT | |

**SECTION D-TO BE COMPLETED BY LANDFILL SITES ONLY**

**Table 2 Waste type and tonnage-landfill only**

| Waste types permitted for disposal | Authorised/licenced annual intake for disposal (tpa) | Actual intake for disposal in reporting year (tpa) | Remaining licensed capacity at end of reporting year (m3) | Comments |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**Table 3 General information-Landfill only**

| Area ID | Date landfilling commenced | Date landfilling ceased | Currently landfilling | Private or Public Operated | Inert or non-hazardous | Predicted date to cease landfilling | Licence permits asbestos | Is there a separate cell for asbestos? | Accepted asbestos in reporting year | Total disposal area occupied by waste | Lined disposal area occupied by waste | Unlined area |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | SELECT UNIT | SELECT UNIT | SELECT UNIT |
| Cell 8 | | | | | | | | | | | | |

**WASTE SUMMARY** Lic No: #REF! Year #REF!

## Table 4 Environmental monitoring-landfill only

Landfill Manual-Monitoring Standards

| Was meterological monitoring in compliance with Landfill Directive (LD) standard in reporting year + | Was leachate monitored in compliance with LD standard in reporting year | Was Landfill Gas monitored in compliance with LD standard in reporting year | Was SW monitored in compliance with LD standard in reporting year | Have GW trigger levels been established | Were emission limit values agreed with the Agency (ELVs) | Was topography of the site surveyed in reporting year | Has the statement under S53(A)(5) of WMA been submitted in reporting year | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

.+ please refer to Landfill Manual linked above for relevant Landfill Directive monitoring standards

## Table 5 Capping-Landfill only

| Area uncapped* | Area with temporary cap | Area with final cap to LD Standard m2 ha, a | Area capped other | Area with waste that should be permanently capped to date under licence | What materials are used in the cap | Comments |
|---|---|---|---|---|---|---|
| SELECT UNIT | SELECT UNIT | | | | | |
| | | | | | | |

*please note this includes daily cover area

## Table 6 Leachate-Landfill only

| | | |
|---|---|---|
| 9 | Is leachate from your site treated in a Waste Water Treatment Plant? | SELECT |
| 10 | Is leachate released to surface water? If yes please complete leachate mass load information below | SELECT |

| Volume of leachate in reporting year(m3) | Leachate (BOD) mass load (kg/annum) | Leachate (COD) mass load (kg/annum) | Leachate (NH4) mass load (kg/annum) | Leachate (Chloride) mass load kg/annum | Leachate treatment on-site | Specify type of leachate treatment | Comments |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

Please ensure that all information reported in the landfill gas section is consistent with the Landfill Gas Survey submitted in conjunction with PRTR returns

## Table 7 Landfill Gas-Landfill only

| Gas Captured&Treated by LFG System m3 | Power generated (MW / KWh) | Used on-site or to national grid | Was surface emissions monitoring performed during the reporting year? | Comments |
|---|---|---|---|---|
| | | | SELECT | |

| Comments on liner type |
| --- |
| |

**Derrygreenagh**

**Decommissioning and Rehabilitation**

**AER Overview 2014.**

Within the Derrygreenagh licensed area (P0501-01) there were no entire bog units available for rehabilitation in 2014. Ongoing monitoring of cutaway within the Derrygreenagh licensing area included the re-survey of Derryarkin and Cavemount bogs.

Draft rehabilitation plans for the Derrygreenagh bogs licensed area, including more detailed draft plans for each component bog unit were submitted to the EPA in 2013. The BNM Ecology Team (who plan and manage rehabilitation) met with the EPA inspectorate in 2013 to outline the general content of the rehab plans and a review process was agreed. This will involve a biannual review and update of plans as well as more detail and finalisation of plans for sites that have been taken out of production. The plans are currently under review (March-April 2015).

The annual Biodiversity Action Plan review day was held in February 2015 and this included an update on progress of this plan, bog restoration and cutaway rehabilitation for a wide range on statutory and non-statutory consultees including members of the EPA, NPWS, BWI, Bord na Mona, Coillte, Inland Fisheries Ireland, An Taisce, IPCC, Irish Red Grouse Association, Irish Wildlife Trust, NARGC, local game councils, Midland Regional Planning Authority as well as a range of local community groups and Heritage Officers from counties Laois, Offaly, Kildare, Roscommon, Longford, Meath, Galway, Westmeath and Dublin.

A copy of our Biodiversity Action Plan is available to view and download at http://www.bordnamona.ie/our-company/biodiversity/

**Bord na Mona Derrygreenagh**

**IPPC Licence P0501-01**

## Siltpond Monitoring Frequency & Results

| X | Y | Bog | SW | Monitoring | Sampled | pH | SS | TS | Ammonia | TP | COD | Colour |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 259415.30 | 256855.75 | Bracklin | SW-29 | Q1 14 | 19/03/2014 | 7.3 | 5 | 312 | 1.9 | 0.07 | 67 | 220 |
| 259519.45 | 257618.44 | Bracklin | SW-30 | Q1 14 | 19/03/2014 | 7.4 | 5 | 288 | 0.61 | 0.06 | 62 | 203 |
| 265632.83 | 254865.04 | Carranstown | SW-33 | Q1 14 | 19/03/2014 | 7.4 | 11 | 338 | 0.73 | 0.06 | 69 | 228 |
| 265886.95 | 254984.18 | Carranstown | SW-34 | Q1 14 | 19/03/2014 | 7.2 | 13 | 410 | 1.6 | 0.14 | 133 | 453 |
| 265140.06 | 254114.54 | Ballivor | SW-35 | Q1 14 | 19/03/2014 | 7.3 | 5 | 518 | 0.3 | 0.05 | 123 | 284 |
| To Be Confirmed | To Be Confirmed | Ballivor | SW-36 | Q2 14 | 13/06/2014 | 7.7 | 39 | 342 | 0.02 | 0.11 | 120 | 169 |
| 266022.62 | 259613.57 | Lisclogher | SW-25 | Q2 14 | 13/06/2014 | 7.4 | 17 | 400 | 2.8 | 0.07 | 76 | 246 |
| To Be Confirmed | To Be Confirmed | Lisclogher | SW-28 | Q2 14 | 13/06/2014 | 7.6 | 8 | 404 | 0.25 | 0.08 | 68 | 308 |
| To Be Confirmed | To Be Confirmed | Ballivor | SW-37 | Q2 14 | 13/06/2014 | 7.5 | 5 | 434 | 1.5 | 0.07 | 63 | 183 |
| 265878.97 | 253506.58 | Ballivor | SW-38 | Q2 14 | 13/06/2014 | 7.6 | 5 | 248 | 0.02 | 0.07 | 63 | 182 |
| 265888.99 | 253456.63 | Ballivor | SW-39 | Q3 14 | 27/07/2014 | 7.1 | 5 | 200 | 0.05 | 0.05 | 69 | 114 |
| 266366.86 | 251598.58 | Ballivor | SW-40 | Q3 14 | 27/07/2014 | 7.3 | 5 | 462 | 0.94 | 0.05 | 67 | 155 |
| 266386.45 | 251579.18 | Ballivor | SW-41 | Q3 14 | 27/07/2014 | 7.2 | 21 | 448 | 0.02 | 0.21 | 82 | 103 |
| To Be Confirmed | To Be Confirmed | Rossan | SW-42 | Q3 14 | 27/07/2014 | 6.6 | 6 | 144 | 3.1 | 0.05 | 109 | 287 |
| 259965.18 | 243847.63 | Rossan | SW-43 | Q3 14 | 27/07/2014 | 6.7 | 6 | 142 | 2.6 | 0.05 | 106 | 301 |
| To Be Confirmed | To Be Confirmed | Rossan | SW-44 | Q4 14 | 15/10/2014 | 7.2 | 5 | 260 | 0.29 | 0.08 | 136 | 370 |
| 258846.25 | 243853.76 | Rossan | SW-45 | Q4 14 | 15/10/2014 | 7.4 | 5 | 190 | 2.2 | 0.05 | 64 | 106 |
| 260629.22 | 242141.39 | Rossan | SW-46 | Q4 14 | 15/10/2014 | 7.4 | 5 | 235 | 1 | 0.05 | 83 | 236 |
| 260145.55 | 242266.71 | Rossan | SW-47 | Q4 14 | 15/10/2014 | 6.8 | 5 | 208 | 2.6 | 0.05 | 107 | 331 |
| To Be Confirmed | To Be Confirmed | Rossan | SW-48 | Q4 14 | 15/10/2014 | 7.4 | 5 | 196 | 2.2 | 0.06 | 68 | 187 |

| Yard Discharge Results 2014 | | |
|---|---|---|
| **Licence: P0501-01** | | |
| **Works: Derrygreenagh** | | |
| **Month** | **D/Greenagh SWE 2 COD** | **Rossan SWE 1 COD** |
| Jan | 44 | 16 |
| Feb | 38 | 41 |
| Mar | 32 | 26 |
| Apr | 30 | 18 |
| May | 30 | 25 |
| June | 12 | 13 |
| July | 23 | 40 |
| Aug | 36 | 95 |
| Sep | 29 | 66 |
| Oct | 38 | 30 |
| Nov | 38 | 23 |
| Dec | 33 | 110 |

**Note: 0** denotes no flow at emission point on day of sampling

Guidance to completing the PRTR workbook

# AER Returns Workbook

Version 1.1.18

| | |
|---|---|
| **REFERENCE YEAR** | 2014 |

**1. FACILITY IDENTIFICATION**

| | |
|---|---|
| Parent Company Name | Bord na Mona Energy Limited |
| Facility Name | Bord na Móna Energy Limited (Derrygreenagh) |
| PRTR Identification Number | P0501 |
| Licence Number | P0501-01 |

Classes of Activity

| **No.** | **class_name** |
|---|---|
| - | Refer to PRTR class activities below |

| | |
|---|---|
| Address 1 | Derrygreenagh Group |
| Address 2 | c/o Derrygreenagh Works |
| Address 3 | Rochfortbridge |
| Address 4 | Mullingar |
| | |
| | Westmeath |
| Country | Ireland |
| Coordinates of Location | -7.25676 53.3910 |
| River Basin District | IEEA |
| NACE Code | 0892 |
| Main Economic Activity | Extraction of peat |
| **AER Returns Contact Name** | Enda Mc Donagh |
| **AER Returns Contact Email Address** | enda.mcdonagh@bnm.ie |
| **AER Returns Contact Position** | Head of Environment |
| **AER Returns Contact Telephone Number** | 0579345911 |
| **AER Returns Contact Mobile Phone Number** | 0862370816 |
| **AER Returns Contact Fax Number** | 0579345160 |
| **Production Volume** | 292439.0 |
| **Production Volume Units** | Tonnes |
| **Number of Installations** | 6 |
| **Number of Operating Hours in Year** | 2216 |
| **Number of Employees** | 60 |
| **User Feedback/Comments** | In accordance with licence condition 6.2 of Technical Amendment A, quarterly sampling is now rotated every quarter and therefore suspended solids results are not factored into loading. |
| **Web Address** | www.bnm.ie |

**2. PRTR CLASS ACTIVITIES**

| **Activity Number** | **Activity Name** |
|---|---|
| 50.1 | General |

**3. SOLVENTS REGULATIONS (S.I. No. 543 of 2002)**

| | |
|---|---|
| Is it applicable? | No |
| Have you been granted an exemption ? | |
| If applicable which activity class applies (as per Schedule 2 of the regulations) ? | |
| Is the reduction scheme compliance route being used ? | |

**4. WASTE IMPORTED/ACCEPTED ONTO SITE** Guidance on waste imported/accepted onto site

| | |
|---|---|
| Do you import/accept waste onto your site for on-site treatment (either recovery or disposal activities) ? | No |

This question is only applicable if you are an IPPC or Quarry site

**4.1 RELEASES TO AIR** Link to previous years emissions data | PRTR# : P0501 | Facility Name : Bord na Móna Energy Limited (Derrygreenagh) | Filename : P0501_2014.xls | Return Year : 2014 | 23/03/2015 12:16

**SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS**

| RELEASES TO AIR | | | | | Please enter all quantities in this section in KGs | | | |
|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | QUANTITY | | | |
| | | | Method Used | | | | | |
| No. Annex II | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

**SECTION B : REMAINING PRTR POLLUTANTS**

| RELEASES TO AIR | | | | | Please enter all quantities in this section in KGs | | | |
|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | QUANTITY | | | |
| | | | Method Used | | | | | |
| No. Annex II | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

**SECTION C : REMAINING POLLUTANT EMISSIONS (As required in your Licence)**

| RELEASES TO AIR | | | | | Please enter all quantities in this section in KGs | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | QUANTITY | | | | | | |
| | | | Method Used | | DM-01 | DM-02 | DM03 | DM-04 | | | |
| Pollutant No. | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | Emission Point 2 | Emission Point 3 | Emission Point 4 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| **210** | **Dust** | E | OTH | VDI 2119 Blatt 2/Part 2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0477 | 0.0 | 0.0477 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

## Additional Data Requested from Landfill operators

**For the purposes of the National Inventory on Greenhouse Gases, landfill operators are requested to provide summary data on landfill gas (Methane) flared or utilised on their facilities to accompany the figures for total methane generated. Operators should only report their Net methane (CH4) emission to the environment under T(total) KG/yr for Section A: Sector specific PRTR pollutants above. Please complete the table below:**

**Landfill:** Bord na Móna Energy Limited (Derrygreenagh)

| **Please enter summary data on the quantities of methane flared and / or utilised** | **T (Total) kg/Year** | **M/C/E** | **Method Used** | | **Facility Total Capacity m3 per hour** | |
|---|---|---|---|---|---|---|
| | | | **Method Code** | **Designation or Description** | | |
| Total estimated methane generation (as per site model) | 0.0 | | | | N/A | |
| Methane flared | 0.0 | | | | 0.0 | (Total Flaring Capacity) |
| Methane utilised in engine/s | 0.0 | | | | 0.0 | (Total Utilising Capacity) |
| Net methane emission (as reported in Section A above) | 0.0 | | | | N/A | |

## 4.2 RELEASES TO WATERS

Link to previous years emissions data



### SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

Data on ambient monitoring of storm/surface water or groundwater, conducted as part of your licence requirements, should NOT be submitted under AER / PRTR Reporting as this only concerns Releases from

| RELEASES TO WATERS | | | | | Please enter all quantities in this section in KGs | | | |
|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | | | | QUANTITY | | | |
| | | | Method Used | | | | | |
| No. Annex II | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

### SECTION B : REMAINING PRTR POLLUTANTS

| RELEASES TO WATERS | | | | | Please enter all quantities in this section in KGs | | | |
|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | | | | QUANTITY | | | |
| | | | Method Used | | | | | |
| No. Annex II | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

### SECTION C : REMAINING POLLUTANT EMISSIONS (as required in your Licence)

| RELEASES TO WATERS | | | | | Please enter all quantities in this section in KGs | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | | | | SW 15 | | | QUANTITY | | |
| | | | Method Used | | | | | | | |
| Pollutant No. | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | Emission Point 2 | Emission Point 3 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| **240** | **Suspended Solids** | E | OTH | G/19 Based on ALPHA,1998,20th Edition, Method 2540D | 13633.0 | 0.0 | 0.0 | 13633.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

## 4.3 RELEASES TO WASTEWATER OR SEWER

Link to previous years emissions data

| PRTR# : P0501 | Facility Name : Bord na Móna Energy Limited (Derrygreenagh) | Filename : P0501_20 23/03/2015 12:18

### SECTION A : PRTR POLLUTANTS

| OFFSITE TRANSFER OF POLLUTANTS DESTINED FOR WASTE-WATER TREATMENT OR SEWER | | | | | Please enter all quantities in this section in KGs | | | |
|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | QUANTITY | | | |
| | | | Method Used | | | | | |
| No. Annex II | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

### SECTION B : REMAINING POLLUTANT EMISSIONS (as required in your Licence)

| OFFSITE TRANSFER OF POLLUTANTS DESTINED FOR WASTE-WATER TREATMENT OR SEWER | | | | | Please enter all quantities in this section in KGs | | | |
|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | QUANTITY | | | |
| | | | Method Used | | | | | |
| Pollutant No. | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

## 4.4 RELEASES TO LAND

Link to previous years emissions data



### SECTION A : PRTR POLLUTANTS

| RELEASES TO LAND | | | | | Please enter all quantities in this section in KGs | | |
|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | QUANTITY | | |
| | | | Method Used | | | | |
| No. Annex II | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

### SECTION B : REMAINING POLLUTANT EMISSIONS (as required in your Licence)

| RELEASES TO LAND | | | | | Please enter all quantities in this section in KGs | | |
|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | QUANTITY | | |
| | | | Method Used | | | | |
| Pollutant No. | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

## 5. ONSITE TREATMENT & OFFSITE TRANSFERS OF WASTE



**Please enter all quantities on this sheet in Tonnes** 0

| Transfer Destination | European Waste Code | Hazardous | Quantity (Tonnes per Year) | Description of Waste | Waste Treatment Operation | Method Used | | Location of Treatment | Haz Waste : Name and Licence/Permit No of Next Destination Facility Non Haz Waste: Name and Licence/Permit No of Recover/Disposer | Haz Waste : Address of Next Destination Facility Non Haz Waste: Address of Recover/Disposer | Name and License / Permit No. and Address of Final Recoverer / Disposer (HAZARDOUS WASTE ONLY) | Actual Address of Final Destination i.e. Final Recovery / Disposal Site (HAZARDOUS WASTE ONLY) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | M/C/E | Method Used | | | | | |
| Within the Country | 01 01 02 | No | 201.21 | wastes from mineral non-metalliferous excavation | D1 | E | Volume Calculation | Onsite of generatic | Bord na Mona Energy Ltd,P0501-01 | Derrygreenagh,Rochfortbridge,Mullingar,Co Westmeath,Ireland | | |
| Within the Country | 02 01 04 | No | 117.06 | waste plastics (except packaging) | R5 | M | Weighed | Offsite in Ireland | Leinster Environmentals Ltd,WP 2008/06 | Haggardstown,Dundalk,Co Louth,,Ireland | | |
| To Other Countries | 11 01 13 | Yes | 0.38 | degreasing wastes containing dangerous substances | R11 | C | Volume Calculation | Abroad | Safety Kleen Ltd,99-1 | Tallaght,,.,.,,Ireland | Solvent Recovery Management,PP33345F,Wheeland Rd,Knottingly,West Yorks,WF11 8DZ,United Kingdom | Wheeland Rd,Knottingly,West Yorks,WF11 8DZ,United Kingdom |
| Within the Country | 13 02 05 | Yes | 38.97 | mineral-based non-chlorinated engine, gear and lubricating oils | R1 | C | Volume Calculation | Offsite in Ireland | Enva Ireland Ltd,184-1 | Clonminam Ind Estate,Portlaoise,Co Laois,,Ireland | Enva Ltd,184-1,Clonminam Industrial Estate,Portlaoise,Laois,,,Ireland | Clonminam Industrial Estate,Portlaoise,Laois,,,Ireland |
| Within the Country | 15 01 03 | No | 3.65 | wooden packaging | R1 | M | Weighed | Offsite in Ireland | AES Ltd,WP-OY-08-061-01 | Cappincur,Tullamore,Co Offaly,,,Iceland | | |
| To Other Countries | 15 02 02 | Yes | 0.72 | absorbents, filter materials (including oil filters not otherwise specified), wiping cloths, protective clothing contaminated by dangerous substances | R1 | C | Volume Calculation | Abroad | Enva Ireland Ltd,184-1 | Clonminam Ind Estate,Portlaoise,Co Laois,,Ireland | Lindenschmidt,Reg no E97095037,IINDENSCHMIDT,Kreuztal,,.,,Germany | IINDENSCHMIDT,Kreuztal,,.,,Germany |
| To Other Countries | 16 01 07 | Yes | 4.08 | oil filters | R4 | C | Volume Calculation | Abroad | Enva Ireland Ltd,184-1 | Clonminam Ind Estate,Portlaoise,Co Laois,,Ireland | R.D. Recycling,Reg no 51727/1/KD,Houthalen,.,.,.,Belgium | Houthalen,.,.,.,Belgium |
| Within the Country | 17 04 07 | No | 14.62 | mixed metals | R4 | M | Weighed | Offsite in Ireland | AES Ltd,WP-OY-08-061-01 | Cappincur,Tullamore,Co Offaly,,,Iceland | | |
| Within the Country | 20 03 01 | No | 54.59 | mixed municipal waste | D1 | M | Weighed | Offsite in Ireland | AES Ltd,WP-OY-08-061-01 | Cappincur,Tullamore,Co Offaly,,,Iceland | | |
| Within the Country | 20 03 01 | No | 5.78 | mixed municipal waste | D1 | M | Volume Calculation | Offsite in Ireland | AES Ltd,WP-OY-08-061-01 | Cappincur,Tullamore,Co Offaly,,,Iceland | | |
| To Other Countries | 08 01 11 | Yes | 0.49 | waste paint and varnish containing organic solvents or other dangerous substances | R1 | M | Weighed | Abroad | Enva Ireland Ltd,184-1 | Clonminam Ind Estate,Portlaoise,Co Laois,,Ireland | Recyfuel Ltd,BE0459.735.458,Enghis,.,.,.,Belgium | Enghis,.,.,.,Belgium |

* Select a row by double-clicking the Description of Waste then click the delete button

| Facility Information Summary | |
|---|---|
| AER Reporting Year | 2015 |
| Licence Register Number | P0501-01 |
| Name of site | Bord na Mona Derrygreenagh |
| Site Location | Derrygreenagh, Rochfortbridge, Co Westmeath |
| NACE Code | 0892 |
| Class/Classes of Activity | 1.4 |
| National Grid Reference (6E, 6 N) | 249450, 238140 |

A description of the activities/processes at the site for the reporting year. This should include information such as production increases or decreases on site, any infrastructural changes, environmental performance which was measured during the reporting year **and an overview of compliance with your licence** listing all exceedances of licence limits (where applicable) and what they relate to e.g. air, water, noise.

Activities on site can be divided into two components, firstly the milling, harrowing, ridiging and harvesting of peat into stockpiles and secondly the transportation of that peat via an internal rail network to the Power Station and lorry outloading facilities. Production achieved was approximately 261,668 tonnes which was down on the 2014 figure. Infrastructurally, there was no bog development. The quarterly grab sampling was 100% compliant, with the continuous composite sampling returning no non-compliances for suspended solids. There was one environmental complaint received during the reporting period. In relation to silt pond cleaning, almost 88% of ponds received two cleanings, inspections dictating cleaning schedules. Decommissioning and Rehabilitation works are described in an attachment.

**Declaration:**

All the data and information presented in this report has been checked and certified as being accurate. The quality of the information is assured to meet licence requirements.

| E. Mulhall | 15-3-16 |
|---|---|
| Signature<br>Group/Facility manager<br>(or nominated, suitably qualified and experienced deputy) | Date |

**AIR-summary template** Lic No: #REF! Year #REF!

**Answer all questions and complete all tables where relevant**

| | | | Additional information |
|---|---|---|---|
| 1 | Does your site have licensed air emissions? If yes please complete table A1 and A2 below for the current reporting year and answer further questions. If **you do not have** licenced emissions and **do not complete a solvent management plan** (table A4 and A5) you do not need to complete the tables | No | Fugitive emissions only |

## Periodic/Non-Continuous Monitoring

| | | | |
|---|---|---|---|
| 2 | Are there any results in breach of licence requirements? If yes please provide brief details in the comment section of TableA1 below | No | |
| 3 | Was all monitoring carried out in accordance with EPA guidance note AG2 and using the basic air monitoring checklist? Basic air monitoring checklist AGN2 | Yes | |

### Table A1: Licensed Mass Emissions/Ambient data-periodic monitoring (non-continuous)

| Emission reference no: | Parameter/ Substance | Frequency of Monitoring | ELV in licence or any revision therof | Licence Compliance criteria | Measured value | Unit of measurement | Compliant with licence limit | Method of analysis | Annual mass load (kg) | Comments - reason for change in % mass load from previous year if applicable |
|---|---|---|---|---|---|---|---|---|---|---|
| | SELECT | | | SELECT | | SELECT | SELECT | SELECT | | |
| | SELECT | | | SELECT | | SELECT | SELECT | SELECT | | |
| | SELECT | | | SELECT | | SELECT | SELECT | SELECT | | |
| | SELECT | | | SELECT | | SELECT | SELECT | SELECT | | |

Note 1: Volumetric flow shall be included as a reportable parameter

| AIR-summary template | Lic No: | #REF! | Year | #REF! |
|---|---|---|---|---|

## Continuous Monitoring

| | | | |
|---|---|---|---|
| 4 | Does your site carry out continuous air emissions monitoring? | No | |
| | If yes please review your continuous monitoring data and report the required fields below in Table A2 and compare it to its relevant Emission Limit Value (ELV) | | |
| 5 | Did continuous monitoring equipment experience downtime? If yes please record downtime in table A2 below | No | |
| 6 | Do you have a proactive service agreement for each piece of continuous monitoring equipment? | No | |
| 7 | Did your site experience any abatement system bypasses? If yes please detail them in table A3 below | No | |

### Table A2: Summary of average emissions -continuous monitoring

| Emission reference no: | Parameter/ Substance | ELV in licence or any revision therof | Averaging Period | Compliance Criteria | Units of measurement | Annual Emission | Annual maximum | Monitoring Equipment downtime (hours) | Number of ELV exceedences in current reporting year | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| DM-01 | Total Particulates | 350 | 84 DAYS | Daily average < ELV | mg/m2/day | 4452 | 67 | 0 | 0 | Dust monitioring took place on 3 occasions for 28 days each time between April and July |
| DM-02 | Total Particulates | 350 | 84 DAYS | Daily average < ELV | mg/m2/day | 14336 | 356 | 0 | 1 | Alder refINCI 007955 |
| DM-03 | Total Particulates | 350 | 84 DAYS | Daily average < ELV | mg/m2/day | 16940 | 305 | 0 | 0 | |
| DM-04 | Total Particulates | 350 | 84 DAYS | Daily average < ELV | mg/m2/day | 17696 | 505 | 0 | 1 | Alder refINCI 008395 |
| | SELECT | | | | SELECT | | | | | |

note 1: Volumetric flow shall be included as a reportable parameter.

### Table A3: Abatement system bypass reporting table

Bypass protocol

| Date* | Duration** (hours) | Location | Reason for bypass | Impact magnitude | Corrective action |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

* this should include all dates that an abatement system bypass occurred

** an accurate record of time bypass beginning and end should be logged on site and maintained for future Agency inspections please refer to bypass protocol link

| AIR-summary template | Lic No: | #REF! | Year | #REF! |
|---|---|---|---|---|

## Solvent use and management on site

8 Do you have a total Emission Limit Value of direct and fugitive emissions on site? if yes please fill out tables A4 and A5

SELECT

**Table A4: Solvent Management Plan Summary**
**Total VOC Emission limit value**

Solvent regulations — Please refer to linked solvent regulations to complete table 5 and 6

| Reporting year | Total solvent input on site (kg) | Total VOC emissions to Air from entire site (direct and fugitive) | Total VOC emissions as %of solvent input | Total Emission Limit Value (ELV) in licence or any revision therof | Compliance |
|---|---|---|---|---|---|
| | | | | | SELECT |
| | | | | | SELECT |

**Table A5: Solvent Mass Balance summary**

| | (I) Inputs (kg) | (O) Outputs (kg) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Solvent | (I) Inputs (kg) | Organic solvent emission in waste | Solvents lost in water (kg) | Collected waste solvent (kg) | Fugitive Organic Solvent (kg) | Solvent released in other ways e.g. by- | Solvents destroyed onsite through | Total emission of Solvent to air (kg) |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | Total | |

**AER Monitoring returns summary template-WATER/WASTEWATER(SEWER)** Lic No: #REF! Year #REF!

| | | | Additional information |
|---|---|---|---|
| 1 | Does your site have licensed emissions direct to surface water or direct to sewer? If yes please complete table W2 and W3 below for the current reporting year and answer further questions. If **you do not have** licenced emissions you only need to complete table W1 and or W2 for storm water analysis and visual inspections | Yes | |
| 2 | Was it a requirement of your licence to carry out visual inspections on any surface water discharges or watercourses on or near your site? If yes please complete table W2 below summarising only any evidence of contamination noted during visual inspections | Yes | Monthly COD of yard run-off is attached. |

**Table W1 Storm water monitoring**

| Location reference | Location relative to site activities | PRTR Parameter | Licenced Parameter | Monitoring date | ELV or trigger level in licence or any revision thereof* | Licence Compliance criteria | Measured value | Unit of measurement | Compliant with licence | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| | SELECT | SELECT | SELECT | | | SELECT | | SELECT | SELECT | |
| | SELECT | SELECT | SELECT | | | SELECT | | SELECT | SELECT | |

*trigger values may be agreed by the Agency outside of licence conditions

**Table W2 Visual inspections-Please only enter details where contamination was observed.**

| Location Reference | Date of inspection | Description of contamination | Source of contamination | Corrective action | Comments |
|---|---|---|---|---|---|
| | | | SELECT | | |
| | | | SELECT | | |

**Licensed Emissions to water and /or wastewater(sewer)-periodic monitoring (non-continuous)**

| | | | | |
|---|---|---|---|---|
| 3 | Was there any result in breach of licence requirements? If yes please provide brief details in the comment section of Table W3 below | | No | |
| 4 | Was all monitoring carried out in accordance with EPA guidance and checklists for Quality of Aqueous Monitoring Data Reported to the EPA? If no please detail what areas require improvement in additional information box | External /Internal Lab Quality checklist / Assessment of results checklist | Yes | Surface water monitoring was carried out on a quarterly basis. The results of which are attached. |

**Table W3: Licensed Emissions to water and /or wastewater (sewer)-periodic monitoring (non-continuous)**

| Emission reference no: | Emission released to | Parameter/ SubstanceNote 1 | Type of sample | Frequency of monitoring | Averaging period | ELV or trigger values in licence or any revision thereof[Note 2] | Licence Compliance criteria | Measured value | Unit of measurement | Compliant with licence | Method of analysis | Procedural reference source | Procedural reference standard number | Annual mass load (kg) | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

Note 1: Volumetric flow shall be included as a reportable parameter

Note 2: Where Emission Limit Values (ELV) do not apply to your licence please compare results against EQS for Surface water or relevant receptor quality standards

**AER Monitoring returns summary template-WATER/WASTEWATER(SEWER)** Lic No: #REF! Year #REF!

## Continuous monitoring

| | | | Additional Information |
|---|---|---|---|
| 5 | Does your site carry out continuous emissions to water/sewer monitoring? | Yes | Flow proportionate composite sampling |

**If yes please summarise your continuous monitoring data below in Table W4 and compare it to its relevant Emission Limit Value (ELV)**

| | | | |
|---|---|---|---|
| 6 | Did continuous monitoring equipment experience downtime? **If yes please record downtime in table W4 below** | Yes | Total of 22 days over 365 days |
| 7 | Do you have a proactive service contract for each piece of continuous monitoring equipment on site? | Yes | |
| 8 | Did abatement system bypass occur during the reporting year? **If yes please complete table W5 below** | No | |

## Table W4: Summary of average emissions -continuous monitoring

| Emission reference no: | Emission released to | Parameter/ Substance | ELV or trigger values in licence or any revision thereof | Averaging Period | Compliance Criteria | Units of measurement | Annual Emission for current reporting year (kg) | % change +/- from previous reporting year | Monitoring Equipment downtime (hours) | Number of ELV exceedences in reporting year | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SW15 | Water | Suspended Solids | 35 | 24 hour | All results < 1.5 times ELV, plus 8 from ten results must be < ELV | mg/L | 14947.98 | 10% | | 0 | Down time primarily due to battery changes and periods of no flow. |
| SW15 | Water | Ammonia (as N) | 2.78 | Weekly | NA | mg/L | 200.46 | -1.55% | | | |
| SW15 | Water | Total phosphorus | NA | Weekly | NA | mg/L | 20.24 | 17.47% | | | Percentage increase can be attributed to decreased downtime by 50% |
| SW15 | Water | COD | 100 | Weekly | NA | mg/L | 13344.34 | -11.15% | | | |
| SW15 | Water | volumetric flow | NA | 24 hour | NA | m3/day | 2204534796 | -10.82% | 528 | | Down time primarily due to battery changes and periods of no flow |
| SW15 | Water | Total Dissolved Solids | NA | Weekly | NA | mg/L | 849112 | 11.71% | | | Percentage increase can be attributed to decreased downtime by 50% |

note 1: Volumetric flow shall be included as a reportable parameter.

## Table W5: Abatement system bypass reporting table

| Date | Duration (hours) | Location | Resultant emissions | Reason for bypass | Corrective action* | Was a report submitted to the EPA? | When was this report submitted? |
|---|---|---|---|---|---|---|---|
| | | | | | | SELECT | |
| | | | | | | | |
| | | | | | | | |

*Measures taken or proposed to reduce or limit bypass frequency

## Bund/Pipeline testing template

Lic No: #REF! Year #REF!

Bund testing — dropdown menu click to see options

| | | | Additional information |
|---|---|---|---|
| 1 | Are you required by your licence to undertake integrity testing on bunds and containment structures ? if yes please fill out table B1 below listing all **new bunds and containment structures** on site, in addition to **all bunds which failed** the integrity test-**all bunding structures which failed including mobile bunds must be listed in the table below, please include all bunds outside the licenced testing period** (mobile bunds and chemstore included) | Yes | |
| 2 | Please provide integrity testing frequency period | Other (2 Yearly) | |
| 3 | Does the site maintain a register of bunds, underground pipelines (including stormwater and foul), Tanks, sumps and containers? (containers refers to "Chemstore" type units and mobile bunds) | Yes | |
| 4 | How many bunds are on site? | 3 | |
| 5 | How many of these bunds have been tested within the required test schedule? | 3 | 1 Passed, 1 scheduled for decommissioning,1 due for test in 2016 |
| 6 | How many mobile bunds are on site? | 6 | |
| 7 | Are the mobile bunds included in the bund test schedule? | No | |
| 8 | How many of these mobile bunds have been tested within the required test schedule? | 0 | |
| 9 | How many sumps on site are included in the integrity test schedule? | 0 | |
| 10 | How many of these sumps are integrity tested within the test schedule? | 0 | |
| | **Please list any sump integrity failures in table B1** | | |
| 11 | Do all sumps and chambers have high level liquid alarms? | N/A | |
| 12 | If yes to Q11 are these failsafe systems included in a maintenance and testing programme? | N/A | |
| 13 | Is the Fire Water Retention Pond included in your integrity test programme? | N/A | |

**Table B1:** Summary details of bund /containment structure integrity test

| Bund/Containment structure ID | Type | Specify Other type | Product containment | Actual capacity | Capacity required* | Type of integrity test | Other test type | Test date | Integrity reports maintained on site? | Results of test | Integrity test failure explanation <50 words | Corrective action taken | Scheduled date for retest | Results of retest(if in current reporting year) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Derrygreenagh 501-37-01 | reinforced concrete | | Gas oil | 49,500 | 45000 | Hydraulic test | | 20/03/2015 | Yes | Pass | | SELECT | | |
| Rossan 501-07-04 | reinforced concrete | | Gas oil | 11000 | 10000 | Hydraulic test | | 20/04/2015 | Yes | Fail | Cracks on outer wall | Other (It has been decided to replace with double skinned tank) | | |

* Capacity required should comply with 25% or 110% containment rule as detailed in your licence

| | | | Commentary |
|---|---|---|---|
| 15 | Has integrity testing been carried out in accordance with licence requirements and are all structures tested in line with BS8007/EPA Guidance? | bunding and storage guidelines | SELECT |
| 16 | Are channels/transfer systems to remote containment systems tested? | | SELECT |
| 17 | Are channels/transfer systems compliant in both integrity and available volume? | | SELECT |

Pipeline/underground structure testing

| | | | |
|---|---|---|---|
| 1 | Are you required by your licence to undertake integrity testing* on underground structures e.g. pipelines or sumps etc ? if yes please fill out table 2 below listing all underground structures and pipelines on site **which failed the integrity test and all which have not been tested withing the integrity test period as specified** | Yes | No underground tanks or pipelines on site |
| 2 | Please provide integrity testing frequency period | SELECT | |

*please note integrity testing means water tightness testing for process and foul pipelines (as required under your licence)

**Table B2:** Summary details of pipeline/underground structures integrity test

| Structure ID | Type system | Material of construction: | Does this structure have Secondary containment? | Type of secondary containment | Type integrity testing | Integrity reports maintained on site? | Results of test | Integrity test failure explanation <50 words | Corrective action taken | Scheduled date for retest | Results of retest(if in current reporting year) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | SELECT | SELECT | SELECT | SELECT | SELECT | SELECT | SELECT | | | | SELECT |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

Please use commentary for additional details not answered by tables/ questions above

| Groundwater/Soil monitoring template | Lic No: | #REF! | Year | #REF! |
|---|---|---|---|---|

| | | | Comments | |
|---|---|---|---|---|
| 1 | Are you required to carry out groundwater monitoring as part of your licence requirements? | no | | Please provide an interpretation of groundwater monitoring data in the interpretation box below or if you require additional space please include a groundwater/contaminated land monitoring results interpretaion as an additional section in this AER |
| 2 | Are you required to carry out soil monitoring as part of your licence requirements? | no | | |
| 3 | Do you extract groundwater for use on site? If yes please specify use in comment section | yes | Drinking water well | |
| 4 | Do monitoring results show that groundwater generic assessment criteria such as GTVs or IGVs are exceeded or is there an upward trend in results for a substance? If yes, please complete the Groundwater Monitoring Guideline Template Report (link in cell G8) and submit separately through ALDER as a licensee return AND answer questions 5-12 below. Groundwater monitoring template | no | | |
| 5 | Is the contamination related to operations at the facility (either current and/or historic) | no | | |
| 6 | Have actions been taken to address contamination issues?If yes please summarise remediation strategies proposed/undertaken for the site | N/A | | |
| 7 | Please specify the proposed time frame for the remediation strategy | N/A | | |
| 8 | Is there a licence condition to carry out/update ELRA for the site? | N/A | | |
| 9 | Has any type of risk assesment been carried out for the site? | N/A | | |
| 10 | Has a Conceptual Site Model been developed for the site? | N/A | | |
| 11 | Have potential receptors been identified on and off site? | N/A | | |
| 12 | Is there evidence that contamination is migrating offsite? | N/A | | Please enter interpretation of data here |

**Table 1: Upgradient Groundwater monitoring results**

| Date of sampling | Sample location reference | Parameter/ Substance | Methodology | Monitoring frequency | Maximum Concentration++ | Average Concentration+ | unit | GTV's* | SELECT** | Upward trend in pollutant concentration over last 5 years of monitoring data |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | SELECT | | | SELECT |
| | | | | | | | SELECT | | | SELECT |

.+ where average indicates arithmetic mean

.++ maximum concentration indicates the maximum measured concentration from all monitoring results produced during the reporting year

**Table 2: Downgradient Groundwater monitoring results**

| Date of sampling | Sample location reference | Parameter/ Substance | Methodology | Monitoring frequency | Maximum Concentration | Average Concentration | unit | GTV's* | SELECT** | Upward trend in yearly average pollutant concentration over last 5 years of monitoring data |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | SELECT | | | SELECT |
| | | | | | | | SELECT | | | SELECT |

| **Groundwater/Soil monitoring template** | Lic No: | #REF! | Year | #REF! |
|---|---|---|---|---|

| | |
|---|---|
| *please note exceedance of generic assessment criteria (GAC) such as a Groundwater Threshold Value (GTV) or an Interim Guideline Value (IGV) or an upward trend in results for a substance indicates that further interpretation of monitoring results is required. In addition to completing the above table, please complete the Groundwater Monitoring Guideline Template Report at the link provided and submit separately through ALDER as a licensee return or as otherwise instructed by the EPA. | Groundwater monitoring template |
| More information on the use of soil and groundwater standards/ generic assessment criteria (GAC) and risk assessment tools is available in the EPA published guidance (see the link in G31) | Guidance on the Management of Contaminated Land and Groundwater at EPA Licensed Sites (EPA 2013). |

| | | | | | |
|---|---|---|---|---|---|
| **Depending on location of the site and proximity to other sensitive receptors alternative Receptor based Water Quality standards should be used in addition to the GTV e.g. if the site is close to surface water compare to Surface Water Environmental Quality Standards (SWEQS), If the site is close to a drinking water supply compare results to the Drinking Water Standards (DWS) | Surface water EQS | Groundwater regulations GTV's | Drinking water (private supply) standards | Drinking water (public supply) standards | Interim Guideline Values (IGV) |

**Groundwater/Soil monitoring template** Lic No: #REF! Year #REF!

**Table 3: Soil results**

| Date of sampling | Sample location reference | Parameter/ Substance | Methodology | Monitoring frequency | Maximum Concentration | Average Concentration | unit |
|---|---|---|---|---|---|---|---|
| | | | | | | | SELECT |
| | | | | | | | SELECT |

Where additional detail is required please enter it here in 200 words or less

| Environmental Liabilities template | Lic No: | #REF! | Year | #REF! |
|---|---|---|---|---|

Click here to access EPA guidance on Environmental Liabilities and Financial provision

| | | | Commentary |
|---|---|---|---|
| 1 | ELRA initial agreement status | Not a licence requirement | |
| 2 | ELRA review status | NA | |
| 3 | Amount of Financial Provision cover required as determined by the latest ELRA | NA | |
| 4 | Financial Provision for ELRA status | NA | |
| 5 | Financial Provision for ELRA - amount of cover | NA | |
| 6 | Financial Provision for ELRA - type | NA | |
| 7 | Financial provision for ELRA expiry date | NA | |
| 8 | Closure plan initial agreement status | NA | Internal budget provision |
| 9 | Closure plan review status | NA | Internal budget provision |
| 10 | Financial Provision for Closure status | NA | Internal budget provision |
| 11 | Financial Provision for Closure - amount of cover | NA | Internal budget provision |
| 12 | Financial Provision for Closure - type | NA | Internal budget provision |
| 13 | Financial provision for Closure expiry date | NA | |

## Environmental Management Programme/Continuous Improvement Programme template

Lic No: #REF! Year #REF!

Highlighted cells contain dropdown menu click to view

| | | | Additional Information |
|---|---|---|---|
| 1 | Do you maintain an Environmental Mangement System (EMS) for the site. If yes, please detail in additional information | Yes | Internal unaccredited EMS. |
| 2 | Does the EMS reference the most significant environmental aspects and associated impacts on-site | Yes | |
| 3 | Does the EMS maintain an Environmental Management Programme (EMP) as required in accordance with the licence requirements | Yes | |
| 4 | Do you maintain an environmental documentation/communication system to inform the public on environmental performance of the facility, as required by the licence | Yes | |

**Environmental Management Programme (EMP) report**

| Objective Category | Target | Status (% completed) | How target was progressed | Responsibility | Intermediate outcomes |
|---|---|---|---|---|---|
| Reduction of emissions to Air | Continue to train all employees in environmental matters. Training will be by means of a new four module training programme delivered by dedicated Bord na Mona training specialists. This new training programme includes environmental compliance-IPPC, Biodiversity, Archaeology and Energy management. Hydraulic harrows will be deployed at dust sensitive locations. Continue with the collection of headland peat. | 90 | In total 21 personnel received training during 2015. Hydraulic harrows were depolyed at 4 locations. Headland peat was collected at all locations and returned with production figures. | Individual | Reduced emissions |
| Waste reduction/Raw material usage efficiency | Waste streamlining is a project we are particularly interested in continuing and hope to reduce wastes further in the future and be more efficient in dealing with all aspects of waste management | 80 | Installed a waste management system. Quarterly waste reports are returned for records/filing and waste streams are segrated on site to maximise recycling potential. | Section Head | Improved Environmental Management Practices |

| Environmental Management Programme/Continuous Improvement Programme template | | | | Lic No: #REF! | Year #REF! |
|---|---|---|---|---|---|
| Waste reduction/Raw material usage efficiency | Continue with the recycling of polyethylene. The sourcing of more recycling contractors will be ongoing. | 100 | In total 112.20 tonnes of polyethlene were sent off site for recycling. Procurement also exploring the possibility of securing further recyclers. | Individual | Improved Environmental Management Practices |
| Energy Management | As part of an Energy Awareness campaign all aspects of energy consumption will be communicated to personnel with the intention of reducing consumption through awareness | 100 | Electrical and Gas oil consumption is in the future to be included in production area budgets with KPI's set for the ongoing monitoring of same. | Section Head | Reduce overall energy output while maintaining productivity. |
| Reduction of emissions to Water | Continue to train all employees in environmental matters. Training will be by means of a new four module training programme delivered by dedicated Bord na Mona training specialists. This new training programme includes environmental compliance-IPPC, Biodiversity, Archaeology and Energy management. Continue with the collection of headland peat. | 90 | In total 21 Personnel received training in 2015. Personnel are trained every two years in Environmental matters. Headland peat was collected at all locations and included as part of overall peat returns. | Individual | Improved Environmental Management Practices |

| Noise monitoring summary report | Lic No: | #REF! | Year | #REF! |
|---|---|---|---|---|

| | | |
|---|---|---|
| 1 | Was noise monitoring a licence requirement for the AER period?<br>If yes please fill in table N1 noise summary below | No |
| 2 | Was noise monitoring carried out using the EPA Guidance note, including completion of the "Checklist for noise measurement report" included in the guidance note as table 6? (Noise Guidance note NG4) | NA |
| 3 | Does your site have a noise reduction plan | NA |
| 4 | When was the noise reduction plan last updated? | Enter date |
| 5 | Have there been changes relevant to site noise emissions (e.g. plant or operational changes) since the last noise survey? | NA |

**Table N1: Noise monitoring summary**

| Date of monitoring | Time period | Noise location (on site) | Noise sensitive location -NSL (if applicable) | $LA_{eq}$ | $LA_{90}$ | $LA_{10}$ | $LA_{max}$ | Tonal or Impulsive noise* (Y/N) | If tonal /impulsive noise was identified was 5dB penalty applied? | Comments (ex. main noise sources on site, & extraneous noise ex. road traffic) | Is site compliant with noise limits (day/evening/night)? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | SELECT | SELECT | | SELECT |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

*Please ensure that a tonal analysis has been carried out as per guidance note NG4. These records must be maintained onsite for future inspection

If noise limits exceeded as a result of noise attributed to site activities, please choose the corrective action from the following options? SELECT

| |
|---|
| ** please explain the reason for not taking action/resolution of noise issues? |
| Any additional comments? (less than 200 words) |

**Resource Usage/Energy efficiency summary** Lic No: #REF! Year #REF!

| | | | Additional information |
|---|---|---|---|
| 1 | When did the site carry out the most recent energy efficiency audit? Please list the recommendations in table 3 below | Nov-12 | Report on file |
| 2 | Is the site a member of any accredited programmes for reducing energy usage/water conservation such as the SEAI programme linked to the right? If yes please list them in additional information | SEAI - Large Industry Energy Network (LIEN) Yes | |
| 3 | Where Fuel Oil is used in boilers on site is the sulphur content compliant with licence conditions? Please state percentage in additional information | NA | Not a Licence requirement |

Table R1 Energy usage on site

| Energy Use | Previous year | Current year | Production +/- % compared to previous reporting year** | Energy Consumption +/- % vs overall site production* |
|---|---|---|---|---|
| Total Energy Used (MWHrs) | 7343 | 6100 | NA | NA |
| Total Energy Generated (MWHrs) | | | | |
| Total Renewable Energy Generated (MWHrs) | | | | |
| Electricity Consumption (MWHrs) | 360 | 451 | NA | NA |
| Fossil Fuels Consumption: | | | | |
| Heavy Fuel Oil (m3) | | | | |
| Light Fuel Oil (m3) | 687.266 | 555.988 | -11.55% | -19.10% |
| Natural gas (m3) | | | | |
| Coal/Solid fuel (metric tonnes) | | | | |
| Peat (metric tonnes) | | | | |
| Renewable Biomass | | | | |
| Renewable energy generated on site | | | | |

* where consumption of energy can be compared to overall site production please enter this information as percentage increase or decrease compared to the previous reporting year.

** where site production information is available please enter percentage increase or decrease compared to previous year

Table R2 Water usage on site

| | | | | | Water Emissions | Water Consumption | |
|---|---|---|---|---|---|---|---|
| Water use | Water extracted Previous year m3/yr. | Water extracted Current year m3/yr. | Production +/- % compared to previous reporting year** | Energy Consumption +/- % vs overall site production* | Volume Discharged back to environment($m^3$yr): | Volume used i.e not discharged to environment e.g. released as steam m3/yr | Unaccounted for Water: |
| Groundwater | | | | | | | |
| Surface water | | | | | | | |
| Public supply | | | | | | | |
| Recycled water | | | | | | | |
| Total | | | | | | | |

* where consumption of water can be compared to overall site production please enter this information as percentage increase or decrease compared to the previous reporting year.

** where site production information is available please enter percentage increase or decrease compared to previous year

Table R3 Waste Stream Summary

| | Total | Landfill | Incineration | Recycled | Other |
|---|---|---|---|---|---|
| Hazardous (Tonnes) | 18.59 | 0 | 1.45 | 17.147 | 0 |
| Non-Hazardous (Tonnes) | 366.2 | 37.64 | 0 | 176.66 | 151.91 |

**Resource Usage/Energy efficiency summary** Lic No: #REF! Year #REF!

Table R4: Energy Audit finding recommendations

| Date of audit | Recommendations | Description of Measures proposed | Origin of measures | Predicted energy savings % | Implementation date | Responsibility | Completion date | Status and comments |
|---|---|---|---|---|---|---|---|---|
| | | | SELECT | | | | | |
| | | | SELECT | | | | | |
| | | | SELECT | | | | | |

Table R5: Power Generation: Where power is generated onsite (e.g. power generation facilities/food and drink industry)please complete the following information

| | Unit ID | Unit ID | Unit ID | Unit ID | Station Total |
|---|---|---|---|---|---|
| Technology | | | | | |
| Primary Fuel | | | | | |
| Thermal Efficiency | | | | | |
| Unit Date of Commission | | | | | |
| Total Starts for year | | | | | |
| Total Running Time | | | | | |
| Total Electricity Generated (GWH) | | | | | |
| House Load (GWH) | | | | | |
| KWH per Litre of Process Water | | | | | |
| KWH per Litre of Total Water used on Site | | | | | |

**Complaints and Incidents summary template** Lic No: #REF! Year #REF!

Complaints

| | | Additional information |
|---|---|---|
| Have you received any environmental complaints in the current reporting year? If yes please complete summary details of complaints received on site in table 1 below | Yes | One complaint was received in Rossan Bog Area relating to dust, this was reported to the Agency. Ref LR017071 |

Table 1 Complaints summary

| Date | Category | Other type (please specify) | Brief description of complaint (Free txt <20 words) | Corrective action< 20 words | Resolution status | Resolution date | Further information |
|---|---|---|---|---|---|---|---|
| 24/06/2015 | Dust | | Complaint received at Rossan Bog relating to dust nuisance. | Peat production was suspended and personnel reminded of their environmental responsibilities | Complete | 24/06/2015 | Reported to the Agency ref: LR017071 on 06/07/2015 |
| | SELECT | | | | SELECT | | |
| | SELECT | | | | SELECT | | |
| | SELECT | | | | SELECT | | |
| | SELECT | | | | SELECT | | |

| | |
|---|---|
| Total complaints open at start of reporting year | 0 |
| Total new complaints received during reporting year | 1 |
| Total complaints closed during reporting year | 1 |
| Balance of complaints end of reporting year | 0 |

Incidents

| | | Additional information |
|---|---|---|
| Have any incidents occurred on site in the current reporting year? Please list all incidents for current reporting year in Table 2 below | Yes | |

| | |
|---|---|
| *For information on how to report and what constitutes an incident | What is an incident |

Table 2 Incidents summary

| Date of occurrence | Incident nature | Location of occurrence | Incident category*please refer to guidance | Receptor | Cause of incident | Other cause(please specify) | Activity in progress at time of incident | Communication | Occurrence | Corrective action<20 words | Preventative action <20 words | Resolution status | Resolution date | Likelihood of reoccurence |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17/04/2015 | Ammonia Trigger level reached | Lisclogher SW22 | 1. Minor | Water | Other (add details | Naturally occurring | Normal activities | EPA INCI007613 | New | Investigate | None Required | Complete | 06/05/2015 | Low |
| 05/05/2015 | COD Trigger level reached | Toar SW15 | 1. Minor | Water | Other (add details | Naturally occurring | Normal activities | EPA INCI007674 | New | Investigate | None Required | Complete | 14/05/2015 | Low |
| 19/05/2015 | Breach of Dust ELV | DM-02 Derryhinch Bog | 1. Minor | Air | Other (add details | Dust from nearby trees | Normal activities | EPA INCI007955 | New | Investigate | Personnel reminded of responsibilities , Gauge moved from nearby trees | Complete | 22/06/2015 | Low |
| 22/07/2015 | COD Trigger level reached | Lisclogher SW24 | 1. Minor | Water | Other (add details | Naturally occurring | Normal activities | EPA INCI008400 | New | Investigate | None Required | Complete | 26/08/2015 | Low |

| Complaints and Incidents summary template | | | | | Lic No: | #REF! | | Year | #REF! | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 21/07/2015 | Breach of Dust ELV | DM-04 Ballybeg | 1. Minor | Air | Dust from vegetation near gauge | | Normal activities | EPA INCI008395 | New | Cut vegetation near gauge | Cut vegetation near gauge | Complete | 25/08/2015 | Low |
| 26/10/2015 | COD Trigger level reached | Toar SW15 | 1. Minor | Water | Other (add details | Naturally occurring | Normal activities | EPA INCI008915 | New | Investigate | None Required | Complete | 10/11/2015 | Low |
| | | | | | | | | | | | | | | |

| | |
|---|---|
| Total number of incidents current year | 6 |
| Total number of incidents previous year | 7 |
| % reduction/ increase | -14% |

**WASTE SUMMARY** Lic No: #REF! Year #REF!

**SECTION A-PRTR ON SITE WASTE TREATMENT AND WASTE TRANSFERS TAB- TO BE COMPLETED BY ALL IPPC AND WASTE FACILITIES** | PRTR facility logon | dropdown list click to see options

**SECTION B- WASTE ACCEPTED ONTO SITE-TO BE COMPLETED BY ALL IPPC AND WASTE FACILITIES**

| | | | Additional Information |
|---|---|---|---|
| 1 | Were any wastes accepted onto your site for recovery or disposal or treatment prior to recovery or disposal within the boundaries of your facility ?; (waste generated within your boundaries is to be captured through PRTR reporting) If yes please enter details in table 1 below | N/A | |
| 2 | Did your site have any rejected consignments of waste in the current reporting year? If yes please give a brief explanation in the additional information | N/A | |
| 3 | Was waste accepted onto your site that was generated outside the Republic of Ireland? If yes please state the quantity in tonnes in additional information | N/A | |

**Table 1 Details of waste accepted onto your site for recovery, disposal or treatment (do not include wastes generated at your site, as these will have been reported in your PRTR workbook)**

| Licenced annual tonnage limit for your site (total tonnes/annum) | EWC code<br>European Waste Catalogue EWC codes | Source of waste accepted | Description of waste accepted **Please enter an accurate and detailed description - which applies to relevant EWC code**<br>European Waste Catalogue EWC codes | Quantity of waste accepted in current reporting year (tonnes) | Quantity of waste accepted in previous reporting year (tonnes) | Reduction/ Increase over previous year +/ - % | Reason for reduction/ increase from previous reporting year | Packaging Content (%)- only applies if the waste has a packaging component | Disposal/Recovery or treatment operation carried out at your site and the description of this operation | Quantity of waste remaining on site at the end of reporting year (tonnes) | Comments - |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**SECTION C-TO BE COMPLETED BY ALL WASTE FACILITIES (waste transfer stations, Composters, Material recovery facilities etc) EXCEPT LANDFILL SITES**

| | | | |
|---|---|---|---|
| 4 | Is all waste processing infrastructure as required by your licence and approved by the Agency in place? If no please list waste processing infrastructure required onsite | SELECT | |
| 5 | Is all waste storage infrastructure as required by your licence and approved by the Agency in place? If no please list waste storage infrastructure required on site | SELECT | |
| 6 | Does your facility have relevant nuisance controls in place? | SELECT | |
| 7 | Do you have an odour management system in place for your facility? If no why? | SELECT | |
| 8 | Do you maintain a sludge register on site? | SELECT | |

**SECTION D-TO BE COMPLETED BY LANDFILL SITES ONLY**

**Table 2 Waste type and tonnage-landfill only**

| Waste types permitted for disposal | Authorised/licenced annual intake for disposal (tpa) | Actual intake for disposal in reporting year (tpa) | Remaining licensed capacity at end of reporting year (m3) | Comments |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**Table 3 General information-Landfill only**

| Area ID | Date landfilling commenced | Date landfilling ceased | Currently landfilling | Private or Public Operated | Inert or non-hazardous | Predicted date to cease landfilling | Licence permits asbestos | Is there a separate cell for asbestos? | Accepted asbestos in reporting year | Total disposal area occupied by waste<br>SELECT UNIT | Lined disposal area occupied by waste<br>SELECT UNIT | Unlined area<br>SELECT UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cell 8 | | | | | | | | | | | | |

## WASTE SUMMARY

Lic No: #REF! Year #REF!

### Table 4 Environmental monitoring-landfill only

Landfill Manual-Monitoring Standards

| Was meterological monitoring in compliance with Landfill Directive (LD) standard in reporting year + | Was leachate monitored in compliance with LD standard in reporting year | Was Landfill Gas monitored in compliance with LD standard in reporting year | Was SW monitored in compliance with LD standard in reporting year | Have GW trigger levels been established | Were emission limit values agreed with the Agency (ELVs) | Was topography of the site surveyed in reporting year | Has the statement under S53(A)(5) of WMA been submitted in reporting year | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

.+ please refer to Landfill Manual linked above for relevant Landfill Directive monitoring standards

### Table 5 Capping-Landfill only

| Area uncapped* | Area with temporary cap | Area with final cap to LD Standard m2 ha, a | Area capped other | Area with waste that should be permanently capped to date under licence | What materials are used in the cap | Comments |
|---|---|---|---|---|---|---|
| SELECT UNIT | SELECT UNIT | | | | | |
| | | | | | | |

*please note this includes daily cover area

### Table 6 Leachate-Landfill only

| | | |
|---|---|---|
| 9 | Is leachate from your site treated in a Waste Water Treatment Plant? | SELECT |
| 10 | Is leachate released to surface water? If yes please complete leachate mass load information below | SELECT |

| Volume of leachate in reporting year(m3) | Leachate (BOD) mass load (kg/annum) | Leachate (COD) mass load (kg/annum) | Leachate (NH4) mass load (kg/annum) | Leachate (Chloride) mass load kg/annum | Leachate treatment on-site | Specify type of leachate treatment | Comments |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

Please ensure that all information reported in the landfill gas section is consistent with the Landfill Gas Survey submitted in conjunction with PRTR returns

### Table 7 Landfill Gas-Landfill only

| Gas Captured&Treated by LFG System m3 | Power generated (MW / KWh) | Used on-site or to national grid | Was surface emissions monitoring performed during the reporting year? | Comments |
|---|---|---|---|---|
| | | | SELECT | |

| Comments on liner type |
| --- |
| |

**Derrygreenagh**
**Decommissioning and Rehabilitation**
**AER Overview 2015.**

Within the Derrygreenagh licensed area (P0501-01) there were no entire bog units available for rehabilitation in 2015. Ongoing monitoring of cutaway within the Derrygreenagh licensing area included the re-survey of Drumman bog.

Active rehabilittaion work was carried out in Cavemount bog with a small area of fertiliser application and a wetland area developed.

Draft rehabilitation plans for the Derrygreenagh bogs licensed area, including more detailed draft plans for each component bog unit were submitted to the EPA in 2013 and these were reviewed and updated in 2015.

The annual Biodiversity Action Plan review day was held in November 2015 and this included an update on progress of this plan, bog restoration and cutaway rehabilitation for a wide range on statutory and non-statutory consultees including members of the EPA, NPWS, BWI, Bord na Mona, Coillte, Inland Fisheries Ireland, An Taisce, IPCC, Irish Red Grouse Association, Irish Wildlife Trust, NARGC, local game councils, Midland Regional Planning Authority as well as a range of local community groups and Heritage Officers from counties Laois, Offaly, Kildare, Roscommon, Longford, Meath, Galway, Westmeath and Dublin. At this meeting the draft of the new Biodiversity Action Plan was discussed, with a further extensive engagement with consultees held online.

The new Biodiversity Action Plan will be available from April 2016.

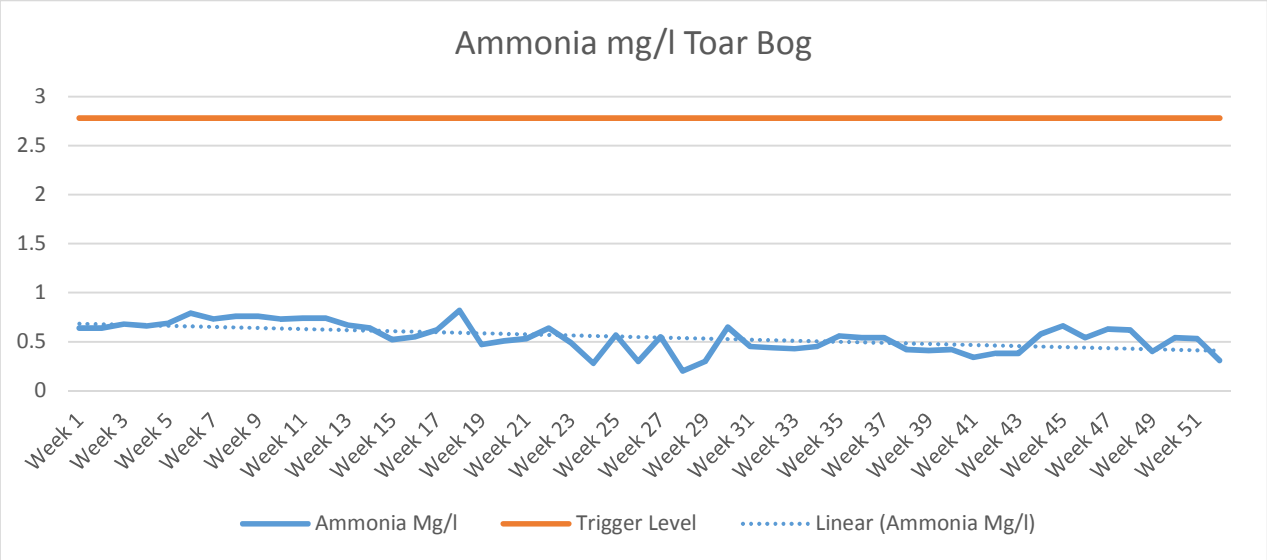
A copy of our Biodiversity Action Plan is available to view and download at http://www.bordnamona.ie/our-company/biodiversity/

**Bord na Mona Derrygreenagh**

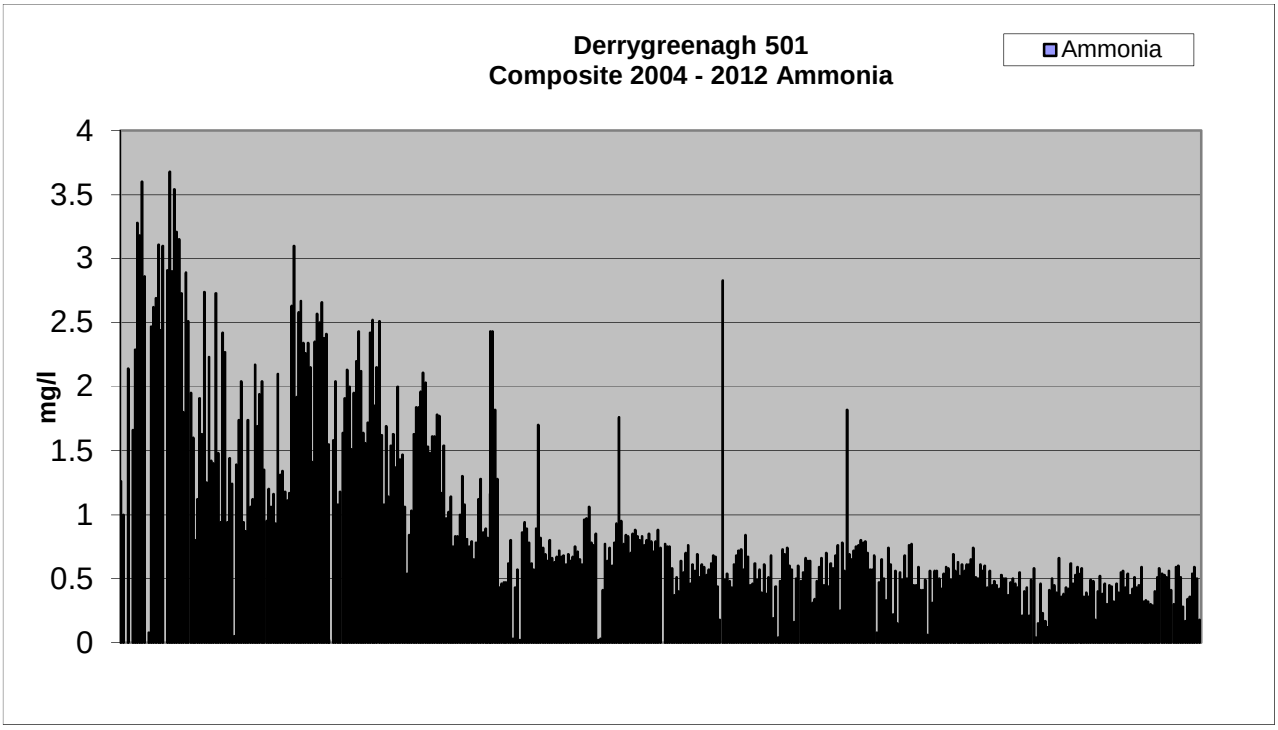
**IPPC Licence P0501-01**

## Siltpond Monitoring Frequency & Results

| X | Y | Bog | SW | Monitoring | Sampled | pH | SS | TS | Ammonia | TP | COD | Colour |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| To Be Confirmed | To Be Confirmed | Rossan | SW-49 | Q1 15 | 04/02/2015 | 6.7 | 5 | 152 | 2.3 | 0.05 | 60 | 210 |
| To Be Confirmed | To Be Confirmed | Derryarkin | SW-10 | Q1 15 | 04/02/2015 | 7.3 | 5 | 272 | 0.11 | 0.05 | 52 | 168 |
| 251559.92 | 235341.71 | Ballybeg | SW-11 | Q1 15 | 04/02/2015 | 7.2 | 5 | 312 | 0.68 | 0.05 | 59 | 208 |
| 240485.16 | 235706.33 | Torr | SW-14 | Q1 15 | 04/02/2015 | 7.2 | 5 | 298 | 1.9 | 0.05 | 46 | 150 |
| 244391.76 | 235128.93 | Torr | SW-15 | Q1 15 | 04/02/2015 | 7.4 | 5 | 382 | 0.77 | 0.05 | 38 | 80 |
| 244435.64 | 235093.42 | Torr | SW-16 | Q1 15 | 04/02/2015 | 7.3 | 5 | 368 | 0.65 | 0.05 | 32 | 83 |
| 240425.65 | 234997.32 | Torr | SW-17 | Q2 15 | 17/04/2015 | 7.5 | 5 | 458 | 1.1 | 0.05 | 49 | 164 |
| 262436.96 | 258824.82 | Lisclogher | SW-19 | Q2 15 | 17/04/2015 | 7.5 | 5 | 202 | 0.66 | 0.05 | 81 | 481 |
| 262935.72 | 258722.50 | Lisclogher | SW-20 | Q2 15 | 17/04/2015 | 7.1 | 5 | 196 | 1.2 | 0.05 | 82 | 499 |
| 262969.12 | 258691.34 | Lisclogher | SW-21 | Q2 15 | 17/04/2015 | 4.6 | 5 | 84 | 0.11 | 0.05 | 81 | 315 |
| 263432.94 | 258465.16 | Lisclogher | SW-22 | Q2 15 | 17/04/2015 | 7.4 | 24 | 378 | 3.4 | 0.14 | 62 | 140 |
| 263467.21 | 258446.56 | Lisclogher | SW-23 | Q3 15 | 22/07/2015 | 7.8 | 5 | 450 | 0.21 | 0.05 | 24 | 72 |
| 263740.80 | 258367.96 | Lisclogher | SW-24 | Q3 15 | 22/07/2015 | 4.6 | 5 | 141 | 0.11 | 0.05 | 146 | 350 |
| 263649.63 | 255035.41 | Carranstown | SW-31 | Q3 15 | 22/07/2015 | 6.9 | 5 | 168 | 0.16 | 0.05 | 60 | 146 |
| 265553.99 | 255989.11 | Carranstown | SW-32 | Q3 15 | 22/07/2015 | 7.4 | 5 | 350 | 0.35 | 0.05 | 89 | 224 |
| 254528.83 | 242354.28 | Derryhinch | SW-2 | Q4 15 | 30/10/2015 | 7.2 | 5 | 166 | 1.5 | 0.05 | 83 | 225 |
| 253369.19 | 242417.94 | Derryhinch | SW-3 | Q4 15 | 30/10/2015 | 7.4 | 5 | 204 | 2.4 | 0.05 | 22 | 129 |
| 252468.68 | 240919.32 | Carrick | SW-5 | Q4 15 | 30/10/2015 | 7.6 | 5 | 280 | 0.73 | 0.05 | 58 | 143 |
| 252409.71 | 241163.33 | Carrick | SW-6 | Q4 15 | 30/10/2015 | 7.8 | 5 | 426 | 0.29 | 0.06 | 10 | 105 |
| 252473.21 | 241162.01 | Carrick | SW-7 | Q4 15 | 30/10/2015 | 7.8 | 5 | 422 | 0.27 | 0.05 | 53 | 109 |




Toar bog is an active production bog with the composite sampler located here during 2015. The composite sampler takes a flow proportional composite sample over a 24 hour period. The sampler had 0% downtime during the period and returned 52 weekly ammonia results. The ammonia trigger level of 2.78mg/l, as agreed with the Agency, was not exceeded during the period. Overall the results are trending downwards as peat extraction continues and this is in-line with the downwards trends submitted to the EPA in 2013 as required by condition 6.14 below. Due to the new licence condition 6.2, where all monitoring locations are required to be sampled at least once in a 5 yr period, it is not possible to trend these ammonia results for each individual location due to the new licence requirement. However the ammonia trends on the 24/7 composite sampler provided, gives a good representation of the ammonia trends in the Derrygreenagh bogs which are downwards.



| Yard Discharge Results 2015 | | |
|---|---|---|
| **Licence: P0501-01** | | |
| **Works: Derrygreenagh** | | |
| **Month** | **D/Greenagh SWE 2 COD** | **Rossan SWE 1 COD** |
| Jan | 26 | 20 |
| Feb | 26 | 51 |
| Mar | 29 | 10 |
| Apr | 23 | 10 |
| May | 10 | 11 |
| June | 10 | 10 |
| July | 20 | 46 |
| Aug | 10 | 44 |
| Sep | 17 | 15 |
| Oct | 16 | 10 |
| Nov | 32 | 20 |
| Dec | 39 | 80 |

**Note: 0** denotes no flow at emission point on day of sampling

Environmental Protection Agency

Guidance to completing the PRTR workbook

# PRTR Returns Workbook

Version 1.1.19

| | |
|---|---|
| **REFERENCE YEAR** | 2015 |

**1. FACILITY IDENTIFICATION**

| | |
|---|---|
| Parent Company Name | Bord na Mona Energy Limited |
| Facility Name | Bord na Móna Energy Limited (Derrygreenagh) |
| PRTR Identification Number | P0501 |
| Licence Number | P0501-01 |

Classes of Activity

| No. | class_name |
|---|---|
| - | Refer to PRTR class activities below |

| | |
|---|---|
| Address 1 | Derrygreenagh Group |
| Address 2 | c/o Derrygreenagh Works |
| Address 3 | Rochfortbridge |
| Address 4 | Mullingar |
| | |
| | Westmeath |
| Country | Ireland |
| Coordinates of Location | -7.25676 53.3910 |
| River Basin District | IEEA |
| NACE Code | 0892 |
| Main Economic Activity | Extraction of peat |
| **AER Returns Contact Name** | Enda Mc Donagh |
| **AER Returns Contact Email Address** | enda.mcdonagh@bnm.ie |
| **AER Returns Contact Position** | Head of Environment |
| **AER Returns Contact Telephone Number** | 0579345911 |
| **AER Returns Contact Mobile Phone Number** | 0862370816 |
| **AER Returns Contact Fax Number** | 0579345160 |
| **Production Volume** | 258641.0 |
| **Production Volume Units** | Tonnes |
| **Number of Installations** | 6 |
| **Number of Operating Hours in Year** | 2216 |
| **Number of Employees** | 60 |
| **User Feedback/Comments** | In accordance with licence condition 6.2 of Technical Amendment A, quarterly sampling is now rotated every quarter and therefore suspended solids results are not factored into loading. |
| **Web Address** | www.bnm.ie |

**2. PRTR CLASS ACTIVITIES**

| Activity Number | Activity Name |
|---|---|
| 50.1 | General |

**3. SOLVENTS REGULATIONS (S.I. No. 543 of 2002)**

| | |
|---|---|
| Is it applicable? | |
| Have you been granted an exemption ? | |
| If applicable which activity class applies (as per Schedule 2 of the regulations) ? | |
| Is the reduction scheme compliance route being used ? | |

**4. WASTE IMPORTED/ACCEPTED ONTO SITE** Guidance on waste imported/accepted onto site

| | |
|---|---|
| Do you import/accept waste onto your site for on-site treatment (either recovery or disposal activities) ? | No |

This question is only applicable if you are an IPPC or Quarry site

**4.1 RELEASES TO AIR** Link to previous years emissions data | PRTR# : P0501 | Facility Name : Bord na Móna Energy Limited (Derrygreenagh) | Filename : Copy of P0501_2015.xls | Return Year : 2015 | 16/3/2016 12:31

**SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS**

| RELEASES TO AIR | | | | | Please enter all quantities in this section in KGs | | | |
|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | | QUANTITY | | |
| | | | Method Used | | | | | |
| No. Annex II | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

**SECTION B : REMAINING PRTR POLLUTANTS**

| RELEASES TO AIR | | | | | Please enter all quantities in this section in KGs | | | |
|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | | QUANTITY | | |
| | | | Method Used | | | | | |
| No. Annex II | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

**SECTION C : REMAINING POLLUTANT EMISSIONS (As required in your Licence)**

| RELEASES TO AIR | | | | | Please enter all quantities in this section in KGs | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | | | | | QUANTITY | | |
| | | | Method Used | | DM-01 | DM-02 | DM-03 | DM-04 | | | |
| Pollutant No. | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | Emission Point 2 | Emission Point 3 | Emission Point 4 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| **210** | **Dust** | E | OTH | VDI 2119 Blatt 2/Part 2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.054364 | 0.0 | 0.054364 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

## Additional Data Requested from Landfill operators

**For the purposes of the National Inventory on Greenhouse Gases, landfill operators are requested to provide summary data on landfill gas (Methane) flared or utilised on their facilities to accompany the figures for total methane generated. Operators should only report their Net methane (CH4) emission to the environment under T(total) KG/yr for Section A: Sector specific PRTR pollutants above. Please complete the table below:**

**Landfill:** Bord na Móna Energy Limited (Derrygreenagh)

| **Please enter summary data on the quantities of methane flared and / or utilised** | | | Method Used | | | |
|---|---|---|---|---|---|---|
| | **T (Total) kg/Year** | **M/C/E** | **Method Code** | **Designation or Description** | **Facility Total Capacity m3 per hour** | |
| Total estimated methane generation (as per site model) | 0.0 | | | | N/A | |
| Methane flared | 0.0 | | | | 0.0 | (Total Flaring Capacity) |
| Methane utilised in engine/s | 0.0 | | | | 0.0 | (Total Utilising Capacity) |
| Net methane emission (as reported in Section A above) | 0.0 | | | | N/A | |

**4.2 RELEASES TO WATERS** Link to previous years emissions data | PRTR# : P0501 | Facility Name : Bord na Móna Energy Limited (Derrygreenagh) | Filename : Copy of P0501_2015.xls | Return Year : 2015 | 16/03/2016 12:32

**SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS**

Data on ambient monitoring of storm/surface water or groundwater, conducted as part of your licence requirements, should NOT be submitted under AER / PRTR Reporting as this

| RELEASES TO WATERS | | | | | Please enter all quantities in this section in KGs | | | |
|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | | | | QUANTITY | | | |
| | | | Method Used | | | | | |
| No. Annex II | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

**SECTION B : REMAINING PRTR POLLUTANTS**

| RELEASES TO WATERS | | | | | Please enter all quantities in this section in KGs | | | |
|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | | | | QUANTITY | | | |
| | | | Method Used | | | | | |
| No. Annex II | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

**SECTION C : REMAINING POLLUTANT EMISSIONS (as required in your Licence)**

| RELEASES TO WATERS | | | | | Please enter all quantities in this section in KGs | | | |
|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | | | | QUANTITY | | | |
| | | | Method Used | | SW15 | | | |
| Pollutant No. | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| **240** | **Suspended Solids** | E | OTH | G/19 Based on ALPHA,1998,20th Edition, Method 2540D | 14947.98 | 14947.98 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

## 4.3 RELEASES TO WASTEWATER OR SEWER

Link to previous years emissions data



### SECTION A : PRTR POLLUTANTS

| OFFSITE TRANSFER OF POLLUTANTS DESTINED FOR WASTE-WATER TREATMENT OR SEWER | | | | | Please enter all quantities in this section in KGs | | | |
|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | QUANTITY | | | |
| | | | Method Used | | | | | |
| No. Annex II | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

### SECTION B : REMAINING POLLUTANT EMISSIONS (as required in your Licence)

| OFFSITE TRANSFER OF POLLUTANTS DESTINED FOR WASTE-WATER TREATMENT OR SEWER | | | | | Please enter all quantities in this section in KGs | | | |
|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | QUANTITY | | | |
| | | | Method Used | | | | | |
| Pollutant No. | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

## 4.4 RELEASES TO LAND

Link to previous years emissions data



### SECTION A : PRTR POLLUTANTS

| RELEASES TO LAND | | | | | Please enter all quantities in this section in KGs | | |
|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | QUANTITY | | |
| | | | Method Used | | | | |
| No. Annex II | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

### SECTION B : REMAINING POLLUTANT EMISSIONS (as required in your Licence)

| RELEASES TO LAND | | | | | Please enter all quantities in this section in KGs | | |
|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | QUANTITY | | |
| | | | Method Used | | | | |
| Pollutant No. | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

## 5. ONSITE TREATMENT & OFFSITE TRANSFERS OF WASTE



**Please enter all quantities on this sheet in Tonnes**



| Transfer Destination | European Waste Code | Hazardous | Quantity (Tonnes per Year) | Description of Waste | Waste Treatment Operation | Method Used | | Location of Treatment | Haz Waste : Name and Licence/Permit No of Next Destination Facility Non Haz Waste: Name and Licence/Permit No of Recover/Disposer | Haz Waste : Address of Next Destination Facility Non Haz Waste: Address of Recover/Disposer | Name and License / Permit No. and Address of Final Recoverer / Disposer (HAZARDOUS WASTE ONLY) | Actual Address of Final Destination i.e. Final Recovery / Disposal Site (HAZARDOUS WASTE ONLY) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | M/C/E | Method Used | | | | | |
| Within the Country | 01 01 02 | No | 151.91 | wastes from mineral non-metalliferous excavation | D1 | E | Volume Calculation | Onsite of generati | Bord na Mona Energy Ltd,P0501-01 | Derrygreenagh,Rochfortbridge,Mullingar,Co Westmeath,Ireland | | |
| Within the Country | 02 01 04 | No | 112.2 | waste plastics (except packaging) | R5 | M | Weighed | Offsite in Ireland | Leinster Environmentals Ltd,WP 2008/06 | Haggardstown,Dundalk,Co Louth,,Ireland | | |
| To Other Countries | 08 01 11 | Yes | 0.0 | waste paint and varnish containing organic solvents or other dangerous substances | R1 | M | Weighed | Abroad | Enva Ireland Ltd,184-1 | Clonminam Ind Estate,Portlaoise,Co Laois,,Ireland | Recyfuel Ltd,BE0459.735.458,Enghis,.,.,.,Belgium | Enghis,.,.,.,Belgium |
| To Other Countries | 11 01 13 | Yes | 0.24 | degreasing wastes containing dangerous substances | R11 | C | Volume Calculation | Abroad | Safety Kleen Ltd,99-1 | Tallaght,.,.,.,Ireland | Solvent Recovery Management,PP33345F,Wheeland Rd,Knottingly,West Yorks,WF11 8DZ,United Kingdom | Wheeland Rd,Knottingly,West Yorks,WF11 8DZ,United Kingdom |
| Within the Country | 13 02 05 | Yes | 15.36 | mineral-based non-chlorinated engine, gear and lubricating oils | R1 | C | Volume Calculation | Offsite in Ireland | Enva Ireland Ltd,184-1 | Clonminam Ind Estate,Portlaoise,Co Laois,,Ireland | Enva Ltd,184-1,Clonminam Industrial Estate,Portlaoise,Laois,,Ireland | Clonminam Industrial Estate,Portlaoise,Laois,,Ireland |
| Within the Country | 15 01 03 | No | 5.6 | wooden packaging | R1 | M | Weighed | Offsite in Ireland | AES Ltd,WP-OY-08-061-01 | Cappincur,Tullamore,Co Offaly,,Iceland | | |
| To Other Countries | 15 02 02 | Yes | 1.45 | absorbents, filter materials (including oil filters not otherwise specified), wiping cloths, protective clothing contaminated by dangerous substances | R1 | C | Volume Calculation | Abroad | Enva Ireland Ltd,184-1 | Clonminam Ind Estate,Portlaoise,Co Laois,,Ireland | Lindenschmidt,Reg no E97095037,lINDENSCHMIDT,Kreuztal,.,.,Germany | lINDENSCHMIDT,Kreuztal,.,.Germany |
| To Other Countries | 16 01 07 | Yes | 0.49 | oil filters | R4 | C | Volume Calculation | Abroad | Enva Ireland Ltd,184-1 | Clonminam Ind Estate,Portlaoise,Co Laois,,Ireland | R.D. Recycling,Reg no 51727/1/KD,Houthalen,.,.,.,Belgium | Houthalen,.,.,.,Belgium |
| Within the Country | 17 04 07 | No | 57.34 | mixed metals | R4 | M | Weighed | Offsite in Ireland | AES Ltd,WP-OY-08-061-01 | Cappincur,Tullamore,Co Offaly,,Iceland | | |
| Within the Country | 20 03 01 | No | 30.96 | mixed municipal waste | D1 | M | Weighed | Offsite in Ireland | AES Ltd,WP-OY-08-061-01 | Cappincur,Tullamore,Co Offaly,,Iceland | | |
| Within the Country | 20 03 01 | No | 6.677 | mixed municipal waste | D1 | M | Volume Calculation | Offsite in Ireland | AES Ltd,WP-OY-08-061-01 | Cappincur,Tullamore,Co Offaly,,Iceland | | |
| To Other Countries | 16 06 01 | Yes | 1.06 | lead batteries | R4 | M | Weighed | Abroad | Enva Ireland Ltd,184-1 | Clonminam Ind Estate,Portlaoise,Co Laois,,Ireland | Campine Recycling,MLAV/05-173/GVDA,Beerse,.,.,.,Belgium | Beerse,.,.,.,Belgium |

* Select a row by double-clicking the Description of Waste then click the delete button

| Facility Information Summary | |
|---|---|
| AER Reporting Year | 2016 |
| Licence Register Number | P0501-01 |
| Name of site | Bord na Mona Derrygreenagh |
| Site Location | Derrygreenagh, Rochfortbridge, Co Westmeath |
| NACE Code | 0892 |
| Class/Classes of Activity | 1.4 |
| National Grid Reference (6E, 6 N) | 249450, 238140 |

| | |
|---|---|
| A description of the activities/processes at the site for the reporting year. This should include information such as production increases or decreases on site, any infrastructural changes, environmental performance which was measured during the reporting year **and an overview of compliance with your licence** listing all exceedances of licence limits (where applicable) and what they relate to e.g. air, water, noise. | Activities on site can be divided into two components, firstly the milling, harrowing, ridiging and harvesting of peat into stockpiles and secondly the transportation of that peat via an internal rail network to the Power Station and lorry outloading facilities. Production achieved was approximately 262,896 tonnes which was slightly up on the 2015 figure. Infrastructurally, there was no bog development. Quarterly grab sampling was 100% compliant, with the continuous composite sampling returning no non-compliances for suspended solids. There was one environmental complaint received during the reporting period, this was dust related and was resolved to the satisfaction of the complainant. In relation to silt pond cleaning, almost 96% of ponds received two cleanings, inspections dictating cleaning schedules. Decommissioning and Rehabilitation works are described in an attachment. |

**Declaration:**

All the data and information presented in this report has been checked and certified as being accurate. The quality of the information is assured to meet licence requirements.

| E. Mulhall | 9-2-17 |
|---|---|
| Signature<br>Group/Facility manager<br>(or nominated, suitably qualified and experienced deputy) | Date |

| AIR-summary template | Lic No: | P0501-01 | Year | 2016 |
|---|---|---|---|---|

**Answer all questions and complete all tables where relevant**

| | | | Additional information |
|---|---|---|---|
| 1 | Does your site have licensed air emissions? If yes please complete table A1 and A2 below for the current reporting year and answer further questions. If **you do not have** licenced emissions and **do not complete a solvent management plan** (table A4 and A5) you do not need to complete the tables | No | Fugitive emissions only |

## Periodic/Non-Continuous Monitoring

| | | | | |
|---|---|---|---|---|
| 2 | Are there any results in breach of licence requirements? If yes please provide brief details in the comment section of TableA1 below | | No | |
| 3 | Was all monitoring carried out in accordance with EPA guidance note AG2 and using the basic air monitoring checklist? | Basic air monitoring checklist | Yes | |

AGN2

### Table A1: Licensed Mass Emissions/Ambient data-periodic monitoring (non-continuous)

| Emission reference no: | Parameter/ Substance | Frequency of Monitoring | ELV in licence or any revision therof | Licence Compliance criteria | Measured value | Unit of measurement | Compliant with licence limit | Method of analysis | Annual mass load (kg) | Comments - reason for change in % mass load from previous year if applicable |
|---|---|---|---|---|---|---|---|---|---|---|
| | SELECT | | | SELECT | | SELECT | SELECT | SELECT | | |
| | SELECT | | | SELECT | | SELECT | SELECT | SELECT | | |
| | SELECT | | | SELECT | | SELECT | SELECT | SELECT | | |
| | SELECT | | | SELECT | | SELECT | SELECT | SELECT | | |

Note 1: Volumetric flow shall be included as a reportable parameter

| AIR-summary template | Lic No: | P0501-01 | Year | 2016 |
|---|---|---|---|---|

## Continuous Monitoring

| | | | |
|---|---|---|---|
| 4 | Does your site carry out continuous air emissions monitoring? | No | |
| | If yes please review your continuous monitoring data and report the required fields below in Table A2 and compare it to its relevant Emission Limit Value (ELV) | | |
| 5 | Did continuous monitoring equipment experience downtime? If yes please record downtime in table A2 below | No | |
| 6 | Do you have a proactive service agreement for each piece of continuous monitoring equipment? | No | |
| 7 | Did your site experience any abatement system bypasses? If yes please detail them in table A3 below | No | |

**Table A2: Summary of average emissions -continuous monitoring**

| Emission reference no: | Parameter/ Substance | ELV in licence or any revision therof | Averaging Period | Compliance Criteria | Units of measurement | Annual Emission | Annual maximum | Monitoring Equipment downtime (hours) | Number of ELV exceedences in current reporting year | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| DM-01 | Total Particulates | 350 | 140 DAYS | Daily average < ELV | mg/m2/day | 3248 | 49 | 0 | 0 | Dust monitioring took place on 5 occasions for 28 days each time between April and September |
| DM-02 | Total Particulates | 350 | 140 DAYS | Daily average < ELV | mg/m2/day | 9492 | 209 | 0 | 0 | |
| DM-03 | Total Particulates | 350 | 140 DAYS | Daily average < ELV | mg/m2/day | 13972 | 252 | 0 | 0 | |
| DM-04 | Total Particulates | 350 | 140 DAYS | Daily average < ELV | mg/m2/day | 8148 | 252 | 0 | 0 | |
| | SELECT | | | | SELECT | | | | | |

note 1: Volumetric flow shall be included as a reportable parameter.

**Table A3: Abatement system bypass reporting table** Bypass protocol

| Date* | Duration** (hours) | Location | Reason for bypass | Impact magnitude | Corrective action |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

* this should include all dates that an abatement system bypass occurred

** an accurate record of time bypass beginning and end should be logged on site and maintained for future Agency inspections please refer to bypass protocol link

| AIR-summary template | Lic No: | P0501-01 | Year | 2016 |
|---|---|---|---|---|

## Solvent use and management on site

| | | |
|---|---|---|
| 8 | Do you have a total Emission Limit Value of direct and fugitive emissions on site? if yes please fill out tables A4 and A5 | SELECT |

**Table A4: Solvent Management Plan Summary**
**Total VOC Emission limit value**

Solvent regulations — Please refer to linked solvent regulations to complete table 5 and 6

| Reporting year | Total solvent input on site (kg) | Total VOC emissions to Air from entire site (direct and fugitive) | Total VOC emissions as %of solvent input | Total Emission Limit Value (ELV) in licence or any revision therof | Compliance |
|---|---|---|---|---|---|
| | | | | | SELECT |
| | | | | | SELECT |

**Table A5: Solvent Mass Balance summary**

| | (I) Inputs (kg) | (O) Outputs (kg) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Solvent | (I) Inputs (kg) | Organic solvent emission in waste | Solvents lost in water (kg) | Collected waste solvent (kg) | Fugitive Organic Solvent (kg) | Solvent released in other ways e.g. | Solvents destroyed onsite through | Total emission of Solvent to air (kg) |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | Total | |

**AER Monitoring returns summary template-WATER/WASTEWATER(SEWER)** Lic No: P0501-01 Year 2016

| | | | Additional information |
|---|---|---|---|
| 1 | Does your site have licensed emissions direct to surface water or direct to sewer? If yes please complete table W2 and W3 below for the current reporting year and answer further questions. If **you do not have** licenced emissions you only need to complete table W1 and or W2 for storm water analysis and visual inspections | Yes | |
| 2 | Was it a requirement of your licence to carry out visual inspections on any surface water discharges or watercourses on or near your site? If yes please complete table W2 below summarising only any evidence of contamination noted during visual inspections | Yes | Monthly COD of yard run-off is attached. |

**Table W1 Storm water monitoring**

| Location reference | Location relative to site activities | PRTR Parameter | Licenced Parameter | Monitoring date | ELV or trigger level in licence or any revision thereof* | Licence Compliance criteria | Measured value | Unit of measurement | Compliant with licence | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| | SELECT | SELECT | SELECT | | | SELECT | | SELECT | SELECT | |
| | SELECT | SELECT | SELECT | | | SELECT | | SELECT | SELECT | |

*trigger values may be agreed by the Agency outside of licence conditions

**Table W2 Visual inspections-Please only enter details where contamination was observed.**

| Location Reference | Date of inspection | Description of contamination | Source of contamination | Corrective action | Comments |
|---|---|---|---|---|---|
| | | | SELECT | | |
| | | | SELECT | | |

**Licensed Emissions to water and /or wastewater(sewer)-periodic monitoring (non-continuous)**

| | | | | |
|---|---|---|---|---|
| 3 | Was there any result in breach of licence requirements? If yes please provide brief details in the comment section of Table W3 below | | No | |
| 4 | Was all monitoring carried out in accordance with EPA guidance and checklists for Quality of Aqueous Monitoring Data Reported to the EPA? If no please detail what areas require improvement in additional information box | External /Internal Lab Quality checklist / Assessment of results checklist | Yes | Surface water monitoring was carried out on a quarterly basis. The results of which are attached. |

**Table W3: Licensed Emissions to water and /or wastewater (sewer)-periodic monitoring (non-continuous)**

| Emission reference no: | Emission released to | Parameter/ SubstanceNote 1 | Type of sample | Frequency of monitoring | Averaging period | ELV or trigger values in licence or any revision therof[Note 2] | Licence Compliance criteria | Measured value | Unit of measurement | Compliant with licence | Method of analysis | Procedural reference source | Procedural reference standard number | Annual mass load (kg) | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

Note 1: Volumetric flow shall be included as a reportable parameter

Note 2: Where Emission Limit Values (ELV) do not apply to your licence please compare results against EQS for Surface water or relevant receptor quality standards

**AER Monitoring returns summary template-WATER/WASTEWATER(SEWER)** Lic No: P0501-01 Year 2016

## Continuous monitoring

| | | | Additional Information |
|---|---|---|---|
| 5 | Does your site carry out continuous emissions to water/sewer monitoring? | Yes | Flow proportionate composite sampling |

**If yes please summarise your continuous monitoring data below in Table W4 and compare it to its relevant Emission Limit Value (ELV)**

| | | | |
|---|---|---|---|
| 6 | Did continuous monitoring equipment experience downtime? **If yes please record downtime in table W4 below** | Yes | Total of 55 days over 365 days |
| 7 | Do you have a proactive service contract for each piece of continuous monitoring equipment on site? | Yes | |
| 8 | Did abatement system bypass occur during the reporting year? **If yes please complete table W5 below** | No | |

## Table W4: Summary of average emissions -continuous monitoring

| Emission reference no: | Emission released to | Parameter/ Substance | ELV or trigger values in licence or any revision thereof | Averaging Period | Compliance Criteria | Units of measurement | Annual Emission for current reporting year (kg) | % change +/- from previous reporting year | Monitoring Equipment downtime (hours) | Number of ELV exceedences in reporting year | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SW15 | Water | Suspended Solids | 35 | 24 hour | All results < 1.5 times ELV, plus 8 from ten results must be < ELV | mg/L | 17620 | | 1320 | 0 | Down time due to battery failure, and sampler repairs. Agency informed of repairs. |
| SW15 | Water | Ammonia (as N) | 2.78 | Weekly | NA | mg/L | 166.08 | | | | Annual loading not representative as parameter only carried out weekly |
| SW15 | Water | Total phosphorus | NA | Weekly | NA | mg/L | 17.1 | | | | Annual loading not representative as parameter only carried out weekly |
| SW15 | Water | COD | 100 | Weekly | NA | mg/L | 14458.98 | | | | Annual loading not representative as parameter only carried out weekly |
| SW15 | Water | volumetric flow | NA | 24 hour | NA | m3/day | 6472.78 | | 1320 | | Total flow divided by 365 |
| SW15 | Water | Total Dissolved Solids | NA | Weekly | NA | mg/L | 958789.01 | | | | |

note 1: Volumetric flow shall be included as a reportable parameter.

## Table W5: Abatement system bypass reporting table

| Date | Duration (hours) | Location | Resultant emissions | Reason for bypass | Corrective action* | Was a report submitted to the EPA? | When was this report submitted? |
|---|---|---|---|---|---|---|---|
| | | | | | | SELECT | |
| | | | | | | | |
| | | | | | | | |

*Measures taken or proposed to reduce or limit bypass frequency

## Bund/Pipeline testing template

Lic No: P0501-01 Year 2016

Bund testing

dropdown menu click to see options

| | | | Additional information |
|---|---|---|---|
| 1 | Are you required by your licence to undertake integrity testing on bunds and containment structures ? if yes please fill out table B1 below listing all **new bunds and containment structures** on site, in addition to **all bunds which failed** the integrity test-**all bunding structures which failed including mobile bunds must be listed in the table below, please include all bunds outside the licenced testing period** (mobile bunds and chemstore included) | Yes | |
| 2 | Please provide integrity testing frequency period | Other (2 Yearly) | |
| 3 | Does the site maintain a register of bunds, underground pipelines (including stormwater and foul), Tanks, sumps and containers? (containers refers to "Chemstore" type units and mobile bunds) | Yes | |
| 4 | How many bunds are on site? | 3 | |
| 5 | How many of these bunds have been tested within the required test schedule? | 0 | 1 replaced with double skinned tank, 1 decommissioned, 1 due for testing in 2017 |
| 6 | How many mobile bunds are on site? | 6 | |
| 7 | Are the mobile bunds included in the bund test schedule? | No | |
| 8 | How many of these mobile bunds have been tested within the required test schedule? | 0 | |
| 9 | How many sumps on site are included in the integrity test schedule? | 0 | |
| 10 | How many of these sumps are integrity tested within the test schedule? | 0 | |
| | **Please list any sump integrity failures in table B1** | | |
| 11 | Do all sumps and chambers have high level liquid alarms? | N/A | |
| 12 | If yes to Q11 are these failsafe systems included in a maintenance and testing programme? | N/A | |
| 13 | Is the Fire Water Retention Pond included in your integrity test programme? | N/A | |

**Table B1:** Summary details of bund /containment structure integrity test

| Bund/Containment structure ID | Type | Specify Other type | Product containment | Actual capacity | Capacity required* | Type of integrity test | Other test type | Test date | Integrity reports maintained on site? | Results of test | Integrity test failure explanation <50 words | Corrective action taken | Scheduled date for retest | Results of retest(if in current reporting year) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Hydraulic test | | | | | | SELECT | | |
| | | | | | | Hydraulic test | | | | | | | | |

* Capacity required should comply with 25% or 110% containment rule as detailed in your licence

| | | | Commentary |
|---|---|---|---|
| 15 | Has integrity testing been carried out in accordance with licence requirements and are all structures tested in line with BS8007/EPA Guidance? | bunding and storage guidelines | SELECT |
| 16 | Are channels/transfer systems to remote containment systems tested? | | SELECT |
| 17 | Are channels/transfer systems compliant in both integrity and available volume? | | SELECT |

Pipeline/underground structure testing

| | | | |
|---|---|---|---|
| 1 | Are you required by your licence to undertake integrity testing* on underground structures e.g. pipelines or sumps etc ? if yes please fill out table 2 below listing all underground structures and pipelines on site **which failed the integrity test and all which have not been tested withing the integrity test period as specified** | Yes | No underground tanks or pipelines on site |
| 2 | Please provide integrity testing frequency period | SELECT | |

*please note integrity testing means water tightness testing for process and foul pipelines (as required under your licence)

**Table B2:** Summary details of pipeline/underground structures integrity test

| Structure ID | Type system | Material of construction: | Does this structure have Secondary containment? | Type of secondary containment | Type integrity testing | Integrity reports maintained on site? | Results of test | Integrity test failure explanation <50 words | Corrective action taken | Scheduled date for retest | Results of retest(if in current reporting year) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | SELECT | SELECT | SELECT | SELECT | SELECT | SELECT | SELECT | | | | SELECT |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

Please use commentary for additional details not answered by tables/ questions above

| Groundwater/Soil monitoring template | Lic No: | P0501-01 | Year | 2016 |
|---|---|---|---|---|

| | | | Comments | |
|---|---|---|---|---|
| 1 | Are you required to carry out groundwater monitoring as part of your licence requirements? | no | | Please provide an interpretation of groundwater monitoring data in the interpretation box below or if you require additional space please include a groundwater/contaminated land monitoring results interpretaion as an additional section in this AER |
| 2 | Are you required to carry out soil monitoring as part of your licence requirements? | no | | |
| 3 | Do you extract groundwater for use on site? If yes please specify use in comment section | yes | Drinking water well | |
| 4 | Do monitoring results show that groundwater generic assessment criteria such as GTVs or IGVs are exceeded or is there an upward trend in results for a substance? If yes, please complete the Groundwater Monitoring Guideline Template Report (link in cell G8) and submit separately through ALDER as a licensee return AND answer questions 5-12 below. Groundwater monitoring template | no | | |
| 5 | Is the contamination related to operations at the facility (either current and/or historic) | no | | |
| 6 | Have actions been taken to address contamination issues?If yes please summarise remediation strategies proposed/undertaken for the site | N/A | | |
| 7 | Please specify the proposed time frame for the remediation strategy | N/A | | |
| 8 | Is there a licence condition to carry out/update ELRA for the site? | N/A | | |
| 9 | Has any type of risk assesment been carried out for the site? | N/A | | |
| 10 | Has a Conceptual Site Model been developed for the site? | N/A | | |
| 11 | Have potential receptors been identified on and off site? | N/A | | |
| 12 | Is there evidence that contamination is migrating offsite? | N/A | | Please enter interpretation of data here |

**Groundwater/Soil monitoring template** Lic No: P0501-01 Year 2016

**Table 1: Upgradient Groundwater monitoring results**

| Date of sampling | Sample location reference | Parameter/ Substance | Methodology | Monitoring frequency | Maximum Concentration++ | Average Concentration+ | unit | GTV's* | SELECT** | Upward trend in pollutant concentration over last 5 years of monitoring data |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | SELECT | | | SELECT |
| | | | | | | | SELECT | | | SELECT |

.+ where average indicates arithmetic mean

.++ maximum concentration indicates the maximum measured concentration from all monitoring results produced during the reporting year

**Table 2: Downgradient Groundwater monitoring results**

| Date of sampling | Sample location reference | Parameter/ Substance | Methodology | Monitoring frequency | Maximum Concentration | Average Concentration | unit | GTV's* | SELECT** | Upward trend in yearly average pollutant concentration over last 5 years of monitoring data |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | SELECT | | | SELECT |
| | | | | | | | SELECT | | | SELECT |

*please note exceedance of generic assessment criteria (GAC) such as a Groundwater Threshold Value (GTV) or an Interim Guideline Value (IGV) or an upward trend in results for a substance indicates that further interpretation of monitoring results is required. In addition to completing the above table, please complete the Groundwater Monitoring Guideline Template Report at the link provided and submit separately through ALDER as a licensee return or as otherwise instructed by the EPA. Groundwater monitoring template

More information on the use of soil and groundwater standards/ generic assessment criteria (GAC) and risk assessment tools is available in the EPA published guidance (see the link in G31) Guidance on the Management of Contaminated Land and Groundwater at EPA Licensed Sites (EPA 2013).

**Depending on location of the site and proximity to other sensitive receptors alternative Receptor based Water Quality standards should be used in addition to the GTV e.g. if the site is close to surface water compare to Surface Water Environmental Quality Standards (SWEQS), If the site is close to a drinking water supply compare results to the Drinking Water Standards (DWS)

Surface water EQS | Groundwater regulations GTV's | Drinking water (private supply) standards | Drinking water (public supply) standards | Interim Guideline Values (IGV)

**Table 3: Soil results**

| Date of sampling | Sample location reference | Parameter/ Substance | Methodology | Monitoring frequency | Maximum Concentration | Average Concentration | unit |
|---|---|---|---|---|---|---|---|
| | | | | | | | SELECT |
| | | | | | | | SELECT |

Where additional detail is required please enter it here in 200 words or less

| | Environmental Liabilities template | Lic No: | P0501-01 | Year 2016 | 2016 |
|---|---|---|---|---|---|

Click here to access EPA guidance on Environmental Liabilities and Financial provision

| | | | Commentary |
|---|---|---|---|
| 1 | ELRA initial agreement status | Not a licence requirement | |
| 2 | ELRA review status | NA | |
| 3 | Amount of Financial Provision cover required as determined by the latest ELRA | NA | |
| 4 | Financial Provision for ELRA status | NA | |
| 5 | Financial Provision for ELRA - amount of cover | NA | |
| 6 | Financial Provision for ELRA - type | NA | |
| 7 | Financial provision for ELRA expiry date | NA | |
| 8 | Closure plan initial agreement status | NA | Internal budget provision |
| 9 | Closure plan review status | NA | Internal budget provision |
| 10 | Financial Provision for Closure status | NA | Internal budget provision |
| 11 | Financial Provision for Closure - amount of cover | NA | Internal budget provision |
| 12 | Financial Provision for Closure - type | NA | Internal budget provision |
| 13 | Financial provision for Closure expiry date | NA | |

| Environmental Management Programme/Continuous Improvement Programme template | | Lic No: | P0501-01 | Year | 2016 |
|---|---|---|---|---|---|

| | Highlighted cells contain dropdown menu click to view | | Additional Information |
|---|---|---|---|
| 1 | Do you maintain an Environmental Mangement System (EMS) for the site. If yes, please detail in additional information | Yes | Internal unaccredited EMS. |
| 2 | Does the EMS reference the most significant environmental aspects and associated impacts on-site | Yes | |
| 3 | Does the EMS maintain an Environmental Management Programme (EMP) as required in accordance with the licence requirements | Yes | |
| 4 | Do you maintain an environmental documentation/communication system to inform the public on environmental performance of the facility, as required by the licence | Yes | |

**Environmental Management Programme (EMP) report**

| Objective Category | Target | Status (% completed) | How target was progressed | Responsibility | Intermediate outcomes |
|---|---|---|---|---|---|
| Reduction of emissions to Air | Continue to train all employees in environmental matters. Training will be by means of a new four module training programme delivered by dedicated Bord na Mona training specialists. This new training programme includes environmental compliance-IPPC, Biodiversity, Archaeology and Energy management. Hydraulic harrows will be deployed at dust sensitive locations. Continue with the collection of headland peat. | 90 | In total 147 personnel received training during 2016. Hydraulic harrows were depolyed at 4 locations. Headland peat was collected at all locations and returned with production figures. | Individual | Reduced emissions |
| Waste reduction/Raw material usage efficiency | Waste streamlining is a project we are particularly interested in continuing and hope to reduce wastes further in the future and be more efficient in dealing with all aspects of waste management | 80 | Installed a waste management system. Monthly waste reports are returned for records/filing and waste streams are segrated on site to maximise recycling potential. | Section Head | Improved Environmental Management Practices |
| Waste reduction/Raw material usage efficiency | Continue with the recycling of polyethylene. The sourcing of more recycling contractors will be ongoing. | 100 | In total 141.72 tonnes of polyethlene were sent off site for recycling. Procurement also exploring the possibility of securing further recyclers. | Individual | Improved Environmental Management Practices |
| Energy Management | As part of an Energy Awareness campaign all aspects of energy consumption will be communicated to personnel with the intention of reducing consumption through awareness | 100 | The monthly consumption of energy was regurally communicated to the relevant personnel. This included the KPI's for peat production, maintenance and transportation as well as bog pumping and workshop electrical consumption. | Section Head | Reduce overall energy output while maintaining productivity. |
| Reduction of emissions to Water | Continue to train all employees in environmental matters. Training will be by means of a new four module training programme delivered by dedicated Bord na Mona training specialists. This new training programme includes environmental compliance-IPPC, Biodiversity, Archaeology and Energy management. Continue with the collection of headland peat. | 90 | In total 147 Personnel received training in 2016. Personnel are trained every two years in Environmental matters. Headland peat was collected at all locations and included as part of overall peat returns. | Individual | Improved Environmental Management Practices |

| Noise monitoring summary report | Lic No: | P0501-01 | Year | 2016 |
|---|---|---|---|---|

| | | |
|---|---|---|
| 1 | Was noise monitoring a licence requirement for the AER period?<br>If yes please fill in table N1 noise summary below | No |
| 2 | Was noise monitoring carried out using the EPA Guidance note, including completion of the "Checklist for noise measurement report" included in the guidance note as table 6? (Noise Guidance note NG4) | NA |
| 3 | Does your site have a noise reduction plan | NA |
| 4 | When was the noise reduction plan last updated? | Enter date |
| 5 | Have there been changes relevant to site noise emissions (e.g. plant or operational changes) since the last noise survey? | NA |

**Table N1: Noise monitoring summary**

| Date of monitoring | Time period | Noise location (on site) | Noise sensitive location -NSL (if applicable) | $LA_{eq}$ | $LA_{90}$ | $LA_{10}$ | $LA_{max}$ | Tonal or Impulsive noise* (Y/N) | If tonal /impulsive noise was identified was 5dB penalty applied? | Comments (ex. main noise sources on site, & extraneous noise ex. road traffic) | Is site compliant with noise limits (day/evening/night)? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | SELECT | SELECT | | SELECT |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

*Please ensure that a tonal analysis has been carried out as per guidance note NG4. These records must be maintained onsite for future inspection

If noise limits exceeded as a result of noise attributed to site activities, please choose the corrective action from the following options? SELECT

| |
|---|
| ** please explain the reason for not taking action/resolution of noise issues? |
| Any additional comments? (less than 200 words) |

| Resource Usage/Energy efficiency summary | Lic No: | P0501-01 | Year | 2016 |
|---|---|---|---|---|

| | | | Additional information |
|---|---|---|---|
| 1 | When did the site carry out the most recent energy efficiency audit? Please list the recommendations in table 3 below | Nov-12 | Report on file |
| 2 | Is the site a member of any accredited programmes for reducing energy usage/water conservation such as the SEAI programme linked to the right? If yes please list them in additional information | Yes | SEAI - Large Industry Energy Network (LIEN) |
| 3 | Where Fuel Oil is used in boilers on site is the sulphur content compliant with licence conditions? Please state percentage in additional information | NA | Not a Licence requirement |

Table R1 Energy usage on site

| Energy Use | Previous year | Current year | Production +/- % compared to previous reporting year** | Energy Consumption +/- % vs overall site production* |
|---|---|---|---|---|
| Total Energy Used (MWHrs) | 6100 | 5907 | NA | NA |
| Total Energy Generated (MWHrs) | | | | |
| Total Renewable Energy Generated (MWHrs) | | | | |
| Electricity Consumption (MWHrs) | 451 | 300.277 | NA | NA |
| Fossil Fuels Consumption: | | | | |
| Heavy Fuel Oil (m3) | | | | |
| Light Fuel Oil (m3) | 555.988 | 551.885 | | |
| Natural gas (m3) | | | | |
| Coal/Solid fuel (metric tonnes) | | | | |
| Peat (metric tonnes) | | | | |
| Renewable Biomass | | | | |
| Renewable energy generated on site | | | | |

* where consumption of energy can be compared to overall site production please enter this information as percentage increase or decrease compared to the previous reporting year.

** where site production information is available please enter percentage increase or decrease compared to previous year

Table R2 Water usage on site

| | | | | | Water Emissions | Water Consumption | |
|---|---|---|---|---|---|---|---|
| Water use | Water extracted Previous year m3/yr. | Water extracted Current year m3/yr. | Production +/- % compared to previous reporting year** | Energy Consumption +/- % vs overall site production* | Volume Discharged back to environment($m^3$yr): | Volume used i.e not discharged to environment e.g. released as steam m3/yr | Unaccounted for Water: |
| Groundwater | | | | | | | |
| Surface water | | | | | | | |
| Public supply | | | | | | | |
| Recycled water | | | | | | | |
| Total | | | | | | | |

* where consumption of water can be compared to overall site production please enter this information as percentage increase or decrease compared to the previous reporting year.

** where site production information is available please enter percentage increase or decrease compared to previous year

## Resource Usage/Energy efficiency summary

Lic No: P0501-01 Year 2016

Table R3 Waste Stream Summary

| | Total | Landfill | Incineration | Recycled | Other |
|---|---|---|---|---|---|
| Hazardous (Tonnes) | 25.42 | 0 | 0.64 | 24.78 | 0 |
| Non-Hazardous (Tonnes) | 691.59 | 36.35 | 0 | 655.24 | 0 |

Table R4: Energy Audit finding recommendations

| Date of audit | Recommendations | Description of Measures proposed | Origin of measures | Predicted energy savings % | Implementation date | Responsibility | Completion date | Status and comments |
|---|---|---|---|---|---|---|---|---|
| | | | SELECT | | | | | |
| | | | SELECT | | | | | |
| | | | SELECT | | | | | |

Table R5: Power Generation: Where power is generated onsite (e.g. power generation facilities/food and drink industry)please complete the following information

| | Unit ID | Unit ID | Unit ID | Unit ID | Station Total |
|---|---|---|---|---|---|
| Technology | | | | | |
| Primary Fuel | | | | | |
| Thermal Efficiency | | | | | |
| Unit Date of Commission | | | | | |
| Total Starts for year | | | | | |
| Total Running Time | | | | | |
| Total Electricity Generated (GWH) | | | | | |
| House Load (GWH) | | | | | |
| KWH per Litre of Process Water | | | | | |
| KWH per Litre of Total Water used on Site | | | | | |

**Complaints and Incidents summary template** | Lic No: P0501-01 | Year 2016

| Complaints | | |
|---|---|---|
| | | Additional information |
| Have you received any environmental complaints in the current reporting year? If yes please complete summary details of complaints received on site in table 1 below | Yes | One complaint was received in Derryhinch Bog Area relating to dust, this was reported to the Agency. Ref LR022579 |

Table 1 Complaints summary

| Date | Category | Other type (please specify) | Brief description of complaint (Free txt <20 words) | Corrective action< 20 words | Resolution status | Resolution date | Further information |
|---|---|---|---|---|---|---|---|
| 30/05/2016 | Dust | | Complaint received at Derryhinch Bog relating to dust nuisance. | Peat production was suspended and personnel reminded of their environmental responsibilities | Complete | 30/05/2016 | Reported to the Agency ref: LR022579 on 01/06/2016 |
| | SELECT | | | | SELECT | | |
| | SELECT | | | | SELECT | | |
| | SELECT | | | | SELECT | | |
| | SELECT | | | | SELECT | | |

| | |
|---|---|
| Total complaints open at start of reporting year | 0 |
| Total new complaints received during reporting year | 1 |
| Total complaints closed during reporting year | 1 |
| Balance of complaints end of reporting year | 0 |

| Incidents | | |
|---|---|---|
| | | Additional information |
| Have any incidents occurred on site in the current reporting year? Please list all incidents for current reporting year in Table 2 below | Yes | All incidents related to Trigger Level limit exceedence |

| | |
|---|---|
| *For information on how to report and what constitutes an incident | What is an incident |

Table 2 Incidents summary

| Date of occurrence | Incident nature | Location of occurrence | Incident category*please refer to guidance | Receptor | Cause of incident | Other cause(please specify) | Activity in progress at time of incident | Communication | Occurrence | Corrective action<20 words | Preventative action <20 words | Resolution status | Resolution date | Likelihood of reoccurence |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11/05/2016 | Trigger level reached | Bracklin Bog SW-26 | 1. Minor | Water | Other (add details) | Naturally occurring | Normal activities | EPA INCI010224 | New | Investigate | None Required | Complete | 01/06/2016 | Medium |
| 11/05/2016 | Trigger level reached | Bracklin Bog SW-27 | 1. Minor | Water | Other (add details) | Naturally occurring | Normal activities | EPA INCI010225 | New | Investigate | None Required | Complete | 01/06/2016 | Medium |
| 12/10/2016 | Trigger level reached | Ballivor Bog SW-36 | 1. Minor | Water | Other (add details) | Naturally occurring | Normal activities | EPA INCI011104 | New | Investigate | None Required | Complete | 08/11/2016 | Low |
| 12/10/2016 | Trigger level reached | Ballivor Bog SW-37 | 1. Minor | Water | Other (add details) | Naturally occurring | Normal activities | EPA INCI011105 | New | Investigate | None Required | Complete | 08/11/2016 | Low |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |

| | |
|---|---|
| Total number of incidents current year | 4 |
| Total number of incidents previous year | 6 |
| % reduction/ increase | -33% |

**WASTE SUMMARY** Lic No: P0501-01 Year 2016

**SECTION A-PRTR ON SITE WASTE TREATMENT AND WASTE TRANSFERS TAB- TO BE COMPLETED BY ALL IPPC AND WASTE FACILITIES** PRTR facility logon dropdown list click to see options

**SECTION B- WASTE ACCEPTED ONTO SITE-TO BE COMPLETED BY ALL IPPC AND WASTE FACILITIES**

| | | | Additional Information |
|---|---|---|---|
| 1 | Were any wastes accepted onto your site for recovery or disposal or treatment prior to recovery or disposal within the boundaries of your facility ?; (waste generated within your boundaries is to be captured through PRTR reporting) If yes please enter details in table 1 below | N/A | |
| 2 | Did your site have any rejected consignments of waste in the current reporting year? If yes please give a brief explanation in the additional information | N/A | |
| 3 | Was waste accepted onto your site that was generated outside the Republic of Ireland? If yes please state the quantity in tonnes in additional information | N/A | |

**Table 1 Details of waste accepted onto your site for recovery, disposal or treatment (do not include wastes generated at your site, as these will have been reported in your PRTR workbook)**

| Licenced annual tonnage limit for your site (total tonnes/annum) | EWC code<br>European Waste Catalogue EWC codes | Source of waste accepted | Description of waste accepted **Please enter an accurate and detailed description - which applies to relevant EWC code**<br>European Waste Catalogue EWC codes | Quantity of waste accepted in current reporting year (tonnes) | Quantity of waste accepted in previous reporting year (tonnes) | Reduction/ Increase over previous year +/ - % | Reason for reduction/ increase from previous reporting year | Packaging Content (%)- only applies if the waste has a packaging component | Disposal/Recovery or treatment operation carried out at your site and the description of this operation | Quantity of waste remaining on site at the end of reporting year (tonnes) | Comments - |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**SECTION C-TO BE COMPLETED BY ALL WASTE FACILITIES (waste transfer stations, Composters, Material recovery facilities etc) EXCEPT LANDFILL SITES**

| | | | |
|---|---|---|---|
| 4 | Is all waste processing infrastructure as required by your licence and approved by the Agency in place? If no please list waste processing infrastructure required onsite | SELECT | |
| 5 | Is all waste storage infrastructure as required by your licence and approved by the Agency in place? If no please list waste storage infrastructure required on site | SELECT | |
| 6 | Does your facility have relevant nuisance controls in place? | SELECT | |
| 7 | Do you have an odour management system in place for your facility? If no why? | SELECT | |
| 8 | Do you maintain a sludge register on site? | SELECT | |

**SECTION D-TO BE COMPLETED BY LANDFILL SITES ONLY**

**Table 2 Waste type and tonnage-landfill only**

| Waste types permitted for disposal | Authorised/licenced annual intake for disposal (tpa) | Actual intake for disposal in reporting year (tpa) | Remaining licensed capacity at end of reporting year (m3) | Comments |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**WASTE SUMMARY** Lic No: P0501-01 Year 2016

**Table 3 General information-Landfill only**

| Area ID | Date landfilling commenced | Date landfilling ceased | Currently landfilling | Private or Public Operated | Inert or non-hazardous | Predicted date to cease landfilling | Licence permits asbestos | Is there a separate cell for asbestos? | Accepted asbestos in reporting year | Total disposal area occupied by waste | Lined disposal area occupied by waste | Unlined area | Comments on liner type |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | SELECT UNIT | SELECT UNIT | SELECT UNIT | |
| Cell 8 | | | | | | | | | | | | | |

**Table 4 Environmental monitoring-landfill only** Landfill Manual-Monitoring Standards

| Was meterological monitoring in compliance with Landfill Directive (LD) standard in reporting year + | Was leachate monitored in compliance with LD standard in reporting year | Was Landfill Gas monitored in compliance with LD standard in reporting year | Was SW monitored in compliance with LD standard in reporting year | Have GW trigger levels been established | Were emission limit values agreed with the Agency (ELVs) | Was topography of the site surveyed in reporting year | Has the statement under S53(A)(5) of WMA been submitted in reporting year | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

.+ please refer to Landfill Manual linked above for relevant Landfill Directive monitoring standards

**Table 5 Capping-Landfill only**

| Area uncapped* | Area with temporary cap | Area with final cap to LD Standard m2 ha, a | Area capped other | Area with waste that should be permanently capped to date under licence | What materials are used in the cap | Comments |
|---|---|---|---|---|---|---|
| SELECT UNIT | SELECT UNIT | | | | | |
| | | | | | | |

*please note this includes daily cover area

**Table 6 Leachate-Landfill only**

| | | |
|---|---|---|
| 9 | Is leachate from your site treated in a Waste Water Treatment Plant? | SELECT |
| 10 | Is leachate released to surface water? If yes please complete leachate mass load information below | SELECT |

| Volume of leachate in reporting year(m3) | Leachate (BOD) mass load (kg/annum) | Leachate (COD) mass load (kg/annum) | Leachate (NH4) mass load (kg/annum) | Leachate (Chloride) mass load kg/annum | Leachate treatment on-site | Specify type of leachate treatment | Comments |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

Please ensure that all information reported in the landfill gas section is consistent with the Landfill Gas Survey submitted in conjunction with PRTR returns

**Table 7 Landfill Gas-Landfill only**

| Gas Captured&Treated by LFG System m3 | Power generated (MW / KWh) | Used on-site or to national grid | Was surface emissions monitoring performed during the reporting year? | Comments |
|---|---|---|---|---|
| | | | SELECT | |

**Derrygreenagh**
**Decommissioning and Rehabilitation**
**AER Overview 2016.**

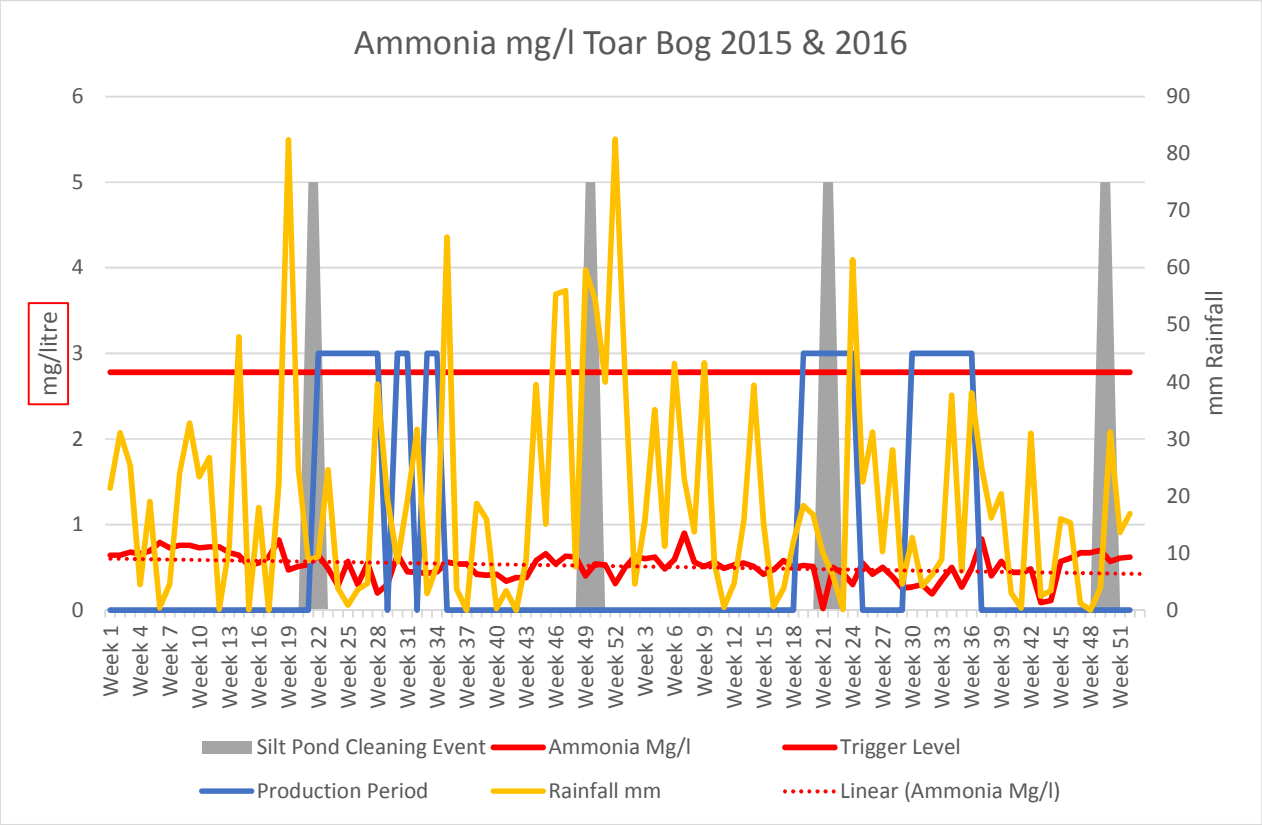
Within the Derrygreenagh licensed area (P0501-01) there were no entire bog units available for rehabilitation in 2016. Ongoing monitoring of cutaway within the Derrygreenagh licensing area included the re-survey of Drumman bog.
Active rehabilitation work was carried out in Cavemount bog with fertiliser application to areas of bare peat. Drain blocking was carried out at a remnant section of high bog at Daingean Rathdrum, this work is due to be finished in 2017.
Draft rehabilitation plans for the Derrygreenagh bogs licensed area, including more detailed draft plans for each component bog unit were submitted to the EPA in 2013 and these were reviewed and updated in 2015.
The new Biodiversity Action Plan (2016-2021) was launched in 2016 with the annual Biodiversity Action Plan review day being held in February 2017, this included an update on the progress of this plan, bog restoration and cutaway rehabilitation for a wide range on statutory and non-statutory consultees including members of the EPA, NPWS, BWI, Bord na Mona, Coillte, Inland Fisheries Ireland, An Taisce, IPCC, Irish Red Grouse Association, Irish Wildlife Trust, NARGC, local game councils, Midland Regional Planning Authority as well as a range of local community groups and Heritage Officers from counties Laois, Offaly, Kildare, Roscommon, Longford, Meath, Galway, Westmeath and Dublin.
A copy of our Biodiversity Action Plan is available to view and download at http://www.bordnamona.ie/our-company/biodiversity/
As required by condition *10.2 Cutaway Bog Rehabilitation Plans*, draft peatland rehabilitation plans for all the individual bog units were submitted to the agency in 2013, reviewed and amended in 2015 and re-submitted to the agency in 2015. All draft rehabilitation plans are currently in the process of being reviewed (2017). These reviewed and amended plans will be re-submitted to the agency in due course.

**Bord na Mona Derrygreenagh**

**IPPC Licence P0501-01**

## Siltpond Monitoring Frequency & Results

| X | Y | Bog | SW | Monitoring | Sampled | pH | SS | TS | Ammonia | TP | COD | Colour |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 254528.83 | 242354.28 | Derryhinch | SW-2 | Q1 16 | 11/03/2016 | 7.9 | 16 | 372 | 1.4 | 0.05 | 53 | 136 |
| 253369.19 | 242417.94 | Derryhinch | SW-3 | Q1 16 | 11/03/2016 | 7.8 | 5 | 400 | 1.5 | 0.05 | 48 | 133 |
| 252468.68 | 240919.32 | Carrick | SW-5 | Q1 16 | 11/03/2016 | 7.5 | 5 | 176 | 1.3 | 0.05 | 43 | 188 |
| 252409.71 | 241163.33 | Carrick | SW-6 | Q1 16 | 11/03/2016 | 7.8 | 5 | 300 | 1.6 | 0.05 | 36 | 177 |
| 252473.21 | 241162.01 | Carrick | SW-7 | Q1 16 | 11/03/2016 | 7.8 | 5 | 360 | 0.16 | 0.05 | 51 | 125 |
| 252275.61 | 239871.62 | Drumman | SW-8 | Q2 16 | 11/05/2016 | 7.6 | 5 | 344 | 0.36 | 0.09 | 68 | 152 |
| 252602.78 | 242540.17 | Derryhinch | SW-4 | Q2 16 | 11/05/2016 | 7.9 | 10 | 446 | 1.5 | 0.05 | 37 | 52 |
| 255381.16 | 243606.05 | Derryhinch | SW-1 | Q2 16 | 11/05/2016 | 7.9 | 7 | 462 | 0.91 | 0.05 | 36 | 33 |
| 252623.61 | 241470.16 | Carrick | SW-4A | Q2 16 | 11/05/2016 | 7.4 | 20 | 254 | 1.5 | 0.22 | 112 | 286 |
| 252950.37 | 238421.69 | Drumman | SW-9 | Q2 16 | 11/05/2016 | 7.3 | 16 | 256 | 0.37 | 0.13 | 101 | 166 |
| 252206.09 | 235207.02 | Ballybeg | SW-12 | Q3 16 | 15/08/2016 | 7.4 | 5 | 347 | 0.73 | 0.05 | 48 | 77 |
| 251880.6 | 234593.13 | Ballybeg | SW-13 | Q3 16 | 15/08/2016 | 7.6 | 7 | 394 | 0.08 | 0.05 | 90 | 101 |
| 252250.49 | 235061.45 | Ballybeg | SW-13A | Q3 16 | 15/08/2016 | 6.9 | 37 | 468 | 2.3 | 0.51 | 93 | 130 |
| 260583.98 | 256514.28 | Bracklin | SW-26 | Q3 16 | 15/08/2016 | 7.5 | 7 | 410 | 0.65 | 0.05 | 99 | 122 |
| 260609.41 | 256526.33 | Bracklin | SW-27 | Q3 16 | 15/08/2016 | 7.7 | 7 | 412 | 0.13 | 0.05 | 98 | 130 |
| 259415.3 | 256855.75 | Bracklin | SW-29 | Q4 16 | 12/10/2016 | 6.9 | 5 | 152 | 0.02 | 0.05 | 126 | 318 |
| 259519.45 | 257618.44 | Bracklin | SW-30 | Q4 16 | 12/10/2016 | 7.9 | 5 | 470 | 0.23 | 0.05 | 26 | 48 |
| 265632.83 | 254865.04 | Carranstown | SW-33 | Q4 16 | 12/10/2016 | 7.1 | 5 | 192 | 1.8 | 0.24 | 100 | 314 |
| 265886.95 | 254984.18 | Carranstown | SW-34 | Q4 16 | 12/10/2016 | 6.7 | 5 | 122 | 0.04 | 0.05 | 101 | 343 |
| 265140.06 | 254114.54 | Ballivor | SW-35 | Q4 16 | 12/10/2016 | 7.2 | 5 | 170 | 0.74 | 0.05 | 71 | 165 |




Toar bog is an active production bog with the composite sampler located here during 2015 and 2016. The composite sampler takes a flow proportional composite sample over a 24 hour period. The sampler had 0% downtime during the period and returned 52 weekly ammonia results during the period of this 2016 AER. The ammonia trigger level of 2.78mg/l, as agreed with the Agency, was not exceeded during the period. Combining the 2015 and 2016 results above show concentrations trending downwards over this two year period as peat extraction continues and this is in-line with the downwards trends submitted to the EPA in 2013 as required by condition 6.14. There is no obvious link between the summer production, winter maintenance, or silt pond maintenance events on the concentration of Ammonia discharging from this peatland. The only link expected would be that related to rainfall events and seasonal weather patterns and the subsequent surfacewater runoff and associated ammonia concentrations.

| Yard Discharge Results 2016 | | |
|---|---|---|
| **Licence: P0501-01** | | |
| **Works: Derrygreenagh** | | |
| **Month** | **D/Greenagh SWE 2 COD** | **Rossan SWE 1 COD** |
| Jan | 35 | 10 |
| Feb | 32 | 10 |
| Mar | 36 | 39 |
| Apr | 24 | 30 |
| May | 19 | 20 |
| June | 37 | 21 |
| July | 23 | 23 |
| Aug | 31 | 10 |
| Sep | 41 | 41 |
| Oct | 33 | 20 |
| Nov | 37 | 27 |
| Dec | 25 | 72 |

**Note: 0** denotes no flow at emission point on day of sampling

Environmental Protection Agency

Guidance to completing the PRTR workbook

# PRTR Returns Workbook

Version 1.1.19

| | |
|---|---|
| **REFERENCE YEAR** | 2016 |

**1. FACILITY IDENTIFICATION**

| | |
|---|---|
| Parent Company Name | Bord na Mona Energy Limited |
| Facility Name | Bord na Móna Energy Limited (Derrygreenagh) |
| PRTR Identification Number | P0501 |
| Licence Number | P0501-01 |

Classes of Activity

| No. | class_name |
|---|---|
| - | Refer to PRTR class activities below |

| | |
|---|---|
| Address 1 | Derrygreenagh Group |
| Address 2 | c/o Derrygreenagh Works |
| Address 3 | Rochfortbridge |
| Address 4 | Mullingar |
| | |
| | Westmeath |
| Country | Ireland |
| Coordinates of Location | -7.25676 53.3910 |
| River Basin District | IEEA |
| NACE Code | 0892 |
| Main Economic Activity | Extraction of peat |
| **AER Returns Contact Name** | Enda Mc Donagh |
| **AER Returns Contact Email Address** | enda.mcdonagh@bnm.ie |
| **AER Returns Contact Position** | Head of Environment |
| **AER Returns Contact Telephone Number** | 0579345911 |
| **AER Returns Contact Mobile Phone Number** | 0862370816 |
| **AER Returns Contact Fax Number** | 0579345160 |
| **Production Volume** | 262896.0 |
| **Production Volume Units** | Tonnes |
| **Number of Installations** | 6 |
| **Number of Operating Hours in Year** | 2216 |
| **Number of Employees** | 60 |
| **User Feedback/Comments** | In accordance with licence condition 6.2 of Technical Amendment A, quarterly sampling is now rotated every quarter and therefore suspended solids results are not factored into loading. |
| **Web Address** | www.bnm.ie |

**2. PRTR CLASS ACTIVITIES**

| Activity Number | Activity Name |
|---|---|
| 50.1 | General |

**3. SOLVENTS REGULATIONS (S.I. No. 543 of 2002)**

| | |
|---|---|
| Is it applicable? | No |
| Have you been granted an exemption ? | |
| If applicable which activity class applies (as per Schedule 2 of the regulations) ? | |
| Is the reduction scheme compliance route being used ? | |

**4. WASTE IMPORTED/ACCEPTED ONTO SITE** Guidance on waste imported/accepted onto site

| | |
|---|---|
| Do you import/accept waste onto your site for on-site treatment (either recovery or disposal activities) ? | |

This question is only applicable if you are an IPPC or Quarry site

**4.1 RELEASES TO AIR** Link to previous years emissions data | PRTR# : P0501 | Facility Name : Bord na Móna Energy Limited (Derrygreenagh) | Filename : P0501_2016.xls | Return Year : 2016 | 13/02/2017 12:30



**SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS**

| RELEASES TO AIR | | | | | Please enter all quantities in this section in KGs | | | |
|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | QUANTITY | | | |
| | | | Method Used | | | | | |
| No. Annex II | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

**SECTION B : REMAINING PRTR POLLUTANTS**

| RELEASES TO AIR | | | | | Please enter all quantities in this section in KGs | | | |
|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | QUANTITY | | | |
| | | | Method Used | | | | | |
| No. Annex II | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

**SECTION C : REMAINING POLLUTANT EMISSIONS (As required in your Licence)**

| RELEASES TO AIR | | | | | Please enter all quantities in this section in KGs | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | | | | | QUANTITY | | |
| | | | Method Used | | DM01 | DM02 | DM03 | DM04 | | | |
| Pollutant No. | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | Emission Point 2 | Emission Point 3 | Emission Point 4 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| 210 | Dust | E | OTH | VDI 2119 Blatt 2/Part 2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.03486 | 0.0 | 0.03486 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

## Additional Data Requested from Landfill operators

**For the purposes of the National Inventory on Greenhouse Gases, landfill operators are requested to provide summary data on landfill gas (Methane) flared or utilised on their facilities to accompany the figures for total methane generated. Operators should only report their Net methane (CH4) emission to the environment under T(total) KG/yr for Section A: Sector specific PRTR pollutants above. Please complete the table below:**

**Landfill:** Bord na Móna Energy Limited (Derrygreenagh)

| **Please enter summary data on the quantities of methane flared and / or utilised** | | | Method Used | | | |
|---|---|---|---|---|---|---|
| | T (Total) kg/Year | M/C/E | Method Code | Designation or Description | Facility Total Capacity m3 per hour | |
| Total estimated methane generation (as per site model) | 0.0 | | | | N/A | |
| Methane flared | 0.0 | | | | 0.0 | (Total Flaring Capacity) |
| Methane utilised in engine/s | 0.0 | | | | 0.0 | (Total Utilising Capacity) |
| Net methane emission (as reported in Section A above) | 0.0 | | | | N/A | |

**4.2 RELEASES TO WATERS** Link to previous years emissions data | PRTR# : P0501 | Facility Name : Bord na Móna Energy Limited (Derrygreenagh) | Filename : P0501_2016.xls | Return Year : 2016 | 13/2/2017 12:33



**SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS**

**Data on ambient monitoring of storm/surface water or groundwater, conducted as part of your licence requirements, should NOT be submitted under AER / PRTR Reporting as this only concerns Releases from your facility**

| RELEASES TO WATERS | | | | | Please enter all quantities in this section in KGs | | | |
|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | | | | | QUANTITY | | |
| | | | Method Used | | | | | |
| No. Annex II | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

**SECTION B : REMAINING PRTR POLLUTANTS**

| RELEASES TO WATERS | | | | | Please enter all quantities in this section in KGs | | | |
|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | | | | | QUANTITY | | |
| | | | Method Used | | | | | |
| No. Annex II | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

**SECTION C : REMAINING POLLUTANT EMISSIONS (as required in your Licence)**

| RELEASES TO WATERS | | | | | Please enter all quantities in this section in KGs | | | |
|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | | | | | QUANTITY | | |
| | | | Method Used | | SW15 | | | |
| Pollutant No. | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| **240** | **Suspended Solids** | E | OTH | G/19 Based on ALPHA,1998,20th Edition, Method 2540D | 17620.91 | 17620.91 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

## 4.3 RELEASES TO WASTEWATER OR SEWER

Link to previous years emissions data

| PRTR# : P0501 | Facility Name : Bord na Móna Energy Limited (Derrygreenagh) | Filename : P050: 13/02/2017 12:35

### SECTION A : PRTR POLLUTANTS

| OFFSITE TRANSFER OF POLLUTANTS DESTINED FOR WASTE-WATER TREATMENT OR SEWER | | | | | Please enter all quantities in this section in KGs | | | |
|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | QUANTITY | | | |
| | | | Method Used | | | | | |
| No. Annex II | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

### SECTION B : REMAINING POLLUTANT EMISSIONS (as required in your Licence)

| OFFSITE TRANSFER OF POLLUTANTS DESTINED FOR WASTE-WATER TREATMENT OR SEWER | | | | | Please enter all quantities in this section in KGs | | | |
|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | QUANTITY | | | |
| | | | Method Used | | | | | |
| Pollutant No. | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

## 4.4 RELEASES TO LAND

Link to previous years emissions data



### SECTION A : PRTR POLLUTANTS

| RELEASES TO LAND | | | | | Please enter all quantities in this section in KGs | | |
|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | QUANTITY | | |
| | | | Method Used | | | | |
| No. Annex II | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

### SECTION B : REMAINING POLLUTANT EMISSIONS (as required in your Licence)

| RELEASES TO LAND | | | | | Please enter all quantities in this section in KGs | | |
|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | QUANTITY | | |
| | | | Method Used | | | | |
| Pollutant No. | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

## 5. ONSITE TREATMENT & OFFSITE TRANSFERS OF WASTE



**Please enter all quantities on this sheet in Tonnes**



| Transfer Destination | European Waste Code | Hazardous | Quantity (Tonnes per Year) | Description of Waste | Waste Treatment Operation | Method Used | | Location of Treatment | Haz Waste : Name and Licence/Permit No of Next Destination Facility Non Haz Waste: Name and Licence/Permit No of Recover/Disposer | Haz Waste : Address of Next Destination Facility Non Haz Waste: Address of Recover/Disposer | Name and License / Permit No. and Address of Final Recoverer / Disposer (HAZARDOUS WASTE ONLY) | Actual Address of Final Destination i.e. Final Recovery / Disposal Site (HAZARDOUS WASTE ONLY) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | M/C/E | Method Used | | | | | |
| Within the Country | 01 01 02 | No | 241.7 | wastes from mineral non-metalliferous excavation | D1 | E | Volume Calculation | Onsite of generati | Bord na Mona Energy Ltd,P0501-01 | Derrygreenagh,Rochfortbridge,Mullingar,Co Westmeath,Ireland | | |
| Within the Country | 02 01 04 | No | 141.72 | waste plastics (except packaging) | R5 | M | Weighed | Offsite in Ireland | Walker Recycling,NWCPO-14-11464-01 | Clonkeen,Portlaoise,Co Laois,.,Ireland | | |
| To Other Countries | 08 01 11 | Yes | 0.66 | waste paint and varnish containing organic solvents or other dangerous substances | R1 | M | Weighed | Abroad | Enva Ireland Ltd,184-1 | Clonminam Ind Estate,Portlaoise,Co Laois,.,Ireland | Recyfuel Ltd,BE0459.735.458,Enghis,.,.,.,Belgium | Enghis,.,.,.,Belgium |
| To Other Countries | 11 01 13 | Yes | 0.84 | degreasing wastes containing dangerous substances | R11 | C | Volume Calculation | Abroad | Safety Kleen Ltd,99-1 | Tallaght,.,.,.,Ireland | Solvent Recovery Management,PP33345F,Wheeland Rd,Knottingly,West Yorks,WF11 8DZ,United Kingdom | Wheeland Rd,Knottingly,West Yorks,WF11 8DZ,United Kingdom |
| Within the Country | 13 02 05 | Yes | 12.74 | mineral-based non-chlorinated engine, gear and lubricating oils | R1 | C | Volume Calculation | Offsite in Ireland | Enva Ireland Ltd,184-1 | Clonminam Ind Estate,Portlaoise,Co Laois,.,Ireland | Enva Ltd,184-1,Clonminam Industrial Estate,Portlaoise,Laois,.,Ireland | Clonminam Industrial Estate,Portlaoise,Laois,.,Ireland |
| Within the Country | 15 01 03 | No | 11.42 | wooden packaging | R1 | M | Weighed | Offsite in Ireland | AES Ltd,WP-OY-08-061-01 | Cappincur,Tullamore,Co Offaly,.,Iceland | | |
| To Other Countries | 15 02 02 | Yes | 0.64 | absorbents, filter materials (including oil filters not otherwise specified), wiping cloths, protective clothing contaminated by dangerous substances | R1 | C | Volume Calculation | Abroad | Enva Ireland Ltd,184-1 | Clonminam Ind Estate,Portlaoise,Co Laois,.,Ireland | Lindenschmidt,Reg no E97095037,IINDENSCHMIDT,Kreuztal,.,.,Germany | IINDENSCHMIDT,Kreuztal,.,.,Germany |
| To Other Countries | 16 01 07 | Yes | 2.96 | oil filters | R4 | C | Volume Calculation | Abroad | Enva Ireland Ltd,184-1 | Clonminam Ind Estate,Portlaoise,Co Laois,.,Ireland | R.D. Recycling,Reg no 51727/1/KD,Houthalen,.,.,.,Belgium | Houthalen,.,.,.,Belgium |
| To Other Countries | 16 06 01 | Yes | 1.5 | lead batteries | R4 | M | Weighed | Abroad | Enva Ireland Ltd,184-1 | Clonminam Ind Estate,Portlaoise,Co Laois,.,Ireland | Campine Recycling,MLAV/05-173/GVDA,Beerse,.,.,.,Belgium | Beerse,.,.,.,Belgium |
| Within the Country | 17 04 07 | No | 258.9 | mixed metals | R4 | M | Weighed | Offsite in Ireland | AES Ltd,WP-OY-08-061-01 | Cappincur,Tullamore,Co Offaly,.,Iceland | | |
| Within the Country | 20 03 01 | No | 32.87 | mixed municipal waste | D1 | M | Weighed | Offsite in Ireland | AES Ltd,WP-OY-08-061-01 | Cappincur,Tullamore,Co Offaly,.,Iceland | | |
| Within the Country | 20 03 01 | No | 4.98 | mixed municipal waste | D1 | M | Volume Calculation | Offsite in Ireland | AES Ltd,WP-OY-08-061-01 | Cappincur,Tullamore,Co Offaly,.,Iceland | | |
| Within the Country | 13 05 03 | Yes | 6.08 | interceptor sludges | R1 | C | Volume Calculation | Offsite in Ireland | Enva Ireland Ltd,184-1 | Clonminam Ind Estate,Portlaoise,Co Laois,.,Ireland | Enva Ltd,184-1,Clonminam Industrial Estate,Portlaoise,Laois,.,Ireland | Clonminam Industrial Estate,Portlaoise,Laois,.,Ireland |

* Select a row by double-clicking the Description of Waste then click the delete button

Link to previous years waste data
Link to previous years waste summary data & percentage change
Link to Waste Guidance

| Facility Information Summary | |
|---|---|
| AER Reporting Year | 2017 |
| Licence Register Number | P0501-01 |
| Name of site | Bord na Mona Derrygreenagh |
| Site Location | Derrygreenagh, Rochfortbridge, Co Westmeath |
| NACE Code | 0892 |
| Class/Classes of Activity | 1.4 |
| National Grid Reference (6E, 6 N) | 249450, 238140 |

| | |
|---|---|
| A description of the activities/processes at the site for the reporting year. This should include information such as production increases or decreases on site, any infrastructural changes, environmental performance which was measured during the reporting year **and an overview of compliance with your licence** listing all exceedances of licence limits (where applicable) and what they relate to e.g. air, water, noise. | Activities on site can be divided into two components, firstly the milling, harrowing, ridiging and harvesting of peat into stockpiles and secondly the transportation of that peat via an internal rail network to the Power Station and lorry outloading facilities. Production achieved was approximately 299,912 tonnes which was up on the 2016 figure. Infrastructurally, there was no bog development. Quarterly grab sampling was 100% compliant, with the continuous composite sampling returning no non-compliances for suspended solids. There was one environmental complaint received during the reporting period, this was dust related and was resolved to the satisfaction of the complainant. A shelter belt 200m long was planted to alleviate the problem.In relation to silt pond cleaning, almost 90% of ponds received two cleanings, inspections dictating cleaning schedules. Bord na Mona liaised with Meath and Offaly Co.Councils to reduce littering in litter hotspots across the licence.Decommissioning and Rehabilitation works are described in an attachment. The composite sampler experienced some technical difficulties which impacted on the collection of flow data. A decision was therefore made to send the sampler away to the manufacturer for overhaul. |

**Declaration:**

All the data and information presented in this report has been checked and certified as being accurate. The quality of the information is assured to meet licence requirements.

| | |
|---|---|
| E. Mulhall | 8 - 3 - 18 |
| Signature<br>Group/Facility manager<br>(or nominated, suitably qualified and experienced deputy) | Date |

**AIR-summary template** | Lic No: P0501-01 | Year 2017

**Answer all questions and complete all tables where relevant**

| | | | Additional information |
|---|---|---|---|
| 1 | Does your site have licensed air emissions? If yes please complete table A1 and A2 below for the current reporting year and answer further questions. If **you do not have** licenced emissions and **do not complete a solvent management plan** (table A4 and A5) you do not need to complete the tables | No | Fugitive emissions only |

**Periodic/Non-Continuous Monitoring**

| | | | |
|---|---|---|---|
| 2 | Are there any results in breach of licence requirements? If yes please provide brief details in the comment section of TableA1 below | Yes | Reported to the Agency ref INCI012674. |
| 3 | Was all monitoring carried out in accordance with EPA guidance note AG2 and using the basic air monitoring checklist? Basic air monitoring checklist AGN2 | Yes | |

**Table A1: Licensed Mass Emissions/Ambient data-periodic monitoring (non-continuous)**

| Emission reference no: | Parameter/ Substance | Frequency of Monitoring | ELV in licence or any revision therof | Licence Compliance criteria | Measured value | Unit of measurement | Compliant with licence limit | Method of analysis | Annual mass load (kg) | Comments - reason for change in % mass load from previous year if applicable |
|---|---|---|---|---|---|---|---|---|---|---|
| DM-01 | SELECT | | | SELECT | | SELECT | SELECT | SELECT | | |
| | SELECT | | | SELECT | | SELECT | SELECT | SELECT | | |
| | SELECT | | | SELECT | | SELECT | SELECT | SELECT | | |
| | SELECT | | | SELECT | | SELECT | SELECT | SELECT | | |

Note 1: Volumetric flow shall be included as a reportable parameter

**Continuous Monitoring**

| | | | |
|---|---|---|---|
| 4 | Does your site carry out continuous air emissions monitoring? | No | |
| | If yes please review your continuous monitoring data and report the required fields below in Table A2 and compare it to its relevant Emission Limit Value (ELV) | | |
| 5 | Did continuous monitoring equipment experience downtime? If yes please record downtime in table A2 below | No | |
| 6 | Do you have a proactive service agreement for each piece of continuous monitoring equipment? | No | |
| 7 | Did your site experience any abatement system bypasses? If yes please detail them in table A3 below | No | |

**AIR-summary template** Lic No: P0501-01 Year 2017

**Table A2: Summary of average emissions -continuous monitoring**

| Emission reference no: | Parameter/ Substance | ELV in licence or any revision therof | Averaging Period | Compliance Criteria | Units of measurement | Annual Emission | Annual maximum | Monitoring Equipment downtime (hours) | Number of ELV exceedences in current reporting year | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| DM-01 | Total Particulates | 350 | 140 DAYS | Daily average < ELV | mg/m2/day | 11340 | 113 | 0 | 0 | Dust monitioring took place on 5 occasions for 28 days each time between April and September |
| DM-02 | Total Particulates | 350 | 140 DAYS | Daily average < ELV | mg/m2/day | 15204 | 214 | 0 | 0 | |
| DM-03 | Total Particulates | 350 | 140 DAYS | Daily average < ELV | mg/m2/day | 21364 | 350 | 0 | 0 | |
| DM-04 | Total Particulates | 350 | 140 DAYS | Daily average < ELV | mg/m2/day | 28560 | 605 | 0 | 1 | Reported to Agency on 14/08/2017.I NCI012674 |
| | SELECT | | | | SELECT | | | | | |

note 1: Volumetric flow shall be included as a reportable parameter.

**Table A3: Abatement system bypass reporting table** Bypass protocol

| Date* | Duration** (hours) | Location | Reason for bypass | Impact magnitude | Corrective action |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |

* this should include all dates that an abatement system bypass occurred

** an accurate record of time bypass beginning and end should be logged on site and maintained for future Agency inspections please refer to bypass protocol link

## Solvent use and management on site

8 Do you have a total Emission Limit Value of direct and fugitive emissions on site? if yes please fill out tables A4 and A5 — SELECT

**Table A4: Solvent Management Plan Summary**
**Total VOC Emission limit value**

Solvent regulations — Please refer to linked solvent regulations to complete table 5 and 6

| Reporting year | Total solvent input on site (kg) | Total VOC emissions to Air from entire site (direct and fugitive) | Total VOC emissions as %of solvent input | Total Emission Limit Value (ELV) in licence or any revision therof | Compliance |
|---|---|---|---|---|---|
| | | | | | SELECT |
| | | | | | SELECT |

**Table A5: Solvent Mass Balance summary**

| | (I) Inputs (kg) | (O) Outputs (kg) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Solvent | (I) Inputs (kg) | Organic solvent emission in waste gases(kg) | Solvents lost in water (kg) | Collected waste solvent (kg) | Fugitive Organic Solvent (kg) | Solvent released in other ways e.g. by-passes (kg) | Solvents destroyed onsite through physical reaction e.g. | Total emission of Solvent to air (kg) |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | Total | |

**AER Monitoring returns summary template-WATER/WASTEWATER(SEWER)** Lic No: P0501-01 Year 2017

| | | | Additional information |
|---|---|---|---|
| 1 | Does your site have licensed emissions direct to surface water or direct to sewer? If yes please complete table W2 and W3 below for the current reporting year and answer further questions. If **you do not have** licenced emissions you only need to complete table W1 and or W2 for storm water analysis and visual inspections | Yes | The continuous monitoring sampler was relocated during the reporting period. The sampler also experienced technical difficulties at both sites which inhibited the collection of flow data and subsequent annual loading calculations. It was therefore decided to present the sampling results in graphical form as an attachment. |
| 2 | Was it a requirement of your licence to carry out visual inspections on any surface water discharges or watercourses on or near your site? If yes please complete table W2 below summarising only any evidence of contamination noted during visual inspections | Yes | Monthly COD of yard run-off is attached. |

**Table W1 Storm water monitoring**

| Location reference | Location relative to site activities | PRTR Parameter | Licenced Parameter | Monitoring date | ELV or trigger level in licence or any revision thereof* | Licence Compliance criteria | Measured value | Unit of measurement | Compliant with licence | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| | SELECT | SELECT | SELECT | | | SELECT | | SELECT | SELECT | |
| | SELECT | SELECT | SELECT | | | SELECT | | SELECT | SELECT | |

*trigger values may be agreed by the Agency outside of licence conditions

**Table W2 Visual inspections-Please only enter details where contamination was observed.**

| Location Reference | Date of inspection | Description of contamination | Source of contamination | Corrective action | Comments |
|---|---|---|---|---|---|
| | | | SELECT | | |
| | | | SELECT | | |

**Licensed Emissions to water and /or wastewater(sewer)-periodic monitoring (non-continuous)**

| | | | | | |
|---|---|---|---|---|---|
| 3 | Was there any result in breach of licence requirements? If yes please provide brief details in the comment section of Table W3 below | | | No | |
| 4 | Was all monitoring carried out in accordance with EPA guidance and checklists for Quality of Aqueous Monitoring Data Reported to the EPA? If no please detail what areas require improvement in additional information box | External /Internal Lab Quality checklist | Assessment of results checklist | Yes | Surface water monitoring was carried out on a quarterly basis. The results of which are attached. |

**Table W3: Licensed Emissions to water and /or wastewater (sewer)-periodic monitoring (non-continuous)**

| Emission reference no: | Emission released to | Parameter/ SubstanceNote 1 | Type of sample | Frequency of monitoring | Averaging period | ELV or trigger values in licence or any revision thereof[Note 2] | Licence Compliance criteria | Measured value | Unit of measurement | Compliant with licence | Method of analysis | Procedural reference source | Procedural reference standard number | Annual mass load (kg) | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

Note 1: Volumetric flow shall be included as a reportable parameter

Note 2: Where Emission Limit Values (ELV) do not apply to your licence please compare results against EQS for Surface water or relevant receptor quality standards

**AER Monitoring returns summary template-WATER/WASTEWATER(SEWER)** Lic No: P0501-01 Year 2017

## Continuous monitoring

| | | | Additional Information |
|---|---|---|---|
| 5 | Does your site carry out continuous emissions to water/sewer monitoring? | Yes | Flow proportionate composite sampling |

**If yes please summarise your continuous monitoring data below in Table W4 and compare it to its relevant Emission Limit Value (ELV)**

| | | | |
|---|---|---|---|
| 6 | Did continuous monitoring equipment experience downtime? **If yes please record downtime in table W4 below** | Yes | Total of 70 days over 365 days |
| 7 | Do you have a proactive service contract for each piece of continuous monitoring equipment on site? | Yes | |
| 8 | Did abatement system bypass occur during the reporting year? **If yes please complete table W5 below** | No | |

## Table W4: Summary of average emissions -continuous monitoring

| Emission reference no: | Emission released to | Parameter/ Substance | ELV or trigger values in licence or any revision thereof | Averaging Period | Compliance Criteria | Units of measurement | Annual Emission for current reporting year (kg) | % change +/- from previous reporting year | Monitoring Equipment downtime (hours) | Number of ELV exceedences in reporting year | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | 0 | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

note 1: Volumetric flow shall be included as a reportable parameter.

## Table W5: Abatement system bypass reporting table

| Date | Duration (hours) | Location | Resultant emissions | Reason for bypass | Corrective action* | Was a report submitted to the EPA? | When was this report submitted? |
|---|---|---|---|---|---|---|---|
| | | | | | | SELECT | |
| | | | | | | | |
| | | | | | | | |

*Measures taken or proposed to reduce or limit bypass frequency

## Bund/Pipeline testing template

Lic No: P0501-01 Year 2017

Bund testing

dropdown menu click to see options

| | | | Additional information |
|---|---|---|---|
| 1 | Are you required by your licence to undertake integrity testing on bunds and containment structures ? if yes please fill out table B1 below listing all **new bunds and containment structures** on site, in addition to **all bunds which failed** the integrity test-**all bunding structures which failed including mobile bunds must be listed in the table below, please include all bunds outside the licenced testing period** (mobile bunds and chemstore included) | Yes | All bunds requiring an integrity test in 2017 were tested and passed. |
| 2 | Please provide integrity testing frequency period | Other (2 Yearly) | |
| 3 | Does the site maintain a register of bunds, underground pipelines (including stormwater and foul), Tanks, sumps and containers? (containers refers to "Chemstore" type units and mobile bunds) | Yes | |
| 4 | How many bunds are on site? | 2 | |
| 5 | How many of these bunds have been tested within the required test schedule? | 1 | 1 decommissioned, 1 tested in 2017 |
| 6 | How many mobile bunds are on site? | 9 | |
| 7 | Are the mobile bunds included in the bund test schedule? | No | |
| 8 | How many of these mobile bunds have been tested within the required test schedule? | 0 | |
| 9 | How many sumps on site are included in the integrity test schedule? | 0 | |
| 10 | How many of these sumps are integrity tested within the test schedule? | 0 | |
| | **Please list any sump integrity failures in table B1** | | |
| 11 | Do all sumps and chambers have high level liquid alarms? | N/A | |
| 12 | If yes to Q11 are these failsafe systems included in a maintenance and testing programme? | N/A | |
| 13 | Is the Fire Water Retention Pond included in your integrity test programme? | N/A | |

**Table B1:** Summary details of bund /containment structure integrity test

| Bund/Containment structure ID | Type | Specify Other type | Product containment | Actual capacity | Capacity required* | Type of integrity test | Other test type | Test date | Integrity reports maintained on site? | Results of test | Integrity test failure explanation <50 words | Corrective action taken | Scheduled date for retest | Results of retest(if in current reporting year) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Derrygreenagh Bund NO:501-37-01 | reinforced concrete | | Gas Oil | 110,592 | 45000 | Hydraulic test | | 22/05/2017 | Yes | Pass | N/A | N/A | N/A | N/A |
| | | | | | | Hydraulic test | | | | | | | | |

* Capacity required should comply with 25% or 110% containment rule as detailed in your licence

| | | | Commentary |
|---|---|---|---|
| 15 | Has integrity testing been carried out in accordance with licence requirements and are all structures tested in line with BS8007/EPA Guidance? bunding and storage guidelines | SELECT | |
| 16 | Are channels/transfer systems to remote containment systems tested? | SELECT | |
| 17 | Are channels/transfer systems compliant in both integrity and available volume? | SELECT | |

Pipeline/underground structure testing

| | | | No underground tanks or pipelines on site |
|---|---|---|---|
| 1 | Are you required by your licence to undertake integrity testing* on underground structures e.g. pipelines or sumps etc ? if yes please fill out table 2 below listing all underground structures and pipelines on site **which failed the integrity test and all which have not been tested withing the integrity test period as specified** | Yes | |
| 2 | Please provide integrity testing frequency period | SELECT | |
| | *please note integrity testing means water tightness testing for process and foul pipelines (as required under your licence) | | |

**Table B2:** Summary details of pipeline/underground structures integrity test

| Structure ID | Type system | Material of construction: | Does this structure have Secondary containment? | Type of secondary containment | Type integrity testing | Integrity reports maintained on site? | Results of test | Integrity test failure explanation <50 words | Corrective action taken | Scheduled date for retest | Results of retest(if in current reporting year) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | SELECT | SELECT | SELECT | SELECT | SELECT | SELECT | SELECT | | | | SELECT |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

Please use commentary for additional details not answered by tables/ questions above

| Groundwater/Soil monitoring template | Lic No: | P0501-01 | Year | 2017 |
|---|---|---|---|---|

| | | | Comments | |
|---|---|---|---|---|
| 1 | Are you required to carry out groundwater monitoring as part of your licence requirements? | no | | Please provide an interpretation of groundwater monitoring data in the interpretation box below or if you require additional space please include a groundwater/contaminated land monitoring results interpretaion as an additional section in this AER |
| 2 | Are you required to carry out soil monitoring as part of your licence requirements? | no | | |
| 3 | Do you extract groundwater for use on site? If yes please specify use in comment section | yes | Drinking water well | |
| 4 | Do monitoring results show that groundwater generic assessment criteria such as GTVs or IGVs are exceeded or is there an upward trend in results for a substance? If yes, please complete the Groundwater Monitoring Guideline Template Report (link in cell G8) and submit separately through ALDER as a licensee return AND answer questions 5-12 below. Groundwater monitoring template | no | | |
| 5 | Is the contamination related to operations at the facility (either current and/or historic) | no | | |
| 6 | Have actions been taken to address contamination issues?If yes please summarise remediation strategies proposed/undertaken for the site | N/A | | |
| 7 | Please specify the proposed time frame for the remediation strategy | N/A | | |
| 8 | Is there a licence condition to carry out/update ELRA for the site? | N/A | | |
| 9 | Has any type of risk assesment been carried out for the site? | N/A | | |
| 10 | Has a Conceptual Site Model been developed for the site? | N/A | | |
| 11 | Have potential receptors been identified on and off site? | N/A | | |
| 12 | Is there evidence that contamination is migrating offsite? | N/A | | Please enter interpretation of data here |

**Table 1: Upgradient Groundwater monitoring results**

| Date of sampling | Sample location reference | Parameter/ Substance | Methodology | Monitoring frequency | Maximum Concentration++ | Average Concentration+ | unit | GTV's* | SELECT** | Upward trend in pollutant concentration over last 5 years of monitoring data |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | SELECT | | | SELECT |
| | | | | | | | SELECT | | | SELECT |

.+ where average indicates arithmetic mean

.++ maximum concentration indicates the maximum measured concentration from all monitoring results produced during the reporting year

**Groundwater/Soil monitoring template** Lic No: P0501-01 Year 2017

**Table 2: Downgradient Groundwater monitoring results**

| Date of sampling | Sample location reference | Parameter/ Substance | Methodology | Monitoring frequency | Maximum Concentration | Average Concentration | unit | GTV's* | SELECT** | Upward trend in yearly average pollutant concentration over last 5 years of monitoring data |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | SELECT | | | SELECT |
| | | | | | | | SELECT | | | SELECT |

*please note exceedance of generic assessment criteria (GAC) such as a Groundwater Threshold Value (GTV) or an Interim Guideline Value (IGV) or an upward trend in results for a substance indicates that further interpretation of monitoring results is required. In addition to completing the above table, please complete the Groundwater Monitoring Guideline Template Report at the link provided and submit separately through ALDER as a licensee return or as otherwise instructed by the EPA.

Groundwater monitoring template

More information on the use of soil and groundwater standards/ generic assessment criteria (GAC) and risk assessment tools is available in the EPA published guidance (see the link in G31)

Guidance on the Management of Contaminated Land and Groundwater at EPA Licensed Sites (EPA 2013).

**Depending on location of the site and proximity to other sensitive receptors alternative Receptor based Water Quality standards should be used in addition to the GTV e.g. if the site is close to surface water compare to Surface Water Environmental Quality Standards (SWEQS), If the site is close to a drinking water supply compare results to the Drinking Water Standards (DWS)

Surface water EQS | Groundwater regulations GTV's | Drinking water (private supply) standards | Drinking water (public supply) standards | Interim Guideline Values (IGV)

**Table 3: Soil results**

| Date of sampling | Sample location reference | Parameter/ Substance | Methodology | Monitoring frequency | Maximum Concentration | Average Concentration | unit |
|---|---|---|---|---|---|---|---|
| | | | | | | | SELECT |
| | | | | | | | SELECT |

Where additional detail is required please enter it here in 200 words or less

| Environmental Liabilities template | Lic No: | P0501-01 | Year | 2017 |
|---|---|---|---|---|

Click here to access EPA guidance on Environmental Liabilities and Financial provision

| | | | Commentary |
|---|---|---|---|
| 1 | ELRA initial agreement status | Not a licence requirement | |
| 2 | ELRA review status | NA | |
| 3 | Amount of Financial Provision cover required as determined by the latest ELRA | NA | |
| 4 | Financial Provision for ELRA status | NA | |
| 5 | Financial Provision for ELRA - amount of cover | NA | |
| 6 | Financial Provision for ELRA - type | NA | |
| 7 | Financial provision for ELRA expiry date | NA | |
| 8 | Closure plan initial agreement status | NA | Internal budget provision |
| 9 | Closure plan review status | NA | Internal budget provision |
| 10 | Financial Provision for Closure status | NA | Internal budget provision |
| 11 | Financial Provision for Closure - amount of cover | NA | Internal budget provision |
| 12 | Financial Provision for Closure - type | NA | Internal budget provision |
| 13 | Financial provision for Closure expiry date | NA | |

**Environmental Management Programme/Continuous Improvement Programme template** Lic No: P0501-01 Year 2017

| | Highlighted cells contain dropdown menu click to view | | Additional Information |
|---|---|---|---|
| 1 | Do you maintain an Environmental Mangement System (EMS) for the site. If yes, please detail in additional information | Yes | Internal unaccredited EMS. |
| 2 | Does the EMS reference the most significant environmental aspects and associated impacts on-site | Yes | |
| 3 | Does the EMS maintain an Environmental Management Programme (EMP) as required in accordance with the licence requirements | Yes | |
| 4 | Do you maintain an environmental documentation/communication system to inform the public on environmental performance of the facility, as required by the licence | Yes | |

**Environmental Management Programme (EMP) report**

| Objective Category | Target | Status (% completed) | How target was progressed | Responsibility | Intermediate outcomes |
|---|---|---|---|---|---|
| Reduction of emissions to Air | Continue to train all employees in environmental matters. Training will be by means of a new four module training programme delivered by dedicated Bord na Mona training specialists. This new training programme includes environmental compliance-IPPC, Biodiversity, Archaeology and Energy management. Hydraulic harrows will be deployed at dust sensitive locations. Continue with the collection of headland peat. | 90 | In total 73 personnel received training during 2017. Hydraulic harrows were depolyed at 4 locations. Headland peat was collected at all locations and returned with production figures. | Individual | Reduced emissions |
| Waste reduction/Raw material usage efficiency | Waste streamlining is a project we are particularly interested in continuing and hope to reduce wastes further in the future and be more efficient in dealing with all aspects of waste management | 80 | Monthly waste reports are returned for records/filing and waste streams are segrated on site to maximise recycling potential. | Section Head | Improved Environmental Management Practices |
| Waste reduction/Raw material usage efficiency | Continue with the recycling of polyethylene. The sourcing of more recycling contractors will be ongoing. | 100 | In total 119.14 tonnes of polyethlene were sent off site for recycling. Procurement also exploring the possibility of securing further recyclers. | Individual | Improved Environmental Management Practices |
| Energy Management | As part of an Energy Awareness campaign all aspects of energy consumption will be communicated to personnel with the intention of reducing consumption through awareness | 100 | The monthly consumption of energy was regurally communicated to the relevant personnel. This included the KPI's for peat production, maintenance and transportation as well as bog pumping and workshop electrical consumption. | Section Head | Reduce overall energy output while maintaining productivity. |
| Reduction of emissions to Water | Continue to train all employees in environmental matters. Training will be by means of a new four module training programme delivered by dedicated Bord na Mona training specialists. This new training programme includes environmental compliance-IPPC, Biodiversity, Archaeology and Energy management. Continue with the collection of headland peat. | 90 | In total 73 Personnel received training in 2017. Personnel are trained every two years in Environmental matters. Headland peat was collected at all locations and included as part of overall peat returns. | Individual | Improved Environmental Management Practices |

| Noise monitoring summary report | Lic No: | P0501-01 | Year | 2017 |
|---|---|---|---|---|

| | | |
|---|---|---|
| 1 | Was noise monitoring a licence requirement for the AER period? If yes please fill in table N1 noise summary below | No |
| 2 | Was noise monitoring carried out using the EPA Guidance note, including completion of the "Checklist for noise measurement report" included in the guidance note as table 6? (Noise Guidance note NG4) | NA |
| 3 | Does your site have a noise reduction plan | NA |
| 4 | When was the noise reduction plan last updated? | Enter date |
| 5 | Have there been changes relevant to site noise emissions (e.g. plant or operational changes) since the last noise survey? | NA |

**Table N1: Noise monitoring summary**

| Date of monitoring | Time period | Noise location (on site) | Noise sensitive location -NSL (if applicable) | $LA_{eq}$ | $LA_{90}$ | $LA_{10}$ | $LA_{max}$ | Tonal or Impulsive noise* (Y/N) | If tonal /impulsive noise was identified was 5dB penalty applied? | Comments (ex. main noise sources on site, & extraneous noise ex. road traffic) | Is site compliant with noise limits (day/evening/night)? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | SELECT | SELECT | | SELECT |
| | | | | | | | | | | | |

*Please ensure that a tonal analysis has been carried out as per guidance note NG4. These records must be maintained onsite for future inspection

If noise limits exceeded as a result of noise attributed to site activities, please choose the corrective action from the following options? SELECT

| |
|---|
| ** please explain the reason for not taking action/resolution of noise issues? |
| Any additional comments? (less than 200 words) |

## Resource Usage/Energy efficiency summary

Lic No: P0501-01 Year 2017

| | | | Additional information |
|---|---|---|---|
| 1 | When did the site carry out the most recent energy efficiency audit? Please list the recommendations in table 3 below | Oct-17 | |
| 2 | Is the site a member of any accredited programmes for reducing energy usage/water conservation such as the SEAI programme linked to the right? If yes please list them in additional information | SEAI - Large Industry Energy Network (LIEN) Yes | The site attained accrediation to the energy standard 50001 |
| 3 | Where Fuel Oil is used in boilers on site is the sulphur content compliant with licence conditions? Please state percentage in additional information | NA | Not a Licence requirement |

Table R1 Energy usage on site

| Energy Use | Previous year | Current year | Production +/- % compared to previous reporting year** | Energy Consumption +/- % vs overall site production* |
|---|---|---|---|---|
| Total Energy Used (MWHrs) | 5907 | 6913 | NA | NA |
| Total Energy Generated (MWHrs) | | | | |
| Total Renewable Energy Generated (MWHrs) | | | | |
| Electricity Consumption (MWHrs) | 300.277 | 318.403 | NA | NA |
| Fossil Fuels Consumption: | | | | |
| Heavy Fuel Oil (m3) | | | | |
| Light Fuel Oil (m3) | 551.885 | 649.037 | | |
| Natural gas (m3) | | | | |
| Coal/Solid fuel (metric tonnes) | | | | |
| Peat (metric tonnes) | | | | |
| Renewable Biomass | | | | |
| Renewable energy generated on site | | | | |

* where consumption of energy can be compared to overall site production please enter this information as percentage increase or decrease compared to the previous reporting year.

** where site production information is available please enter percentage increase or decrease compared to previous year

Table R2 Water usage on site

| | | | | | Water Emissions | Water Consumption | |
|---|---|---|---|---|---|---|---|
| Water use | Water extracted Previous year m3/yr. | Water extracted Current year m3/yr. | Production +/- % compared to previous reporting year** | Energy Consumption +/- % vs overall site production* | Volume Discharged back to environment($m^3$/yr): | Volume used i.e not discharged to environment e.g. released as steam m3/yr | Unaccounted for Water: |
| Groundwater | | | | | | | |
| Surface water | | | | | | | |
| Public supply | | | | | | | |
| Recycled water | | | | | | | |
| Total | | | | | | | |

* where consumption of water can be compared to overall site production please enter this information as percentage increase or decrease compared to the previous reporting year.

** where site production information is available please enter percentage increase or decrease compared to previous year

Table R3 Waste Stream Summary

| | Total | Landfill | Incineration | Recycled | Other |
|---|---|---|---|---|---|
| Hazardous (Tonnes) | 17.82 | 0 | 1.62 | 16.2 | 0 |
| Non-Hazardous (Tonnes) | 560.32 | 20.06 | | 370.56 | 169.7 |

Table R4: Energy Audit finding recommendations

| Date of audit | Recommendations | Description of Measures proposed | Origin of measures | Predicted energy savings % | Implementation date | Responsibility | Completion date | Status and comments |
|---|---|---|---|---|---|---|---|---|
| | | | SELECT | | | | | |
| | | | SELECT | | | | | |
| | | | SELECT | | | | | |

Table R5: Power Generation: Where power is generated onsite (e.g. power generation facilities/food and drink industry)please complete the following information

| | Unit ID | Unit ID | Unit ID | Unit ID | Station Total |
|---|---|---|---|---|---|
| Technology | | | | | |
| Primary Fuel | | | | | |
| Thermal Efficiency | | | | | |
| Unit Date of Commission | | | | | |
| Total Starts for year | | | | | |
| Total Running Time | | | | | |
| Total Electricity Generated (GWH) | | | | | |
| House Load (GWH) | | | | | |
| KWH per Litre of Process Water | | | | | |
| KWH per Litre of Total Water used on Site | | | | | |

**Complaints and Incidents summary template** Lic No: P0504-01 Year 2017

Complaints

| Have you received any environmental complaints in the current reporting year? If yes please complete summary details of complaints received on site in table 1 below | Yes | Additional information: One complaint was received in Ballybeg Bog Area relating to dust, this was reported to the Agency. RefLR029212 |
|---|---|---|

Table 1 Complaints summary

| Date | Category | Other type (please specify) | Brief description of complaint (Free txt <20 words) | Corrective action< 20 words | Resolution status | Resolution date | Further information |
|---|---|---|---|---|---|---|---|
| 11/05/2017 | Dust | | Complaint received at Ballybeg Bog relating to dust nuisance. | Peat production was suspended and personnel reminded of their environmental responsibilities. 200m shelter belt sown. | Complete | 11/05/2017 | Reported to the Agency ref: LR029212 on 08/06/2017 |
| | SELECT | | | | SELECT | | |
| | SELECT | | | | SELECT | | |
| | SELECT | | | | SELECT | | |
| | SELECT | | | | SELECT | | |

| | |
|---|---|
| Total complaints open at start of reporting year | 0 |
| Total new complaints received during reporting year | 1 |
| Total complaints closed during reporting year | 1 |
| Balance of complaints end of reporting year | 0 |

**Complaints and Incidents summary template** Lic No: P0504-01 Year 2017

| Incidents | | |
|---|---|---|
| | | Additional information |
| Have any incidents occurred on site in the current reporting year? Please list all incidents for current reporting year in Table 2 below | Yes | |

| | |
|---|---|
| *For information on how to report and what constitutes an incident | What is an incident |

Table 2 Incidents summary

| Date of occurrence | Incident nature | Location of occurrence | Incident category*please refer to guidance | Receptor | Cause of incident | Other cause(please specify) | Activity in progress at time of incident | Communication | Occurrence | Corrective action<20 words | Preventative action <20 words | Resolution status | Resolution date | Likelihood of reoccurence |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 07/06/2017 | Trigger level reached | Rossan SW-43 | 1. Minor | Water | Other (add details) | Naturally occurring | Normal activities | EPA INCI012535 | New | Investigate | None Required | Complete | 27/07/2017 | Medium |
| 20/06/2017 | Trigger level reached | Rossan SW-43 | 1. Minor | Water | Other (add details) | Naturally occurring | Normal activities | EPA INCI012538 | New | Investigate | None Required | Complete | 21/07/2017 | Medium |
| 13/07/2017 | Breach of ELV | Ballybeg DM-04 | 1. Minor | Air | Other (add details) | Dust from nearby trees | Normal activities | EPA INCI012674 | New | Investigate | Move dust gauge | Complete | 14/08/2017 | Low |
| 01/09/2017 | Trigger level reached | Derryhinch SW-2 | 1. Minor | Water | Other (add details) | Naturally occurring | Normal activities | EPA INCI013178 | New | Investigate | None Required | Complete | 19/10/2017 | Medium |
| 01/09/2017 | Trigger level reached | Derryhinch SW-3 | 1. Minor | Water | Other (add details) | Naturally occurring | Normal activities | EPA INCI0013180 | New | Investigate | None Required | Complete | 19/10/2017 | Medium |
| 07/11/2017 | Trigger level reached | Rossan SW-43 | 1. Minor | Water | Other (add details) | Naturally occurring | Normal activities | EPA INCI013385 | New | Investigate | None Required | Complete | 21/11/2017 | Medium |
| | | | | | | | | | | | | | | |

| | |
|---|---|
| Total number of incidents current year | 6 |
| Total number of incidents previous year | 4 |
| % reduction/ increase | 50% |

| WASTE SUMMARY | Lic No: | P0501-01 | Year | 2017 |
|---|---|---|---|---|
| SECTION A-PRTR ON SITE WASTE TREATMENT AND WASTE TRANSFERS TAB- TO BE COMPLETED BY ALL IPPC AND WASTE FACILITIES | | PRTR facility logon | dropdown list click to see options | |

## SECTION B- WASTE ACCEPTED ONTO SITE-TO BE COMPLETED BY ALL IPPC AND WASTE FACILITIES

| | | | Additional Information |
|---|---|---|---|
| 1 | Were any wastes accepted onto your site for recovery or disposal or treatment prior to recovery or disposal within the boundaries of your facility ?; (waste generated within your boundaries is to be captured through PRTR reporting)<br>If yes please enter details in table 1 below | N/A | |
| 2 | Did your site have any rejected consignments of waste in the current reporting year? If yes please give a brief explanation in the additional information | N/A | |
| 3 | Was waste accepted onto your site that was generated outside the Republic of Ireland? If yes please state the quantity in tonnes in additional information | N/A | |

### Table 1 Details of waste accepted onto your site for recovery, disposal or treatment (do not include wastes generated at your site, as these will have been reported in your PRTR workbook)

| Licenced annual tonnage limit for your site (total tonnes/annum) | EWC code<br>European Waste Catalogue EWC codes | Source of waste accepted | Description of waste accepted<br>**Please enter an accurate and detailed description - which applies to relevant EWC code**<br>European Waste Catalogue EWC codes | Quantity of waste accepted in current reporting year (tonnes) | Quantity of waste accepted in previous reporting year (tonnes) | Reduction/ Increase over previous year +/ - % | Reason for reduction/ increase from previous reporting year | Packaging Content (%)- only applies if the waste has a packaging component | Disposal/Recovery or treatment operation carried out at your site and the description of this operation | Quantity of waste remaining on site at the end of reporting year (tonnes) | Comments - |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

## SECTION C-TO BE COMPLETED BY ALL WASTE FACILITIES (waste transfer stations, Composters, Material recovery facilities etc) EXCEPT LANDFILL SITES

| | | | |
|---|---|---|---|
| 4 | Is all waste processing infrastructure as required by your licence and approved by the Agency in place? If no please list waste processing infrastructure required onsite | SELECT | |
| 5 | Is all waste storage infrastructure as required by your licence and approved by the Agency in place? If no please list waste storage infrastructure required on site | SELECT | |
| 6 | Does your facility have relevant nuisance controls in place? | SELECT | |
| 7 | Do you have an odour management system in place for your facility? If no why? | SELECT | |
| 8 | Do you maintain a sludge register on site? | SELECT | |

## SECTION D-TO BE COMPLETED BY LANDFILL SITES ONLY

### Table 2 Waste type and tonnage-landfill only

| Waste types permitted for disposal | Authorised/licenced annual intake for disposal (tpa) | Actual intake for disposal in reporting year (tpa) | Remaining licensed capacity at end of reporting year (m3) | Comments |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |

### Table 3 General information-Landfill only

| Area ID | Date landfilling commenced | Date landfilling ceased | Currently landfilling | Private or Public Operated | Inert or non-hazardous | Predicted date to cease landfilling | Licence permits asbestos | Is there a separate cell for asbestos? | Accepted asbestos in reporting year | Total disposal area occupied by waste<br>SELECT UNIT | Lined disposal area occupied by waste<br>SELECT UNIT | Unlined area<br>SELECT UNIT | Comments on liner type |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | |

**WASTE SUMMARY** Lic No: P0501-01 Year 2017

## Table 4 Environmental monitoring-landfill only

Landfill Manual-Monitoring Standards

| Was meterological monitoring in compliance with Landfill Directive (LD) standard in reporting year + | Was leachate monitored in compliance with LD standard in reporting year | Was Landfill Gas monitored in compliance with LD standard in reporting year | Was SW monitored in compliance with LD standard in reporting year | Have GW trigger levels been established | Were emission limit values agreed with the Agency (ELVs) | Was topography of the site surveyed in reporting year | Has the statement under S53(A)(5) of WMA been submitted in reporting year | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

.+ please refer to Landfill Manual linked above for relevant Landfill Directive monitoring standards

## Table 5 Capping-Landfill only

| Area uncapped* | Area with temporary cap | Area with final cap to LD Standard m2 ha, a | Area capped other | Area with waste that should be permanently capped to date under licence | What materials are used in the cap | Comments |
|---|---|---|---|---|---|---|
| SELECT UNIT | SELECT UNIT | | | | | |
| | | | | | | |

*please note this includes daily cover area

## Table 6 Leachate-Landfill only

| | | |
|---|---|---|
| 9 | Is leachate from your site treated in a Waste Water Treatment Plant? | SELECT |
| 10 | Is leachate released to surface water? If yes please complete leachate mass load information below | SELECT |

| Volume of leachate in reporting year(m3) | Leachate (BOD) mass load (kg/annum) | Leachate (COD) mass load (kg/annum) | Leachate (NH4) mass load (kg/annum) | Leachate (Chloride) mass load kg/annum | Leachate treatment on-site | Specify type of leachate treatment | Comments |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

Please ensure that all information reported in the landfill gas section is consistent with the Landfill Gas Survey submitted in conjunction with PRTR returns

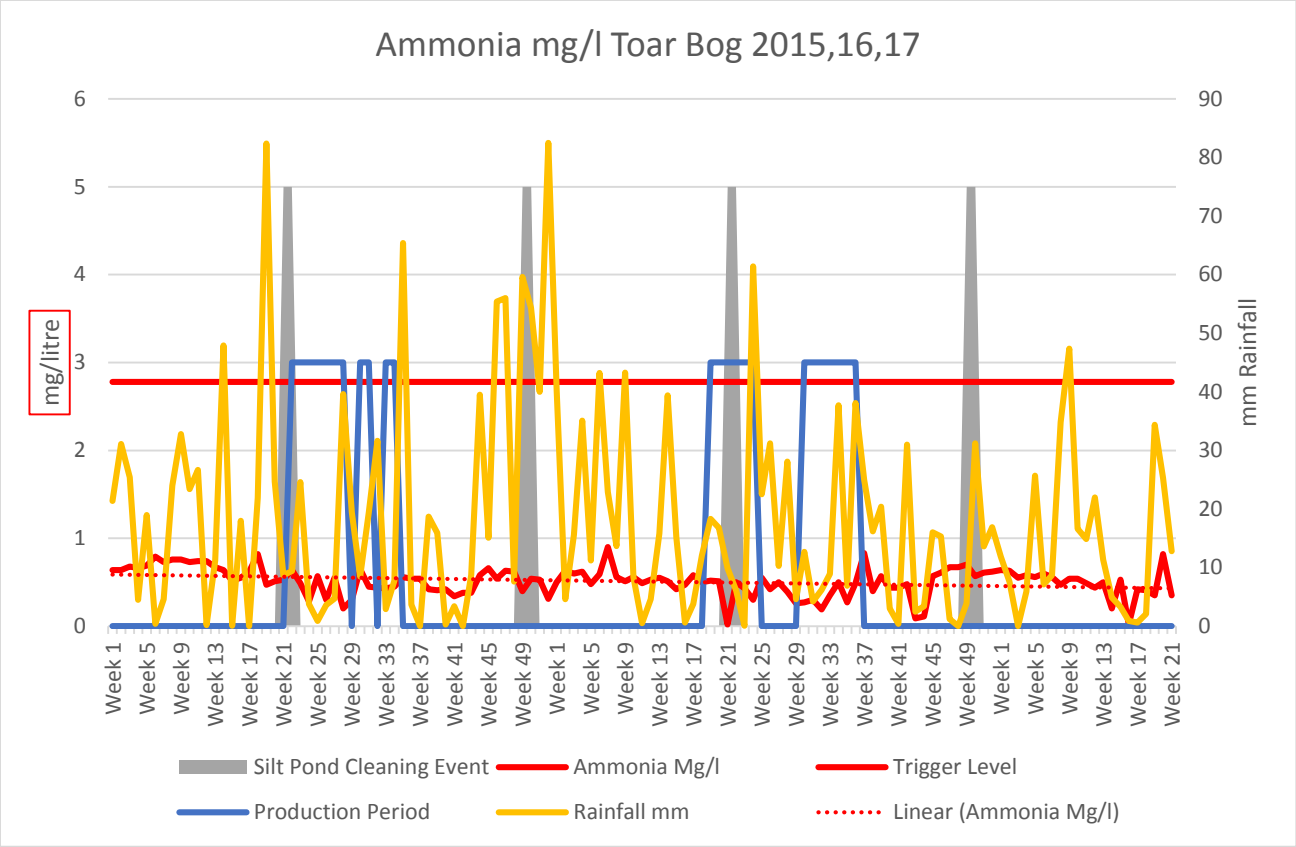
## Table 7 Landfill Gas-Landfill only

| Gas Captured&Treated by LFG System m3 | Power generated (MW / KWh) | Used on-site or to national grid | Was surface emissions monitoring performed during the reporting year? | Comments |
|---|---|---|---|---|
| | | | SELECT | |

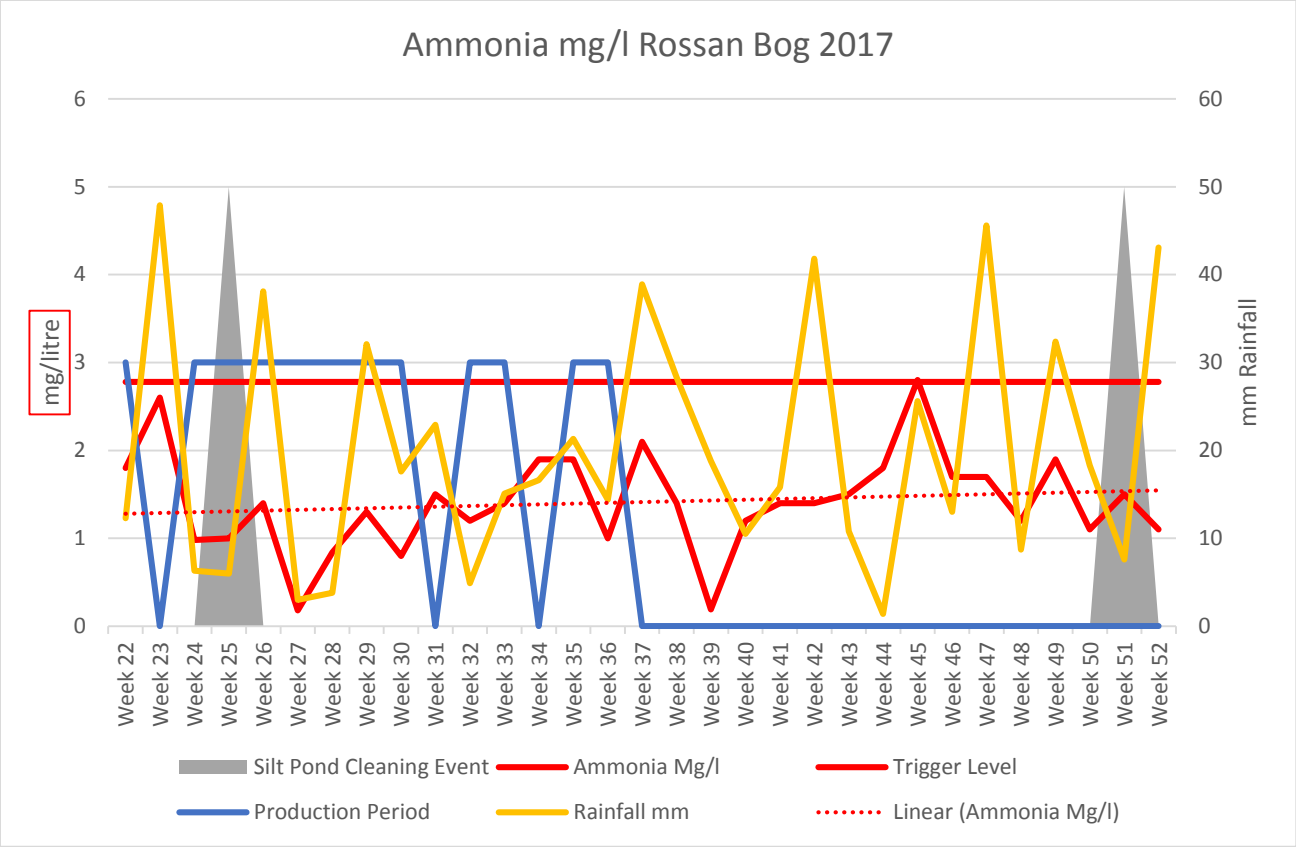
**Derrygreenagh**
**Decommissioning and Rehabilitation**
**AER Overview 2017.**

Within the Derrygreenagh licensed area (P0501-01) there were no entire bog units available for rehabilitation in 2017. Ongoing monitoring of cutaway within the Derrygreenagh licensing area included the re-survey of Drumman bog.
Active rehabilitation work was carried out in Cavemount bog in 2017 with some hydrological management. An overflow pipe was constructed in 2017 to manage the maximum winter water levels. Some ground works were also carried out with a bulldozer to help stabilise a small section of the headland and to block field drains. This is a phased rehabilitation programme and will be completed over several years. Cavemount is developing as a cutaway wetland and is attracting nationally important wintering and breeding bird species. This cutaway wetland will continue to be managed to enhance its biodiversity value.
Bog restoration and drain-blocking is being carried out at a remnant section of high bog at Daingean Rathdrum. This work is due to be finished in 2018.
Draft rehabilitation plans for the Derrygreenagh bogs licensed area, including more detailed draft plans for each component bog unit were submitted to the EPA in 2013 and these were reviewed and updated in 2015, and 2017.
The new Biodiversity Action Plan (2016-2021) was launched in 2016 with the annual Biodiversity Action Plan review day being held in February 2017, this included an update on the progress of this plan, bog restoration and cutaway rehabilitation for a wide range on statutory and non-statutory consultees including members of the EPA, NPWS, BWI, Bord na Mona, Coillte, Inland Fisheries Ireland, An Taisce, IPCC, Irish Red Grouse Association, Irish Wildlife Trust, NARGC, local game councils, Midland Regional Planning Authority as well as a range of local community groups and Heritage Officers from counties Laois, Offaly, Kildare, Roscommon, Longford, Meath, Galway, Westmeath and Dublin.
A copy of our Biodiversity Action Plan is available to view and download at http://www.bordnamona.ie/our-company/biodiversity/
As required by condition *10.2 Cutaway Bog Rehabilitation Plans*, draft peatland rehabilitation plans for all the individual bog units were submitted to the agency in 2013, reviewed and amended in 2015 and re-submitted to the agency in 2015. All draft rehabilitation plans have been reviewed in 2017. These reviewed and amended plans will be re-submitted to the agency in due course.

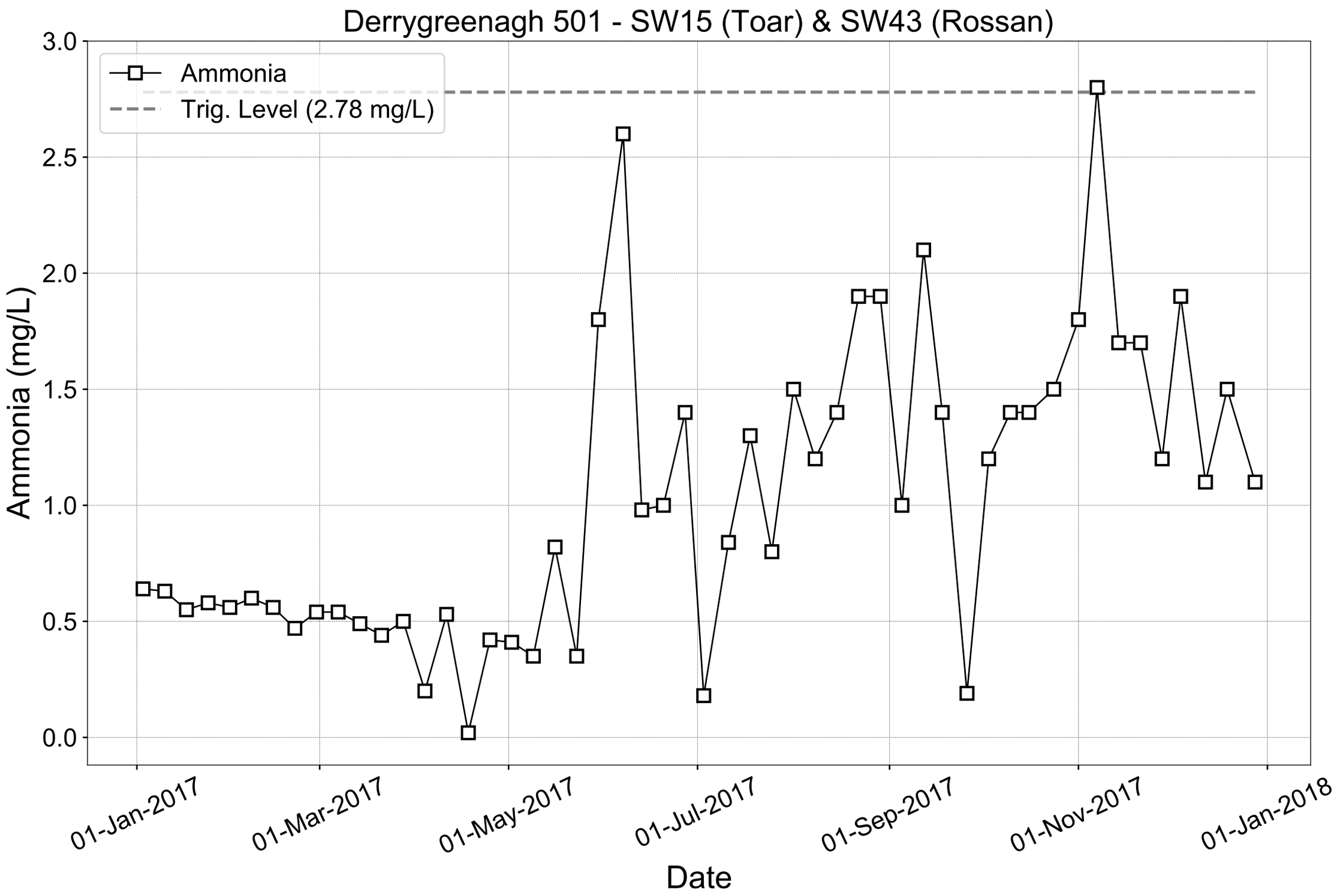
| IPC License P0501-01 Quarterly Grab Sampling Results 2017 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| X | Y | Bog | SW | Monitoring | Sampled | pH | SS | TS | Ammonia | TP | COD | Colour |
| 265888.99 | 253456.63 | Ballivor | SW-39 | Q1 17 | 13/03/2017 | 7.6 | 5 | 206 | 0.29 | 0.05 | 64 | 142 |
| 266366.86 | 251598.58 | Ballivor | SW-40 | Q1 17 | 13/03/2017 | 7.4 | 5 | 320 | 0.64 | 0.05 | 98 | 287 |
| 266386.45 | 251579.18 | Ballivor | SW-41 | Q1 17 | 13/03/2017 | 7.2 | 6 | 176 | 0.67 | 0.05 | 71 | 220 |
| To Be Confirmed | To Be Confirmed | Rossan | SW-42 | Q1 17 | 13/03/2017 | 7.3 | 5 | 146 | 1.7 | 0.05 | 71 | 255 |
| 259965.18 | 243847.63 | Rossan | SW-43 | Q1 17 | 13/03/2017 | 7.3 | 5 | 205 | 1.3 | 0.05 | 71 | 242 |
| To Be Confirmed | To Be Confirmed | Rossan | SW-44 | Q2 17 | 08/05/2017 | 7.6 | 5 | 289 | 0.88 | 0.05 | 72 | 148 |
| 258846.25 | 243853.76 | Rossan | SW-45 | Q2 17 | 08/05/2017 | 7.3 | 5 | 254 | 1.4 | 0.05 | 65 | 178 |
| 260629.22 | 242141.39 | Rossan | SW-46 | Q2 17 | 08/05/2017 | 7.3 | 5 | 278 | 1.4 | 0.05 | 74 | 231 |
| 260145.55 | 242266.71 | Rossan | SW-47 | Q2 17 | 08/05/2017 | 7.7 | 11 | 320 | 1.3 | 0.08 | 72 | 122 |
| To Be Confirmed | To Be Confirmed | Rossan | SW-48 | Q2 17 | 08/05/2017 | 7.6 | 5 | 260 | 1.1 | 0.05 | 52 | 96 |
| 255381.16 | 243606.05 | Derryhinch | SW-1 | Q3 17 | 01/09/2017 | 7.6 | 5 | 226 | 0.71 | 0.08 | 39 | 86 |
| 254528.83 | 242354.28 | Derryhinch | SW-2 | Q3 17 | 01/09/2017 | 7.3 | 5 | 278 | 3 | 0.05 | 30 | 75 |
| 253369.19 | 242417.94 | Derryhinch | SW-3 | Q3 17 | 01/09/2017 | 7.5 | 5 | 284 | 3 | 0.05 | 28 | 61 |
| 252602.78 | 242540.17 | Derryhinch | SW-4 | Q3 17 | 01/09/2017 | 7.7 | 5 | 314 | 0.14 | 0.05 | 33 | 108 |
| 252623.61 | 241470.16 | Carrick | SW-4A | Q3 17 | 01/09/2017 | 7.9 | 9 | 316 | 1 | 0.05 | 39 | 118 |
| 252468.68 | 240919.32 | Carrick | SW-5 | Q3 17 | 01/09/2017 | 7.7 | 6 | 370 | 1.4 | 0.05 | 44 | 119 |
| 252409.71 | 241163.33 | Carrick | SW-6 | Q3 17 | 01/09/2017 | 7.8 | 5 | 442 | 0.1 | 0.05 | 24 | 51 |
| 252473.21 | 241162.01 | Carrick | SW-7 | Q3 17 | 01/09/2017 | 7.8 | 6 | 430 | 0.09 | 0.05 | 24 | 49 |
| 252275.61 | 239871.62 | Drumman | SW-8 | Q3 17 | 01/09/2017 | 7.9 | 7 | 366 | 0.19 | 0.05 | 38 | 93 |
| 252950.37 | 238421.69 | Drumman | SW-9 | Q3 17 | 01/09/2017 | 7.6 | 6 | 274 | 0.02 | 0.05 | 42 | 122 |
| 251559.92 | 235341.71 | Ballybeg | SW-11 | Q4 17 | 17/11/2017 | 7.2 | 5 | 500 | 0.1 | 0.05 | 48 | 90 |
| 252206.09 | 235207.02 | Ballybeg | SW-12 | Q4 17 | 17/11/2017 | 7.2 | 5 | 324 | 0.05 | 0.05 | 100 | 278 |
| 251880.6 | 234593.13 | Ballybeg | SW-13 | Q4 17 | 17/11/2017 | 7.3 | 5 | 516 | 1.1 | 0.06 | 45 | 60 |
| 252250.49 | 235061.45 | Ballybeg | SW-13A | Q4 17 | 17/11/2017 | 7.3 | 6 | 514 | 0.9 | 0.05 | 45 | 69 |
| 240485.16 | 235706.33 | Torr | SW-14 | Q4 17 | 16/11/2017 | 7 | 6 | 256 | 1.5 | 0.05 | 66 | 219 |
| 244391.76 | 235128.93 | Torr | SW-15 | Q4 17 | 16/11/2017 | 7.2 | 5 | 438 | 0.52 | 0.05 | 34 | 71 |
| 244435.64 | 235093.42 | Torr | SW-16 | Q4 17 | 16/11/2017 | 7.2 | 7 | 466 | 0.43 | 0.05 | 44 | 65 |
| 240425.65 | 234997.32 | Torr | SW-17 | Q4 17 | 23/11/2017 | 7.2 | 6 | 406 | 0.22 | 0.05 | 75 | 186 |
| 259415.3 | 256855.75 | Bracklin | SW-29 | Q4 17 | 23/11/2017 | 7.1 | 5 | 240 | 0.4 | 0.05 | 97 | 319 |
| 259519.45 | 257618.44 | Bracklin | SW-30 | Q4 17 | 23/11/2017 | 6.2 | 7 | 106 | 0.5 | 0.05 | 55 | 252 |

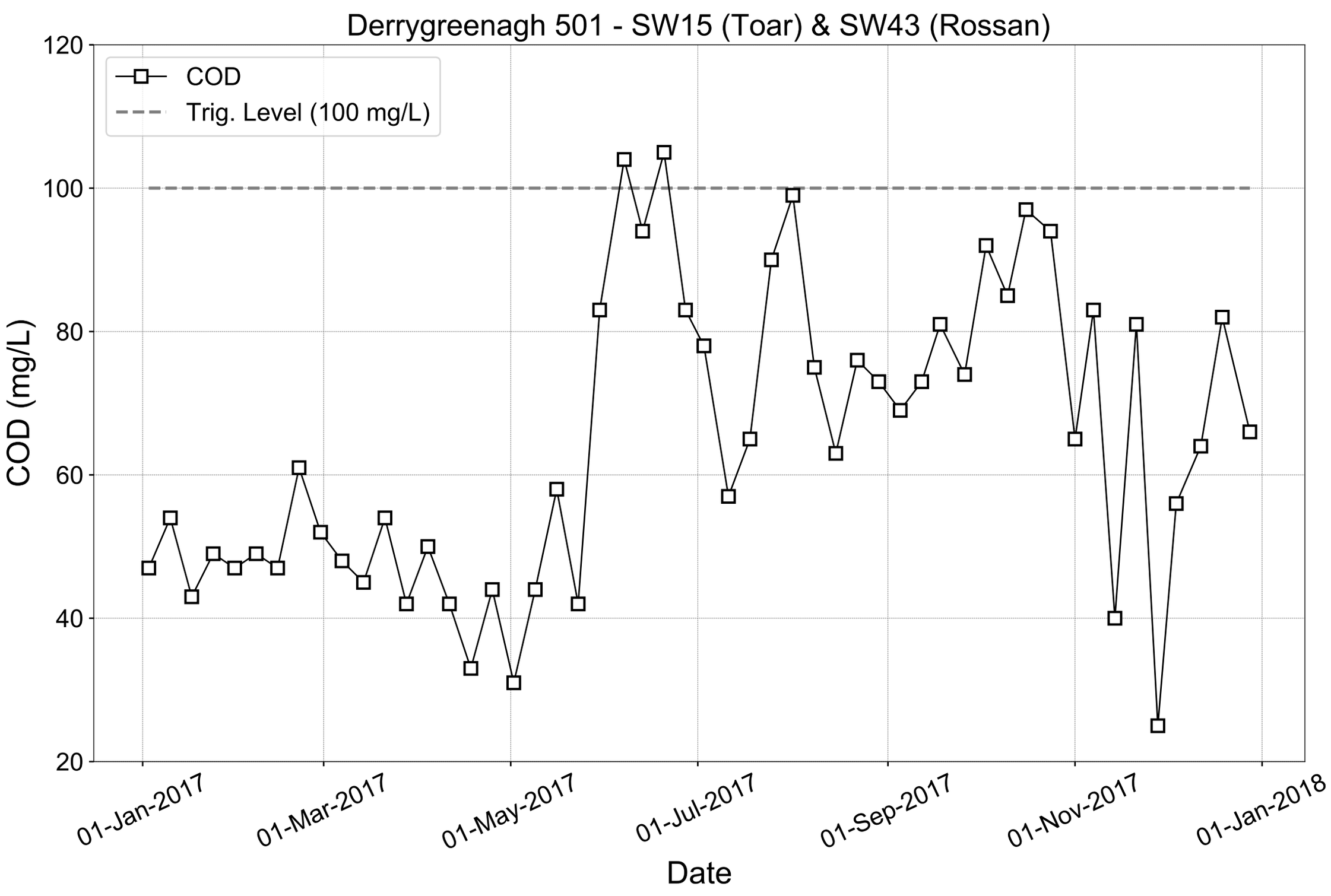


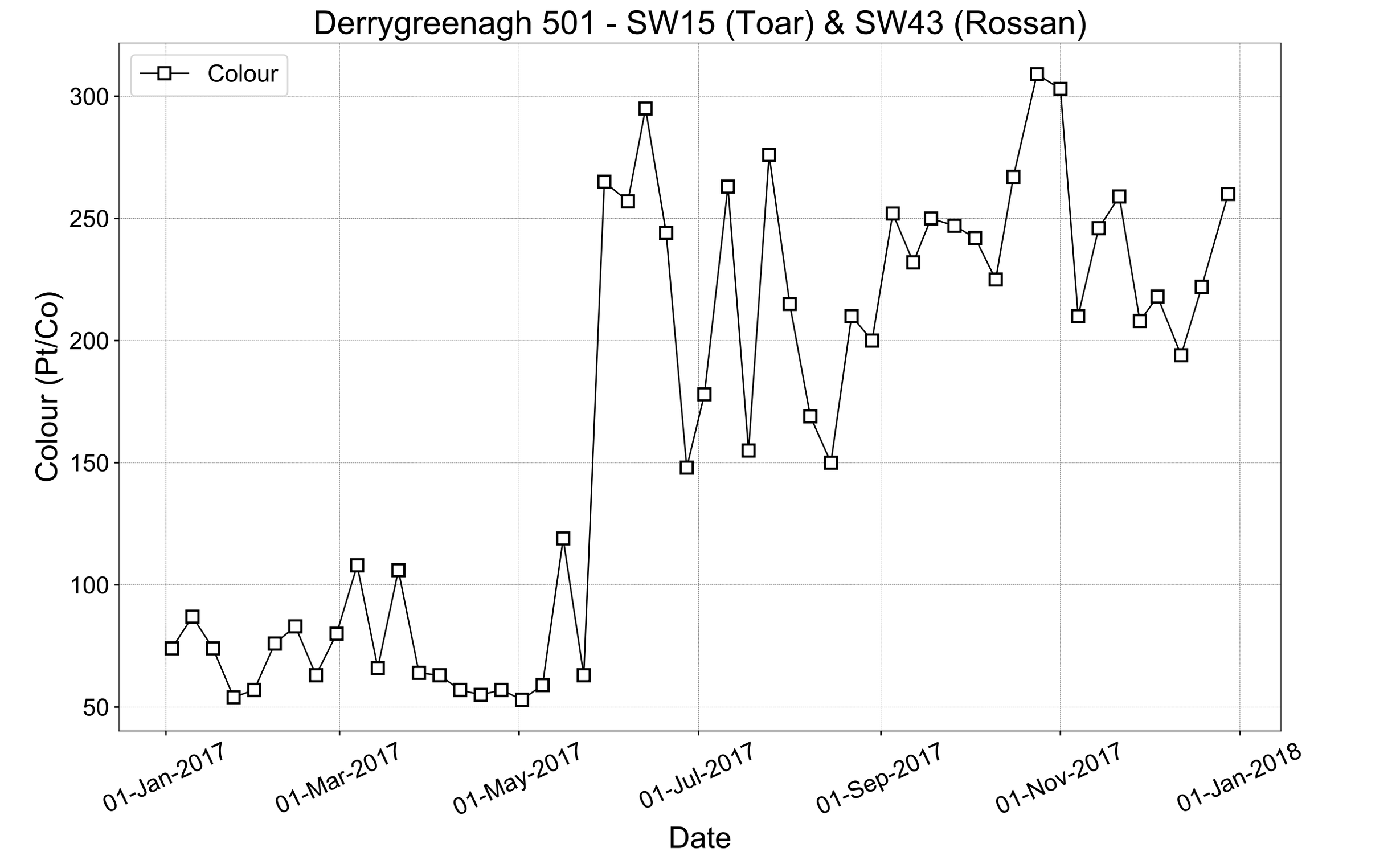

Toar bog is an active production bog with the composite sampler located here during 2015, 2016 and until May 2017 where it was moved to Rossan Bog within the Derrygreenagh IPC Licence. The composite sampler takes a flow proportional composite sample over a 24 hour period. The sampler had 0% downtime during this reporting period and returned 21 weekly ammonia results during the period of its location at Toar bog . The ammonia trigger level of 2.78mg/l, as agreed with the Agency, was not exceeded during the period. Combining the 2015,16 and May 2017 results above shows concentrations trending downwards over this 2.5 year period as peat extraction continues and this is in-line with the downwards trends submitted to the EPA in 2013 as required by condition 6.14. There is no obvious link between the summer production, winter maintenance, or silt pond maintenance events on the concentration of Ammonia discharging from this peatland. The only link expected would be that related to rainfall events and seasonal weather patterns and the subsequent surfacewater runoff and associated ammonia concentrations.

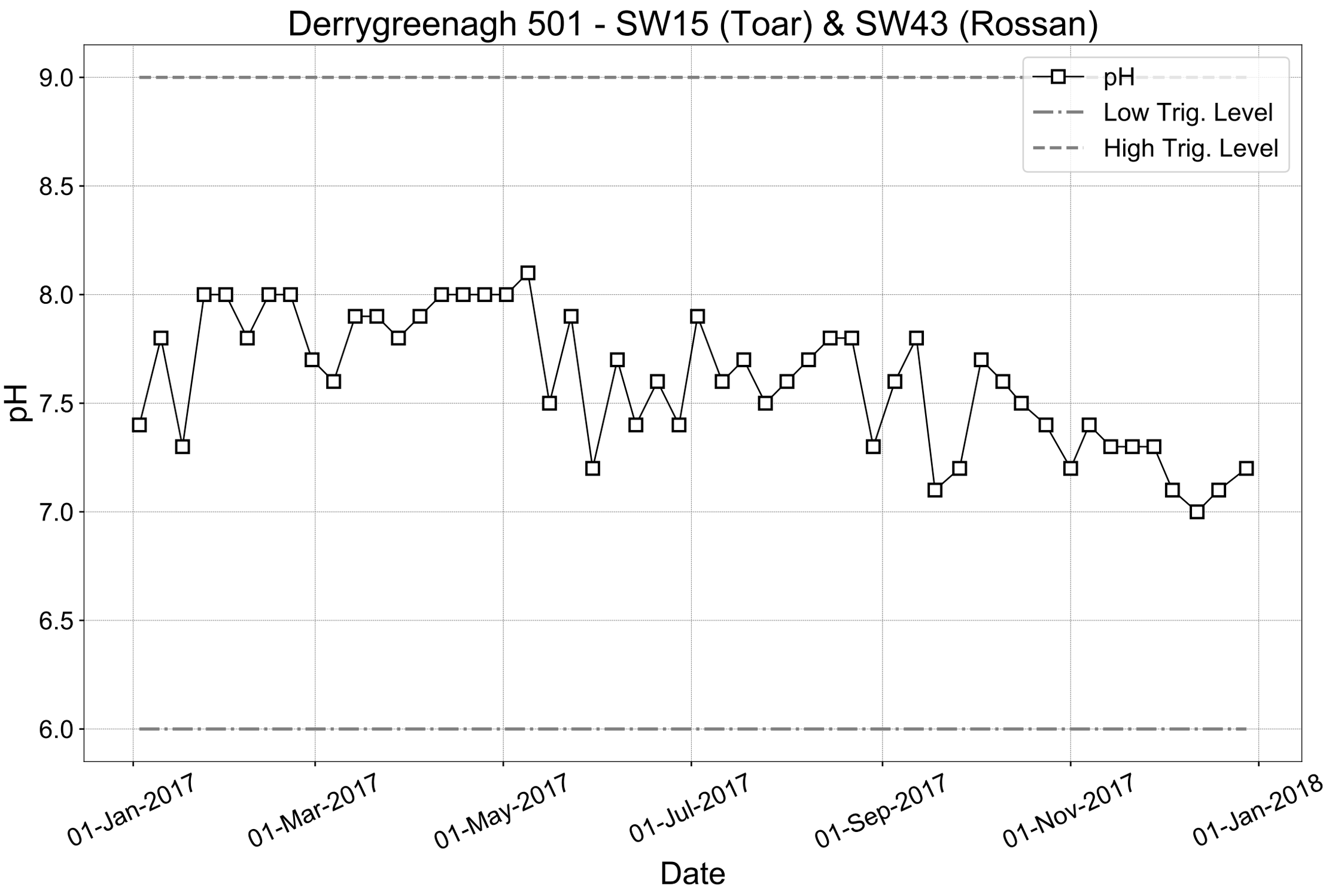


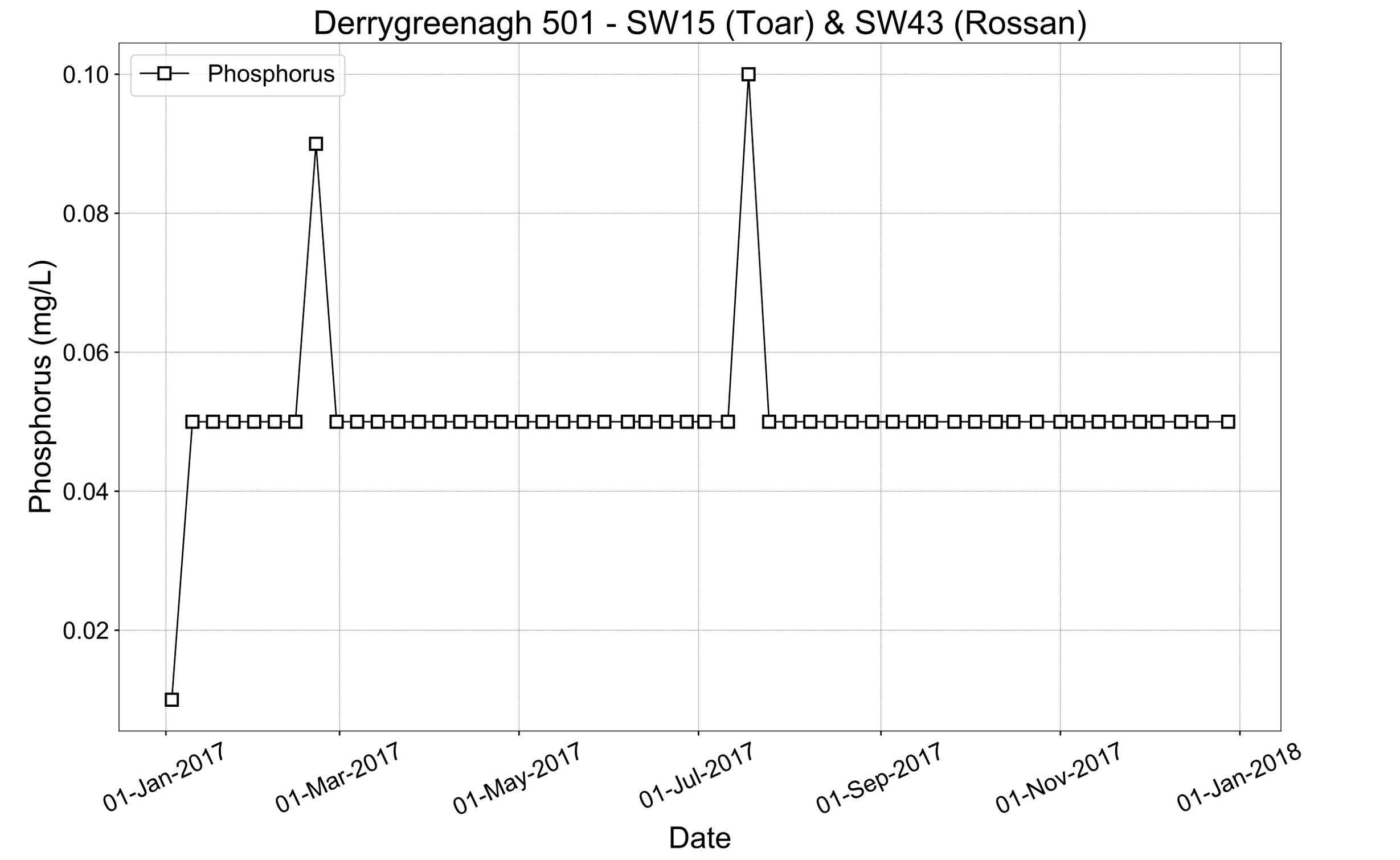

Rossan bog is an active horticultural production bog with the composite sampler located here from May 2017 where it was moved from Toar Bog within the Derrygreenagh IPC Licence. The composite sampler takes a flow proportional composite sample over a 24 hour period. The sampler had 0% downtime during this reporting period and returned 31 weekly ammonia results during the period. The ammonia trigger level of 2.78mg/l, as agreed with the Agency, was marginally exceeded once during the period. There sampling period of 31 weeks showed a slight increasing trend in ammonia, but as per previous sampler relocations, it will need up to two years at this locations and associated weekly ammonia spanning two seasonal production periods to establish the trend. There is no obvious link between the summer production, winter maintenance, or silt pond maintenance events on the concentration of Ammonia discharging from this peatland. The only link expected would be that related to rainfall events and seasonal weather patterns and the subsequent surfacewater runoff and associated ammonia concentrations.

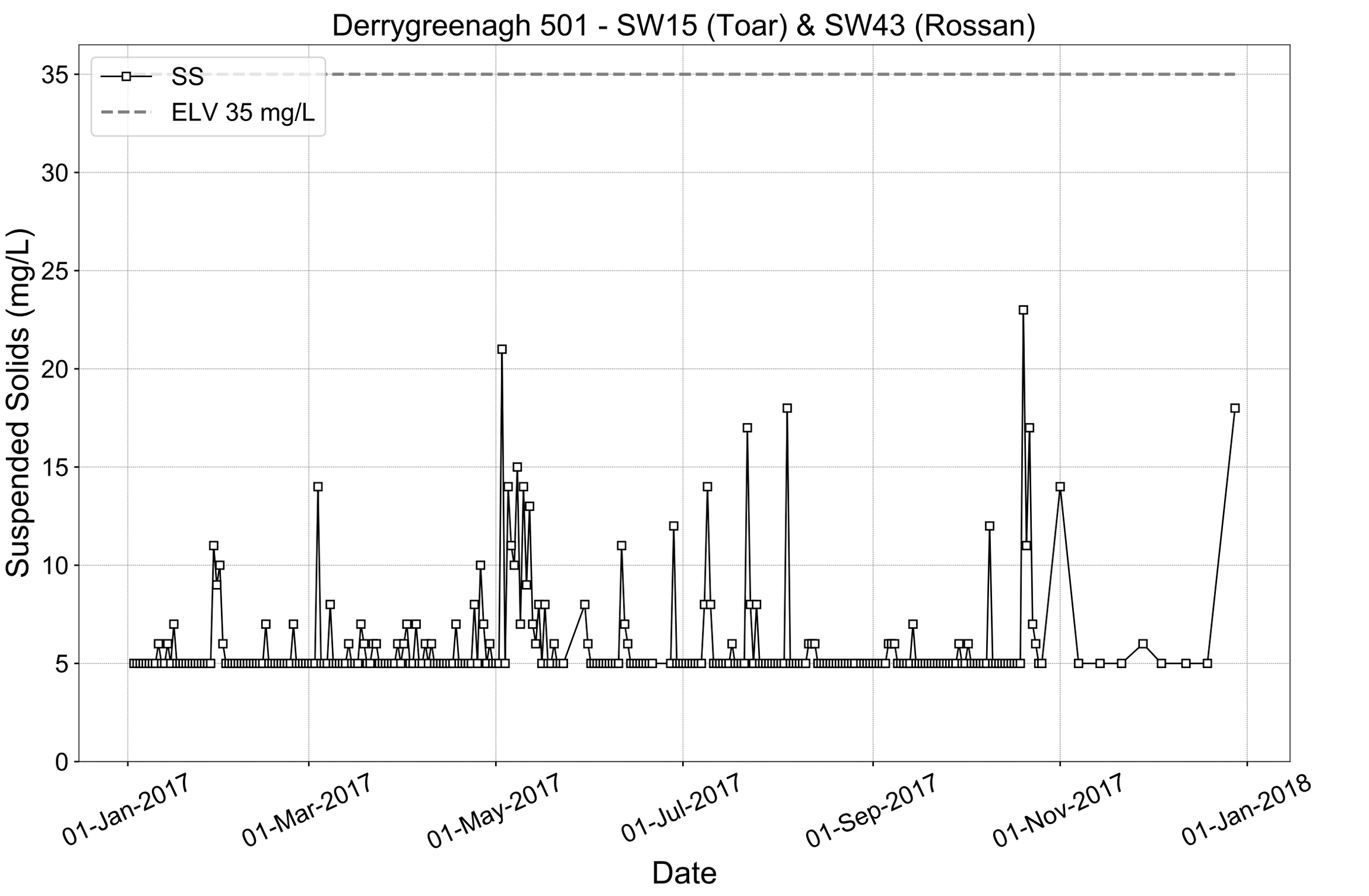

Derrygreenagh 501 - SW15 (Toar) & SW43 (Rossan)
Ammonia
Trig. Level (2.78 mg/L)
Ammonia (mg/L)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
01-Jan-2017
01-Mar-2017
01-May-2017
01-Jul-2017
01-Sep-2017
01-Nov-2017
01-Jan-2018
Date

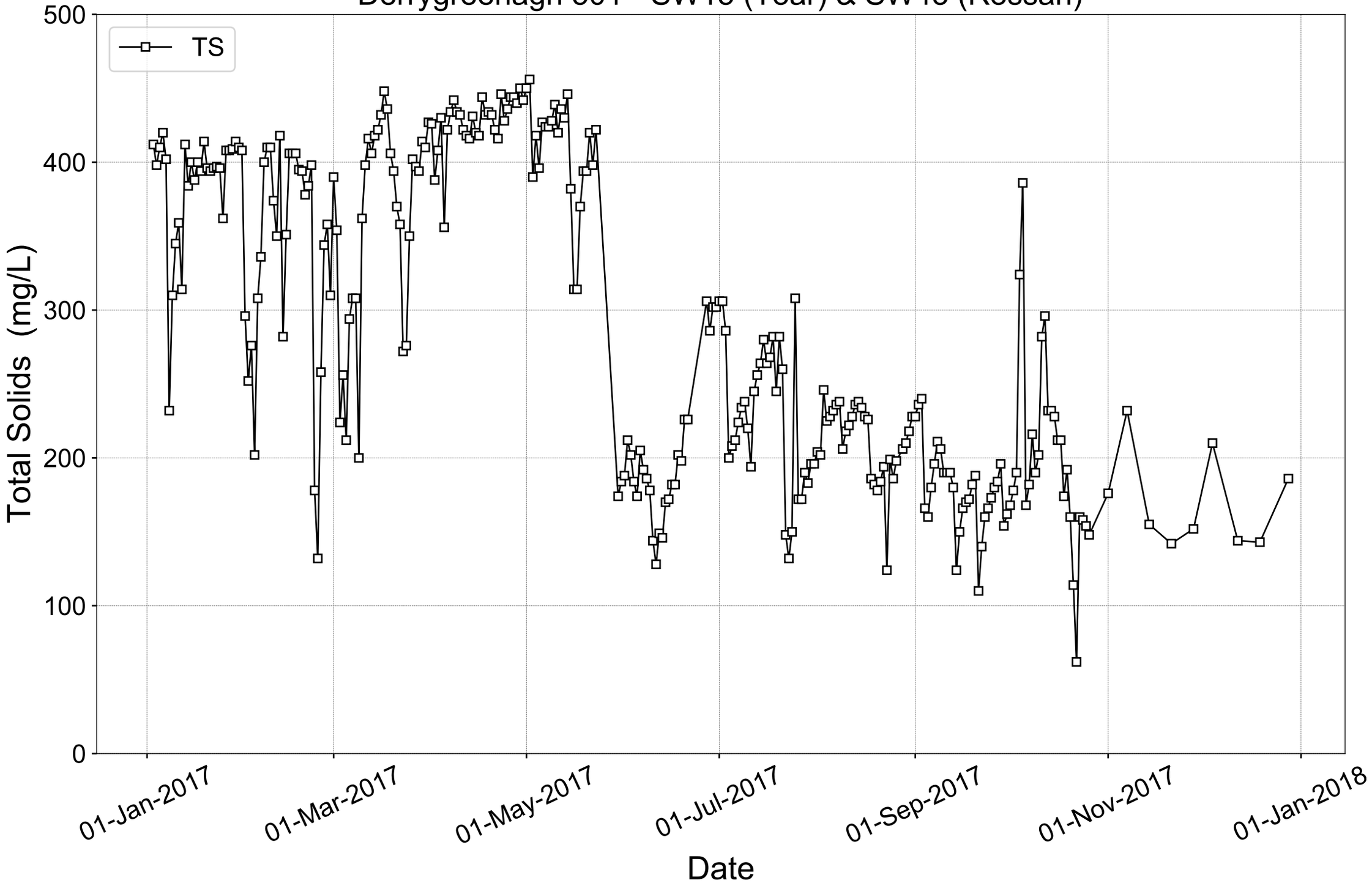

Derrygreenagh 501 - SW15 (Toar) & SW43 (Rossan)
COD
Trig. Level (100 mg/L)
COD (mg/L)
120
100
80
60
40
20
01-Jan-2017
01-Mar-2017
01-May-2017
01-Jul-2017
01-Sep-2017
01-Nov-2017
01-Jan-2018
Date


Derrygreenagh 501 - SW15 (Toar) & SW43 (Rossan)
Colour
Colour (Pt/Co)
300
250
200
150
100
50
01-Jan-2017
01-Mar-2017
01-May-2017
01-Jul-2017
01-Sep-2017
01-Nov-2017
01-Jan-2018
Date


Derrygreenagh 501 - SW15 (Toar) & SW43 (Rossan)
pH
Low Trig. Level
High Trig. Level
9.0
8.5
8.0
7.5
7.0
6.5
6.0
pH
01-Jan-2017
01-Mar-2017
01-May-2017
01-Jul-2017
01-Sep-2017
01-Nov-2017
01-Jan-2018
Date


Derrygreenagh 501 - SW15 (Toar) & SW43 (Rossan)
Phosphorus
0.10
0.08
0.06
0.04
0.02
Phosphorus (mg/L)
01-Jan-2017
01-Mar-2017
01-May-2017
01-Jul-2017
01-Sep-2017
01-Nov-2017
01-Jan-2018
Date


Derrygreenagh 501 - SW15 (Toar) & SW43 (Rossan)
SS
ELV 35 mg/L
Suspended Solids (mg/L)
0
5
10
15
20
25
30
35
01-Jan-2017
01-Mar-2017
01-May-2017
01-Jul-2017
01-Sep-2017
01-Nov-2017
01-Jan-2018
Date


Derrygreenagh 501 - SW15 (Toar) & SW43 (Rossan)
TS
Total Solids (mg/L)
500
400
300
200
100
0
01-Jan-2017
01-Mar-2017
01-May-2017
01-Jul-2017
01-Sep-2017
01-Nov-2017
01-Jan-2018
Date

| Yard Discharge Results 2017 | | |
|---|---|---|
| Licence: P0501-01 | | |
| Works: Derrygreenagh | | |
| **Month** | **D/Greenagh SWE 2 COD** | **Rossan SWE 1 COD** |
| Jan | 30 | 64 |
| Feb | 52 | 70 |
| Mar | 41 | 34 |
| Apr | 40 | 11 |
| May | 36 | 31 |
| June | 33 | 83 |
| July | 23 | 20 |
| Aug | 14 | 87 |
| Sep | 34 | 41 |
| Oct | 39 | 91 |
| Nov | 46 | 69 |
| Dec | 30 | 70 |

Guidance to completing the PRTR workbook

# PRTR Returns Workbook

Version 1.1.19

| | |
|---|---|
| **REFERENCE YEAR** | 2017 |

**1. FACILITY IDENTIFICATION**

| | |
|---|---|
| Parent Company Name | Bord na Mona Energy Limited |
| Facility Name | Bord na Móna Energy Limited (Derrygreenagh) |
| PRTR Identification Number | P0501 |
| Licence Number | P0501-01 |

Classes of Activity

| No. | class_name |
|---|---|
| - | Refer to PRTR class activities below |

| | |
|---|---|
| Address 1 | Derrygreenagh Group |
| Address 2 | c/o Derrygreenagh Works |
| Address 3 | Rochfortbridge |
| Address 4 | Mullingar |
| | |
| | Westmeath |
| Country | Ireland |
| Coordinates of Location | -7.25676 53.3910 |
| River Basin District | IEEA |
| NACE Code | 0892 |
| Main Economic Activity | Extraction of peat |
| **AER Returns Contact Name** | Enda Mc Donagh |
| **AER Returns Contact Email Address** | enda.mcdonagh@bnm.ie |
| **AER Returns Contact Position** | Head of Environment |
| **AER Returns Contact Telephone Number** | 0579345911 |
| **AER Returns Contact Mobile Phone Number** | 0862370816 |
| **AER Returns Contact Fax Number** | 0579345160 |
| **Production Volume** | 299912.0 |
| **Production Volume Units** | Tonnes |
| **Number of Installations** | 6 |
| **Number of Operating Hours in Year** | 2216 |
| **Number of Employees** | 60 |
| **User Feedback/Comments** | In accordance with licence condition 6.2 of Technical Amendment A, quarterly sampling is now rotated every quarter and therefore suspended solids results are not factored into loading. Due to technical difficulties experienced with the composite sampler annual loading was not possible to calculate. All composite sampler results are attached for review in the AER document. |
| **Web Address** | www.bnm.ie |

**2. PRTR CLASS ACTIVITIES**

| Activity Number | Activity Name |
|---|---|
| 50.1 | General |

**3. SOLVENTS REGULATIONS (S.I. No. 543 of 2002)**

| | |
|---|---|
| Is it applicable? | No |
| Have you been granted an exemption ? | |
| If applicable which activity class applies (as per Schedule 2 of the regulations) ? | |
| Is the reduction scheme compliance route being used ? | |

**4. WASTE IMPORTED/ACCEPTED ONTO SITE** Guidance on waste imported/accepted onto site

| | |
|---|---|
| Do you import/accept waste onto your site for on-site treatment (either recovery or disposal activities) ? | No |

This question is only applicable if you are an IPPC or Quarry site

**4.1 RELEASES TO AIR** Link to previous years emissions data





**SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS**

| RELEASES TO AIR | | | | | Please enter all quantities in this section in KGs | | | |
|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | QUANTITY | | | |
| | | | Method Used | | | | | |
| No. Annex II | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

**SECTION B : REMAINING PRTR POLLUTANTS**

| RELEASES TO AIR | | | | | Please enter all quantities in this section in KGs | | | |
|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | QUANTITY | | | |
| | | | Method Used | | | | | |
| No. Annex II | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

**SECTION C : REMAINING POLLUTANT EMISSIONS (As required in your Licence)**

| RELEASES TO AIR | | | | | Please enter all quantities in this section in KGs | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | QUANTITY | | | | | | |
| | | | Method Used | | DM01 | DM02 | DM03 | DM04 | | | |
| Pollutant No. | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | Emission Point 2 | Emission Point 3 | Emission Point 4 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| 210 | Dust | E | OTH | VDI 2119 Blatt 2/Part 2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.076468 | 0.0 | 0.076468 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

**Additional Data Requested from Landfill operators**

**For the purposes of the National Inventory on Greenhouse Gases, landfill operators are requested to provide summary data on landfill gas (Methane) flared or utilised on their facilities to accompany the figures for total methane generated. Operators should only report their Net methane (CH4) emission to the environment under T(total) KG/yr for Section A: Sector specific PRTR pollutants above. Please complete the table below:**

**Landfill:** Bord na Móna Energy Limited (Derrygreenagh)

| **Please enter summary data on the quantities of methane flared and / or utilised** | **T (Total) kg/Year** | **M/C/E** | **Method Used** | | **Facility Total Capacity m3 per hour** | |
|---|---|---|---|---|---|---|
| | | | **Method Code** | **Designation or Description** | | |
| Total estimated methane generation (as per site model) | 0.0 | | | | N/A | |
| Methane flared | 0.0 | | | | 0.0 | (Total Flaring Capacity) |
| Methane utilised in engine/s | 0.0 | | | | 0.0 | (Total Utilising Capacity) |
| Net methane emission (as reported in Section A above) | 0.0 | | | | N/A | |

## 4.2 RELEASES TO WATERS

Link to previous years emissions data





### SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

Data on ambient monitoring of storm/surface water or groundwater, conducted as part of your licence requirements, should NOT be submitted under AER / PRTR Reporting as this only concerns Releases from your facility

| RELEASES TO WATERS | | | | | Please enter all quantities in this section in KGs | | | |
|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | | | | QUANTITY | | | |
| | | | Method Used | | | | | |
| No. Annex II | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

### SECTION B : REMAINING PRTR POLLUTANTS

| RELEASES TO WATERS | | | | | Please enter all quantities in this section in KGs | | | |
|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | | | | QUANTITY | | | |
| | | | Method Used | | | | | |
| No. Annex II | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

### SECTION C : REMAINING POLLUTANT EMISSIONS (as required in your Licence)

| RELEASES TO WATERS | | | | | Please enter all quantities in this section in KGs | | | | |
|---|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | | | | QUANTITY | | | | |
| | | | Method Used | | SW15 | SW43 | | | |
| Pollutant No. | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | Emission Point 2 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| **240** | **Suspended Solids** | E | OTH | G/19 Based on ALPHA,1998,20th Edition, Method 2540D | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

## 4.3 RELEASES TO WASTEWATER OR SEWER

Link to previous years emissions data



### SECTION A : PRTR POLLUTANTS

| OFFSITE TRANSFER OF POLLUTANTS DESTINED FOR WASTE-WATER TREATMENT OR SEWER | | | | | Please enter all quantities in this section in KGs | | | |
|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | QUANTITY | | | |
| | | | Method Used | | | | | |
| No. Annex II | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

### SECTION B : REMAINING POLLUTANT EMISSIONS (as required in your Licence)

| OFFSITE TRANSFER OF POLLUTANTS DESTINED FOR WASTE-WATER TREATMENT OR SEWER | | | | | Please enter all quantities in this section in KGs | | | |
|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | QUANTITY | | | |
| | | | Method Used | | | | | |
| Pollutant No. | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

## 4.4 RELEASES TO LAND

Link to previous years emissions data



### SECTION A : PRTR POLLUTANTS

| RELEASES TO LAND | | | | | Please enter all quantities in this section in KGs | | |
|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | QUANTITY | | |
| | | | Method Used | | | | |
| No. Annex II | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

### SECTION B : REMAINING POLLUTANT EMISSIONS (as required in your Licence)

| RELEASES TO LAND | | | | | Please enter all quantities in this section in KGs | | |
|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | QUANTITY | | |
| | | | Method Used | | | | |
| Pollutant No. | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year |
| | | | | | 0.0 | 0.0 | 0.0 |

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

## 5. ONSITE TREATMENT & OFFSITE TRANSFERS OF WASTE



**Please enter all quantities on this sheet in Tonnes**



| Transfer Destination | European Waste Code | Hazardous | Quantity (Tonnes per Year) | Description of Waste | Waste Treatment Operation | Method Used | | Location of Treatment | Haz Waste : Name and Licence/Permit No of Next Destination Facility Non Haz Waste: Name and Licence/Permit No of Recover/Disposer | Haz Waste : Address of Next Destination Facility Non Haz Waste: Address of Recover/Disposer | Name and License / Permit No. and Address of Final Recoverer / Disposer (HAZARDOUS WASTE ONLY) | Actual Address of Final Destination i.e. Final Recovery / Disposal Site (HAZARDOUS WASTE ONLY) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | M/C/E | Method Used | | | | | |
| Within the Country | 01 01 02 | No | 169.7 | wastes from mineral non-metalliferous excavation | D1 | E | Volume Calculation | Onsite of generati | Bord na Mona Energy Ltd,P0501-01 | Derrygreenagh,Rochfortbridge,Mullingar,Co Westmeath,Ireland | | |
| Within the Country | 02 01 04 | No | 119.14 | waste plastics (except packaging) | R5 | M | Weighed | Offsite in Ireland | Walker Recycling,NWCPO-14-11464-01 | Clonkeen,Portlaoise,Co Laois,,Ireland | | |
| To Other Countries | 08 01 11 | Yes | 0.25 | waste paint and varnish containing organic solvents or other dangerous substances | R2 | M | Weighed | Abroad | Enva Ireland Ltd,184-1 | Clonminam Ind Estate,Portlaoise,Co Laois,,Ireland | Recyfuel Ltd,BE0459.735.458,Enghis,.,.,.,Belgium | Enghis,.,.,.,Belgium |
| To Other Countries | 11 01 13 | Yes | 0.39 | degreasing wastes containing dangerous substances | R11 | C | Volume Calculation | Abroad | Safety Kleen Ltd,99-1 | Tallaght,.,.,.,Ireland | Solvent Recovery Management,PP33345F,Wheeland Rd,Knottingly,West Yorks,WF11 8DZ,United Kingdom | Wheeland Rd,Knottingly,West Yorks,WF11 8DZ,United Kingdom |
| Within the Country | 13 02 05 | Yes | 10.45 | mineral-based non-chlorinated engine, gear and lubricating oils | R1 | C | Volume Calculation | Offsite in Ireland | Enva Ireland Ltd,184-1 | Clonminam Ind Estate,Portlaoise,Co Laois,,Ireland | Enva Ltd,184-1,Clonminam Industrial Estate,Portlaoise,Laois,,Ireland | Clonminam Industrial Estate,Portlaoise,Laois,,Ireland |
| Within the Country | 13 05 03 | Yes | 2.62 | interceptor sludges | R1 | C | Volume Calculation | Offsite in Ireland | Enva Ireland Ltd,184-1 | Clonminam Ind Estate,Portlaoise,Co Laois,,Ireland | Enva Ltd,184-1,Clonminam Industrial Estate,Portlaoise,Laois,,Ireland | Clonminam Industrial Estate,Portlaoise,Laois,,Ireland |
| Within the Country | 15 01 03 | No | 14.26 | wooden packaging | R1 | M | Weighed | Offsite in Ireland | AES Ltd,WP-OY-08-061-01 | Cappincur,Tullamore,Co Offaly,,Iceland | | |
| To Other Countries | 15 02 02 | Yes | 1.62 | absorbents, filter materials (including oil filters not otherwise specified), wiping cloths, protective clothing contaminated by dangerous substances | R1 | C | Volume Calculation | Abroad | Enva Ireland Ltd,184-1 | Clonminam Ind Estate,Portlaoise,Co Laois,,Ireland | Lindenschmidt,Reg no E97095037,IINDENSCHMIDT,Kreuztal,.,.,Germany | IINDENSCHMIDT,Kreuztal,.,.,Germany |
| To Other Countries | 16 01 07 | Yes | 1.6 | oil filters | R4 | C | Volume Calculation | Abroad | Enva Ireland Ltd,184-1 | Clonminam Ind Estate,Portlaoise,Co Laois,,Ireland | R.D. Recycling,Reg no 51727/1/KD,Houthalen,.,.,.,Belgium | Houthalen,.,.,.,Belgium |
| To Other Countries | 16 06 01 | Yes | 0.82 | lead batteries | R4 | M | Weighed | Abroad | Enva Ireland Ltd,184-1 | Clonminam Ind Estate,Portlaoise,Co Laois,,Ireland | Campine Recycling,MLAV/05-173/GVDA,Beerse,.,.,.,Belgium | Beerse,.,.,.,Belgium |
| Within the Country | 17 04 07 | No | 54.8 | mixed metals | R4 | M | Weighed | Offsite in Ireland | AES Ltd,WP-OY-08-061-01 | Cappincur,Tullamore,Co Offaly,,Iceland | | |
| Within the Country | 20 03 01 | No | 12.1 | mixed municipal waste | D5 | M | Weighed | Offsite in Ireland | AES Ltd,WP-OY-08-061-01 | Cappincur,Tullamore,Co Offaly,,Iceland | | |
| Within the Country | 20 03 01 | No | 7.96 | mixed municipal waste | D5 | M | Volume Calculation | Offsite in Ireland | AES Ltd,WP-OY-08-061-01 | Cappincur,Tullamore,Co Offaly,,Iceland | | |
| Within the Country | 17 09 04 | No | 180.0 | mixed construction and demolition wastes other than those mentioned in 17 09 01, 17 09 02 and 17 09 03 | R5 | E | Volume Calculation | Offsite in Ireland | Anthony Cocoman,NWCPO-10-10642-02 | Cloncant,Clonbullogue,Tullamore,Co Offaly,Ireland | | |
| **Within the Country** | **20 01 21** | **Yes** | 0.08 | fluorescent tubes and other mercury-containing waste | R4 | M | Weighed | Offsite in Ireland | KMK Metal Recycling Ltd,NWCPO-08-10607-02 | Cappincur Ind Estate,Daingean Rd,Tullamore ,Co Offaly,Ireland | DELA GmbH,E11315322,Alte,Landstr 4,Essen,.,Germany | Alte,Landstr 4,Essen,.,Germany |
| Within the Country | 16 02 14 | No | 2.36 | discarded equipment other than those mentioned in 16 02 09 to 16 02 13 | R4 | M | Weighed | Offsite in Ireland | KMK Metal Recycling Ltd,NWCPO-08-10607-02 | Cappincur Ind Estate,Daingean Rd,Tullamore ,Co Offaly,Ireland | | |

* Select a row by double-clicking the Description of Waste then click the delete button

| Transfer Destination | European Waste Code | Hazardous | Quantity (Tonnes per Year) | Description of Waste | Waste Treatment Operation | Method Used | | Location of Treatment | Haz Waste : Name and Licence/Permit No of Next Destination Facility Non Haz Waste: Name and Licence/Permit No of Recover/Disposer | Haz Waste : Address of Next Destination Facility Non Haz Waste: Address of Recover/Disposer | Name and License / Permit No. and Address of Final Recoverer / Disposer (HAZARDOUS WASTE ONLY) | Actual Address of Final Destination i.e. Final Recovery / Disposal Site (HAZARDOUS WASTE ONLY) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | M/C/E | Method Used | | | | | |

Link to previous years waste data
Link to previous years waste summary data & percentage change
Link to Waste Guidance

# Annual Environmental Report 2018

# Bord na Mona Energy Ltd
# (Derrygreenagh Group of Bogs)
# IPC Licence P0501-01

LEABEG, TULLAMORE, CO. OFFALY, IRELAND
TELEPHONE: (05793) 45900. INT: +353-5793-45900. FAX :( 05793) 45160. INT: +353-5793-45160

| Facility Information Summary | |
|---|---|
| AER Reporting Year | 2018 |
| Licence Register Number | P0501-01 |
| Name of site | Bord na Mona Derrygreenagh |
| Site Location | Derrygreenagh, Rochfortbridge, Co Westmeath |
| NACE Code | 0892 |
| Class/Classes of Activity | 1.4 |
| National Grid Reference (6E, 6 N) | 249450, 238140 |

A description of the activities/processes at the site for the reporting year. This should include information such as production increases or decreases on site, any infrastructural changes, environmental performance which was measured during the reporting year **and an overview of compliance with your licence** listing all exceedances of licence limits (where applicable) and what they relate to e.g. air, water, noise.

Activities on site can be divided into two components, firstly the milling, harrowing, ridiging and harvesting of peat into stockpiles and secondly the transportation of that peat via an internal rail network to the Power Station and lorry outloading facilities. Production achieved was approximately 268,559 tonnes which was slightly up on the 2017 figure. Infrastructurally, there was no bog development. Quarterly grab sampling was 100% compliant, with the continuous composite sampling returning no non-compliances for suspended solids. There were three environmental complaints received during the reporting period, this was dust related and was resolved to the satisfaction of the complainants. The number of incidents reported rose in 2018. These were mainly trigger level exceedences for ammonia and COD due to the exceptionally dry summer we experienced. In relation to silt pond cleaning, 75% of ponds received two cleanings.The remaining 25% of silt ponds serviced a bog that was not operational in 2018 but were cleaned in December 2017, June 2018 and again in January 2019, so did receive two cleaning within the 12month period. Inspections dictate cleaning schedules. Decommissioning and Rehabilitation works are described in an attachment. During the period of reporting, a draft Rehabilitation plan was submitted along with consent sought and approved for two new trail projects, namely the trial cultivation of herbs and wildcrafting for indigenous herbs and plant water

**Declaration:**

All the data and information presented in this report has been checked and certified as being accurate. The quality of the information is assured to meet licence requirements.

| E. Mullall | 15-3-19 |
|---|---|
| Signature<br>Group/Facility manager<br>(or nominated, suitably qualified and experienced deputy) | Date |

## AIR-summary template

Lic No: P0501-01 Year 2018

**Answer all questions and complete all tables where relevant**

| | | | Additional information |
|---|---|---|---|
| 1 | Does your site have licensed air emissions? If yes please complete table A1 and A2 below for the current reporting year and answer further questions. If **you do not have** licenced emissions and **do not complete a solvent management plan** (table A4 and A5) you do not need to complete the tables | No | Fugitive emissions only |

## Periodic/Non-Continuous Monitoring

| | | | |
|---|---|---|---|
| 2 | Are there any results in breach of licence requirements? If yes please provide brief details in the comment section of TableA1 below | No | |
| 3 | Was all monitoring carried out in accordance with EPA guidance note AG2 and using the basic air monitoring checklist? Basic air monitoring checklist AGN2 | Yes | |

### Table A1: Licensed Mass Emissions/Ambient data-periodic monitoring (non-continuous)

| Emission reference no: | Parameter/ Substance | Frequency of Monitoring | ELV in licence or any revision therof | Licence Compliance criteria | Measured value | Unit of measurement | Compliant with licence limit | Method of analysis | Annual mass load (kg) | Comments - reason for change in % mass load from previous year if applicable |
|---|---|---|---|---|---|---|---|---|---|---|
| | SELECT | | | SELECT | | SELECT | SELECT | SELECT | | |
| | SELECT | | | SELECT | | SELECT | SELECT | SELECT | | |
| | SELECT | | | SELECT | | SELECT | SELECT | SELECT | | |
| | SELECT | | | SELECT | | SELECT | SELECT | SELECT | | |

Note 1: Volumetric flow shall be included as a reportable parameter

## Continuous Monitoring

| | | | |
|---|---|---|---|
| 4 | Does your site carry out continuous air emissions monitoring? | No | |
| | If yes please review your continuous monitoring data and report the required fields below in Table A2 and compare it to its relevant Emission Limit Value (ELV) | | |
| 5 | Did continuous monitoring equipment experience downtime? If yes please record downtime in table A2 below | No | |
| 6 | Do you have a proactive service agreement for each piece of continuous monitoring equipment? | No | |
| 7 | Did your site experience any abatement system bypasses? If yes please detail them in table A3 below | No | |

**AIR-summary template** Lic No: P0501-01 Year 2018

**Table A2: Summary of average emissions -continuous monitoring**

| Emission reference no: | Parameter/ Substance | ELV in licence or any revision therof | Averaging Period | Compliance Criteria | Units of measurement | Annual Emission | Annual maximum | Monitoring Equipment downtime (hours) | Number of ELV exceedences in current reporting year | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| DM-01 | Total Particulates | 350 | 140 DAYS | Daily average < ELV | mg/m2/day | 8176 | 71 | 0 | 0 | Dust monitioring took place on 5 occasions for 28 days each time between April and September |
| DM-02 | Total Particulates | 350 | 140 DAYS | Daily average < ELV | mg/m2/day | 14448 | 178 | 0 | 0 | |
| DM-03 | Total Particulates | 350 | 140 DAYS | Daily average < ELV | mg/m2/day | 30688 | 305 | 0 | 0 | |
| DM-04 | Total Particulates | 350 | 140 DAYS | Daily average < ELV | mg/m2/day | 14280 | 178 | 0 | 0 | |
| | SELECT | | | | SELECT | | | | | |

note 1: Volumetric flow shall be included as a reportable parameter.

**Table A3: Abatement system bypass reporting table** Bypass protocol

| Date* | Duration** (hours) | Location | Reason for bypass | Impact magnitude | Corrective action |
|---|---|---|---|---|---|
| | | | | | |

* this should include all dates that an abatement system bypass occurred

** an accurate record of time bypass beginning and end should be logged on site and maintained for future Agency inspections please refer to bypass protocol link

## Solvent use and management on site

8 Do you have a total Emission Limit Value of direct and fugitive emissions on site? if yes please fill out tables A4 and A5 SELECT

**Table A4: Solvent Management Plan Summary Total VOC Emission limit value** Solvent regulations Please refer to linked solvent regulations to complete table 5 and 6

| Reporting year | Total solvent input on site (kg) | Total VOC emissions to Air from entire site (direct and fugitive) | Total VOC emissions as %of solvent input | Total Emission Limit Value (ELV) in licence or any revision therof | Compliance |
|---|---|---|---|---|---|
| | | | | | SELECT |
| | | | | | SELECT |

**Table A5: Solvent Mass Balance summary**

| | (I) Inputs (kg) | (O) Outputs (kg) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Solvent | (I) Inputs (kg) | Organic solvent emission in waste | Solvents lost in water (kg) | Collected waste solvent (kg) | Fugitive Organic Solvent (kg) | Solvent released in other ways | Solvents destroyed onsite | Total emission of Solvent to air (kg) |
| | | | | | | | | |
| | | | | | | | Total | |

**AER Monitoring returns summary template-WATER/WASTEWATER(SEWER)** Lic No: P0501-01 Year 2018

| | | | Additional information |
|---|---|---|---|
| 1 | Does your site have licensed emissions direct to surface water or direct to sewer? If yes please complete table W2 and W3 below for the current reporting year and answer further questions. If **you do not have** licenced emissions you only need to complete table W1 and or W2 for storm water analysis and visual inspections | Yes | |
| 2 | Was it a requirement of your licence to carry out visual inspections on any surface water discharges or watercourses on or near your site? If yes please complete table W2 below summarising only any evidence of contamination noted during visual inspections | Yes | Monthly COD of yard run-off is attached. |

**Table W1 Storm water monitoring**

| Location reference | Location relative to site activities | PRTR Parameter | Licenced Parameter | Monitoring date | ELV or trigger level in licence or any revision thereof* | Licence Compliance criteria | Measured value | Unit of measurement | Compliant with licence | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| | SELECT | SELECT | SELECT | | | SELECT | | SELECT | SELECT | |
| | SELECT | SELECT | SELECT | | | SELECT | | SELECT | SELECT | |

*trigger values may be agreed by the Agency outside of licence conditions

**Table W2 Visual inspections-Please only enter details where contamination was observed.**

| Location Reference | Date of inspection | Description of contamination | Source of contamination | Corrective action | Comments |
|---|---|---|---|---|---|
| | | | SELECT | | |
| | | | SELECT | | |

**Licensed Emissions to water and /or wastewater(sewer)-periodic monitoring (non-continuous)**

| | | | | | |
|---|---|---|---|---|---|
| 3 | Was there any result in breach of licence requirements? If yes please provide brief details in the comment section of Table W3 below | | | No | |
| 4 | Was all monitoring carried out in accordance with EPA guidance and checklists for Quality of Aqueous Monitoring Data Reported to the EPA? If no please detail what areas require improvement in additional information box | External /Internal Lab Quality checklist | Assessment of results checklist | Yes | Surface water monitoring was carried out on a quarterly basis. The results of which are attached. |

**Table W3: Licensed Emissions to water and /or wastewater (sewer)-periodic monitoring (non-continuous)**

| Emission reference no: | Emission released to | Parameter/ SubstanceNote 1 | Type of sample | Frequency of monitoring | Averaging period | ELV or trigger values in licence or any revision therof[Note 2] | Licence Compliance criteria | Measured value | Unit of measurement | Compliant with licence | Method of analysis | Procedural reference source | Procedural reference standard number | Annual mass load (kg) | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

Note 1: Volumetric flow shall be included as a reportable parameter

Note 2: Where Emission Limit Values (ELV) do not apply to your licence please compare results against EQS for Surface water or relevant receptor quality standards

**AER Monitoring returns summary template-WATER/WASTEWATER(SEWER)** Lic No: P0501-01 Year 2018

## Continuous monitoring

| | | | Additional Information |
|---|---|---|---|
| 5 | Does your site carry out continuous emissions to water/sewer monitoring? | Yes | Flow proportionate composite sampling |

**If yes please summarise your continuous monitoring data below in Table W4 and compare it to its relevant Emission Limit Value (ELV)**

| | | | |
|---|---|---|---|
| 6 | Did continuous monitoring equipment experience downtime? **If yes please record downtime in table W4 below** | Yes | Total of 101 days over 365 days |
| 7 | Do you have a proactive service contract for each piece of continuous monitoring equipment on site? | Yes | |
| 8 | Did abatement system bypass occur during the reporting year? **If yes please complete table W5 below** | No | |

## Table W4: Summary of average emissions -continuous monitoring

| Emission reference no: | Emission released to | Parameter/ Substance | ELV or trigger values in licence or any revision thereof | Averaging Period | Compliance Criteria | Units of measurement | Annual Emission for current reporting year (kg) | % change +/- from previous reporting year | Monitoring Equipment downtime (hours) | Number of ELV exceedences in reporting year | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SW43 | Water | Suspended Solids | 35 | 24 hour | All results < 1.5 times ELV, plus from ten 8 results must be ELV > | mg/L | | | | 0 | |
| SW43 | Water | Ammonia (as N) | 2.78 | Weekly | NA | mg/L | | | | | |
| SW43 | Water | Total phosphorus | NA | Weekly | NA | mg/L | | | | | |
| SW43 | Water | COD | 100 | Weekly | NA | mg/L | | | | | |
| SW43 | Water | volumetric flow | NA | 24 hour | NA | m3/day | | | 2424 | | Down time due to battery failure, and sampler repairs. Agency informed of repairs. |
| SW43 | Water | Total Dissolved Solids | NA | Weekly | NA | mg/L | | | | | |

note 1: Volumetric flow shall be included as a reportable parameter.

## Table W5: Abatement system bypass reporting table

| Date | Duration (hours) | Location | Resultant emissions | Reason for bypass | Corrective action* | Was a report submitted to the EPA? | When was this report submitted? |
|---|---|---|---|---|---|---|---|
| | | | | | | SELECT | |
| | | | | | | | |
| | | | | | | | |

*Measures taken or proposed to reduce or limit bypass frequency

## Bund/Pipeline testing template

Lic No: P0501-01 Year 2018

**Bund testing**

dropdown menu click to see options

| | | | Additional information |
|---|---|---|---|
| 1 | Are you required by your licence to undertake integrity testing on bunds and containment structures ? if yes please fill out table B1 below listing all **new bunds and containment structures** on site, in addition to **all bunds which failed** the integrity test-**all bunding structures which failed including mobile bunds must be listed in the table below, please include all bunds outside the licenced testing period** (mobile bunds and chemstore included) | Yes | |
| 2 | Please provide integrity testing frequency period | Other (2 Yearly) | |
| 3 | Does the site maintain a register of bunds, underground pipelines (including stormwater and foul), Tanks, sumps and containers? (containers refers to "Chemstore" type units and mobile bunds) | Yes | |
| 4 | How many bunds are on site? | 1 | |
| 5 | How many of these bunds have been tested within the required test schedule? | 1 | |
| 6 | How many mobile bunds are on site? | | |
| 7 | Are the mobile bunds included in the bund test schedule? | No | |
| 8 | How many of these mobile bunds have been tested within the required test schedule? | 0 | |
| 9 | How many sumps on site are included in the integrity test schedule? | 0 | |
| 10 | How many of these sumps are integrity tested within the test schedule? **Please list any sump integrity failures in table B1** | 0 | |
| 11 | Do all sumps and chambers have high level liquid alarms? | N/A | |
| 12 | If yes to Q11 are these failsafe systems included in a maintenance and testing programme? | N/A | |
| 13 | Is the Fire Water Retention Pond included in your integrity test programme? | N/A | |

**Table B1:** Summary details of bund /containment structure integrity test

| Bund/Containment structure ID | Type | Specify Other type | Product containment | Actual capacity | Capacity required* | Type of integrity test | Other test type | Test date | Integrity reports maintained on site? | Results of test | Integrity test failure explanation <50 words | Corrective action taken | Scheduled date for retest | Results of retest(if in current reporting year) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Derrygreenagh Bund NO:501-37-01 | reinforced concrete | | Gas Oil | 110,592 | 45000 | Hydraulic test | | 22/05/2017 | Yes | Pass | N/A | N/A | N/A | N/A |
| | | | | | | | | | | | | | | |

*Capacity required should comply with 25% or 110% containment rule as detailed in your licence

| | | | Commentary |
|---|---|---|---|
| 15 | Has integrity testing been carried out in accordance with licence requirements and are all structures tested in line with BS8007/EPA Guidance? | bunding and storage guidelines | SELECT |
| 16 | Are channels/transfer systems to remote containment systems tested? | | SELECT |
| 17 | Are channels/transfer systems compliant in both integrity and available volume? | | SELECT |

**Pipeline/underground structure testing**

| | | | |
|---|---|---|---|
| 1 | Are you required by your licence to undertake integrity testing* on underground structures e.g. pipelines or sumps etc ? if yes please fill out table 2 below listing all underground structures and pipelines on site **which failed the integrity test and all which have not been tested withing the integrity test period as specified** | Yes | No underground tanks or pipelines on site |
| 2 | Please provide integrity testing frequency period | SELECT | |

*please note integrity testing means water tightness testing for process and foul pipelines (as required under your licence)

**Table B2:** Summary details of pipeline/underground structures integrity test

| Structure ID | Type system | Material of construction: | Does this structure have Secondary containment? | Type of secondary containment | Type integrity testing | Integrity reports maintained on site? | Results of test | Integrity test failure explanation <50 words | Corrective action taken | Scheduled date for retest | Results of retest(if in current reporting year) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | SELECT | SELECT | SELECT | SELECT | SELECT | SELECT | SELECT | | | | SELECT |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

Please use commentary for additional details not answered by tables/ questions above

| Groundwater/Soil monitoring template | Lic No: | P0501-01 | Year | 2018 |
|---|---|---|---|---|

| | | | Comments | |
|---|---|---|---|---|
| 1 | Are you required to carry out groundwater monitoring as part of your licence requirements? | no | | Please provide an interpretation of groundwater monitoring data in the interpretation box below or if you require additional space please include a groundwater/contaminated land monitoring results interpretaion as an additional section in this AER |
| 2 | Are you required to carry out soil monitoring as part of your licence requireme | no | | |
| 3 | Do you extract groundwater for use on site? If yes please specify use in comment section | yes | Drinking water well | |
| 4 | Do monitoring results show that groundwater generic assessment criteria such as GTVs or IGVs are exceeded or is there an upward trend in results for a substance? If yes, please complete the Groundwater Monitoring Guideline Template Report (link in cell G8) and submit separately through ALDER as a licensee return AND answer questions 5-12 below. Groundwater monitoring template | no | | |
| 5 | Is the contamination related to operations at the facility (either current and/or historic) | no | | |
| 6 | Have actions been taken to address contamination issues?If yes please summarise remediation strategies proposed/undertaken for the site | N/A | | |
| 7 | Please specify the proposed time frame for the remediation strategy | N/A | | |
| 8 | Is there a licence condition to carry out/update ELRA for the site? | N/A | | |
| 9 | Has any type of risk assesment been carried out for the site? | N/A | | |
| 10 | Has a Conceptual Site Model been developed for the site? | N/A | | |
| 11 | Have potential receptors been identified on and off site? | N/A | | |
| 12 | Is there evidence that contamination is migrating offsite? | N/A | | Please enter interpretation of data here |

**Table 1: Upgradient Groundwater monitoring results**

| Date of sampling | Sample location reference | Parameter/ Substance | Methodology | Monitoring frequency | Maximum Concentration++ | Average Concentration+ | unit | GTV's* | SELECT** | Upward trend in pollutant concentration over last 5 years of monitoring data |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | SELECT | | | SELECT |
| | | | | | | | SELECT | | | SELECT |

.+ where average indicates arithmetic mean

.++ maximum concentration indicates the maximum measured concentration from all monitoring results produced during the reporting year

**Groundwater/Soil monitoring template** Lic No: P0501-01 Year 2018

**Table 2: Downgradient Groundwater monitoring results**

| Date of sampling | Sample location reference | Parameter/ Substance | Methodology | Monitoring frequency | Maximum Concentration | Average Concentration | unit | GTV's* | SELECT** | Upward trend in yearly average pollutant concentration over last 5 years of monitoring data |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | SELECT | | | SELECT |
| | | | | | | | SELECT | | | SELECT |

*please note exceedance of generic assessment criteria (GAC) such as a Groundwater Threshold Value (GTV) or an Interim Guideline Value (IGV) or an upward trend in results for a substance indicates that further interpretation of monitoring results is required. In addition to completing the above table, please complete the Groundwater Monitoring Guideline Template Report at the link provided and submit separately through ALDER as a licensee return or as otherwise instructed by the EPA.

Groundwater monitoring template

More information on the use of soil and groundwater standards/ generic assessment criteria (GAC) and risk assessment tools is available in the EPA published guidance (see the link in G31)

Guidance on the Management of Contaminated Land and Groundwater at EPA Licensed Sites (EPA 2013)

**Depending on location of the site and proximity to other sensitive receptors alternative Receptor based Water Quality standards should be used in addition to the GTV e.g. if the site is close to surface water compare to Surface Water Environmental Quality Standards (SWEQS), If the site is close to a drinking water supply compare results to the Drinking Water Standards (DWS)

Surface water EQS | Groundwater regulations GTV's | Drinking water (private supply) standards | Drinking water (public supply) standards | Interim Guideline Values (IGV)

**Table 3: Soil results**

| Date of sampling | Sample location reference | Parameter/ Substance | Methodology | Monitoring frequency | Maximum Concentration | Average Concentration | unit |
|---|---|---|---|---|---|---|---|
| | | | | | | | SELECT |
| | | | | | | | SELECT |

Where additional detail is required please enter it here in 200 words or less

| **Environmental Liabilities template** | Lic No: | P0501-01 | Year 2018 | 2018 |
|---|---|---|---|---|

Click here to access EPA guidance on Environmental Liabilities and Financial provision

| | | Commentary |
|---|---|---|
| ELRA initial agreement status | Not a licence requirement | |
| ELRA review status | NA | |
| Amount of Financial Provision cover required as determined by the latest ELRA | NA | |
| Financial Provision for ELRA status | NA | |
| Financial Provision for ELRA - amount of cover | NA | |
| Financial Provision for ELRA - type | NA | |
| Financial provision for ELRA expiry date | NA | |
| Closure plan initial agreement status | NA | Internal budget provision |
| Closure plan review status | NA | Internal budget provision |
| Financial Provision for Closure status | NA | Internal budget provision |
| Financial Provision for Closure - amount of cover | NA | Internal budget provision |
| Financial Provision for Closure - type | NA | Internal budget provision |
| Financial provision for Closure expiry date | NA | |

## Environmental Management Programme/Continuous Improvement Programme template

Lic No: P0501-01 Year 2018

Highlighted cells contain dropdown menu click to view

| | | | Additional Information |
|---|---|---|---|
| 1 | Do you maintain an Environmental Mangement System (EMS) for the site. If yes, please detail in additional information | Yes | Internal unaccredited EMS. |
| 2 | Does the EMS reference the most significant environmental aspects and associated impacts on-site | Yes | |
| 3 | Does the EMS maintain an Environmental Management Programme (EMP) as required in accordance with the licence requirements | Yes | |
| 4 | Do you maintain an environmental documentation/communication system to inform the public on environmental performance of the facility, as required by the licence | Yes | |

**Environmental Management Programme (EMP) report**

| Objective Category | Target | Status (% completed) | How target was progressed | Responsibility | Intermediate outcomes |
|---|---|---|---|---|---|
| Reduction of emissions to Air | Continue to train all employees in environmental matters. Training will be by means of a new four module training programme delivered by dedicated Bord na Mona training specialists. This new training programme includes environmental compliance-IPPC, Biodiversity, Archaeology and Energy management. Hydraulic harrows will be deployed at dust sensitive locations. Continue with the collection of headland peat. | 90 | In total 34 personnel received training during 2018. Hydraulic harrows were depolyed at 4 locations. Headland peat was collected at all locations and returned with production figures. | Individual | Reduced emissions |
| Waste reduction/Raw material usage efficiency | Waste streamlining is a project we are particularly interested in continuing and hope to reduce wastes further in the future and be more efficient in dealing with all aspects of waste management | 80 | Installed a waste management system. Monthly waste reports are returned for records/filing and waste streams are segrated on site to maximise recycling potential. | Section Head | Improved Environmental Management Practices |
| Waste reduction/Raw material usage efficiency | Continue with the recycling of polyethylene. The sourcing of more recycling contractors will be ongoing. | 100 | In total 80.9 tonnes of polyethlene were sent off site for recycling. Procurement also exploring the possibility of securing further recyclers. In an attempt to curtail illegal dumping on Bord na Mona remain in contact with Meath and Westmeath Co Councils. | Individual | Improved Environmental Management Practices |
| Energy Management | As part of an Energy Awareness campaign all aspects of energy consumption will be communicated to personnel with the intention of reducing consumption through awareness | 100 | The monthly consumption of energy was regurally communicated to the relevant personnel. This included the KPI's for peat production, maintenance and transportation as well as bog pumping and workshop electrical consumption. | Section Head | Reduce overall energy output while maintaining productivity. |
| Reduction of emissions to Water | Continue to train all employees in environmental matters. Training will be by means of a new four module training programme delivered by dedicated Bord na Mona training specialists. This new training programme includes environmental compliance-IPPC, Biodiversity, Archaeology and Energy management. Continue with the collection of headland peat. | 90 | In total 34 Personnel received training in 2018. Personnel are trained every two years in Environmental matters. Headland peat was collected at all locations and included as part of overall peat returns. | Individual | Improved Environmental Management Practices |

## Noise monitoring summary report

Lic No: P0501-01 Year 2018

| | | |
|---|---|---|
| 1 | Was noise monitoring a licence requirement for the AER period? If yes please fill in table N1 noise summary below | No |
| 2 | Was noise monitoring carried out using the EPA Guidance note, including completion of the "Checklist for noise measurement report" included in the guidance note as table 6? Noise Guidance note NG4 | NA |
| 3 | Does your site have a noise reduction plan | NA |
| 4 | When was the noise reduction plan last updated? | Enter date |
| 5 | Have there been changes relevant to site noise emissions (e.g. plant or operational changes) since the last noise survey? | NA |

**Table N1: Noise monitoring summary**

| Date of monitoring | Time period | Noise location (on site) | Noise sensitive location -NSL (if applicable) | $LA_{eq}$ | $LA_{90}$ | $LA_{10}$ | $LA_{max}$ | Tonal or Impulsive noise* (Y/N) | If tonal /impulsive noise was identified was 5dB penalty applied? | Comments (ex. main noise sources on site, & extraneous noise ex. road traffic) | Is site compliant with noise limits (day/evening/night)? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | SELECT | SELECT | | SELECT |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

*Please ensure that a tonal analysis has been carried out as per guidance note NG4. These records must be maintained onsite for future inspection

If noise limits exceeded as a result of noise attributed to site activities, please choose the corrective action from the following options? SELECT

** please explain the reason for not taking action/resolution of noise issues?

Any additional comments? (less than 200 words)

## Resource Usage/Energy efficiency summary

Lic No: P0501-01 Year 2018

| | | | Additional information |
|---|---|---|---|
| 1 | When did the site carry out the most recent energy efficiency audit? Please list the recommendations in table 3 below | Sep-18 | Report on file |
| 2 | Is the site a member of any accredited programmes for reducing energy usage/water conservation such as the SEAI programme linked to the right? If yes please list them in additional information | SEAI - Large Industry Energy Network (LIEN) Yes | ISO50001 accreditation attained from Certification Europe |
| 3 | Where Fuel Oil is used in boilers on site is the sulphur content compliant with licence conditions? Please state percentage in additional information | NA | Not a Licence requirement |

Table R1 Energy usage on site

| Energy Use | Previous year | Current year | Production +/- % compared to previous reporting year** | Energy Consumption +/- % vs overall site production* |
|---|---|---|---|---|
| Total Energy Used (MWHrs) | 6100 | 5858 | NA | NA |
| Total Energy Generated (MWHrs) | | | | |
| Total Renewable Energy Generated (MWHrs) | | | | |
| Electricity Consumption (MWHrs) | 451 | 226 | NA | NA |
| Fossil Fuels Consumption: | | | | |
| Heavy Fuel Oil (m3) | | | | |
| Light Fuel Oil (m3) | 555.988 | 1692 | | |
| Natural gas (m3) | | | | |
| Coal/Solid fuel (metric tonnes) | | | | |
| Peat (metric tonnes) | | | | |
| Renewable Biomass | | | | |
| Renewable energy generated on site | | | | |

* where consumption of energy can be compared to overall site production please enter this information as percentage increase or decrease compared to the previous reporting year.
** where site production information is available please enter percentage increase or decrease compared to previous year

Table R2 Water usage on site

| | | | | | Water Emissions | Water Consumption | |
|---|---|---|---|---|---|---|---|
| Water use | Water extracted Previous year m3/yr. | Water extracted Current year m3/yr. | Production +/- % compared to previous reporting year** | Energy Consumption +/- % vs overall site production* | Volume Discharged back to environment($m^3$yr) : | Volume used i.e not discharged to environment e.g. released as steam m3/yr | Unaccounted for Water: |
| Groundwater | | | | | | | |
| Surface water | | | | | | | |
| Public supply | | | | | | | |
| Recycled water | | | | | | | |
| Total | | | | | | | |

* where consumption of water can be compared to overall site production please enter this information as percentage increase or decrease compared to the previous reporting year.
** where site production information is available please enter percentage increase or decrease compared to previous year

Table R3 Waste Stream Summary

| | Total | Landfill | Incineration | Recycled | Other |
|---|---|---|---|---|---|
| Hazardous (Tonnes) | 92.8 | | | | |
| Non-Hazardous (Tonnes) | 332.73 | | | | |

Table R4: Energy Audit finding recommendations

| Date of audit | Recommendations | Description of Measures proposed | Origin of measures | Predicted energy savings % | Implementation date | Responsibility | Completion date | Status and comments |
|---|---|---|---|---|---|---|---|---|
| | | | SELECT | | | | | |
| | | | SELECT | | | | | |
| | | | SELECT | | | | | |

Table R5: Power Generation: Where power is generated onsite (e.g. power generation facilities/food and drink industry)please complete the following information

| | Unit ID | Unit ID | Unit ID | Unit ID | Station Total |
|---|---|---|---|---|---|
| Technology | | | | | |
| Primary Fuel | | | | | |
| Thermal Efficiency | | | | | |
| Unit Date of Commission | | | | | |
| Total Starts for year | | | | | |
| Total Running Time | | | | | |
| Total Electricity Generated (GWH) | | | | | |
| House Load (GWH) | | | | | |
| KWH per Litre of Process Water | | | | | |
| KWH per Litre of Total Water used on Site | | | | | |

**Complaints and Incidents summary template** Lic No: P0501-01 Year 2018

Complaints

| | Additional information |
|---|---|
| Yes | |

Have you received any environmental complaints in the current reporting year? If yes please complete summary details of complaints received on site in table 1 below

Table 1 Complaints summary

| Date | Category | Other type (please specify) | Brief description of complaint (Free txt <20 words) | Corrective action< 20 words | Resolution status | Resolution date | Further information |
|---|---|---|---|---|---|---|---|
| 04/04/2018 | Dust | | Complaint about dust blowing into adjoining land and silage | Moved stockpile | Complete | 05/04/2018 | Reported to Agency Ref:LR034726 |
| 14/06/2018 | Dust | | Complaint about dust blowing into their house and property | No peat production adjacent to the homeowner in question | Complete | 15/06/2018 | Reported to the Agency Ref:LR035599 |
| 25/08/2018 | Dust | | Complaint about dust blowing into their house and property | Employees reminded of their environmental training. | Complete | 25/08/2018 | Reported to the Agency Ref:LR036695 |
| | SELECT | | | | SELECT | | |
| | SELECT | | | | SELECT | | |

| | |
|---|---|
| Total complaints open at start of reporting year | 0 |
| Total new complaints received during reporting year | 3 |
| Total complaints closed during reporting year | 3 |
| Balance of complaints end of reporting year | 0 |

**Complaints and Incidents summary template** Lic No: P0501-01 Year 2018

| Incidents | | Additional information |
|---|---|---|
| Have any incidents occurred on site in the current reporting year? Please list all incidents for current reporting year in Table 2 below | Yes | |

| | |
|---|---|
| *For information on how to report and what constitutes an incident | What is an incident |

Table 2 Incidents summary

| Date of occurrence | Incident nature | Location of occurrence | Incident category*please refer to guidance | Receptor | Cause of incident | Other cause(please specify) | Activity in progress at time of incident | Communication | Occurrence | Corrective action<20 words | Preventative action <20 words | Resolution status | Resolution date | Likelihood of reoccurence |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16/02/2018 | Trigger level reached | Lisclogher SW-20 | 1. Minor | Water | Other (add details) | Unknown | Normal activities | EPA INCI014018 | New | Investigate | None Required | Complete | 07/03/2018 | Low |
| 05/04/2018 | Spillage | Toar Bog | 1. Minor | Ground | Other (add details) | Plant or equipment breakdown | Normal activities | EPA INCI014221 | New | Investigate | Material excavated and removed. Incident reporting re-emphasised to all personnel. | Complete | 05/04/2018 | Low |
| 24/04/2018 | Trigger level reached | Rossan Bog SW-43 | 1. Minor | Water | Other (add details) | Unknown | Normal activities | EPA INCI014395 | New | Investigate | None Required | Complete | 15/05/2018 | Medium |
| 07/06/2018 | Trigger level reached | Ballivor Bog SW-35 | 1. Minor | Water | Other (add details) | Unknown | Normal activities | EPA INCI014714 | New | Investigate | None Required | Complete | 02/07/2018 | Medium |
| 07/06/2018 | Trigger level reached | Ballivor Bog SW-38 | 1. Minor | Water | Other (add | Unknown | Normal activities | EPA INCI014715 | New | Investigate | None Required | Complete | 02/07/2018 | Medium |
| 07/06/2018 | Trigger level reached | Ballivor Bog SW-39 | 1. Minor | Water | Other (add details) | Unknown | Normal activities | EPA INCI014716 | New | Investigate | None Required | Complete | 02/07/2018 | Medium |
| 07/06/2018 | Trigger level reached | Ballivor Bog SW-40 | 1. Minor | Water | Other (add details) | Unknown | Normal activities | EPA INCI014717 | New | Investigate | None Required | Complete | 02/07/2018 | Medium |
| 07/06/2018 | Trigger level reached | Ballivor Bog SW-41 | 1. Minor | Water | Other (add details) | Unknown | Normal activities | EPA INCI014719 | New | Investigate | None Required | Complete | 02/07/2018 | Medium |
| 07/06/2018 | Trigger level reached | Carranstown Bog SW-31 | 1. Minor | Water | Other (add details) | Unknown | Normal activities | EPA INCI014720 | New | Investigate | None Required | Complete | 02/07/2018 | Medium |
| 07/06/2018 | Trigger level reached | Carranstown Bog SW-32 | 1. Minor | Water | Other (add details) | Unknown | Normal activities | EPA INCI014732 | New | Investigate | None Required | Complete | 02/07/2018 | Medium |
| 07/06/2018 | Trigger level reached | Carranstown Bog SW-33 | 1. Minor | Water | Other (add details) | Unknown | Normal activities | EPA INCI014733 | New | Investigate | None Required | Complete | 02/07/2018 | Medium |
| 07/06/2018 | Trigger level reached | Carranstown Bog SW-34 | 1. Minor | Water | Other (add details) | Unknown | Normal activities | EPA INCI014734 | New | Investigate | None Required | Complete | 02/07/2018 | Medium |
| 12/06/2018 | Trigger level reached | Rossan Bog SW-43 | 1. Minor | Water | Other (add details) | Unknown | Normal activities | EPA INCI014736 | Recurring | Investigate | None Required | Complete | 02/07/2018 | Medium |
| 26/06/2018 | Trigger level reached | Rossan Bog SW-43 | 1. Minor | Water | Other (add details) | Unknown | Normal activities | EPA INCI014737 | New | Investigate | None Required | Complete | 02/07/2018 | Medium |
| 01/10/2018 | Trigger level reached | Rossan Bog SW-43 | 1. Minor | Water | Other (add details) | Unknown | Normal activities | EPA INCI015376 | Recurring | Investigate | None Required | Complete | 18/10/2018 | Medium |
| 11/10/2018 | Trigger level reached | Ballybeg Bog SW-12 | 1. Minor | Water | Other (add details) | Unknown | Normal activities | EPA INCI015377 | New | Investigate | None Required | Complete | 18/10/2018 | Medium |
| 11/10/2018 | Trigger level reached | Ballybeg Bog SW-13 | 1. Minor | Water | Other (add details) | Unknown | Normal activities | EPA INCI015378 | New | Investigate | None Required | Complete | 18/10/2018 | Medium |
| 11/10/2018 | Trigger level reached | Ballybeg Bog SW-13A | 1. Minor | Water | Other (add details) | Unknown | Normal activities | EPA INCI015379 | New | Investigate | None Required | Complete | 18/10/2018 | Medium |
| 11/10/2018 | Trigger level reached | Toar Bog SW-14 | 1. Minor | Water | Other (add details) | Unknown | Normal activities | EPA INCI015380 | New | Investigate | None Required | Complete | 18/10/2018 | Medium |
| 15/10/2018 | Trigger level reached | Rossan Bog SW-43 | 1. Minor | Water | Other (add details) | Unknown | Normal activities | EPA INCI015381 | Recurring | Investigate | None Required | Complete | 18/10/2018 | Medium |
| 24/09/2018 | Trigger level reached | Rossan Bog SW-43 | 1. Minor | Water | Other (add details) | Unknown | Normal activities | EPA INCI015382 | Recurring | Investigate | None Required | Complete | 25/09/2018 | Medium |
| 06/11/2018 | Trigger level reached | Rossan Bog SW-43 | 1. Minor | Water | Other (add details) | Unknown | Normal activities | EPA INCI015641 | Recurring | Investigate | None Required | Complete | 05/12/2018 | Medium |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| Total number of incidents current year | 22 | | | | | | | | | | | | | |
| Total number of incidents previous year | 6 | | | | | | | | | | | | | |
| % reduction/ increase | 366% | | | | | | | | | | | | | |

| WASTE SUMMARY | Lic No: | P0501-01 | Year | 2018 |
|---|---|---|---|---|
| SECTION A-PRTR ON SITE WASTE TREATMENT AND WASTE TRANSFERS TAB- TO BE COMPLETED BY ALL IPPC AND WASTE FACILITIES | | PRTR facility logon | dropdown list click to see options | |

**SECTION B- WASTE ACCEPTED ONTO SITE-TO BE COMPLETED BY ALL IPPC AND WASTE FACILITIES**

| | | | Additional Information |
|---|---|---|---|
| 1 | Were any wastes accepted onto your site for recovery or disposal or treatment prior to recovery or disposal within the boundaries of your facility ?; (waste generated within your boundaries is to be captured through PRTR reporting) | N/A | |
| | If yes please enter details in table 1 below | | |
| 2 | Did your site have any rejected consignments of waste in the current reporting year? If yes please give a brief explanation in the additional information | N/A | |
| 3 | Was waste accepted onto your site that was generated outside the Republic of Ireland? If yes please state the quantity in tonnes in additional information | N/A | |

**Table 1 Details of waste accepted onto your site for recovery, disposal or treatment (do not include wastes generated at your site, as these will have been reported in your PRTR workbook)**

| Licenced annual tonnage limit for your site (total tonnes/annum) | EWC code<br>European Waste Catalogue EWC codes | Source of waste accepted | Description of waste accepted<br>**Please enter an accurate and detailed description - which applies to relevant EWC code**<br>European Waste Catalogue EWC codes | Quantity of waste accepted in current reporting year (tonnes) | Quantity of waste accepted in previous reporting year (tonnes) | Reduction/ Increase over previous year +/ - % | Reason for reduction/ increase from previous reporting year | Packaging Content (%)- only applies if the waste has a packaging component | Disposal/Recovery or treatment operation carried out at your site and the description of this operation | Quantity of waste remaining on site at the end of reporting year (tonnes) | Comments - |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**SECTION C-TO BE COMPLETED BY ALL WASTE FACILITIES (waste transfer stations, Composters, Material recovery facilities etc) EXCEPT LANDFILL SITES**

| | | | |
|---|---|---|---|
| 4 | Is all waste processing infrastructure as required by your licence and approved by the Agency in place? If no please list waste processing infrastructure required onsite | SELECT | |
| 5 | Is all waste storage infrastructure as required by your licence and approved by the Agency in place? If no please list waste storage infrastructure required on site | SELECT | |
| 6 | Does your facility have relevant nuisance controls in place? | SELECT | |
| 7 | Do you have an odour management system in place for your facility? If no why? | SELECT | |
| 8 | Do you maintain a sludge register on site? | SELECT | |

**SECTION D-TO BE COMPLETED BY LANDFILL SITES ONLY**

**Table 2 Waste type and tonnage-landfill only**

| Waste types permitted for disposal | Authorised/licenced annual intake for disposal (tpa) | Actual intake for disposal in reporting year (tpa) | Remaining licensed capacity at end of reporting year (m3) | Comments |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |

| WASTE SUMMARY | Lic No: | P0501-01 | Year | 2018 |
|---|---|---|---|---|

## Table 3 General information-Landfill only

| Area ID | Date landfilling commenced | Date landfilling ceased | Currently landfilling | Private or Public Operated | Inert or non-hazardous | Predicted date to cease landfilling | Licence permits asbestos | Is there a separate cell for asbestos? | Accepted asbestos in reporting year | Total disposal area occupied by waste | Lined disposal area occupied by waste | Unlined area | Comments on liner type |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | SELECT UNIT | SELECT UNIT | SELECT UNIT | |
| | | | | | | | | | | | | | |

## Table 4 Environmental monitoring-landfill only Landfill Manual-Monitoring Standards

| Was meterological monitoring in compliance with Landfill Directive (LD) standard in reporting year + | Was leachate monitored in compliance with LD standard in reporting year | Was Landfill Gas monitored in compliance with LD standard in reporting year | Was SW monitored in compliance with LD standard in reporting year | Have GW trigger levels been established | Were emission limit values agreed with the Agency (ELVs) | Was topography of the site surveyed in reporting year | Has the statement under S53(A)(5) of WMA been submitted in reporting year | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

.+ please refer to Landfill Manual linked above for relevant Landfill Directive monitoring standards

## Table 5 Capping-Landfill only

| Area uncapped* | Area with temporary cap | Area with final cap to LD Standard m2 ha, a | Area capped other | Area with waste that should be permanently capped to date under licence | What materials are used in the cap | Comments |
|---|---|---|---|---|---|---|
| SELECT UNIT | SELECT UNIT | | | | | |
| | | | | | | |

*please note this includes daily cover area

## Table 6 Leachate-Landfill only

| | | |
|---|---|---|
| 9 | Is leachate from your site treated in a Waste Water Treatment Plant? | SELECT |
| 10 | Is leachate released to surface water? If yes please complete leachate mass load information below | SELECT |

| Volume of leachate in reporting year(m3) | Leachate (BOD) mass load (kg/annum) | Leachate (COD) mass load (kg/annum) | Leachate (NH4) mass load (kg/annum) | Leachate (Chloride) mass load kg/annum | Leachate treatment on-site | Specify type of leachate treatment | Comments |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

Please ensure that all information reported in the landfill gas section is consistent with the Landfill Gas Survey submitted in conjunction with PRTR returns

## Table 7 Landfill Gas-Landfill only

| Gas Captured&Treated by LFG System m3 | Power generated (MW / KWh) | Used on-site or to national grid | Was surface emissions monitoring performed during the reporting year? | Comments |
|---|---|---|---|---|
| | | | SELECT | |

**Waste Summary Continued** Lic No: P0501-01 Year 2018

| European Waste Code (EWC) | Description of Waste (in line with applicable EWC code) | Hazardous - Yes/No | Quantity (Tonnes) | Name & Permit No. of Agent/Carrier | Treatment Type – Recovered / Disposed / Recycled | Name, Address & Licence/Permit No. of FINAL Destination | Location of Treatment - Country |
|---|---|---|---|---|---|---|---|
| 02 01 04 | waste plastics (except packaging) | No | 80.9 | ADN Materials Ltd.WFP-MN-12-0001-04 | R05 - Recycling/reclamation of other inorganic materials | ADN Materials Ltd., Lossetts, Carrickmacross, Co. Monaghan - WFP-MN-12-0001-04 | Ireland |
| 08 01 11* | waste paint and varnish containing organic solvents or other hazardous substances | Yes | 1 | Enva Ireland Limited (Portlaoise) - W0184 | R02 - Solvent reclamation/regeneration | Recyfuel Ltd., Enghis - BE0459.735.458 | Belgium |
| 11 01 13* | degreasing wastes containing hazardous substances | Yes | 0.27 | Safety Kleen Ireland Ltd - W0099 | R11 - Use of waste obtained from any of the operations numbered R 1 to R 10 | Solvent Recovery Management, PP33345F, Wheeland Rd., Knottingly, West Yorks | UK |
| 13 02 05* | mineral-based non-chlorinated engine, gear and lubricating oils | Yes | 10.37 | Enva Ireland Limited (Portlaoise) - W0184 | R01 - Use principally as a fuel or other means to generate energy | Enva Ireland Limited, Clonminam Industrial Estate, Portlaoise - W0184 | Ireland |
| 13 05 03* | interceptor sludges | Yes | 46.14 | Enva Ireland Limited (Portlaoise) - W0184 | R01 - Use principally as a fuel or other means to generate energy | Enva Ireland Limited, Clonminam Industrial Estate, Portlaoise - W0184 | Ireland |
| 15 01 03 | wooden packaging | No | 12.08 | AES Ltd WP-OY-08-601-01 | R01 - Use principally as a fuel or other means to generate energy | AES LTD, Cappincur, Tullamore, Co. Offaly - WP-OY-08-601-01 | Ireland |
| 15 02 02* | absorbents, filter materials (including oil filters not otherwise specified), wiping cloths, protective clothing contaminated by hazardous substances | Yes | 1.01 | Enva Ireland Limited (Portlaoise) - W0184 | R01 - Use principally as a fuel or other means to generate energy | Lindenschmidt, Kreutzal - Reg No: E97095037 | Germany |
| 16 01 07* | oil filters | Yes | 1.06 | Enva Ireland Limited (Portlaoise) - W0184 | R04 - Recycling/reclamation of metals and metal compounds | R.D. Recycling, Houthalen, Reg No: 51727/1KD | Belgium |
| 16 06 01* | lead batteries | Yes | 0.96 | Enva Ireland Limited (Portlaoise) - W0184 | R04 - Recycling/reclamation of metals and metal compounds | Campine Recycling, Beerse - MLAV/05173/GVDA | Belgium |
| 17 04 07 | mixed metals | No | 57.78 | AES Ltd WP-OY-08-601-01 | R04 - Recycling/reclamation of metals and metal compounds | AES LTD, Cappincur, Tullamore, Co. Offaly - WP-OY-08-601-01 | Ireland |
| 20 03 01 A | Municipal mixed residual household | No | 5.79 | AES Ltd WP-OY-08-601-01 | D05 - Specially engineered landfill (e.g. placement into lined discrete cells which are capped and isolated from one another and the environment, etc.) | AES LTD, Cappincur, Tullamore, Co. Offaly - WP-OY-08-601-01 | Ireland |
| 20 03 01 B | Municipal mixed residual non-household | No | 20.62 | AES Ltd WP-OY-08-601-01 | D05 - Specially engineered landfill (e.g. placement into lined discrete cells which are capped and isolated from one another and the environment, etc.) | AES LTD, Cappincur, Tullamore, Co. Offaly - WP-OY-08-601-01 | Ireland |
| 17 05 03* | soil and stones containing hazardous substances | Yes | 31.98 | Enva Ireland Limited (Portlaoise) - W0184 | D10 - Incineration on land | Enva Ireland Limited, Clonminam Industrial Estate, Portlaoise - W0184 | Ireland |

**Derrygreenagh**

**Decommissioning and Rehabilitation**
**Bog Rehabilitation Progress Report 2018.**

Within the Derrygreenagh licensed area (P0501-01) there were no entire bog units available for rehabilitation in 2018. Ongoing monitoring of cutaway within the Derrygreenagh licensing area included the re-survey of Drumman bog.
Monitoring of cutaway sites within the Derrygreenagh Bog Group is ongoing with Lisclogher East re-surveyed in 2018. The surveys comprised of baseline walkover surveys to identify and map pioneer and established habitats on the cutaway and to assess the condition of raised bog remnants along bog margins.

Some fertiliser (Ground Rock Phosphate) was applied to an area within Derryarkin Bog in 2018 to speed up natural recolonization, as part of the rehabilitation plan for this bog.

Bog restoration and drain-blocking is being carried out at a remnant section of high bog at Daingean Rathdrum. This work was completed in 2018.

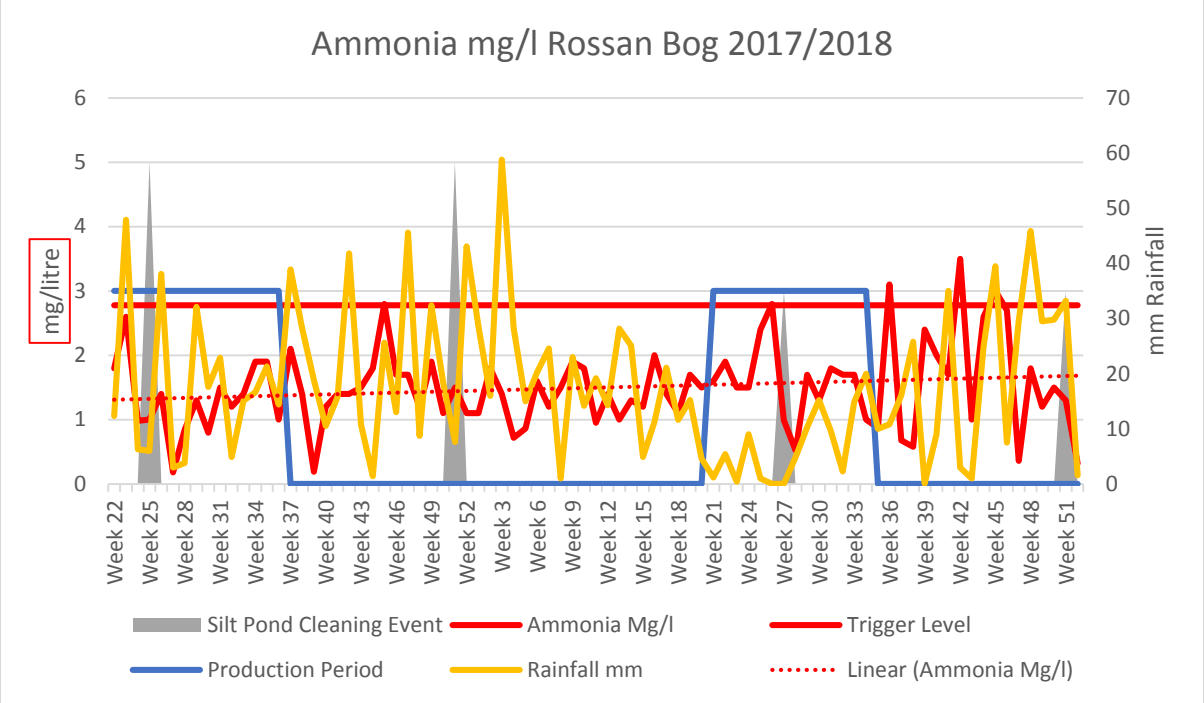
Draft rehabilitation plans for the Derrygreenagh bogs licensed area, including more detailed draft plans for each component bog unit were submitted to the EPA in 2013 and these were reviewed and updated in 2015, and 2017.

The new Biodiversity Action Plan (2016-2021) was launched in 2016 with the annual Biodiversity Action Plan review day being held in February 2017, this included an update on the progress of this plan, bog restoration and cutaway rehabilitation for a wide range on statutory and non-statutory consultees including members of the EPA, NPWS, BWI, Bord na Mona, Coillte, Inland Fisheries Ireland, An Taisce, IPCC, Irish Red Grouse Association, Irish Wildlife Trust, NARGC, local game councils, Midland Regional Planning Authority as well as a range of local community groups and Heritage Officers from counties Laois, Offaly, Kildare, Roscommon, Longford, Meath, Galway, Westmeath and Dublin.

A copy of our Biodiversity Action Plan is available to view and download at http://www.bordnamona.ie/our-company/biodiversity/

As required by condition *10.2 Cutaway Bog Rehabilitation Plans*, draft peatland rehabilitation plans for all the individual bog units were submitted to the agency in 2013, reviewed and amended in 2015 and re-submitted to the agency in 2015. All draft rehabilitation plans have been reviewed in 2017. These reviewed and amended plans will be re-submitted to the agency in due course.
Organic certification was sought for the majority of the Bord na Móna property with the aim of using some areas for the cultivation of plants for use in herbal medicine, this project is ongoing.

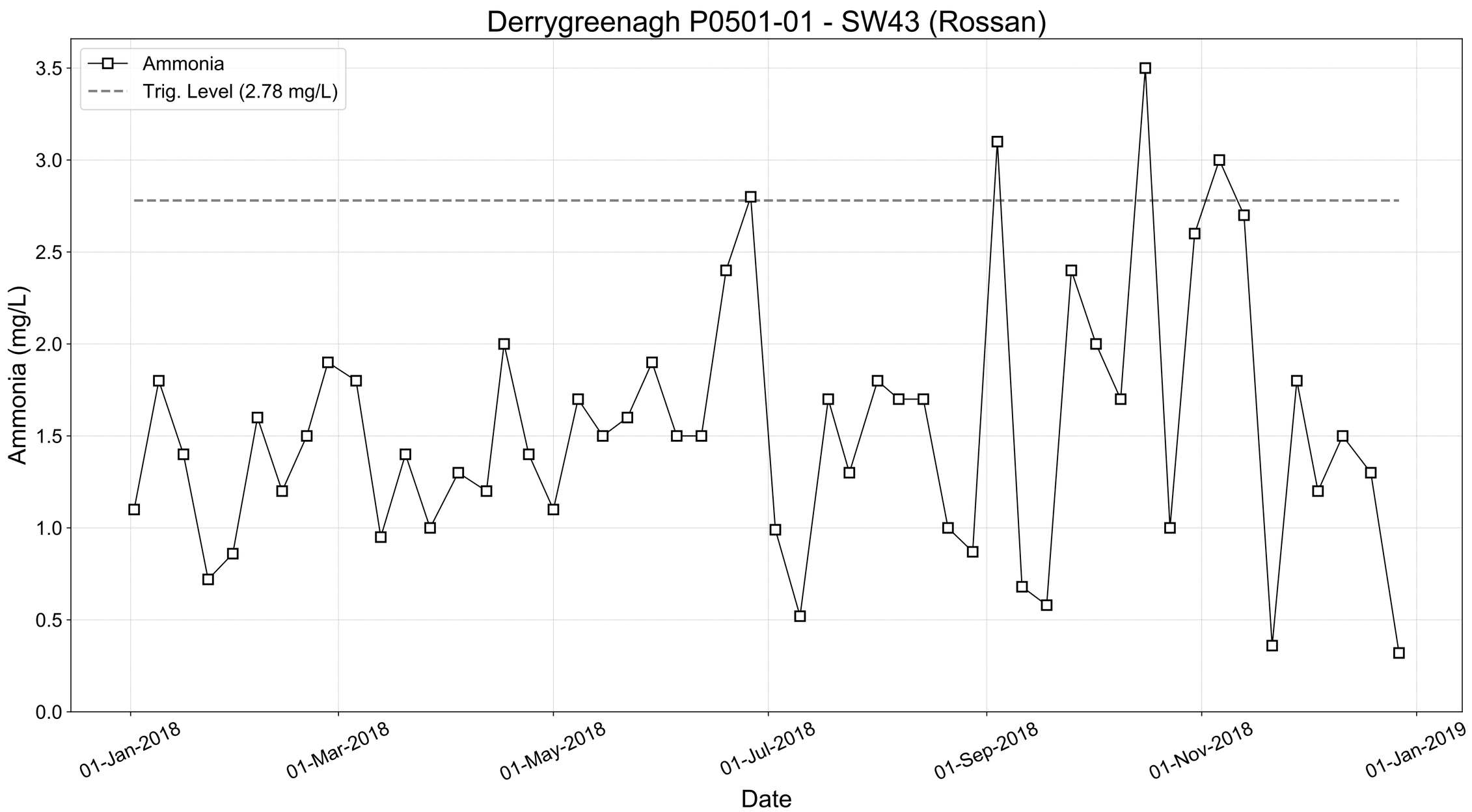
| Bord na Mona Derrygreenagh PO501-01 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Grab Sampling 2018 | | | | | | | | | | | | |
| X | Y | Bog | SW | Monitoring | Sampled | pH | SS | TS | Ammonia | TP | COD | Colour |
| 262436.96 | 258824.82 | Lisclogher | SW-19 | Q1 18 | 16/02/2018 | 6.8 | 5 | 124 | 0.1 | 0.05 | 72 | 340 |
| 262935.72 | 258722.5 | Lisclogher | SW-20 | Q1 18 | 16/02/2018 | 5.8 | 5 | 160 | 0.14 | 0.05 | 119 | 548 |
| 262969.12 | 258691.34 | Lisclogher | SW-21 | Q1 18 | 16/02/2018 | 5.4 | 5 | 116 | 0.11 | 0.05 | 96 | 417 |
| 263432.94 | 258465.16 | Lisclogher | SW-22 | Q1 18 | 16/02/2018 | 6.9 | 5 | 164 | 0.96 | 0.05 | 93 | 544 |
| 263467.21 | 258446.56 | Lisclogher | SW-23 | Q1 18 | 16/02/2018 | 7.3 | 5 | 196 | 1.6 | 0.06 | 82 | 399 |
| 263740.8 | 258367.96 | Lisclogher | SW-24 | Q1 18 | 16/02/2018 | 4.3 | 5 | 60 | 0.09 | 0.05 | 47 | 212 |
| 266022.62 | 259613.57 | Lisclogher | SW-25 | Q1 18 | 20/02/2018 | 7.4 | 5 | 358 | 2.9 | 0.12 | 85 | 277 |
| 260583.98 | 256514.28 | Bracklin | SW-26 | Q1 18 | 16/02/2018 | 6.4 | 5 | 96 | 0.71 | 0.06 | 57 | 191 |
| 260609.41 | 256526.33 | Bracklin | SW-27 | Q1 18 | 16/02/2018 | 7.1 | 5 | 224 | 1.6 | 0.05 | 72 | 326 |
| 263649.63 | 255035.41 | Carranstown | SW-31 | Q2 18 | 07/06/2018 | 7.6 | 5 | 171 | 0.03 | 0.05 | 126 | 230 |
| 265553.99 | 255989.11 | Carranstown | SW-32 | Q2 18 | 07/06/2018 | 7.6 | 5 | 394 | 0.54 | 0.1 | 140 | 176 |
| 265632.83 | 254865.04 | Carranstown | SW-33 | Q2 18 | 07/06/2018 | 7.1 | 35 | 414 | 2.8 | 0.65 | 124 | 178 |
| 265886.95 | 254984.18 | Carranstown | SW-34 | Q2 18 | 07/06/2018 | 7.4 | 12 | 432 | 0.99 | 0.12 | 142 | 272 |
| 265140.06 | 254114.54 | Ballivor | SW-35 | Q2 18 | 07/06/2018 | 7.7 | 15 | 476 | 0.06 | 0.09 | 144 | 242 |
| 265878.97 | 253506.58 | Ballivor | SW-38 | Q2 18 | 07/06/2018 | 8 | 8 | 212 | 0.24 | 0.08 | 136 | 238 |
| 265888.99 | 253456.63 | Ballivor | SW-39 | Q2 18 | 07/06/2018 | 7.9 | 5 | 286 | 0.07 | 0.11 | 115 | 104 |
| 266366.86 | 251598.58 | Ballivor | SW-40 | Q2 18 | 07/06/2018 | 7.6 | 9 | 436 | 1.6 | 0.12 | 124 | 134 |
| 266386.45 | 251579.18 | Ballivor | SW-41 | Q2 18 | 07/06/2018 | 7.8 | 6 | 356 | 0.02 | 0.07 | 110 | 102 |
| 255381.16 | 243606.05 | Derryhinch | SW-1 | Q3 18 | 10/09/2018 | 7.7 | 7 | 344 | 0.51 | 0.09 | 78 | 95 |
| 254528.83 | 242354.28 | Derryhinch | SW-2 | Q3 18 | 10/09/2018 | 7.6 | 5 | 228 | 1.1 | 0.06 | 61 | 119 |
| 253369.19 | 242417.94 | Derryhinch | SW-3 | Q3 18 | 10/09/2018 | 7.7 | 5 | 214 | 2.3 | 0.05 | 49 | 201 |
| 252602.78 | 242540.17 | Derryhinch | SW-4 | Q3 18 | 10/09/2018 | 7.8 | 5 | 432 | 0.08 | 0.05 | 52 | 105 |
| 252623.61 | 241470.16 | Carrick | SW-4A | Q3 18 | 10/09/2018 | 7.9 | 5 | 288 | 0.95 | 0.05 | 61 | 227 |
| 252468.68 | 240919.32 | Carrick | SW-5 | Q3 18 | 10/09/2018 | 7.5 | 5 | 394 | 0.09 | 0.05 | 42 | 59 |
| 252409.71 | 241163.33 | Carrick | SW-6 | Q3 18 | 10/09/2018 | 7.6 | 5 | 462 | 0.1 | 0.05 | 42 | 66 |
| 252473.21 | 241162.01 | Carrick | SW-7 | Q3 18 | 10/09/2018 | 7.6 | 5 | 462 | 0.09 | 0.06 | 42 | 142 |
| 252275.61 | 239871.62 | Drumman | SW-8 | Q3 18 | 10/09/2018 | 8 | 5 | 366 | 0.35 | 0.05 | 50 | 166 |
| 252950.37 | 238421.69 | Drumman | SW-9 | Q3 18 | 10/09/2018 | 7.5 | 5 | 240 | 0.04 | 0.07 | 62 | 146 |
| 251559.92 | 235341.71 | Ballybeg | SW-11 | Q4 18 | 15/10/2018 | 7.2 | 5 | 418 | 0.12 | 0.05 | 61 | 119 |
| 252206.09 | 235207.02 | Ballybeg | SW-12 | Q4 18 | 15/10/2018 | 7.1 | 5 | 358 | 3 | 0.05 | 83 | 213 |
| 251880.6 | 234593.13 | Ballybeg | SW-13 | Q4 18 | 15/10/2018 | 7.3 | 5 | 368 | 3.7 | 0.05 | 74 | 184 |
| 252250.49 | 235061.45 | Ballybeg | SW-13A | Q4 18 | 15/10/2018 | 7.2 | 5 | 402 | 3 | 0.05 | 71 | 148 |
| 240485.16 | 235706.33 | Toar | SW-14 | Q4 18 | 11/10/2018 | 7.2 | 14 | 396 | 3.2 | 0.05 | 35 | 42 |
| 244391.76 | 235128.93 | Toar | SW-15 | Q4 18 | 11/10/2018 | 7.5 | 9 | 418 | 0.42 | 0.05 | 37 | 44 |
| 244435.64 | 235093.42 | Toar | SW-16 | Q4 18 | 11/10/2018 | 7.8 | 5 | 452 | 0.15 | 0.25 | 44 | 59 |
| 240425.65 | 234997.32 | Toar | SW-17 | Q4 18 | 11/10/2018 | 8.1 | 5 | 328 | 0.02 | 0.1 | 10 | 32 |
| 259415.3 | 256855.75 | Bracklin | SW-29 | Q4 18 | 15/10/2018 | 7 | 5 | 164 | 2.6 | 0.28 | 91 | 345 |
| 259519.45 | 257618.44 | Bracklin | SW-30 | Q4 18 | 15/10/2018 | 6.6 | 5 | 136 | 2.4 | 0.05 | 95 | 90 |

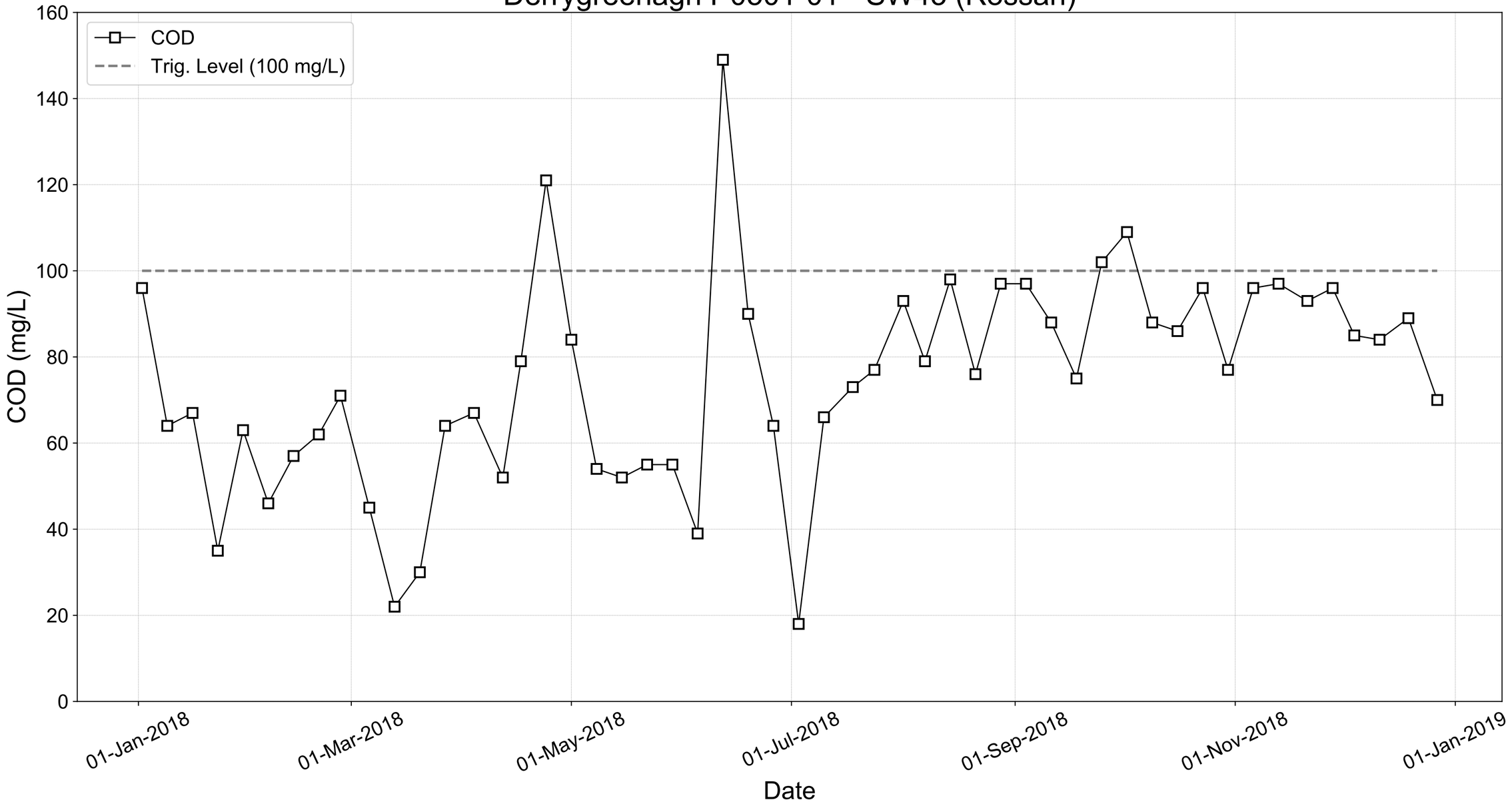


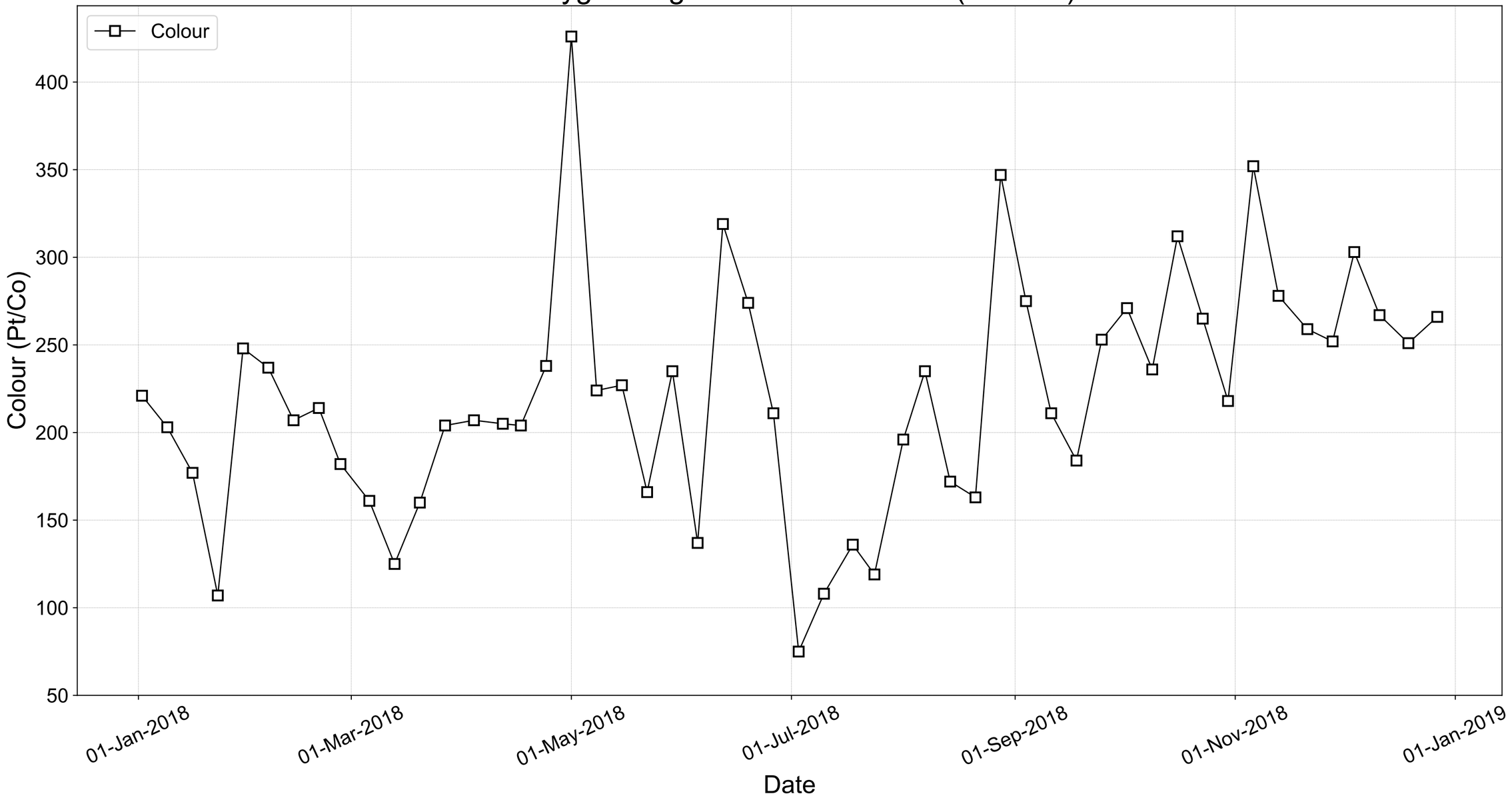

Rossan bog is an active horticultural production bog with the composite sampler located here from May 2017 where it was moved from Toar Bog within the Derrygreenagh IPC Licence. The composite sampler takes a flow proportional composite sample over a 24 hour period. The sampler had 0% downtime during this reporting period and returned 52 weekly ammonia results during the period. The ammonia trigger level of 2.78mg/l, as agreed with the Agency, was exceeded four times during the period, all reported to the Agency. Overall the sampling period of 82 weeks showed a slightly increasing trend in ammonia.

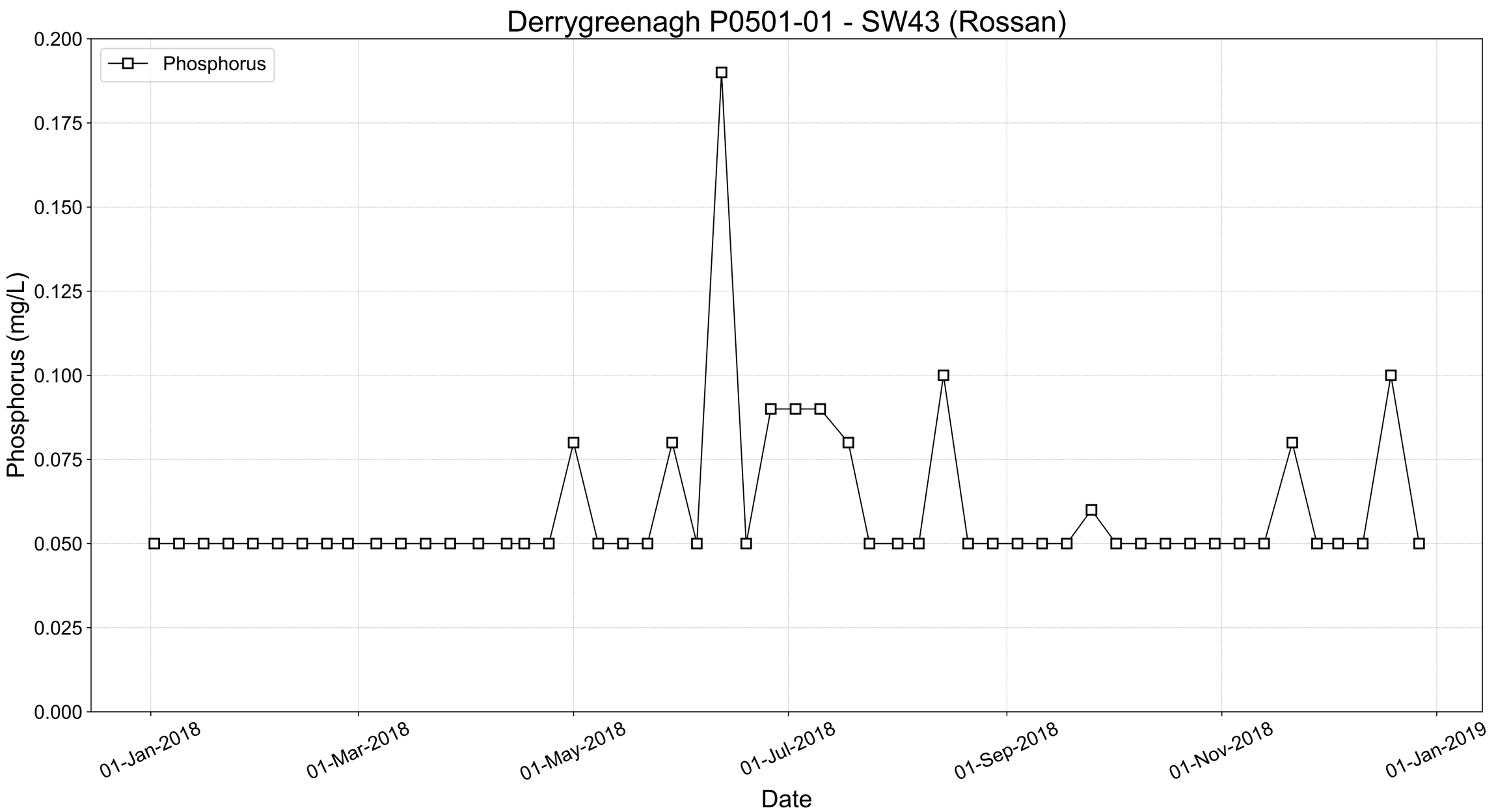
There is no obvious link between the summer production, winter maintenance, or silt pond maintenance events on the concentration of Ammonia discharging from this peatland. The only link expected would be that related to rainfall events and seasonal weather patterns and the subsequent surfacewater runoff and associated ammonia concentrations.

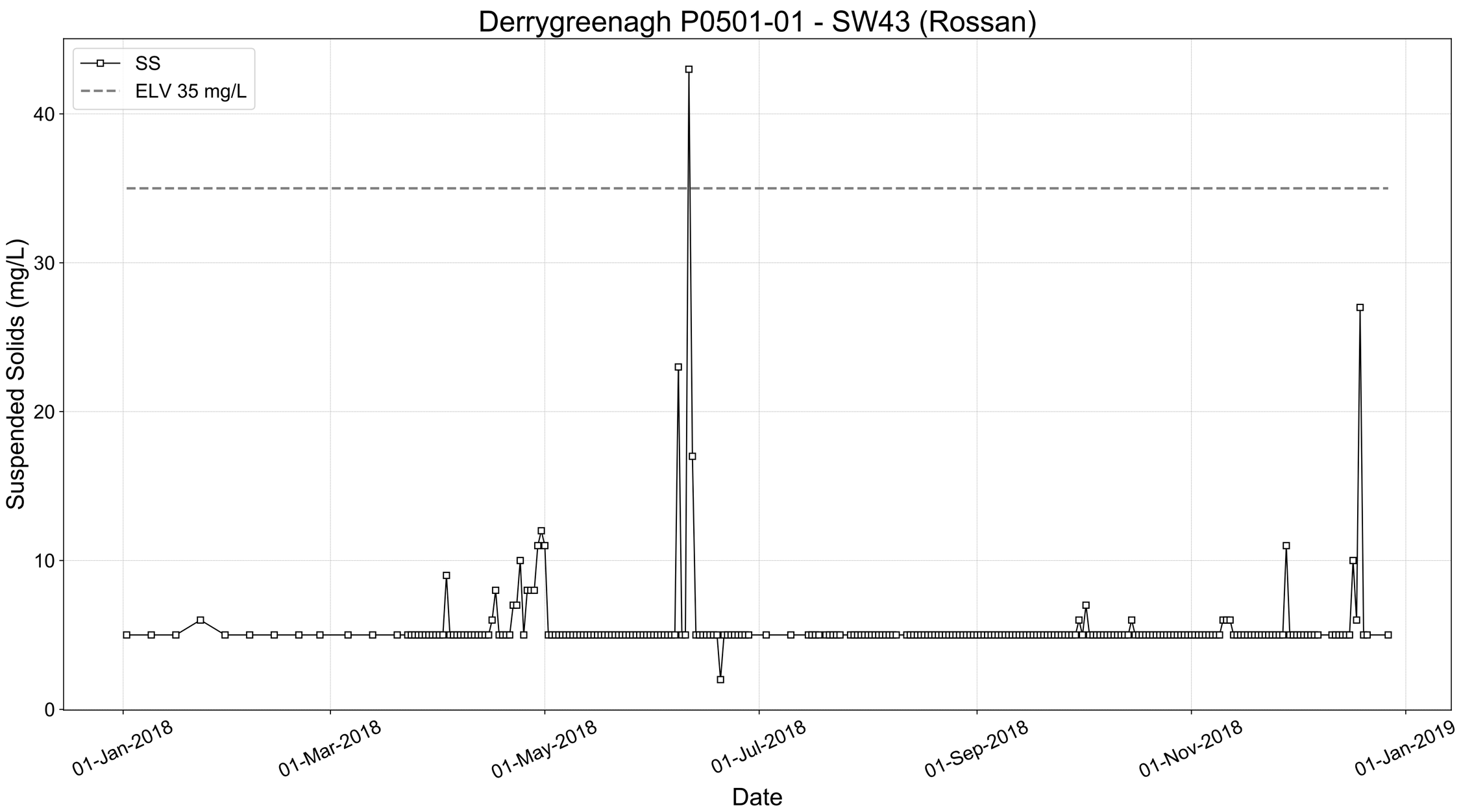
The sampler at this location may be relocated to fill any information gaps on other peatland catchments and to reflect the need to support the information gathering required for the Water Framework Directive's River Basin Management Plan. There is also an EPA lead research project commencing in 2019, called the SWAMP project, whose aims are to appraise and understand the nutrient impact from peatlands, to evaluate treatment technologies and to propose predictive tools for watershed management.

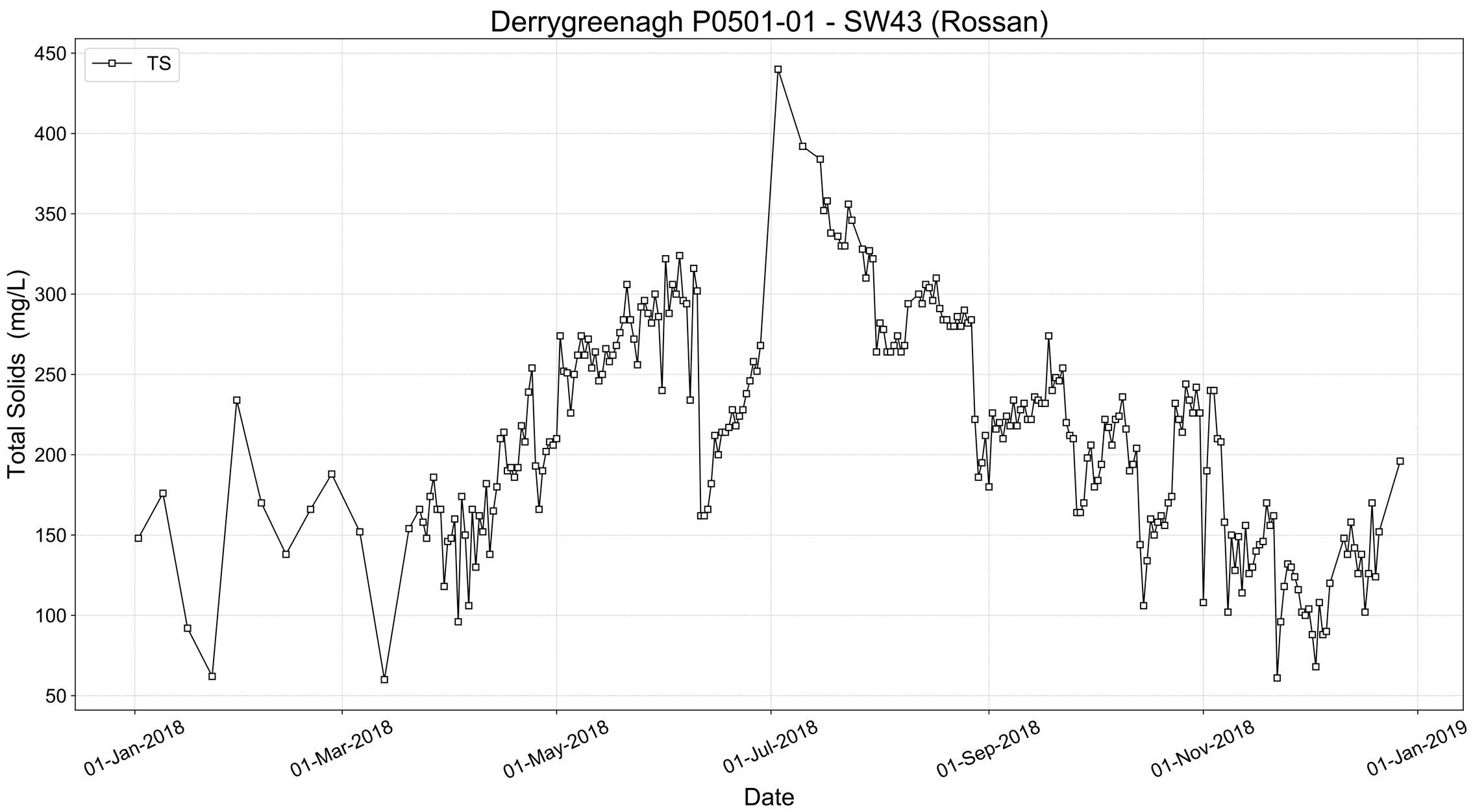

Derrygreenagh P0501-01 - SW43 (Rossan)
Ammonia
Trig. Level (2.78 mg/L)
Ammonia (mg/L)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
01-Jan-2018
01-Mar-2018
01-May-2018
01-Jul-2018
01-Sep-2018
01-Nov-2018
01-Jan-2019
Date

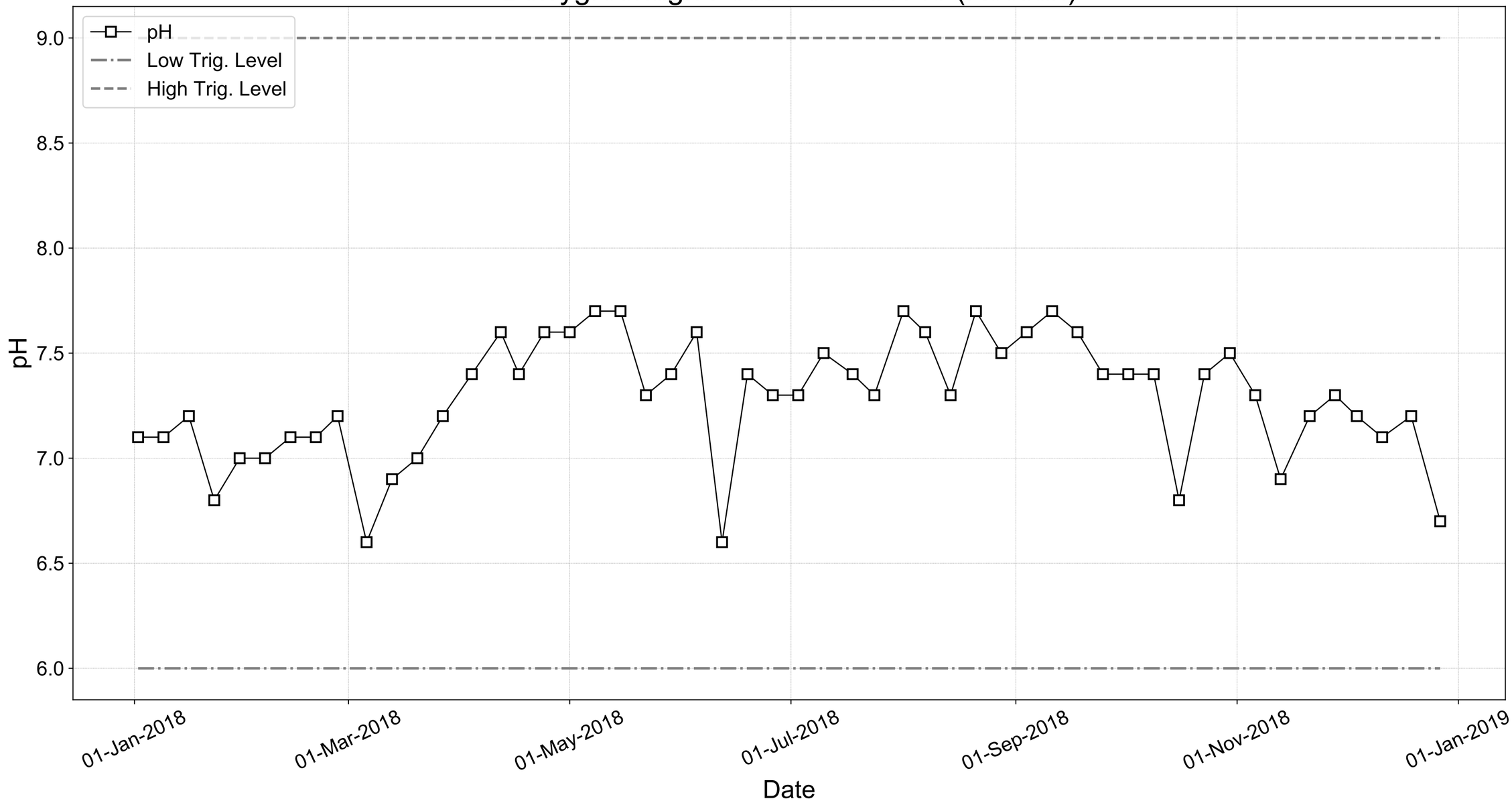

Derrygreenagh P0501-01 - SW43 (Rossan)
COD
Trig. Level (100 mg/L)
COD (mg/L)
0
20
40
60
80
100
120
140
160
01-Jan-2018
01-Mar-2018
01-May-2018
01-Jul-2018
01-Sep-2018
01-Nov-2018
01-Jan-2019
Date


Derrygreenagh P0501-01 - SW43 (Rossan)
Colour
Colour (Pt/Co)
400
350
300
250
200
150
100
50
01-Jan-2018
01-Mar-2018
01-May-2018
01-Jul-2018
01-Sep-2018
01-Nov-2018
01-Jan-2019
Date


Derrygreenagh P0501-01 - SW43 (Rossan)
Phosphorus
Phosphorus (mg/L)
0.200
0.175
0.150
0.125
0.100
0.075
0.050
0.025
0.000
01-Jan-2018
01-Mar-2018
01-May-2018
01-Jul-2018
01-Sep-2018
01-Nov-2018
01-Jan-2019
Date


Derrygreenagh P0501-01 - SW43 (Rossan)
SS
ELV 35 mg/L
Suspended Solids (mg/L)
0
10
20
30
40
01-Jan-2018
01-Mar-2018
01-May-2018
01-Jul-2018
01-Sep-2018
01-Nov-2018
01-Jan-2019
Date


Derrygreenagh P0501-01 - SW43 (Rossan)
TS
Total Solids (mg/L)
450
400
350
300
250
200
150
100
50
01-Jan-2018
01-Mar-2018
01-May-2018
01-Jul-2018
01-Sep-2018
01-Nov-2018
01-Jan-2019
Date


Derrygreenagh P0501-01 - SW43 (Rossan)
pH
Low Trig. Level
High Trig. Level
9.0
8.5
8.0
7.5
7.0
6.5
6.0
pH
01-Jan-2018
01-Mar-2018
01-May-2018
01-Jul-2018
01-Sep-2018
01-Nov-2018
01-Jan-2019
Date

**Yard Discharge Results 2018**

**Licence: P0501-01**

**Works: Derrygreenagh**

| Month | D/Greenagh SWE 2 COD | Rossan SWE 1 COD |
|---|---|---|
| Jan | 49 | 52 |
| Feb | 18 | 56 |
| Mar | 18 | 29 |
| Apr | 32 | 53 |
| May | 10 | 48 |
| June | 0 | 0 |
| July | 0 | 0 |
| Aug | 0 | 0 |
| Sep | 40 | 68 |
| Oct | 10 | 21 |
| Nov | 21 | 60 |
| Dec | 34 | 21 |

**Note: 0** denotes no flow at emission point on day of sampling

**Extractive Waste Management Plan Implementation AER Update.**

**March 2019.**

**IPC Licence P0501-01.**

**1.0 Extractive Wastes.**

Waste classified as extractive waste from peat extraction operations arise from two operations associated with this activity.

- Silt Pond excavations and maintenance
- Bog Timbers

There has been no change to the type and nature of these two waste streams and no new waste streams added to this list. These wastes streams continue to be stored and maintained at between 1 and 3 metres in height.

**2.0 Condition 7.5 Extractive Waste Management**

- An extractive waste management plan (EWMP) was submitted to the Agency in September 2012 and was approved.
- The EWMP was reviewed in September 2017. There were no substantial changes to the operation of the plan, associated waste facilities or to the waste deposited.

**3.0 Minimisation**

- The IPC Licence has various conditions that require the installation, inspections and maintenance of silt ponds for operational areas and as such these requirements dictate the need for silt ponds and associated excavation materials and cleanings.
- Bog timbers arise from the active production footprint and are naturally occurring. The active footprint is dictated by the peat production targets and customer supply contract and service level agreements.

**4.0 Treatment**

- Silt pond excavation and maintenance materials do not require any treatment and are stored as per the EWMP, adjacent to the associated silt pond.
- There is no treatment of bog timbers arising and these are stockpiled at various locations in associated bogs.

**5.0 Recovery**

- As per the EWMP, there is still no opportunity to recover these silt pond associated materials
- Bog timbers stored on the bog are natural to the peat bog and while there have been trails to recover this waste material, these have not proved viable.

**6.0 Disposal**

- Silt pond cleanings continue to be disposed of adjacent to the associated silt pond and will be incorporated back into the rehabilitation plans for these bogs, post production and decommissioning.
- Bog timbers will continue to be stockpiled at suitable locations to be either incorporated back into the bog, as a supply of bog timbers for the crafting industry or will continue to decay naturally.

# Annual Environmental Report 2019
# Bord na Mona Energy Ltd
# (Derrygreenagh Group of Bogs)
# IPC Licence P0501-01

LEABEG, TULLAMORE, CO. OFFALY, IRELAND
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| Facility Information Summary | |
|---|---|
| AER Reporting Year | 2019 |
| Licence Register Number | P0501-01 |
| Name of site | Bord na Mona Derrygreenagh |
| Site Location | Derrygreenagh, Rochfortbridge, Co Westmeath |
| NACE Code | 0892 |
| Class/Classes of Activity | 1.4 |
| National Grid Reference (6E, 6 N) | 249450, 238140 |

| | |
|---|---|
| A description of the activities/processes at the site for the reporting year. This should include information such as production increases or decreases on site, any infrastructural changes, environmental performance which was measured during the reporting year **and an overview of compliance with your licence** listing all exceedances of licence limits (where applicable) and what they relate to e.g. air, water, noise. | Activities on site can be divided into two components, firstly the milling, harrowing, ridiging and harvesting of peat into stockpiles and secondly the transportation of that peat via an internal rail network to the Power Station and lorry outloading facilities. Production achieved was approximately 140,237 tonnes which is a 52% reduction on the 2018 figure. Quarterly grab sampling was 100% compliant with regard to the ELV, with the continuous composite sampling returning no non-compliances for suspended solids, with 29% downtime due to battery and maintenence issues but 52 weekly samples were achieved. The number of exceedances in trigger levels noted and reported to the Agency was 11 which was a 50% reduction on 2018, with the majority being exceedances in COD or Ammonia Trigger levels, with one spillage incident where a stolen tractor was driven into a drain with a resultant fuel spillage that required remediation. There was one environmental complaint received during the reporting period, this was dust related and was resolved to the satisfaction of the complainant and reported to the Agency. In relation to silt pond cleaning, 100% of all 58 silt ponds received the required two cleanings, with inspections dictating the cleaning schedules. During the reporting period, there were a number of notifications to the Agency including notification of an interim cessation of peat extraction at Derrygreenagh, pending regularisation. Decommissioning and Rehabilitation works are described in an attachment. |

**Declaration:**

All the data and information presented in this report has been checked and certified as being accurate. The quality of the information is assured to meet licence requirements.

| | |
|---|---|
| Cathal Brenna | 31/05/2020 |
| Signature<br>Group/Facility manager<br>(or nominated, suitably qualified and experienced deputy) | Date |

| AIR-summary template | Lic No: | P0501-01 | Year | 2019 |
|---|---|---|---|---|

**Answer all questions and complete all tables where relevant**

| | | | Additional information |
|---|---|---|---|
| 1 | Does your site have licensed air emissions? If yes please complete table A1 and A2 below for the current reporting year and answer further questions. If **you do not have** licenced emissions and **do not complete a solvent management plan** (table A4 and A5) you do not need to complete the tables | No | Fugitive emissions only |

## Periodic/Non-Continuous Monitoring

| | | | |
|---|---|---|---|
| 2 | Are there any results in breach of licence requirements? If yes please provide brief details in the comment section of TableA1 below | No | |
| 3 | Was all monitoring carried out in accordance with EPA guidance note AG2 and using the basic air monitoring checklist? Basic air monitoring checklist AGN2 | Yes | |

### Table A1: Licensed Mass Emissions/Ambient data-periodic monitoring (non-continuous)

| Emission reference no: | Parameter/ Substance | Frequency of Monitoring | ELV in licence or any revision therof | Licence Compliance criteria | Measured value | Unit of measurement | Compliant with licence limit | Method of analysis | Annual mass load (kg) | Comments -reason for change in % mass load from previous year if applicable |
|---|---|---|---|---|---|---|---|---|---|---|
| | SELECT | | | SELECT | | SELECT | SELECT | SELECT | | |
| | SELECT | | | SELECT | | SELECT | SELECT | SELECT | | |
| | SELECT | | | SELECT | | SELECT | SELECT | SELECT | | |
| | SELECT | | | SELECT | | SELECT | SELECT | SELECT | | |

Note 1: Volumetric flow shall be included as a reportable parameter

| AIR-summary template | Lic No: | P0501-01 | Year | 2019 |
|---|---|---|---|---|

## Continuous Monitoring

| | | | |
|---|---|---|---|
| 4 | Does your site carry out continuous air emissions monitoring? | No | |

If yes please review your continuous monitoring data and report the required fields below in Table A2 and compare it to its relevant Emission Limit Value (ELV)

| | | | |
|---|---|---|---|
| 5 | Did continuous monitoring equipment experience downtime? If yes please record downtime in table A2 below | No | |
| 6 | Do you have a proactive service agreement for each piece of continuous monitoring equipment? | No | |
| 7 | Did your site experience any abatement system bypasses? If yes please detail them in table A3 below | No | |

### Table A2: Summary of average emissions -continuous monitoring

| Emission reference no: | Parameter/ Substance | ELV in licence or any revision therof | Averaging Period | Compliance Criteria | Units of measurement | Annual Emission | Annual maximum | Monitoring Equipment downtime (hours) | Number of ELV exceedences in current reporting year | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| DM-01 | Total Particulates | 350 | 140 DAYS | Daily average < ELV | mg/m2/day | 4536 | 83 | 0 | 0 | Dust monitioring took place on 4 occasions for 28 days each time between April and August |
| DM-02 | Total Particulates | 350 | 140 DAYS | Daily average < ELV | mg/m2/day | 8512 | 178 | 0 | 0 | |
| DM-03 | Total Particulates | 350 | 140 DAYS | Daily average < ELV | mg/m2/day | 10808 | 166 | 0 | 0 | |
| DM-04 | Total Particulates | 350 | 140 DAYS | Daily average < ELV | mg/m2/day | 12740 | 261 | 0 | 0 | |
| | SELECT | | | | SELECT | | | | | |

note 1: Volumetric flow shall be included as a reportable parameter.

### Table A3: Abatement system bypass reporting table

Bypass protocol

| Date* | Duration** (hours) | Location | Reason for bypass | Impact magnitude | Corrective action |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

* this should include all dates that an abatement system bypass occurred

** an accurate record of time bypass beginning and end should be logged on site and maintained for future Agency inspections please refer to bypass protocol link

| AIR-summary template | Lic No: | P0501-01 | Year | 2019 |
|---|---|---|---|---|

## Solvent use and management on site

8 Do you have a total Emission Limit Value of direct and fugitive emissions on site? if yes please fill out tables A4 and A5

SELECT

**Table A4: Solvent Management Plan Summary**
**Total VOC Emission limit value**

Solvent regulations — Please refer to linked solvent regulations to complete table 5 and 6

| Reporting year | Total solvent input on site (kg) | Total VOC emissions to Air from entire site (direct and fugitive) | Total VOC emissions as %of solvent input | Total Emission Limit Value (ELV) in licence or any revision therof | Compliance |
|---|---|---|---|---|---|
| | | | | | SELECT |
| | | | | | SELECT |

**Table A5: Solvent Mass Balance summary**

| | (I) Inputs (kg) | (O) Outputs (kg) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Solvent | (I) Inputs (kg) | Organic solvent emission in waste | Solvents lost in water (kg) | Collected waste solvent (kg) | Fugitive Organic Solvent (kg) | Solvent released in other ways e.g. | Solvents destroyed onsite | Total emission of Solvent to air (kg) |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | Total | |

**AER Monitoring returns summary template-WATER/WASTEWATER(SEWER)** Lic No: P0501-01 Year 2019

| | | | Additional information |
|---|---|---|---|
| 1 | Does your site have licensed emissions direct to surface water or direct to sewer? If yes please complete table W2 and W3 below for the current reporting year and answer further questions. If **you do not have** licenced emissions you only need to complete table W1 and or W2 for storm water analysis and visual inspections | Yes | |
| 2 | Was it a requirement of your licence to carry out visual inspections on any surface water discharges or watercourses on or near your site? If yes please complete table W2 below summarising only any evidence of contamination noted during visual inspections | Yes | Monthly COD of yard run-off is attached. |

**Table W1 Storm water monitoring**

| Location reference | Location relative to site activities | PRTR Parameter | Licenced Parameter | Monitoring date | ELV or trigger level in licence or any revision thereof* | Licence Compliance criteria | Measured value | Unit of measurement | Compliant with licence | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| | SELECT | SELECT | SELECT | | | SELECT | | SELECT | SELECT | |
| | SELECT | SELECT | SELECT | | | SELECT | | SELECT | SELECT | |

*trigger values may be agreed by the Agency outside of licence conditions

**Table W2 Visual inspections-Please only enter details where contamination was observed.**

| Location Reference | Date of inspection | Description of contamination | Source of contamination | Corrective action | Comments |
|---|---|---|---|---|---|
| | | | SELECT | | |
| | | | SELECT | | |

**Licensed Emissions to water and /or wastewater(sewer)-periodic monitoring (non-continuous)**

| | | | | |
|---|---|---|---|---|
| 3 | Was there any result in breach of licence requirements? If yes please provide brief details in the comment section of Table W3 below | | No | |
| 4 | Was all monitoring carried out in accordance with EPA guidance and checklists for Quality of Aqueous Monitoring Data Reported to the EPA? If no please detail what areas require improvement in additional information box | External /Internal Lab Quality checklist / Assessment of results checklist | Yes | Surface water monitoring was carried out on a quarterly basis. The results of which are attached. |

**Table W3: Licensed Emissions to water and /or wastewater (sewer)-periodic monitoring (non-continuous)**

| Emission reference no: | Emission released to | Parameter/ SubstanceNote 1 | Type of sample | Frequency of monitoring | Averaging period | ELV or trigger values in licence or any revision therof[Note 2] | Licence Compliance criteria | Measured value | Unit of measurement | Compliant with licence | Method of analysis | Procedural reference source | Procedural reference standard number | Annual mass load (kg) | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

Note 1: Volumetric flow shall be included as a reportable parameter

Note 2: Where Emission Limit Values (ELV) do not apply to your licence please compare results against EQS for Surface water or relevant receptor quality standards

**AER Monitoring returns summary template-WATER/WASTEWATER(SEWER)** Lic No: P0501-01 Year 2019

## Continuous monitoring

| | | | Additional Information |
|---|---|---|---|
| 5 | Does your site carry out continuous emissions to water/sewer monitoring? | Yes | Flow proportionate composite sampling |

**If yes please summarise your continuous monitoring data below in Table W4 and compare it to its relevant Emission Limit Value (ELV)**

| | | | |
|---|---|---|---|
| 6 | Did continuous monitoring equipment experience downtime? **If yes please record downtime in table W4 below** | Yes | Total of 108 days over 365 days |
| 7 | Do you have a proactive service contract for each piece of continuous monitoring equipment on site? | Yes | |
| 8 | Did abatement system bypass occur during the reporting year? **If yes please complete table W5 below** | No | |

## Table W4: Summary of average emissions -continuous monitoring

| Emission reference no: | Emission released to | Parameter/ Substance | ELV or trigger values in licence or any revision thereof | Averaging Period | Compliance Criteria | Units of measurement | Annual Emission for current reporting year (kg) | % change +/- from previous reporting year | Monitoring Equipment downtime (hours) | Number of ELV exceedences in reporting year | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SW43 | Water | Suspended Solids | 35 | 24 hour | All results < 1.5 times ELV, plus 8 from ten results must be < ELV | mg/L | | | 2592 | 0 | Down time due to battery failure, and sampler repairs. Agency informed of repairs. Its not possible to report average continuous emissions as this sampler is located on one of 58 silt ponds and samplers are moved around periodically to allow for analysis of other silt pond performance. |
| SW43 | Water | Ammonia (as N) | 2.78 | Weekly | NA | mg/L | | | | | |
| SW43 | Water | Total phosphorus | NA | Weekly | NA | mg/L | | | | | |
| SW43 | Water | COD | 100 | Weekly | NA | mg/L | | | | | |
| SW43 | Water | volumetric flow | NA | 24 hour | NA | m3/day | | | | | |
| SW43 | Water | Total Dissolved Solids | NA | Weekly | NA | mg/L | | | | | |

note 1: Volumetric flow shall be included as a reportable parameter.

## Table W5: Abatement system bypass reporting table

| Date | Duration (hours) | Location | Resultant emissions | Reason for bypass | Corrective action* | Was a report submitted to the EPA? | When was this report submitted? |
|---|---|---|---|---|---|---|---|
| | | | | | | SELECT | |
| | | | | | | | |
| | | | | | | | |

*Measures taken or proposed to reduce or limit bypass frequency

## Bund/Pipeline testing template

Lic No: P0501-01 Year 2019

Bund testing

dropdown menu click to see options

| | | | Additional information |
|---|---|---|---|
| 1 | Are you required by your licence to undertake integrity testing on bunds and containment structures ? if yes please fill out table B1 below listing all **new bunds and containment structures** on site, in addition to **all bunds which failed** the integrity test-**all bunding structures which failed including mobile bunds must be listed in the table below, please include all bunds outside the licenced testing period** (mobile bunds and chemstore included) | Yes | |
| 2 | Please provide integrity testing frequency period | Other (2 Yearly) | |
| 3 | Does the site maintain a register of bunds, underground pipelines (including stormwater and foul), Tanks, sumps and containers? (containers refers to "Chemstore" type units and mobile bunds) | Yes | |
| 4 | How many bunds are on site? | 2 | |
| 5 | How many of these bunds have been tested within the required test schedule? | 2 | |
| 6 | How many mobile bunds are on site? | 0 | |
| 7 | Are the mobile bunds included in the bund test schedule? | No | |
| 8 | How many of these mobile bunds have been tested within the required test schedule? | 0 | |
| 9 | How many sumps on site are included in the integrity test schedule? | 0 | |
| 10 | How many of these sumps are integrity tested within the test schedule? | 0 | |
| | **Please list any sump integrity failures in table B1** | | |
| 11 | Do all sumps and chambers have high level liquid alarms? | N/A | |
| 12 | If yes to Q11 are these failsafe systems included in a maintenance and testing programme? | N/A | |
| 13 | Is the Fire Water Retention Pond included in your integrity test programme? | N/A | |

**Table B1:** Summary details of bund /containment structure integrity test

| Bund/Containment structure ID | Type | Specify Other type | Product containment | Actual capacity | Capacity required* | Type of integrity test | Other test type | Test date | Integrity reports maintained on site? | Results of test | Integrity test failure explanation <50 words | Corrective action taken | Scheduled date for retest | Results of retest(if in current reporting year) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Derrygreenagh Bund NO:501-37-01 | reinforced concrete | | Gas Oil | 110,592 | 45000 | Hydraulic test | | 22/07/2019 | Yes | Pass | N/A | N/A | N/A | N/A |
| | | | | | | Hydraulic test | | | | | | | | |

* Capacity required should comply with 25% or 110% containment rule as detailed in your licence

| | | | Commentary |
|---|---|---|---|
| 15 | Has integrity testing been carried out in accordance with licence requirements and are all structures tested in line with BS8007/EPA Guidance? | SELECT | |
| 16 | Are channels/transfer systems to remote containment systems tested? | SELECT | |
| 17 | Are channels/transfer systems compliant in both integrity and available volume? | SELECT | |

bunding and storage guidelines

Pipeline/underground structure testing

| | | | |
|---|---|---|---|
| 1 | Are you required by your licence to undertake integrity testing* on underground structures e.g. pipelines or sumps etc ? if yes please fill out table 2 below listing all underground structures and pipelines on site **which failed the integrity test and all which have not been tested withing the integrity test period as specified** | Yes | No underground tanks or pipelines on site |
| 2 | Please provide integrity testing frequency period | SELECT | |

*please note integrity testing means water tightness testing for process and foul pipelines (as required under your licence)

**Table B2:** Summary details of pipeline/underground structures integrity test

| Structure ID | Type system | Material of construction: | Does this structure have Secondary containment? | Type of secondary containment | Type integrity testing | Integrity reports maintained on site? | Results of test | Integrity test failure explanation <50 words | Corrective action taken | Scheduled date for retest | Results of retest(if in current reporting year) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | SELECT | SELECT | SELECT | SELECT | SELECT | SELECT | SELECT | | | | SELECT |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

Please use commentary for additional details not answered by tables/ questions above

| Groundwater/Soil monitoring template | Lic No: | P0501-01 | Year | 2019 |
|---|---|---|---|---|

| | | | Comments | |
|---|---|---|---|---|
| 1 | Are you required to carry out groundwater monitoring as part of your licence requirements? | no | | Please provide an interpretation of groundwater monitoring data in the interpretation box below or if you require additional space please include a groundwater/contaminated land monitoring results interpretaion as an additional section in this AER |
| 2 | Are you required to carry out soil monitoring as part of your licence requirements? | no | | |
| 3 | Do you extract groundwater for use on site? If yes please specify use in comment section | yes | Drinking water well | |
| 4 | Do monitoring results show that groundwater generic assessment criteria such as GTVs or IGVs are exceeded or is there an upward trend in results for a substance? If yes, please complete the Groundwater Monitoring Guideline Groundwater monitoring template | no | | |
| 5 | Is the contamination related to operations at the facility (either current and/or historic) | no | | |
| 6 | Have actions been taken to address contamination issues?If yes please summarise remediation strategies proposed/undertaken for the site | N/A | | |
| 7 | Please specify the proposed time frame for the remediation strategy | N/A | | |
| 8 | Is there a licence condition to carry out/update ELRA for the site? | N/A | | |
| 9 | Has any type of risk assesment been carried out for the site? | N/A | | |
| 10 | Has a Conceptual Site Model been developed for the site? | N/A | | |
| 11 | Have potential receptors been identified on and off site? | N/A | | |
| 12 | Is there evidence that contamination is migrating offsite? | N/A | | Please enter interpretation of data here |

## Table 1: Upgradient Groundwater monitoring results

| Date of sampling | Sample location reference | Parameter/ Substance | Methodology | Monitoring frequency | Maximum Concentration++ | Average Concentration+ | unit | GTV's* | SELECT** | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | SELECT | | | SELECT |
| | | | | | | | SELECT | | | SELECT |

.+ where average indicates arithmetic mean

.++ maximum concentration indicates the maximum measured concentration from all monitoring results produced during the reporting year

## Table 2: Downgradient Groundwater monitoring results

| Date of sampling | Sample location reference | Parameter/ Substance | Methodology | Monitoring frequency | Maximum Concentration | Average Concentration | unit | GTV's* | SELECT** | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | SELECT | | | SELECT |
| | | | | | | | SELECT | | | SELECT |

*please note exceedance of generic assessment criteria (GAC) such as a Groundwater Threshold Value (GTV) or an Interim Guideline Value (IGV) or an upward trend in results for a substance indicates that further interpretation of monitoring results is required. In addition to completing the above table, please complete the Groundwater Monitoring Guideline Template Report at the link provided and submit separately through ALDER as a licensee return or as otherwise instructed by the EPA. Groundwater monitoring template

More information on the use of soil and groundwater standards/ generic assessment criteria (GAC) and risk assessment tools is available in the EPA published guidance (see the link in G31) Guidance on the Management of Contaminated Land and Groundwater at EPA Licensed Sites (EPA 2013).

**Depending on location of the site and proximity to other sensitive receptors alternative Receptor based Water Quality standards should be used in addition to the GTV e.g. if the site is close to surface water compare to Surface Water Environmental Quality Standards (SWEQS), If the site is close to a drinking water supply compare results to the Drinking Water Standards (DWS)

Surface water EQS | Groundwater regulations GTV's | Drinking water (private supply) standards | Drinking water (public supply) standards | Interim Guideline Values (IGV)

**Groundwater/Soil monitoring template** Lic No: P0501-01 Year 2019

**Table 3: Soil results**

| Date of sampling | Sample location reference | Parameter/ Substance | Methodology | Monitoring frequency | Maximum Concentration | Average Concentration | unit |
|---|---|---|---|---|---|---|---|
| | | | | | | | SELECT |
| | | | | | | | SELECT |

Where additional detail is required please enter it here in 200 words or less

| Environmental Liabilities template | Lic No: | P0501-01 | Year 2017 | 2019 |
|---|---|---|---|---|

Click here to access EPA guidance on Environmental Liabilities and Financial provision

| | | | Commentary |
|---|---|---|---|
| 1 | ELRA initial agreement status | Not a licence requirement | |
| 2 | ELRA review status | NA | |
| 3 | Amount of Financial Provision cover required as determined by the latest ELRA | NA | |
| 4 | Financial Provision for ELRA status | NA | |
| 5 | Financial Provision for ELRA - amount of cover | NA | |
| 6 | Financial Provision for ELRA - type | NA | |
| 7 | Financial provision for ELRA expiry date | NA | |
| 8 | Closure plan initial agreement status | NA | |
| 9 | Closure plan review status | NA | |
| 10 | Financial Provision for Closure status | NA | |
| 11 | Financial Provision for Closure - amount of cover | NA | |
| 12 | Financial Provision for Closure - type | NA | |
| 13 | Financial provision for Closure expiry date | NA | |

## Environmental Management Programme/Continuous Improvement Programme template

Lic No: P0501-01 Year 2019

Highlighted cells contain dropdown menu click to view

| | | | Additional Information |
|---|---|---|---|
| 1 | Do you maintain an Environmental Mangement System (EMS) for the site. If yes, please detail in additional information | Yes | Internal unaccredited EMS. |
| 2 | Does the EMS reference the most significant environmental aspects and associated impacts on-site | Yes | |
| 3 | Does the EMS maintain an Environmental Management Programme (EMP) as required in accordance with the licence requirements | Yes | |
| 4 | Do you maintain an environmental documentation/communication system to inform the public on environmental performance of the facility, as required by the licence | Yes | |

**Environmental Management Programme (EMP) report**

| Objective Category | Target | Status (% completed) | How target was progressed | Responsibility | Intermediate outcomes |
|---|---|---|---|---|---|
| Reduction of emissions to Air | Continue to train all employees in environmental matters. Training will be by means of a new four module training programme delivered by dedicated Bord na Mona training specialists. This new training programme includes environmental compliance-IPPC, Biodiversity, Archaeology and Energy management. Hydraulic harrows will be deployed at dust sensitive locations. Continue with the collection of headland peat. | 50 | In total 0 Personnel received training in 2019. Training takes place every two years, so no training due in the period. Hydraulic harrows were depolyed at 4 locations. Headland peat was collected at all locations and returned with production figures. | Individual | Reduced emissions |

| Environmental Management Programme/Continuous Improvement Programme template | | | | Lic No: | P0501-01 | Year | 2019 |
|---|---|---|---|---|---|---|---|
| Waste reduction/Raw material usage efficiency | Waste streamlining is a project we are particularly interested in continuing and hope to reduce wastes further in the future and be more efficient in dealing with all aspects of waste management | 80 | Installed a waste management system. Monthly waste reports are returned for records/filing and waste streams are segrated on site to maximise recycling potential. | Section Head | Improved Environmental Management Practices | | |
| Waste reduction/Raw material usage efficiency | Continue with the recycling of polyethylene. The sourcing of more recycling contractors will be ongoing. | 100 | In total 89.85 tonnes of polyethlene were sent off site for recycling. Procurement also exploring the possibility of securing further recyclers. | Individual | Improved Environmental Management Practices | | |
| Energy Management | As part of an Energy Awareness campaign all aspects of energy consumption will be communicated to personnel with the intention of reducing consumption through awareness | 80 | The monthly consumption of energy is regurally communicated to the relevant personnel. This included the KPI's for peat production, maintenance and transportation as well as bog pumping and workshop electrical consumption. | Section Head | Reduce overall energy output while maintaining productivity. | | |
| Reduction of emissions to Water | Continue to train all employees in environmental matters. Training will be by means of a new four module training programme delivered by dedicated Bord na Mona training specialists. This new training programme includes environmental compliance-IPPC, Biodiversity, Archaeology and Energy management. Continue with the collection of headland peat. | 50 | Personnel are trained every two years in Environmental matters. Headland peat was collected at all locations and included as part of overall peat returns. | Individual | Improved Environmental Management Practices | | |

| Noise monitoring summary report | Lic No: | P0501-01 | Year | 2019 |
|---|---|---|---|---|

| | | |
|---|---|---|
| 1 | Was noise monitoring a licence requirement for the AER period?<br>If yes please fill in table N1 noise summary below | No |
| 2 | Was noise monitoring carried out using the EPA Guidance note, including completion of the "Checklist for noise measurement report" included in the guidance note as table 6? (Noise Guidance note NG4) | NA |
| 3 | Does your site have a noise reduction plan | NA |
| 4 | When was the noise reduction plan last updated? | Enter date |
| 5 | Have there been changes relevant to site noise emissions (e.g. plant or operational changes) since the last noise survey? | NA |

**Table N1: Noise monitoring summary**

| Date of monitoring | Time period | Noise location (on site) | Noise sensitive location -NSL (if applicable) | $LA_{eq}$ | $LA_{90}$ | $LA_{10}$ | $LA_{max}$ | Tonal or Impulsive noise* (Y/N) | If tonal /impulsive noise was identified was 5dB penalty applied? | Comments (ex. main noise sources on site, & extraneous noise ex. road traffic) | Is site compliant with noise limits (day/evening/night)? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | SELECT | SELECT | | SELECT |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

*Please ensure that a tonal analysis has been carried out as per guidance note NG4. These records must be maintained onsite for future inspection

If noise limits exceeded as a result of noise attributed to site activities, please choose the corrective action from the following options? SELECT

| |
|---|
| ** please explain the reason for not taking action/resolution of noise issues? |
| Any additional comments? (less than 200 words) |

| Resource Usage/Energy efficiency summary | Lic No: | P0501-01 | Year | 2019 |
|---|---|---|---|---|

| | | | Additional information |
|---|---|---|---|
| 1 | When did the site carry out the most recent energy efficiency audit? Please list the recommendations in table 3 below | Aug-19 | Report on file |
| 2 | Is the site a member of any accredited programmes for reducing energy usage/water conservation such as the SEAI programme linked to the right? If yes please list them in additional information | Yes | SEAI - Large Industry Energy Network (LIEN) |
| 3 | Where Fuel Oil is used in boilers on site is the sulphur content compliant with licence conditions? Please state percentage in additional information | NA | Not a Licence requirement |

Table R1 Energy usage on site

| Energy Use | Previous year | Current year | Production +/- % compared to previous reporting year** | Energy Consumption +/- % vs overall site production* |
|---|---|---|---|---|
| Total Energy Used (MWHrs) | 5858 | 4191.88 | -52 | -28 |
| Total Energy Generated (MWHrs) | | | | |
| Total Renewable Energy Generated (MWHrs) | | | | |
| Electricity Consumption (MWHrs) | 226 | 191.88 | -52.00% | -15 |
| Fossil Fuels Consumption: | | | | |
| Heavy Fuel Oil (m3) | | | | |
| Light Fuel Oil (m3) | 1692 | 400 | -52.00% | -76.00% |
| Natural gas (m3) | | | | |
| Coal/Solid fuel (metric tonnes) | | | | |
| Peat (metric tonnes) | | | | |
| Renewable Biomass | | | | |
| Renewable energy generated on site | | | | |

* where consumption of energy can be compared to overall site production please enter this information as percentage increase or decrease compared to the previous reporting year.
** where site production information is available please enter percentage increase or decrease compared to previous year

Table R2 Water usage on site

| | | | | | Water Emissions | Water Consumption | |
|---|---|---|---|---|---|---|---|
| Water use | Water extracted Previous year m3/yr. | Water extracted Current year m3/yr. | Production +/- % compared to previous reporting year** | Energy Consumption +/- % vs overall site production* | Volume Discharged back to environment($m^3$yr): | Volume used i.e not discharged to environment e.g. released as steam m3/yr | Unaccounted for Water: |
| Groundwater | | | | | | | |
| Surface water | | | | | | | |
| Public supply | | | | | | | |
| Recycled water | | | | | | | |
| Total | | | | | | | |

* where consumption of water can be compared to overall site production please enter this information as percentage increase or decrease compared to the previous reporting year.
** where site production information is available please enter percentage increase or decrease compared to previous year

| Resource Usage/Energy efficiency summary | Lic No: | P0501-01 | Year | 2019 |
|---|---|---|---|---|

Table R3 Waste Stream Summary

| | Total | Landfill | Incineration | Recycled | Other |
|---|---|---|---|---|---|
| Hazardous (Tonnes) | 13.38 | | | 13.38 | |
| Non-Hazardous (Tonnes) | 331.59 | 45.88 | 0 | 122.35 | 163.36 |

**Resource Usage/Energy efficiency summary** Lic No: P0501-01 Year 2019

Table R4: Energy Audit finding recommendations

| Date of audit | Recommendations | Description of Measures proposed | Origin of measures | Predicted energy savings % | Implementation date | Responsibility | Completion date | Status and comments |
|---|---|---|---|---|---|---|---|---|
| | | | SELECT | | | | | |
| | | | SELECT | | | | | |
| | | | SELECT | | | | | |

Table R5: Power Generation: Where power is generated onsite (e.g. power generation facilities/food and drink industry)please complete the following information

| | Unit ID | Unit ID | Unit ID | Unit ID | Station Total |
|---|---|---|---|---|---|
| Technology | | | | | |
| Primary Fuel | | | | | |
| Thermal Efficiency | | | | | |
| Unit Date of Commission | | | | | |
| Total Starts for year | | | | | |
| Total Running Time | | | | | |
| Total Electricity Generated (GWH) | | | | | |
| House Load (GWH) | | | | | |
| KWH per Litre of Process Water | | | | | |
| KWH per Litre of Total Water used on Site | | | | | |

**Complaints and Incidents summary template**

Lic No: P0501-01 Year 2019

| Complaints | | |
|---|---|---|
| | | Additional information |
| Have you received any environmental complaints in the current reporting year? If yes please complete summary details of complaints received on site in table 1 below | Yes | |

Table 1 Complaints summary

| Date | Category | Other type (please specify) | Brief description of complaint (Free txt <20 words) | Corrective action< 20 words | Resolution status | Resolution date | Further information |
|---|---|---|---|---|---|---|---|
| 22/06/2019 | Dust | | Complaint about dust blowing onto house and property | Complainants property visited and damage assessed. Production suspended and amended. Employees reminded of their environmental training. | Complete | 22/06/2019 | Reported to Agency Ref:LR042924 |

| | |
|---|---|
| Total complaints open at start of reporting year | 0 |
| Total new complaints received during reporting year | 1 |
| Total complaints closed during reporting year | 1 |
| Balance of complaints end of reporting year | 0 |

| Incidents | | |
|---|---|---|
| | | Additional information |
| Have any incidents occurred on site in the current reporting year? Please list all incidents for current reporting year in Table 2 below | Yes | All reported to the Agency |

| | |
|---|---|
| *For information on how to report and what constitutes an incident | What is an incident |

Table 2 Incidents summary

| Date of occurrence | Incident nature | Location of occurrence | Incident category*please refer to guidance | Receptor | Cause of incident | Other cause(please specify) | Activity in progress at time of incident | Communication | Occurrence | Corrective action<20 words | Preventative action <20 words | Resolution status | Resolution date | Likelihood of reoccurence |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30/04/2019 | Trigger level reached | Rossan Bog SW-43 | 1. Minor | Water | Not related to site activities | Unknown | Normal activities | EPA INCI016437 | New | No corrective action available, naturally ocurring | None available | Complete | 08/05/2019 | Medium |
| 25/06/2019 | Trigger level reached | Rossan Bog SW-43 | 1. Minor | Water | Not related to site activities | Unknown | Normal activities | EPA INCI016838 | New | No corrective action available, naturally ocurring | None available | Complete | 18/07/2019 | Medium |
| 23/07/2019 | Trigger level reached | Rossan Bog SW-43 | 1. Minor | Water | Not related to site activities | Unknown | Normal activities | EPA INCI016886 | Recurring | No corrective action available, naturally ocurring | None available | Complete | 26/07/2019 | Medium |

**Complaints and Incidents summary template**

Lic No: P0501-01 Year 2019

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 02/07/2019 | Trigger level reached | Rossan Bog SW-43 | 1. Minor | Water | Not related to site activities | Unknown | Normal activities | EPA INCI016958 | Recurring | No corrective action available, naturally ocurring | None available | Complete | 08/08/2019 | Medium |
| 11/08/2019 | Other(please specify) | Ballybeg Bog | 1. Minor | Water | Not related to site activities | Unknown | Normal activities | EPA INCI017000 | New | No corrective action available, naturally ocurring | None available | Complete | 12/08/2019 | Medium |
| 10/09/2019 | Trigger level reached | Carranstown Bog SW-31 | 1. Minor | Water | Not related to site activities | Unknown | Normal activities | EPA INCI017219 | New | No corrective action available, naturally ocurring | None available | Complete | 16/09/2019 | Medium |
| 23/09/2019 | Trigger level reached | Rossan Bog SW-43 | 1. Minor | Water | Not related to site activities | Unknown | Normal activities | EPA INCI017379 | Recurring | No corrective action available, naturally ocurring | None available | Complete | 27/09/2019 | Medium |
| 06/08/2019 | Trigger level reached | Rossan Bog SW-43 | 1. Minor | Water | Not related to site activities | Unknown | Normal activities | EPA INCI017394 | Recurring | No corrective action available, naturally ocurring | None available | Complete | 11/10/2019 | Medium |
| 13/08/2019 | Trigger level reached | Rossan Bog SW-43 | 1. Minor | Water | Not related to site activities | Unknown | Normal activities | EPA INCI017396 | Recurring | No corrective action available, naturally ocurring | None available | Complete | 11/10/2019 | Medium |
| 30/07/2019 | Trigger level reached | Rossan Bog SW-43 | 1. Minor | Water | Not related to site activities | Unknown | Normal activities | EPA INCI017435 | Recurring | No corrective action available, naturally ocurring | None available | Complete | 16/10/2019 | Medium |
| 11/11/2019 | Trigger level reached | Rossan Bog SW-43 | 1. Minor | Water | Not related to site activities | Unknown | Normal activities | EPA INCI017600 | Recurring | No corrective action available, naturally ocurring | None available | Complete | 14/11/2019 | Medium |
| Total number of incidents current year | 11 | | | | | | | | | | | | | |
| Total number of incidents previous year | 22 | | | | | | | | | | | | | |
| % reduction/ increase | 50% | | | | | | | | | | | | | |

**Waste Summary Continued** Lic No: P0501-01 Year 2019

| European Waste Code (EWC) | Description of Waste (in line with applicable EWC code) | Hazardous - Yes/No | Quantity (Tonnes) | Name & Permit No. of Agent/Carrier | Treatment Type – Recovered / Disposed / Recycled | Name, Address & Licence/Permit No. of FINAL Destination | Location of Treatment - Country |
|---|---|---|---|---|---|---|---|
| 02 01 04 | waste plastics (except packaging) | No | 89.85 | ADN Materials Ltd.WFP-MN-12-0001-04 | R05 - Recycling/reclamation of other inorganic materials | ADN Materials Ltd., Lossetts, Carrickmacross, Co. Monaghan - WFP-MN-12-0001-04 | Ireland |
| 08 01 11* | waste paint and varnish containing organic solvents or other hazardous substances | Yes | 0 | Enva Ireland Limited (Portlaoise) - W0184 | R02 - Solvent reclamation/regeneration | Recyfuel Ltd., Enghis - BE0459.735.458 | Belgium |
| 11 01 13* | degreasing wastes containing hazardous substances | Yes | 0.06 | Safety Kleen Ireland Ltd - W0099 | R11 - Use of waste obtained from any of the operations numbered R 1 to R 10 | Solvent Recovery Management, PP33345F, Wheeland Rd., Knottingly, West Yorks | UK |
| 13 02 05* | mineral-based non-chlorinated engine, gear and lubricating oils | Yes | 5.77 | Enva Ireland Limited (Portlaoise) - W0184 | R01 - Use principally as a fuel or other means to generate energy | Enva Ireland Limited, Clonminam Industrial Estate, Portlaoise - W0184 | Ireland |
| 13 05 03* | interceptor sludges | Yes | 3.58 | Enva Ireland Limited (Portlaoise) - W0184 | R01 - Use principally as a fuel or other means to generate energy | Enva Ireland Limited, Clonminam Industrial Estate, Portlaoise - W0184 | Ireland |
| 15 01 03 | wooden packaging | No | 1.16 | AES Ltd WP-OY-08-601-01 | R01 - Use principally as a fuel or other means to generate energy | AES LTD, Cappincur, Tullamore, Co. Offaly - WP-OY-08-601-01 | Ireland |
| 15 02 02* | absorbents, filter materials (including oil filters not otherwise specified), wiping cloths, protective clothing contaminated by hazardous substances | Yes | 0.21 | Enva Ireland Limited (Portlaoise) - W0184 | R01 - Use principally as a fuel or other means to generate energy | Lindenschmidt, Kreutzal - Reg No: E97095037 | Germany |
| 16 01 07* | oil filters | Yes | 0.6 | Enva Ireland Limited (Portlaoise) - W0184 | R04 - Recycling/reclamation of metals and metal compounds | R.D. Recycling, Houthalen, Reg No: 51727/1KD | Belgium |
| 16 06 01* | lead batteries | Yes | 2.83 | Enva Ireland Limited (Portlaoise) - W0184 | R04 - Recycling/reclamation of metals and metal compounds | Campine Recycling, Beerse - MLAV/05173/GVDA | Belgium |
| 17 04 07 | mixed metals | No | 31.34 | AES Ltd WP-OY-08-601-01 | R04 - Recycling/reclamation of metals and metal compounds | AES LTD, Cappincur, Tullamore, Co. Offaly - WP-OY-08-601-01 | Ireland |
| 20 03 01 A | Municipal mixed residual household | No | 3.88 | AES Ltd WP-OY-08-601-01 | D05 - Specially engineered landfill (e.g. placement into lined discrete cells which are capped and isolated from one another and the environment, etc.) | AES LTD, Cappincur, Tullamore, Co. Offaly - WP-OY-08-601-01 | Ireland |
| 20 03 01 B | Municipal mixed residual non-household | No | 42 | AES Ltd WP-OY-08-601-01 | D05 - Specially engineered landfill (e.g. placement into lined discrete cells which are capped and isolated from one another and the environment, etc.) | AES LTD, Cappincur, Tullamore, Co. Offaly - WP-OY-08-601-01 | Ireland |
| 17 05 03* | soil and stones containing hazardous substances | Yes | 0 | Enva Ireland Limited (Portlaoise) - W0184 | D10 - Incineration on land | Enva Ireland Limited, Clonminam Industrial Estate, Portlaoise - W0184 | Ireland |

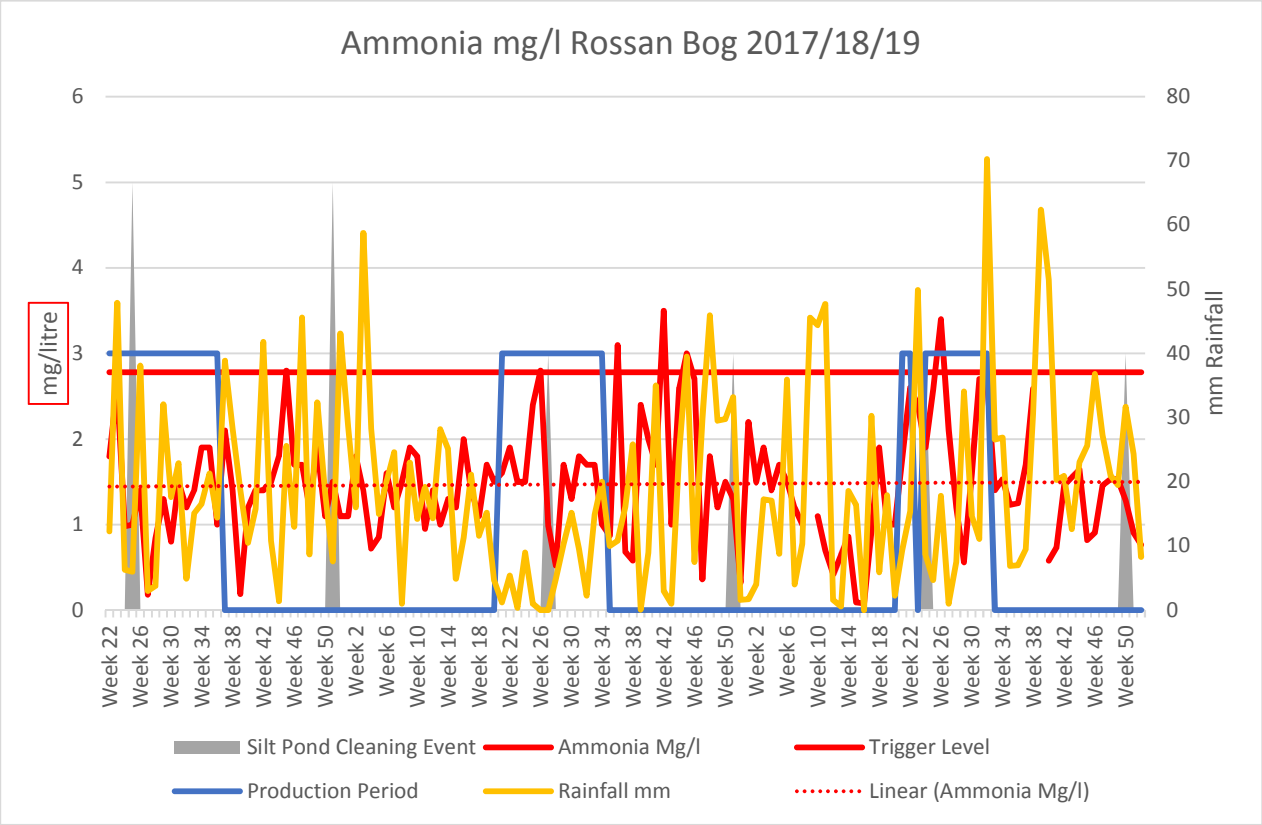
**Derrygreenagh IPC Licence**

**Decommissioning and Rehabilitation**

**Bog Rehabilitation Progress Report 2019.**

- No active peatland rehabilitation in Derrygreenagh licence area in 2019.
- There was ongoing monitoring of peatland rehabilitation carried out in previous years at Derryarkin, Drumman and Daingean-Rathdrum bogs.
- Fertiliser spread in Derryarkin in 2018 as part of the rehabilitation has had a positive impact and has increased vegetation cover
- Bog restoration in Daingean-Rathdrum carried out in 2019 has been successful in re-wetting this portion of bog.
- The majority of the Bord na Móna property in this bog group has been organically certified with the aim of using some areas for the cultivation of plants for use in herbal medicine into the future. This project in ongoing. Bord na Mona have committed not to use herbicides in organically certified areas to maintain industrial railways and other infrastructure.
- Draft rehabilitation plans for the Derrygreenagh bogs licensed area, including more detailed draft plans for each component bog unit were submitted to the EPA in 2013 and these were reviewed and updated in 2015 and 2017, and again submitted to the EPA May 2018.
- The new Biodiversity Action Plan (2016-2021) was launched in 2016 with the annual Biodiversity Action Plan review day being held in May 2018. This included an update on the progress of this plan, bog restoration and cutaway rehabilitation for a wide range on statutory and non-statutory consultees including members of the EPA, NPWS, BWI, Bord na Mona, Coillte, Inland Fisheries Ireland, An Taisce, IPCC, Irish Red Grouse Association, Irish Wildlife Trust, NARGC, local game councils, Midland Regional Planning Authority as well as a range of local community groups and Heritage Officers from counties Laois, Offaly, Kildare, Roscommon, Longford, Meath, Galway, Westmeath and Dublin.
- A copy of our Biodiversity Action Plan is available to view and download at http://www.bordnamona.ie/our-company/biodiversity/

| | | Bord na Mona Derrygreenagh | | | Siltpond Monitoring Frequency & Results | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | IPPC Licence P0501-01 | | | | | | | | | |
| X | Y | Bog | SW | Monitoring | Sampled | pH | SS | TS | Ammonia | TP | COD | Colour |
| 255381.2 | 243606.1 | Derryhinch | SW-1 | Q1 19 | 19/02/2019 | 7.4 | 5 | 222 | 1.3 | 0.05 | 73 | 139 |
| 254528.8 | 242354.3 | Derryhinch | SW-2 | Q1 19 | 19/02/2019 | 7.4 | 5 | 200 | 1.8 | 0.05 | 63 | 186 |
| 253369.2 | 242417.9 | Derryhinch | SW-3 | Q1 19 | 22/02/2019 | 7.4 | 5 | 276 | 1.9 | 0.05 | 50 | 125 |
| 252602.8 | 242540.2 | Derryhinch | SW-4 | Q1 19 | 22/02/2019 | 7.6 | 5 | 272 | 1 | 0.05 | 10 | 167 |
| 252623.6 | 241470.2 | Carrick | SW-4A | Q1 19 | 19/02/2019 | 7.7 | 5 | 298 | 1.8 | 0.05 | 61 | 178 |
| 252468.7 | 240919.3 | Carrick | SW-5 | Q1 19 | 19/02/2019 | 7.7 | 5 | 258 | 0.2 | 0.05 | 41 | 55 |
| 252409.7 | 241163.3 | Carrick | SW-6 | Q1 19 | 19/02/2019 | 7.7 | 5 | 224 | 0.16 | 0.05 | 30 | 50 |
| 252473.2 | 241162 | Carrick | SW-7 | Q1 19 | 19/02/2019 | 7.8 | 5 | 254 | 0.13 | 0.05 | 36 | 47 |
| 252275.6 | 239871.6 | Drumman | SW-8 | Q1 19 | 22/02/2019 | 7.7 | 5 | 240 | 1.2 | 0.05 | 10 | 127 |
| 252950.4 | 238421.7 | Drumman | SW-9 | Q1 19 | 19/02/2019 | 7.7 | 5 | 228 | 0.15 | 0.05 | 54 | 118 |
| 251559.9 | 235341.7 | Ballybeg | SW-11 | Q 2 19 | 27/05/2019 | 7.4 | 5 | 554 | 0.11 | 0.05 | 52 | 112 |
| 252206.1 | 235207 | Ballybeg | SW-12 | Q 2 19 | 27/05/2019 | 7.8 | 5 | 574 | 0.6 | 0.05 | 69 | 133 |
| 251880.6 | 234593.1 | Ballybeg | SW-13 | Q 2 19 | 27/05/2019 | 7.9 | 5 | 584 | 1.5 | 0.05 | 19 | 49 |
| 252250.5 | 235061.5 | Ballybeg | SW-13A | Q 2 19 | 27/05/2019 | 7.8 | 5 | 556 | 1.1 | 0.05 | 40 | 51 |
| 240485.2 | 235706.3 | Torr | SW-14 | Q 2 19 | 27/05/2019 | 7.8 | 7 | 552 | 2.8 | 0.05 | 34 | 50 |
| 244391.8 | 235128.9 | Torr | SW-15 | Q 2 19 | 27/05/2019 | 8 | 5 | 482 | 0.45 | 0.05 | 28 | 51 |
| 244435.6 | 235093.4 | Torr | SW-16 | Q 2 19 | 27/05/2019 | 7.6 | 5 | 530 | 0.39 | 0.05 | 29 | 49 |
| 240425.7 | 234997.3 | Torr | SW-17 | Q 2 19 | 27/05/2019 | 7.9 | 5 | 508 | 0.06 | 0.05 | 33 | 44 |
| 259415.3 | 256855.8 | Bracklin | SW-29 | Q 2 19 | 27/05/2019 | 7.4 | 5 | 305 | 1.4 | 0.05 | 60 | 166 |
| 259519.5 | 257618.4 | Bracklin | SW-30 | Q 2 19 | 27/05/2019 | 7.5 | 6 | 328 | 1.6 | 0.05 | 60 | 177 |
| 262437 | 258824.8 | Lisclogher | SW-19 | Q3 19 | 10/09/2019 | 7.8 | 2 | 369 | 0.176 | 0.07 | 66 | 380 |
| 262935.7 | 258722.5 | Lisclogher | SW-20 | Q3 19 | 10/09/2019 | 7.6 | 15 | 366 | 0.223 | 0.09 | 88 | 493 |
| 262969.1 | 258691.3 | Lisclogher | SW-21 | Q3 19 | 10/09/2019 | 8 | 7 | 385 | 0.174 | 0.05 | 65 | 325 |
| 263432.9 | 258465.2 | Lisclogher | SW-22 | Q3 19 | 10/09/2019 | 8.1 | 16 | 379 | 0.158 | 0.06 | 66 | 301 |
| 263467.2 | 258446.6 | Lisclogher | SW-23 | Q3 19 | 10/09/2019 | 8 | 15 | 352 | 0.166 | 0.06 | 68 | 337 |
| 263740.8 | 258368 | Lisclogher | SW-24 | Q3 19 | 10/09/2019 | 8.1 | 10 | 367 | 0.172 | 0.05 | 63 | |
| 266022.6 | 259613.6 | Lisclogher | SW-25 | Q3 19 | 10/09/2019 | 7.5 | 5 | 357 | 3.49 | 0.09 | 74 | 489 |
| 260584 | 256514.3 | Bracklin | SW-26 | Q3 19 | 10/09/2019 | 6.6 | 2 | 211 | 1.38 | 0.05 | 82 | 307 |
| 260609.4 | 256526.3 | Bracklin | SW-27 | Q3 19 | 10/09/2019 | 7.4 | 2 | 306 | 1.9 | 0.05 | 76 | 247 |
| 263649.6 | 255035.4 | Carranstown | SW-31 | Q3 19 | 10/09/2019 | 6.8 | 3 | 213 | 0.149 | 0.05 | 106 | 620 |
| 265554 | 255989.1 | Carranstown | SW-32 | Q4 19 | 05/12/2019 | 8 | 2 | 371 | 0.249 | 0.05 | 49 | 163 |
| 265632.8 | 254865 | Carranstown | SW-33 | Q4 19 | 05/12/2019 | 8 | 2 | 438 | 0.129 | 0.05 | 52 | 169 |
| 265887 | 254984.2 | Carranstown | SW-34 | Q4 19 | 05/12/2019 | 7.7 | 2 | 195 | 0.086 | 0.05 | 47 | 140 |
| 265140.1 | 254114.5 | Ballivor | SW-35 | Q4 19 | 05/12/2019 | 8.1 | 2 | 337 | 0.301 | 0.05 | 42 | 107 |
| 265879 | 253506.6 | Ballivor | SW-38 | Q4 19 | 05/12/2019 | 8 | 2 | 434 | 0.046 | 0.06 | 33 | 103 |
| 265889 | 253456.6 | Ballivor | SW-39 | Q4 19 | 05/12/2019 | 7.6 | 2 | 378 | 2.12 | 0.05 | 27 | 82.5 |
| 266366.9 | 251598.6 | Ballivor | SW-40 | Q4 19 | Site backed up | | | | | | | |
| 266386.5 | 251579.2 | Ballivor | SW-41 | Q4 19 | Site backed up | | | | | | | |




Rossan bog is an active horticultural production bog with the composite sampler located here from May 2017 to date. The composite sampler takes a flow proportional composite sample over a 24 hour period. The sampler had 29% downtime during this reporting period but returned 50 weekly ammonia results during the period. The ammonia trigger level of 2.78mg/l, as agreed with the Agency, was exceeded once during the reporting period, as reported to the Agency. Over the sampling period of 82 weeks up to 2018 the trending showed a slightly increasing trend in ammonia, however including the period of 2019, the ammonia seems to have levelled off. The rainfall levels were higher in 2019, but the average ammonia was slight reduced over 2018, so the ammonia concentration in this bog, may be heading in-line with the downwards trends in some bogs as production progresses, as submitted to the EPA in 2013 under condition 6.14.

There is no obvious link between the summer production, winter maintenance, or silt pond maintenance events on the concentration of Ammonia discharging from this peatland. The only link expected would be that related to rainfall events and seasonal weather patterns and the subsequent surfacewater runoff and associated ammonia concentrations.

The sampler at this location may be relocated to fill any information gaps on other peatland catchments and to reflect the need to support the information gathering required for the Water Framework Directive's River Basin Management Plan. There is also an EPA lead research project commencing in 2019, called the SWAMP project, whose aims are to appraise and understand the nutrient impact from peatlands, to evaluate treatment technologies and to propose predictive tools for watershed management.

**Extractive Waste Management Plan Implementation AER Update 2019.**

**March 2020.**

**IPC Licence P0501-01.**

**1.0 Extractive Wastes.**

Waste classified as extractive waste from peat extraction operations arise from two operations associated with this activity.

- Silt Pond excavations and maintenance
- Bog Timbers

There has been no change to the type and nature of these two waste streams and no new waste streams added to this list. These wastes streams continue to be stored and maintained at between 1 and 3 metres in height.

**2.0 Condition 7.5 Extractive Waste Management**

- An extractive waste management plan (EWMP) was submitted to the Agency in September 2012 and was approved.
- The EWMP was reviewed in September 2017. There were no substantial changes to the operation of the plan, associated waste facilities or to the waste deposited. The EWMP will be reviewed again in September 2022. At this stage, it is envisaged that many bogs will be entering a decommissioning and rehabilitation phase, which will see a significant reduction in the generation of bog timbers. In addition, and depending on the progress with bog stabilisation and rehabilitation, silt generation will significantly reduce which will lead to reduced volumes to be removed from the silt ponds.

**3.0 Minimisation**

- The IPC Licence has various conditions that require the installation, inspections and maintenance of silt ponds for operational areas and as such these requirements dictate the need for silt ponds and associated excavation materials and cleanings.
- Bog timbers arise from the active production footprint and are naturally occurring. The active footprint is dictated by the peat production targets and customer supply contract and service level agreements.

**4.0 Treatment**

- Silt pond excavation and maintenance materials do not require any treatment and are stored as per the EWMP, adjacent to the associated silt pond.
- There is no treatment of bog timbers arising and these are stockpiled at various locations in associated bogs.

**5.0 Recovery**

- As per the EWMP, there is still no opportunity to recover these silt pond associated materials
- Bog timbers stored on the bog are natural to the peat bog and while there have been trails to recover this waste material, these have not proved viable.

**6.0 Disposal**

- Silt pond cleanings continue to be disposed of adjacent to the associated silt pond and will be incorporated back into the rehabilitation plans for these bogs, post production and decommissioning.
- Bog timbers will continue to be stockpiled at suitable locations to be either incorporated back into the bog, as a supply of bog timbers for the crafting industry or will continue to decay naturally.

# Annual Environmental Report (AER)

# 2020

Company Name: Bord na Mona Energy Ltd (Derrygreenagh Group)

Licence Number: P0501-01

Address: Bord na Mona, Derrygreenagh Works,

Rochfordsbridge, Co Westmeath.

Class of Activity[1]: 1.4

[1] See Appendix I

# Purpose of this Report

One of the functions of the Environmental Protection Agency (EPA) is to licence and regulate the activities[2] of large scale industrial (e.g. chemical, food processors, power plants) and waste facilities. Submitting an Annual Environmental Report (AER) is a requirement of all EPA licences.

An AER is a public document. To this end, this format has been developed for industrial and waste licence holders (other than the intensive agriculture sector) to use as a template. This is to assist any member of the public to interpret and understand the environmental performance of the licensed facility.

The AER is a **summary** of environmental information for a given year. It includes:

- Details of the licence holder's environmental goals achieved, goals to maintain compliance and/or improve their environmental performance;
- Answers to questions regarding their facility's activities;
- Tables of results from monitoring emissions such as air, water, noise, and odour; and
- Details of waste generated, accepted and treated.

An AER does **not** provide detailed technical data. Such information is available in three ways:

1) Contacting the licence holder directly. The Contact Us section of this template enables the licence holder to provide details of where a member of the public can obtain further information on topics reported in this document.

[2] See Appendix I

2) Some documents[3] are available on the EPA website via the licence details page for each individual licence. This can be found by browsing either the http://www.epa.ie/licensing/ or http://www.epa.ie/enforcement/ pages of the EPA website.

3) All formal enforcement correspondence exchanged between the EPA and a licence holder during the regulatory process is available for public viewing by appointment at any EPA Office.

If you have a question or query about an AER or an individual EPA licensed facility see the EPA's website or contact the relevant EPA office. See http://www.epa.ie/about/contactus/ for contact details.

[3] This includes EPA site inspection and compliance monitoring reports, licence holders' self-monitoring reports, AERs and special reports

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# Glossary

| | |
|---|---|
| Abatement Equipment | Technology used to reduce pollution |
| AER | Annual Environmental Report. |
| CRAMP | Closure, Restoration and Aftercare Management Plan. |
| ELRA | Environmental Liability Risk Assessment. |
| Emission Limit Value | Limits set for specified emissions, typically outlined in Schedule B of an EPA licence. |
| EMS | Environmental Management System. |
| Environmental Goal | An objective or target set by a licensee as part of an environmental management system (EMS). |
| Environmental Pollutant | Substance or material that due to its quantity and/or nature has a negative impact on the environment. |
| Facility | Any site or premises that holds an EPA industrial or waste licence. |
| FP | Financial Provision. |
| GJ | Giga joules, an international unit of energy measurement. |
| Groundwater | All water which is below the surface of the ground in the saturation zone and in direct contact with the ground or subsoil. |
| Incident | As defined by an EPA industrial or waste licence. |

| | |
|---|---|
| Inert Waste | Is waste that will not undergo physical, chemical or biological change thereby, is unlikely to cause environmental pollution or harm human health. |
| List of Wastes (LoW) | A list of wastes drawn up by the European Commission and published as Commission Decision 2014/955/EU. |
| Noise Sensitive Location | Any dwelling house, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other installation or area of high amenity which for its proper enjoyment requires the absence of noise at nuisance levels. |
| Non-Renewable Resource | A resource of economic value that cannot be replaced at the same rate it is being consumed e.g. coal, peat, oil and natural gas. |
| Oil Separator | Separator system for light liquids (e.g. oil and petrol). |
| PRTR | Pollutant Release and Transfer Register. |
| Renewable Resource | Wind, solar, aerothermal, geothermal, hydrothermal and ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases. |
| Sanitary Waste | Waste water from toilet, washroom and canteen facilities. |
| Storm Water | Rain water run-off from roof and non-process areas. |

| | |
|---|---|
| Surface Water | Lakes, rivers, streams, estuaries and coastal waters. |
| Trigger Level | A value set for a specific parameter, the achievement or exceedance of which requires certain actions to be taken by the licence holder. |
| Volatile Organic Compounds | Gases produced from solids or liquids that evaporate readily in ambient conditions. |
| Waste | Any substance or object which the holder discards or intends or is required to discard. |

Disclaimer

These are **not** legal definitions. Legal definitions can be found in the corresponding legislation.

# Declaration

I, Cathal Brennan, confirm that by ticking the box below, all information in this report is truthful and accurate to the best of my knowledge and belief.

In addition, I confirm that all monitoring and performance reporting required by our EPA licence and summarised herein is available for inspection by the EPA.

**Tick here** [X]

# 1) Introduction

See below a brief description of our facility and a summary of our environmental performance this year.

• The primary activity during the reporting period was peat sales and transport. Bord na Mona had a delayed start to peat production operations 2020, commencing on the 11th of June. However, activities ceased again at the end of June.
• In the reporting period there were no complaints, this is down from the one received in 2019. There were two reported incidents of an environmental nature, relating to trigger levels for ammonia and COD.
• During the period, there were approvals sought for cultivation trials of medicinal herbs, and notifications regarding late commencement of production and early cessation of activities.
• During the season, 37782 tonnes of peat were produced, down 71.6% on 2019.
• During the period, there was a 23.75% decrease in waste generated and this was mainly related to polythene and scrap steel.
• During the period, certification to ISO9001 and ISO 50001 were retained.
• In January 2021, Bord na Mona announced it was permanently ending all peat harvesting activities on its lands. Since then Bord na Mona have been engaged in the Governments Peatlands Climate Action Scheme (https://www.gov.ie/en/publication/136a7-bord-na-mona-bog-rehabilitation-scheme/), with a view to commencing applicable decommissioning & rehabilitation activities on a number of bogs under the Condition 10 obligations of this licence. In addition, Bord na Mona are continuing to sell and transport existing peat stock harvested in previous years.

## Contact Us

If you have any questions or would like further information on any aspect of this report, please contact us directly.

See below details:

Enda McDonagh,
Bord na Mona Energy Ltd
Leabeg
Tullamore
Co Offaly
Enda.mcdonagh@bnm.ie
0579329701
www.bnm.ie

# 2) How we Manage our Facility

Bord na Mona have an Environmental Compliance Department with a team of five who manage the day to day IPC Licence requirements. This licence governs the extraction of peat and associated activities and manages emission to air, water and land.

The information below sets out the environmental goals for our facility to help us prevent environmental pollution and reduce our impact on the environment. Target dates for completing each goal and progress towards achieving the goal are outlined in Table 1.

**Table 1 Environmental Goals**

| Environmental Goal | Target Date | Progress |
|---|---|---|
| 2020 Training (no of people trained) | Dec 2020 | None trained in 2020 due to Covid 19 restrictions |
| 2020 Waste Management (any reduction in waste volumes on 2019) | Dec 2020 | Decrease of 23.75% from 2019, due to decrease in polythene tonnes recycled and scrap steel recycling. |
| 2020 Energy Efficiency (any reduction in electricity/energy use) | Dec 2020 | 86.86% decrease |
| 2021 Reduction of Complaints | Dec 2021 | Commenced |
| 2021 Reduction of Incidents | Dec 2021 | Commenced |
| 2021Communication regarding decommissioning and rehabilitation. | Ongoing for applicable Bogs | Commenced |

| | | |
|---|---|---|
| 2021 Review of environmental monitoring programme | Ongoing in-line with PCAS & LAWPRO | Commenced |
| 2021 Training & Awareness | May 2021 | On Track |
| 2021 Completion of Internal Audits | June 2021 | On Track |
| 2021 Decommissioning and Rehabilitation of 5 bogs in accordance with Condition 10 of the IPC Licence and in accordance with Peatlands Climate Action Scheme https://www.gov.ie/en/publication/136a7-bord-na-mona-bog-rehabilitation-scheme/ | December 2021 | Not Commenced |

Add rows as necessary

Comment

Bord na Mona had a delayed start to peat production operations in 2020, commencing on the 11th June. However activities ceased again at the end of June.

In January 2021, Bord na Mona announced it was permanently ending all peat harvesting activities on its lands. Since then Bord na Mona have been engaged in the Governments Peatlands Climate Action Scheme (https://www.gov.ie/en/publication/136a7-bord-na-mona-bog-rehabilitation-scheme/), with a view to commencing applicable decommissioning & rehabilitation activities on a number of bogs under the Condition 10 obligations of this licence. In addition Bord na Mona are continuing to sell and transport existing peat stock harvested in previous years.

# 3) Energy & Water

## Energy

**Explanation**
Fossil fuels such as coal, gas and oil are non-renewable resources. As a result, our EPA licence requires that we measure our energy use and set targets to improve the energy efficiency of our activities and reduce our overall use, where possible. Where we have the means and technology on-site to generate energy, this is also captured in this report.

The information below summarises the energy used this year compared to the previous year and includes renewable and non-renewable energy types.

**Table 2 Energy Used**

| Energy Used (GJ) | Quantity | % Increase/ decrease on previous year |
|---|---|---|
| Electricity | 413.78 GJ | -32.95% |
| Heavy Fuel Oil | - | |
| Light Fuel Oil | 1693 GJ | -89% |
| Natural Gas | - | |
| Coal / Solid Fuel | - | |
| Peat | - | |
| Renewable Biomass | - | |
| Renewable Energy Generated On-site | - | |
| **Total Energy Used** | 2106.78 GJ | -86.83% |

Comment

Bord na Mona had a delayed start to peat production operations in 2020, commencing on the 11th June. However, activities ceased again at the end of June.

Bord na Mona Energy were certified to the energy management standard ISO50001 during the 2020 season.

The information below summarises the energy we generated on our site this year with specific focus on renewable energy generation.

**Table 3 Energy Generated**

| **Energy Generated (GJ)** | **Quantity** | **% Increase/ decrease on previous year** |
|---|---|---|
| Renewable Energy | NA | |
| **Total Energy Generated** | | |

Comment

| |
|---|
| There are no renewable energy assets on this site. |

## Water

**Explanation**
Water is a natural resource and we are required by our EPA licence to identify ways to reduce our use where possible. Water used in industry can be extracted from groundwater, rivers and lakes (surface water), taken from public water supplies (Irish Water), recycled from the facility's processes or harvested from rainwater.

The information below summarises and compares the quantity of water used this year compared to the previous year.

**Table 4 Water Used**

| **Source of Water Used** | **Quantity ($m^3$/year)** | **% Increase/ decrease on previous year** |
|---|---|---|
| Groundwater | | |
| Surface Water | 0 | |
| Public Supply | | |
| Recycled Water | 0 | |
| Rainwater | 0 | |
| **Total Water Used** | | |

Comment

Water is not used in any of the peat harvesting or transport processes. The only water used is that required to provide associated offices and workshop welfare facilities (canteen/toilets)

# 4) Environmental Complaints

**Explanation**
Our EPA licence requires that activities do not cause environmental nuisance such as odour, dust or noise. Our licence also requires that we have procedures in place to record, investigate and respond to environmental complaints if or when they arise.
We have an environmental complaints procedure in place where you can contact us[4] directly. You can also contact the EPA[5] if you wish to make an environmental complaint, confidentially or not.

See the information below for a summary of **all** the environmental complaints relating to our activities made directly to us and to the EPA this year.

**Table 5 Summary of All Environmental Complaints Received in**

| Type of Complaint | Number of Complaints Received | Number Closed |
|---|---|---|
| **Odour / Smells** | | |
| **Noise** | | |
| **Dust** | | |
| **Water Quality** | | |
| **Air Quality** | | |
| **Waste** | | |
| **Litter** | | |
| **Vermin/Flies/Birds** | | |
| **Soil Contamination** | | |
| **Vibration** | | |
| **Other** | | |

[4] See Section 1, Introduction – Contact Us

[5] If you wish to contact the EPA to make an environmental complaint about an EPA licenced facility, please go to https://lema.epa.ie/complaints

Comment

| |
|---|
| As required environmental complaints are reportable to the EPA and as such must be investigated. In the 2020 reporting period, this licence had No complaints received and there were none carried over into 2021. At present there are no complaints from 2020 still open. |

# 5) Environmental Incidents

**Explanation**
It is our responsibility as an EPA licensed facility to ensure we have systems in place to prevent incidents that have the potential to cause environmental pollution. If an incident occurs, we are required to report it to the EPA, investigate the cause and fix the problem.
The EPA classify environmental incidents into 5 categories based on the potential impact on the environment:

- Minor
- Limited
- Serious
- Very Serious
- Catastrophic

See Table 6 for the number of the environmental incidents we reported to the EPA this year.

**Table 6 Number of Environmental Incidents**

| Incident Category | Minor | Limited | Serious | Very Serious | Catastrophic |
|---|---|---|---|---|---|
| Abatement Equipment Offline | | | | | |
| Breach of Ambient ELV | | | | | |
| Breach of Emission Limit | | | | | |
| Explosion | | | | | |
| Fire | | | | | |
| Monitoring Equipment Failure | | | | | |
| Odour | | | | | |
| Spillage | | | | | |
| Breach of trigger Level | 2 | | | | |
| Uncontrolled Release | | | | | |

| Incident Category | Minor | Limited | Serious | Very Serious | Catastrophic |
|---|---|---|---|---|---|
| Other | | | | | |

Comment

| |
|---|
| As required, incidents of an environmental nature are reportable to the EPA and as such must be investigated. In the 2020 reporting period, this licence recorded and reported 2 incidents. These incidents we primarily related to trigger level breach for ammonia and COD |

# 6) Our Environmental Emissions

**Explanation**

We are required to ensure the emissions from our activities do not cause environmental pollution.

We are required to monitor any of the following emissions that we make:

- Storm water
- Waste water
- Air
- Groundwater
- Noise

We regularly test any such emissions for specific pollutants and materials to ensure they do not contain levels of pollution that exceed emission limit values (ELVs) or cause environmental pollution. If monitoring of an emission indicates an ELV is exceeded, we are required to report this to the EPA[6].

The next sub-sections of this report summarise our compliance with any ELVs set in our EPA licence. Some emissions monitored do not have specific ELVs, but we still carry out monitoring and report all incidents that may give rise to environmental pollution.

[6] See section 5, Incidents

## Storm Water

**Explanation**
Storm water is rain water run-off from roof and non-process areas of a facility, e.g. carparks, and generally shall not contain any pollution.
Storm water is usually released into a local water body after a basic form of treatment. Our EPA licence requires that we manage storm water to ensure no polluting substances or materials are released into the environment.

The information below summarises how the storm water from our facility is treated, where it is released and the results of monitoring this year.

1. **Storm water from our facility is managed prior to release by;**

Either direct to drain where it is roof water only, or via petrol/oil interceptor.

2. **Storm water from our facility is released into the following water bodies:**

Yellow River, Kinnegad River & Boyne River. Curris River, Stoneyford River

**Table 7 Summary of Storm Water Monitoring**

| Parameter measured | No. of Samples | % Compliant[7] | Comment |
|---|---|---|---|
| COD | 17 | 100% Compliant | Oil Interceptors cleaned at Derrygreenagh W/shop, and Oil Interceptor & Rossan outloading facility. |
| | | | |

Add rows as necessary

Comment

| |
|---|
| As required by the licence, stormwater is required to be separated where possible from process/non-process areas. Where this is not possible, stormwater is managed via oil-interceptors which are inspected on a monthly basis and sampled for associated discharges each month. Other than visual observations, the other main criteria to define adequate treatment is COD mg/l so this and visual inspections dictate when the interceptor is cleaned by an approved hazardous waste contractor. |

[7] % compliant = [(number of samples compliant) / (number of samples taken)] x 100. Compliance could refer to emission limit values or trigger levels. The EPA commonly use trigger levels on stormwater discharges.

## Waste Water

**Explanation**
There are two types of waste water that can be produced:

- Process waste water produced from the activities and;
- Sanitary waste water from toilets, washrooms and canteens.

Our EPA licence requires us to manage our waste water on or off-site and ensure that it does not cause environmental pollution when discharged into the environment.

The information below summarises how we treat the waste water produced from our activities, where it is released and the results of monitoring this year.

1. **Waste water produced by our activities is treated as follows before discharge to a receiving waterbody**;

All production area runoff is treated via an associated silt pond designed, inspected and maintained in accordance with condition 6 of the IPC Licence

2. **Treated waste water from our facility is released into the following water bodies:**

Mongagh River, Yellow River, Castlejordan River, Kinnegad River, Deel River, Boyne River, Curris River, Stoneyford River

**Table 8 Summary of Waste Water Monitoring**

| Parameter measured | No. of Samples | % Compliant | Comment |
|---|---|---|---|
| Suspended Solids | 123 | 100% | |
| Ammonia | 75 | 98.67% | Trigger level reached on one occasion on Automatic Sampler |
| Total Solids | 123 | NA | |
| Total Phosphorus | 75 | NA | |
| pH | 75 | NA | |
| Colour | 75 | NA | |
| COD | 92 | 98.92% | Trigger level reached on one occasion on Automatic Sampler |
| | | | |

Add rows as necessary

Comment

Licence requirements are quarterly grab samples on a selected number of silt pond outlets as per condition 6.2 and one 24hr flow proportional composite sampler at Rossan bog.
The emission limit values are 35mg/l suspended solids, 4.0mg/l total ammonia and 100mg/l COD. The Trigger Level for COD in 2020 was reached on one occasion, down on 2019 levels, while the trigger level for Ammonia was reached once in 2020, same as in 2019. There is no obvious reason for reaching these trigger levels, other than naturally occuring background levels of ammonia and associated COD.

## Air

**Explanation**
Generally, three types of air emissions are monitored from industry in Ireland: gases, dust (particulates) and odour. Our EPA licence requires us to ensure that any air emissions from our activities do not cause air pollution or create an odour nuisance.

The information below details the number of air emission points we monitor, the results from testing the air emissions and any odour assessments carried out by us and the EPA this year.

1. **We monitor air emissions from the following number of emission points at our facility.**

**DM-01 Toar, DM-02 Derryhinch, DM-03 Ballivor, DM-04 Ballybeg**

**Table 9 Summary of Air Emissions Monitoring**

| Parameter measured | No. of Samples | % Compliant | Comment |
|---|---|---|---|
| Fugitive Dust | 12 | 100% | |
| | | | |

Add rows as necessary

Comment

Due to peat extraction being suspended on two occasions in the reporting period, the bergerhoff dust gauges were only deployed on three occasions in 2020.

**Table 10 Summary of Odour Assessments Carried Out**

| Assessment Conducted By | No. of Odour Assessments | % Compliant[8] | Comment |
|---|---|---|---|
| Licence Holder | NA | | Not required |
| EPA | NA | | Not required |

Add rows where necessary

Comment

| |
|---|
| There are no odour emissions of note from the activity, no requirements to monitor and no associated complaints. |

[8] A compliant odour assessment is based on EPA Odour Impact Assessment Guidance available at http://www.epa.ie/pubs/advice/air/emissions/ag5-odourassessment.html

## Fugitive Solvent Emissions

**Are you are required to monitor fugitive solvent air emissions from your facility?**

Yes [ ] No [X]

**Explanation**
The use of solvents is regulated under Irish and European Union (EU) Regulations[9]. Solvents are chemicals that, by their nature, are volatile (evaporate readily under ambient conditions). Solvents can be found in many inks, glues and cleaning agents. Due to the volatility of solvents some emissions may be released into the atmosphere during our activities before being captured in our air treatment system. This type of emission is called a **fugitive solvent emission**.

The information below summarises the quantity of solvents used this year, the percentage of fugitive solvent emissions (% of total quantity used) and whether the percentage complied with the targets set in the EU Regulations.

**Table 11 Summary of Fugitive Solvent Emissions**

| Quantity of Solvents Used (Kg) | % Fugitive Solvent Emissions | Compliant |
|---|---|---|
| | | |

Comment

| 100 word limit |
|---|

[9] See Annex VII of the Industrial Emissions Directive
https://ec.europa.eu/environment/industry/stationary/ied/legislation.htm

## Groundwater

**Explanation**
Groundwater is an important and sensitive resource in Ireland. Our EPA licence requires that we monitor groundwater to ensure our activities do not cause groundwater pollution.
Understanding how groundwater flows through soil and rock layers and eventually into surface and coastal waters is a complex science. Sometimes groundwater pollution that occurred in the past can take years and even decades to disappear. Therefore, it is important that experts help us monitor and interpret results from groundwater monitoring and testing.

The information below is a basic summary of the condition of the groundwater this year.

1. **Do you have a groundwater monitoring programme in place?**

Yes [ ] No [X]

2. **Have the groundwater monitoring results over the last 5 years indicated the presence of groundwater pollution?**

Yes [ ] No [X]

**Table 12 List of Groundwater Pollutants Identified**

| Pollutants |
|---|
| |

Add rows as necessary

**3. Give details of the investigations and subsequent actions taken, where applicable, to manage the groundwater pollution.**

| |
|---|
| |

Comment

| |
|---|
| There are no licence requirements to monitor groundwater from the activity. |

## Noise

**Explanation**
Our EPA licence requires that we monitor noise emissions from our facility. Noise monitoring can be conducted at the boundary of our facility and/or at locations beyond the boundary referred to as “noise sensitive locations”. Noise monitoring requires the use of special noise monitoring equipment. Our EPA licence requires that noise produced by our facility shall not exceed the noise limit values and/or give rise to nuisance.

The information below gives a summary of when and where we conducted noise monitoring this year and if results complied with our EPA licence limits.

1. **We conducted noise monitoring on the following dates this year:**

NA

2. **Was the noise monitoring carried out at:**
   i. **the boundary of our facility,**
   ii. **noise sensitive locations off-site, or**
   iii. **both?**

NA

3. **Were measured noise levels compliant with your EPA licence limits?**

Yes ☐ No ☐

If No, we took the following actions to address the noise level exceedances?

NA

Comment

There are no licence requirements to monitor noise from the activity, or any complaints regarding noise impact.

# 7) Waste

## Waste Generated

**Explanation**
Our EPA licence requires us to manage the waste we generate in a manner that does not cause environmental pollution.
We manage, store and record hazardous, non-hazardous and inert waste we generate in accordance with our licence. We ensure that this waste is subsequently treated or disposed of in accordance with the relevant waste Regulations.

The information in table 13 is a summary of waste we generated this year and the percentage increase or decrease on the previous year. The percentage recovery is the amount of total waste generated that was reused, recycled or recovered.

**Table 13 Waste Generated**

| Type | Quantity (Tonnes) | % Increase/ decrease on previous year | % Recovery |
|---|---|---|---|
| Hazardous | 17.47 | 30% increase | 100% |
| Non-Hazardous | 245.56 | 26% decrease | 70.9% |
| Inert | | | |
| **Total Tonnes** | 263.03 | 23.75% decrease | 85% |

Comment

The main wastes generated from this activity are Polythene, scrap metal, Silt Pond Waste, Peat Screenings, Waste Oil, Interceptor Waste, Oil Filters, Parts Wash all of which are recycled. The waste generated for landfill was general waste skips and wheelie bins from workshops and office waste.

## Waste Accepted

Did you accept waste onto your facility for storage, treatment, recovery or disposal this year?

Yes [ ] No [X]

**Explanation**
Our EPA licence requires us to manage the waste we accept in a manner that does not cause environmental pollution.
We manage, store and record all incoming and outgoing hazardous, non-hazardous and inert waste. The waste we accept may be treated, recovered, disposed or stored at our facility depending on our licence requirements.

The information in Table 14 provides a summary of waste we accepted this year and the percentage increase or decrease on the previous year. The percentage recovery is the amount of total waste accepted that was reused, recycled or recovered.

**Table 14 Waste Accepted**

| Type | Quantity (Tonnes) | % Increase/ decrease on previous year | % Recovery |
|---|---|---|---|
| Hazardous | | | |
| Non-Hazardous | | | |
| Inert | | | |
| **Total Tonnes** | | | |

Comment

No waste accepted during the period.

# 8) Financial Provision

**Explanation**
Our EPA licence requires us to assess the risk our activities pose to the environment if we cease our activities or if an incident occurred. If we are identified as a high risk facility[10] by the EPA, we are required to put provision in place such as a financial bond or insurance to cover the cost of restoring our site to a satisfactory condition. This financial provision can then be used to cover the cost of managing the restoration or clean up should such an event occur.

1. Are you required to have an agreed financial provision in place?

Yes [ ] No [X]

2. What year was your Closure, Restoration and Aftercare Management Plan (CRAMP) last agreed by the Agency?

Not required under the Licence. However, Bog Rehabilitation Plans are required to be submitted to the EPA. These were submitted to the Agency in May 2018. Since then, the EPA issued new Guidance on the process of preparing and implementing a bog rehabilitation plan and under the Peatlands Climate Action Plan www.bnmpcas.ie & https://www.gov.ie/en/publication/136a7-bord-na-mona-bog-rehabilitation-scheme/, Bord na Mona are preparing new rehabilitation plans to be submitted by March/April 2021.

3. What year was your Environmental Liability Assessment Report (ELRA) agreed by the Agency?

Not required under the Licence.

[10] See Appendix II

4. Has there been any significant changes on your site since the last agreements?

Yes [ ] No [X]

If yes, have you submitted details to the EPA?

Yes [X] No [ ] N/A [ ]

# Appendix I

**Class of Activity**

Industrial and waste facilities are classed into different sectors depending on the nature of their activity and its potential impact on the environment. The EPA Act 1992 as amended, outlines these as follows:

| | |
|---|---|
| Class 1 | Minerals and other materials |
| Class 2 | Energy |
| Class 3 | Metals |
| Class 4 | Mineral fibres and glass |
| Class 5 | Chemicals |
| Class 6 | Intensive Agriculture[11] |
| Class 7 | Food and drink |
| Class 8 | Wood, paper, textiles and leather |
| Class 9 | Fossil fuels |
| Class 10 | Cement, lime and magnesium oxide |
| Class 11 | Waste |

[11] This reporting template is not applicable to the **intensive agriculture sector**. Their annual environmental reporting structure is different and can be found at http://www.epa.ie/pubs/advice/aerprtr/aerguid/

Class 12 Surface Coatings

Class 13 Other Activities

# Appendix II

**High Environmental Risk Categories**

If an industrial or waste licence falls into one of these categories it is deemed, by the EPA, as a high environmental risk. As a result, the licence holder is required to have financial provision in place. See section 8, Financial Provision.

1. Landfills
2. Non-Hazardous Waste Transfer Station
3. Incineration and Co-Incineration Waste Facilities
4. Category A – Extractive Waste Facilities
5. Upper and Lower Tier Seveso Facilities
6. Hazardous Waste Transfer Stations
7. High Risk Contaminated Land
8. Exceptional Circumstances

**NOTE:**

This list is subject to change.

See the link below for further information.

http://www.epa.ie/pubs/advice/licensee/fp/epaapproachtoenvironmentalliabilitiesandfinancialprovision.html

# Annual Environmental Report (AER)

# 2021

Company Name: Bord na Móna Energy Ltd (Derrygreenagh Group)

Licence Number: P0501-01

Address: Bord na Móna, Derrygreenagh Works, Rochfordsbridge, Co Westmeath.

Class of Activity[1]: 1.4

[1] See Appendix I

# Purpose of this Report

One of the functions of the Environmental Protection Agency (EPA) is to licence and regulate the activities[2] of large scale industrial (e.g. chemical, food processors, power plants) and waste facilities. Submitting an Annual Environmental Report (AER) is a requirement of all EPA licences.

An AER is a public document. To this end, this format has been developed for industrial and waste licence holders (other than the intensive agriculture sector) to use as a template. This is to assist any member of the public to interpret and understand the environmental performance of the licensed facility.

The AER is a **summary** of environmental information for a given year. It includes:

- Details of the licence holder's environmental goals achieved, goals to maintain compliance and/or improve their environmental performance;
- Answers to questions regarding their facility's activities;
- Tables of results from monitoring emissions such as air, water, noise, and odour; and
- Details of waste generated, accepted and treated.

An AER does **not** provide detailed technical data. Such information is available in three ways:

1) Contacting the licence holder directly. The Contact Us section of this template enables the licence holder to provide details of where a member of the public can obtain further information on topics reported in this document.

[2] See Appendix I

2) Some documents[3] are available on the EPA website via the licence details page for each individual licence. This can be found by browsing either the http://www.epa.ie/licensing/ or http://www.epa.ie/enforcement/ pages of the EPA website.

3) All formal enforcement correspondence exchanged between the EPA and a licence holder during the regulatory process is available for public viewing by appointment at any EPA Office.

If you have a question or query about an AER or an individual EPA licensed facility see the EPA's website or contact the relevant EPA office. See http://www.epa.ie/about/contactus/ for contact details.

[3] This includes EPA site inspection and compliance monitoring reports, licence holders' self-monitoring reports, AERs and special reports

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# Glossary

| | |
|---|---|
| Abatement Equipment | Technology used to reduce pollution |
| AER | Annual Environmental Report. |
| CRAMP | Closure, Restoration and Aftercare Management Plan. |
| ELRA | Environmental Liability Risk Assessment. |
| Emission Limit Value | Limits set for specified emissions, typically outlined in Schedule B of an EPA licence. |
| EMS | Environmental Management System. |
| Environmental Goal | An objective or target set by a licensee as part of an environmental management system (EMS). |
| Environmental Pollutant | Substance or material that due to its quantity and/or nature has a negative impact on the environment. |
| Facility | Any site or premises that holds an EPA industrial or waste licence. |
| FP | Financial Provision. |
| GJ | Giga joules, an international unit of energy measurement. |
| Groundwater | All water which is below the surface of the ground in the saturation zone and in direct contact with the ground or subsoil. |
| Incident | As defined by an EPA industrial or waste licence. |

| | |
|---|---|
| Inert Waste | Is waste that will not undergo physical, chemical or biological change thereby, is unlikely to cause environmental pollution or harm human health. |
| List of Wastes (LoW) | A list of wastes drawn up by the European Commission and published as Commission Decision 2014/955/EU. |
| Noise Sensitive Location | Any dwelling house, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other installation or area of high amenity which for its proper enjoyment requires the absence of noise at nuisance levels. |
| Non-Renewable Resource | A resource of economic value that cannot be replaced at the same rate it is being consumed e.g. coal, peat, oil and natural gas. |
| Oil Separator | Separator system for light liquids (e.g. oil and petrol). |
| PRTR | Pollutant Release and Transfer Register. |
| Renewable Resource | Wind, solar, aerothermal, geothermal, hydrothermal and ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases. |
| Sanitary Waste | Waste water from toilet, washroom and canteen facilities. |
| Storm Water | Rain water run-off from roof and non-process areas. |

| | |
|---|---|
| Surface Water | Lakes, rivers, streams, estuaries and coastal waters. |
| Trigger Level | A value set for a specific parameter, the achievement or exceedance of which requires certain actions to be taken by the licence holder. |
| Volatile Organic Compounds | Gases produced from solids or liquids that evaporate readily in ambient conditions. |
| Waste | Any substance or object which the holder discards or intends or is required to discard. |

Disclaimer

These are **not** legal definitions. Legal definitions can be found in the corresponding legislation.

# Declaration

I, Cathal Brennan, confirm that by ticking the box below, all information in this report is truthful and accurate to the best of my knowledge and belief.

In addition, I confirm that all monitoring and performance reporting required by our EPA licence and summarised herein is available for inspection by the EPA.

**Tick here** ☑

# 1) Introduction

See below a brief description of our facility and a summary of our environmental performance this year.

- 
- During the reporting period, Bord na Móna notified the Agency, that in line with its Brown to Green strategy, it had decided to end all peat harvesting on Bord na Móna lands. It is now progressing with its requirements under Condition 10 of the relevant IPC Licences to decommission and rehabilitate available bogs under the Peatlands Climate Action Scheme PCAS (February 2021).
- During the reporting period the primary activity was peat sales of existing stock.
- In the period, there were no complaints of an environmental nature, the same as in 2020.
- During the period, there was a 102.98% increase in waste generated, mostly related to a decrease in activity but an increase in polythene recycling and scrap steel recycling
- In the period, there was one reported incident of an environmental nature relating to exceedances in trigger level. This was of minor significance and was closed out during the period.
- During the period, there were notifications submitted regarding new waste contractors, relocation of composite samplers, and notification of planning applications.
- Monthly water quality sampling data was submitted for sampling undertaken during the period, which included peatlands prior to the rehabilitation undertaken in 2021 and to provide baseline data for peatlands to be rehabilitated in subsequent years.
- During the period, certification to ISO9001 was retained.

## Contact Us

If you have any questions or would like further information on any aspect of this report, please contact us directly.

See below details:

Enda McDonagh,
Bord na Mona Energy Ltd
Leabeg
Tullamore
Co Offaly
www.bnm.ie

# 2) How we Manage our Facility

Bord na Mona have an Environmental Compliance Department with a team of five who manage the day to day IPC Licence requirements. This licence governs the extraction of peat and associated activities and manages emission to air, water and land.

The information below sets out the environmental goals for our facility to help us prevent environmental pollution and reduce our impact on the environment. Target dates for completing each goal and progress towards achieving the goal are outlined in Table 1.

**Table 1 Environmental Goals**

| Environmental Goal | Target Date | Progress |
|---|---|---|
| Training/awareness for all area leaders and operatives in advance of decommissioning and rehabilitation of the 2022 bogs | May2022 | Underway |
| Waste Management – Removal of all waste that are deemed a risk the environment in bogs scheduled to be decommissioned in 2022 | Dec 2022 | Underway |
| Communication of Decommissioning and Rehabilitation plans to all neighbours within 1km of the proposed activity for 2022 | June 2022 | One bog is scheduled for 2022 and has had letters and associated details delivered. |
| Completion of internal audits/inspections of applicable bogs scheduled for decommissioning and rehabilitation as required by condition 10 and the Peatlands Climate Action Scheme | Sept 2022 | Not commenced yet |

| | | |
|---|---|---|
| Maintain surface water quality compliance with emission limit values for Suspended Solids during the proposed decommissioning and rehabilitation programme. | Dec 2022 | Underway |
| Decommissioning and Rehabilitation of one bog in accordance with Condition 10 of the IPC Licence and in accordance with Peatlands Climate Action Scheme https://www.gov.ie/en/publication/136a7-bord-na-mona-bog-rehabilitation-scheme/ | December 2022 to March 2023 | To commence on the 1st April 2022 |

Add rows as necessary

Comment

| |
|---|
| As peat extraction on all bogs in this licence ceased in 2020, all environmental goals for 2022 are linked to the remaining bog activity which is the decommissioning and rehabilitation of the one bog planned for 2022. |

# 3) Energy & Water

## Energy

**Explanation**
Fossil fuels such as coal, gas and oil are non-renewable resources. As a result, our EPA licence requires that we measure our energy use and set targets to improve the energy efficiency of our activities and reduce our overall use, where possible. Where we have the means and technology on-site to generate energy, this is also captured in this report.

The information below summarises the energy used this year compared to the previous year and includes renewable and non-renewable energy types.

**Table 2 Energy Used**

| Energy Used (GJ) | Quantity | % Increase/ decrease on previous year |
|---|---|---|
| Electricity | 716.99 GJ | 73.28% |
| Heavy Fuel Oil | - | |
| Light Fuel Oil | 5645 GJ | 233.43% |
| Natural Gas | - | |
| Coal / Solid Fuel | - | |
| Peat | - | |
| Renewable Biomass | - | |
| Renewable Energy Generated On-site | - | |
| **Total Energy Used** | 6361.99 GJ | 201.9% |

Comment

Electricity usage increased in 2021 as did fuel usage. This was mainly due to ongoing peat stock sales and continual requirements to pumps relevant bogs in advance of any planned decommissioning and rehabilitation.

The information below summarises the energy we generated on our site this year with specific focus on renewable energy generation.

**Table 3 Energy Generated**

| **Energy Generated (GJ)** | **Quantity** | **% Increase/ decrease on previous year** |
|---|---|---|
| Renewable Energy | N/A | |
| **Total Energy Generated** | | |

Comment

| |
|---|
| There are no renewable energy assets on this site. |

## Water

**Explanation**
Water is a natural resource and we are required by our EPA licence to identify ways to reduce our use where possible. Water used in industry can be extracted from groundwater, rivers and lakes (surface water), taken from public water supplies (Irish Water), recycled from the facility's processes or harvested from rainwater.

The information below summarises and compares the quantity of water used this year compared to the previous year.

**Table 4 Water Used**

| **Source of Water Used** | **Quantity ($m^3$/year)** | **% Increase/ decrease on previous year** |
|---|---|---|
| Groundwater | | |
| Surface Water | 0 | |
| Public Supply | | |
| Recycled Water | 0 | |
| Rainwater | 0 | |
| **Total Water Used** | | |

Comment

Water is not used in any of the peat harvesting or transport processes. The only water used is that required to provide associated offices and workshop welfare facilities (canteen/toilets)

# 4) Environmental Complaints

**Explanation**
Our EPA licence requires that activities do not cause environmental nuisance such as odour, dust or noise. Our licence also requires that we have procedures in place to record, investigate and respond to environmental complaints if or when they arise.
We have an environmental complaints procedure in place where you can contact us[4] directly. You can also contact the EPA[5] if you wish to make an environmental complaint, confidentially or not.

See the information below for a summary of **all** the environmental complaints relating to our activities made directly to us and to the EPA this year.

**Table 5 Summary of All Environmental Complaints Received in**

| Type of Complaint | Number of Complaints Received | Number Closed |
|---|---|---|
| **Odour / Smells** | | |
| **Noise** | | |
| **Dust** | | |
| **Water Quality** | | |
| **Air Quality** | | |
| **Waste** | | |
| **Litter** | | |
| **Vermin/Flies/Birds** | | |
| **Soil Contamination** | | |
| **Vibration** | | |
| **Other** | | |

[4] See Section 1, Introduction – Contact Us

[5] If you wish to contact the EPA to make an environmental complaint about an EPA licenced facility, please go to https://lema.epa.ie/complaints

Comment

| |
|---|
| As required environmental complaints are reportable to the EPA and as such must be investigated. In the 2021 reporting period, this licence received no complaints of an environmental nature. |

# 5) Environmental Incidents

**Explanation**
It is our responsibility as an EPA licensed facility to ensure we have systems in place to prevent incidents that have the potential to cause environmental pollution. If an incident occurs, we are required to report it to the EPA, investigate the cause and fix the problem.
The EPA classify environmental incidents into 5 categories based on the potential impact on the environment:

- Minor
- Limited
- Serious
- Very Serious
- Catastrophic

See Table 6 for the number of the environmental incidents we reported to the EPA this year.

**Table 6 Number of Environmental Incidents**

| Incident Category | Minor | Limited | Serious | Very Serious | Catastrophic |
|---|---|---|---|---|---|
| Abatement Equipment Offline | | | | | |
| Breach of Ambient ELV | | | | | |
| Breach of Emission Limit | | | | | |
| Explosion | | | | | |
| Fire | | | | | |
| Monitoring Equipment Failure | | | | | |
| Odour | | | | | |
| Spillage | | | | | |
| Breach of trigger Level | 1 | | | | |
| Uncontrolled Release | | | | | |

| Incident Category | Minor | Limited | Serious | Very Serious | Catastrophic |
|---|---|---|---|---|---|
| Other | | | | | |

Comment

| |
|---|
| As required, incidents of an environmental nature are reportable to the EPA and as such must be investigated. In the 2021 reporting period, this licence recorded and reported 1 incident. This incident was related to trigger level breach for COD, which was investigated and closed out. |

# 6) Our Environmental Emissions

**Explanation**

We are required to ensure the emissions from our activities do not cause environmental pollution.

We are required to monitor any of the following emissions that we make:

- Storm water
- Waste water
- Air
- Groundwater
- Noise

We regularly test any such emissions for specific pollutants and materials to ensure they do not contain levels of pollution that exceed emission limit values (ELVs) or cause environmental pollution. If monitoring of an emission indicates an ELV is exceeded, we are required to report this to the EPA[6].

The next sub-sections of this report summarise our compliance with any ELVs set in our EPA licence. Some emissions monitored do not have specific ELVs, but we still carry out monitoring and report all incidents that may give rise to environmental pollution.

[6] See section 5, Incidents

## Storm Water

**Explanation**
Storm water is rain water run-off from roof and non-process areas of a facility, e.g. carparks, and generally shall not contain any pollution.
Storm water is usually released into a local water body after a basic form of treatment. Our EPA licence requires that we manage storm water to ensure no polluting substances or materials are released into the environment.

The information below summarises how the storm water from our facility is treated, where it is released and the results of monitoring this year.

1. **Storm water from our facility is managed prior to release by;**

Either direct to drain where it is roof water only, or via petrol/oil interceptor.

2. **Storm water from our facility is released into the following water bodies:**

Yellow River, Kinnegad River & Boyne River. Curris River, Stoneyford River

**Table 7 Summary of Storm Water Monitoring**

| Parameter measured | No. of Samples | % Compliant[7] | Comment |
|---|---|---|---|
| COD | 18 | 100% Compliant | Oil Interceptors cleaned at Derrygreenagh W/shop, and Oil Interceptor & Rossan outloading facility. |
| | | | |

Add rows as necessary

Comment

| |
|---|
| As required by the licence, stormwater is required to be separated where possible from process/non-process areas. Where this is not possible, stormwater is managed via oil-interceptors which are inspected on a monthly basis and sampled for associated discharges each month. Other than visual observations, the other main criteria to define adequate treatment is COD mg/l so this and visual inspections dictate when the interceptor is cleaned by an approved hazardous waste contractor. |

[7] % compliant = [(number of samples compliant) / (number of samples taken)] x 100. Compliance could refer to emission limit values or trigger levels. The EPA commonly use trigger levels on stormwater discharges.

## Waste Water

**Explanation**
There are two types of waste water that can be produced:

- Process waste water produced from the activities and;
- Sanitary waste water from toilets, washrooms and canteens.

Our EPA licence requires us to manage our waste water on or off-site and ensure that it does not cause environmental pollution when discharged into the environment.

The information below summarises how we treat the waste water produced from our activities, where it is released and the results of monitoring this year.

1. **Waste water produced by our activities is treated as follows before discharge to a receiving waterbody**;

All production area runoff is treated via an associated silt pond designed, inspected and maintained in accordance with condition 6 of the IPC Licence

2. **Treated waste water from our facility is released into the following water bodies:**

Mongagh River, Yellow River, Castlejordan River, Kinnegad River, Deel River, Boyne River, Curris River, Stoneyford River

**Table 8 Summary of Waste Water Monitoring**

| Parameter measured | No. of Samples | % Compliant | Comment |
|---|---|---|---|
| Suspended Solids | 115 | 100% | |
| Ammonia | 76 | 100% | |
| Total Solids | 115 | NA | |
| Total Phosphorus | 76 | NA | |
| pH | 76 | NA | |
| Colour | 76 | NA | |
| COD | 94 | 98.94% | Trigger level reached on one occasion on Automatic Sampler |

Add rows as necessary

Comment

Licence requirements are quarterly grab samples on a selected number of silt pond outlets as per condition 6.2 and one 24hr flow proportional composite sampler at Rossan bog.
The emission limit values are 35mg/l suspended solids, 2.78mg/l total ammonia and 100mg/l COD. The Trigger Level for COD in 2021 was reached on one occasion, the same as 2020. There is no obvious reason for reaching these trigger levels, other than naturally occuring background levels associated with COD.

7)

## Air

**Explanation**

Generally, three types of air emissions are monitored from industry in Ireland: gases, dust (particulates) and odour. Our EPA licence requires us to ensure that any air emissions from our activities do not cause air pollution or create an odour nuisance.

The information below details the number of air emission points we monitor, the results from testing the air emissions and any odour assessments carried out by us and the EPA this year.

1. **We monitor air emissions from the following number of emission points at our facility.**

N/A

**Table 9 Summary of Air Emissions Monitoring**

| Parameter measured | No. of Samples | % Compliant | Comment |
|---|---|---|---|
| Fugitive Dust | | | |
| | | | |

Add rows as necessary

Comment

Due to the cessation of production it is no longer a requirement to monitor Air Emissions

**Table 10 Summary of Odour Assessments Carried Out**

| Assessment Conducted By | No. of Odour Assessments | % Compliant[8] | Comment |
|---|---|---|---|
| Licence Holder | NA | | Not required |
| EPA | NA | | Not required |

Add rows where necessary

Comment

| |
|---|
| There are no odour emissions of note from the activity, no requirements to monitor and no associated complaints. |

[8] A compliant odour assessment is based on EPA Odour Impact Assessment Guidance available at http://www.epa.ie/pubs/advice/air/emissions/ag5-odourassessment.html

## Fugitive Solvent Emissions

**Are you are required to monitor fugitive solvent air emissions from your facility?**

Yes [ ] No [X]

**Explanation**
The use of solvents is regulated under Irish and European Union (EU) Regulations[9]. Solvents are chemicals that, by their nature, are volatile (evaporate readily under ambient conditions). Solvents can be found in many inks, glues and cleaning agents. Due to the volatility of solvents some emissions may be released into the atmosphere during our activities before being captured in our air treatment system. This type of emission is called a **fugitive solvent emission**.

The information below summarises the quantity of solvents used this year, the percentage of fugitive solvent emissions (% of total quantity used) and whether the percentage complied with the targets set in the EU Regulations.

**Table 11 Summary of Fugitive Solvent Emissions**

| Quantity of Solvents Used (Kg) | % Fugitive Solvent Emissions | Compliant |
|---|---|---|
| | | |

Comment

N/A

[9] See Annex VII of the Industrial Emissions Directive
https://ec.europa.eu/environment/industry/stationary/ied/legislation.htm

## Groundwater

**Explanation**
Groundwater is an important and sensitive resource in Ireland. Our EPA licence requires that we monitor groundwater to ensure our activities do not cause groundwater pollution.
Understanding how groundwater flows through soil and rock layers and eventually into surface and coastal waters is a complex science. Sometimes groundwater pollution that occurred in the past can take years and even decades to disappear. Therefore, it is important that experts help us monitor and interpret results from groundwater monitoring and testing.

The information below is a basic summary of the condition of the groundwater this year.

1. **Do you have a groundwater monitoring programme in place?**

Yes [ ] No [X]

2. **Have the groundwater monitoring results over the last 5 years indicated the presence of groundwater pollution?**

Yes [ ] No [X]

**Table 12 List of Groundwater Pollutants Identified**

| Pollutants |
|---|
| |

Add rows as necessary

**3. Give details of the investigations and subsequent actions taken, where applicable, to manage the groundwater pollution.**

| |
|---|
| N/A |

Comment

| |
|---|
| There are no licence requirements to monitor groundwater from the activity. |

## Noise

**Explanation**
Our EPA licence requires that we monitor noise emissions from our facility. Noise monitoring can be conducted at the boundary of our facility and/or at locations beyond the boundary referred to as “noise sensitive locations”. Noise monitoring requires the use of special noise monitoring equipment. Our EPA licence requires that noise produced by our facility shall not exceed the noise limit values and/or give rise to nuisance.

The information below gives a summary of when and where we conducted noise monitoring this year and if results complied with our EPA licence limits.

1. **We conducted noise monitoring on the following dates this year:**

N/A

2. **Was the noise monitoring carried out at:**
   i. **the boundary of our facility,**
   ii. **noise sensitive locations off-site, or**
   iii. **both?**

N/A

3. **Were measured noise levels compliant with your EPA licence limits?**

Yes ☐ No ☐

If No, we took the following actions to address the noise level exceedances?

NA

Comment

There are no licence requirements to monitor noise from the activity, or any complaints regarding noise impact.

# 8) Waste

## Waste Generated

**Explanation**
Our EPA licence requires us to manage the waste we generate in a manner that does not cause environmental pollution.
We manage, store and record hazardous, non-hazardous and inert waste we generate in accordance with our licence. We ensure that this waste is subsequently treated or disposed of in accordance with the relevant waste Regulations.

The information in table 13 is a summary of waste we generated this year and the percentage increase or decrease on the previous year. The percentage recovery is the amount of total waste generated that was reused, recycled or recovered.

**Table 13 Waste Generated**

| Type | Quantity (Tonnes) | % Increase/ decrease on previous year | % Recovery |
|---|---|---|---|
| Hazardous | 14.74 | 15.62% decrease | 100% |
| Non-Hazardous | 519.17 | 111% increase | 95.52% |
| Inert | | | |
| **Total Tonnes** | 533.91 | 102.9% increase | 95.65% |

Comment

The main wastes generated from this activity are Polythene, scrap metal, Silt Pond Waste, Peat Screenings, Waste Oil, Interceptor Waste, Oil Filters, Parts Wash all of which are recycled. The waste generated for landfill was general waste skips and wheelie bins from workshops and office waste.

## Waste Accepted

Did you accept waste onto your facility for storage, treatment, recovery or disposal this year?

Yes [ ] No [X]

**Explanation**
Our EPA licence requires us to manage the waste we accept in a manner that does not cause environmental pollution.
We manage, store and record all incoming and outgoing hazardous, non-hazardous and inert waste. The waste we accept may be treated, recovered, disposed or stored at our facility depending on our licence requirements.

The information in Table 14 provides a summary of waste we accepted this year and the percentage increase or decrease on the previous year. The percentage recovery is the amount of total waste accepted that was reused, recycled or recovered.

**Table 14 Waste Accepted**

| Type | Quantity (Tonnes) | % Increase/ decrease on previous year | % Recovery |
|---|---|---|---|
| Hazardous | | | |
| Non-Hazardous | | | |
| Inert | | | |
| **Total Tonnes** | | | |

Comment

No waste accepted during the period.

# 9) Financial Provision

**Explanation**
Our EPA licence requires us to assess the risk our activities pose to the environment if we cease our activities or if an incident occurred. If we are identified as a high risk facility[10] by the EPA, we are required to put provision in place such as a financial bond or insurance to cover the cost of restoring our site to a satisfactory condition. This financial provision can then be used to cover the cost of managing the restoration or clean up should such an event occur.

1. Are you required to have an agreed financial provision in place?

Yes [ ] No [X]

2. What year was your Closure, Restoration and Aftercare Management Plan (CRAMP) last agreed by the Agency?

Not required under the licence. However, the equivalent Bog Rehabilitation Plans, which include closure, restoration and aftercare are being submitted to the Agency in advance of any decommissioning and rehabilitation.

3. What year was your Environmental Liability Assessment Report (ELRA) agreed by the Agency?

Not required under the Licence.

4. Has there been any significant changes on your site since the last agreements?

Yes [ ] No [X]

[10] See Appendix II

If yes, have you submitted details to the EPA?

Yes [ ] No [ ] N/A [X]

# Appendix I

**Class of Activity**

Industrial and waste facilities are classed into different sectors depending on the nature of their activity and its potential impact on the environment. The EPA Act 1992 as amended, outlines these as follows:

| | |
|---|---|
| Class 1 | Minerals and other materials |
| Class 2 | Energy |
| Class 3 | Metals |
| Class 4 | Mineral fibres and glass |
| Class 5 | Chemicals |
| Class 6 | Intensive Agriculture[11] |
| Class 7 | Food and drink |
| Class 8 | Wood, paper, textiles and leather |
| Class 9 | Fossil fuels |
| Class 10 | Cement, lime and magnesium oxide |
| Class 11 | Waste |
| Class 12 | Surface Coatings |
| Class 13 | Other Activities |

[11] This reporting template is not applicable to the **intensive agriculture sector**. Their annual environmental reporting structure is different and can be found at http://www.epa.ie/pubs/advice/aerprtr/aerguid/

# Appendix II

**High Environmental Risk Categories**

If an industrial or waste licence falls into one of these categories it is deemed, by the EPA, as a high environmental risk. As a result, the licence holder is required to have financial provision in place. See section 8, Financial Provision.

1. Landfills
2. Non-Hazardous Waste Transfer Station
3. Incineration and Co-Incineration Waste Facilities
4. Category A – Extractive Waste Facilities
5. Upper and Lower Tier Seveso Facilities
6. Hazardous Waste Transfer Stations
7. High Risk Contaminated Land
8. Exceptional Circumstances

## NOTE:

This list is subject to change.

See the link below for further information.

http://www.epa.ie/pubs/advice/licensee/fp/epaapproachtoenvironmentalliabilitiesandfinancialprovision.html

# Annual Environmental Report (AER)

# 2022

Company Name: Bord na Móna Energy Ltd (Derrygreenagh Group)

Licence Number: P0501-01

Address: Bord na Móna, Derrygreenagh Works, Rochfordsbridge, Co Westmeath.

Class of Activity[1]: 1.4

[1] See Appendix I

# Purpose of this Report

One of the functions of the Environmental Protection Agency (EPA) is to licence and regulate the activities[2] of large scale industrial (e.g. chemical, food processors, power plants) and waste facilities. Submitting an Annual Environmental Report (AER) is a requirement of all EPA licences.

An AER is a public document. To this end, this format has been developed for industrial and waste licence holders (other than the intensive agriculture sector) to use as a template. This is to assist any member of the public to interpret and understand the environmental performance of the licensed facility.

The AER is a **summary** of environmental information for a given year. It includes:

- Details of the licence holder's environmental goals achieved, goals to maintain compliance and/or improve their environmental performance;
- Answers to questions regarding their facility's activities;
- Tables of results from monitoring emissions such as air, water, noise, and odour; and
- Details of waste generated, accepted and treated.

An AER does **not** provide detailed technical data. Such information is available in three ways:

1) Contacting the licence holder directly. The Contact Us section of this template enables the licence holder to provide details of where a member of the public can obtain further information on topics reported in this document.

[2] See Appendix I

2) Some documents[3] are available on the EPA website via the licence details page for each individual licence. This can be found by browsing either the http://www.epa.ie/licensing/ or http://www.epa.ie/enforcement/ pages of the EPA website.

3) All formal enforcement correspondence exchanged between the EPA and a licence holder during the regulatory process is available for public viewing by appointment at any EPA Office.

If you have a question or query about an AER or an individual EPA licensed facility see the EPA's website or contact the relevant EPA office. See http://www.epa.ie/about/contactus/ for contact details.

[3] This includes EPA site inspection and compliance monitoring reports, licence holders' self-monitoring reports, AERs and special reports

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# Glossary

| | |
|---|---|
| Abatement Equipment | Technology used to reduce pollution |
| AER | Annual Environmental Report. |
| CRAMP | Closure, Restoration and Aftercare Management Plan. |
| ELRA | Environmental Liability Risk Assessment. |
| Emission Limit Value | Limits set for specified emissions, typically outlined in Schedule B of an EPA licence. |
| EMS | Environmental Management System. |
| Environmental Goal | An objective or target set by a licensee as part of an environmental management system (EMS). |
| Environmental Pollutant | Substance or material that due to its quantity and/or nature has a negative impact on the environment. |
| Facility | Any site or premises that holds an EPA industrial or waste licence. |
| FP | Financial Provision. |
| GJ | Giga joules, an international unit of energy measurement. |
| Groundwater | All water which is below the surface of the ground in the saturation zone and in direct contact with the ground or subsoil. |
| Incident | As defined by an EPA industrial or waste licence. |

| | |
|---|---|
| Inert Waste | Is waste that will not undergo physical, chemical or biological change thereby, is unlikely to cause environmental pollution or harm human health. |
| List of Wastes (LoW) | A list of wastes drawn up by the European Commission and published as Commission Decision 2014/955/EU. |
| Noise Sensitive Location | Any dwelling house, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other installation or area of high amenity which for its proper enjoyment requires the absence of noise at nuisance levels. |
| Non-Renewable Resource | A resource of economic value that cannot be replaced at the same rate it is being consumed e.g. coal, peat, oil and natural gas. |
| Oil Separator | Separator system for light liquids (e.g. oil and petrol). |
| PRTR | Pollutant Release and Transfer Register. |
| Renewable Resource | Wind, solar, aerothermal, geothermal, hydrothermal and ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases. |
| Sanitary Waste | Waste water from toilet, washroom and canteen facilities. |
| Storm Water | Rain water run-off from roof and non-process areas. |

| | |
|---|---|
| Surface Water | Lakes, rivers, streams, estuaries and coastal waters. |
| Trigger Level | A value set for a specific parameter, the achievement or exceedance of which requires certain actions to be taken by the licence holder. |
| Volatile Organic Compounds | Gases produced from solids or liquids that evaporate readily in ambient conditions. |
| Waste | Any substance or object which the holder discards or intends or is required to discard. |

Disclaimer

These are **not** legal definitions. Legal definitions can be found in the corresponding legislation.

# Declaration

I, Cathal Brennan, confirm that by ticking the box below, all information in this report is truthful and accurate to the best of my knowledge and belief.

In addition, I confirm that all monitoring and performance reporting required by our EPA licence and summarised herein is available for inspection by the EPA.

**Tick here** ☑

# 1) Introduction

See below a brief description of our facility and a summary of our environmental performance this year.

- During the reporting period the primary activity was peat sales of existing stock and decommissioning and rehabilitation of bogs in this IPC Licence.
- In the period, there were no complaints of an environmental nature, as was the case in 2021.
- During the reporting period, 137 Ha's or 75% of peatlands at Carranstown Bog was rehabilitated with some of this works extending into the 2023 period.
- During the period, there was a 102.98% increase in waste generated, mostly related to a decrease in activity but an increase in polythene and scrap metal recycling and general waste disposal.
- During 2022, Rehabilitation plans, maps and associated assessments were submitted to the Agency for Carranstown Bog and these are available to view at https://www.bnmpcas.ie/bogs-peatlands-climate-action-scheme/
- During the period, there were notifications submitted regarding general compliance reporting obligations and the 2021 Annual Environmental Reports.
- During 2022 Bord na Mona retained certification to ISO9001 for the decommissioning and rehabilitation of peatlands to support the climate action scheme.

## Contact Us

If you have any questions or would like further information on any aspect of this report, please contact us directly.

See below details:

Enda McDonagh,
Bord na Mona Energy Ltd
Leabeg
Tullamore
Co Offaly
www.bnm.ie

# 2) How we Manage our Facility

Bord na Mona have an Environmental Compliance Department with a team of five who manage the day to day IPC Licence requirements. This licence governs the extraction of peat and associated activities and manages emission to air, water and land.

The information below sets out the environmental goals for our facility to help us prevent environmental pollution and reduce our impact on the environment. Target dates for completing each goal and progress towards achieving the goal are outlined in Table 1.

**Table 1 Environmental Goals**

| Environmental Goal | Target Date | Progress |
|---|---|---|
| Training/awareness for all area leaders and operatives in advance of decommissioning and rehabilitation of the 2023 bogs | May 2023 | Underway |
| Waste Management – Removal of all waste that are deemed a risk the environment in bogs scheduled to be decommissioned in 2023 | Dec 2023 | Underway |
| Communication of Decommissioning and Rehabilitation plans to all neighbours within 1km of the proposed activity for 2023 | June 2023 | Two bogs are scheduled for 2023 and will have had letters and associated details delivered/ |
| Completion of internal audits/inspections of applicable bogs scheduled for decommissioning and rehabilitation as required by condition 10 and the Peatlands Climate Action Scheme | December 2023 | Not commenced yet |

| | | |
|---|---|---|
| Maintain surface water quality compliance with emission limit values for Suspended Solids during the proposed decommissioning and rehabilitation programme. | Dec 2023 | Underway |
| Decommissioning and Rehabilitation of 2023 bogs in accordance with Condition 10 of the IPC Licence and in accordance with Peatlands Climate Action Scheme https://www.gov.ie/en/publication/136a7-bord-na-mona-bog-rehabilitation-scheme/ | January to December 2023 | To commence once approved by NPWS and EPA |

Add rows as necessary

Comment

| |
|---|
| As peat extraction on all bogs in this licence ceased in 2020, all environmental goals for 2023 are linked to the remaining bog activity which is the decommissioning and rehabilitation of the bogs planned for 2023. |

# 3) Energy & Water

## Energy

**Explanation**
Fossil fuels such as coal, gas and oil are non-renewable resources. As a result, our EPA licence requires that we measure our energy use and set targets to improve the energy efficiency of our activities and reduce our overall use, where possible. Where we have the means and technology on-site to generate energy, this is also captured in this report.

The information below summarises the energy used this year compared to the previous year and includes renewable and non-renewable energy types.

**Table 2 Energy Used**

| Energy Used (GJ) | Quantity | % Increase/ decrease on previous year |
|---|---|---|
| Electricity | 715.05 GJ | 0.27% decrease |
| Heavy Fuel Oil | - | |
| Light Fuel Oil | 2,583.8 GJ | 54.2% decrease |
| Natural Gas | - | |
| Coal / Solid Fuel | - | |
| Peat | - | |
| Renewable Biomass | - | |
| Renewable Energy Generated On-site | - | |
| **Total Energy Used** | 3,298.85GJ | 48.14% decrease |

Comment

Electricity usage decreased in 2022 as did fuel usage. Energy use fluctuations are mainly defined by ceasing peat extraction activities in 2020, peat stock depletion and ramping up of decommissioning and rehabilitation activity.

The information below summarises the energy we generated on our site this year with specific focus on renewable energy generation.

**Table 3 Energy Generated**

| **Energy Generated (GJ)** | **Quantity** | **% Increase/ decrease on previous year** |
|---|---|---|
| Renewable Energy | N/A | |
| **Total Energy Generated** | | |

Comment

| |
|---|
| There are no renewable energy assets on this site. |

## Water

**Explanation**
Water is a natural resource and we are required by our EPA licence to identify ways to reduce our use where possible. Water used in industry can be extracted from groundwater, rivers and lakes (surface water), taken from public water supplies (Irish Water), recycled from the facility's processes or harvested from rainwater.

The information below summarises and compares the quantity of water used this year compared to the previous year.

**Table 4 Water Used**

| **Source of Water Used** | **Quantity ($m^3$/year)** | **% Increase/ decrease on previous year** |
|---|---|---|
| Groundwater | | |
| Surface Water | 0 | |
| Public Supply | | |
| Recycled Water | 0 | |
| Rainwater | 0 | |
| **Total Water Used** | | |

Comment

Water is not used in any of the peat harvesting or transport processes. The only water used is that required to provide associated offices and workshop welfare facilities (canteen/toilets)

# 4) Environmental Complaints

**Explanation**
Our EPA licence requires that activities do not cause environmental nuisance such as odour, dust or noise. Our licence also requires that we have procedures in place to record, investigate and respond to environmental complaints if or when they arise.
We have an environmental complaints procedure in place where you can contact us[4] directly. You can also contact the EPA[5] if you wish to make an environmental complaint, confidentially or not.

See the information below for a summary of **all** the environmental complaints relating to our activities made directly to us and to the EPA this year.

**Table 5 Summary of All Environmental Complaints Received in**

| Type of Complaint | Number of Complaints Received | Number Closed |
|---|---|---|
| **Odour / Smells** | | |
| **Noise** | | |
| **Dust** | | |
| **Water Quality** | | |
| **Air Quality** | | |
| **Waste** | | |
| **Litter** | | |
| **Vermin/Flies/Birds** | | |
| **Soil Contamination** | | |
| **Vibration** | | |
| **Other** | | |

[4] See Section 1, Introduction – Contact Us

[5] If you wish to contact the EPA to make an environmental complaint about an EPA licenced facility, please go to https://lema.epa.ie/complaints

Comment

| |
|---|
| As required environmental complaints are reportable to the EPA and as such must be investigated. In the 2022 reporting period, this licence did not receive any complaints of an environmental nature. |

# 5) Environmental Incidents

**Explanation**
It is our responsibility as an EPA licensed facility to ensure we have systems in place to prevent incidents that have the potential to cause environmental pollution. If an incident occurs, we are required to report it to the EPA, investigate the cause and fix the problem.
The EPA classify environmental incidents into 5 categories based on the potential impact on the environment:

- Minor
- Limited
- Serious
- Very Serious
- Catastrophic

See Table 6 for the number of the environmental incidents we reported to the EPA this year.

**Table 6 Number of Environmental Incidents**

| Incident Category | Minor | Limited | Serious | Very Serious | Catastrophic |
|---|---|---|---|---|---|
| Abatement Equipment Offline | | | | | |
| Breach of Ambient ELV | | | | | |
| Breach of Emission Limit | | | | | |
| Explosion | | | | | |
| Fire | | | | | |
| Monitoring Equipment Failure | | | | | |
| Odour | | | | | |
| Spillage | | | | | |
| Breach of trigger Level | | | | | |
| Uncontrolled Release | | | | | |

| Incident Category | Minor | Limited | Serious | Very Serious | Catastrophic |
|---|---|---|---|---|---|
| Other | | | | | |

Comment

| |
|---|
| As required, incidents of an environmental nature are reportable to the EPA and as such must be investigated. In the 2022 reporting period, this licence recorded no incidents of an environmental nature. |

# 6) Our Environmental Emissions

**Explanation**

We are required to ensure the emissions from our activities do not cause environmental pollution.

We are required to monitor any of the following emissions that we make:

- Storm water
- Waste water
- Air
- Groundwater
- Noise

We regularly test any such emissions for specific pollutants and materials to ensure they do not contain levels of pollution that exceed emission limit values (ELVs) or cause environmental pollution. If monitoring of an emission indicates an ELV is exceeded, we are required to report this to the EPA[6].

The next sub-sections of this report summarise our compliance with any ELVs set in our EPA licence. Some emissions monitored do not have specific ELVs, but we still carry out monitoring and report all incidents that may give rise to environmental pollution.

[6] See section 5, Incidents

## Storm Water

**Explanation**
Storm water is rain water run-off from roof and non-process areas of a facility, e.g. carparks, and generally shall not contain any pollution.
Storm water is usually released into a local water body after a basic form of treatment. Our EPA licence requires that we manage storm water to ensure no polluting substances or materials are released into the environment.

The information below summarises how the storm water from our facility is treated, where it is released and the results of monitoring this year.

1. **Storm water from our facility is managed prior to release by;**

Either direct to drain where it is roof water only, or via petrol/oil interceptor.

2. **Storm water from our facility is released into the following water bodies:**

Yellow River, Kinnegad River & Boyne River. Curris River, Stoneyford River

## Table 7 Summary of Storm Water Monitoring

| Parameter measured | No. of Samples | % Compliant[7] | Comment |
|---|---|---|---|
| COD | 11 | 100% Compliant | |
| | | | |

Add rows as necessary

Comment

| |
|---|
| As required by the licence, stormwater is required to be separated where possible from process/non-process areas. Where this is not possible, stormwater is managed via oil-interceptors which are inspected on a monthly basis and sampled for associated discharges each month. Other than visual observations, the other main criteria to define adequate treatment is COD mg/l so this and visual inspections dictate when the interceptor is cleaned by an approved hazardous waste contractor. |

[7] % compliant = [(number of samples compliant) / (number of samples taken)] x 100. Compliance could refer to emission limit values or trigger levels. The EPA commonly use trigger levels on stormwater discharges.

## Waste Water

**Explanation**
There are two types of waste water that can be produced:

- Process waste water produced from the activities and;
- Sanitary waste water from toilets, washrooms and canteens.

Our EPA licence requires us to manage our waste water on or off-site and ensure that it does not cause environmental pollution when discharged into the environment.

The information below summarises how we treat the waste water produced from our activities, where it is released and the results of monitoring this year.

1. **Waste water produced by our activities is treated as follows before discharge to a receiving waterbody**;

All production area runoff is treated via an associated silt pond designed, inspected and maintained in accordance with condition 6 of the IPC Licence

2. **Treated waste water from our facility is released into the following water bodies:**

Mongagh River, Yellow River, Castlejordan River, Kinnegad River, Deel River, Boyne River, Curris River, Stoneyford River

**Table 8 Summary of Waste Water Monitoring**

| Parameter measured | No. of Samples | % Compliant | Comment |
|---|---|---|---|
| Suspended Solids | 105 | 100% | |
| Ammonia | 63 | 100% | |
| Total Solids | 105 | NA | |
| Total Phosphorus | 63 | NA | |
| pH | 63 | NA | |
| Colour | 63 | NA | |
| COD | 82 | 95.2% | |

Add rows as necessary

Comment

Licence requirements are quarterly grab samples on a selected number of silt pond outlets as per condition 6.2 and one 24hr flow proportional composite sampler at Rossan bog.
The emission limit values are 35mg/l suspended solids, 2.78mg/l total ammonia and 100mg/l COD. The Trigger Level for COD in 2022 was reached on four occasions. There is no obvious reason for reaching these trigger levels, other than naturally occurring background levels associated with COD.

7)

## Air

**Explanation**
Generally, three types of air emissions are monitored from industry in Ireland: gases, dust (particulates) and odour. Our EPA licence requires us to ensure that any air emissions from our activities do not cause air pollution or create an odour nuisance.

The information below details the number of air emission points we monitor, the results from testing the air emissions and any odour assessments carried out by us and the EPA this year.

1. **We monitor air emissions from the following number of emission points at our facility.**

N/A

**Table 9 Summary of Air Emissions Monitoring**

| Parameter measured | No. of Samples | % Compliant | Comment |
|---|---|---|---|
| Fugitive Dust | | | |
| | | | |

Add rows as necessary

Comment

Due to the cessation of production it is no longer a requirement to monitor Air Emissions

**Table 10 Summary of Odour Assessments Carried Out**

| Assessment Conducted By | No. of Odour Assessments | % Compliant[8] | Comment |
|---|---|---|---|
| Licence Holder | NA | | Not required |
| EPA | NA | | Not required |

Add rows where necessary

Comment

| |
|---|
| There are no odour emissions of note from the activity, no requirements to monitor and no associated complaints. |

[8] A compliant odour assessment is based on EPA Odour Impact Assessment Guidance available at http://www.epa.ie/pubs/advice/air/emissions/ag5-odourassessment.html

## Fugitive Solvent Emissions

**Are you are required to monitor fugitive solvent air emissions from your facility?**

Yes [ ] No [X]

**Explanation**
The use of solvents is regulated under Irish and European Union (EU) Regulations[9]. Solvents are chemicals that, by their nature, are volatile (evaporate readily under ambient conditions). Solvents can be found in many inks, glues and cleaning agents. Due to the volatility of solvents some emissions may be released into the atmosphere during our activities before being captured in our air treatment system. This type of emission is called a **fugitive solvent emission**.

The information below summarises the quantity of solvents used this year, the percentage of fugitive solvent emissions (% of total quantity used) and whether the percentage complied with the targets set in the EU Regulations.

**Table 11 Summary of Fugitive Solvent Emissions**

| Quantity of Solvents Used (Kg) | % Fugitive Solvent Emissions | Compliant |
|---|---|---|
| | | |

Comment

N/A

[9] See Annex VII of the Industrial Emissions Directive
https://ec.europa.eu/environment/industry/stationary/ied/legislation.htm

## Groundwater

**Explanation**
Groundwater is an important and sensitive resource in Ireland. Our EPA licence requires that we monitor groundwater to ensure our activities do not cause groundwater pollution.
Understanding how groundwater flows through soil and rock layers and eventually into surface and coastal waters is a complex science. Sometimes groundwater pollution that occurred in the past can take years and even decades to disappear. Therefore, it is important that experts help us monitor and interpret results from groundwater monitoring and testing.

The information below is a basic summary of the condition of the groundwater this year.

1. **Do you have a groundwater monitoring programme in place?**

Yes [ ] No [X]

2. **Have the groundwater monitoring results over the last 5 years indicated the presence of groundwater pollution?**

Yes [ ] No [X]

**Table 12 List of Groundwater Pollutants Identified**

| Pollutants |
|---|
| |

Add rows as necessary

**3. Give details of the investigations and subsequent actions taken, where applicable, to manage the groundwater pollution.**

| |
|---|
| N/A |

Comment

| |
|---|
| There are no licence requirements to monitor groundwater from the activity. |

## Noise

**Explanation**
Our EPA licence requires that we monitor noise emissions from our facility. Noise monitoring can be conducted at the boundary of our facility and/or at locations beyond the boundary referred to as “noise sensitive locations”. Noise monitoring requires the use of special noise monitoring equipment. Our EPA licence requires that noise produced by our facility shall not exceed the noise limit values and/or give rise to nuisance.

The information below gives a summary of when and where we conducted noise monitoring this year and if results complied with our EPA licence limits.

1. **We conducted noise monitoring on the following dates this year:**

N/A

2. **Was the noise monitoring carried out at:**
   i. **the boundary of our facility,**
   ii. **noise sensitive locations off-site, or**
   iii. **both?**

N/A

3. **Were measured noise levels compliant with your EPA licence limits?**

Yes ☐ No ☐

If No, we took the following actions to address the noise level exceedances?

NA

Comment

There are no licence requirements to monitor noise from the activity, or any complaints regarding noise impact.

# 8) Waste

## Waste Generated

**Explanation**
Our EPA licence requires us to manage the waste we generate in a manner that does not cause environmental pollution.
We manage, store and record hazardous, non-hazardous and inert waste we generate in accordance with our licence. We ensure that this waste is subsequently treated or disposed of in accordance with the relevant waste Regulations.

The information in table 13 is a summary of waste we generated this year and the percentage increase or decrease on the previous year. The percentage recovery is the amount of total waste generated that was reused, recycled or recovered.

**Table 13 Waste Generated**

| Type | Quantity (Tonnes) | % Increase/ decrease on previous year | % Recovery |
|---|---|---|---|
| Hazardous | 8.39 | 43.08% decrease | 100% |
| Non-Hazardous | 751.84 | 44.8% increase | 98.5% |
| Inert | | | |
| **Total Tonnes** | 760.23 | 42.38% increase | 98.5% |

Comment

The main wastes generated from this activity are Polythene, scrap metal, Silt Pond Waste, Peat Screenings, Waste Oil, Interceptor Waste, Oil Filters, Parts Wash all of which are recycled. The waste generated for landfill was general waste skips and wheelie bins from workshops and office waste.

## Waste Accepted

Did you accept waste onto your facility for storage, treatment, recovery or disposal this year?

Yes [ ] No [X]

**Explanation**
Our EPA licence requires us to manage the waste we accept in a manner that does not cause environmental pollution.
We manage, store and record all incoming and outgoing hazardous, non-hazardous and inert waste. The waste we accept may be treated, recovered, disposed or stored at our facility depending on our licence requirements.

The information in Table 14 provides a summary of waste we accepted this year and the percentage increase or decrease on the previous year. The percentage recovery is the amount of total waste accepted that was reused, recycled or recovered.

**Table 14 Waste Accepted**

| Type | Quantity (Tonnes) | % Increase/ decrease on previous year | % Recovery |
|---|---|---|---|
| Hazardous | | | |
| Non-Hazardous | | | |
| Inert | | | |
| **Total Tonnes** | | | |

Comment

No waste accepted during the period.

# 9) Financial Provision

**Explanation**
Our EPA licence requires us to assess the risk our activities pose to the environment if we cease our activities or if an incident occurred. If we are identified as a high risk facility[10] by the EPA, we are required to put provision in place such as a financial bond or insurance to cover the cost of restoring our site to a satisfactory condition. This financial provision can then be used to cover the cost of managing the restoration or clean up should such an event occur.

1. Are you required to have an agreed financial provision in place?

Yes [ ] No [X]

2. What year was your Closure, Restoration and Aftercare Management Plan (CRAMP) last agreed by the Agency?

Not required under the licence. However, the equivalent Bog Rehabilitation Plans, which include closure, restoration and aftercare are being submitted to the Agency in advance of any decommissioning and rehabilitation.

3. What year was your Environmental Liability Assessment Report (ELRA) agreed by the Agency?

Not required under the Licence.

4. Has there been any significant changes on your site since the last agreements?

Yes [ ] No [X]

[10] See Appendix II

If yes, have you submitted details to the EPA?

Yes [ ] No [ ] N/A [X]

# Appendix I

**Class of Activity**

Industrial and waste facilities are classed into different sectors depending on the nature of their activity and its potential impact on the environment. The EPA Act 1992 as amended, outlines these as follows:

| | |
|---|---|
| Class 1 | Minerals and other materials |
| Class 2 | Energy |
| Class 3 | Metals |
| Class 4 | Mineral fibres and glass |
| Class 5 | Chemicals |
| Class 6 | Intensive Agriculture[11] |
| Class 7 | Food and drink |
| Class 8 | Wood, paper, textiles and leather |
| Class 9 | Fossil fuels |
| Class 10 | Cement, lime and magnesium oxide |
| Class 11 | Waste |
| Class 12 | Surface Coatings |
| Class 13 | Other Activities |

[11] This reporting template is not applicable to the **intensive agriculture sector**. Their annual environmental reporting structure is different and can be found at http://www.epa.ie/pubs/advice/aerprtr/aerguid/

# Appendix II

**High Environmental Risk Categories**

If an industrial or waste licence falls into one of these categories it is deemed, by the EPA, as a high environmental risk. As a result, the licence holder is required to have financial provision in place. See section 8, Financial Provision.

1. Landfills
2. Non-Hazardous Waste Transfer Station
3. Incineration and Co-Incineration Waste Facilities
4. Category A – Extractive Waste Facilities
5. Upper and Lower Tier Seveso Facilities
6. Hazardous Waste Transfer Stations
7. High Risk Contaminated Land
8. Exceptional Circumstances

## NOTE:

This list is subject to change.

See the link below for further information.

http://www.epa.ie/pubs/advice/licensee/fp/epaapproachtoenvironmentalliabilitiesandfinancialprovision.html

# Annual Environmental Report (AER)

# 2023

Company Name: Bord na Mona Energy Ltd (Derrygreenagh Group)

Licence Number: P0501-01

Address: Bord na Mona, Derrygreenagh Works,

Rochfordbridge, Co Westmeath.

Class of Activity[1]: 1.4

[1] See Appendix I



Bord na Móna - Data Classification - Public

# Purpose of this Report

One of the functions of the Environmental Protection Agency (EPA) is to licence and regulate the activities[2] of large scale industrial (e.g. chemical, food processors, power plants) and waste facilities. Submitting an Annual Environmental Report (AER) is a requirement of all EPA licences.

An AER is a public document. To this end, this format has been developed for industrial and waste licence holders (other than the intensive agriculture sector) to use as a template. This is to assist any member of the public to interpret and understand the environmental performance of the licensed facility.

The AER is a **summary** of environmental information for a given year. It includes:

- Details of the licence holder's environmental goals achieved, goals to maintain compliance and/or improve their environmental performance;
- Answers to questions regarding their facility's activities;
- Tables of results from monitoring emissions such as air, water, noise, and odour; and
- Details of waste generated, accepted and treated.

An AER does **not** provide detailed technical data. Such information is available in three ways:

1) Contacting the licence holder directly. The Contact Us section of this template enables the licence holder to provide details of where a member of the public can obtain further information on topics reported in this document.

[2] See Appendix I



Bord na Móna - Data Classification - Public

2) Some documents[3] are available on the EPA website via the licence details page for each individual licence. This can be found by browsing either the http://www.epa.ie/licensing/ or http://www.epa.ie/enforcement/ pages of the EPA website.

3) All formal enforcement correspondence exchanged between the EPA and a licence holder during the regulatory process is available for public viewing by appointment at any EPA Office.

If you have a question or query about an AER or an individual EPA licensed facility see the EPA's website or contact the relevant EPA office. See http://www.epa.ie/about/contactus/ for contact details.

[3] This includes EPA site inspection and compliance monitoring reports, licence holders' self-monitoring reports, AERs and special reports



Bord na Móna - Data Classification - Public

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Bord na Móna - Data Classification - Public

# Glossary

| | |
|---|---|
| Abatement Equipment | Technology used to reduce pollution |
| AER | Annual Environmental Report. |
| Beyond Compliance | Beyond compliance is concept to help deliver greater organisational performance and long-term value for the environment, society and the economy. |
| CRAMP | Closure, Restoration and Aftercare Management Plan. |
| ELRA | Environmental Liability Risk Assessment. |
| Emission Limit Value | Limits set for specified emissions, typically outlined in Schedule B of an EPA licence. |
| EMS | Environmental Management System. |
| Environmental Goal | An objective or target set by a licensee as part of an environmental management system (EMS). |
| Environmental Pollutant | Substance or material that due to its quantity and/or nature has a negative impact on the environment. |
| Facility | Any site or premises that holds an EPA industrial or waste licence. |
| FP | Financial Provision. |
| GJ | Giga joules, an international unit of energy measurement. |



Bord na Móna - Data Classification - Public

| | |
|---|---|
| Groundwater | All water which is below the surface of the ground in the saturation zone and in direct contact with the ground or subsoil. |
| Incident | As defined by an EPA industrial or waste licence. |
| Inert Waste | Is waste that will not undergo physical, chemical or biological change thereby, is unlikely to cause environmental pollution or harm human health. |
| List of Wastes (LoW) | A list of wastes drawn up by the European Commission and published as Commission Decision 2014/955/EU. |
| Noise Sensitive Location | Any dwelling house, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other installation or area of high amenity which for its proper enjoyment requires the absence of noise at nuisance levels. |
| Non-Renewable Resource | A resource of economic value that cannot be replaced at the same rate it is being consumed e.g. coal, peat, oil and natural gas. |
| Oil Separator | Separator system for light liquids (e.g. oil and petrol). |
| PRTR | Pollutant Release and Transfer Register. |
| Renewable Resource | Wind, solar, aerothermal, geothermal, hydrothermal and ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases. |
| Sanitary Waste | Waste water from toilet, washroom and canteen facilities. |



Bord na Móna - Data Classification - Public

| | |
|---|---|
| Storm Water | Rain water run-off from roof and non-process areas. |
| Surface Water | Lakes, rivers, streams, estuaries and coastal waters. |
| Trigger Level | A value set for a specific parameter, the achievement or exceedance of which requires certain actions to be taken by the licence holder. |
| Volatile Organic Compounds | Gases produced from solids or liquids that evaporate readily in ambient conditions. |
| Waste | Any substance or object which the holder discards or intends or is required to discard. |

Disclaimer

These are **not** legal definitions. Legal definitions can be found in the corresponding legislation.



Bord na Móna - Data Classification - Public

# Declaration

I, Cathal Brennan PCAS Operations Manager, confirm that by ticking the box below, all information in this report is truthful and accurate to the best of my knowledge and belief.

In addition, I confirm that all monitoring and performance reporting required by our EPA licence and summarised herein is available for inspection by the EPA.

**Tick here** ☑



Bord na Móna - Data Classification - Public

# 1) Introduction

See below a brief description of our facility and a summary of our environmental performance this year.

- During the reporting period the main activity was decommissioning and rehabilitation of several bogs in this IPC Licence.
- During the reporting period 80 hectares of peatlands at Carranstown Bog were rehabilitated, with any balance of the rehabilitation extending into the 2024 period.
- Similarly, 289 Ha's of peatlands were decommissioned, with plant, equipment and waste materials removed at this bog.
- During the period, there was no complaints received of an environmental nature.
- During the reporting period, there was a 28.9% decrease in waste generated for recycling or disposal. One of the main activities during 2023 was the decommissioning of bog and workshop activities as required under Condition 10.1.
- In the period,10% of sampling reported exceedances in the COD trigger levels related to emissions from peatlands. This was of minor significance and was closed out during the period as they are not linked to any ongoing activity.
- During the period, there were various submissions to the Agency including the 2022 AER, mapping clarifications, review of silt pond maintenance, the annual monitoring returns, and various updates on relevant activities.
- In 2023, rehabilitation plans, maps and associated assessments were submitted to the Agency for Bracklin and Lisclogher West Bogs and these are available to view at www.bnmpcas.ie
- Bord na Mona continued to retain certification to ISO9001 for the decommissioning and rehabilitation of peatlands to support the climate action scheme (PCAS).



Bord na Móna - Data Classification - Public

## Contact Us

If you have any questions or would like further information on any aspect of our licensed activity, please contact us directly.

See below details:

Enda McDonagh,
Bord na Mona Energy Ltd.,
Leabeg,
Tullamore,
Co. Offaly.

# 2) How we Manage our Facility

## Environmental Management System

**Explanation**
To ensure our facility's activities do not cause environmental pollution we are required to have detailed documentation systems in place to help us manage and track our environmental performance. These systems are referred to as Environmental Management Systems (EMS). We review our EMS every year and set up-to-date **environmental goals** to continually improve our environmental performance.

The information below sets out the environmental goals for our facility to help us prevent environmental pollution and reduce our impact on the environment. Target dates for completing each goal and progress towards achieving the goal are outlined in Table 1.

**Table 1 Environmental Goals**

| Environmental Goal | Target Date | Progress |
|---|---|---|
| Training/awareness for all area leaders and operatives in advance of decommissioning and rehabilitation of the 2024 bogs | May 2024 | Underway |
| Waste Management – Removal of all waste that are deemed a risk the environment in bogs scheduled to be decommissioned in 2024 | Dec 2024 | Underway |
| Communication of Decommissioning and Rehabilitation plans to all neighbours within 1km of the proposed activity for 2024 where applicable. | June 2024 | Any bogs scheduled for 2024. |
| Completion of internal audits/inspections of applicable bogs scheduled for decommissioning and rehabilitation as | Sept 2024 | Not yet commenced |



Bord na Móna - Data Classification - Public

| | | |
|---|---|---|
| required by condition 10 and the Peatlands Climate Action Scheme | | |
| Maintain surface water quality compliance with emission limit values for Suspended Solids during the proposed decommissioning and rehabilitation programme. | Dec 2024 | Underway |
| Decommissioning and Rehabilitation of bogs in accordance with Condition 10 of the IPC Licence and in accordance with Peatlands Climate Action Scheme https://www.gov.ie/en/publication/136a7-bord-na-mona-bog-rehabilitation-scheme/ | Dec 2024 | To commence on the 1st April 2023 |

Add rows as necessary

Comment

| |
|---|
| As peat extraction on all bogs in this licence ceased in 2020, all environmental goals for 2024 are linked to the remaining bog activity which is the decommissioning and rehabilitation of bogs planned for 2024. |



Bord na Móna - Data Classification - Public

## Beyond Compliance

**Explanation**
We are legally required to comply with our environmental licence. However, the EPA realise that some sites go further than just complying with their environmental licence requirements. Some projects carried out at facilities can have long term positive impacts on the environment and local communities.
The EPA's beyond compliance initiative is encouraging us to identify and report on these environmental and sustainability projects. For example, the project could involve renewable energy, biodiversity, water conservation or exemplar community engagement.

**Did any project completed on your site in the reporting year go beyond your licence requirements?**

Yes ☑ No ☐

If yes, provide details of one case study in Appendix III that demonstrates how the project went beyond compliance of your licence.



Bord na Móna - Data Classification - Public

# 3) Energy & Water

## Energy

**Explanation**
Fossil fuels such as coal, gas and oil are non-renewable resources. As a result, our EPA licence requires that we measure our energy use and set targets to improve the energy efficiency of our activities and reduce our overall use, where possible. Where we have the means and technology on-site to generate energy, this is also captured in this report.

The information below summarises the energy used this year compared to the previous year and includes renewable and non-renewable energy types.

**Table 3 Energy Used**

| Energy Used | Quantity (GJ) | % Increase/ decrease on previous year |
|---|---|---|
| Electricity | 469.07 | - 34.4% decrease |
| Heavy Fuel Oil | | |
| Light Fuel Oil | 1178.8 | - 54.37% decrease |
| Natural Gas | | |
| Coal / Solid Fuel | | |
| Peat | | |
| Renewable Biomass | | |
| Renewable Energy Generated On-site | | |
| **Total Energy Used** | 1647.87 | - 50.04% decrease |

Comment

| |
|---|
| Electricity usage decreased in 2023 as did fuel usage, due to decommissioning and Rehabilitation |



Bord na Móna - Data Classification - Public

The information below summarises the energy we generated on our site this year with specific focus on renewable energy generation.

**Table 4 Energy Generated**

| **Energy Generated** | **Quantity (GJ)** | **% Increase/ decrease on previous year** |
|---|---|---|
| Renewable Energy | N/A | |
| **Total Energy Generated** | | |

Comment

| |
|---|
| There are no renewable energy assets on this site. |



Bord na Móna - Data Classification - Public

## Water

**Explanation**
Water is a natural resource and we are required by our EPA licence to identify ways to reduce our use where possible. Water used in industry can be extracted from groundwater, rivers and lakes (surface water), taken from public water supplies (Irish Water), recycled from the facility's processes or harvested from rainwater.

The information below summarises and compares the quantity of water used this year compared to the previous year.

**Table 5 Water Used**

| **Source of Water Used** | **Quantity ($m^3$/year)** | **% Increase/ decrease on previous year** |
|---|---|---|
| Groundwater | | |
| Surface Water | 0 | |
| Public Supply | | |
| Recycled Water | 0 | |
| Rainwater | 0 | |
| **Total Water Used** | | |

Comment

The only water used is that required to provide associated offices and workshop welfare facilities (canteen/toilets)



Bord na Móna - Data Classification - Public

# 4) Environmental Complaints

**Explanation**
Our EPA licence requires that activities do not cause environmental nuisance such as odour, dust or noise. Our licence also requires that we have procedures in place to record, investigate and respond to environmental complaints if or when they arise.
We have an environmental complaints procedure in place where you can contact us[4] directly. You can also contact the EPA[5] if you wish to make an environmental complaint, confidentially or not.

See the information below for a summary of **all** the environmental complaints relating to our activities made directly to us and to the EPA this year.

**Table 6 Summary of All Environmental Complaints Received in**

| Type of Complaint | Number of Complaints | Number Closed |
|---|---|---|
| **Odour / Smells** | | |
| **Noise** | | |
| **Dust** | | |
| **Water Quality** | | |
| **Air Quality** | | |
| **Waste** | | |
| **Litter** | | |
| **Vermin/Flies/Birds** | | |
| **Soil Contamination** | | |
| **Vibration** | | |
| **Other** | | |

[4] See Section 1, Introduction – Contact Us

[5] If you wish to contact the EPA to make an environmental complaint about an EPA licenced facility, please go to https://lema.epa.ie/complaints



Bord na Móna - Data Classification - Public

Comment

| |
|---|
| As required environmental complaints are reportable to the EPA and as such must be investigated. In the 2023 reporting period, this licence did not receive any complaints of an environmental nature. |



Bord na Móna - Data Classification - Public

# 5) Environmental Incidents

**Explanation**
It is our responsibility as an EPA licensed facility to ensure we have systems in place to prevent incidents that have the potential to cause environmental pollution. If an incident occurs, we are required to report it to the EPA, investigate the cause and fix the problem.
The EPA classify environmental incidents into 5 categories based on the potential impact on the environment:

- Minor
- Limited
- Serious
- Very Serious
- Catastrophic

See Table 6 for the number of the environmental incidents we reported to the EPA this year.



Bord na Móna - Data Classification - Public

**Table 7 Number of Environmental Incidents**

| Incident Category | Minor | Limited | Serious | Very Serious | Catastrophic |
|---|---|---|---|---|---|
| Abatement Equipment Offline | | | | | |
| Breach of Ambient ELV | | | | | |
| Breach of Emission Limit | | | | | |
| Explosion | | | | | |
| Fire | | | | | |
| Monitoring Equipment Failure | | | | | |
| Odour | | | | | |
| Spillage | | | | | |
| Breach of trigger Level | 7 | | | | |
| Uncontrolled Release | | | | | |



Bord na Móna - Data Classification - Public

| Incident Category | Minor | Limited | Serious | Very Serious | Catastrophic |
|---|---|---|---|---|---|
| Other | | | | | |

Comment

| |
|---|
| As required, incidents of an environmental nature are reportable to the EPA and as such must be investigated. In the 2023 reporting period, this licence recorded 7 incidents, all of which are closed in the EPA's Eden reporting system |



Bord na Móna - Data Classification - Public

# 6) Our Environmental Emissions

**Explanation**

We are required to ensure the emissions from our activities do not cause environmental pollution.

We are required to monitor any of the following emissions that we make:

- Storm water
- Waste water
- Air
- Groundwater
- Noise

We regularly test any such emissions for specific pollutants and materials to ensure they do not contain levels of pollution that exceed emission limit values (ELVs) or cause environmental pollution. If monitoring of an emission indicates an ELV is exceeded, we are required to report this to the EPA[6].

The next sub-sections of this report summarise our compliance with any ELVs set in our EPA licence. Some emissions monitored do not have specific ELVs, but we still carry out monitoring and report all incidents that may give rise to environmental pollution.

[6] See section 5, Incidents



Bord na Móna - Data Classification - Public

## Storm Water

**Explanation**
Storm water is rain water run-off from roof and non-process areas of a facility, e.g. carparks, and generally shall not contain any pollution.
Storm water is usually released into a local water body after a basic form of treatment. Our EPA licence requires that we manage storm water to ensure no polluting substances or materials are released into the environment.

The information below summarises how the storm water from our facility is treated, where it is released and the results of monitoring this year.

1. **Storm water from our facility is managed prior to release by;**

Either direct to drain where it is roof water only, or via petrol/oil interceptor.

2. **Storm water from our facility is released into the following water bodies:**

Yellow River, Kinnegad River & Boyne River. Curris River, Stoneyford River



Bord na Móna - Data Classification - Public

**Table 8 Summary of Storm Water Monitoring**

| Parameter measured | No. of Samples | % Compliant[7] | Comment |
|---|---|---|---|
| COD | 8 | 100% Compliant | |
| | | | |

Add rows as necessary

Comment

| |
|---|
| As required by the licence, stormwater is required to be separated where possible from process/non-process areas. Where this is not possible, stormwater is managed via oil-interceptors which are inspected monthly and sampled for associated discharges each month. Other than visual observations, the other main criteria to define adequate treatment is COD mg/l so this and visual inspections dictate when the interceptor is cleaned by an approved hazardous waste contractor. The number of samples is dictated by there been no flow at time of inspection |

[7] % compliant = [(number of samples compliant) / (number of samples taken)] x 100. Compliance could refer to emission limit values or trigger levels. The EPA commonly use trigger levels on stormwater discharges.



Bord na Móna - Data Classification - Public

## Waste Water

**Explanation**

There are two types of waste water that can be produced:

- Process waste water produced from the activities and;
- Sanitary waste water from toilets, washrooms and canteens.

Our EPA licence requires us to manage our waste water on or off-site and ensure that it does not cause environmental pollution when discharged into the environment.

The information below summarises how we treat the waste water produced from our activities, where it is released and the results of monitoring this year.

1. **Waste water produced by our activities is treated as follows before discharge to a receiving waterbody**;

All production area runoff is treated via an associated silt pond designed, inspected and maintained in accordance with condition 6 of the IPC Licence

2. **Treated waste water from our facility is released into the following water bodies:**

Mongagh River, Yellow River, Castlejordan River, Kinnegad River, Deel River, Boyne River, Curris River, Stoneyford River



Bord na Móna - Data Classification - Public

**Table 9 Summary of Waste Water Monitoring**

| Parameter measured | No. of Samples | % Compliant | Comment |
|---|---|---|---|
| Suspended Solids | 183 | 100% | |
| Ammonia | 69 | 100% | |
| Total Solids | 183 | N/A | |
| Total Phosphorus | 69 | N/A | |
| PH | 69 | N/A | |
| Colour | 69 | N/A | |
| COD | 77 | 91% | |

Comment

| | |
|---|---|
| Licence requirements are quarterly grab samples on a selected number of silt pond outlets as per condition 6.2 and one 24hr flow proportional composite sampler at Rossan bog.<br>The emission limit values are 35mg/l suspended solids, 2.78mg/l total ammonia (N) and 100mg/l COD. The Trigger Level for COD in 2023 was breached on seven occasions. There is no obvious reason for breaching these trigger levels, other than naturally occurring background levels associated with COD, with these exceedances reported to the Agency. | |



Bord na Móna - Data Classification - Public

## Air

**Explanation**
Generally, three types of air emissions are monitored from industry in Ireland: gases, dust (particulates) and odour. Our EPA licence requires us to ensure that any air emissions from our activities do not cause air pollution or create an odour nuisance.

The information below details the number of air emission points we monitor, the results from testing the air emissions and any odour assessments carried out by us and the EPA this year.

1. **We monitor air emissions from the following number of emission points at our facility.**

**N/A**

**Table 10 Summary of Air Emissions Monitoring**

| Parameter measured | No. of Samples | % Compliant | Comment |
|---|---|---|---|
| Fugitive Dust | | | |
| | | | |

Add rows as necessary

Comment

Due to the cessation of production, it is no longer a requirement to monitor Air Emissions



Bord na Móna - Data Classification - Public

**Table 11 Summary of Odour Assessments Carried Out**

| Assessment Conducted By | No. of Odour Assessments | % Compliant[8] | Comment |
|---|---|---|---|
| Licence Holder | N/A | | |
| EPA | N/A | | |

Add rows where necessary

Comment

| |
|---|
| There are no odour emissions of note from the activity, no requirements to monitor and no associated complaints. |

[8] A compliant odour assessment is based on EPA Odour Impact Assessment Guidance available at Air Enforcement | Environmental Protection Agency (epa.ie)



Bord na Móna - Data Classification - Public

## Fugitive Solvent Emissions

**Are you required to monitor fugitive solvent air emissions from your facility?**

Yes ☐ No ☑

**Explanation**
The use of solvents is regulated under Irish and European Union (EU) Regulations[9]. Solvents are chemicals that, by their nature, are volatile (evaporate readily under ambient conditions). Solvents can be found in many inks, glues and cleaning agents. Due to the volatility of solvents some emissions may be released into the atmosphere during our activities before being captured in our air treatment system. This type of emission is called a **fugitive solvent emission**.

The information below summarises the quantity of solvents used this year, the percentage of fugitive solvent emissions (% of total quantity used) and whether the percentage complied with the targets set in the EU Regulations.

**Table 12 Summary of Fugitive Solvent Emissions**

| Quantity of Solvents Used (Kg) | % Fugitive Solvent Emissions | Compliant |
|---|---|---|
| | | |

Comment

N/A

[9] See Annex VII of the Industrial Emissions Directive
https://ec.europa.eu/environment/industry/stationary/ied/legislation.htm



Bord na Móna - Data Classification - Public

## Groundwater

**Explanation**
Groundwater is an important and sensitive resource in Ireland. Our EPA licence requires that we monitor groundwater to ensure our activities do not cause groundwater pollution.
Understanding how groundwater flows through soil and rock layers and eventually into surface and coastal waters is a complex science. Sometimes groundwater pollution that occurred in the past can take years and even decades to disappear. Therefore, it is important that experts help us monitor and interpret results from groundwater monitoring and testing.

The information below is a basic summary of the condition of the groundwater this year.

1. **Do you have a groundwater monitoring programme in place?**

Yes ☐ No ☑

2. **Have the groundwater monitoring results over the last 5 years indicated the presence of groundwater pollution?**

Yes ☐ No ☑

**Table 13 List of Groundwater Pollutants Identified**

| Pollutants |
|---|
| |

Add rows as necessary



Bord na Móna - Data Classification - Public

**3. Give details of the investigations and subsequent actions taken, where applicable, to manage the groundwater pollution.**

| |
|---|
| N/A |

Comment

| |
|---|
| There are no licence requirements to monitor groundwater from the activity. |



Bord na Móna - Data Classification - Public

## Noise

**Explanation**
Our EPA licence requires that we monitor noise emissions from our facility. Noise monitoring can be conducted at the boundary of our facility and/or at locations beyond the boundary referred to as “noise sensitive locations”. Noise monitoring requires the use of special noise monitoring equipment. Our EPA licence requires that noise produced by our facility shall not exceed the noise limit values and/or give rise to nuisance.

The information below gives a summary of when and where we conducted noise monitoring this year and if results complied with our EPA licence limits.

1. **We conducted noise monitoring on the following dates this year:**

N/A

2. **Where was the noise monitoring carried out?**
   - i. **the boundary of our facility;**
   - ii. **noise sensitive locations off-site; or**
   - iii. **both.**

N/A

3. **Were measured noise levels compliant with your EPA licence limits?**

Yes ☐ No ☐

If No, we took the following actions to address the noise level exceedances?

N/A

Comment

There are no licence requirements to monitor noise from the activity, or any complaints regarding noise impact.



Bord na Móna - Data Classification - Public

# 7) Waste

## Waste Generated

**Explanation**
Our EPA licence requires us to manage the waste we generate in a manner that does not cause environmental pollution.
We manage, store and record hazardous, non-hazardous and inert waste we generate in accordance with our licence. We ensure that this waste is subsequently treated or disposed of in accordance with the relevant waste Regulations.

The information in Table 14 is a summary of waste we generated this year and the percentage increase or decrease on the previous year. The percentage recovery is the amount of total waste generated that was reused, recycled or recovered.

**Table 14 Waste Generated**

| Type | Quantity (Tonnes) | % Increase/ decrease on previous year | % Recovery |
|---|---|---|---|
| Hazardous | 16.17 | 49.72% increase | 100% |
| Non-Hazardous | 524.01 | 30.3% decrease | 97.52% |
| Inert | | | |
| **Total Tonnes** | 540.18 | 28.9% decrease | 97.59% |

Comment

The main wastes generated from this activity are polythene, scrap metal, Silt Pond Waste, Peat Screenings, Waste Oil, Interceptor Waste, Oil Filters, Parts Wash all of which are recycled. The waste generated for landfill was general waste skips and wheelie bins from workshops and office waste.



Bord na Móna - Data Classification - Public

## Waste Accepted

Did you accept waste onto your facility for storage, treatment, recovery or disposal this year?

Yes ☐ No ☑

**Explanation**
Our EPA licence requires us to manage the waste we accept in a manner that does not cause environmental pollution.
We manage, store and record all incoming and outgoing hazardous, non-hazardous and inert waste. The waste we accept may be treated, recovered, disposed or stored at our facility depending on our licence requirements.

The information in Table 15 provides a summary of waste we accepted this year and the percentage increase or decrease on the previous year. The percentage recovery is the amount of total waste accepted that was reused, recycled or recovered.

**Table 15 Waste Accepted**

| Type | Quantity (Tonnes) | % Increase/ decrease on previous year | % Recovery |
|---|---|---|---|
| Hazardous | | | |
| Non-Hazardous | | | |
| Inert | | | |
| **Total Tonnes** | | | |

Comment

No Waste accepted during the period.



Bord na Móna - Data Classification - Public

# 8) Financial Provision

**Explanation**
Our EPA licence requires us to assess the risk our activities pose to the environment if we cease our activities or if an incident occurred. If we are identified as a high risk facility[10] by the EPA, we are required to put provision in place such as a financial bond or insurance to cover the cost of restoring our site to a satisfactory condition. This financial provision can then be used to cover the cost of managing the restoration or clean up should such an event occur.

1. Are you required to have an agreed financial provision in place?

Yes ☐ No ☑

2. What year was your Closure, Restoration and Aftercare Management Plan (CRAMP) last agreed by the Agency?

Not required under the licence. However, the equivalent Bog Rehabilitation Plans, which include closure, restoration and aftercare are being submitted to the Agency in advance of any decommissioning and rehabilitation.

3. What year was your Environmental Liability Assessment Report (ELRA) agreed by the Agency?

Not required under the Licence

4. Has there been any significant changes on your site since the last agreements?

Yes ☐ No ☑

[10] See Appendix II



Bord na Móna - Data Classification - Public

If yes, have you submitted details to the EPA?

Yes ☐ No ☐ N/A ☑

# Appendix I

**Class of Activity**

Industrial and waste facilities are classed into different sectors depending on the nature of their activity and its potential impact on the environment. The EPA Act 1992 as amended, outlines these as follows:

| | |
|---|---|
| Class 1 | Minerals and other materials |
| Class 2 | Energy |
| Class 3 | Metals |
| Class 4 | Mineral fibres and glass |
| Class 5 | Chemicals |
| Class 6 | Intensive Agriculture[11] |
| Class 7 | Food and drink |
| Class 8 | Wood, paper, textiles and leather |
| Class 9 | Fossil fuels |
| Class 10 | Cement, lime and magnesium oxide |
| Class 11 | Waste |
| Class 12 | Surface Coatings |
| Class 13 | Other Activities |

[11] This reporting template is not applicable to the **intensive agriculture sector**. Their annual environmental reporting structure is different and can be found at Compliance & Enforcement: Licensees: Reporting Publications | Environmental Protection Agency (epa.ie)



Bord na Móna - Data Classification - Public

# Appendix II

**High Environmental Risk Categories**

If an industrial or waste licence falls into one of these categories it is deemed, by the EPA, as a high environmental risk. As a result, the licence holder is required to have financial provision in place. See section 8, Financial Provision.

1. Landfills
2. Non-Hazardous Waste Transfer Station
3. Incineration and Co-Incineration Waste Facilities
4. Category A – Extractive Waste Facilities
5. Upper and Lower Tier Seveso Facilities
6. Hazardous Waste Transfer Stations
7. High Risk Contaminated Land
8. Exceptional Circumstances

**NOTE:**

This list is subject to change.

See the link below for further information.

Compliance & Enforcement: Financial Provisions Publications | Environmental Protection Agency (epa.ie)



Bord na Móna - Data Classification - Public

# Appendix III

## Beyond Compliance

The case study below shows how we went beyond the requirements of our licence in the reporting year.

The Government implemented a scheme called the 'Peatlands Climate Action Scheme' (PCAS), also known as the Peatlands Enhanced Decommissioning, Rehabilitation and Restoration Scheme (EDRRS). The Scheme commenced in 2021 and was devised so that Bord na Móna could carry out enhanced rehabilitation of its industrial peatlands, having ceased peat extraction in 2020. The scheme is supported by Government through the Climate Action Fund, and Ireland's National Recovery and Resilience Plan administered by the Department of Environment, Climate and Communications (DECC), while the National Parks and Wildlife Service (NPWS) act as the Scheme regulator and the Environmental Protection Agency regulate rehabilitation plan under Condition 10 of this IPC Licence. This Scheme will significantly go beyond what is required to meet rehabilitation and decommissioning obligations under the existing EPA IPC licence conditions. Improvements supported by the Scheme will ensure that environmental stabilisation is achieved (meaning IPC obligations are met), and importantly, significant additional benefits, particularly relating to climate action and other ecosystem services, will also be delivered.

To measure and verify the rehabilitation outcomes, the scheme has increased the water monitoring requirements of the licence, the range of parameters to be included and the frequency of monitoring.

These co-benefits include supporting the objectives of the Irelands Climate Action Plan, the preservation of wetland archaeology, the reduction of peak flows to receiving water, supporting Irelands Biodiversity objectives, reduction in carbon emissions, improvements in water quality and reduction in water abstraction pressures associated with drainage. For further details see www.bnmpcas.ie



Bord na Móna - Data Classification - Public

# APPENDIX 4-4

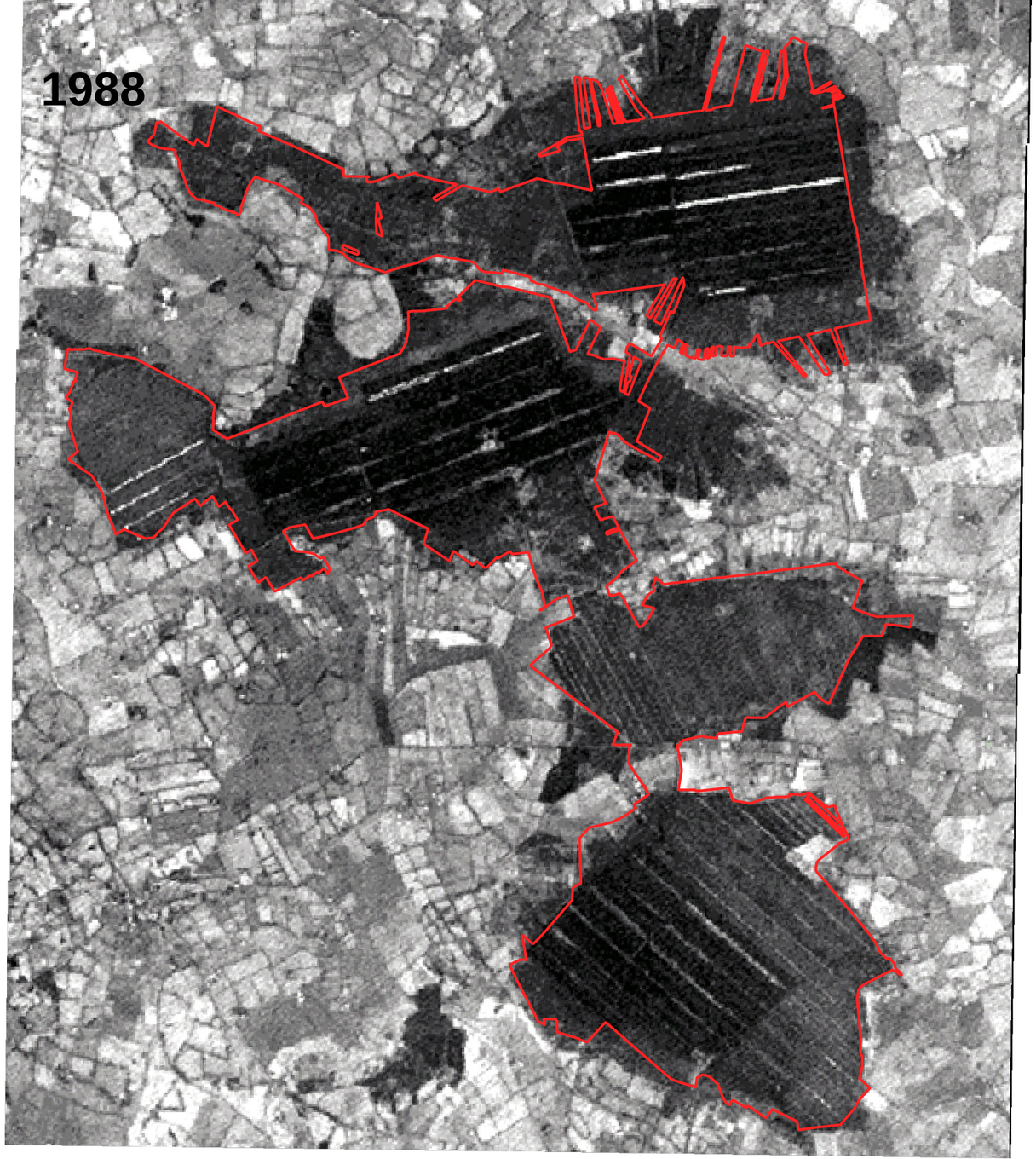
*Aerial Imagery 1973-2020*

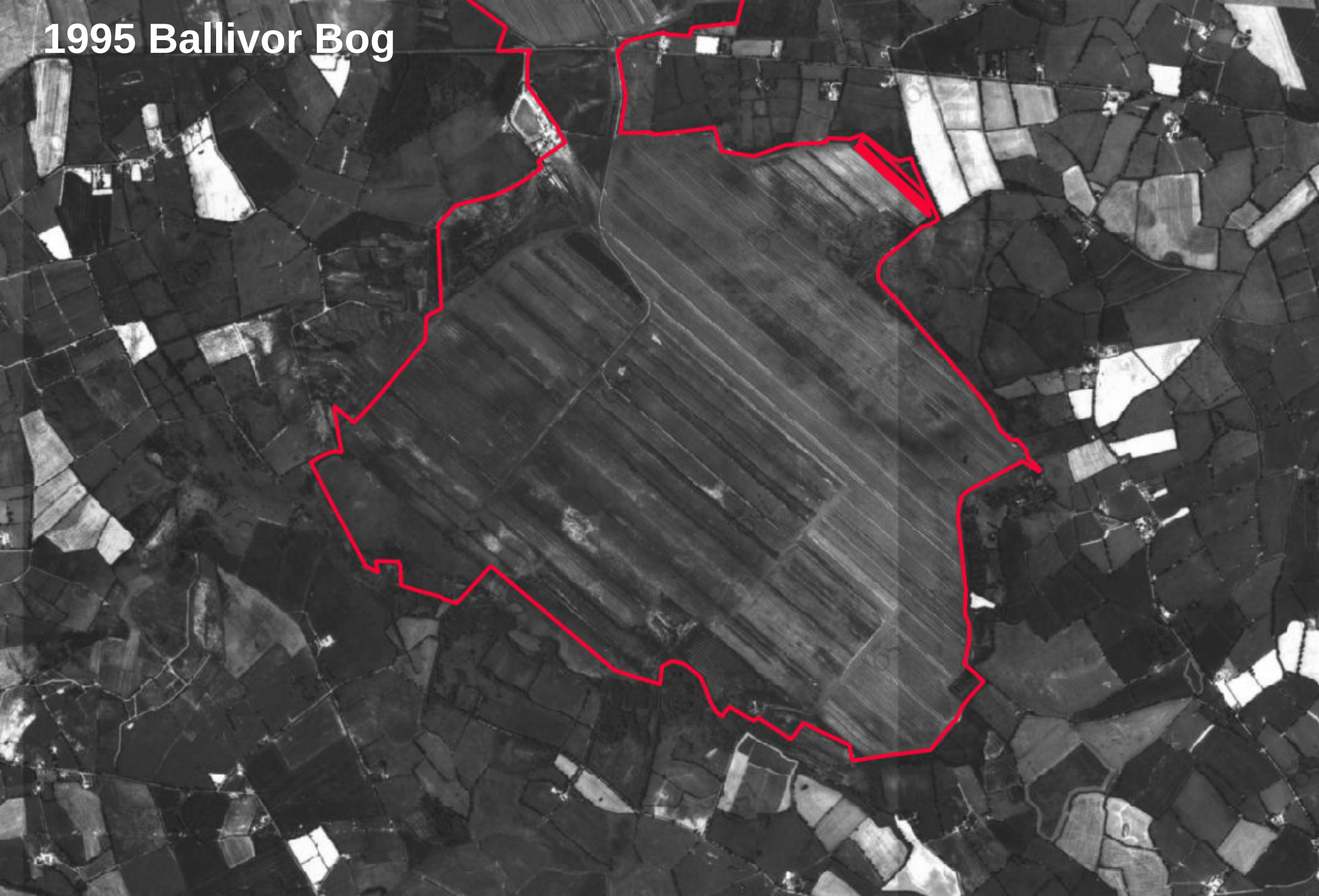

1973 Ballivor and
Carranstown Bog


1973 Lisclogher
and Bracklin Bog
LISCLOGHER
BRACKLIN


1973 Lisclogher
West Bog


1973


1988


1995 Ballivor Bog

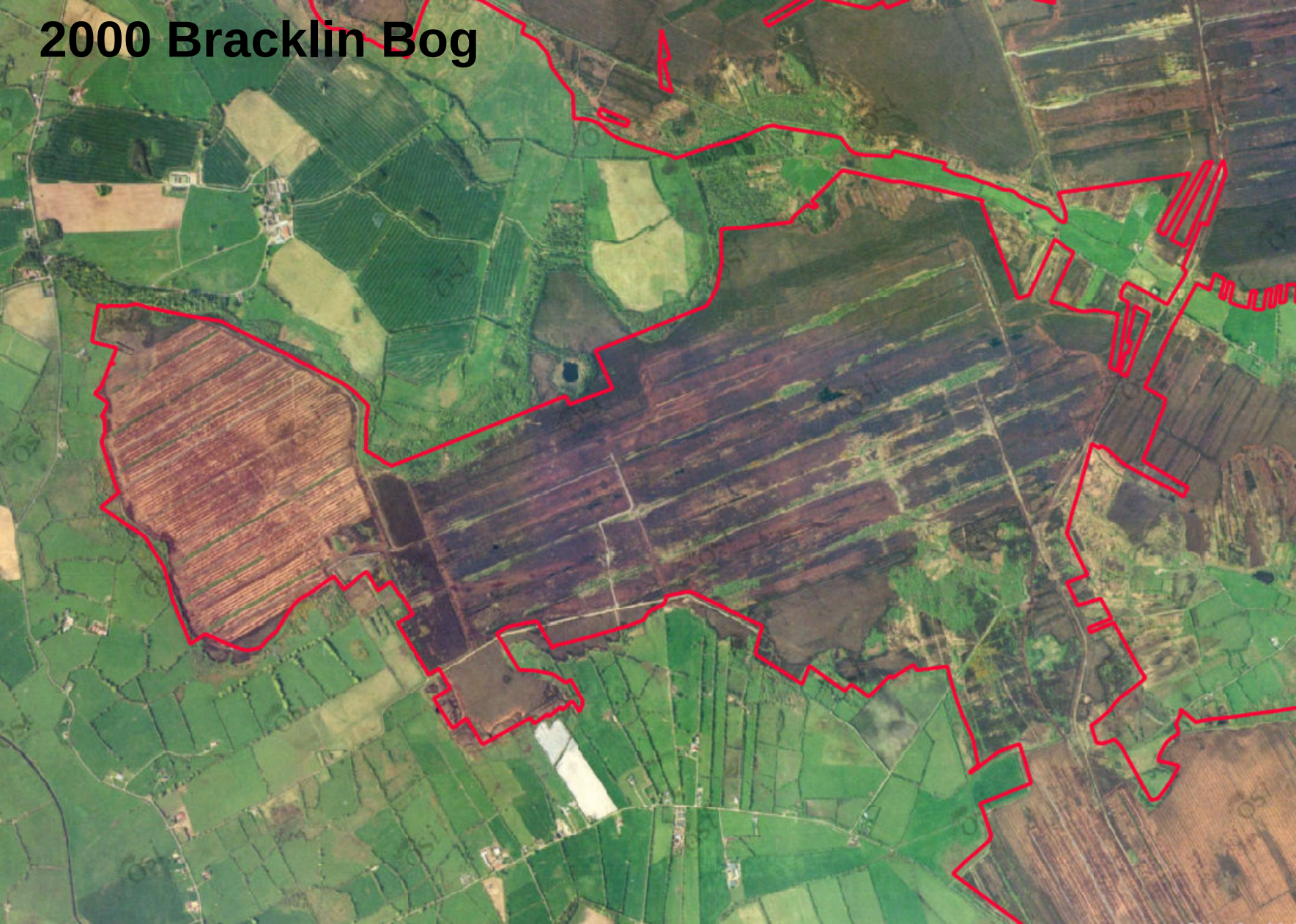

1995 Bracklin Bog


1995 Carranstown
Bog


1995 Lisclogher Bog


1995 Lisdogher West Bog


2000 Ballivor Bog


2000 Bracklin Bog

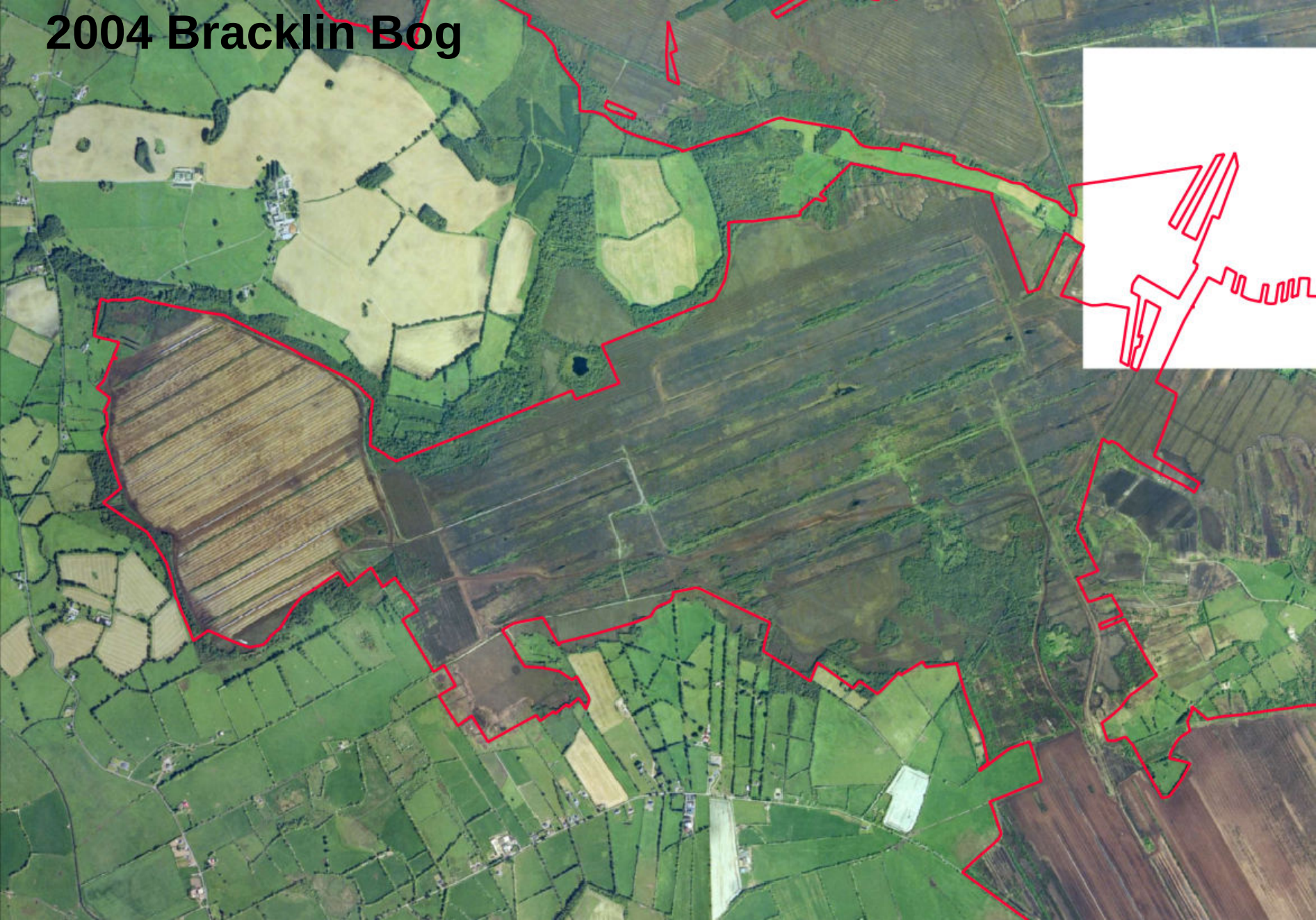

2000 Carranstown Bog

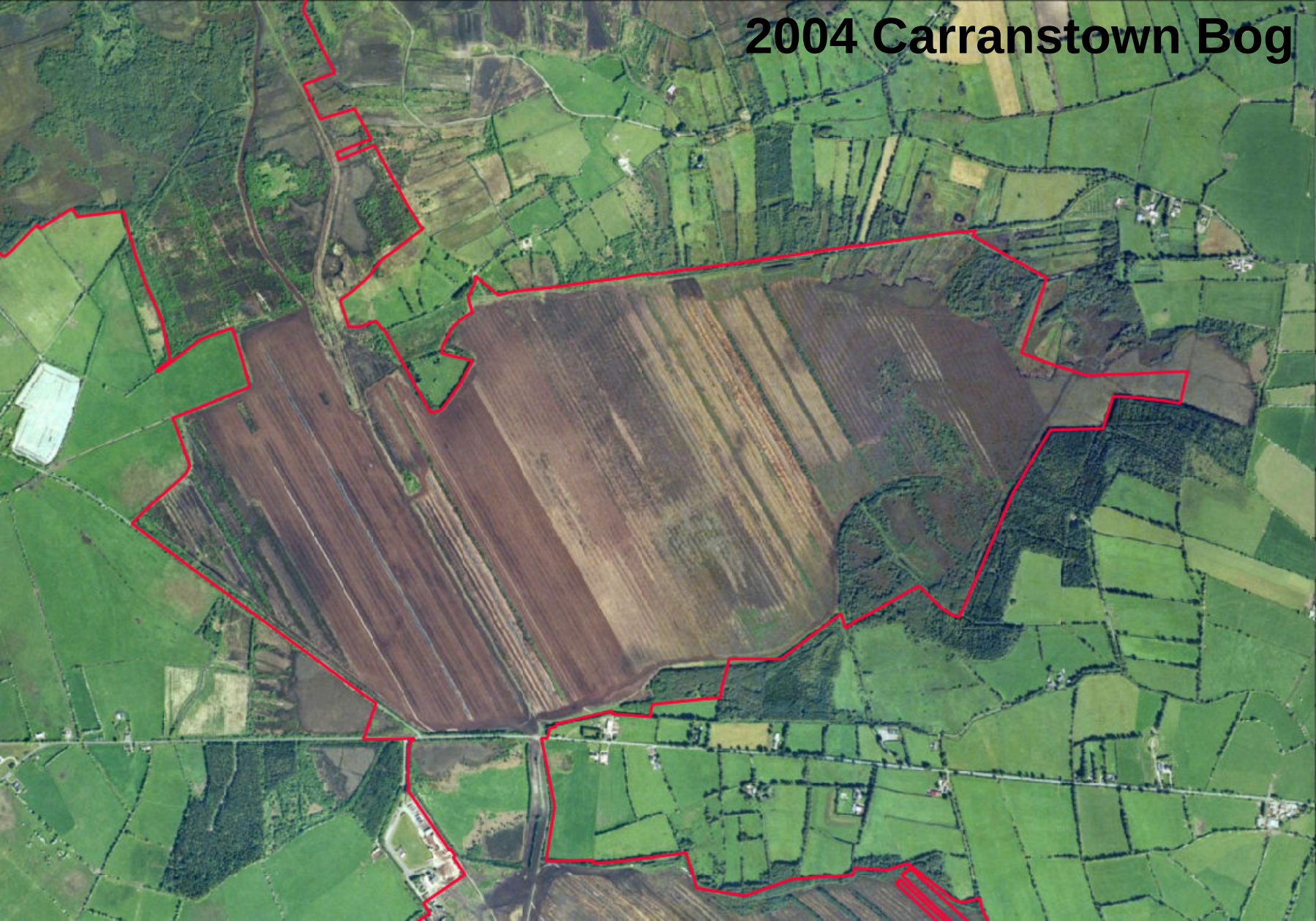

2000 Lisclogher Bog

# 2000 Lisclogher West Bog




2004 Ballivor Bog

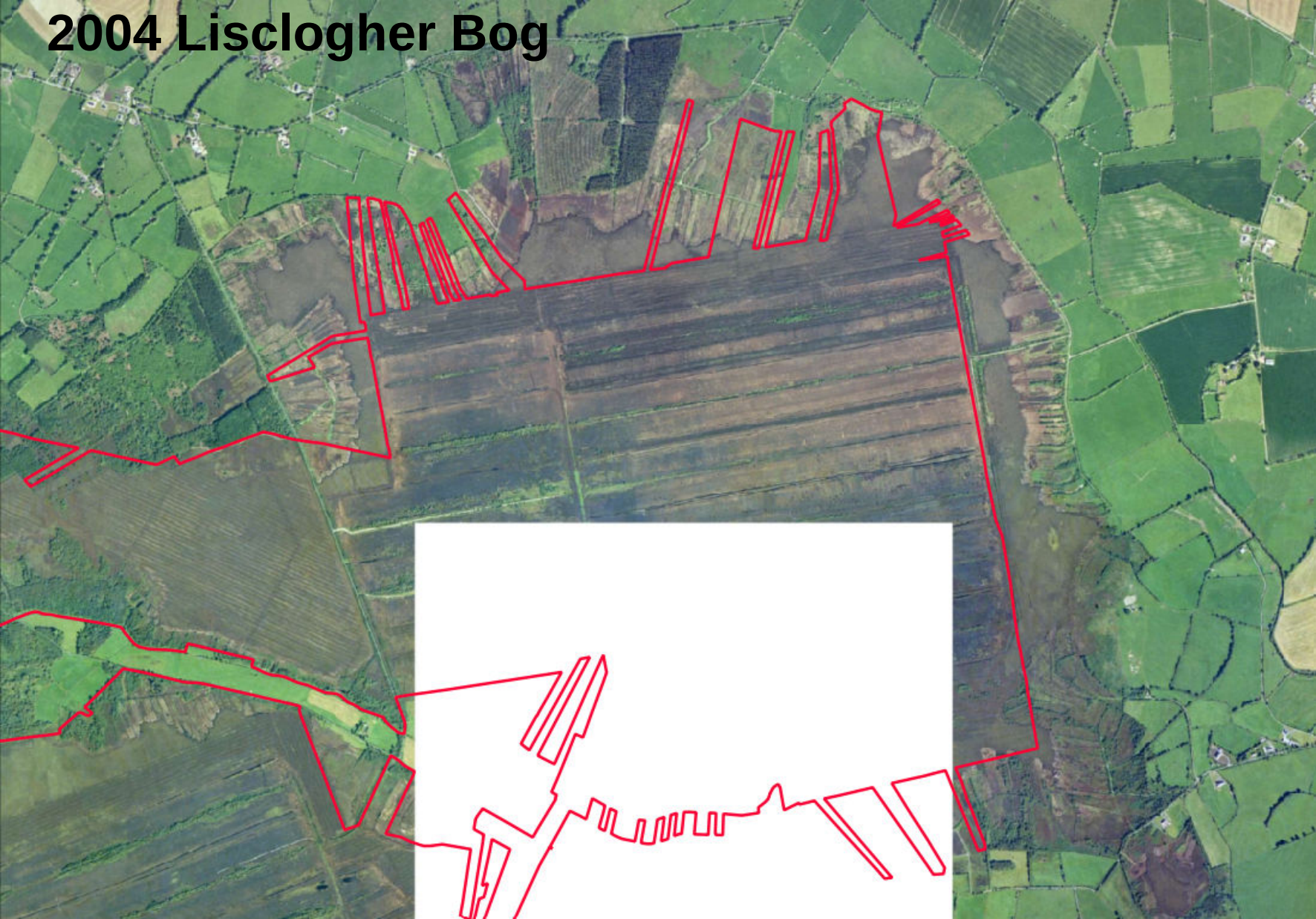

2004 Bracklin Bog

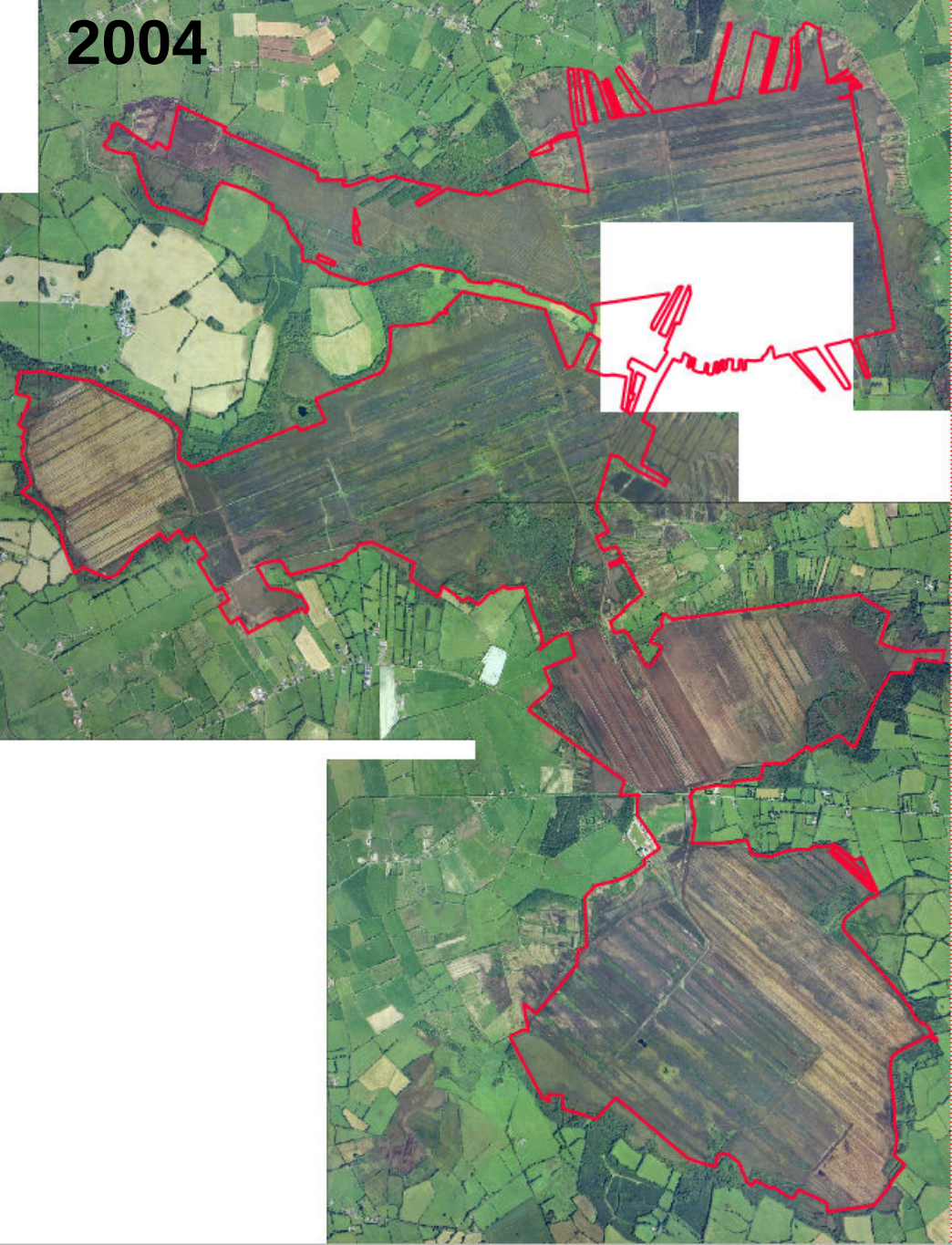

2004 Carranstown Bog

# 2004 Lisclogher West Bog



# 2004 Lisclogher Bog




2004




Carranstown Bog Basemap
'MapGenie Imagery (2006-2012)'
GeoHive Map Viewer
Tailte Ireland
(https://webapps.geohive.ie/mapviewer/index.html)


2012 Ballivor Bog


2012 Bracklin Bog

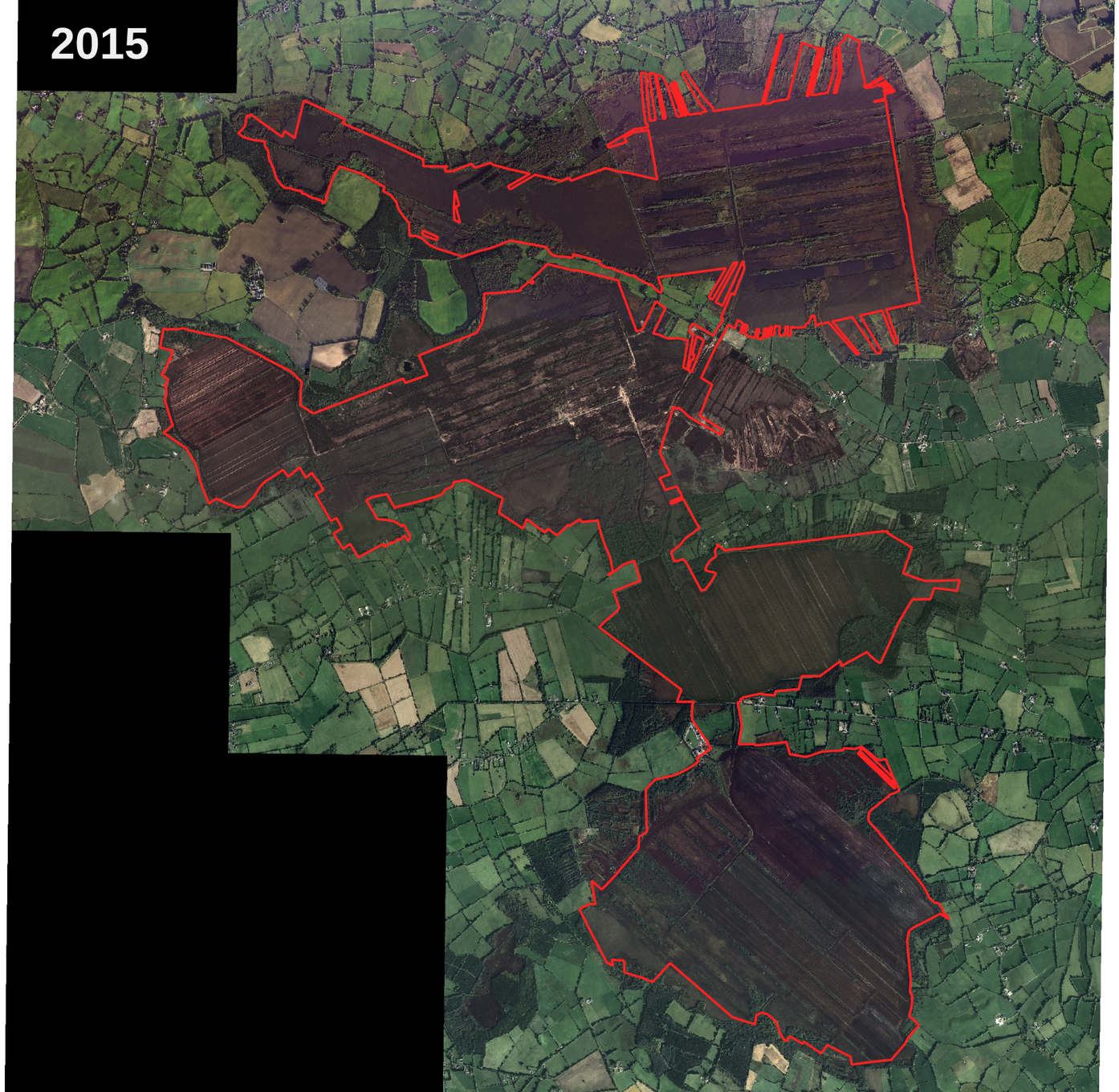
# 2012 Carranstown Bog

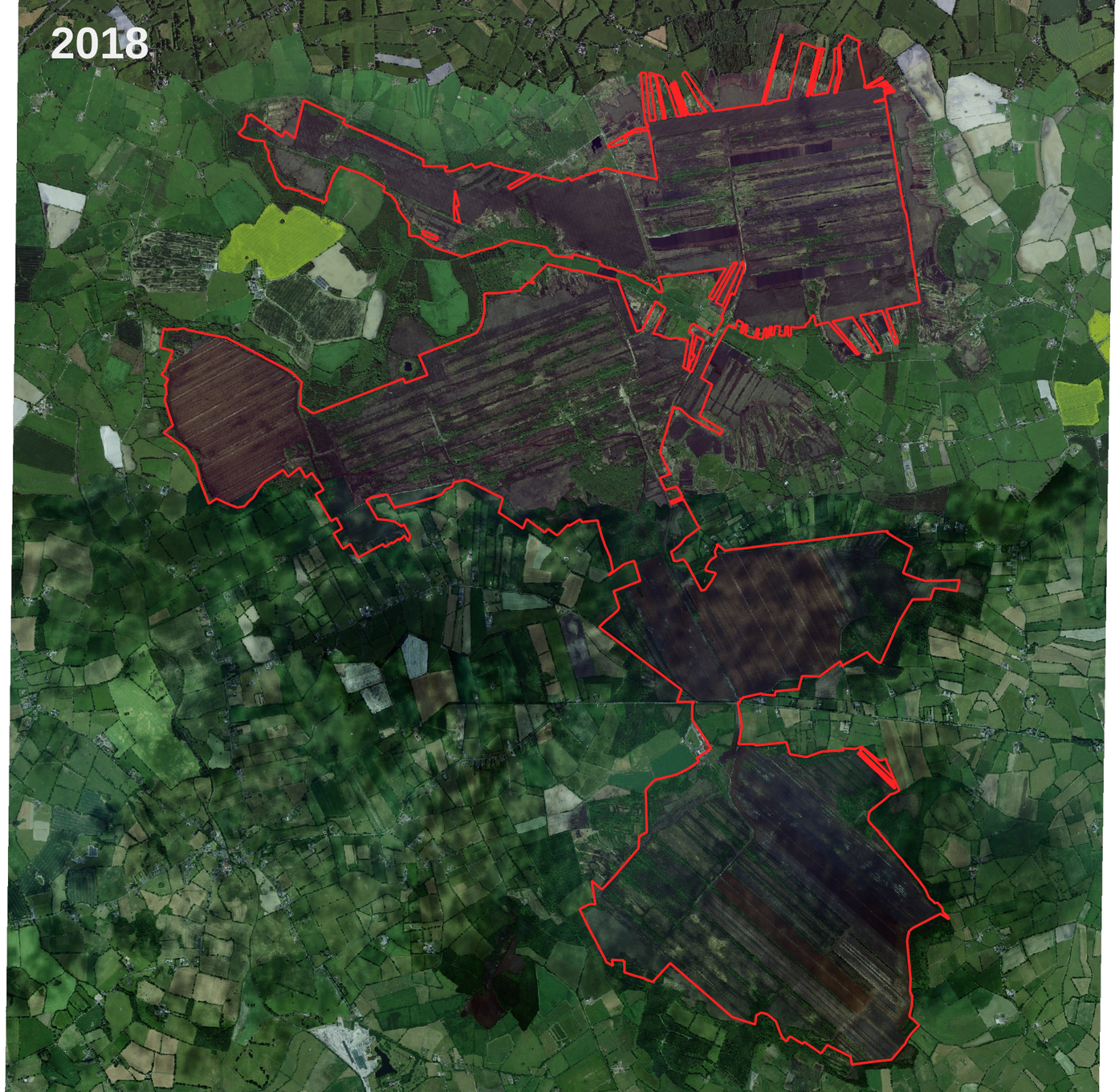


Basemap –
'MapGenie Imagery (2006-2012)'
GeoHive Map Viewer
Tailte Ireland
(https://webapps.geohive.ie/mapviewer/index.html)

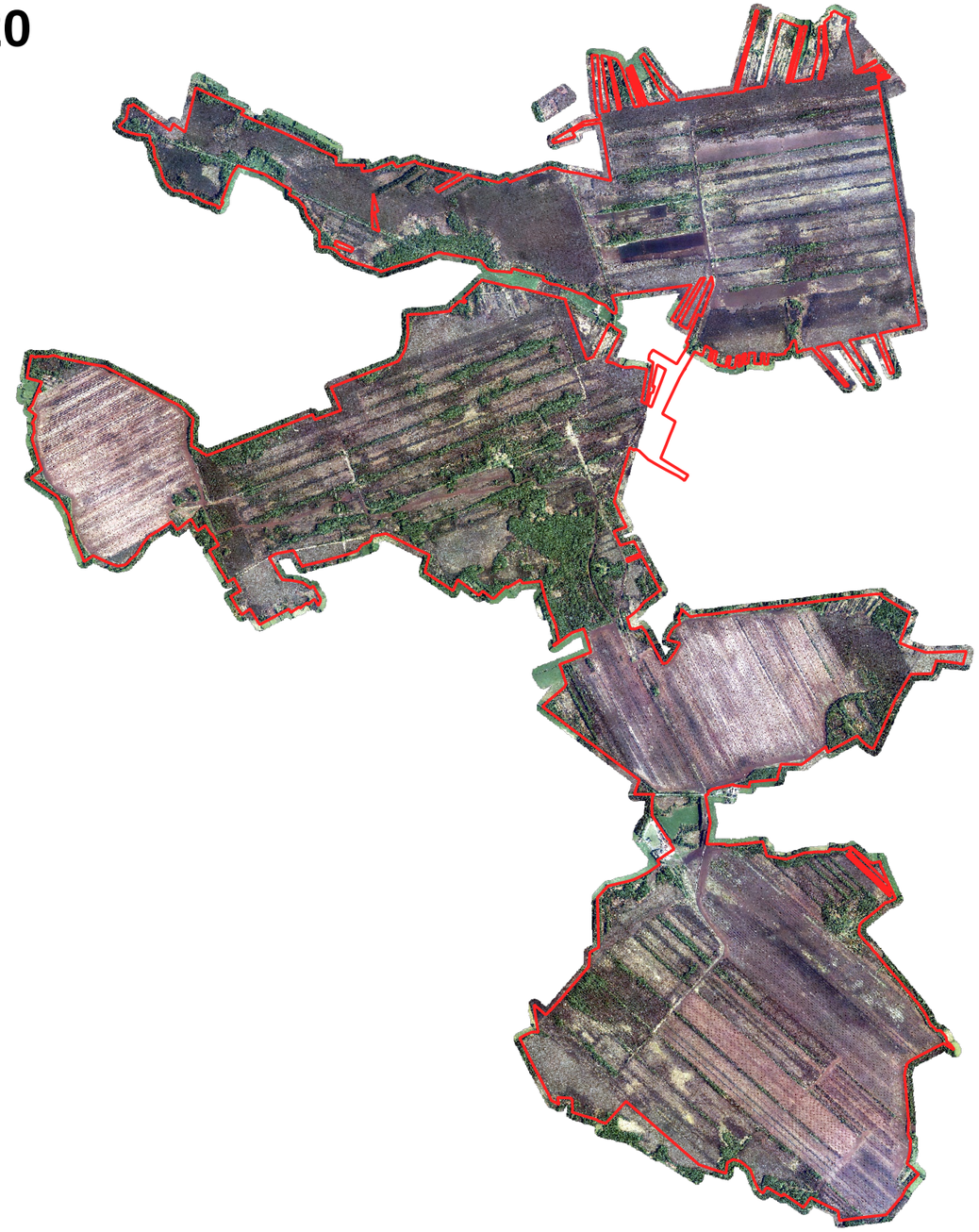

2012 Lisclogher West Bog


2012 Lisclogher Bog


2015


2018

2020



# APPENDIX 4-5

***EPA LICENCE BORD NA MÓNA***
***TRAINING DOCUMENT***

# *Bord na Mona Energy Ltd*
# *Integrated Pollution Control Licence*

# TRAINING FOR WORKS PERSONNEL ARISING FROM IPC LICENSING

| | | |
|---|---|---|
| • Introduction by General Manager | 9.00am | |
| • Background | 9.15am | D.Wynne |
| • Introduction to the Environmental Protection Agency | | |
| • Responsibilities IPCLicensing/monitoring/advising etc) | | D.Wynne |
| • Status | | |
| • Organisation | | |
| • Licence application & present position | | |
| • Tea Break | 10.00am | |
| • Integrated Pollution Control Licence (IPCL) (disharges to water, air & land) | | E.McDonagh |
| • Implications for Bord na Mona | | |
| • Workshops & Yards | | |
| • Bog Areas | | |
| • Transport | | |
| • Environmental Management Programme | | Donal Wynne |
| • Annual Environmental Review (AER) | | |
| • Lunch | 1.00pm | |
| • Bord na Mona's Environmental Policy | 1.30pm | Donal Wynne |
| • Environmental Management Systems (EMS) | | E.McDonagh |
| • Planning | | |
| • Implementation & Operation | | |
| • Checking &. Corrective Action | | |
| • Management Review | | |
| • BENEFITS | | |
| • Codes of Practice | | M.Nugent |
| • Production | | |
| • Transport | | |
| • Teacentres | | |
| • Workshops | | |
| • Polythene | | |
| • Individual Responsibilities | | |
| • Discussion | 3.00pm | |
| | Approx 3.30pm Finish | |

# ENVIRONMENTAL PROTECTION AGENCY

## ESTABLISHMENT

The Environmental Protection Agency Act, 1992, was enacted on 23 April, 1992 and under this legislation the Agency was formally established on 26 July, 1993.

## RESPONSIBILITIES

The Agency has a wide range of statutory duties and powers under the Act. The main responsibilities of the Agency include the following:

- the licensing and regulation of large/complex industrial and other processes with significant polluting potential, on the basis of integrated pollution control (IPC) and the application of best available technologies for this purpose;
- the monitoring of environmental quality, including the establishment of databases to which the public will have access, and the publication of periodic reports on the state of the environment;
- advising public authorities in respect of environmental functions and assisting local authorities in the performance of their environmental protection functions;
- the promotion of environmentally sound practices through, for example, the encouragement of the use of environmental audits, the establishment of an eco-labelling scheme, the setting of environmental quality objectives and the issuing of codes of practice on matters affecting the environment;
- the promotion and co-ordination of environmental research; and
- generally overseeing the performance by local authorities of their statutory environmental protection functions.

## STATUS

The Agency is an independent public body. Its sponsor in Government is the Department of the Environment. Independence is assured through the selection procedures for the Director General and Directors and the freedom, as provided in the legislation, to act on its own initiative. The assignment, under the legislation, of direct responsibility for a wide range of functions underpins this independence. Under the legislation, it is a specific offence to attempt to influence the Agency, or anyone acting on its behalf, in an improper manner.

## ORGANISATION

The Agency's headquarters are located in Wexford and it operates five regional inspectorates, located in Dublin, Cork, Kilkenny, Castlebar and Monaghan.

## MANAGEMENT

The Agency is managed by a full-time Executive Board consisting of a Director General and four Directors. The Executive Board is appointed by the Government following detailed procedures laid down in the Act.

## ADVISORY COMMITTEE

The Agency is assisted by an Advisory Committee of twelve members. The members are appointed by the Minister for the Environment and are selected mainly from those nominated by organisations with an interest in environmental and developmental matters. The Committee has been given a wide range of advisory functions under the Act, both in relation to the Agency and to the Minister.

# BORD NA MÓNA

BORD NA MÓNA ENERGY LIMITED

## ENVIRONMENTAL POLICY STATEMENT *(currently under review)*

Bord na Móna Energy Limited is a commercial semi-state body with responsibility to develop Irelands peat resources in the national interest.

Bord na Móna Energy Limited is committed to gather and make available information on all aspects of its environmental impact and to help improve understanding among the public generally of its role and of the importance of Irish peatlands.

Bord na Móna Energy Limited recognises the importance of peatland conservation.

Bord na Móna Energy Limited will leave behind all areas it owns as either an economically or socially integrated resource of a high environmental value.

Bord na Móna Energy Limited seeks to conduct all aspects of its business in an environmentally sensitive value.

Bord na Móna Energy Limited will establish an environmental management system specifically addressing the following impacts:

- Discharges to water
- Emissions to atmosphere
- Waste disposal
- Use of natural resources
- Noise, vibration, odour, dust and visual effects
- Natural environment and eco-system

The environmental management system will be monitored, maintained and continually improved.

A system of regular environmental audits will be put in place.

Bord na Móna Energy Limited will continue research and development (R & D) into all aspects of its environmental impact.

This statement is published and is available at all locations within the section and its contents are brought to the attention of all employees.

LEABEG, TULLAMORE, CO. OFFALY, IRELAND
TELEPHONE: (0506) 45900. FAX: (0506) 45160

REGISTERED OFFICE: MAIN STREET, NEWBRIDGE, CO. KILDARE
REGISTERED IN IRELAND NUMBER: 303287

# Integrated Pollution Control Licence

## 1. Workshops & Yards

| *Monitoring* | | | |
|---|---|---|---|
| | *Item* | *Frequency* | *Condition of Licence* |
| | Surface water discharge pts. | Monthly | 9.1.2 |
| | | | |
| *Inspection & Recording* | | | |
| | Surface water discharge pts. | Weekly | 9.1.2 |
| | Septic tanks | Bi-annually | 9.1.9 |
| | Oil Interceptors | Weekly | 9.1.9 |
| | Overground Pipelines | Weekly | 9.1.10 |
| | Rail/Tractor service wagons | Bi-annually | 9.1.12 |
| | Waste management recording | | 7.3 |
| | Complaints recording | Monthly (if any) | 12.3 |
| *Testing* | | | |
| | Integrity of Bunding | After 18mths & every 2 yrs | 9.1.6 |
| | Boiler combustion efficiency | Annually | 5.1 |
| | | | |
| *Improvements* | | | |
| | All tank & drum storage to be bunded | Within 12mths | 9.1.4 |
| | Drainage from bunded areas to be collected & disposed | Within 12mths | 9.1.5 |
| | Fuel loading & unloading carried out in bunded areas | Within 6mths | 9.1.7 |
| | All surface water discharges to have oil interceptors | Within 24mths | 9.1.8 |
| | Adequate supply of containment booms | Within 12mths | 9.1.11 |
| | Provision of safe access to monitoring pts. | On-going | 11.8 |
| | Identification & labelling of All emission pts | On-going | 11.6 |
| *Reporting* | | | |
| | Results of monitoring | Quarterly | 9.1.2 |
| | Notification of contamination release, incidents etc. | On-going | 9.1.3, 12.2, 4.1, 4.4-4.7 |

## 2. Bog Areas

| *Monitoring* | | | |
|---|---|---|---|
| | *Item* | *Frequency* | *Condition of Licence* |
| | Surface water discharge pts. | Quarterly | 6.2 |
| | Identification & monitoring of Dust Sensitive Locations | To be agreed | 5.3 |
| *Inspections & Recording* | | | |
| | Silt ponds | Fortnightly | 6.7 |
| | Complaints recording | Monthly (if any) | 12.3 |
| | | | |
| *Improvements* | | | |
| | Implementation of Dust Sensitive Location's procedure | On-going | 5.3 |
| | Implementation of 100% drainage water treatment programme | On-going | 6.6 |
| | Implementation of de-silting procedure (minimum – bi-annually) | On-going | 6.7,6.8 |
| | Implementation of silt pond up-grade programme | On-going | 6.9 |
| | 1st Nov. de-silting programme for flood plain ponds | On-going | 6.11 |
| | Implementation of Cleaner Production procedures | On-going | 6.12 |
| | Post-production bog decommissioning procedure | On-going | 10.1.1 |
| | Implementation of Cutaway Bog Rehabilitation Plan | On-going | 10.1.2 |
| | Installation of Composite sampler | On-going | 6.3 |
| | Labelling of all emission pts & provision of safe access | On-going | 11.6 & 11.8 |
| | | | |
| *Reporting* | | | |
| | Notification of contamination, release, incidents etc. | On-going | 9.1.3, 12.2, 4.1, 4.4-4.7 |
| | Results of monitoring | Quarterly | 6.4 |
| | Bog development & operational programme | On-going | 4.7 |

## 3. Transport

| *Inspection & Recording* | | | |
|---|---|---|---|
| | *Item* | *Frequency* | *Condition of Licence* |
| | Rail & Tractor service wagons | Bi-annually | 9.1.12 |
| | | | |
| *Improvements* | | | |
| | Fuel loading & unloading carried out in bunded areas | Within 6 mths | 9.1.7 |
| | Road transported peat to be covered at all times | On – going | 5.5 |
| | | | |
| *Reporting* | | | |
| | Results of inspections | Annually | 9.1 |
| | Notification of contamination | On – going | 9.1.3, 12.2, 4.1, 4.4-4.7 |
| | | | |

# ENVIRONMENTAL CODE OF PRACTICE FOR PEAT ENERGY WORKS

## *PRODUCTION*

### Silt Control

1. Ensure that properly designed silt control ponds are on all outfalls.
2. Keep silt ponds properly maintained.
3. Keep records of silt control and maintenance.
4. Deal with all complaints promptly.
5. Install weirs on all silt ponds.
6. Raise weirs during heavy rain if stock is not affected.
7. Protect manholes and keep free of peat.
8. Ensure that harrows, millers, ridgers do not drag loose peat into manholes.
9. Have outer harrow spoons directed away from drain.
10. Take precautions to prevent silt run off while piping outfalls.
11. Clean outfalls starting upstream.
12. While cleaning outfalls install barrier (e.g. poles) downstream.
13. Ditch drains in suitable weather.
14. Block outlets from field drains during stockpile loading.
15. Ditch dry peat from drain before unblocking.

# ENVIRONMENTAL CODE OF PRACTICE FOR PEAT ENERGY WORKS

## *PRODUCTION*

### Dust Control

1. Identify and record sensitive areas.
2. Plant shelter belts in sensitive areas.
3. Avoid harvesting in sensitive areas during windy weather.
4. Use grassed passways for machinery.
5. Keep headlands clean - remove loose peat.
6. Slow down when travelling along dusty headlands.
7. When harvesting keep jib low on stockpile.
8. Roll final harvest on uncovered stockpiles.
9. Plant shelter belts around outloading facilities.
10. Clean road crossings after use.

# ENVIRONMENTAL CODE OF PRACTICE FOR PEAT ENERGY WORKS

## *TRANSPORT*

1. Ensure all road transport is clean and well maintained.
2. Keep entrance/exit to outloading areas clean.
3. Ensure that no loose peat remains on top of lorries.
4. Ensure all lorries are properly covered.

## *TEMPORARY TRACK*

1. Ensure all materials are collected following lifting of temporary track.

# ENVIRONMENTAL CODE OF PRACTICE FOR PEAT ENERGY WORKS

## *TEA CENTRES*

1. Keep the buildings clean and painted.

2. Arrange for collection of garbage, scrap, waste oil and filters.

3. Ensure public road access is free of hazards.

4. Bund oil tanks.

5. Ensure septic tank is properly maintained.

# ENVIRONMENTAL CODE OF PRACTICE FOR PEAT ENERGY WORKS

## *WORKSHOPS*

1. Ensure oil storage tanks are adequately bunded.
2. Have in place emergency procedures for oil spillage.
3. Recycle waste oil.
4. Keep yards clean - free of oil, dust and debris.
5. Have a designated area for scrap.
6. Use bins for garbage and dispose of in County Council landfill.
7. Keep buildings clean and painted.
8. Insulate where possible and keep doors maintained to conserve energy.
9. Landscape all open areas.
10. Ensure septic tanks and treatment works are properly maintained.

# ENVIRONMENTAL CODE OF PRACTICE FOR PEAT ENERGY WORKS

## Polythene

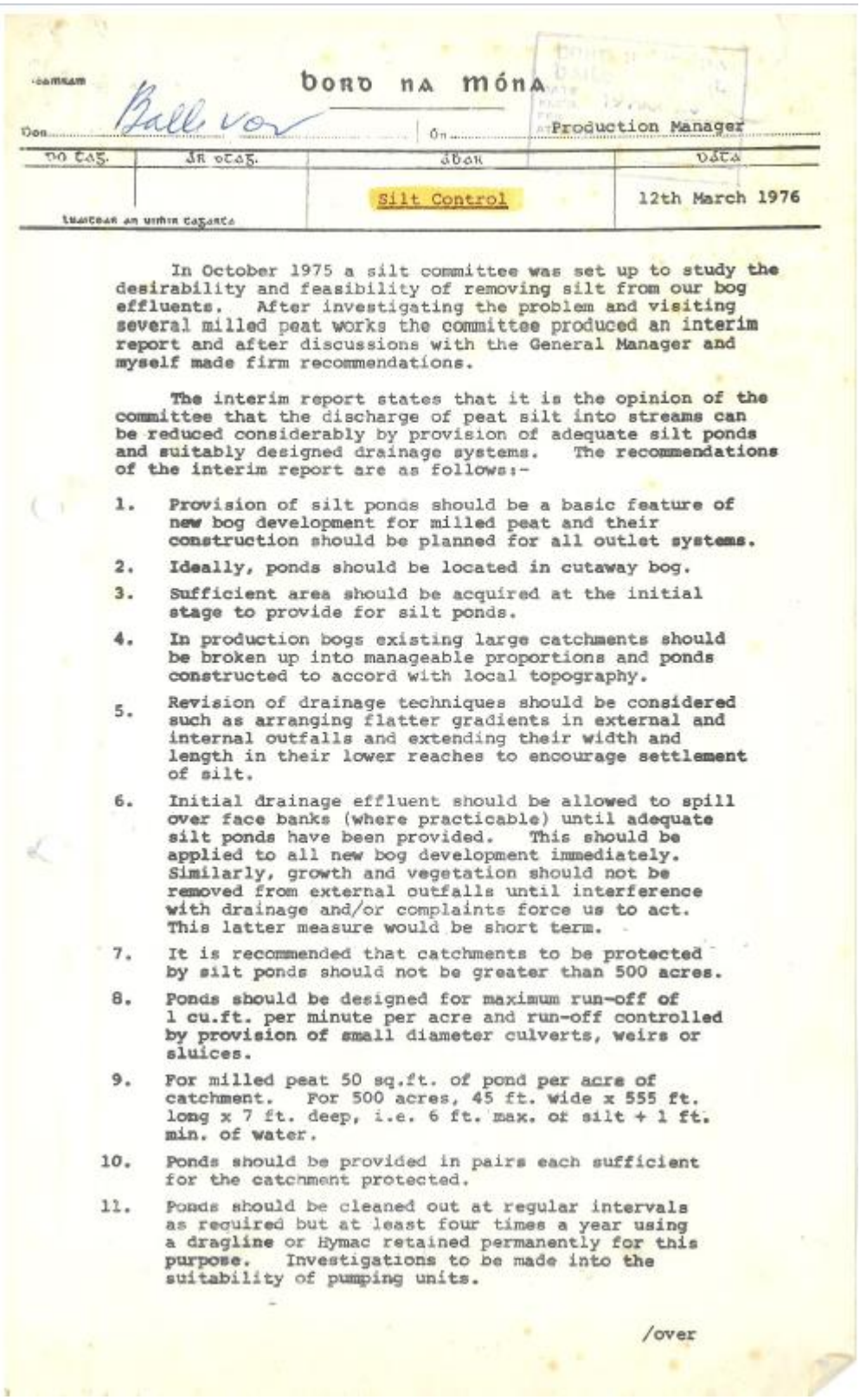
1. **Remove any damaged or torn polythene immediately.**

2. **Take all used polythene to designated area for collection and recycling.**

# APPENDIX 4-6

***SILT CONTROL MEETING INTERIM REPORT- RECOMMENDED MEASURES 1976***

Appendix 4-6 Ballivor Silt Control Meeting Interim Report: Recommended Measures 1976



Coimhram

**Bord na Móna**

Don Ballivor | Ón Production Manager

| Do tag. | Ar otag. | Ábar | Data |
|---|---|---|---|
| | | Silt Control | 12th March 1976 |

Luaitear an uimir tagarta

In October 1975 a silt committee was set up to study the desirability and feasibility of removing silt from our bog effluents. After investigating the problem and visiting several milled peat works the committee produced an interim report and after discussions with the General Manager and myself made firm recommendations.

The interim report states that it is the opinion of the committee that the discharge of peat silt into streams can be reduced considerably by provision of adequate silt ponds and suitably designed drainage systems. The recommendations of the interim report are as follows:-

1. Provision of silt ponds should be a basic feature of new bog development for milled peat and their construction should be planned for all outlet systems.
2. Ideally, ponds should be located in cutaway bog.
3. Sufficient area should be acquired at the initial stage to provide for silt ponds.
4. In production bogs existing large catchments should be broken up into manageable proportions and ponds constructed to accord with local topography.
5. Revision of drainage techniques should be considered such as arranging flatter gradients in external and internal outfalls and extending their width and length in their lower reaches to encourage settlement of silt.
6. Initial drainage effluent should be allowed to spill over face banks (where practicable) until adequate silt ponds have been provided. This should be applied to all new bog development immediately. Similarly, growth and vegetation should not be removed from external outfalls until interference with drainage and/or complaints force us to act. This latter measure would be short term.
7. It is recommended that catchments to be protected by silt ponds should not be greater than 500 acres.
8. Ponds should be designed for maximum run-off of 1 cu.ft. per minute per acre and run-off controlled by provision of small diameter culverts, weirs or sluices.
9. For milled peat 50 sq.ft. of pond per acre of catchment. For 500 acres, 45 ft. wide x 555 ft. long x 7 ft. deep, i.e. 6 ft. max. of silt + 1 ft. min. of water.
10. Ponds should be provided in pairs each sufficient for the catchment protected.
11. Ponds should be cleaned out at regular intervals as required but at least four times a year using a dragline or Hymac retained permanently for this purpose. Investigations to be made into the suitability of pumping units.

/over

Coimram

# Bord na Móna

Don Ballivor | Ón Production Manager

| Do tag. | Ar otag. | Ábar | Data |
|---|---|---|---|
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/over

# APPENDIX 4-7

***SILT COMMITTEE***
***EXCAVATOR RECORDS 1984***

# Appendix 4-7 Silt Committee Excavator records 1984

Chief Civil Engineer : H.O. Manager : Ballivor.

GH/JK DH/AK. Silt Control 9th May, 1984.

Below are figures for numbers of excavator hours spent at present and estimates of future excavator requirements as requested by the General Operations Manager.

In 1983/84 210 Hymac hours were spent in installing our first silt ponds.

The following is a table of expected numbers of Hymac's required at Ballivor works for silt control in the next few years.

| Year. | Pond Excavation | Pond Maintenance | Total |
|---|---|---|---|
| 1984/'85. | 0.11 Hymac Year | 0.08 Hymac Year | 0.19 Hymac Yr |
| 1985/'86. | 0.14 " " | 0.30 " " | 0.44 " " |
| 1986/'87. | 0.10 " " | 0.60 " " | 0.70 " " |
| 1987/'88. | 0.00 " " | 0.81 " " | 0.81 " " |

Manager.

Meamram

# Bord na Móna

Don Manager Ballivor | Ón General Operations Manager

| Do Chas. | Ar dtas. | Ábhar | Dáta |
|---|---|---|---|
| Tuairean an uimhir tagartha | | Re: Silt Control | 16/4/'84 |

I attach a copy of report on the silt control meeting held at Derrygreenagh on 4th April 1984. You should submit the following information to the Chief Engineer:-

(a) The annual number of excavator hours (specifying excavator type) spent at present on silt control at your works.

(b) The expected annual number of excavator hours which would be required in complying with Board Policy in this regard i.e. all effluents flowing through silt traps of standard size.

General Operations Manager

GH/JK
ENC.

c.c. Chief Engineer



# APPENDIX 4-8

***SILT MEETING***
***DERRYGREENAGH 1984***

Appendix 4-8 Silt Control Meeting Derrygreenagh 1984

Meeting on Silt Control held at
Derrygreenagh on 4th April 1984

Present:

Chairman - Mr. S. Grogan - General Operations Manager

Mr. H. Flood - Chief Engineer
Mr. B. Keville - Manager, Mech. Eng. Services
Mr. J. Welsby - Head Civil Works
Mr. G. Hannon - Civil Works

Mr. J. Doyle - Group Manager West
Mr. H. Hickland - " " East
Mr. J. Hughes - " " Briquett
Mr. P. Hughes - Manager Blackwater
Mr. E. Moore - " Derryfadda
Mr. M. Kelly - " Derrygreenag
Mr. S. McCabe - " Littleton
Mr. T. Quinn - " Mountdillor
Mr. L. Concannon - " Oweninny
Mr. D. Wynne - Prod. Eng. Boora

Mr. P. Coffey - Scientific Officer

Mr. C. O Gogain - Manager Lullymore was unavoidably absent

Acceptable Standards of Effluent:

Legal interpretations of the 1977 Water Pollution Act and the various Fisheries Acts suggest that Bord na Mona is not legally obliged to treat bog run-off. These interpretations have not been tested in court nor have they been widely publicised.

Notwithstanding the question of our Statutory obligation, Works should meet their responsibilities towards the provision of acceptable bog effluents in accordance with Board Policy. To comply with this policy all bog and factory effluents should be directed through silt traps before discharge to external waterways.

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Derrygreenagh on 4th April 1984

Present:

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Mr. B. Keville - Manager, Mech. Eng. Services
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Mr. G. Hannon - Civil Works

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Mr. H. Hickland - " " East
Mr. J. Hughes - " " Briquett
Mr. P. Hughes - Manager Blackwater
Mr. E. Moore - " Derryfadda
Mr. M. Kelly - " Derrygreenag
Mr. S. McCabe - " Littleton
Mr. T. Quinn - " Mountdillon
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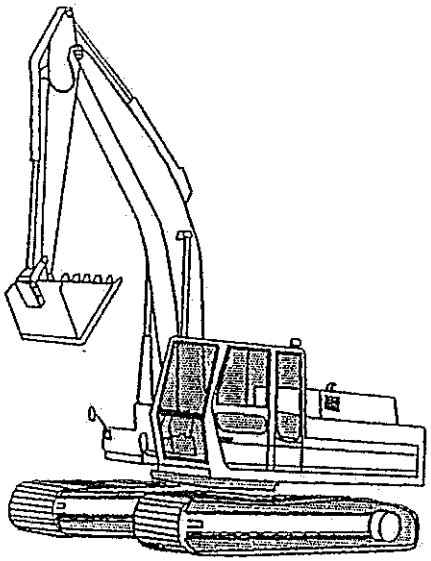
# APPENDIX 4-9

***Silt Control Report Jim Harkins***
***1991 Bord na Móna***

503 Boora

# SILT CONTROL



# REPORT

FOR

PEAT ENERGY DIVISION

BOOR
BLACKWATER
DERRYGREENAGH
MOUNTDILLON
OWENINNY

by JIM HARKINS

BORDNAMÓNA

April 1991

## SUMMARY

A study was carried out at three works Boora, Mountdillon and Oweninny to assess the quantity of silt run-off from our bogs. These bogs are representative of Works attached to the Peat Energy Division. The findings show that the silt run-off is substantially less than previous reports indicate. All standards, silt control ponds, plant and labour are based on findings. The estimated cleaning costs for the Division is £425,000 per annum.

Following this, an audit was carried out at each works to quantify the size and number of Silt Control Ponds already constructed. From this, we know the number and capacity of Silt Control ponds outstanding to cater for run-off from bogs. This will cost £324,000 for the Peat Energy Division. An assumption is made that existing draglines will excavate and extend ponds. Depreciation of plant and acquisition of bog for siting silting ponds is not included.

The report has a two-pronged approach to the Silt Control problem:-

(a) Provision of silt control ponds to clean effluent from the bogs.

(b) Ways of minimising silt run-off at operations stage.

Following discussions with works personnel practical measures are outlined to minimise silt run-off. These measures are based on good husbandry and are the most cost effective method for dealing with part of the silt control problem. A system is recommended to control the cleaning and inspection of silt control ponds.

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Appendix No. 5. Moisture Content of Sludge and Silt Run-off/acre/annum.

Appendix No. 6. Rainfall at five works attached to the Division.

Appendix No. 7. Silt Ponds at Blackwater Works.

Appendix No. 8. Silt Ponds at Boora Works.

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Appendix No. 12. Freqency of Cleaning Silt Control Ponds.

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Appendix No. 14. Peat Silt Related Claims.

Appendix No. 15. Dilution of Receiving Waters.

Appendix No. 16. Output of Plant, Specification of Plant.

## 1.0 INTRODUCTION.

There is a drive within Bord na Mona to establish an "Environmentally friendly" ethos and protect the environment in all our operations. To that end our long term objective is that all effluent from the bog will be controlled, monitored and conform to a satisfactory standard. In future, we may have to conform with environmental protection laws meeting rigorous standards.

Many good technical reports have been written on silt control. This report forms an addendum to these reports dwelling on a Peat Energy Divisional Environmental control plan to limit the external impact of peat silt.

The report outlines:-

(a) Study to establish standards for sizing silt control ponds and frequency of cleaning same.

(b) Data on silt control at works at present.

(c) Plant to achieve standards.

(d) Practical measures to be adopted to minimise silt run-off.

The project is an overview of the silt control problem in the division on which decisions for the future can be made.

## 2.0 QUANTITY OF SUSPENDED SOLIDS AND SETTLED SLUDGE.

**2.1** Before an investigation can be concluded as to the feasibility of solving the silt control problem, it is necessary to quantify the silt run-off from bogs. To this end, a study was carried out on two silt control ponds at three works Boora, Mountdillon and Oweninny to ascertain the quantities of silt run-off from bogs. For silt control pond characteristics (see appendix No. 4). This study was carried out with data taken on a daily basis except weekends for a calender year.

The following data from each silt control pond was monitored:

(a) Rainfall.

(b) Silt quantity at inlet to ponds.

(c) Silt quantity at outlet from ponds.

(d) Run-off flow quantities using a V-notch.

(e) Operation in progress within the catchment area.

(f) Saturated sludge samples from ponds were tested.

The gross and nett catchment areas for each silt control pond was measured. We interpolated on existing data to ascertain weekend data.

**2.2** From the above data, tables were drawn up for each silt pond location under the following headings see appendix No. 1 for Boora Wooks, Appendix No. 2 for Mountdillon Works and Appendix No. 3 for Oweninny Works.

(1) Date.

(2) Height over weir from V-notch reading.

(3) Flow from catchment area in cu.m. per sec.

(4) Flow from catchment area in cu.m. per day.

(5) Cumulative flow in cu.m. from start of monitoring.

(6) Silt quantity in parts per million (p.p.m.) at inlet to silt pond.

(7) The quantity of anhydrous peat silt in kg. per day at inlet to silt pond.

(8) Silt quantity in parts per million (p.p.m.) at outlet from the pond.

(9) The quantity of anhydrous peat silt in kg. per day at outlet from pond.

(10) Silt quantity in parts per million (p.p.m.) retained in the silt control pond.

(11) The quantity of anhydrous peat silt in kg. per day retained in silt pond.

(12) Cumulative quantity of anhydrous peat silt in kg. retained in silt ponds since commencement of monitoring.

(13) Rainfall in m.m.

(14) Date.

(15) Ditching operations.

**2.3** From the above tables of information the following graphs were produced. (see appendix No. 4)

(a) Monthly rainfall.

(b) Anhydrous silt in kgs. at inlet **V** Anhydrous silt in kgs. at outlet

(c) Charts showing data from silt control ponds.

**2.4** Silt run-off per acre per annum for the Silt ponds under test (see appendix No. 5)

Sludge tests from silt control ponds (see appendix No. 5).

**2.5** The rainfall for each works over the past five years is shown in appendix No. 6. The average rainfall for each works is also shown, so it is safe to conclude that the period of study represents average conditions.

## 2.6 EFFECTIVENESS OF SILT PONDS.

Silt control ponds do not remove all silt. They have limitations. Extensive research has been carried out on drop velocities of peat particles of different sizes and concentrations. 72% of peat silt particle sizes are less than 50 microns. Particle grain size of less than 15 microns do not settle out. The only effective means of removing these particles is filtration. This is not practical with the quantities of run-off waters we are dealing with. (See report 'Decantation of Peat Bog residue' by Laborataire central D'Hydraulique de France and 'Development of methods for purifying run-off water from peat production areas' by Raimo Ihme, Esko Lakso and Kaisa Heikinin).

## 2.7 NUTRIENT AND B.O.D. COMPOSITION OF RUN-OFF WATERS.

Exhaustive chemical monitoring programmes have been carried out on the river Suck over the past ten years by Bord na Mona and the Central Fisheries Board. Detailed nutrient analysis was carried out by the Central Fisheries Board. Water samples were analyses at inlets and outlets of silt ponds with further samples taken on the main river Suck channel both upstream and downstream of the silt pond outfalls.

From these analyses it is safe to conclude that effluents from bogs do not contribute to nitrification of water, nor do they increase the B.O.D. of receiving waters.
(See reports on River Suck survey by Central Fisheries Board).

**2.8** The following findings can be drawn from above study.

(1) (a) One net acre produces 20 cu.m. of sludge annually in Midlands bogs.

(b) One net acre produces 30 cu.m. of sludge annually at Oweninny works.

This is at variance with recommendations of 'Silt Control Study' carried out by Mr. G. Hannon in 1983. That study recommends silt control systems to cater for 60 cu.m. of sludge per acre per annum. I have had discussions with Mr. G. Hannon on our findings. His study was carried out over a period of 3 months, the primary thrust of his project was to devise a mathematical formula, taking all variables in account, to assess silt run-off. However, if the previous report is right then there would be a run-off of 741 p.p.m. suspended solids on average at inlet to silt control ponds assuming there was complete run-off of rainfall for the year. The silt quantities in p.p.m. at inlets to silt ponds are mostly substantially less than 741 p.p.m. as obtained by our study.

(2) Oweninny has a higher silt run-off than midlands bogs for the following reasons:-

(a) Substantially higher rainfall on average than midland bogs.

(b) The gradient to field drains and outalls are greater than midland bogs - thereby giving faster run-off.

(3) Concentration of suspended solids varies with rainfalls. If the rainfall is high then the silt run-off is high, if the rainfall is low then the silt run-off is low.

(4) There is significant silt run-off during ditching operations in October at all bogs.

(5) Periods of highest silt run-off are:-

(a) High rainfall.

(b) Weather break in production. (Boora Works)

(c) Ditching in progress in catchment area.

(6) Peat sludge has no cohesion and re-entrainments occurs easily. Silt control ponds can increase the silt content at oultets during periods of high rainfall or when the suspended solids at inlet are small with pond partially full.

(7) 57% of year with suspended solids less than 30 p.p.m. at inlet for Midland bogs.

(8) 81% of year with suspended solids at inlet less than 100 p.p.m. for Midland bogs.

(9) 80% of year with suspended solids at outlet from silt pond less than 30 p.p.m. for Midland bogs.

(10) 98% of year with supsended solids at outlet from silt pond less than 100 p.p.m. for Midland bogs.

(11) 49% of year with suspended solids less than 30 p.p.m. at inlet for Oweninny Works.

(12) 74% of year with suspended solids at inlet less than 100 p.p.m. for Oweninny Works.

(13) 61% of year with suspended solids at outlet from silt pond less than 30 p.p.m. for Oweninny Works.

(14) 86% of year with suspended solids at outlets from silt pond less than 100 p.p.m. for Oweninny Works.

(15) 63% effectiveness of silt control ponds in Midland Bogs in removing silt.

(16) 47% effectiveness of silt control ponds at Oweninny Works in removing silt.

(17) There is a run-off of 21,000 tonnes peat at 55% moisture content at average suspended solids contentration of 30 p.p.m. at outlets from bogs attached to the Division.

(18) There is a run-off 71,000 tonnes peat at 55% moisture content at average suspended solids concentration of 100 p.p.m. at outlets from bogs attached to the Division.

(19) The frequency of cleaning ponds determines its effectiveness and reduces re-entrainment.

(20) The silt deposited out in silt control ponds starting at pond inlet and filling up to surface of pond and carried on filling to outlet.

(21) Silt control ponds will not produce acceptable levels of suspended solids in effluent when subjected to intense rainfall.

(22) Silt control ponds will not produce effluent to a standard of say 100 p.p.m. suspended solids at all times.

## 3.0 DATA ON SILT CONTROL AT WORKS.

**3.1** In the Peat Energy Division production related operations are carried on 74,000 net acres. The surface is milled to a depth of 8-10 m.m, twelve times per year. With field drains at 15m. centres some milled peat will be deposited into the drains by various means:-

(a) Wind blowing dry peat of the fields.

(b) Rains washing peat of the fields into drains.

(c) Milling machines and harrows inadvertently depositing peat into drains.

At the end of the production season field drains are ditched, some of the ditched peat gets washed back into the drains.

Again some peat gets deposited into drains during rail bed preparation of Peco piles and during the loading out operations.

The above are the main sources of generating silt.

**3.2** Silt control ponds have been constructed at all works to trap silt and to keep it within confines of works. They are the only practical way of slowing down the rate of flow of an outfall enabling the silt particles to settle out.

**3.3** A survey has been carried out at works giving details of all silt control ponds (see appendix Nos. 7-11) under the following headings:-

(a) Gross catchment area (acres): Land area within confines of watershed - this may include private property, upland etc.

(b) Net catchment area (acres): The area of bog from which silt run-off can occur, i.e. sum of net production area, pile fields and turing grounds.

(c) Storage capacity of silt control pond required in cu.m. to conform with recommendations of study.

(d) Storage capacity of silt control pond provided in cu.m. is the volume of the existing pond below invert level or weir level of outlet to pond.

(e) The percentage coverage is the ratio of storage provided over storage required.

(f) By-pass - status of silt ponds with by-passes.

(g) Pond location: this gives the location of the silt control pond relative to flood plain of receiving rivers or lakes.

(h) The remaining headings are self-explanatory.

## 3.4 CLEANING OF SILT CONTROL PONDS.

Cleaning of silt control ponds and the construction of more silt ponds was carried out during 1990. A table showing the frequency of cleaning of ponds is outlined in appendix No. 12.

## 3.5 MANAGEMENT CONTROL OF CLEANING AND INSPECTING SILT PONDS.

There is not a comprehensive control system to monitor frequency of cleaning and condition of ponds at works with the exception of perhaps Oweninny Works.

I recommend that an inspection be carried out on all silt ponds at regular intervals by the supervisor in a bog area. This information is to be logged onto computer giving all relevant data on silt control. See appendix No. 13 giving details of cleaning and Inspection sheet.

Dedicated plant for silt control to have a modified log sheet (see appendix No. 13 showing modified log sheet).

## 3.6 PEAT SILT RELATED CLAIMS.

Peat siltation can cause interference with normal farm drainage and livestock drinking facilities. It can also affect spawning beds and general water quality for leisure and other uses. Peat silt related claims for the works are listed in appendix No. 14. The monetary settlements are small, this does not reflect the true cost, in practice the silting problems are rectified on the ground by our personnel.

## 3.7 ACCEPTABLE SUSPENDED SOLIDS CONCENTRATION.

Following the 1977 Water Pollution Act threshold values for maximum allowable suspended solids concentration are left by and large to the discretion of the local authorities involved.

The "Eight Report of the Royal Commission on Water and Sewage" (1912) recommended that "maximum suspended solids concentration" be regarded as 30 p.p.m. (in the case of peat solids = 30 mg/1) assuming an outfall to receiving water flow rate ratio of 1:8.

Although the situation is not clarified, it is reasonable to assume that suspended solids concentration of the order of 100mg/1 should be deemed acceptable by the authorities where the outfall to receiving water flow rate ratio is more that 1:25.

## 3.8 DESTINATION OF OUTALLS FROM BOGS.

As shown in appendix Nos. 7-11, outfalls from our bogs discharge into tributaries of main rivers.

The dry weather flow of some of these rivers was obtained from the Office of Public Works. We have compiled data on catchment areas of tributaries. See appendix No. 15.

**3.9** The following conclusions can be drawn from above

(1) The percentage coverage for each works to proposed standard:

| | |
|---|---|
| Boora | 35.8% |
| Blackwater | 57.3% |
| Derrygreenagh | 62.8% |
| Mountdillon | 41.0% |
| Oweninny | 50.3% |

There is insufficient coverage and many outfalls from bogs have no silt control ponds.

(2) The frequency of cleaning ponds is inadequate relative to recommendations. This is because there is old and insufficient plant at the works. Silt control is also the first casualty in times of financial cutbacks.

(3) Each works has different priorities and silt control is more sensitive at some works.

(4) More by-passes to silt control ponds are required for periods of heavy rainfall. If this is not possible a piped outlet to silt ponds should be installed.

(5) Gross catchment area is high relative to net catchment area.

(6) There are not comprehensive silt pond cleaning records at works with the exception of Oweninny Works.

(7) Acceptable suspended solids in run-off from bogs depends on dilution of receiving waters. This may be different for receiving tributaries.

(8) Silt control ponds should be constructed as large as conditions will allow in keeping with previous technical reports to minimise frequency of cleaning.

(9) Net catchment acres for silt ponds may not include turning grounds and pile fields at some works.

(10) Silt Related Claims are low relative to proposed costs of construction and maintainance of silt ponds.

## 4.0 CLEANING OF SILT CONTROL PONDS.

**4.1** Cleaning of silt control ponds is carried out at all works either by dragline excavator or conventional hydraulic excavator. The dragline excavators are old, there is difficulty in getting replacement parts. The conventional hydraulic excavators have limitations in reach and are more suitable for other bog operations.

**4.2** Studies were carried out on pumping sludge from silt control ponds on Clooneeny Bog. The object of the exercise was to study pumping as an alternative system for cleaning silt ponds.

A hydrostatically - driven transfer tube piston pump from Putzmeister Ltd. was tested. The findings were as follows:-

(a) Output was low at 13 cu.m. of sludge per hour.

(b) It was capable of pumping sludge, however, it had to be moved to other locations in the silt pond to operate efficiently. The re-location of the pump was labour intensive with discharge pipes having to be moved, the pump itself was moved by a dragline.

(c) Cost of pump £20,500 punts. ex. works. In conclusion, it is not a satisfactory alternative to our present system of cleaning ponds.

**4.3** Recently, a long reach hydraulic excavator (VC-15) was purchased by each works in the Peat Energy Divisions. Studies have been carried out on the capabilities of the VC-15 by our Industrial Engineers. Comparisons with our existing machines along with specifications are listed in tables (see appendix No. 16).

It must be remembered that silt control is not just confined to cleaning silt ponds at works. All works clean open outfalls and small rivers on an annual basis. Hy-macs carry out other operations as well as silt cleaning.

**4.4** Based on the findings of the study, a table has been drawn up showing the content of work required for a VC-15 hydraulic machine to clean silt control ponds and conform with proposed standards.

A further table has been drawn up showing the content of work required for a dragline to excavate and extend silt control ponds. An assumption is made that half the volume of excavation is above the water level of the silt control ponds.

Further tables show the cost of cleaning Silt Control Ponds for Division at £425,000 per annum.

Cost of excavation and extension of ponds to conform with proposed standard is £324,000. This does not include depreciation of plant or acquisition of bog for silt control ponds. These tables serve as a guide only (see overleaf).

## WORK CONTENT FOR CLEANING SILT CONTROL PONDS.

| WORKS | BOORA | BLACKWATER | DERRYGREENAGH | MOUNTDILLON | OWENINNY |
|---|---|---|---|---|---|
| REQUIRED NO. OF PONDS IN TOTAL | 83 | 171 | 52 | 95 | 118 |
| TOTAL QUANTITY OF SILT (CU.M.) | 301,400 | 366,480 | 306,960 | 311,380 | 290,040 |
| WORK CONTENT (VC 15) CLEANING HOURS | 3173 | 3858 | 3231 | 3278 | 2417 |
| PREPARE/FINISH | 83 | 171 | 52 | 95 | 118 |
| IDLE TRAVEL | 83 | 171 | 52 | 95 | 118 |
| TOTAL STD. HOURS | 3339 | 4200 | 3335 | 3468 | 2653 |
| NO. OF WEEKS 48 HOUR/WEEK | 70 | 88 | 70 | 73 | 56 |
| 56.75 HOUR/WEEK | 59 | 74 | 59 | 62 | 47 |

## COST OF REMOVING SILT WITH A VC-15.

| | YEAR | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | TOTAL |
| Cost of Machine | 92000 | | | | | | | | | | |
| Repayments incl. Interest | 16955 | 16955 | 16955 | 16955 | 16955 | 16955 | 16955 | 16955 | 16955 | 16955 | 169550 |
| Wages | 16640 | 17301 | 17998 | 18718 | 19466 | 20245 | 20155 | 22897 | 22773 | 23684 | 199777 |
| Fuel | 4888 | 5084 | 5280 | 5498 | 5718 | 5947 | 6185 | 6432 | 6680 | 6957 | 58686 |
| Maintenance | 5564 | 5787 | 6018 | 6259 | 6509 | 6769 | 7040 | 7322 | 7615 | 7919 | 66802 |
| Residual Value | | | | | | | | | | (1500) | (15000) |
| Total Cost | 44047 | 45127 | 46258 | 47430 | 48468 | 49916 | 51235 | 52606 | 54033 | 40515 | 479815 |

Total cost per year 1 to 10 = £479,815

cost per year = £ 47,982

Cost per Weel (48 Hr.) = £ 923

## COST OF CLEANING SILT PONDS WITH A VC-15.

| WORKS | BOORA | BLACKWATER | DERRYGREENAGH | MOUNTDILLON | OWENINNY |
|---|---|---|---|---|---|
| CUBIC METRES OF SILT | 301,400 | 366,480 | 306,960 | 311,380 | 290,040 |
| MAN HOURS OF WORK | 3,339 | 4,200 | 3,335 | 3,468 | 2,653 |
| COST OF CLEANING @ £923/WK. | £64,206 | £80,763 | £64,129 | £66,687 | £51,015 |
| DOZING @ 30% OF VC-15 COST | £19,262 | £24,229 | £19,239 | £20,006 | £15,304 |
| TOTAL COST | £83,468 | £104,992 | £83,368 | £86,693 | £66,319 |

Total £424,840

NOTES:-

1. A week is taken as 48 hours.
2. A year is taken as 48 weeks.
3. The costs include repayment plus interest on the VC-15.

## EXCAVATE NEW SILT CONTROL PONDS.

| WORKS | BOORA | BLACKWATER | DERRYGREENAGH | MOUNTDILLON | OWENINNY |
|---|---|---|---|---|---|
| NO. OF NEW PONDS REQUIRED AND EXTENSION TO EXTISING PONDS | 59 | 64 | 20 | 57 | 58 |
| STORAGE NEEDED (CU.M.) | 97,410 | 78,258 | 75,063 | 97,740 | 51,261 |
| WORK CONTENT (DRAGLINE)<br>EXCAVATE HOURS | 2,435 | 1,956 | 1,427 | 2,444 | 1,282 |
| PREPARE/FINISH AT 12 HOURS/POND | 708 | 768 | 240 | 648 | 696 |
| IDLE TRAVEL AT 4 HOURS/POND | 236 | 256 | 80 | 228 | 232 |
| TOTAL STD. HOURS | 3,379 | 2,980 | 1,747 | 3,356 | 2,210 |
| NO. OF WEEKS 48 HOUR/WEEK | 71 | 63 | 37 | 70 | 46 |

COST OF EXCAVATING NEW SILT PONDS.

| WORKS | | BOORA | B/WATER | D/GREENAGH | MT.DILLON | OWENINNY |
|---|---|---|---|---|---|---|
| CUBIC METRES OF BOG | | 97401 | 78258 | 57063 | 97740 | 51261 |
| STD. HOURS OF WORK | | 3379 | 2980 | 1747 | 3356 | 2210 |
| DRAGLINE | LABOUR @ £6.67/HR. | 22,538 | 19,877 | 11,652 | 22,385 | 14,741 |
| | FUEL: 3 GALS/HR @ £.82.GAL | 2,771 | 2,444 | 1,433 | 2,752 | 1,812 |
| | MAINTENANCE | 6864 | 6053 | 3549 | 6817 | 4,489 |
| SUB-TOTAL | | 32,173 | 28,374 | 16,634 | 31,954 | 21,042 |
| DOZING @ 30% OF DRAGLINE COST | | 9,652 | 8,512 | 4,990 | 9,586 | 6,313 |
| FENCING @ £300/POND | | 17,700 | 19,200 | 6,000 | 17,100 | 17,400 |
| PIPES @ £300/POND | | 17,700 | 19,200 | 6,000 | 17,100 | 17,400 |
| TOTAL COST | | £77,225 | £75,286 | £33,624 | £75,740 | £62,155 |

TOTAL £324,030

NOTES:-

1. DEPRECIATION IS NOT ALLOWED FOR.
2. MAINTENANCE IS £4680 P.A. AND BASED ON DRAGLINE COSTS OVER 4 YRS.
3. A YEAR IS TAKEN AS 2304 HOURS.

## 5.0 PRACTICAL MEASURES TO MINIMISE SILT RUN-OFF FROM BOGS.

This is an area that can greatly assist in reducing costs associated with silt control. Peat silt is an asset in the form of milled peat and an expensive problem when it leaves our bogs in the form of silt.

Our employees have a big contribution to make in reducing silt run-off from our bogs. The items listed will help to reduce silt run-off as they address the source of the problem, they are as a result of discussions with management at works, the benefits are obvious and are not quantified scientifically.

(1) Harrow spoons are properly handed so that peat during production operations does not enter field drains.

(2) Drivers of millers and harrows do not turn short at turning ground.

(3) New outfalls and manholes to be set 50 m. back from turning ground.

(4) Ridging all fields that have been milled at end of production season.

(5) Ditching operations to be carried out as much as possible during anti-cyclonic weather.

(6) Setting of disc of standard ditcher to match profile of drain.

(7) Clean all silt ponds in an area prior to commencemen of ditching.

(8) Offset peco pile in field for rail bed.

(9) Reduce flooding in bog areas - pumps in working order.

(10) Weirs or piped outlets to all silt ponds maintained.

We propose developing a drain cleaner for cleaning silt during production. This will reduce necessity for ditching bog on an annual basis.

## 6.0 RECOMMENDATIONS.

(1) (a) That a figure of 20 cu.m. per acre per year be taken as quantity of sludge for design purposes at Midland Bogs.

(b) A figure of 30 cu.m. per acre per year be taken as quantity of sludge for design purpose at Oweninny Bog.

(2) (a) That each silt control pond be designed to cater for 10 cu.m. per acre per annum for Midland bogs.

(b) That each silt control pond be designed to cater for 15 cu.m. per acre per annum for Oweninny bog.

(3) That silt control ponds be cleaned twice per year to cater for production and ditching.

(a) Before production so that the pond is available to cater for run-off during production.

(b) Before ditching. Before moving in to ditch a bog area, all control ponds should be cleaned.

(4) Silt control ponds located in flood plains to be cleaned for a third time prior to river rising in late part of November or early par of December. Otherwise, an embankment should be constructed around silt control area with a piped outlet.

(5) A phased programme be adopted by each works to construct silt control ponds on all bog outfalls within a specified time limit. This will give consistency throughout the works.

(6) As peat silt is more sensitive at some works, greater emphasis should be placed on getting an agreed plan in place more quickly.

(7) All employees to be informed of methods of reducing silt run-off from bogs. Great emphasis is to be placed on this as it can reduce silt control costs.

(8) Introduce a uniform system of controlling and recording cleaning of silt control ponds at all works.

(9) Construct by-passes to all silt control ponds where practical. This is very essential as at times some ponds will be full, we may not be in a position to clean it immediately. During periods of heavy rainfall, silt ponds can disimprove effluents.

(10) Upland catchment areas to silt control ponds should be diverted away so that run-off amounts during periods of high rainfall will be lessened.

(11) A silt pond should be deemed full when peat silt is visible on 75% of surface area of pond.

(12) Long reach hydraulic excavator (VC-15) is only suitable for cleaning ponds and not excavating new ponds.

(13) If legislation is introduced on acceptable effluents from our bogs, silt control ponds cannot conform with standards at all times. Part of the legislation should include achieving standards 90% to 95% of the time.

(14) Acceptable effluents from our bogs is based on dilution of receiving waters. O.P.W. have some information on tributaries into which our bog outfalls flow. More information is required to ascertain dilution rates.

## 7.0 REFERENCES


(1) Mr. G. Hannon, Bord na Mona, Civil Engineering Division 1983. : Silt Control Study No. 1.

(2) Mr. P. Coffey, Bord na Mona, Scientific Office, Newbridge, 1980. : Water Pollution Report.

(3) Mr. J. Feely, Bord na Mona, Civil Engineering Division : Environmental Aspects of Peat Production.

(4) Mr. L. Byrne, Bord na Mona, Boora Works 1989 : Milled Peat Silt Control.

(5) Mr. J. M. Caffrey and J. J. King, Central Fisheries Board, Glasnevin : Report on the Affects of Peat Bog Development on the River Suck Fishery.

(6) Labaratoire Central D'Hydraulique De France, France 1969 : Decantation of Peat Bog Residue.

(7) Esko Lakso, Raimo Inme, Kaisa Heikinen, University of Oulu, Finland : Development of methods of Purifying run-off water from Peat Production Areas.

Appendix No. 1

# BOORA WORKS

# TABLE ON MONETTIA SILT POND

| DATE<br>1 | Height Over Weir<br>2 | Flow M/sec<br>3 | Flow M/day<br>4 | Cumulativ Flow<br>5 | Part/Mil Influent<br>6 | KG.INF<br>7 | Part/Mil Effluent<br>8 | KG.EFF<br>9 | Part/Mil Retained<br>10 | CUM. Retained.<br>10A | KG.Silt per day<br>11 | CUM KG.silt<br>12 | Rainfall.<br>13 | DATE<br>14 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 01-Apr-90 | | .0000000 | .00 | 2151 | 86.89 | .00 | 47.07 | .00 | 39.83 | 1074.00 | .00 | .0 | 0.00 | 1 |
| 02-Apr-91 | | .0000000 | .00 | 0 | 86.89 | .00 | 47.07 | .00 | 39.83 | 79.65 | .00 | .0 | 0.00 | 2 |
| 03-Apr-91 | | .0000000 | .00 | 0 | 94.13 | .00 | 47.07 | .00 | 47.07 | 126.72 | .00 | .0 | 0.00 | 3 |
| 04-Apr-90 | | .0000000 | .00 | 0 | 100.17 | .00 | 47.07 | .00 | 53.10 | 179.82 | .00 | .0 | 0.00 | 4 |
| 05-Apr-90 | | .0504482 | 4358.72 | 4359 | 106.20 | 462.91 | 47.07 | 205.15 | 59.14 | 238.96 | 257.76 | 257.8 | 2.50 | 5 |
| 06-Apr-90 | | .0000000 | .00 | 4359 | 112.24 | .00 | 47.07 | .00 | 65.17 | 304.13 | .00 | 257.8 | 0.00 | 6 |
| 07-Apr-90 | | .0000000 | .00 | 4359 | 182.24 | .00 | 37.41 | .00 | 144.82 | 448.95 | .00 | 257.8 | 0.00 | 7 |
| 08-Apr-90 | | .0000000 | .00 | 4359 | 182.24 | .00 | 37.41 | .00 | 144.82 | 593.77 | .00 | 257.8 | 0.00 | 8 |
| 09-Apr-90 | | .0000000 | .00 | 4359 | 182.24 | .00 | 37.41 | .00 | 144.82 | 738.60 | .00 | 257.8 | 0.00 | 9 |
| 10-Apr-90 | | .0100896 | 871.74 | 5230 | 182.24 | 158.86 | 37.41 | 32.61 | 144.82 | 883.42 | 126.25 | 384.0 | .50 | 10 |
| 11-Apr-90 | | .0050448 | 435.87 | 5666 | 66.38 | 28.93 | 10.86 | 4.73 | 55.52 | 938.93 | 24.20 | 408.2 | .25 | 11 |
| 12-Apr-90 | | .0100896 | 871.74 | 6538 | 83.27 | 72.59 | 9.65 | 8.42 | 73.62 | 1012.55 | 64.18 | 472.4 | .50 | 12 |
| 13-Apr-90 | | .0302689 | 2615.23 | 9153 | 4.83 | 12.62 | 10.86 | 28.41 | -6.03 | 1006.52 | -15.78 | 456.6 | 1.50 | 13 |
| 14-Apr-90 | | .0000000 | .00 | 9153 | 55.52 | .00 | 7.24 | .00 | 48.27 | 1054.79 | .00 | 456.6 | 0.00 | 14 |
| 15-Apr-90 | | .0000000 | .00 | 9153 | 9.65 | .00 | 7.24 | .00 | 2.41 | 1057.20 | .00 | 456.6 | 0.00 | 15 |
| 16-Apr-90 | | .0000000 | .00 | 9153 | 9.65 | .00 | 10.86 | .00 | -1.21 | 1056.00 | .00 | 456.6 | 0.00 | 16 |
| 17-Apr-90 | | .1563893 | 13512.03 | 22665 | 9.65 | 130.46 | 10.86 | 146.76 | -1.21 | 1054.79 | -16.31 | 440.3 | 7.75 | 17 |
| 18-Apr-90 | | .1008963 | 8717.44 | 31383 | 4.83 | 42.08 | 8.45 | 73.64 | -3.62 | 1051.17 | -31.56 | 408.7 | 5.00 | 18 |
| 19-Apr-90 | | .0605378 | 5230.46 | 36613 | 3.62 | 18.94 | 9.65 | 50.50 | -6.03 | 1045.14 | -31.56 | 377.2 | 3.00 | 19 |
| 20-Apr-90 | | .0000000 | .00 | 36613 | 15.69 | .00 | 12.07 | .00 | 3.62 | 1048.76 | .00 | 377.2 | 0.00 | 20 |
| 21-Apr-90 | | .0000000 | .00 | 36613 | 32.59 | .00 | 8.45 | .00 | 24.14 | 1072.89 | .00 | 377.2 | 0.0 | 21 |
| 22-Apr-90 | | .0000000 | .00 | 36613 | 6.03 | .00 | 8.45 | .00 | -2.41 | 1070.48 | .00 | 377.2 | 0.0 | 22 |
| 23-Apr-90 | | .0000000 | .00 | 36613 | 3.62 | .00 | 8.45 | .00 | -4.83 | 1065.65 | .00 | 377.2 | 0.00 | 23 |
| 24-Apr-90 | | .0000000 | .00 | 36613 | 14.48 | .00 | 9.65 | .00 | 4.83 | 1070.48 | .00 | 377.2 | 0.00 | 24 |
| 25-Apr-90 | | .0000000 | .00 | 36613 | 4.83 | .00 | 9.65 | .00 | -4.83 | 1065.65 | .00 | 377.2 | 0.00 | 25 |
| 26-Apr-90 | | .0151344 | 1307.62 | 37921 | 9.65 | 12.62 | 2.41 | 3.16 | 7.24 | 1072.89 | 9.47 | 386.6 | .75 | 26 |
| 27-Apr-90 | | .0302689 | 2615.23 | 40536 | 15.69 | 41.03 | 13.28 | 34.72 | 2.41 | 1075.31 | 6.31 | 392.9 | 1.50 | 27 |
| 28-Apr-90 | | .0100896 | 871.74 | 41408 | 6.03 | 5.26 | 6.03 | 5.26 | .00 | 1075.31 | .00 | 392.9 | .50 | 28 |
| 29-Apr-90 | | .0000000 | .00 | 41408 | 12.07 | .00 | 7.24 | .00 | 3.00 | 1078.31 | .00 | 392.9 | 0.00 | 29 |
| 30-Apr-90 | | .0000000 | .00 | 41408 | 22.93 | .00 | 10.86 | .00 | 12.07 | 1090.38 | .00 | 392.9 | 0.00 | 30 |
| | | | 41407.84 | | | 986.31 | | 593.37 | | | | | 23.75 | |

| DATE | Height Over Weir | Flow M/sec | Flow M/day | Cumulativ Flow | Part/Mil Influent | KG.INF | Part/Mil Effluent | KG.EFF | Part/Mil Retained | CUM. Retained. | KG.Silt per day | CUM KG.silt | Rainfall. | DATE | KM. DITCHED |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 01-May-90 | | .0000000 | .00 | 41408 | 121.89 | .00 | 12.07 | .00 | 109.82 | 1200.20 | .00 | 392.9 | 0.00 | 1 | 6.27 |
| 02-May-90 | | .0000000 | .00 | 41408 | 53.10 | .00 | 9.65 | .00 | 43.45 | 1243.65 | .00 | 392.9 | 0.00 | 2 | 6.27 |
| 03-May-90 | | .0000000 | .00 | 41408 | 477.91 | .00 | 9.65 | .00 | 468.26 | 1711.91 | .00 | 392.9 | 0.00 | 3 | 7.95 |
| 04-May-90 | | .0000000 | .00 | 41408 | 24.14 | .00 | 9.65 | .00 | 14.48 | 1726.39 | .00 | 392.9 | 0.00 | 4 | 7.95 |
| 05-May-90 | | .0000000 | .00 | 41408 | 16.90 | .00 | 7.24 | .00 | 9.65 | 1736.04 | .00 | 392.9 | 0.00 | 5 | 7.95 |
| 06-May-90 | | .0000000 | .00 | 41408 | 14.48 | .00 | 8.45 | .00 | 6.03 | 1742.08 | .00 | 392.9 | 0.00 | 6 | 7.95 |
| 07-May-90 | | .0050448 | 435.87 | 41844 | 13.28 | 5.79 | 8.45 | 3.68 | 4.83 | 1746.91 | 2.10 | 395.1 | .25 | 7 | 7.95 |
| 08-May-90 | | .1008963 | 8717.44 | 50561 | 96.55 | 841.65 | 12.07 | 105.21 | 84.48 | 1831.39 | 736.45 | 1131.5 | 5.00 | 8 | 7.95 |
| 09-May-90 | | .0403585 | 3486.98 | 54048 | 319.82 | 1115.19 | 10.86 | 37.87 | 308.95 | 2140.34 | 1077.32 | 2208.8 | 2.00 | 9 | 7.95 |
| 10-May-90 | | .1412548 | 12204.42 | 66253 | 27.76 | 338.77 | 8.45 | 103.10 | 19.31 | 2159.65 | 235.66 | 2444.5 | 7.00 | 10 | 0.00 |
| 11-May-90 | | .0050448 | 435.87 | 66688 | 60.34 | 26.30 | 14.48 | 6.31 | 45.86 | 2205.51 | 19.99 | 2464.5 | .25 | 11 | 0.00 |
| 12-May-90 | | .0000000 | .00 | 66688 | 243.78 | .00 | 12.07 | .00 | 231.72 | 2437.23 | .00 | 2464.5 | 0.00 | 12 | 0.00 |
| 13-May-90 | | .0000000 | .00 | 66688 | 120.69 | .00 | 60.34 | .00 | 60.34 | 2497.57 | .00 | 2464.5 | 0.00 | 13 | 0.00 |
| 14-May-90 | | .0000000 | .00 | 66688 | 59.14 | .00 | 106.20 | .00 | -47.07 | 2450.50 | .00 | 2464.5 | 0.00 | 14 | 0.00 |
| 15-May-90 | | .0605378 | 5230.46 | 71919 | 25.34 | 132.56 | 61.55 | 321.93 | -36.21 | 2414.30 | -189.37 | 2275.1 | 3.00 | 15 | 0.00 |
| 16-May-90 | | .1917030 | 16563.14 | 88482 | 67.58 | 1119.40 | 190.68 | 3158.31 | -123.10 | 2291.20 | -2038.91 | 236.2 | 9.50 | 16 | 0.00 |
| 17-May-90 | | .0100896 | 871.74 | 89354 | 25.34 | 22.09 | 143.62 | 125.20 | -118.27 | 2172.93 | -103.10 | 133.1 | .50 | 17 | 11.17 |
| 18-May-90 | | .0000000 | .00 | 89354 | 27.76 | .00 | 22.93 | .00 | 4.83 | 2177.75 | .00 | 133.1 | 0.00 | 18 | 11.17 |
| 19-May-90 | | .0000000 | .00 | 89354 | 26.55 | .00 | 15.69 | .00 | 10.86 | 2188.61 | .00 | 133.1 | 0.00 | 19 | 11.17 |
| 20-May-90 | | .0000000 | .00 | 89354 | 22.93 | .00 | 14.48 | .00 | 8.45 | 2197.06 | .00 | 133.1 | 0.00 | 20 | 11.17 |
| 21-May-90 | | .0000000 | .00 | 89354 | 19.31 | .00 | 13.28 | .00 | 6.03 | 2203.10 | .00 | 133.1 | 0.00 | 21 | 11.17 |
| 22-May-90 | | .0000000 | .00 | 89354 | 20.52 | .00 | 16.90 | .00 | 3.62 | 2206.72 | .00 | 133.1 | 0.00 | 22 | 11.17 |
| 23-May-90 | | .0000000 | .00 | 89354 | 18.10 | .00 | 15.69 | .00 | 2.41 | 2209.13 | .00 | 133.1 | 0.00 | 23 | 11.17 |
| 24-May-90 | | .0000000 | .00 | 89354 | 789.28 | .00 | 19.31 | .00 | 769.97 | 2979.10 | .00 | 133.1 | 0.00 | 24 | 5.87 |
| 25-May-90 | | .0000000 | .00 | 89354 | 19.31 | .00 | 8.45 | .00 | 10.86 | 2989.97 | .00 | 133.1 | 0.00 | 25 | 5.87 |
| 26-May-90 | | .0000000 | .00 | 89354 | 133.96 | .00 | 12.07 | .00 | 121.89 | 3111.86 | .00 | 133.1 | 0.00 | 26 | 5.87 |
| 27-May-90 | | .0000000 | .00 | 89354 | 60.34 | .00 | 60.34 | .00 | .00 | 3111.86 | .00 | 133.1 | 0.00 | 27 | 5.87 |
| 28-May-90 | | .0000000 | .00 | 89354 | 27.76 | .00 | 242.58 | .00 | -214.82 | 2897.04 | .00 | 133.1 | 0.00 | 28 | 5.87 |
| 29-May-90 | | .1109859 | 9589.18 | 98943 | 86.89 | 833.24 | 26.55 | 254.60 | 60.34 | 2957.38 | 578.64 | 711.7 | 5.50 | 29 | 5.87 |
| 30-May-90 | | .1816133 | 15691.39 | 114634 | 21.72 | 340.87 | 27.76 | 435.56 | -6.03 | 2951.35 | -94.69 | 617.0 | 9.00 | 30 | 5.87 |
| 31-May-90 | | .0000000 | .00 | 114634 | 8.45 | .00 | 19.31 | .00 | -10.86 | 2940.48 | .00 | 617.0 | 0.00 | 31 | 0.00 |
| | | | 73226.50 | | | 4775.87 | | 4551.77 | | | | | 42.00 | | |

| DATE | Height Over Weir | Flow M/sec | Flow M/day | Cumulativ Flow | Part/Mil Influent | KG.INF | Part/Mil Effluent | KG.EFF | Part/Mil Retained | CUM. Retained. | KG.Silt per day | CUM KG.silt | Rainfall. | DATE | KM. DITCHED |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 01-Jun-90 | | .0403585 | 3486.98 | 118121 | 12.07 | 42.08 | 20.52 | 71.54 | -8.45 | 2932.04 | -29.46 | 587.6 | 2.00 | 1 | 0.00 |
| 02-Jun-90 | | .1008963 | 8717.44 | 126839 | 33.79 | 294.58 | 42.24 | 368.22 | -8.45 | 2923.59 | -73.64 | 513.9 | 5.00 | 2 | 0.00 |
| 03-Jun-90 | | .0000000 | .00 | 126839 | 60.34 | .00 | 38.62 | .00 | 21.72 | 2945.31 | .00 | 513.9 | 0.00 | 3 | 0.00 |
| 04-Jun-90 | | .0000000 | .00 | 126839 | 120.69 | .00 | 36.21 | .00 | 84.48 | 3029.79 | .00 | 513.9 | 0.00 | 4 | 0.00 |
| 05-Jun-90 | | .1412548 | 12204.42 | 139043 | 214.82 | 2621.75 | 38.62 | 471.33 | 176.20 | 3205.99 | 2150.43 | 2664.4 | 7.00 | 5 | 0.00 |
| 06-Jun-90 | | .0353137 | 3051.10 | 142094 | 9.65 | 29.46 | 35.00 | 106.78 | -25.34 | 3180.65 | -77.33 | 2587.0 | 1.75 | 6 | 0.00 |
| 07-Jun-90 | | .0151344 | 1307.62 | 143402 | 14.48 | 18.94 | 24.14 | 31.56 | -9.65 | 3170.99 | -12.62 | 2574.4 | .75 | 7 | 0.00 |
| 08-Jun-90 | | .1008963 | 8717.44 | 152119 | 9.65 | 84.17 | 25.34 | 220.93 | -15.69 | 3155.31 | -136.77 | 2437.6 | 5.00 | 8 | 0.00 |
| 09-Jun-90 | | .0958515 | 8281.57 | 160401 | 32.59 | 269.86 | 31.38 | 259.86 | 1.21 | 3156.51 | 9.99 | 2447.6 | 4.75 | 9 | 0.00 |
| 10-Jun-90 | | .0000000 | .00 | 160401 | 28.96 | .00 | 31.38 | .00 | -2.41 | 3154.10 | .00 | 2447.6 | 0.00 | 10 | 0.00 |
| 11-Jun-90 | | .0000000 | .00 | 160401 | 26.55 | .00 | 27.76 | .00 | -1.21 | 3152.89 | .00 | 2447.6 | 0.00 | 11 | 0.00 |
| 12-Jun-90 | | .0000000 | .00 | 160401 | 76.03 | .00 | 25.34 | .00 | 50.69 | 3203.58 | .00 | 2447.6 | 0.00 | 12 | 0.00 |
| 13-Jun-90 | | .0000000 | .00 | 160401 | 494.81 | .00 | 32.59 | .00 | 462.23 | 3665.80 | .00 | 2447.6 | 0.00 | 13 | 0.00 |
| 14-Jun-90 | | .0000000 | .00 | 160401 | 6.03 | .00 | 19.31 | .00 | -13.28 | 3652.53 | .00 | 2447.6 | 0.00 | 14 | 0.00 |
| 15-Jun-90 | | .0000000 | .00 | 160401 | 55.52 | .00 | 25.34 | .00 | 30.17 | 3682.70 | .00 | 2447.6 | 0.00 | 15 | 0.00 |
| 16-Jun-90 | | .0000000 | .00 | 160401 | 7.24 | .00 | 19.31 | .00 | -12.07 | 3670.63 | .00 | 2447.6 | 0.00 | 16 | 0.00 |
| 17-Jun-90 | | .0000000 | .00 | 160401 | 15.69 | .00 | 26.55 | .00 | -10.86 | 3659.77 | .00 | 2447.6 | 0.00 | 17 | 0.00 |
| 18-Jun-90 | | .0908067 | 7845.70 | 168247 | 24.14 | 189.37 | 33.79 | 265.12 | -9.65 | 3650.12 | -75.75 | 2371.9 | 4.50 | 18 | 0.00 |
| 19-Jun-90 | | .0605378 | 5230.46 | 173477 | 8.45 | 44.19 | 37.41 | 195.68 | -28.96 | 3621.15 | -151.50 | 2220.4 | 3.00 | 19 | 0.00 |
| 20-Jun-90 | | .0706274 | 6102.21 | 179579 | 133.96 | 817.46 | 7.24 | 44.19 | 126.72 | 3747.87 | 773.27 | 2993.7 | 3.50 | 20 | 0.00 |
| 21-Jun-90 | | .0000000 | .00 | 179579 | 72.41 | .00 | 36.21 | .00 | 36.21 | 3784.08 | .00 | 2993.7 | 0.00 | 21 | 5.56 |
| 22-Jun-90 | | .3228682 | 27895.81 | 207475 | 48.27 | 1346.65 | 26.55 | 740.66 | 21.72 | 3805.80 | 605.99 | 3599.7 | 16.00 | 22 | 5.56 |
| 23-Jun-90 | | .0201793 | 1743.49 | 209219 | 14.48 | 25.25 | 7.24 | 12.62 | 7.24 | 3813.04 | 12.62 | 3612.3 | 1.00 | 23 | 5.56 |
| 24-Jun-90 | | .0000000 | .00 | 209219 | 22.93 | .00 | 15.69 | .00 | 7.24 | 3820.28 | .00 | 3612.3 | 0.00 | 24 | 5.56 |
| 25-Jun-90 | | .0706274 | 6102.21 | 215321 | 31.38 | 191.48 | 28.96 | 176.75 | 2.41 | 3822.70 | 14.73 | 3627.0 | 3.50 | 25 | 5.56 |
| 26-Jun-90 | | .0100896 | 871.74 | 216193 | 54.31 | 47.34 | 20.52 | 17.89 | 33.79 | 3856.49 | 29.46 | 3656.5 | .50 | 26 | 5.56 |
| 27-Jun-90 | | .0706274 | 6102.21 | 222295 | 28.96 | 176.75 | 12.07 | 73.64 | 16.90 | 3873.38 | 103.10 | 3759.6 | 3.50 | 27 | 5.56 |
| 28-Jun-90 | | .0000000 | .00 | 222295 | 10.86 | .00 | 12.07 | .00 | -1.21 | 3872.18 | .00 | 3759.6 | 0.00 | 28 | 6.76 |
| 29-Jun-90 | | .0100896 | 871.74 | 223166 | 12.07 | 10.52 | 13.28 | 11.57 | -1.21 | 3870.97 | -1.05 | 3758.5 | .50 | 29 | 6.76 |
| 30-Jun-90 | | .2724200 | 23537.09 | 246704 | 27.76 | 653.33 | 10.86 | 255.65 | 16.90 | 3887.87 | 397.68 | 4156.2 | 13.50 | 30 | 6.76 |
| | | | 132069.22 | | | 6863.17 | | 3324.01 | | | | | 75.75 | | |

| DATE | Height Over Weir | Flow M/sec | Flow M/day | Cumulativ Flow | Part/Mil Influent | KG.INF | Part/Mil Effluent | KG.EFF | Part/Mil Retained | CUM. Retained. | KG.Silt per day | CUM KG.silt | Rainfall. | DATE | KM. DITCHED |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 01-Jul-90 | | .0000000 | .00 | 246704 | 16.90 | .00 | 9.65 | .00 | 7.24 | 3895.11 | .00 | 4156.2 | 0.00 | 1 | 6.76 |
| 02-Jul-90 | | .0706274 | 6102.21 | 252806 | 6.03 | 36.82 | 9.65 | 58.92 | -3.62 | 3891.49 | -22.09 | 4134.1 | 3.50 | 2 | 6.76 |
| 03-Jul-90 | | .0403585 | 3486.98 | 256293 | 3.62 | 12.62 | 7.24 | 25.25 | -3.62 | 3887.87 | -12.62 | 4121.5 | 2.00 | 3 | 6.76 |
| 04-Jul-90 | | .2522408 | 21793.60 | 278086 | 323.44 | 7048.86 | 16.90 | 368.22 | 306.54 | 4194.41 | 6680.64 | 10802.1 | 12.50 | 4 | 6.76 |
| 05-Jul-90 | | .1816133 | 15691.39 | 293778 | 35.00 | 549.18 | 8.45 | 132.56 | 26.55 | 4220.96 | 416.62 | 11218.7 | 9.00 | 5 | 7.84 |
| 06-Jul-90 | | .0000000 | .00 | 293778 | 13.28 | .00 | 9.65 | .00 | 3.62 | 4224.58 | .00 | 11218.7 | 0.00 | 6 | 7.84 |
| 07-Jul-90 | | .0000000 | .00 | 293778 | 12.07 | .00 | 8.45 | .00 | 3.62 | 4228.20 | .00 | 11218.7 | 0.00 | 7 | 7.84 |
| 08-Jul-90 | | .0000000 | .00 | 293778 | 12.07 | .00 | 7.24 | .00 | 4.83 | 4233.03 | .00 | 11218.7 | 0.00 | 8 | 7.84 |
| 09-Jul-90 | | .1109859 | 9589.18 | 303367 | 12.07 | 115.73 | 6.03 | 57.86 | 6.03 | 4239.06 | 57.86 | 11276.6 | 5.50 | 9 | 7.84 |
| 10-Jul-90 | | .0403585 | 3486.98 | 306854 | 9.65 | 33.67 | 7.24 | 25.25 | 2.41 | 4241.47 | 8.42 | 11285.0 | 2.00 | 10 | 7.84 |
| 11-Jul-90 | | .0000000 | .00 | 306854 | 13.28 | .00 | 8.45 | .00 | 4.83 | 4246.30 | .00 | 11285.0 | 0.00 | 11 | 7.84 |
| 12-Jul-90 | | .0000000 | .00 | 306854 | 24.14 | .00 | 9.65 | .00 | 14.48 | 4260.78 | .00 | 11285.0 | 0.00 | 12 | 11.26 |
| 13-Jul-90 | | .0000000 | .00 | 306854 | 55.52 | .00 | 9.65 | .00 | 45.86 | 4306.64 | .00 | 11285.0 | 0.00 | 13 | 11.26 |
| 14-Jul-90 | | .0000000 | .00 | 306854 | 26.55 | .00 | 9.65 | .00 | 16.90 | 4323.54 | .00 | 11285.0 | 0.00 | 14 | 11.26 |
| 15-Jul-90 | | .0000000 | .00 | 306854 | 15.69 | .00 | 9.65 | .00 | 6.03 | 4329.57 | .00 | 11285.0 | 0.00 | 15 | 11.26 |
| 16-Jul-90 | | .0302689 | 2615.23 | 309469 | 6.03 | 15.78 | 9.65 | 25.25 | -3.62 | 4325.95 | -9.47 | 11275.5 | 1.50 | 16 | 11.26 |
| 17-Jul-90 | | .0000000 | .00 | 309469 | 65.17 | .00 | 14.48 | .00 | 50.69 | 4376.64 | .00 | 11275.5 | 0.00 | 17 | 11.26 |
| 18-Jul-90 | | .0000000 | .00 | 309469 | 10.86 | .00 | 22.93 | .00 | -12.07 | 4364.57 | .00 | 11275.5 | 0.00 | 18 | 11.26 |
| 19-Jul-90 | | .0000000 | .00 | 309469 | 12.07 | .00 | 18.10 | .00 | -6.03 | 4358.54 | .00 | 11275.5 | 0.00 | 19 | 7.86 |
| 20-Jul-90 | | .0000000 | .00 | 309469 | 120.69 | .00 | 10.86 | .00 | 109.82 | 4468.36 | .00 | 11275.5 | 0.00 | 20 | 7.86 |
| 21-Jul-90 | | .0000000 | .00 | 309469 | 101.38 | .00 | 14.48 | .00 | 86.89 | 4555.26 | .00 | 11275.5 | 0.00 | 21 | 7.86 |
| 22-Jul-90 | | .0000000 | .00 | 309469 | 72.41 | .00 | 12.07 | .00 | 60.34 | 4615.60 | .00 | 11275.5 | 0.00 | 22 | 7.86 |
| 23-Jul-90 | | .0000000 | .00 | 309469 | 779.63 | .00 | 10.86 | .00 | 768.77 | 5384.37 | .00 | 11275.5 | 0.00 | 23 | 7.86 |
| 24-Jul-90 | | .0000000 | .00 | 309469 | 15.69 | .00 | 15.69 | .00 | .00 | 5384.37 | .00 | 11275.5 | 0.00 | 24 | 7.86 |
| 25-Jul-90 | | .0000000 | .00 | 309469 | 15.69 | .00 | 19.31 | .00 | -3.62 | 5380.75 | .00 | 11275.5 | 0.00 | 25 | 7.86 |
| 26-Jul-90 | | .0000000 | .00 | 309469 | 43.45 | .00 | 16.90 | .00 | 26.55 | 5407.30 | .00 | 11275.5 | 0.00 | 26 | 10.26 |
| 27-Jul-90 | | .1109859 | 9589.18 | 319058 | 267.92 | 2569.15 | 14.48 | 138.87 | 253.44 | 5660.74 | 2430.28 | 13705.8 | 5.50 | 27 | 10.26 |
| 28-Jul-90 | | .3430474 | 29639.30 | 348698 | 852.04 | 25253.85 | 10.86 | 321.93 | 841.18 | 6501.91 | 24931.92 | 38637.7 | 17.00 | 28 | 10.26 |
| 29-Jul-90 | | .0000000 | .00 | 348698 | 9.65 | .00 | 9.65 | .00 | .00 | 6501.91 | .00 | 38637.7 | 0.00 | 29 | 10.26 |
| 30-Jul-90 | | .1210756 | 10460.93 | 359159 | 4.83 | 50.50 | 8.45 | 88.37 | -3.62 | 6498.29 | -37.87 | 38599.9 | 6.00 | 30 | 10.26 |
| 31-Jul-90 | | .0000000 | .00 | 359159 | 24.14 | .00 | 13.28 | .00 | 10.86 | 6509.15 | .00 | 38599.9 | 0.00 | 31 | 10.26 |
| | | | 112454.98 | | | 35686.17 | | 1242.49 | | | | | 64.50 | | |

| DATE | Height Over Weir | Flow M/sec | Flow M/day | Cumulativ Flow | Part/Mil Influent | KG.INF | Part/Mil Effluent | KG.EFF | Part/Mil Retained | CUM. Retained. | KG.Silt per day | CUM KG.silt | Rainfall. | DATE | KM. DITCHED |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 01-Aug-90 | | .0000000 | .00 | 359159 | 42.24 | .00 | 26.55 | .00 | 15.69 | 6524.84 | .00 | 38599.9 | 0.00 | 1 | 10.26 |
| 02-Aug-90 | | .0000000 | .00 | 359159 | 21.72 | .00 | 24.14 | .00 | -2.41 | 6522.43 | .00 | 38599.9 | 0.00 | 2 | 8.88 |
| 03-Aug-90 | | .0000000 | .00 | 359159 | 10.86 | .00 | 12.07 | .00 | -1.21 | 6521.22 | .00 | 38599.9 | 0.00 | 3 | 8.88 |
| 04-Aug-90 | | .0000000 | .00 | 359159 | 42.24 | .00 | 16.90 | .00 | 25.34 | 6546.57 | .00 | 38599.9 | 0.00 | 4 | 8.88 |
| 05-Aug-90 | | .0000000 | .00 | 359159 | 60.34 | .00 | 13.28 | .00 | 47.07 | 6593.63 | .00 | 38599.9 | 0.00 | 5 | 8.88 |
| 06-Aug-90 | | .0000000 | .00 | 359159 | 438.09 | .00 | 9.65 | .00 | 428.43 | 7022.07 | .00 | 38599.9 | 0.00 | 6 | 8.88 |
| 07-Aug-90 | | .0000000 | .00 | 359159 | 279.99 | .00 | 13.28 | .00 | 266.71 | 7288.78 | .00 | 38599.9 | 0.00 | 7 | 8.88 |
| 08-Aug-90 | | .0000000 | .00 | 359159 | 596.19 | .00 | 16.90 | .00 | 579.29 | 7368.07 | .00 | 38599.9 | 0.00 | 8 | 8.88 |
| 09-Aug-90 | | .0177698 | 1535.31 | 360694 | 483.95 | 743.01 | 7.24 | 11.12 | 476.71 | 8344.78 | 731.89 | 39331.8 | 1.00 | 9 | 8.07 |
| 10-Aug-90 | | .0266547 | 2302.97 | 362997 | 358.44 | 825.47 | 9.65 | 22.23 | 348.78 | 8693.56 | 803.23 | 40135.0 | 1.50 | 10 | 3.07 |
| 11-Aug-90 | | .0000000 | .00 | 362997 | 545.50 | .00 | 12.07 | .00 | 533.43 | 9226.99 | .00 | 40135.0 | 0.00 | 11 | 8.07 |
| 12-Aug-90 | | .0000000 | .00 | 362997 | 965.48 | .00 | 13.28 | .00 | 952.21 | 10179.20 | .00 | 40135.0 | 0.00 | 12 | 8.07 |
| 13-Aug-90 | | .0577518 | 4989.76 | 367987 | 1647.36 | 8219.91 | 14.48 | 72.26 | 1632.87 | 11812.08 | 8147.65 | 48282.6 | 3.25 | 13 | 8.07 |
| 14-Aug-90 | | .0266547 | 2302.97 | 370290 | 441.71 | 1017.24 | 16.90 | 38.91 | 424.81 | 12236.89 | 978.33 | 49261.0 | 1.50 | 14 | 8.07 |
| 15-Aug-90 | | .1110612 | 9595.69 | 379885 | 22.93 | 220.03 | 14.48 | 138.97 | 8.45 | 12245.34 | 81.06 | 49342.0 | 6.25 | 15 | 8.07 |
| 16-Aug-90 | | .0000000 | .00 | 379885 | 15.69 | .00 | 9.65 | .00 | 6.03 | 12251.37 | .00 | 49342.0 | 0.00 | 16 | 1.56 |
| 17-Aug-90 | | .0355396 | 3070.62 | 382956 | 8.45 | 25.94 | 7.24 | 22.23 | 1.21 | 12252.58 | 3.71 | 49345.7 | 2.00 | 17 | 1.56 |
| 18-Aug-90 | | .1332735 | 11514.83 | 394471 | 6.03 | 69.48 | 10.86 | 125.07 | -4.83 | 12247.75 | -55.59 | 49290.2 | 7.50 | 18 | 1.56 |
| 19-Aug-90 | | .0000000 | .00 | 394471 | 12.07 | .00 | 10.86 | .00 | 1.21 | 12248.96 | .00 | 49290.2 | 0.00 | 19 | 1.56 |
| 20-Aug-90 | | .2487771 | 21494.35 | 415965 | 15.69 | 337.23 | 12.07 | 259.41 | 3.62 | 12252.58 | 77.82 | 49368.0 | 14.00 | 20 | 1.56 |
| 21-Aug-90 | | .0000000 | .00 | 415965 | 33.79 | .00 | 7.24 | .00 | 26.55 | 12279.13 | .00 | 49368.0 | 0.00 | 21 | 1.56 |
| 22-Aug-90 | | .0000000 | .00 | 415965 | 24.14 | .00 | 1.21 | .00 | 22.93 | 12302.06 | .00 | 49368.0 | 0.00 | 22 | 1.56 |
| 23-Aug-90 | | .0222122 | 1919.14 | 417884 | 21.72 | 41.69 | 10.86 | 20.85 | 10.86 | 12312.92 | 20.85 | 49388.8 | 1.25 | 23 | 0.00 |
| 24-Aug-90 | | .0444245 | 3838.28 | 421722 | 10.86 | 41.69 | 9.65 | 37.06 | 1.21 | 12314.13 | 4.63 | 49393.5 | 2.50 | 24 | 0.00 |
| 25-Aug-90 | | .0000000 | .00 | 421722 | 10.86 | .00 | 9.65 | .00 | 1.21 | 12315.33 | .00 | 49393.5 | 0.00 | 25 | 0.00 |
| 26-Aug-90 | | .0000000 | .00 | 421722 | 9.65 | .00 | 8.45 | .00 | 1.21 | 12316.54 | .00 | 49393.5 | 0.00 | 26 | 0.00 |
| 27-Aug-90 | | .4087053 | 35312.14 | 457035 | 8.45 | 298.32 | 7.24 | 255.70 | 1.21 | 12317.75 | 42.62 | 49436.1 | 23.00 | 27 | 0.00 |
| 28-Aug-90 | | .0444245 | 3838.28 | 460873 | 8.45 | 32.43 | 7.24 | 27.79 | 1.21 | 12318.95 | 4.63 | 49440.7 | 2.50 | 28 | 0.00 |
| 29-Aug-90 | | .2665469 | 23029.66 | 483903 | 568.43 | 13090.72 | 7.24 | 166.76 | 561.19 | 12880.14 | 12923.96 | 62364.7 | 15.00 | 29 | 0.00 |
| 30-Aug-90 | | .0710792 | 6141.24 | 490044 | 27.76 | 170.47 | 20.52 | 126.00 | 7.24 | 12887.38 | 44.47 | 62409.1 | 4.00 | 30 | 0.00 |
| 31-Aug-90 | | .1599282 | 13817.79 | 503862 | 31.38 | 433.58 | 7.24 | 100.06 | 24.14 | 12911.52 | 333.52 | 62742.7 | 9.00 | 31 | 0.00 |
| | | | 144703.00 | | | 25567.20 | | 1424.41 | | | | | 94.25 | | |

# APPENDIX NO. 14

## PEAT SILT RELATED CLAIMS.

Appendix No. 14

## 1990 PEAT SILT RELATED CLAIMS.

| WORKS | NO. OF CLAIMS RELATING TO PEAT SILT | SILTING FLOODING CLAIMS IR£ |
|---|---|---|
| BLACKWATER | 153 | 625 |
| BOORA | 113 | 1,170 |
| DERRYGREENAGH | 6 | -- |
| MOUNTDILLON | 32 | 4,000 |
| OWENINNY | 10 | 9,750 |
| TOTAL | 314 | 17,299 |

These claims may not be a true reflection of actual claims as the area foreman may deal with some of the silt problems on the ground as they arise.

## ACKNOWLEDGEMENT

I have drawn on many inputs on both a formal and informal basis and am thankful to all.

Studies on the Silt Control Project was carried out at three Works:- Boora, Mountdillon and Oweninny.

Special thanks to Pat Fitzgerald who devised the project, to Celine Robbins who analysed the samples, to Terry McGovern who set up computer programmes in compiling data, to the General Manager, Boora and his staff Aidan O'Hara and Patricia Fahy for their assistance and to the General Manager, Oweninny Works, in particular Gerry Loftus and Richard Cosgrove.

Thanks to Donal Wynne, Michael Hoban, Sean Canny, Louis Byrne and John Welsby from the Peat Energy Division in assisting with data.

Thanks to General Manager, Blackwater and Derrygreenagh Works and their staff Gerry Salmon and John McDermott for their assistance.

Thanks to Eugene Dalton for taking the samples at Mountdillon Works, to Michael O'Sullivan for study on plant and finally thanks to Sharon Gray for her patience in typing and amending the report.

# APPENDIX NO. 15


| | PAGE NO. |
|---|---|
| RIVER SHANNON | 1. |
| TRIBUTARIES | 2. |

Appendix No. 15

# RIVER SHANNON

The net catchment area of bog for the Peat Energy Division is 50,000 acres. This does not include Derryfadda Works. The gross catchment area owned by Bord na Mona is 2.7% of total catchment area of River Shannon. The area of peat soils within catchment is 540,300 acres or 19.4% of total catchment. Bord na Mona operates on 13.95% of the peatland in the catchment (see Environmental aspects of Peat Production by J. Feely).

Lough Ree

| | |
|---|---|
| Catchment Area | 1,147,000 acres |
| Mountdillon bogs | 16,600 acres |
| Catchment | 1.45% |
| Volume | 651 x 10 6 cu.m. |
| Water Residence time | 80 days. |

Appendix No. 15

| CATCHMENT | RIVER | GUAGE PT. | DRY WEATHER FLOW (CU.M./SEC) | BORD NA MONA NETT ACRE | TOTAL CATCHMENT AREA OF RIVER IN ACRES |
|---|---|---|---|---|---|
| Boyne | Boyne | Trim | 1.730 | 2,036 | 316,777 |
| Barrow | Figile | Clonbullogue | 0.230 | 5,328 | 70,916 |
| | Cushina | Cushina | 0.110 | 830 | 16,802 |
| Camlin | Camlin | Mullagh | 0.110 | 317 | 64,245 |
| | Fallon | Kilmore | 0.010 | 546 | 15,073 |
| Brosna | Brosna | Ferbane | | 11,056 | 298,245 |
| | Cladagh | Rahan | 0.190 | 1,720 | 67,704 |
| | Silver | Millbroke | | 1,430 | 40,771 |

# APPENDIX NO. 16


| | PAGE NO. |
|---|---|
| OUTOUT OF PLANT | 1. |
| PLANT SPECIFICATION | 2. |

Appendix No. 16

A study was carried out on the new long reach excavators (VC15's) to establish their output, and to compare them with a Hy-mac and Dragline.

The output of the machines were as follows:-

| WORKS | MACHINE TYPE | BUCKET SIZE | CUBIC METRES /STANDARD HR. |
|---|---|---|---|
| Mountdillon | VC 15 | .84 Cub. Metres | 95 |
| Oweninny | VC 15 | .84 Cub. Metres | 120 |
| | Hy-Mac | .31 Cub. Metres | 65 |
| | 19 RB | 1 Cub. Metre | 78 |

Appendix No. 16

## MACHINE SPECIFICATIONS

| | HY-MAC | 19 RB | VC 15 |
|---|---|---|---|
| Weight | 13.2 Tonnes | 19 tonnes | 19.5 Tonnes |
| Bearing Pressure | 2 lbs/sq. in | 1.75 lbs/sq. in | 2.15 lbs/sq.in |
| Idle travel Speed | 2000 M/Hr. | 2800 M/Hr. | 2400 M/Hr. |
| Reach (from Centre of m/c) | 7.46 M | 12.2 M dropped | 15 M |
| Max. Digging Depth | 2.8 M | 4.6 M | 6 M |
| Max. Load | | 1.2 T @ 11.6 M | 1.4 T @ 15 M |
| Pond Width (Max) Cleaning from both sides | 8.00 m | 22.5 m | 19.00 m |

Appendix No. 4

## SILT CONTROL POND CHARACTERISTICS.

| | STORAGE CAPACITY (CU.M.) | GROSS CATCHMENT AREA (ACRES) | NET CATCHMENT AREA (ACRES) |
|---|---|---|---|
| **BOORA** | | | |
| Monettia | 3880 | 776 | 643 |
| Noggus | 2416 | 665 | 451 |
| **MOUNTDILLON** | | | |
| Cloontagh | 3762 | 401 | 137 |
| Derryshannogue | 3480 | 500 | 424 |
| **OWENINNY** | | | |
| O'Connells | 6285 | 274 | 243 |
| Railway 100 | 330 | 68 | 50 |

# APPENDIX 4-10

***BORD NA MÓNA PEAT DEVELOPMENT IN IRELAND 1954***

# BORD NA MÓNA

*Peat Development in Ireland*

# bord na móna

## A Statutory Organisation for the Development of the Peat Resources of Ireland

BOGS are a characteristic feature of the Irish landscape. It has been calculated that one seventh of the area of Ireland is bogland. Throughout the centuries these great wastelands have provided fuel for the farmers living in their vicinity: but only the perimeter of the bogs was used and the implements were of the simplest—the slean, the barrow and the fork.

Inside these outer fringes the bogs were impenetrable and unuseable. It was impossible to walk on them, because bog, despite its seemingly solid surface is ninety-three per cent. water and only seven per cent. solid matter. The problem of converting this very low-grade but abundant material to useful ends presented a challenge to which the successful response is described in this brochure. In essence the problem is to remove the water from the peat economically; the methods and stages by which this is done are shown herein.

Bord na Móna or in English the Peat Board is an organization set up by the Oireachtas i.e. the Irish Parliament, to carry out the task of producing fuel from the bogs. It was established in 1946 following successful experiments carried out by its predecessor the Turf Development Board Ltd. on the large scale production of fuel from a bog at Clonsast near Portarlington. It is endowed with statutory powers and is authorised by legislation to spend on its projects up to £14 million of public funds all of which is repayable with interest.

There are two main methods in use by the Board for the production of fuel:

*(a)* Machine sod peat process.

*(b)* Milled peat process.

THE two methods are here illustrated and described in outline. The objective of the Board is to produce one million tons of sod peat and two and a half million tons of milled peat. The sod peat is used partly for electricity generating stations and partly for domestic and industrial consumption; the milled peat except for a relatively small quantity used at present for conversion to briquettes will be used only in power stations.

The Board employs seven thousand workers at peak and an executive staff of four hundred consisting of engineers, accountants, clerks and supervisors. It has built villages for its employees and maintains hostels where two thousand men are catered for and housed. There is a research station, museum and library. The Board constructs and maintains light railway systems which when completed will comprise nearly four hundred miles of rail; it also has a road transport system. It operates shops, canteens and recreation halls. Trees, flowers and shrubs are planted to make bright and cheerful the environment of its works, villages and buildings.

Mechanisation is the keynote of the Board's response to the challenge of the bogs and a rural population is being industrialized without being uprooted. When the peat is cut away the land will be left in a fit condition for the cultivation of crops or for afforestation.

The swamps which for so long were a dreary and useless wasteland are already sustaining new families; the fuel from them is producing cheap electricity for the national network and heat and power for factory and home.

# STAGES OF DEVELOPMENT

ACQUISITION, DRAINAGE, BUILDINGS, RAILWAYS, MACHINES, POWER

# STAGES OF PRODUCTION

## SOD PEAT

Stripping

Cutting and Spreading

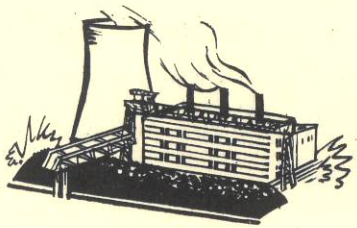
Windrowing or Footing

Windrow Turning

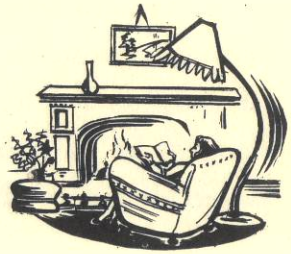
Collecting and Ricking

Loading

Transport



POWER STATION



PRIVATE CONSUMERS

## MILLED PEAT

Disc Ditching

Milling

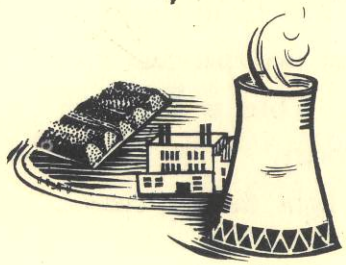
Harrowing

Ridging

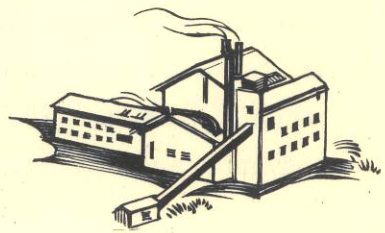
Harvesting

Loading

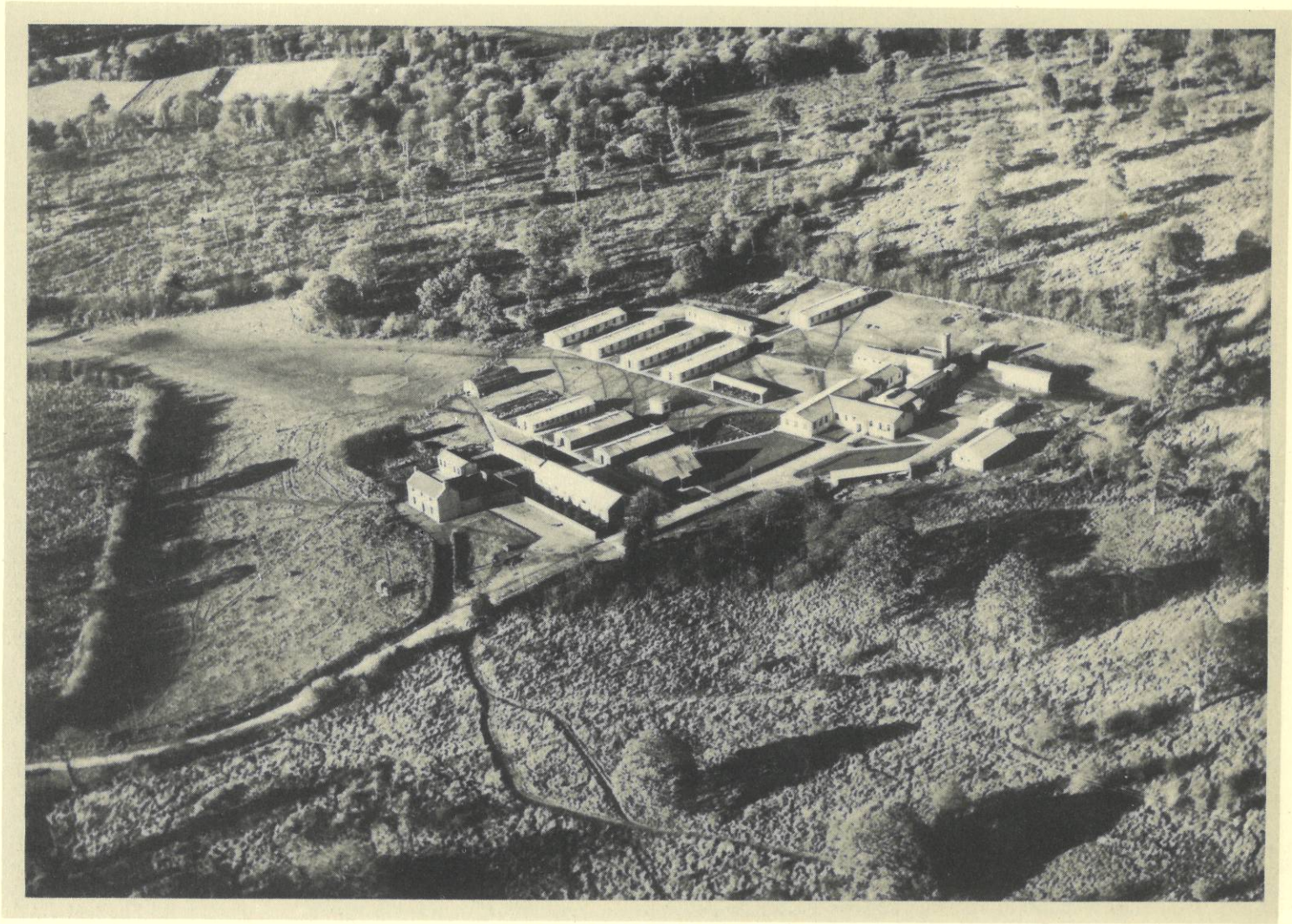
Transport



POWER STATION

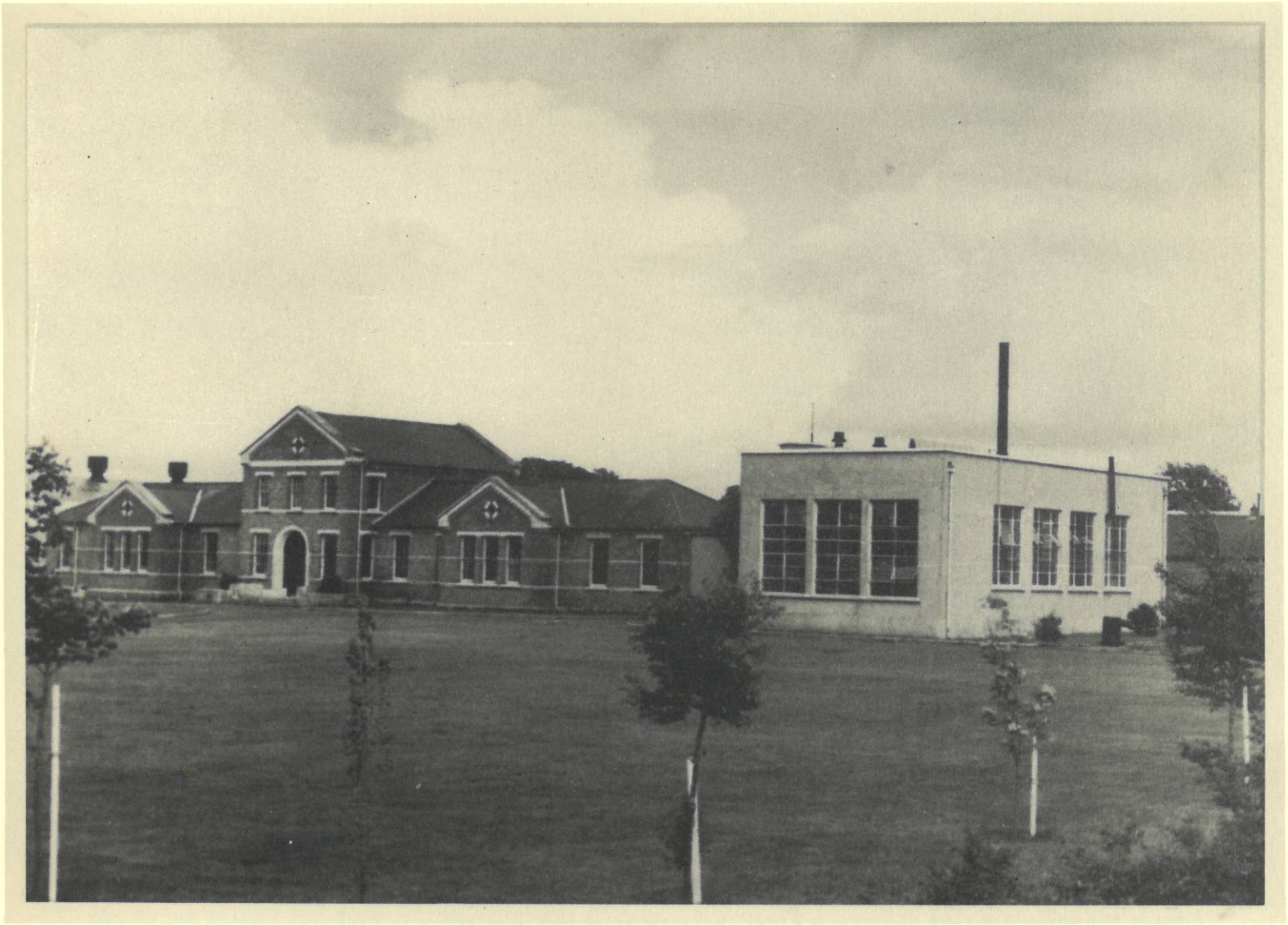


BRIQUETTE FACTORY



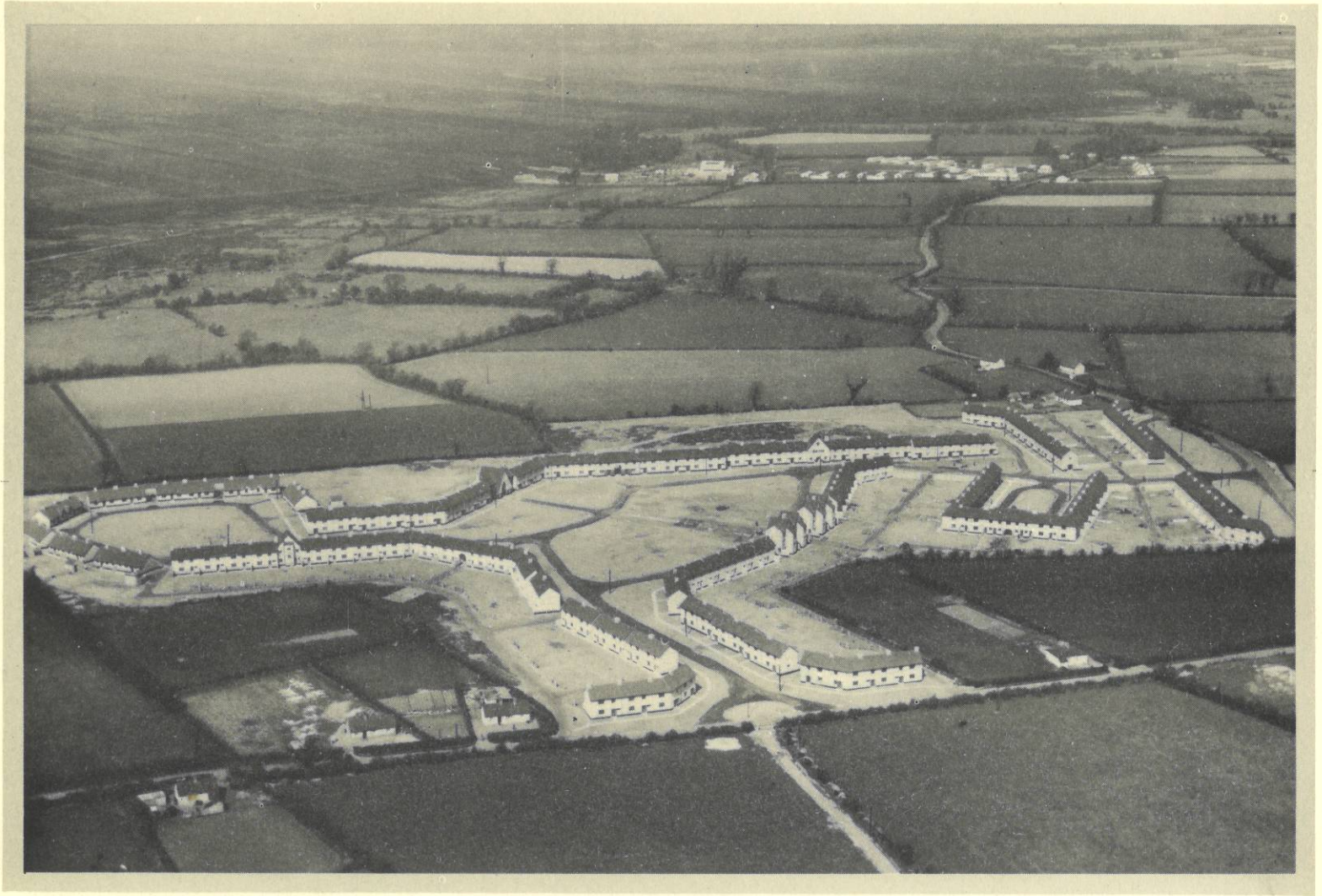
BAILE DHIARMADA HOSTEL

SITUATED NEAR RATHANGAN, CO. KILDARE, THIS HOSTEL IS TYPICAL OF OTHERS IN VARIOUS AREAS. SEASONAL WORKERS CAN OBTAIN FULL BOARD AND ACCOMMODATION AS REQUIRED



STAISIUN TURGHNAMHACH AT DROICHEAD NUA

HEADQUARTERS OF THE BOARD'S RESEARCH STAFF



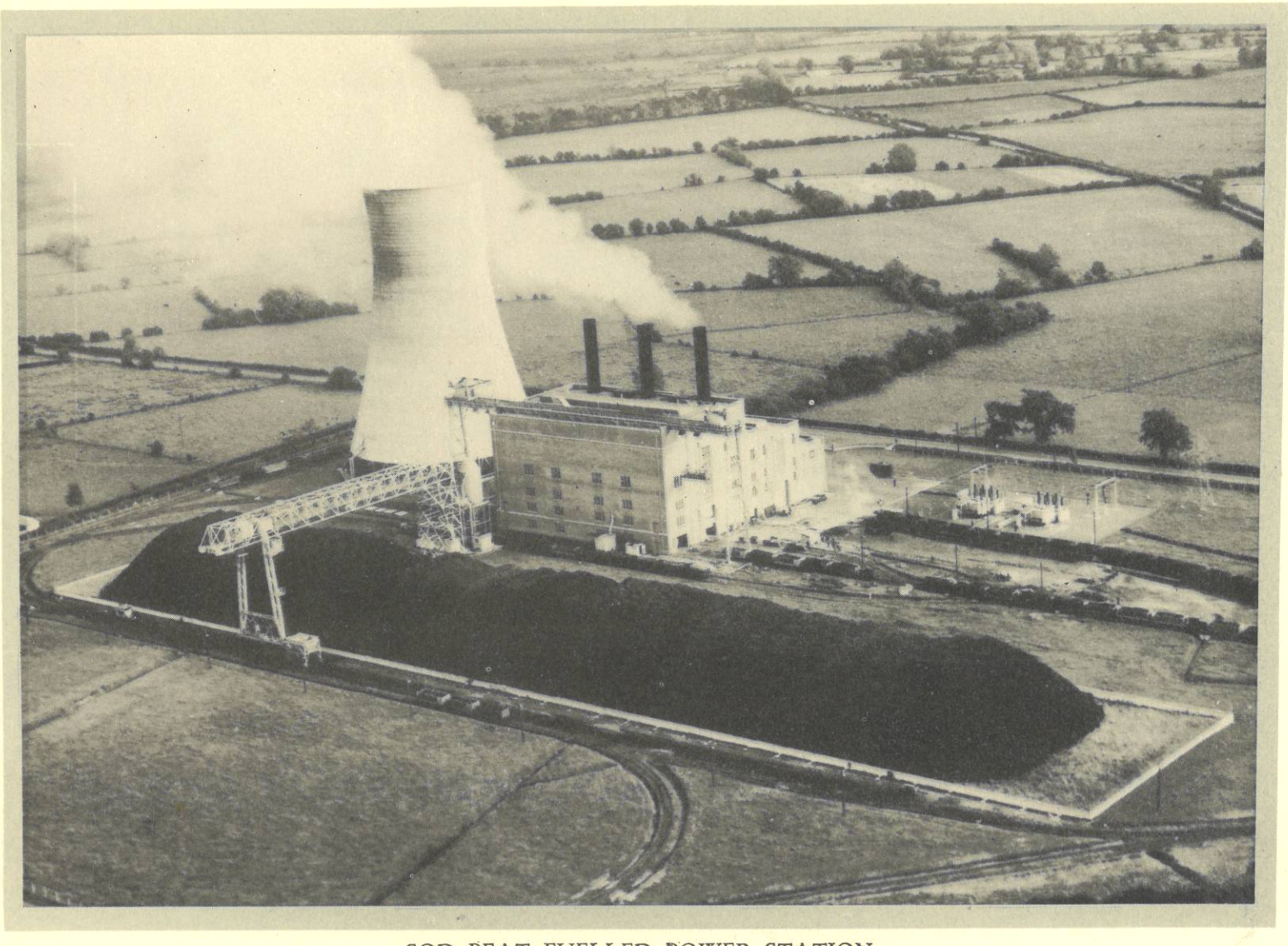
## COILL DUBH VILLAGE

ONE OF THE BOARD'S NEW HOUSING SCHEMES OF ONE HUNDRED AND FIFTY-SIX HOUSES AND FOUR SHOPS FOR THE BOARD'S PERMANENT EMPLOYEES AT TIGH MOCHUA, CO. KILDARE. THE WORKS BUILDINGS AND HOSTEL CAN BE SEEN IN THE BACKGROUND



COILL DUBH VILLAGE

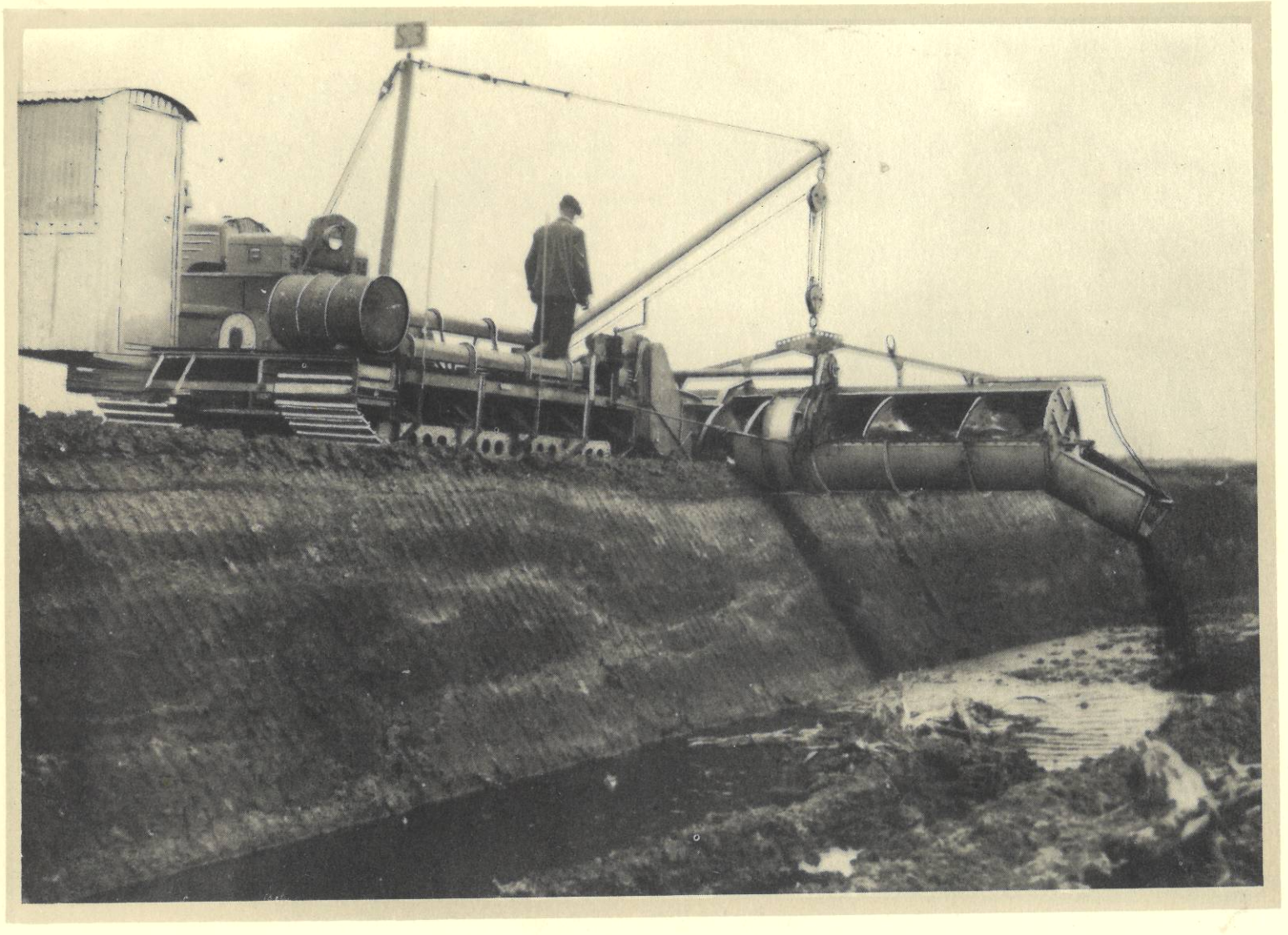
CHILDREN AT PLAY IN THE NEW VILLAGE



## SOD PEAT FUELLED POWER STATION

PORTARLINGTON POWER STATION HAD A DESIGNED AVERAGE CONSUMPTION OF ONE HUNDRED AND TWENTY THOUSAND TONS OF PEAT PER ANNUM PRODUCING NINETY MILLION UNITS OF ELECTRICITY. IT IS NOW KNOWN THAT THE STATION CAN USE AND PRODUCE AT LEAST FIFTY PER CENT MORE

THIS POWER STATION IS OWNED AND OPERATED BY THE ELECTRICITY SUPPLY BOARD



SOD PEAT STRIPPER

A TWO METRE WIDTH OF MOSS AND HEATHER UP TO HALF A METRE DEEP IS MILLED FROM THE BANK AND DISCHARGED IN THE CUTAWAY BELOW



UNDRAINED BOG

WESTERN BOG INTENDED FOR MILLED PEAT DEVELOPMENT. THE BOG HAS RISING ROLLING CONTOURS BROKEN BY LAKES AND OUTFALLS



MILLED PEAT BOG BEING DRAINED

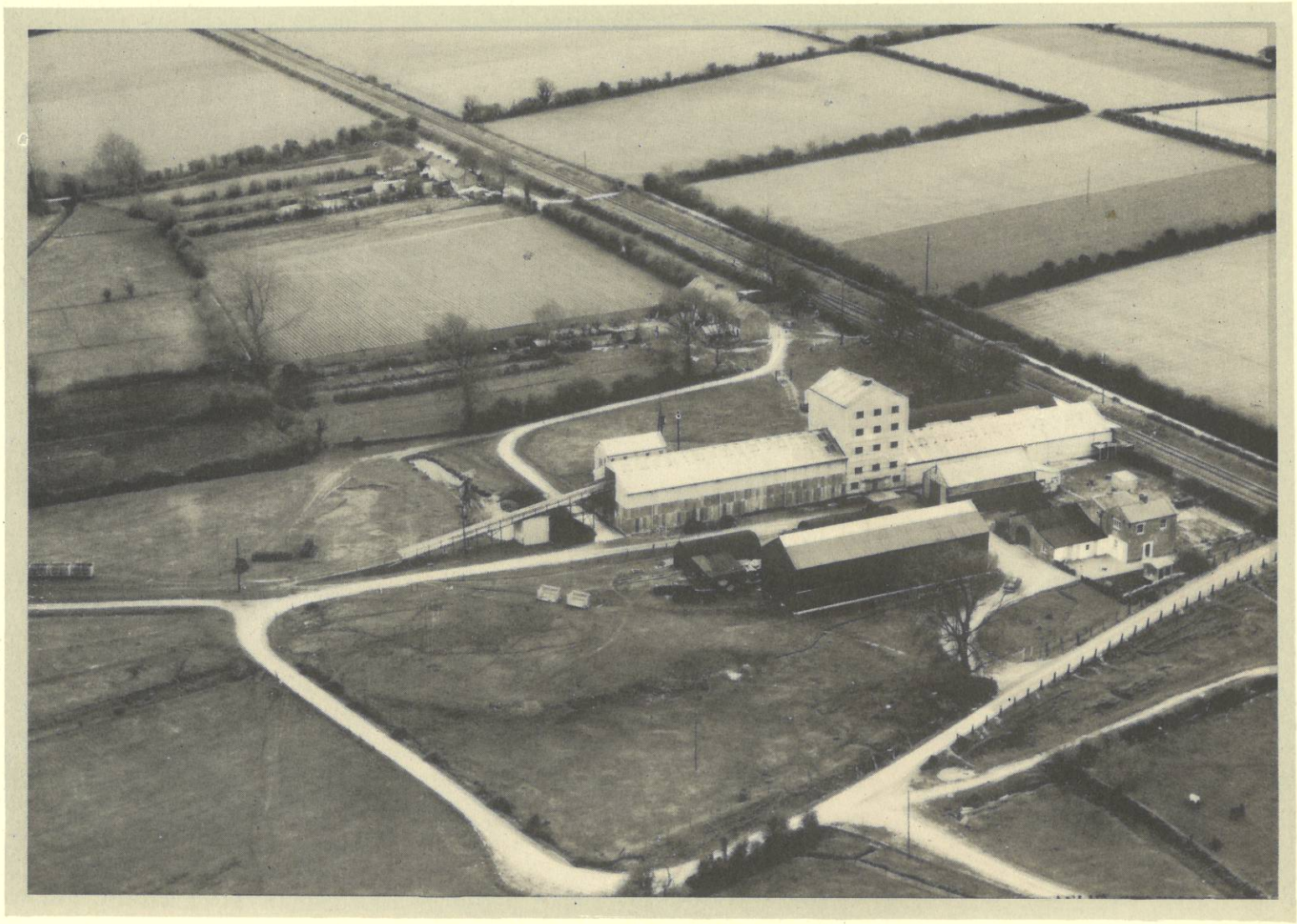
INITIAL PLOUGH AND DISC DITCHER DRAINS

SPACED AT FIFTY FEET INTERVALS



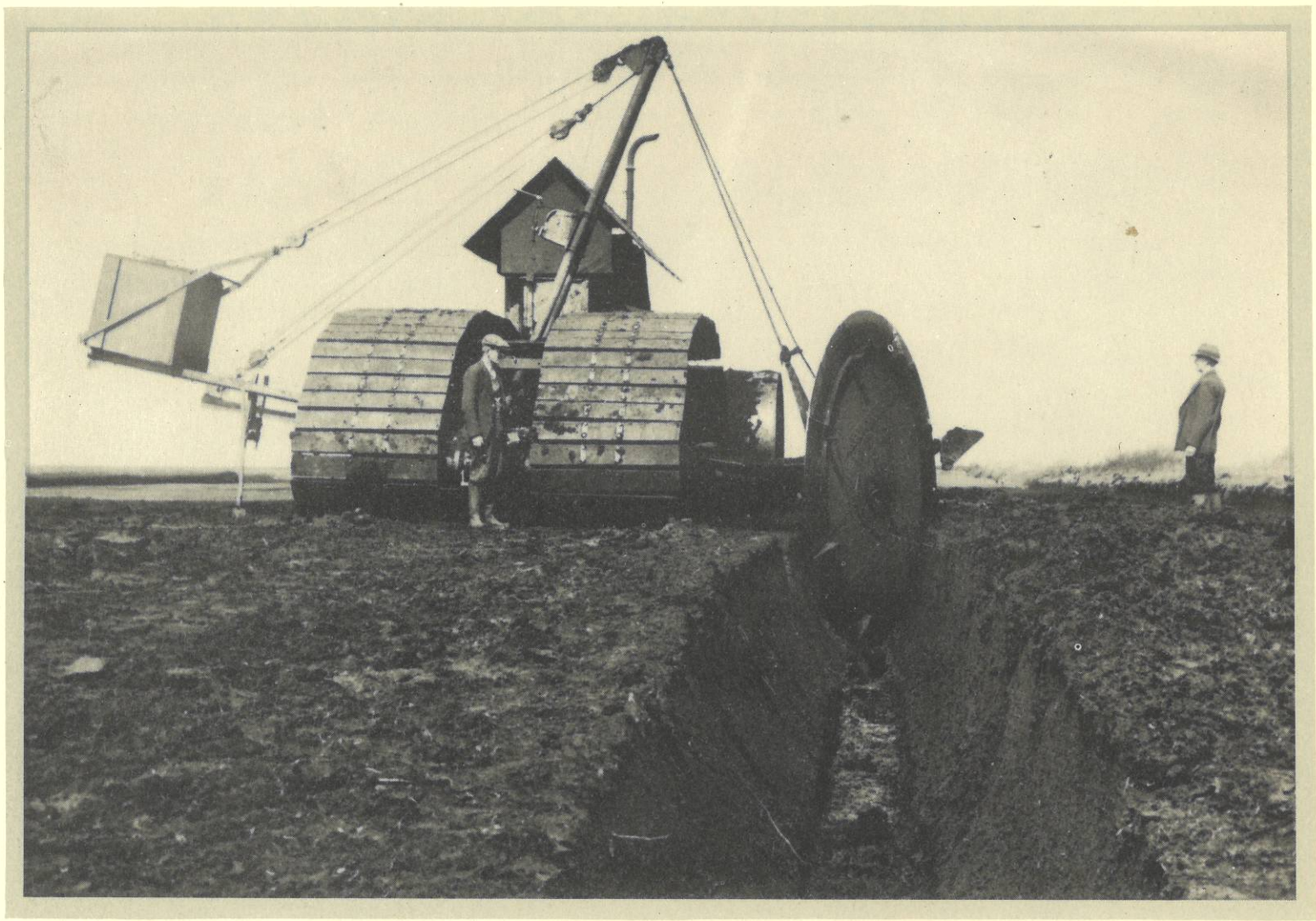
PEAT MOSS CUTTING TRENCHES AND SPREAD FIELDS

PEAT MOSS IS CUT BY HAND FROM THE TRENCHES, WEATHERED, FOOTED, HARVESTED AND SUBSEQUENTLY RICKED IN OPEN SIDED DRYING SHEDS ON THE BOG



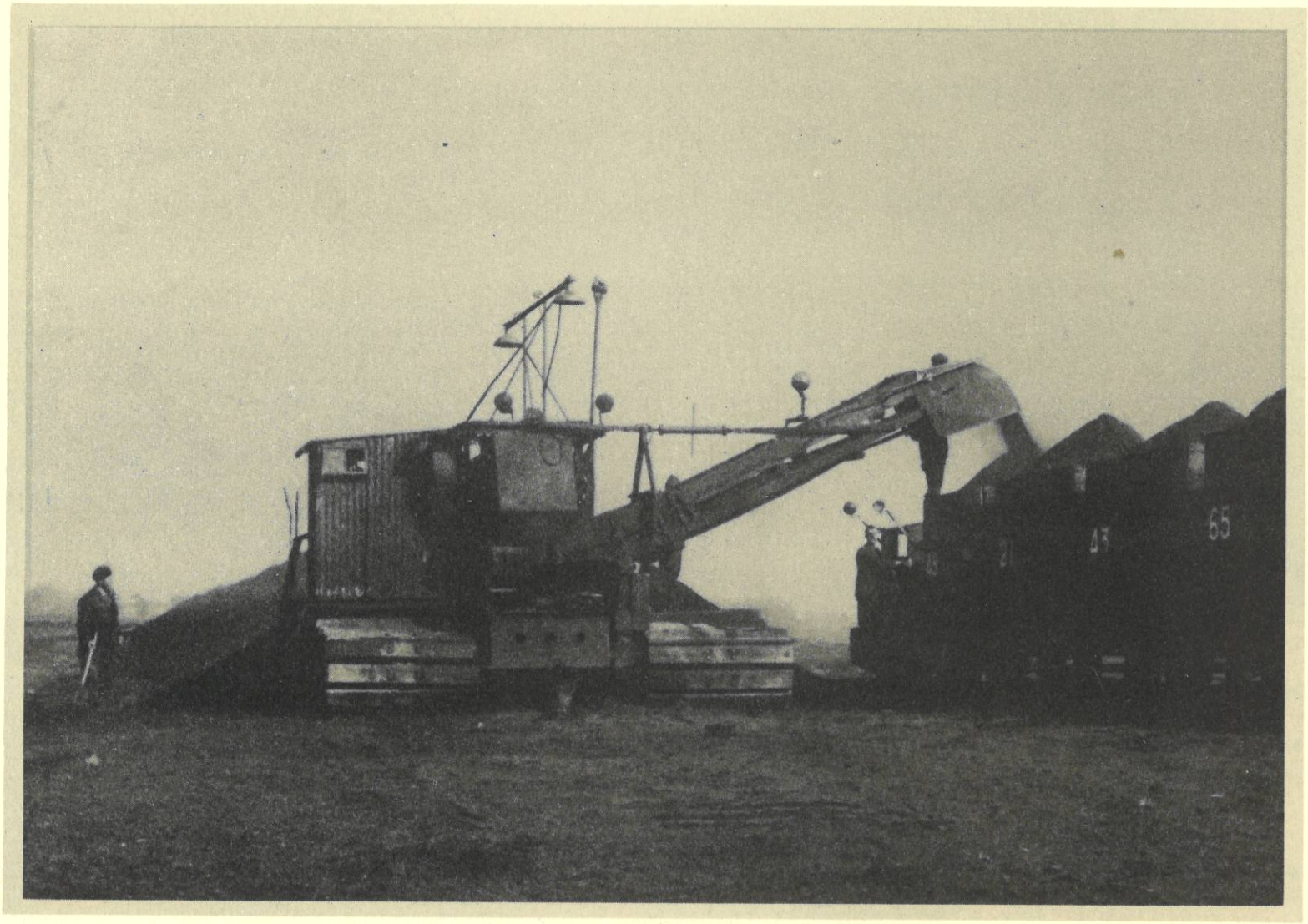
CILL BEARA PEAT MOSS FACTORY

THE DRIED PEAT MOSS IS DELIVERED INTO THE FACTORY WHERE IT IS DISINTEGRATED, SCREENED, GRADED AND BALED READY FOR DELIVERY BY ROAD OR RAIL TO THE CONSUMER



DISC DITCHER

BOG DRAIN BEING EXCAVATED TO A DEPTH OF FOUR FEET SIX INCHES.
THE SPOIL IS UNIFORMLY DISPERSED OVER ADJOINING AREAS



## LOADER

THE LOADER CONVEYS MILLED PEAT AT THE RATE OF FIFTY TONS PER HOUR FROM THE RAILPILE INTO RAILWAY WAGONS WHENCE DELIVERY IS MADE EITHER TO THE FACTORY FOR THE MANUFACTURE OF BRIQUETTES OR TO THE POWER STATION FOR THE GENERATION OF ELECTRIC POWER

## DRAINAGE PLOUGH

PRELIMINARY MARKING OUT AND INITIAL SHALLOW CUTS ON DRAINS CAN BE RAPIDLY MADE ON VIRGIN BOGS.



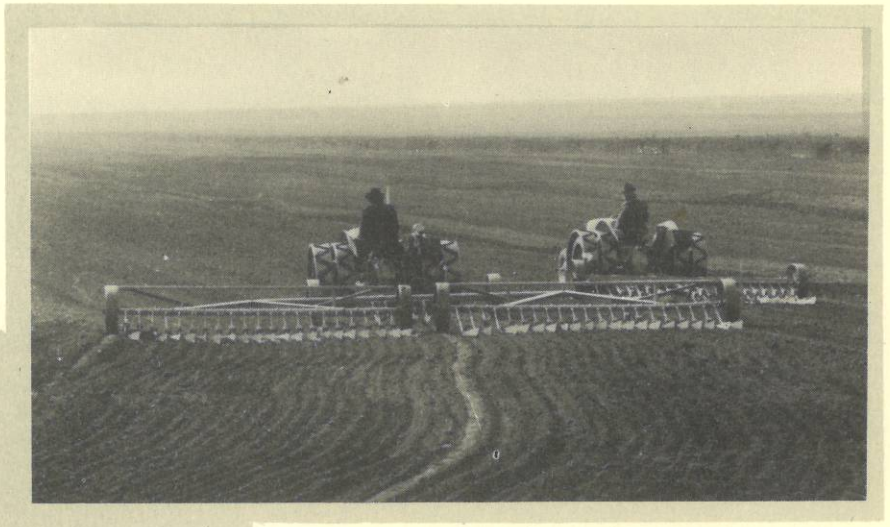


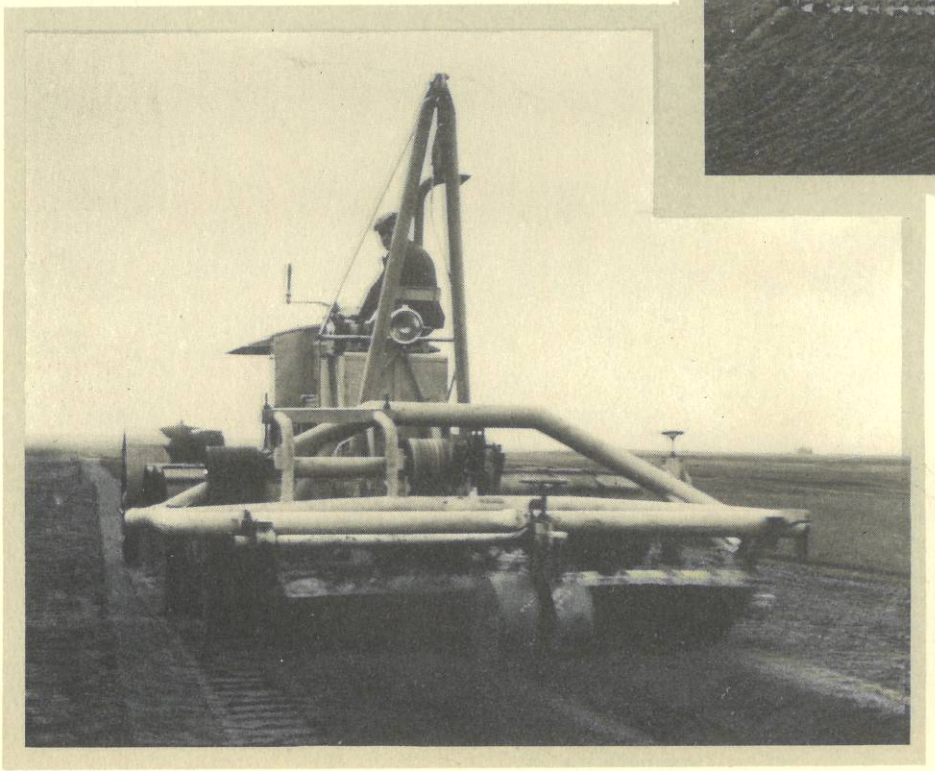
## MOLE DRAINER

IMPROVEMENT OF SURFACE CONDITIONS ON SPREAD GROUNDS CAN BE ACHIEVED AT RELATIVELY LITTLE COST. THE MACHINE IS MAINLY USED TO SUPPLEMENT THE CROSS DRAIN SYSTEM BETWEEN MAIN TRENCHES ON SOD PEAT BOGS.

## HARROWS

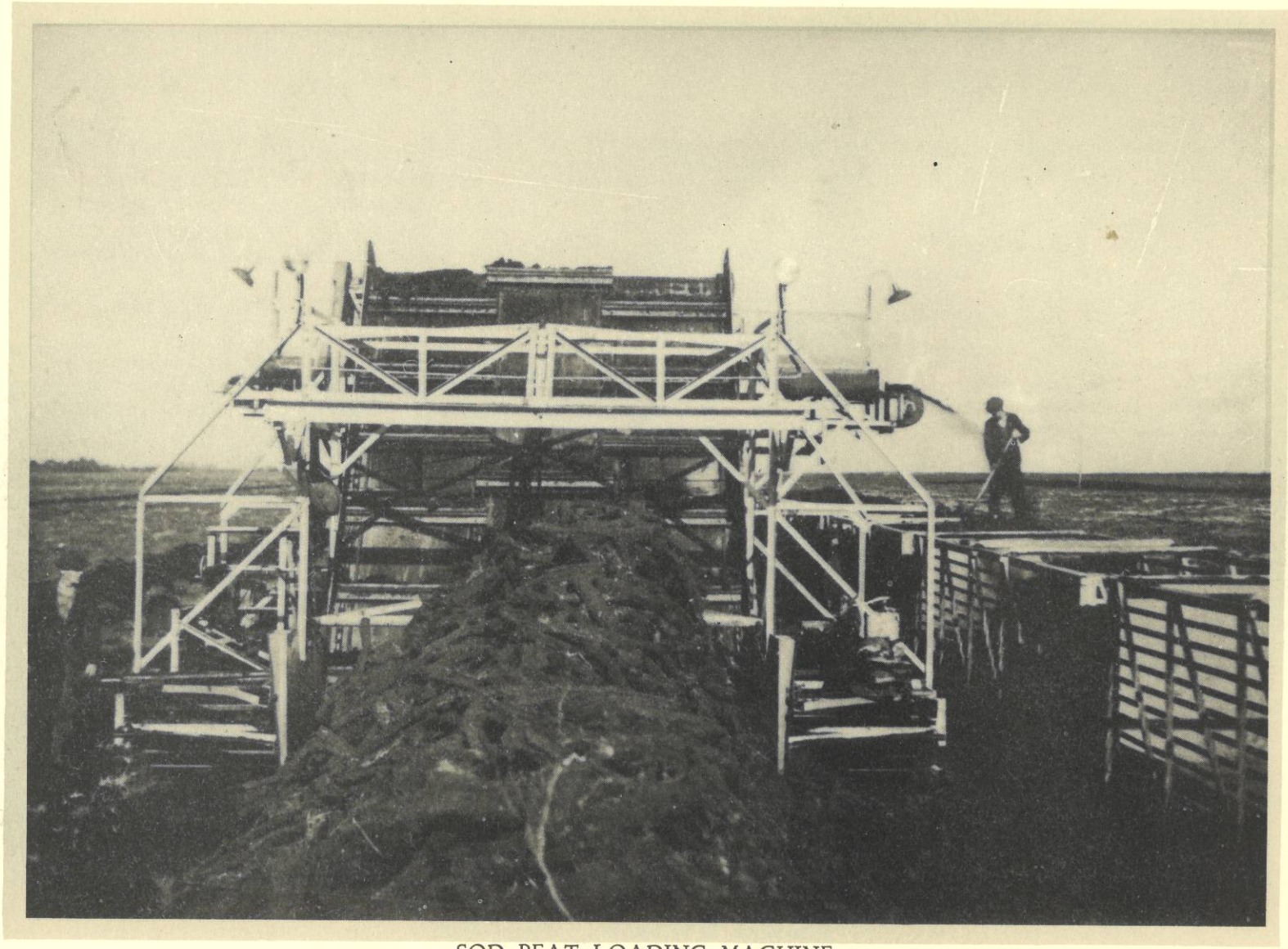
SINGLE AND DOUBLE SPOON HARROWS ACCELERATE THE DRYING OF THE MILLED PEAT





## MILLER

THE SURFACE AREA OF THE FIELD IS CUT TO A DEPTH OF APPROXIMATELY HALF AN INCH BY THE MILLING ATTACHMENT FITTED TO A SPECIALLY DESIGNED HALF-TRACK TRACTOR

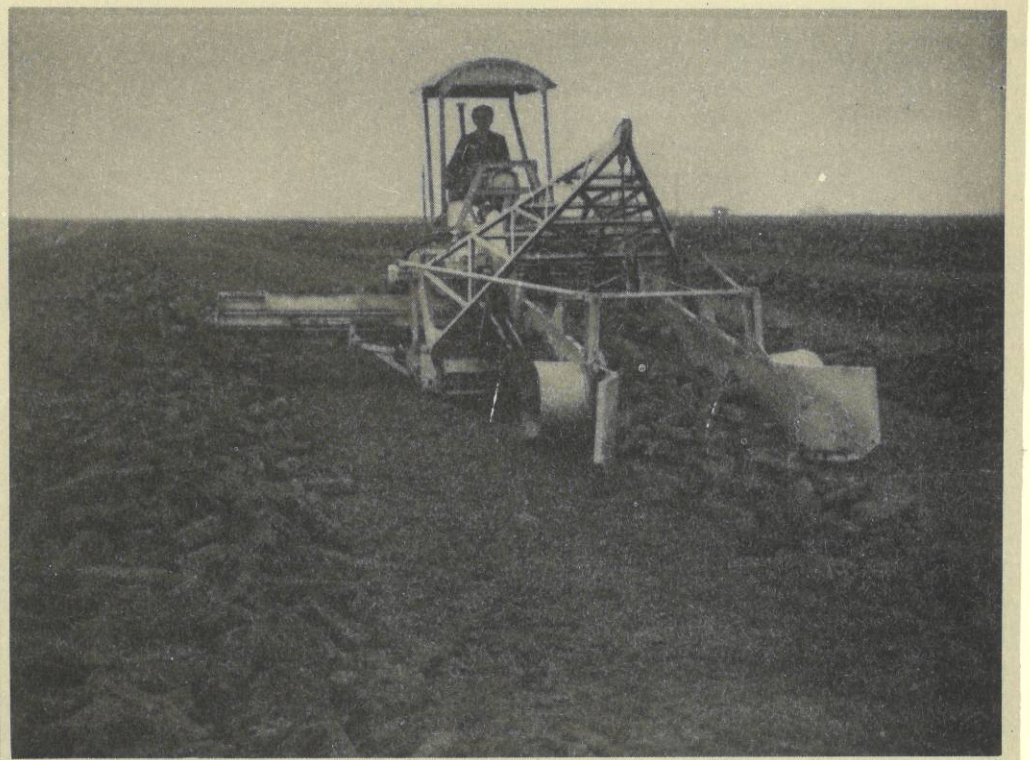


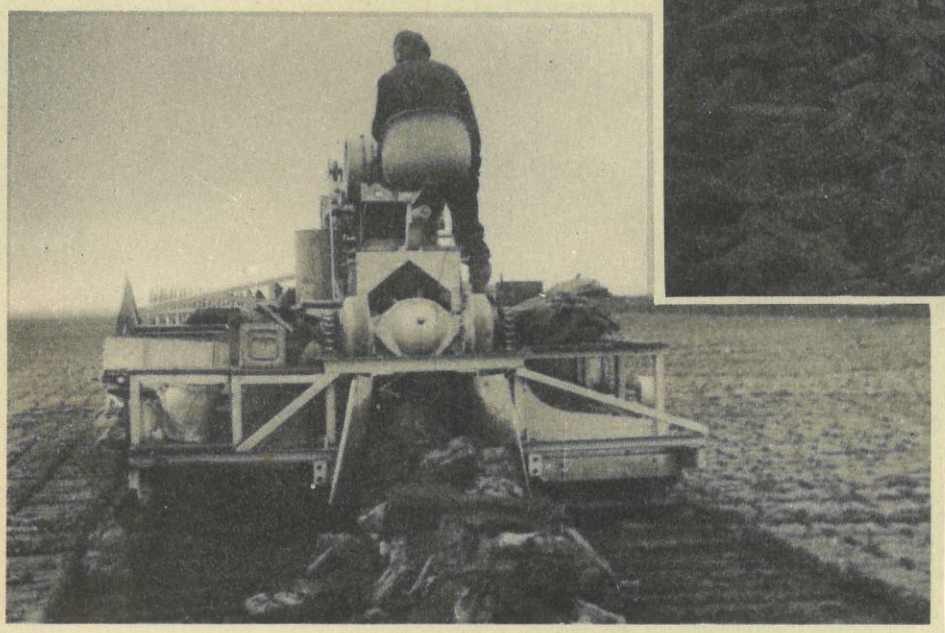
SOD PEAT LOADING MACHINE

THE LOADER FILLS WAGONS OF SIXTEEN CUBIC METRE CAPACITY
FROM A CLAMPED RICK OF TURF FOR DELIVERY TO CONSUMERS
OR POWER STATION

## SOD PEAT WINDROW TURNER

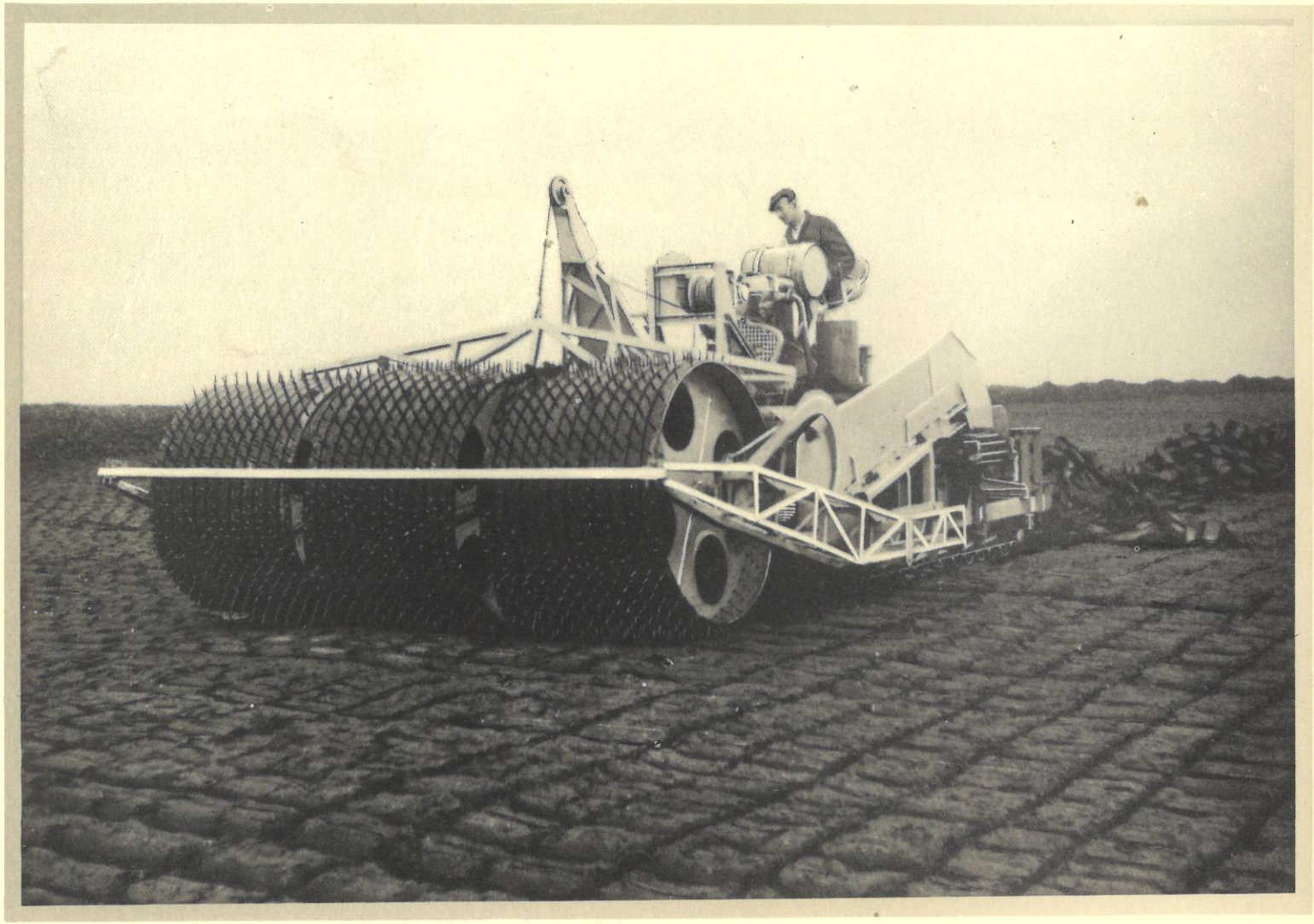
THE WINDROWS REQUIRE TO BE TURNED AFTER A PERIOD SO THAT THE SODS AT THE BOTTOM OF THE ORIGINAL WINDROW CAN BE EXPOSED. THE WINDROWS ARE TURNED AND RE-MADE THREE METRES AWAY FROM THE ORIGINAL POSITION, LEAVING THE PEAT IN POSITION READY FOR COLLECTION





## SOD PEAT WINDROWER *(Rear)*

THE PEAT IS DISCHARGED AT THE REAR AND FORMED INTO A CONTINUOUS WIND-ROW, IN WHICH IT GRADUALLY DRIES



SOD PEAT WINDROWER *(Front)*

THIS IS THE LATEST IMPROVEMENT IN SOD PEAT MECHANISATION. THE DRYING PEAT IS PICKED UP ON PINS AND FED ON TO A CHUTE DELIVERING AT THE REAR OF THE MACHINE. THIS MACHINE WILL REDUCE THE AMOUNT OF MANUAL FOOTING REQUIRED ON EACH CROP



SOD PEAT AUTOMATIC COLLECTOR

THIS NEWLY DEVELOPED MACHINE COMPLETES THE LAST PHASE OF FULLY MECHANISED PRODUCTION—
LIFTING THE WINDROWS POSITIONED BY THE PREVIOUS MACHINES AND CONVEYING THEM TO THE RICK



SOD PEAT BAGGER SPREADER WITH CUTTING DISCS

THE SPREADER ARM IS MOUNTED ON CATERPILLARS AND ROLLERS AND MOVES FORWARD WITH THE BAGGER. THE MACERATED PEAT IS FED OUT ALONG THE ARM AND IS DEPOSITED IN CONTINUOUS ROWS ON THE GROUND WHERE IT IS CUT BY THE DISCS



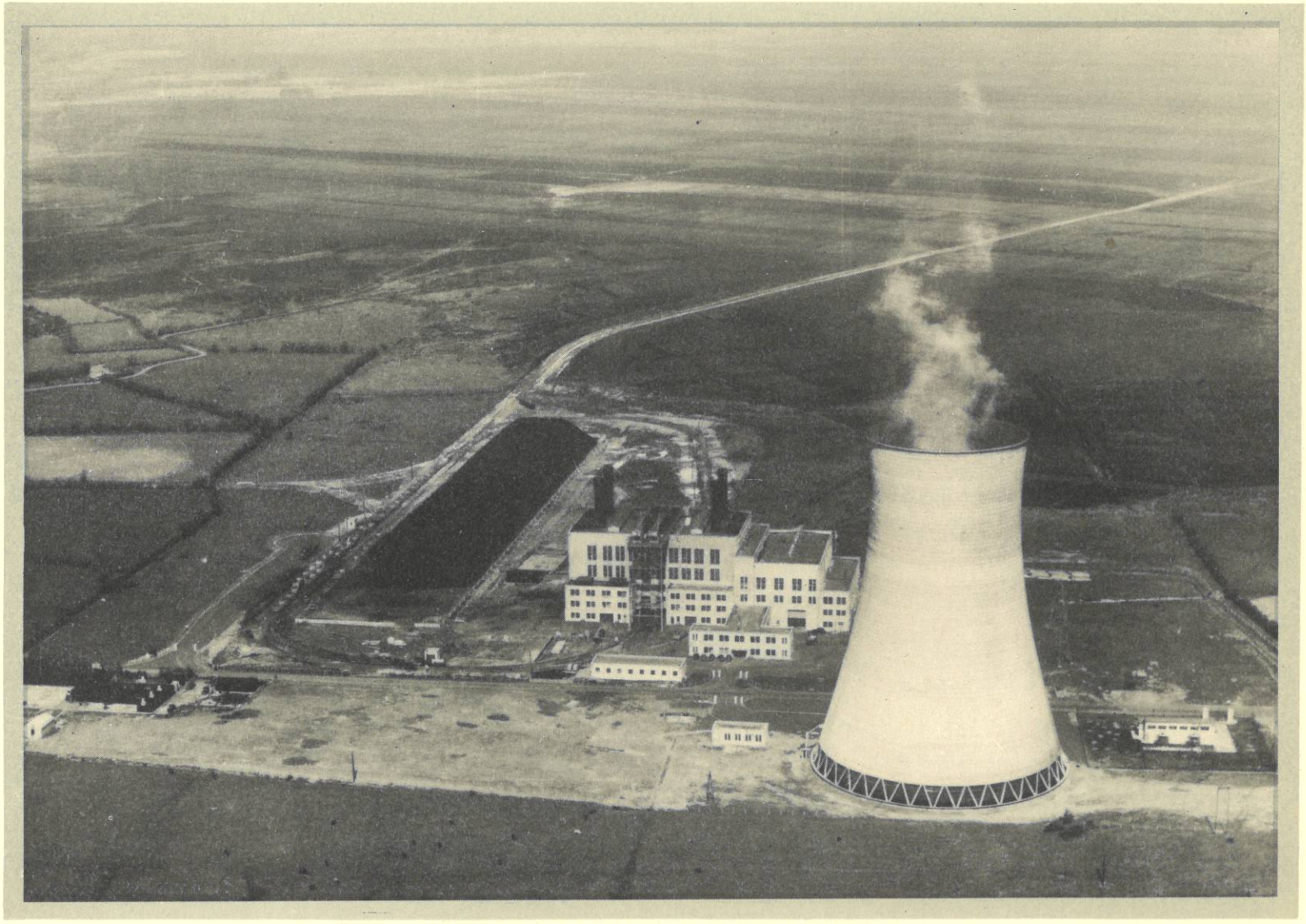
SOD PEAT BAGGER

FULLY-AUTOMATIC EXCAVATOR CUTTING A TWO METRE WIDTH OF BANK THREE METRES DEEP. THE TURF IS SUBSEQUENTLY MACERATED AND FED ON TO THE FIFTY-FOUR METRE SPREADER ARM OF THE MACHINE AS A CONTINUOUS SOD



SOD PEAT BOG IN PRODUCTION

CUTTING TRENCHES, SUB DRAINS, CROSS DRAINS AND RAILWAYS
SHOWING TYPICAL LAYOUT FOR SOD PEAT PRODUCTION



## SOD PEAT FUELLED POWER STATION

ALLENWOOD POWER STATION, CO. KILDARE WITH A DESIGNED CONSUMPTION OF ONE HUNDRED AND EIGHTY THOUSAND TONS OF PEAT PER ANNUM AND AN OUTPUT OF ONE HUNDRED AND THIRTY-FIVE MILLION UNITS OF ELECTRICITY. IT IS NOW ESTIMATED THAT THE STATION CAN USE AND PRODUCE AT LEAST FIFTY PER CENT MORE

THIS POWER STATION IS OWNED AND OPERATED BY THE ELECTRICITY SUPPLY BOARD

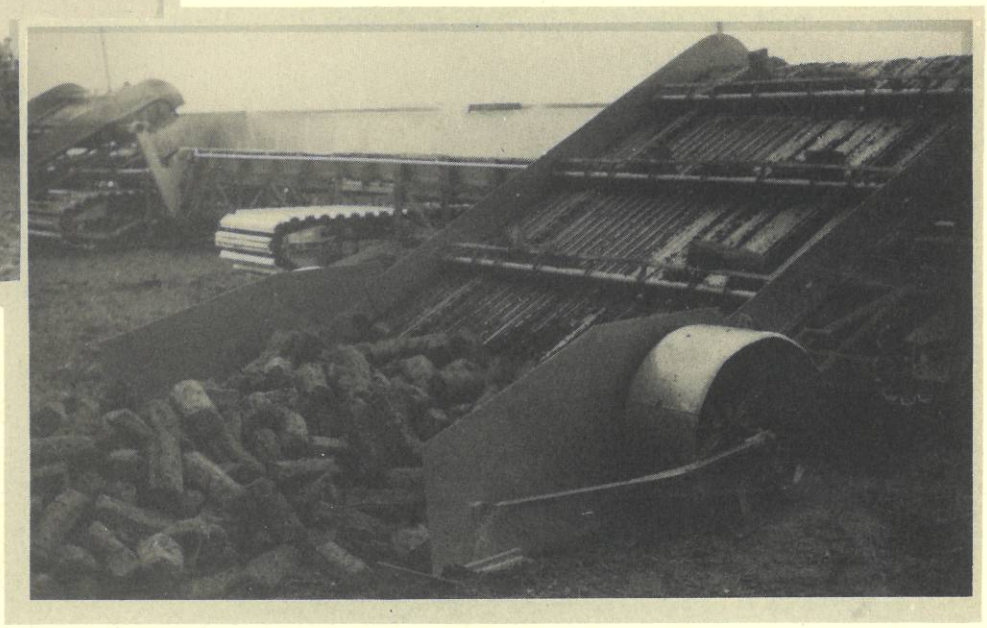


## ELEVATOR OF AUTOMATIC SOD COLLECTOR

PARALLEL TO THE CUTTING TRENCH, THE AIR-DRIED PEAT IS FORMED INTO A RICK ALONGSIDE WHICH TEMPORARY TRACK IS LAID TO MAKE DELIVERIES TO THE RAILHEAD

## WINDROW ELEVATOR OF AUTOMATIC SOD COLLECTOR

THE WINDROWS ARE LIFTED FROM THE GROUND ON TO THE STEEL-PLATE CONVEYOR OF THE SOD COLLECTOR WHICH FEEDS THE ELEVATOR





Ceapaḋ agus rinneaḋ an leaḃrán
so imḊaile Áṫa Cliaṫ ꝑaor ċomarṫa
na dTrí gConneal. In Éirinn a rinn-
eaḋ a ḃꝑuil ann de ꝑlátaí de ꝑáipéar
agus de ḋubaċ. ⁊ Dia dár gcabair.
1954

Sé príom-ċúiṙ foillṙiċe an leaḃṙáin ṙeo, é a ṙcaipeaḋ i meaṙg daoine i dtíoṙċa ṫaṙ leaṙ.

Fágṫaṙ le h-uḋaċt ag Muinntiṙ na h-Éiṙeann anoiṙ í, maṙ annál aṙ ḋéantaiṙí Boṙd na Móna, cómluċt Gaeḋalaċ a ṙáṫann í féin i gceiṙt teicniúil Gaeḋalaċ ṙṙeiṙialta.

# boRD na móna

# APPENDIX 4-12

***Surface Water Environmental and Operational Control Procedure***

# Bord na Mona Energy Ltd.

# Environmental and Operational Procedures for the Protection of Surface Water

**Prepared by**

BORD NA MÓNA
Naturally Driven

**Bord na Móna Environmental and Operational Procedures for Protection of Surface Water**

| Title | SOP Ref | Rev | Purpose |
|---|---|---|---|
| Bund Maintenance & Integrity Procedure | BM&IP | 4 | Procedure for the maintenance and integrity testing of bund structures |
| Communication Procedure | CP | 3 | Effective communication of environmental issues. |
| Environmental Complaints Procedure | ECP | 3 | To ensure all environmental complaints are dealt with effectively. |
| Composite Sampler Service procedure | VSD | | Procedure for servicing of Composite Samplers |
| Environmental Management Plan (Draft) | | 1 | To specify the method in which emissions and energy usage will be reduced or eliminated over a specified period of time. |
| Dust Complaint Procedure | | | Procedure to deal with all complaints relating to emissions air and land |
| Environmental Communications | VSD | | Procedure for external and internal environmental communications |
| Environmental Training Procedure | | 4 | Procedure for training of operatives in good environmental work practices. |
| Gas Oil Loading Procedure | VSD | 1 | Procedure for external delivery, internal loading and dispensing of gas oil. |
| General ERP | VSD | | General Emergency Preparedness and Response |
| Litter Action Plan | | | Prevention and control of litter arising from Bord na Mona's activities and from unauthorised dumping on and around its property. |
| Local Authority Contact Info | | | Local Authority contact information relating to IPC Incidents |
| Programme for Public Information | | | To define how Bord na Mona Peat manages the communication of Environmental information concerning the facility with external parties. |
| Restoration and Aftercare Procedure | RAP | 3 | Procedure to address Condition 10, regarding the Restoration & Aftercare requirements of IPC Licence P0499-01 to P0507-01 |
| Service Level Agreement (between AES and BnM) | | | Document setting out the waste management services provided by AES to Bord Na Móna Peat including the communication lines, responsibilities and response times. |
| Waste Management Procedure | | Rev 1 | To define the correct procedure to be followed when requesting a waste collection service from AES regarding removal of all wastes from all sites within the Feedstock group. |
| Bog Maintenance Flowchart | SOP: FS-BM-01 | | Flowchart for Bog maintenance |
| Bog Maintenance Plan | SOP: FS-BM-02 | 2 | SOP for Bog Maintenance Plans to include ditching, piping, pumps, open drains, silt ponds, timber extraction, pile field levelling, screw levelling and headland preparation. |
| Drainage Planning and Implementation | SOP: FS-BM-03 | 2 | SOP for preparation and implementation of Bog Drainage Plans |
| Ditching | SOP: FS-BM-04 | 2 | SOP for ditching work as required in Bog Drainage Plan. |
| Piping and Re-Piping | SOP: FS-BM-05 | 2 | SOP for piping and re-piping work as required in Bog Drainage Plan. |
| Open Outfalls | SOP: FS-BM-06 | 2 | SOP for opening of outfalls as required in Bog Drainage Plan. |
| Silt Pond Cleaning | SOP: FS-BM-07 | 3 | SOP for cleaning of Silt Ponds as set out in Bog Maintenance Plan. |
| Timber Extraction | SOP: FS-BM-08 | 2 | SOP for clearing of Timber as set out in Bog Maintenance Plan. |
| Headland Levelling | SOP: FS-BM-09 | 2 | SOP for levelling of headlands as set out in Bog Maintenance Plan. |
| Screw Levelling | SOP: FS-BM-10 | 2 | SOP for use of screw leveller as set out in Bog Maintenance Plan. |
| Pile Field Lowering | SOP: FS-BM-11 | 3 | SOP for lowering of pile field greater than 1m above adjoining field as set out in Bog Maintenance Plan. |
| Production Flowchart | SOP: FS-PR-01 | 2 | Flowchart for Peat Production |

**Bord na Móna Environmental and Operational Procedures for Protection of Surface Water**

| Title | SOP Ref | Rev | Purpose |
|---|---|---|---|
| General Milled Peat Production | SOP: FS-PR-02 | 2 | SOP to describe the general arrangements for the production of milled peat in Bord na Móna Energy. |
| Milling | SOP: FS-PR-03 | 1 | SOP for milling of peat (Light or new triple miller) |
| Offset Milling | SOP: FS-PR-04 | 2 | SOP for offset milling of peat to be carried out at start of production or max every fourth harvest. |
| Harrowing | SOP: FS-PR-05 | 2 | SOP for harrowing of milled peat |
| Ridging | SOP: FS-PR-06 | 2 | SOP for ridging of harrowed peat. |
| Pile Rolling | SOP: FS-PR-07 | 1 | SOP for rolling of piles to shape pile profile to be carried out at a minimum every fourth harvest. |
| Peco Harvesting | SOP: FS-PR-08 | 4 | SOP for harvesting of peat into stockpiles for rail loading and haulage |
| Haku Harvesting | SOP: FS-PR-09 | 2 | SOP for harvesting of peat into stockpiles for haku trailer loading and haulage. |
| Preparation of Production Charts | SOP: FS-PR-10 | 2 | SOP for general arrangements for deciding on the Production Chart for each milled peat area |
| Updating Production Plan | SOP: FS-PR-11 | 1 | SOP for the updating of production charts and starting new stockpiles. |
| Stockpile Inventory | SOP: FS-PR-12 | 1 | SOP for annual peat stock check. |
| Headland Harvesting | SOP: FS-PR-13 | Draft | SOP for harvesting peat from headlands |
| Stockpile Survey with Trimble Tablet | SOP: FS-PR-14 | 1 | SOP for survey of stockpile with Trimble Yuma 2 Tablet. |
| Ridge Sampling | SOP: FS-PR-15 | 3 | SOP for the sampling of ridges during production. |
| End of Production Season Procedure | SOP: FS-PR-16 | Draft | SOP describing end of production Season activities |
| Document Control | Procedure 001 | 7 | The purpose of this procedure is to describe the arrangements in Bord na Móna Peat Division for document control. |
| Record Control | Procedure 002 | 3 | Procedure is to describe the arrangements in Bord na Móna Peat Division for record control. |
| Internal Audit | Procedure 003 | 4 | Procedure is to describe the arrangements in Bord na Móna Peat Division for internal audits. |
| Hort Bogs - General | SOP: FS-HO-01 | 2 | The purpose of this procedure is to describe the differences (from standard peat division requirements) in the operation and maintenance of horticultural bogs. |
| Hort Bogs - Bog Maintenance | SOP: FS-HO-02 | 1 | The purpose of this procedure is to describe the differences (from standard Feedstock requirements) in the maintenance of horticultural bogs. |
| Hort Bogs - Bog Housekeeping | SOP: FS-HO-03 | 1 | The purpose of this procedure is to describe the differences (from standard Feedstock requirements) in the housekeeping of horticultural bogs. |
| Bog Maintenance Compliance Check List | | | Bog operations and maintenance check list for peat production activities. |
| Scheduling Flowchart | SOP: FS-SC-01 | 2 | Scheduling flowchart for stockpile sampling and loading |
| Develop Moisture Targets | SOP: FS-SC-02 | 2 | Flowchart to establish and circulate moisture targets |
| Peat loading | SOP: FS-SC-06 | 2 | Procedure for loading peat from a stockpile into a wagon/lorry. |
| Rail Bed Creation | SOP: FS-SC-10 | 1 | Flow chart for creation of rail bed adjacent to stockpile. |
| Stock Protection Flowchart | SOP: FS-SP-01 | 4 | Flowchart for polycovering and subsequent stipping of peat stockpiles. |
| Polythene Ordering | SOP: FS-SP-03 | 2 | Procedure to describe the methodology used to determine the polythene to be ordered for stock protection each year. |

**Bord na Móna Environmental and Operational Procedures for Protection of Surface Water**

| Title | SOP Ref | Rev | Purpose |
|---|---|---|---|
| Polythene Distribution | SOP: FS-SP-04 | 4 | Procedure to describe the arrangements for distributing polythene to the production areas. |
| Covering Haku Piles | SOP: FS-SP-05 | 2 | Procedure for covering of haku piles with polythene |
| Covering Peco Piles | SOP: FS-SP-06 | 2 | Procedure for covering of peco piles with polythene |
| Stripping Haku Stockpiles | SOP: FS-SP-07 | 2 | Procedure for stripping polythene from haku piles |
| Stripping Peco stockpiles | SOP: FS-SP-08 | 2 | Procedure for stripping polythene from peco piles |
| Covering Piles during Production | SOP: FS-SP-09 | 3 | Procedure for covering full piles during production. |
| Management of Heating Peat | SOP: FS-SP-10 | 1 | Procedure for management of heating peat stockpiles |

# Bund Maintenance & Integrity Procedure

## 1. Purpose

The purpose of this procedure is to provide for the efficient, maintenance and integrity testing of bund structures, in accordance with conditions 9.1.6, 9.1.10 and Schedule 3 of the Bord na Mona Energy Ltd IPC Licence's. P0499-01 – P0507-01.

## 2. Scope

The scope of this procedure covers all Bund Structures in the Bord na Mona Energy Group.

## 3. Responsibility

The implementation of Bund Maintenance and Bund Integrity testing is the responsibility of the Environmental Co-ordinator or an individual appointed by the Resource Manager.

## 4. Bund Maintenance Procedure

**4.1** The level equivalent to 10% of the bund volume should be highlighted on the internal bund wall.

**4.2** All bunds must be inspected weekly in accordance with condition 9.1.10, with the level of rainwater noted and any evidence of leaking valves, nozzles, pipes and tanks.

**4.3** On inspection of this weekly workshop inspection sheet, if a bund is noted as containing in excess of 10% of the bund volume, its contents must be pumped out as soon as is practicable.

**4.4** The contents must be discharged through the adjacent oil interceptor.

**4.5** Firstly a small amount of water, enough to retrieve a sample should be pumped. The sample should be retrieved from the discharge point of the interceptor.

**4.6** This sample should be analyzed for COD. If results are within Bord na Mona trigger levels of 100mg/litre pumping can recommence until the bund is emptied.

**4.7** Should the trigger level be exceeded then oil dispersal products such as absorbent mats and pillows should be deployed in both the bund and adjacent interceptor.

**4.8** Sampling should then be carried out again as per 4.3 and 4.4 above.

**4.9** If COD trigger levels are still being exceeded then a specialist contractor will be required to evacuate and clean down the bund. Prices for this should be sought through Paul Curtis AES via stores, stating the volume and location of the bund to be cleaned

## 5. Bund Integrity Initiation Procedure

**5.1** On inspection of the Bund Master list, the Coordinator will identify bunds which are due for integrity testing as per condition 9.1.6. (every 2 years)

**5.2** Bunds which are overdue in relation to testing must be prioritized.

**5.3** Once a particular bund is identified as requiring an integrity test. The Co-coordinator must contact Technical Services Boora (05793/45907), who will arrange to carry out the test.

**5.4** The bund which is scheduled for testing must be clear of debris and filled with water, to accommodate the test. A barrel of water must also be made available to the test Engineer and sited adjacent to the bund.

**5.5** Once testing is complete, the bund must be emptied, through the oil-interceptor, at a rate not in excess of the oil-interceptor capacity.

**5.6** A signed copy of the test results are to be retained on file.

**5.7** Bunds which fail the integrity test should be repaired without delay and retested, following the above procedure.

_____ **Procedure: CP**

**Resource Manager**

**Page: 1 of 2**

**Date:**_____ **Rev: 3**

# Communications Procedure

1. **Purpose**
   The purpose of this procedure is to ensure that the company will take all the necessary steps to communicate environmental issues effectively.

2. **Scope**
   The scope of this procedure covers all communications both internal and external regarding incidents requiring reporting under Condition 4 of the IPPC Licence.

3. **Responsibility**
   It is the responsibility of the Licence Holder to ensure all external and internal communications are managed in accordance with this procedure

4. **Procedure**

**External Communications**

**4.1.1.** All written communications and reports sent to the EPA and other regulatory bodies by the Licence Holder or his deputy, will be through the EPA Communications Portal Eden/Alder.

All correspondence from the EPA will be communicated, where necessary, to relevant local management for appropriate action.

**4.1.2** The Licence Holder or his deputy will also deal with all verbal and electronic requests for environmental information from any source.

**4.1.3** In the event of an environmental incident the company Emergency Response Procedure will be activated and the designated person will contact the following parties, if the incidents come under their remit, and provide them with the relevant information.

- EPA
- Local Authority
- NPWS

- Fire Authorities
- Garda
- Fisheries Board
- Bord na Mona Health & Safety Department

4.1.5 All complaints from the public, staff and from regulatory bodies will be handled in accordance with the company Environmental Complaints Procedure.

**4.3.2** The company will retain and update a file at reception (Ref: Programme for Public Information) which will contain the following Company documents.

- IPPC Licence
- Environmental Policy
- AER

## 4.4 Internal Communications

**4.3.1** The Licence Holder will provide details on the Company's environmental performance as per the Communications Plan.

**4.4.2** The Environmental Co-ordinator will retain all records on internal and external communications.

**BORD NA MÓNA**

**BORD NA MÓNA ENERGY LIMITED**

**Procedure: ECP**

**_____**
**Resource Manager**

**Page: 1**

**Date:_____** **Rev: 3**

# Environmental Complaints Procedure

**Purpose:** To ensure all environmental complaints are dealt with effectively.

**Scope:** External and internal environmental complaints.

**Responsibility:** Licence Holder or his/her environmental deputy

**References:** EPA Communications Portal Eden/Alder

**Procedure:**

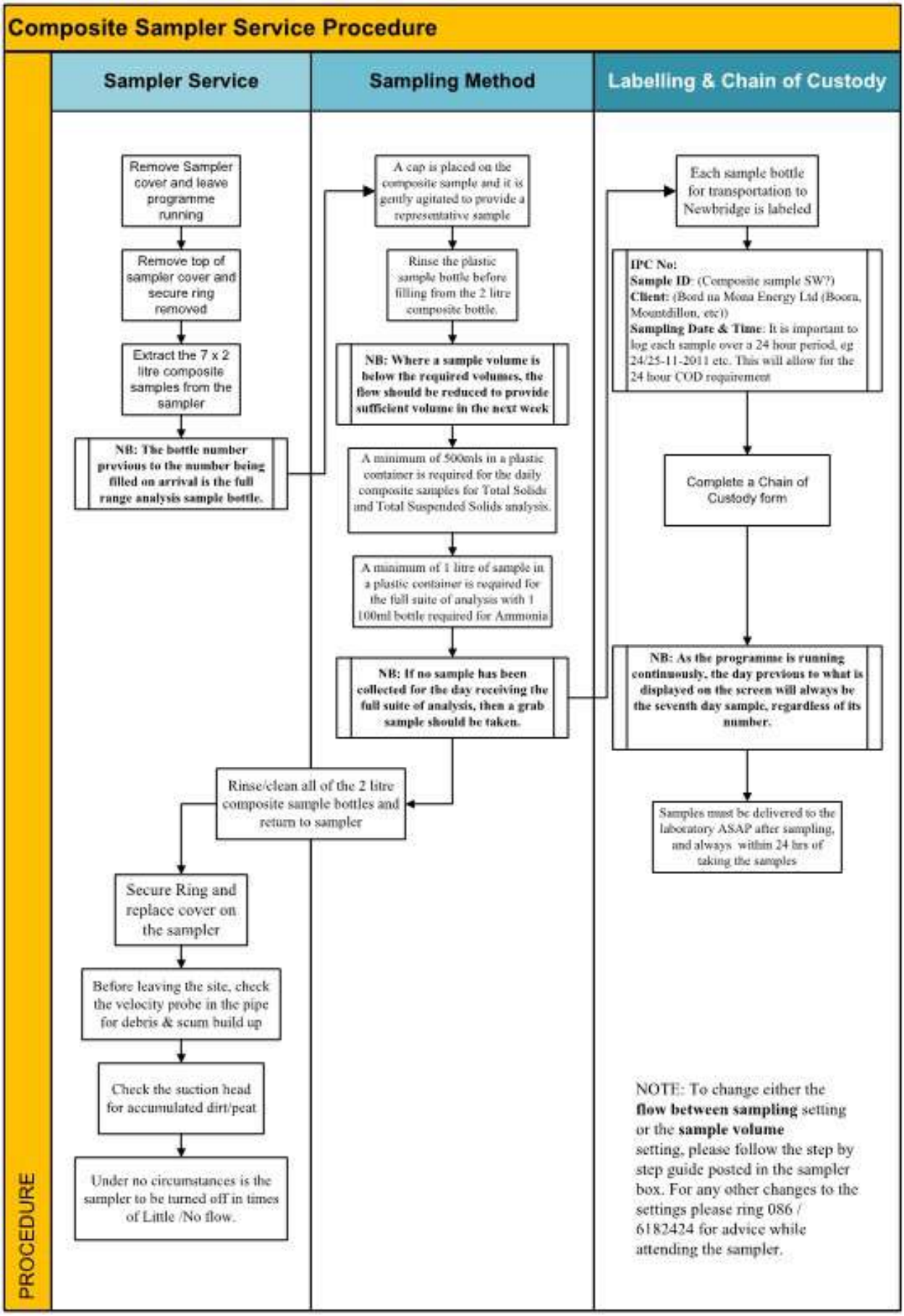
1. All environmental complaints with regard to the activities of the company are recorded, investigated and actioned if deemed necessary, or feasible, by the Licence Holder or his /her environmental deputy.

2. The Licence Holder or his/her environmental deputy will ensure that all environmental complaints written and verbal, from internal and external sources, are recorded on the EPA Communications Portal Eden/Alder.

3. Each *Environmental Complaint* will be completed with information detailing the name and address of the complainant, the nature of the complaints and the time and date of the receipt of the complaint.

4. If further corrective action is required, the Licence Holder or his/her deputy will communicate corrective action via the EPA Communications Portal.

5. All complaints will be logged on the internal Peat Compliance Log and remain until they are closed out. Ref. G:\Feedstock\Compliance


Composite Sampler Service Procedure
PROCEDURE
Sampler Service
Sampling Method
Labelling & Chain of Custody
Remove Sampler cover and leave programme running
Remove top of sampler cover and secure ring removed
Extract the 7 x 2 litre composite samples from the sampler
NB: The bottle number previous to the number being filled on arrival is the full range analysis sample bottle.
A cap is placed on the composite sample and it is gently agitated to provide a representative sample
Rinse the plastic sample bottle before filling from the 2 litre composite bottle.
NB: Where a sample volume is below the required volumes, the flow should be reduced to provide sufficient volume in the next week
A minimum of 500mls in a plastic container is required for the daily composite samples for Total Solids and Total Suspended Solids analysis.
A minimum of 1 litre of sample in a plastic container is required for the full suite of analysis with 1 100ml bottle required for Ammonia
NB: If no sample has been collected for the day receiving the full suite of analysis, then a grab sample should be taken.
Rinse/clean all of the 2 litre composite sample bottles and return to sampler
Secure Ring and replace cover on the sampler
Before leaving the site, check the velocity probe in the pipe for debris & scum build up
Check the suction head for accumulated dirt/peat
Under no circumstances is the sampler to be turned off in times of Little /No flow.
Each sample bottle for transportation to Newbridge is labeled
IPC No:
Sample ID: (Composite sample SW?)
Client: (Bord na Mona Energy Ltd (Boora, Mountdillon, etc!)
Sampling Date & Time: It is important to log each sample over a 24 hour period, eg 24/25-11-2011 etc. This will allow for the 24 hour COD requirement
Complete a Chain of Custody form
NB: As the programme is running continuously, the day previous to what is displayed on the screen will always be the seventh day sample, regardless of its number.
Samples must be delivered to the laboratory ASAP after sampling, and always within 24 hrs of taking the samples
NOTE: To change either the flow between sampling setting or the sample volume setting, please follow the step by step guide posted in the sampler box. For any other changes to the settings please ring 086 / 6182424 for advice while attending the sampler.

**Date:**_____ **Rev: 1**

# Environmental Management Plan

## 1. ***Purpose***

The purpose of the environmental management programme is to specify the method in which emissions and energy usage will be reduced or eliminated over a specified period of time.

The EMP will be prepared by the Environmental Management Systems team and will be reported on and up-dated annually to account for yearly improvements resulting from the phased introduction of the objectives and targets programme

## 2. Scope

All operations shall be assessed and all practicable options for the use of cleaner technology and the reduction and minimisation of waste shall be reviewed in accordance with the licence.

## 3. Procedure

Emissions to Atmosphere (cdn. 5.3)

- Train all personnel as per the Environmental Training Procedure
- Provide shelter belts if required
- Erect wind socks if required
- Deploy hydraulic harrows at dust sensitive locations
- Details of any CI projects with link

Emissions to Water (cdn. 6.2)

- Train all personnel as per the Environmental Training Procedure
- Details of any CI projects with link

Waste Management (cdn. 7.3)

- Details of any CI projects with link
- Continue to follow Waste Management Procedure XXX

Water Protection (cdn. 9.1.2)

- Details of any CI projects with link
- Implement Silt Pond upgrade programme
- Review production footprint and assess current Silt Pond adequacy

## 4. Reporting

4.1 Report progress annually in the AER

## 1. Responsibility

The implementation of this Procedure is the responsibility of the Resource Manager or his/her deputy.

## 2. Waste Collection Procedure

4.1 All non-hazardous and hazardous waste collection services are as per the SLA.

4.2 On a monthly basis, stores to provide the relevant IPC Licence Coordinator with a copy of all waste receipts for the Waste Management file.

4.3 On an quarterly basis, AES to provide each stores and the IPC Licence Coordinator with a quarterly report as per the SLA.

## 3. Litter Action Plan

5.1 Refer to Bord na Mona Group Litter Action Plan at XXX

## 4. Poly Recycling Procedure

6.1 Once the pile has been stripped, all rolls should be gathered and brought straight to the dedicated hardstand for collection.

6.2 At the hard stand, stack the rolls neatly within easy reach of a truck with grab arm.

6.3 Once 40 to fifty rolls have been gathered at the hardstand, notify your IPPC Coordinator, who will schedule a collection dedicated collection at this location or will make up a load from this location.

**IPC Licence P05499-01 to P0507-01.**

**Reporting Requirements to the EPA. June 2018.**

**Complaints Procedure**

*12.3 The licensee shall record all complaints of an environmental nature related to the operation of the activity. Each such record shall give details of the date and time of the complaint, the name of the complainant and give details of the nature of the complaint.*
*A record shall also be kept of the response made in the case of each complaint. The licensee shall submit a report to the Agency, during the month following such complaints, giving details of any complaints which arise. A summary of the number and nature of complaints received shall be included in the AER.*

**Action:**

This covers all complaints relating to emissions air and land which can occur as follows:

- Complaints regarding dust on adjoining lands or property, received direct to the area.
- Complaints to the local works office
- Complaints to the Environmental Department
- Complaints received via the BNM web, Newbridge, post or email.

**Procedure:**

1. Compliance Officer and Area Leader to telephone or visit the complainant, enquiring and recording the nature of the complaint.
2. Compliance Officer to complete the attached Complaint Form and submit the details via the Alder portal in the month following the month of receipt of the complaint.
3. Compliance Officer to communicate the complaint to the relevant Operations Leader, meet on site and agree on any corrective actions that can be implemented to reduce the migration of the dust from the operations, on the attached Investigation Report form.

   The licence requirements are as follows and include some additions possible solutions:

   - Regular ridging of headland peat that may be contributing to the dust nuisance
   - Regular ridging of machine passes.
   - Grassing of machine pass ways to reduce loose peat
   - Alternative routes through machine passes
   - Installation of a wind sock to advise on wind direction.
   - Installation of a dust gauge
   - Planting of tree screening/wind breaks
   - Avoidance of the activity during windy weather in the direction of the sensitive property
   - Relocation of haku piles
   - Checking that belt seals and cowls are in place
   - Checking on good operations practice.
   - Availability of hydraulic harrows.
   - Slow travel speeds along dusty headlands, Tool box talks with operators/slow down signs.
   - Structural screens.
   - Relocation of teacentre/welfare facilities to reduce idle travel

4. Complete the Resolution section of the Complaint form based on the results of the investigation and proposed corrective actions
5. Update the resolution to the EPA via Eden.
6. Implement the corrective action and report on progress to the licence holder.

# Environmental Communications

Procedure

## External

All written communications and reports to be communicated via Eden/Alder

Depending on nature of communication – refer to XXXX Doc

**1. EPA** – Any incident (Oil Spill/Fire Etc). Exceedance of an emission limit or Trigger level.
**2. Fisheries** – Oil spills affecting rivers/outfalls.
**3. Local Authority** – Oil spills affecting rivers/outfalls and fires involving emergency services.
**4. National Parks and Wildlife Service** – Any incident reported to the EPA that impacts on a SAC, NHA, Natura 2000 site.

Communication from members of the Public?

Refer to Procedure XXX Programme for Public Information

## Internal

Reference to internal communications available through the Communications Plan

Environmental Co-ordinator to retain all records on internal and external communications

**Date:**_____ **Rev: 4**

# Environmental Training Procedure

## 1. Purpose

The purpose of this procedure is to provide for the protection of the environment by training all operatives in good environmental work practices. This will be achieved by identifying and training all personnel in accordance with condition 2.5.1 of the Bord na Mona Energy Ltd IPC Licence's P0499-01 to P0507-01.

## 2. Scope

The scope of this procedure covers all operatives involved in the production, transportation of peat and all other personnel involved in the craft and technical backup of same.

## 3. Responsibility

Human Resources and Group Training Department are responsible for identifying new and existing personnel for Environmental Induction training. It is the responsibility of local management to ensure this is carried out.

## 4 Procedure

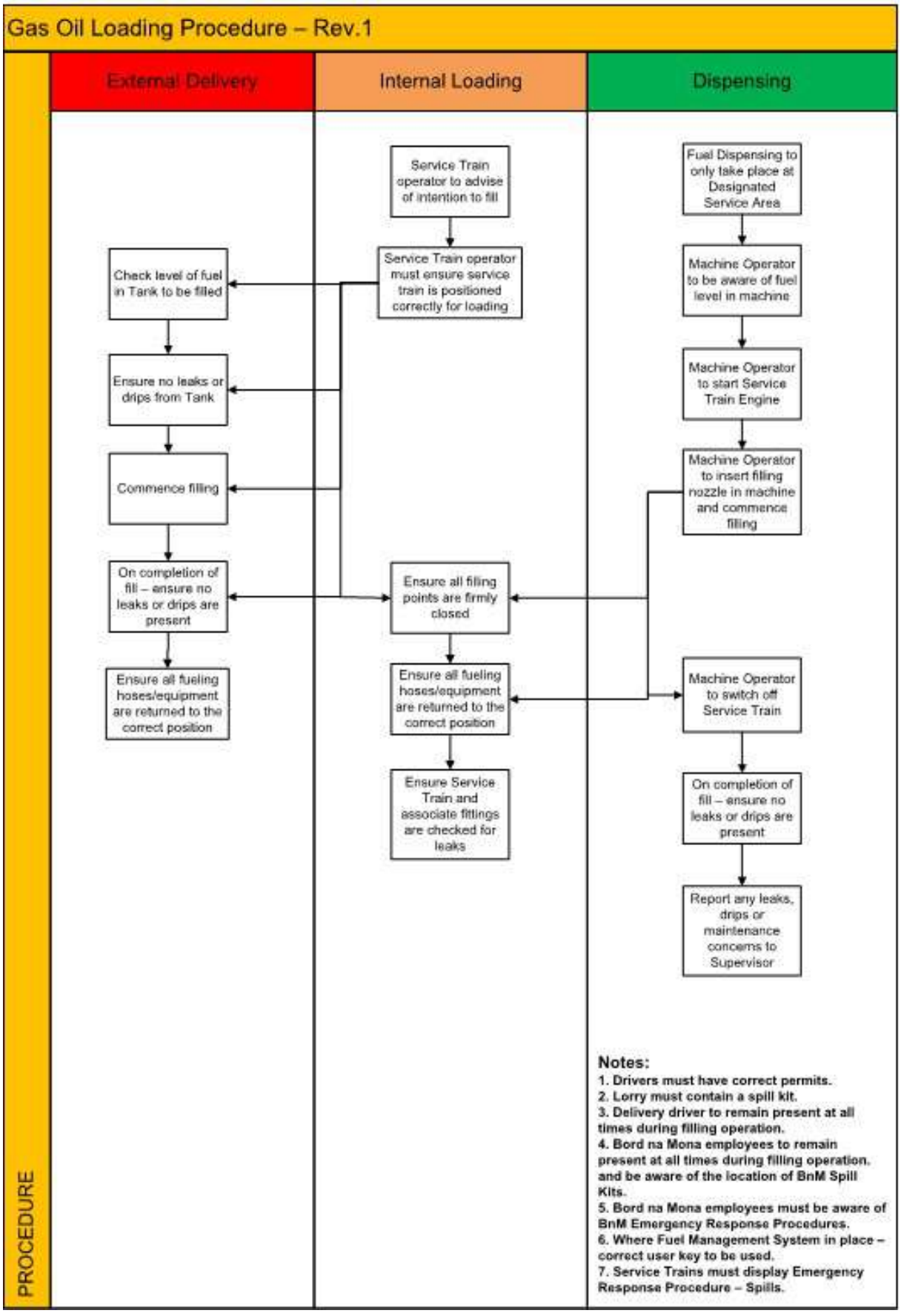
4.1 All relevant operatives to receive in house training, dealing with their responsibilities in maintaining an IPC Licence.

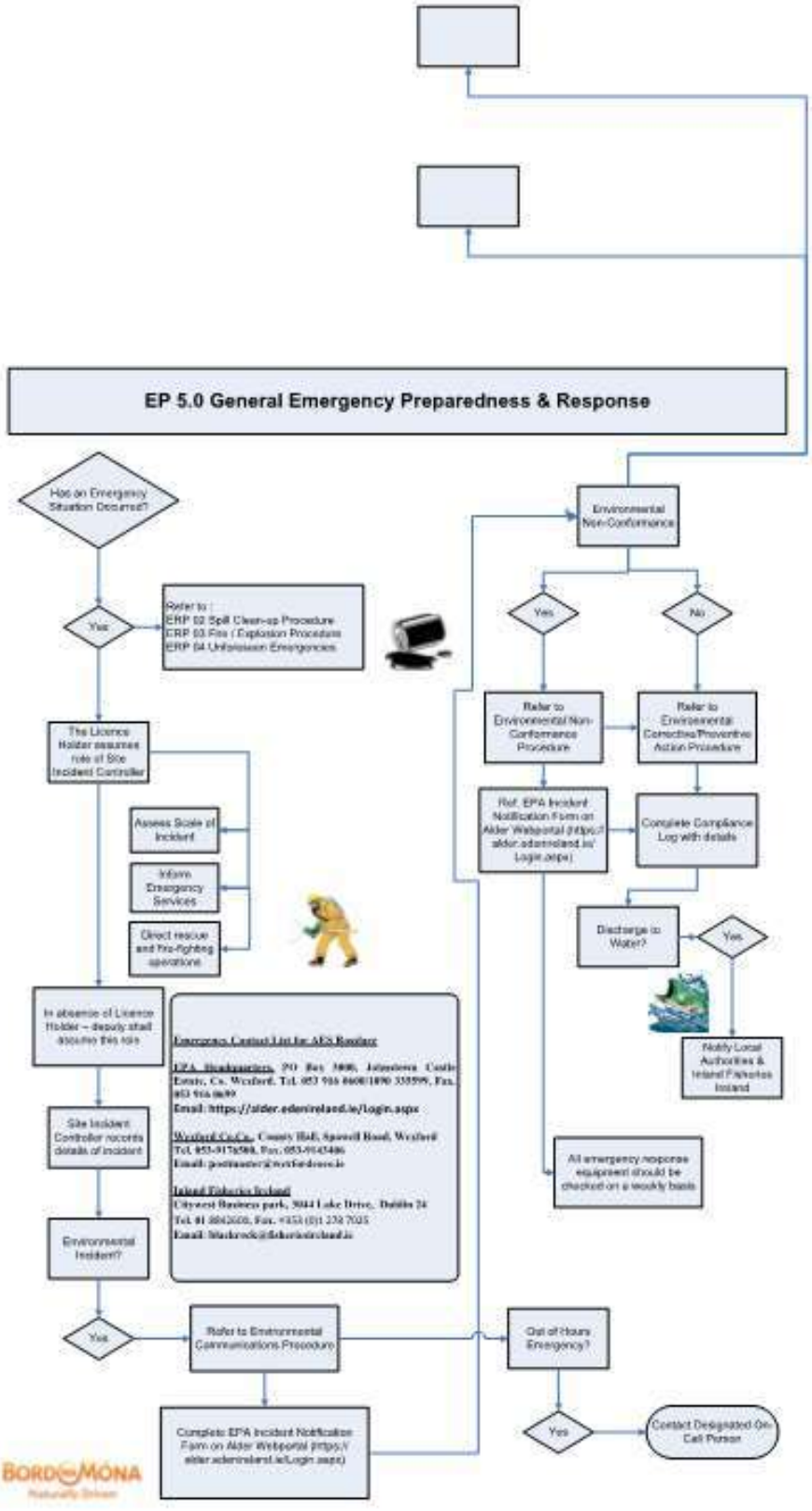
4.2 All relevant personnel to be informed of all monitoring locations at their facility.

4.3 All personnel to be informed of any relevant legislation involving environmental matters.

4.4 All trainees to complete a training assessment form, a record of which will be maintained on Oracle and retained on site.

4.5 The training procedure will be reviewed as per Group Training Department policy.


Gas Oil Loading Procedure – Rev.1
PROCEDURE
External Delivery
Internal Loading
Dispensing
Service Train operator to advise of intention to fill
Service Train operator must ensure service train is positioned correctly for loading
Check level of fuel in Tank to be filled
Ensure no leaks or drips from Tank
Commence filling
On completion of fill – ensure no leaks or drips are present
Ensure all fueling hoses/equipment are returned to the correct position
Ensure all filling points are firmly closed
Ensure all fueling hoses/equipment are returned to the correct position
Ensure Service Train and associate fittings are checked for leaks
Fuel Dispensing to only take place at Designated Service Area
Machine Operator to be aware of fuel level in machine
Machine Operator to start Service Train Engine
Machine Operator to insert filling nozzle in machine and commence filling
Machine Operator to switch off Service Train
On completion of fill – ensure no leaks or drips are present
Report any leaks, drips or maintenance concerns to Supervisor
Notes:
1. Drivers must have correct permits.
2. Lorry must contain a spill kit.
3. Delivery driver to remain present at all times during filling operation.
4. Bord na Mona employees to remain present at all times during filling operation. and be aware of the location of BnM Spill Kits.
5. Bord na Mona employees must be aware of BnM Emergency Response Procedures.
6. Where Fuel Management System in place – correct user key to be used.
7. Service Trains must display Emergency Response Procedure – Spills.


EP 5.0 General Emergency Preparedness & Response
Has an Emergency Situation Occurred?
Yes
Refer to :
ERP 02 Spill Clean-up Procedure
ERP 03 Fire / Explosion Procedure
ERP 04 Unforeseen Emergencies
The Licence Holder assumes role of Site Incident Controller
Assess Scale of Incident
Inform Emergency Services
Direct rescue and Fire-fighting operations
In absence of Licence Holder – deputy shall assume this role
Site Incident Controller records details of incident
Environmental Incident?
Yes
Refer to Environmental Communications Procedure
Complete EPA Incident Notification Form on Alder Webportal (https://alder.edenireland.ie/Login.aspx)
Environmental Non-Conformance
Yes
No
Refer to Environmental Non-Conformance Procedure
Refer to Environmental Corrective/Preventive Action Procedure
Ref. EPA Incident Notification Form on Alder Webportal (https://alder.edenireland.ie/Login.aspx)
Complete Compliance Log with details
Discharge to Water?
Yes
Notify Local Authorities & Inland Fisheries Ireland
All emergency response equipment should be checked on a weekly basis
Out of Hours Emergency?
Yes
Contact Designated On-Call Person
Emergency Contact List for AES Roadway
EPA Headquarters, PO Box 3000, Johnstown Castle Estate, Co. Wexford. Tel. 053 916 0600/1890 335599, Fax. 053 916 0699
Email: https://alder.edenireland.ie/Login.aspx
Wexford Co.Co., County Hall, Spawell Road, Wexford
Tel. 053-9178500, Fax. 053-9143406
Email: postmaster@wexfordcoco.ie
Inland Fisheries Ireland
Citywest Business park, 3044 Lake Drive, Dublin 24
Tel. 01 8842600, Fax. +353 (0)1 278 7025
Email: blackrock@fisheriesireland.ie
BORD NA MÓNA
Naturally Driven

# *Bord na Mona Group*
# *Litter Action Plan*

## *Preamble*

Bord na Mona Group operates four main businesses:

- Energy

Peat extraction for power generation/solid fuel and horticultural applications.

- Fuels

Manufacture of solid fuels/Sales and Distribution.

- Horticulture

Manufacture/Distribution of growing media products.

- Environmental

Design, manufacture and installation of filtration products for water/air. It also provides Environmental Consultancy and Laboratory Services.

The company has multiple locations and extensive land holdings (circa. 80,000 Ha). It's various bogs and factories are subject to licensing by the Environmental Protection Agency. (IPC Licence's 499 – 507).

Under these licence's, Bord na Mona is obliged to document and operate specific waste management procedures and does so diligently and successfully.

However, there are situations where waste materials can become litter and set out hereunder are the company's plans for dealing with this material, some considerable proportion of which is not generated by the company itself (unauthorised dumping by members of the public)

## *Litter Action Plan*

**Objective**

Focus on the prevention and control of litter arising from Bord na Mona's activities and that arising from unauthorised dumping on and around its property. It also focuses on the good housekeeping of its buildings and land.

The relevant sections of the Litter Pollution Act 1997, that are relevant to Bord na Mona's activities are sections 3 (Prohibitions relating to litter) and 6 (Duty of occupiers etc. regarding littering).

**Scope**

The scope of this plan covers all lands and premises owned by Bord na Mona.

**Responsibility**

The implementation of the Litter Action Plan is the responsibility of the General Manager and/or his/her deputies at each location.

**Relevant Documentation**

Governments *Litter Action Plan* 2001
Litter Pollution Act, 1997 (Sections 3 & 6)
Integrated Pollution Control Licences.
Waste Management Regulations 1998

**Key Action**

The key action in the Government Litter Action Plan, relevant to Bord na Mona is set out below:

- *"Consistent with the emphasis in the Forum report on the public sector leading anti-litter action by example, public authorities will be asked to develop litter action plans for their own organisations"*

## Action Items

1. Bog Areas (Loose Polythene & other litter)

Ensure of the immediate collection of polythene and other litter
A litter watch will be included in the fortnightly inspections and recorded as part of the requirements of the IPC Licence.

2. Premises.

All premises will operate a daily clean-up regime. Litter bins, if not already provided will be placed at appropriate locations on the site.
A painting programme will be maintained for all buildings.

3. Scrap machines.

A programme of dismantling and recycling scrap machines will be put in place. It will take the form of a quarterly inspection of all redundant machines, where items for scrapping/recycling will be highlighted for dismantling and removed to an appropriate metal recycler.

4. Unauthorised Dumping.

   a) Any incidents of littering and illegal dumping by members of the public on Bord na Mona property or public access roads to the bog, will be reported to the General Manager and/or Environmental Co-ordinator.

   b) The Litter warden for the area will be contacted, and the details passed on.(see attached list of wardens.

   c) Arrangements will be made to meet with the Litter Warden, at the location of the illegal dumping.

   d) If illegal dumping continues to be a problem at this location, the erection of signs, etc will be discussed with the Local Authority.

   e) All incidents of littering/unauthorised dumping will be recorded as part of the Bord na Mona's IPC Licence's. These inspections occur on a fortnightly basis as part of the works inspections/monitoring.

   f) "Hot Spots" for illegal dumping will be observed/monitored during the day to day operations and reported to the Local Authority.

Training & Awareness

This action plan will be circulated to all relevant personnel and will form part of the Annual Environmental Training Programme.
This document will be reviewed annually and updated as necessary.

Local Authority Litter Wardens:

| County | Director of Services | Litter Wardens |
|---|---|---|
| Laois Co Council<br>Áras An Chontae<br>Portlaoise<br>**Co Laois**<br><br>057 8664000 | • Kieran Kehoe | • John Rogers<br>0502 64000/087 9473159<br>(*Western region*)<br>• John Ging<br>0502 64000/086 7988312<br>(*Central region*)<br>• Emily Doyle<br>(*Eastern region*) |
| Offaly Co Council<br>Aras an Chontae<br>Charleville Rd<br>Tullamore<br>**Co Offaly**<br><br>057 9346800 | • Sean Murray | • Michael Malone<br>0506 46800<br>(*Ferbane/Tullamore area*)<br>• Padraic Minnock (*Birr/Ferbane area*)<br>• Paul Fogarty (*Tullamore area*) |
| Kildare Co Council<br>St Mary's<br>Naas<br>**Co Kildare** | • Joe Boland | • Noel Geoghan<br>086 2848563<br>• Peter Mahoney<br>• Pat Conway |

| | | |
|---|---|---|
| 045 980200 | | • Philip Baxter<br>086 8285577 |
| Westmeath Co. Council<br>Administrative Offices<br>Co. Buildings<br>Mullingar<br>**Co Westmeath**<br><br>044 9332000 | • David Hogan | • Larry Murphy<br>*(Mullingar area)*<br>• Olive Manning<br>(*Mullingar area*)<br>• Lorraine Derwin<br>(*Athlone area*) |
| North Tipperary County Council,<br>The Courthouse,<br>Nenagh,<br>**Co Tipperary (North Riding)**<br><br>067 44500 | • Jimmy Harney | • Thomas Sheehan<br>087 4194540<br>• Francis Casey<br>(*Littleton area*) |
| South Tipperary County Council<br>Main Office<br>South Tipperary Co Council,<br>Co. Hall,<br>Emmet Street,<br>Clonmel<br>**Co Tipperary (South Riding)**<br><br>052 6134455 | • Jimmy Harney | • Matthew Peters<br>087 9192097<br>• Anthony Wynne<br>087 9192096 |
| Aras an Chontae<br>Castlebar,<br>**Co Mayo**<br><br>094 9024444 | • Martin Keating | • Gary Smith<br>087 2318746<br>• Josephine Armstrong<br>087 9192839 |
| Courthouse,<br><br>Roscommon<br>**Co Roscommon**<br><br>0906 637100 | • Majella Hunt | • Annette Donlon<br>0903 37100<br>(*Athlone/Roscommon/Castlerea area*)<br>• Danny McHuge<br>(*Boyle/Ballangare/Strokestown area*) |
| Aras an Chontae,<br>Great Water St,<br>Longford<br>**Co Longford**<br><br>043 3346231 | • Jack Killgallen | • Declan Murtagh<br>(*North region*)<br>• Brigid Devine<br>(*South region*)<br>• Padriac McGee<br>(*Town area*) |
| Galway County | • Jim Cullen | • Patrick Roche |

| | | |
|---|---|---|
| Council<br>PO Box 27,<br>County Hall,<br>Prospect Hill,<br>Galway<br>**Co Galway**<br><br>091 509000 | | 091 509302<br>• David Kelly<br>091 509302 |

# Local Authority Contact Info

# Relating to IPC Incidents

**Local Authorities**

**Roscommon:** Kieran Madden – 0906637185 – environment@roscommoncoco.ie

**Meath:** environment@meathcoco.ie

**Westmeath:** environment@westmeathcoco.ie

**Longford:** environment@longfordcoco.ie

**Kildare:** environ@kildarecoco.ie (Note: environ in address)

**Galway:** adolan@galwaycoco.ie / environment@galwaycoco.ie

**Laois:** Environmental Protection Section 057 8664000 / environmentadmin@laoiscoco.ie

**Tipperary:** Mark for the attention of Environment section and send to customerservises@tipperarycoco.ie

**Inland Fisheries Ireland**

For all the upper Shannon areas, covering from Athlone to north Leitrim, Cavan, Meath (from Oldcastle and the upper Inny) Inny catchment, Mullingar lakes area, Lough Ree and River Suck areas the contact person is Jane Gilleran Jane.gilleran@fisheriesireland.ie (087 6878568)

For the lower Shannon covering Offaly (Brosna system, Little Brosna, Tullamore, Camcor, Nenagh, Lough Derg catchments (among others outside the areas you mention), the contact is Michael Fitzsimons michael.fitzsimons@fisheriesireland.ie (087 2473708). In Michaels absence please contact Lorraine O Donnell on Lorraine.odonnell@fisheriesireland.ie (087 9285892)

Awaiting remainder ?

**National Parks and Wildlife**

nature.conservation@chg.gov.ie

The above should be included in correspondence to the Agency in relation to the following.

1. **EPA** – Any incident (Oil Spill/Fire Etc), Exceedance of an emission limit or Trigger level.
2. **Fisheries** – Oil spills affecting rivers/outfalls.
3. **Local Authority** – Oil spills affecting rivers/outfalls and fires involving emergency services.
4. **National Parks and Wildlife Service** – Any Incident reported to the EPA that impacts on a SAC, NHA, Natura 2000 site.

# PROGRAMME FOR PUBLIC INFORMATION

**Purpose:** To define how Bord na Mona Peat manages the communication of Environmental information concerning the facility with external parties.

**Scope:** This procedure applies to ALL Bord na Mona Peat IPC Licences.

**References:** Data Protection Act 1988 with 2003 amendment
IPC Licence Condition 2.7, 2.7.1

**Procedure:**

1. All external, out-going communication of environmental issues, unless specifically outlined below, must be approved by the Licence Holder. If the Licence Holder is unavailable, then the Environmental Co-ordinator may approve the communication.

2. Certain environmental information, as detailed below, will be available to external parties. Only 1 copy of each document is available for view at any time.

3. It is recommended that visitors should phone or write in advance, as this will facilitate the company to arrange for the necessary staff and documents to be available. However, a prior appointment by any member of the public is not necessary.

4. Viewing time is restricted to normal office hours (8.00am to 3.30pm Mon to Thur, 8.00am to 2.30 Friday).
   No more than 1 hour of staff time is available for assistance of queries per day.

5. Visitors may ask for the Site Manager. They are requested to sign in at reception, giving their name, address, and reason for their visit.

6. Access is restricted to the Meeting Room, and the information will be brought to this designated room for viewing. The original documents are not to be removed, altered or damaged in any way.

7. A copy of the following files will be kept in Document Control and are available to the public as outlined above:

   - IPC licence
   - Annual Environmental Reports
   - Environmental Monitoring Reports
   - Environmental Management System

8. Every effort shall be made to keep the files up-to-date. The information provided will comply with legal requirements and the requirements of the IPC licence, but confidential and commercially sensitive information will be restricted and Bord na Mona Peat must comply with the Data Protection Act 1988 with 2003 amendment.

**_____**
**Resource Manager**

**Date:_____**

# Restoration & Aftercare Plan

## 1. Purpose

The purpose of this procedure is to address Condition 10, regarding the Restoration & Aftercare requirements of IPC Licence P0499-01 to P0507-01

## 2. Scope

The scope of this procedure is contained in the Bord na Mona Ecology Department's Restoration & Aftercare Rehabilitation draft plans.

## 3. Responsibility

The implementation of the Restoration & Aftercare plan is the responsibility of the Ecology Department in association with the Environmental Department, Works Management and in consultation with the Land Management Department.

## 4. Procedure

4.1 Please refer to the Bord na Mona Ecology Department's Restoration & Aftercare Rehabilitation draft plans.

4.2 This plan is to be reviewed on an annual basis.

# Service Level Agreement (SLA)

## For the provision of a fully Managed Waste Collection, Recycling and Disposal Service

## Between

## AES Bord Na Móna

## and

## Bord Na Móna Peat

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# 1. Objectives and Scope

This document represents a Service Level Agreement ("SLA") between Advanced Environmental Solutions (Ireland) Limited (AES) and Bord Na Móna Peat; setting out the waste management services provided by AES to Bord Na Móna Peat, the communication lines, responsibilities and response times associated with providing that service.

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This SLA:

- Serves as a reference document
- Is a service SLA which is an agreement between the following:
  - AES
  - Bord Na Móna Peat

  Is required to clarify the service expectations of Bord Na Móna Peat and determine the services requirements for AES.
- Defines the key service targets and responsibilities of all parties.
- Defines the communication for queries or complaints.
- Reflects the responsibilities of stakeholders and all parties to the agreement.

## 2. SLA Duration and Review

This SLA is valid throughout the duration of the current waste management contract between Bord Na Móna Peat and AES.

The AES Account Manager, Paul Curtis, is responsible for maintaining this SLA which will be reviewed at least once per year. The Account Manager, Paul Curtis, will also discuss, document and agree any requested changes to this SLA before any such changes may be made to the SLA.

## 3. Customer Service Responsibilities

*This section sets out the specific service detail, responsibilities and timelines for completion of tasks.*

The AES Customer Services Team is responsible for the following:

- Administering sales orders and day-to-day invoicing
- Produce Monthly Waste Reports
- Changes to Scheduled Services

The AES Customer Sales and Account Management Team is responsible for the following:

- Monitor the progress of delivery and service implementation
- Respond to additional sales enquiries outside the contract scope
- Address customers' Head Office queries
- Attend regular review meetings

For all Customer Service queries please contact:
Central Accounts Newbridge
045 439042 centralaccounts@aesirl.ie

**Paul Curtis** – Account Manager for Bord Na Móna Peat
087 0508582 pcurtis@aesirl.ie

The AES Sales Support for the Bord Na Móna Peat contract is managed from the AES Head Office, Newbridge which is operational from 8.30am to 5.30 pm Monday to Friday.

The Newbridge office is available to assist with the following:

1. Service requests
2. Equipment requests and repairs
3. Service complaints

### 3.1 Services provided by AES to Bord Na Móna Peat:

The Service Request Document- ie Advice Note Number is attached as an appendix (Appendix 1) to this SLA. This is a dynamic document and may be subject to change over the Term of this Contract as agreed by Bord Na Móna Peat and AES. However, additional service requests outside the scope of the Schedule of Services are charged at the applicable rates and agreed by Bord Na Móna Peat and AES.

The metal process will remain the same for any metal collected in skips & roll on's that price is based on the current market value of the previous month in Ireland. If sites have larger quantities and rather than use skips there is a better price to be had when the metal is collected in bulk by artic & grab but that will be up to each BNM site to manage that. The order is placed the same way they just request artic & grab. Again for this to work we need to be lifting around 15 ton. The monthly metals report can be circulated to the email addresses below if the price can't be inserted into the report, the rate will be included in on the email.

## 3.2 Equipment Service Requests:

The Schedule of Services & Equipment may be subject to change over the Term of this Contract as agreed by Bord Na Móna Peat.

**Equipment Breakdown and Repair**

AES Ireland Limited maintain a regular equipment maintenance programme. Maintenance of the Equipment (see Equipment Schedule) will be completed on a six monthly basis. This service will include the replacement of all defective parts, oil changes, etc. for all equipment.

Should Bord Na Móna Peat require an emergency repair please phone the AES Head Office, Newbridge on 045 439066; informing the attendant of a Level 1 Issue as per the Issue Prioritisation Table in section 7 of this SLA document.

**Repair Procedure**

Calls for repairs of equipment should be made to the AES Head Office, Newbridge as per the above but should be placed with a Priority Level 1 as per the above. Priority 1 issues received during normal working hours will be responded to immediately and an engineer will be contacted within the hour. Once we have an understanding of the issue with the equipment, the engineer will determine the on-site response time. Depending upon the nature of the service requirement, an engineer may:

- Come on site to repair the equipment
- Have the equipment removed from site to repair the equipment

AES will keep Bord Na Móna Peat staff fully informed of the issue resolution and the progress of any resulting repair work.

**Costs**

Equipment that is under rental from AES (Ireland) Ltd will be serviced under the same scheduled service and a service report will be issued to the Bord Na Móna Peat for this equipment. All scheduled and emergency call outs for the equipment owned by AES will not incur a charge to Bord Na Móna Peat. If the reason for the cause of equipment malfunction is discovered to be misuse or incorrect treatment of the equipment by Bord Na Móna Peat staff, a charge for the repair will apply.

### 3.3 Additional Service Requests by Bord Na Móna Peat

All Standard Service requests will be logged manually into a call book, which will detail date, time of request, equipment type, location and waste type.

AES will offer Bord Na Móna Peat a 3 day turnaround for Skip Delivery, Exchanges and Collections. All Haz Waste and Weee collections to be completed within 5 working days.

If a service is required urgently then Bord Na Móna Peat shall indicate that at the time of request.

Copy of collection/advice note, containing at least:

- Date
- BNM peat request number
- Type of waste
- Weight
- Signature

on skip collection/exchange to be e-mailed to the original requestor within 48hrs

Additional sales requests should be directed to AES Account Manager, Paul Curtis, who will respond with relevant pricing and service information.

### 3.4 KPIs agreed between AES and Bord Na Móna Peat

In order to track/monitor the quality of the service provision the following monthly KPIs to be established by AES:

1. Turnaroud time from placement of the request to container/skip delivery (criteria: number of skips delivered/exchanged within 3 days as per agreement and outside of the 3 days)
2. Turnaroud time from placement of the request to container/skip delivery (criteria: number of skips delivered/exchanged within 5 days as per agreement and outside of the 5 days for Haz Waste and WEE collections)
3. Number of the delivery notes e-mailed to the original requestor vs number of requests placed
4. Number of reports (waste report and metal report) e-mailed on time as per agreement

Any additional KPIs if required to be discussed between two parties prior establishment

## 4. Invoicing and Credit Control:

The AES Finance Department are responsible for the following tasks:

1. Monthly Invoice
2. Invoice queries
3. Account queries
4. Supply of service dockets, weighbridge dockets, etc, upon request

Invoices will be issued each month for the previous month's service. AES credit terms are strictly 30 days from date of invoice.

Reporting:

A monthly waste report along with a Metal Monthly report will be provided by the 15th of the month. The Reports are to be circulated to the following:-

| Report Title | Email Details | Frequency |
|---|---|---|
| **Bord Na Móna Peat Monthly Waste Report** | ○ DGMstore@bnm.ie<br>○ BWMstore@bnm.ie<br>○ MDMstore@bnm.ie<br>○ LTMstore@bnm.ie<br>○ Nikolas.Sezonovs@bnm.ie | Monthly |
| **Bord Na Móna Peat monthly Metal report** | ○ DGMstore@bnm.ie<br>○ BWMstore@bnm.ie<br>○ MDMstore@bnm.ie<br>○ LTMstore@bnm.ie<br>○ Nikolas.Sezonovs@bnm.ie | Monthly |

**Traceability**

**Wheelie Bins**: Utilising chip and pin technology and weighing systems on our own collection vehicles, AES is able to capture details (including unique bin identification number, weights and time of service) for wheelie bins directly serviced. These figures will be provided in the monthly reports and invoices.

**Skips and Wheelie Bins**: The details of waste streams collected by skips, and containers will be provided via the details recorded on the weighbridge dockets. Service collection dockets and weighbridge dockets are matched using collection reference numbers and the waste types, weights, and collection details are reported to Bord Na Móna Peat through the monthly reports and invoices.

Waste collection details from services provided by our sub-contractor companies will be determined by dockets and invoices provided to AES by each sub-contracting company. AES will provide these service details to Bord Na Móna Peat through the monthly reports and invoices.

## 5. Service Queries or Complaints:

Communication of all service issues must be made to the following:

| Issue type: | Communicated by: | Communicated to: | Communication Method: |
|---|---|---|---|
| All | Bord Na Móna Peat | Central Accounts | centralaccounts@aesirl.ie |
| | | | 045 439042 |

In order to better assist all our customers, AES have developed a prioritisation list by which to determine the level of importance for all concerned. Please familiarise yourself with the below prioritisation table so your particular issue can be dealt with in an appropriate manner.

Communication of Priority 1 issues must be made by phone and email.

Communication of Priority 2-4 issues may be made by email.

## 6. Issue Prioritization:

| Priority type | Description: |
|---|---|
| Priority 1 | Priority 1 issues have a high impact on the levels of customer service, cause high call volumes and need to be addressed immediately but can be resolved within the effected department (e.g. equipment breakdown). |
| Priority 2 | Priority 2 issues have a significant impact on the service offered (e.g. non collection of a customer's bin). |
| Priority 3 | Priority 3 issues are low service impact routine queries (e.g. invoice queries). |
| Priority 4 | Priority 4 issues have little or no impact on the level of customer services offered (e.g. request for tax certificates). |

***Note:*** *The status of issues may change if the issue is not resolved adequately when reported, e.g. repeated non collection of a paid bin may change the status of the issue from a Priority 2 to a Priority 1.*

### Escalation:

Issues may be escalated as follows

| Role: | Issue type: | Timing: |
|---|---|---|
| Paul Curtis – Account Manager | Unresolved Priority 1 | 1 hour |
| Paul Curtis – Account Manager | Unresolved Priority 2 issues | 5 hours |
| Paul Curtis – Account Manager | Unresolved Priority 3 issues | 2 days |
| Paul Curtis – Account Manager | Unresolved Priority 4 issues | 3 days |

## 7. Performance Review:

### Service and Equipment

The regular review meetings between Bord Na Móna Peat and AES will be structured in such a manner as to accomplish the following:

- Review service levels
- Review and/or benchmark recycling progress
- Propose additional recycling initiatives
- Update on upcoming legislation
- Review charges and savings

Review meetings should be once a month for the first three months and quarterly thereafter.

**Paul Curtis** can be contacted with regard to any of the above issues.

### Charges

The Charges will be subject to a review after the first year of the Contract.

## 8. Supporting Responsibilities:

### Environmental

AES will endeavour to ensure that all materials disposed by Bord Na Móna Peat will be treated in line with all appropriate environmental legislation and best practise. As a rule, AES maintain operations in line with the waste hierarchy and utilise landfill as a last resort for otherwise unrecoverable materials.

The Environmental Department ensure that the treatment of various waste streams is compliant with all relevant legislation. They will also ensure that all AES facilities and sub-contract facilities maintain appropriate licences & permits for all waste activities undertaken on behalf of the customer.

The Environmental Department will provide the following functions:

- Ensure provision of service is compliant with all relevant environmental legislation.
- Carry out environmental audits of suppliers and waste outlet facilities.
- Arrange for customer site audits when requested.
- Provide general support on environmental queries.
- Inform AES and customers of any new and/or upcoming environmental legislation.

**Charlotte Green** (045 439 464) is responsible for all environment functions.

### Health and Safety

AES shall ensure that all reasonable steps are taken to ensure the safety of all people and property within the areas covered by the contract. AES maintain a Safety Policy and regularly update our Safety Statement.

The Health & Safety staff ensure services are operated according to health and safety legislation and provide the following functions:

- Carry out appropriate safety audits and risk assessments of customer facilities, especially where machinery and/or equipment will be in operation.
- Ensure all customer staff are trained in the use of machinery and/or equipment.
- Record and track incidents and accidents to appropriate levels.

**Garrett Leech** will be responsible for all Health, Safety and Quality functions.

## Quality Systems

AES has implemented an Integrated Management System Manual incorporating ISO 14001 and OHSAS 18001. In addition, AES has identified the requirements of ISO 9001 and has begun the process for applying for this quality standard across the AES Group.

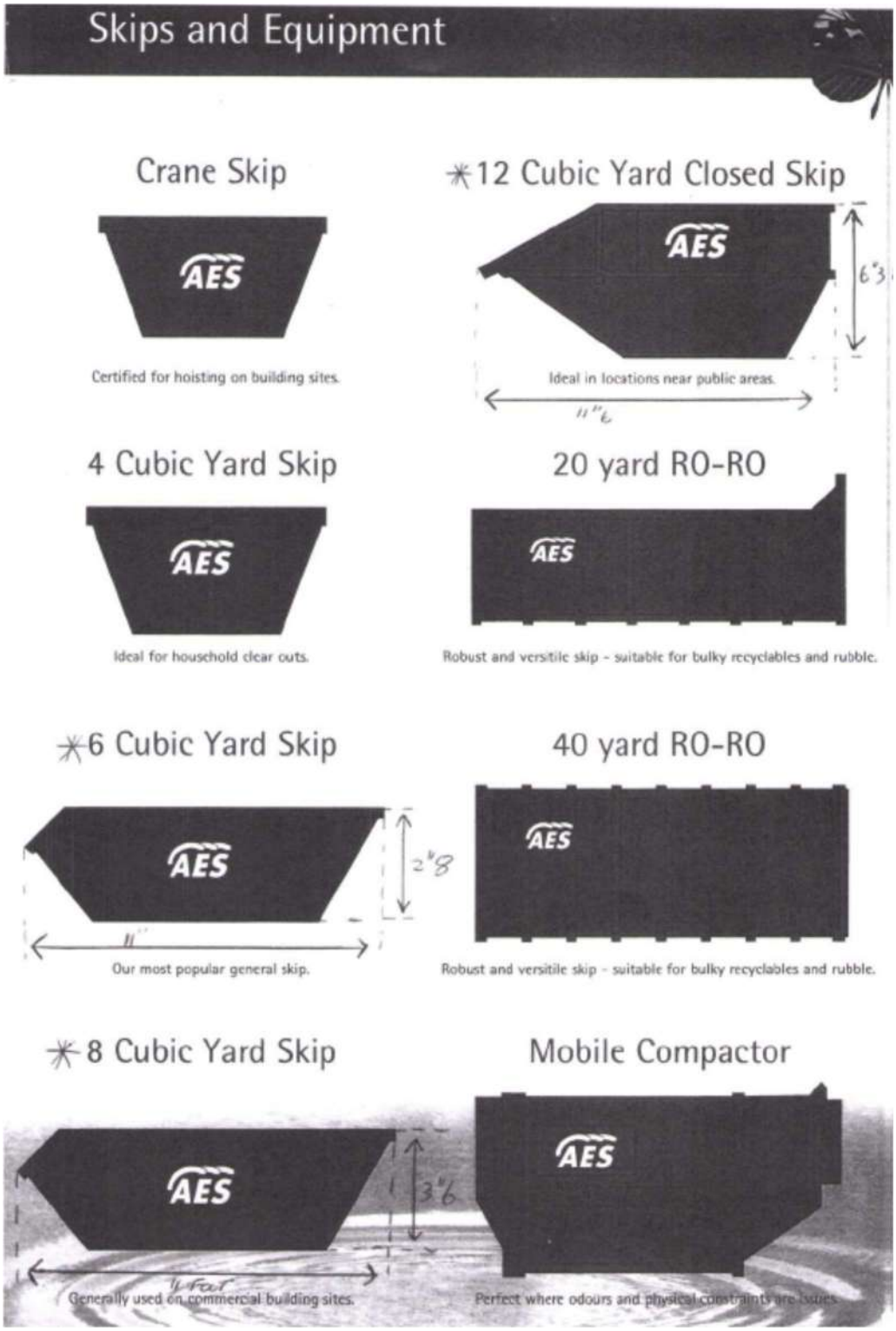
The Quality staff will provide the following functions

- Ensure services are carried out according to AES quality standards and quality management systems.
- Carry out audits of AES's services to ensure compliance with quality management systems.
- Maintain and update AES's quality management manual.

## APPENDIX 1

### BORD NA MONA REQUEST FORM

| BORD NA MONA BLACKWATER WASTE COLLECTION/DELIVERY REQUEST FORM (VER.0.1) IPPC Licence P0502-01 | | | |
|---|---|---|---|
| BNM ADVICE NOTE NO: (HAVE TO BE QUOTED ON ALL DOCUMENTATION) | W21/113 | | |
| WORKS NAME | W21 BLACKWATER | | |
| CONTAINER TYPE | Skip | QUANTITY | 1 |
| WASTE MATERIAL | Steel | COLLECTION Y/N | YES |
| SIZE/TYPE | 12 Cu. Yd. Lift-On OPEN | EXCHANGE Y/N | NO |
| LOCATION/SITE DELIVERY ADDRESS | Clonfert Workshop 03 / Clonfert, Eyrecourt, Co Galway | | |
| CONTACT NAME/ NUMBER | Tom Rigney / 087 9924101 | | |
| DATE REQUIRED | 05/04/2017 | | |
| DATE ORDERED | 04/04/2017 | | |
| REQUESTOR NAME | Brendan Sweeney / 087 7655059 | | |
| BILL TO ADDRESS/CONTACT DETAILS | Bord na Móna. Blackwater, Shannonbridge, Co. Offaly. Ireland., Tel: 090-9674420, 090-9674440, Fax: 090-9674424 Brendan.Sweeney@bnm.ie, Ann.Bennett@bnm.ie | | |


Skips and Equipment
Crane Skip
Certified for hoisting on building sites.
12 Cubic Yard Closed Skip
Ideal in locations near public areas.
4 Cubic Yard Skip
Ideal for household clear outs.
20 yard RO-RO
Robust and versitile skip - suitable for bulky recyclables and rubble.
6 Cubic Yard Skip
Our most popular general skip.
40 yard RO-RO
Robust and versitile skip - suitable for bulky recyclables and rubble.
8 Cubic Yard Skip
Generally used on commercial building sites.
Mobile Compactor
Perfect where odours and physical constraints are issues.

**Date:**_____ **Rev: 1**

# Waste Management Procedure

## 1. Purpose

To define the correct procedure to be followed when requesting a waste collection service from AES regarding removal of all wastes from all sites within the Feedstock group.

## 2. Scope

The scope of this procedure covers all bogs in the Licence areas P0499-01 to P0507-01, and Waste Facilities WL0049-02 and 0199-02. It also covers the requirements of Condition 7 of these IPC licences and is detailed in Bord na Mona Peat/AES Service Level Agreement (SLA) located in xxxxx.

## 3. Responsibility

The implementation of this Procedure is the responsibility of the Resource Manager or his/her deputy.

## 4. Waste Collection Procedure

4.1 All non-hazardous and hazardous waste collection services are as per the SLA.

4.2 On a monthly basis, stores to provide the relevant IPC Licence Coordinator with a copy of all waste receipts for the Waste Management file.

4.3 On an quarterly basis, AES to provide each stores and the IPC Licence Coordinator with a quarterly report as per the SLA.

## 5. Litter Action Plan

5.1 Refer to Bord na Mona Group Litter Action Plan at XXX

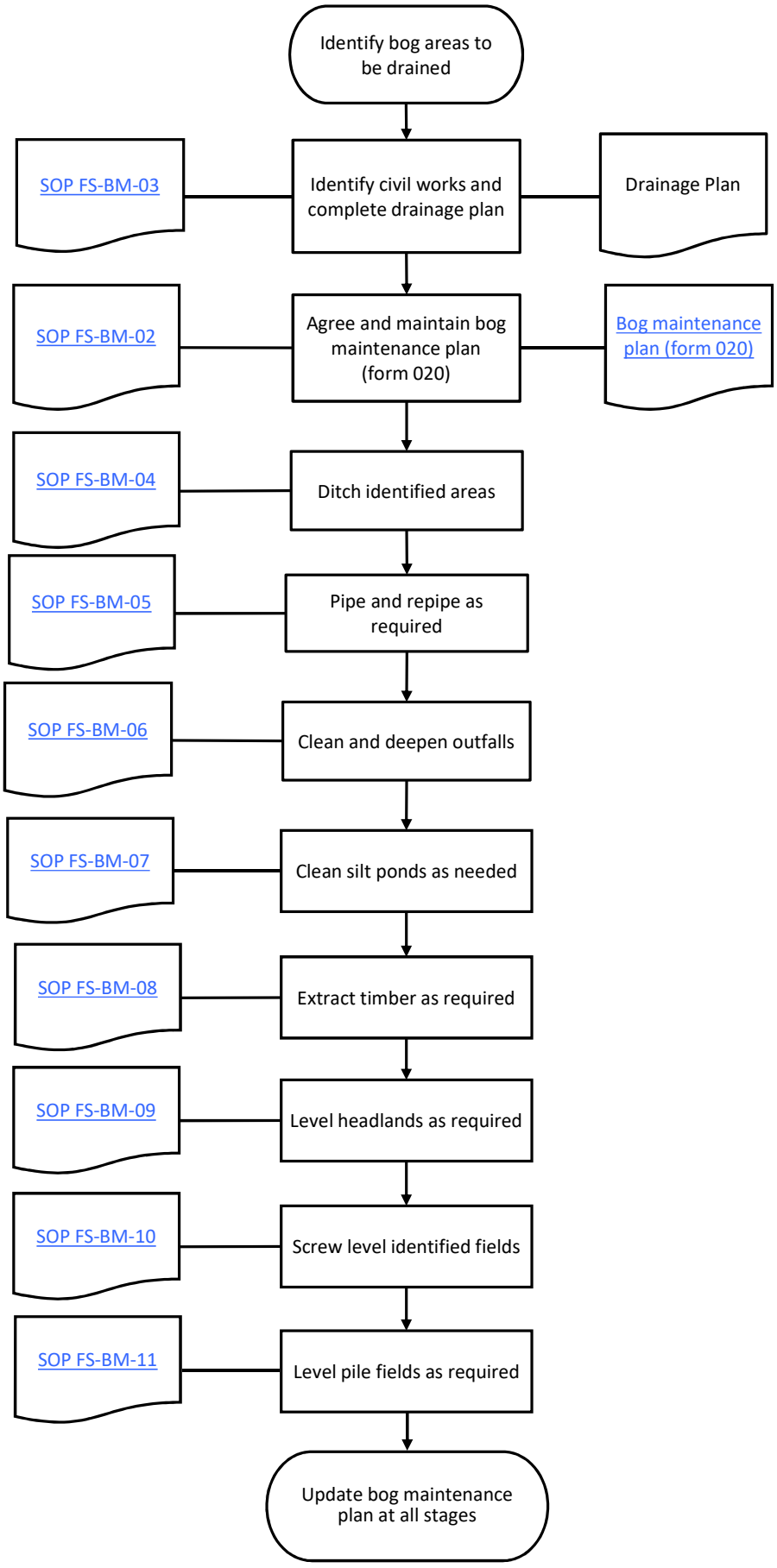
## 6. Poly Recycling Procedure

6.1 Once the pile has been stripped, all rolls should be gathered and brought straight to the dedicated hardstand for collection.

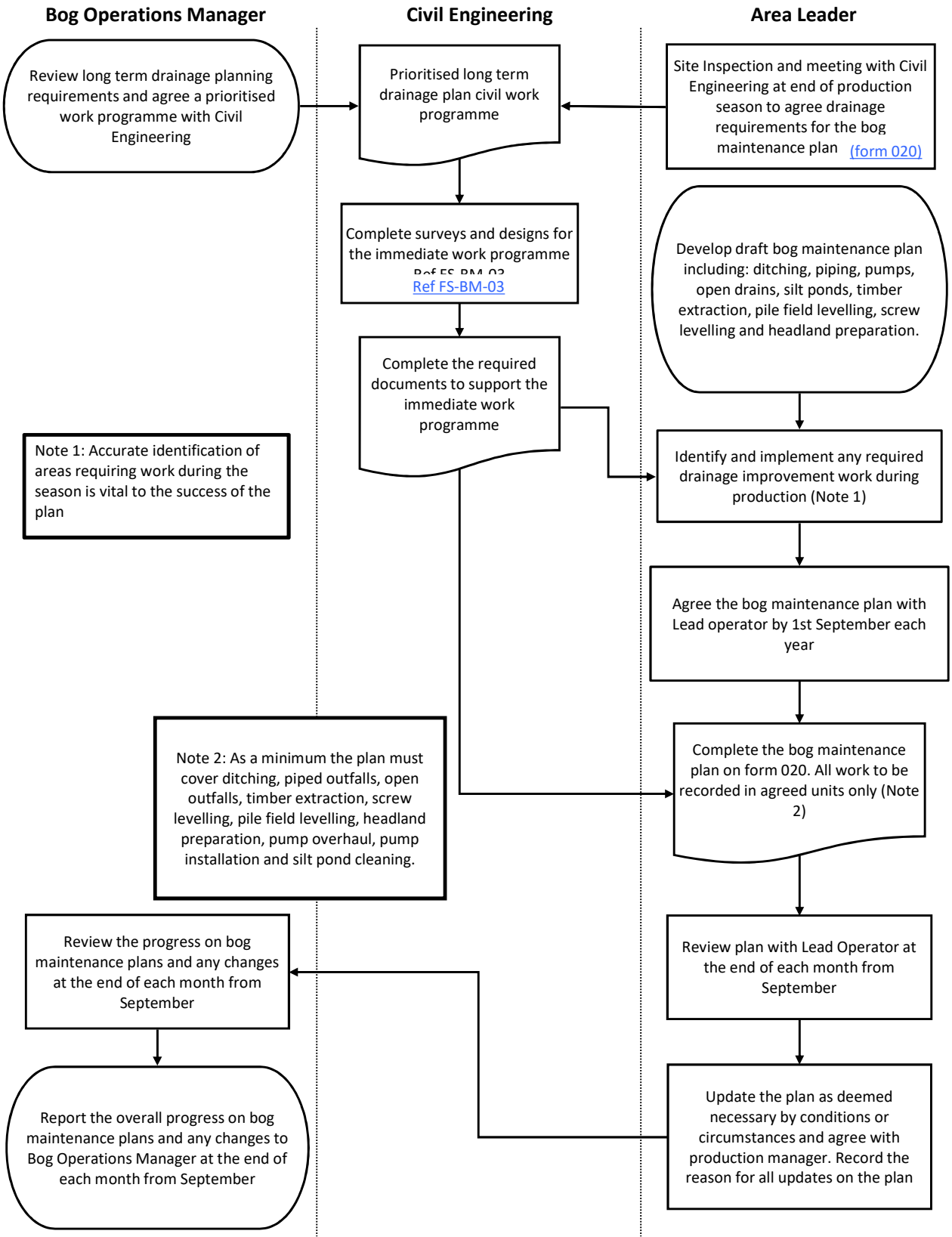
6.2 At the hard stand, stack the rolls neatly within easy reach of a truck with grab arm.

6.3 Once 40 to fifty rolls have been gathered at the hardstand, notify your IPPC Coordinator, who will schedule a collection dedicated collection at this location or will make up a load from this location.

| BORD NA MÓNA Naturally Driven | SOP: FS-BM-01 | Rev: 1 |
|---|---|---|
| Title: Bog Maintenance Flowchart | Approved: PR | Date: 01/11/2012 |



| BORD NA MÓNA Naturally Driven | SOP: FS-BM-02 | Rev: 2 |
|---|---|---|
| Title: Bog Maintenance Plan | Approved: JMcN | Date: 15/07/2016 |




**Additional Notes:**

**It is vital to identify areas with timber problems during production and remove timber and repair the field where possible**

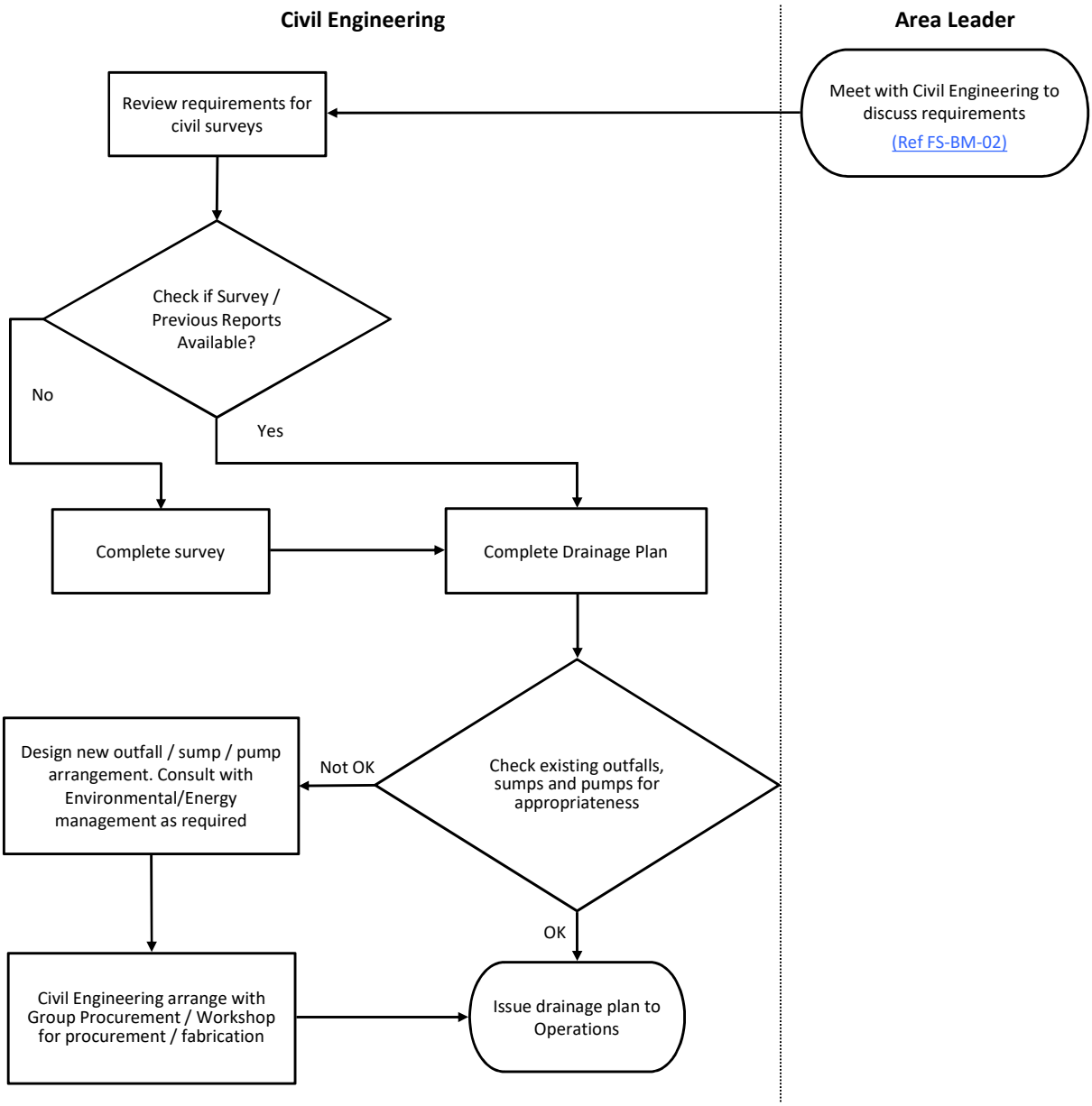
**Headland levelling plan to be based on kilometers of headland in the area.**

**Base screw levelling plan on observations of field profiles during production.**

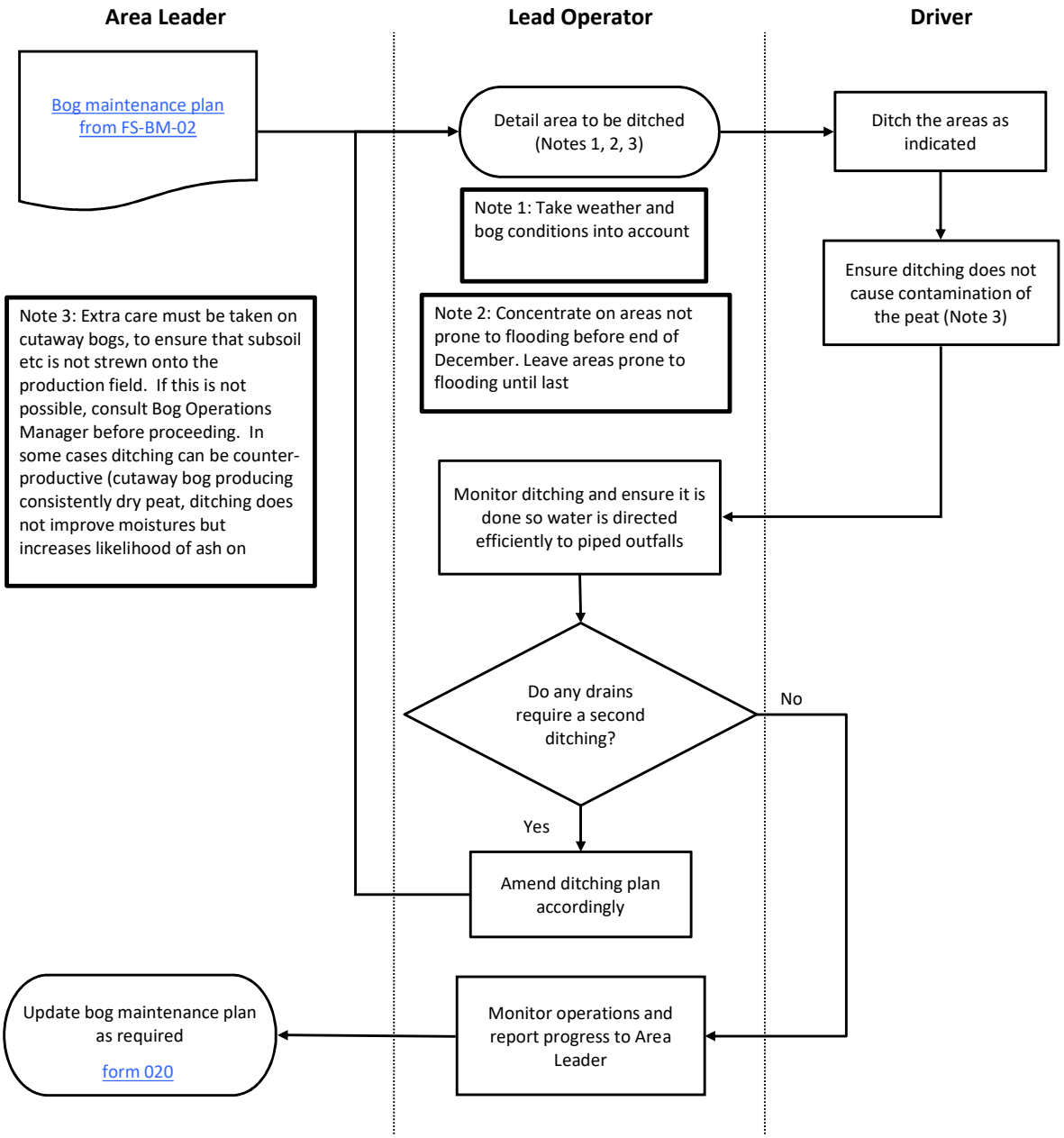
**Pile field levelling plan to be based on height above adjoining field.**

**Any field greater than 1m above adjoining field must be levelled unless lowering the field puts the stock at risk from flooding.**

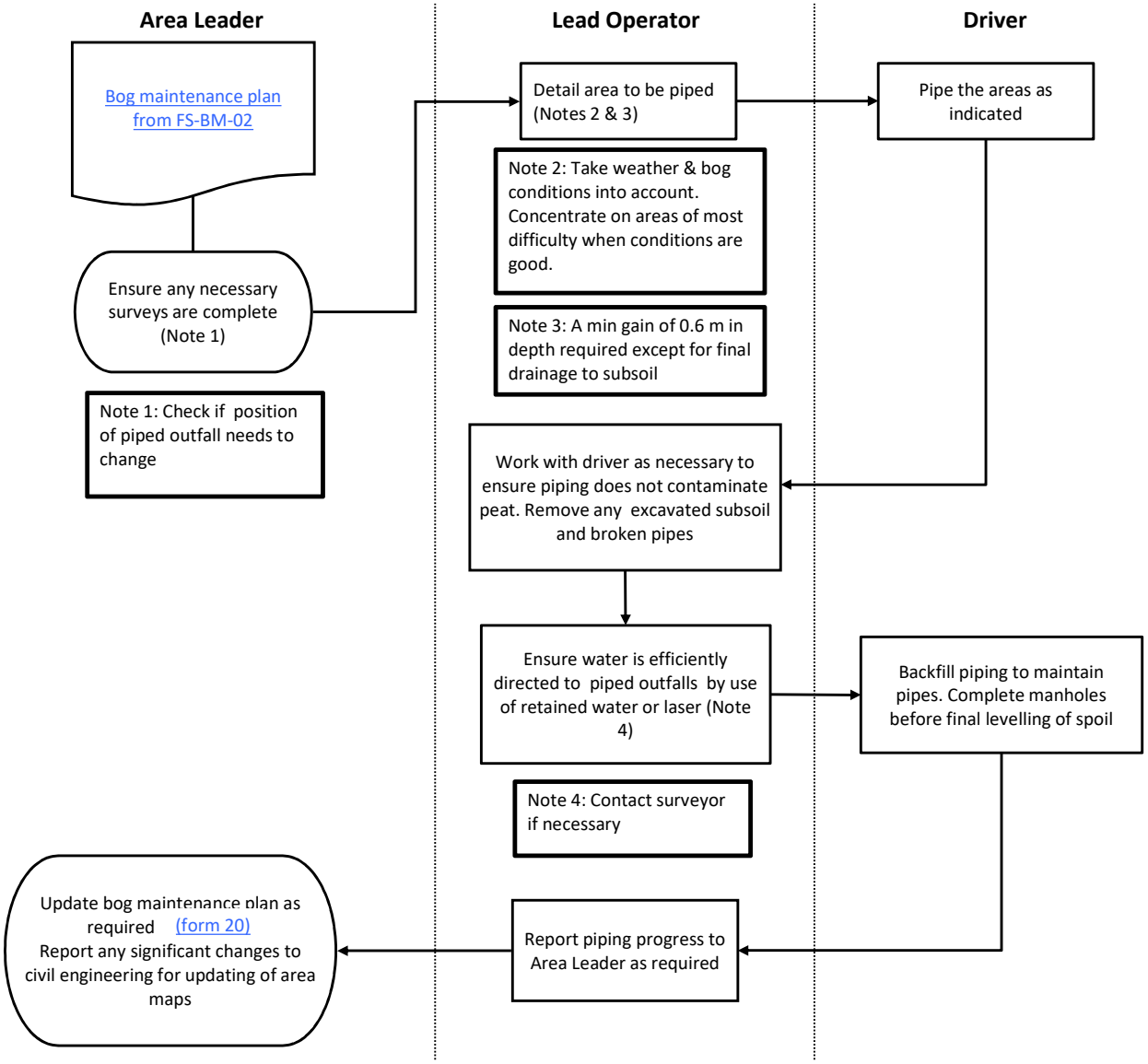
| BORD NA MÓNA Naturally Driven | SOP: FS-BM-03 | Rev: 2 |
|---|---|---|
| Title: Drainage Planning & Implementation | Approved: JMcN | Date: 15/07/2016 |



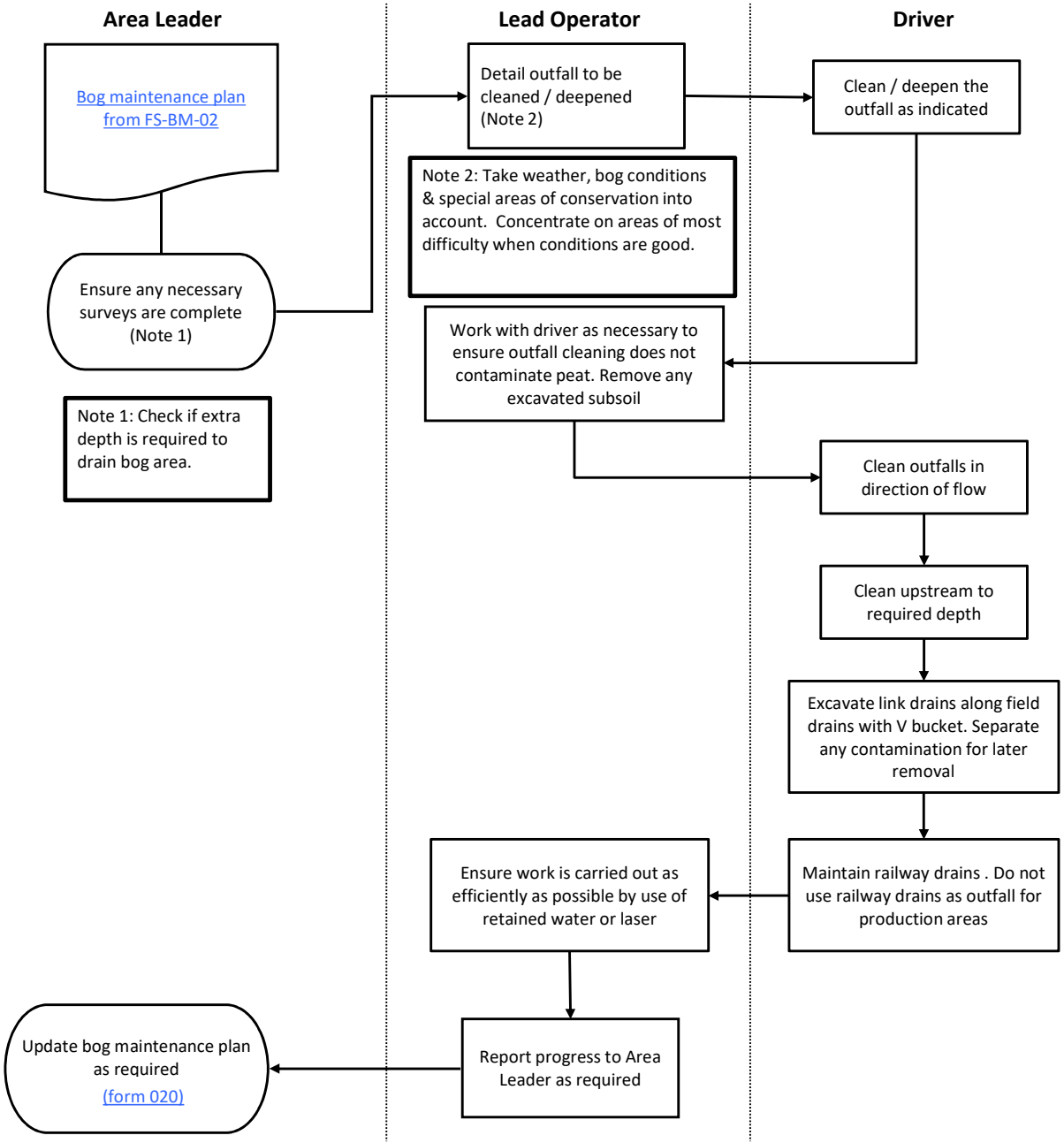
| BORD NA MÓNA Naturally Driven | SOP: FS-BM-04 | Rev: 2 |
|---|---|---|
| Title: Ditching | Approved: JMcN | Date: 09/02/2016 |



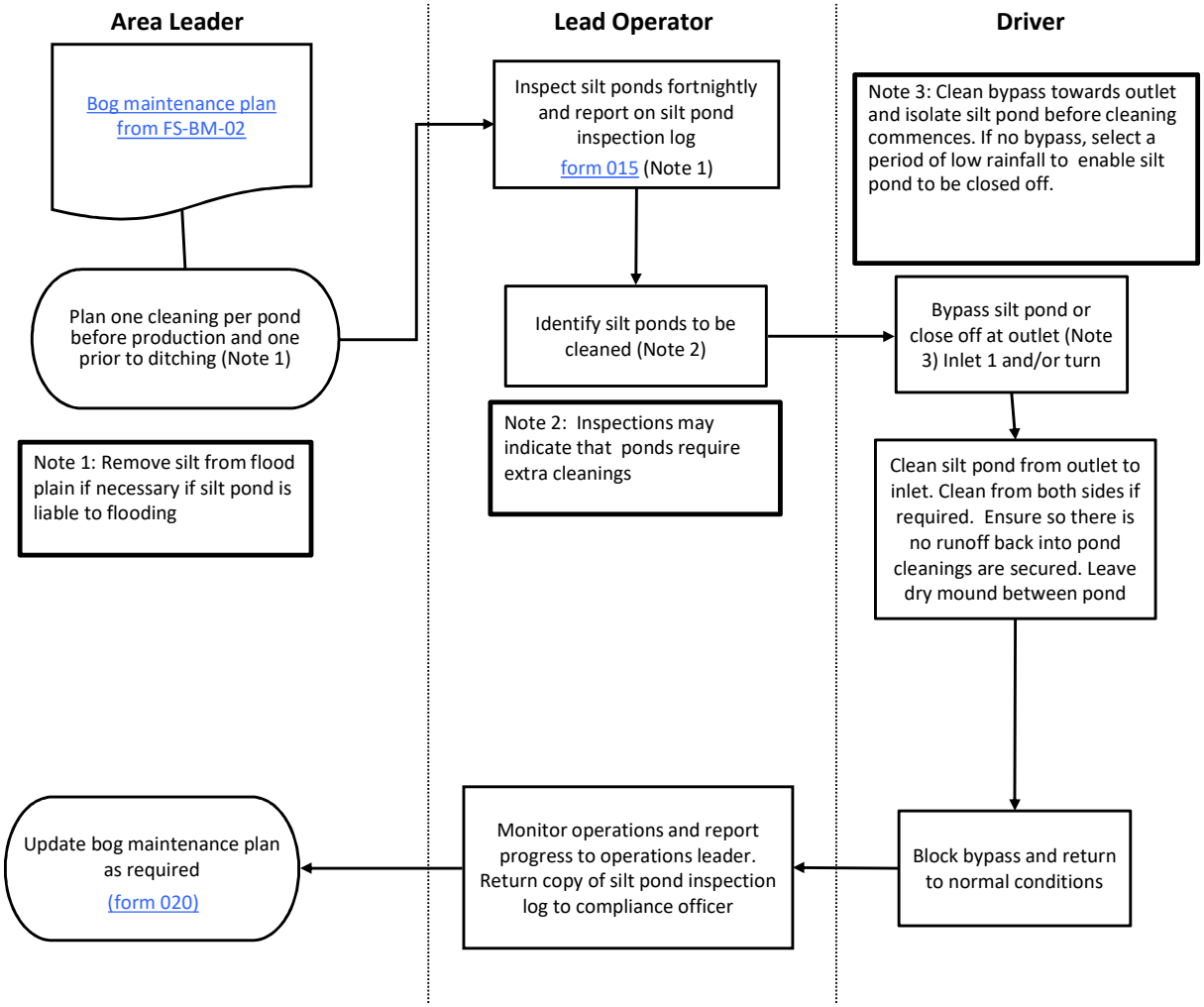
| BORD NA MÓNA Naturally Driven | SOP: FS-BM-05 | Rev: 2 |
|---|---|---|
| Title: Piping & Repiping | Approved: JMcN | Date: 15/07/2016 |



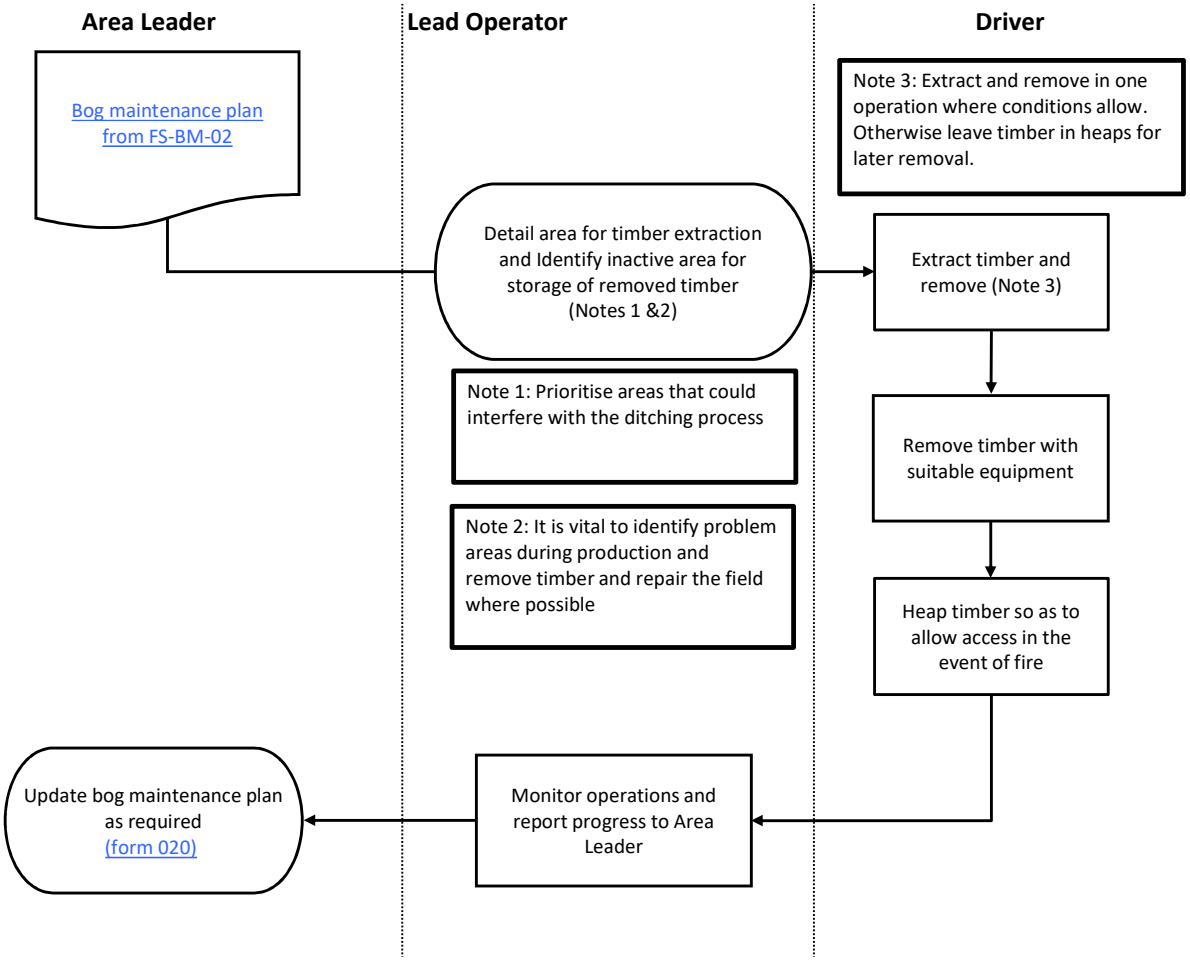
| BORD NA MÓNA Naturally Driven | SOP: FS-BM-06 | Rev: 2 |
|---|---|---|
| Title: Open Outfall Procedure | Approved: JMcN | Date: 15/07/2016 |



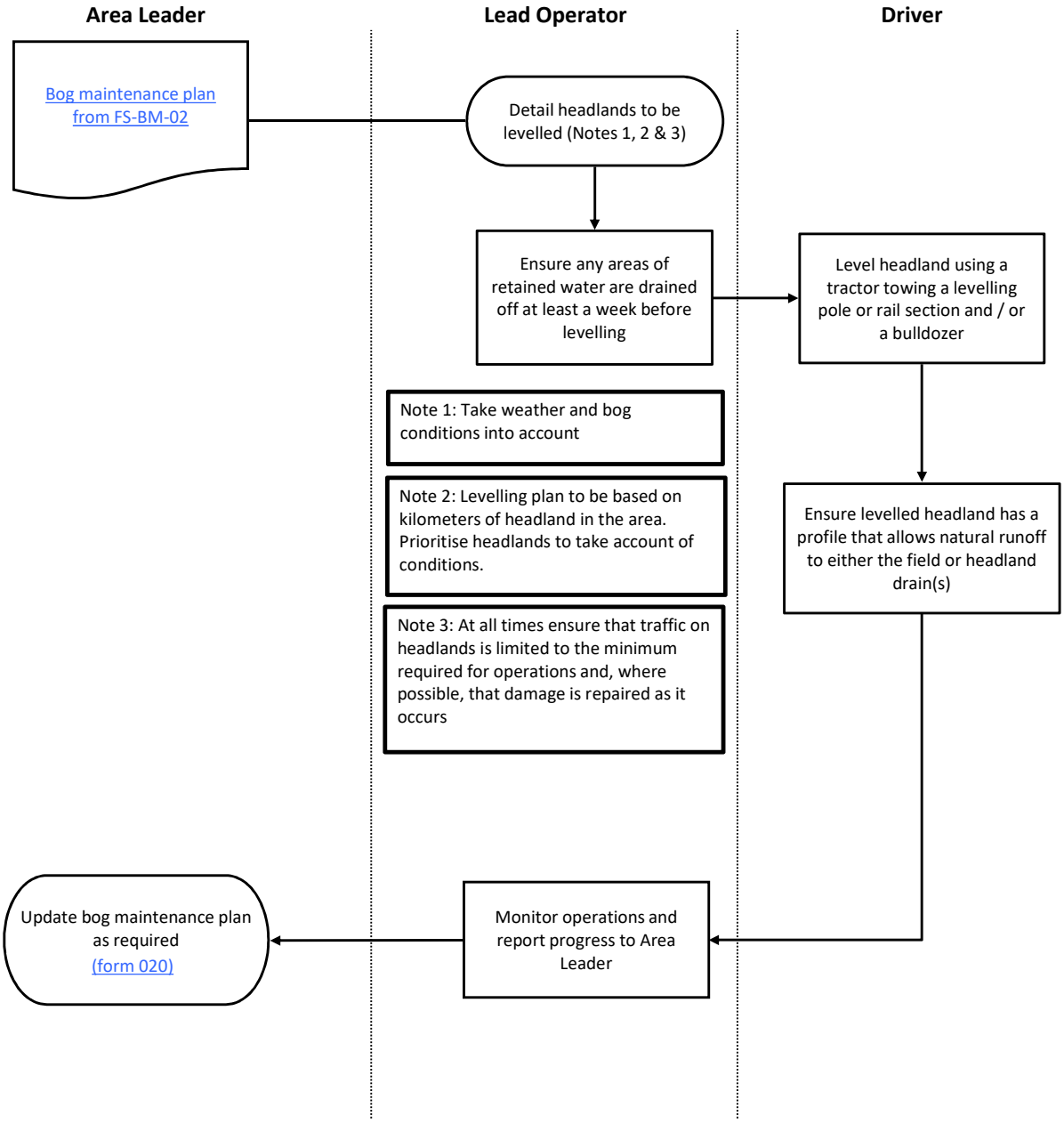
| BORD NA MÓNA Naturally Driven | SOP: FS-BM-07 | Rev: 3 |
|---|---|---|
| Title: Silt Pond Cleaning | Approved: JMcN | Date: 15/07/2016 |



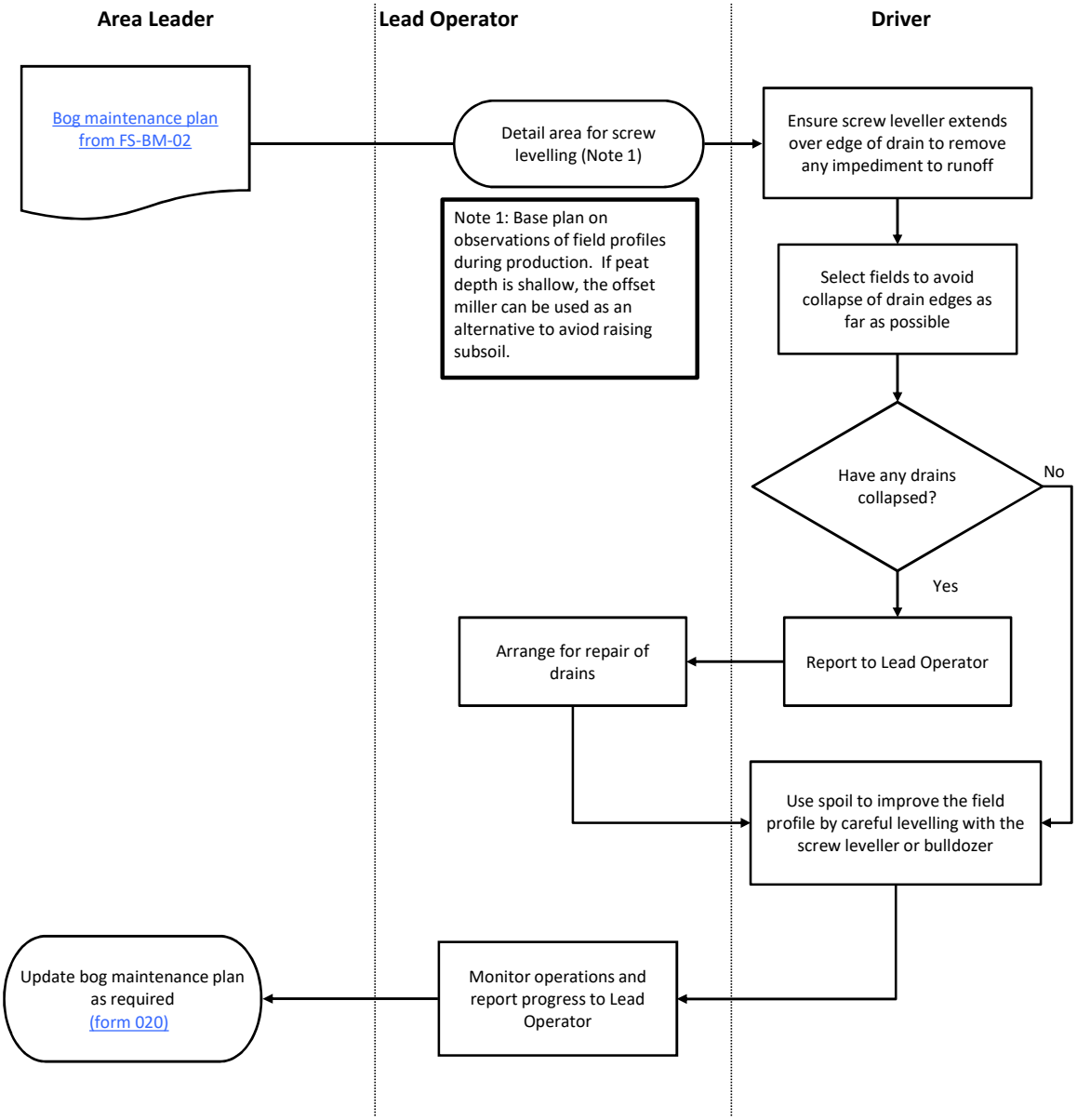
| BORD NA MÓNA Naturally Driven | SOP: FS-BM-08 | Rev: 2 |
|---|---|---|
| Title: Timber Extraction | Approved: JMcN | Date: 15/07/2016 |



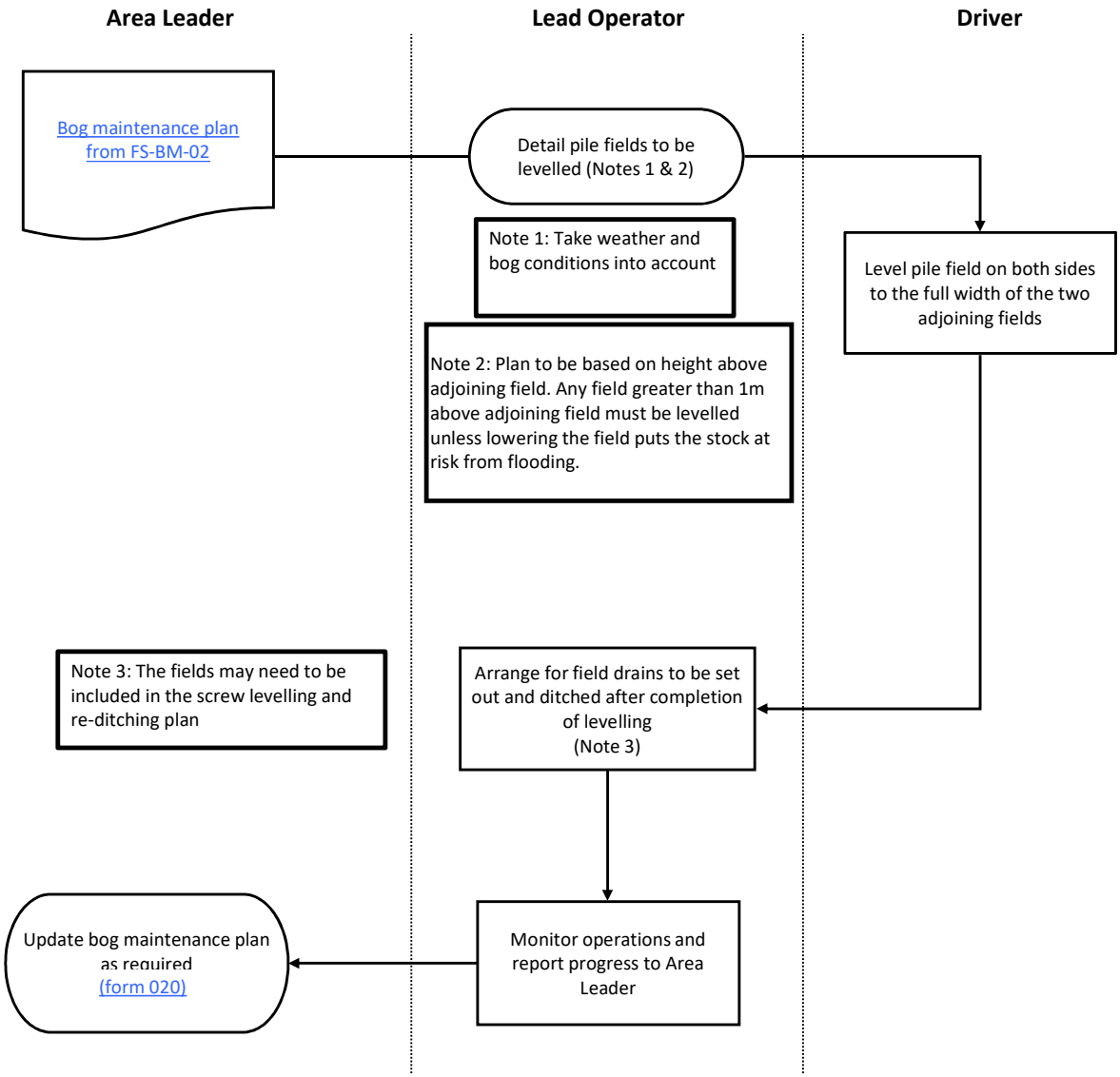
| BORD NA MÓNA Naturally Driven | SOP: FS-BM-09 | Rev: 2 |
|---|---|---|
| Title: Headland Levelling | Approved: JMcN | Date: 15/07/2016 |



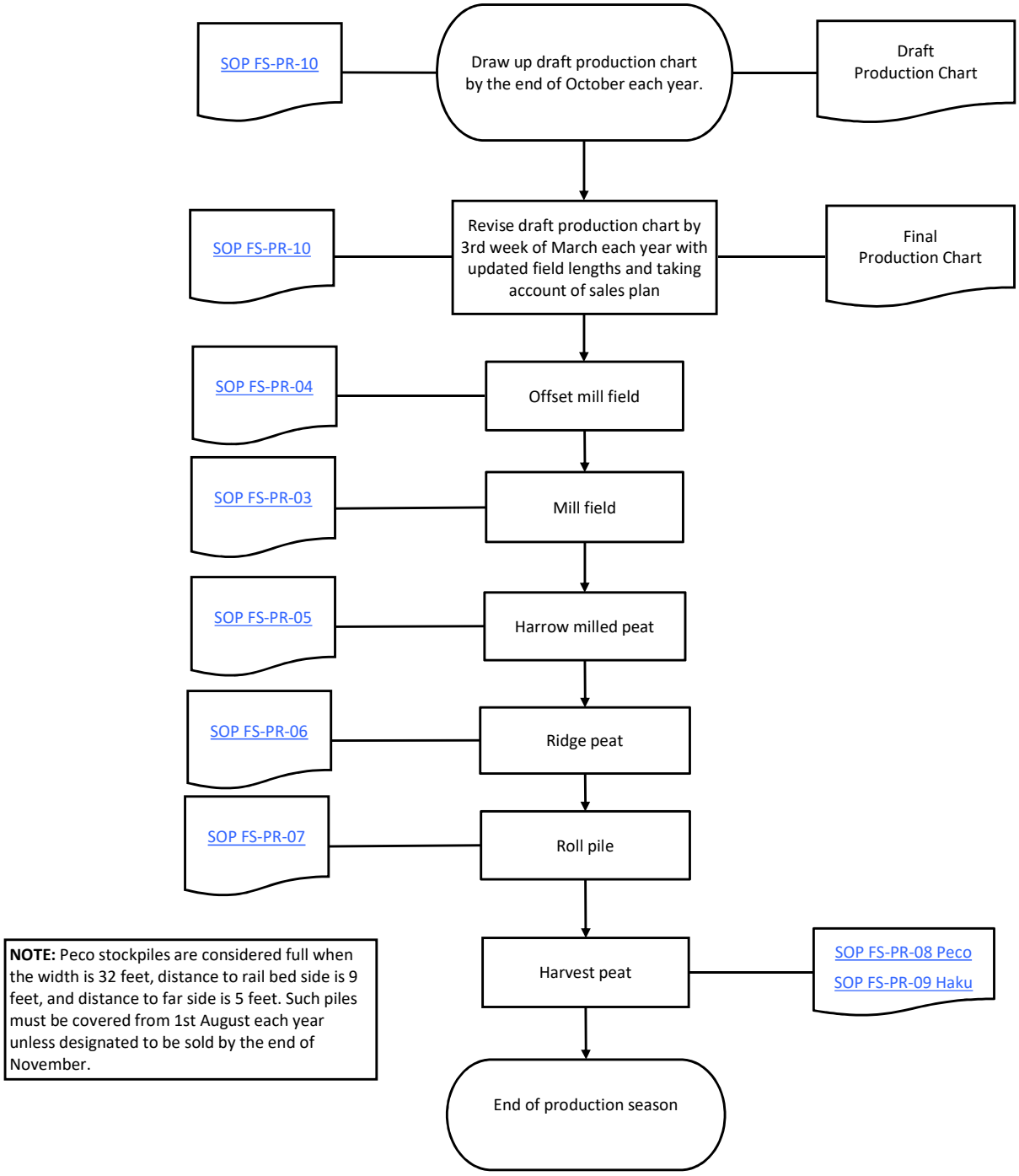
| BORD NA MÓNA Naturally Driven | SOP: FS-BM-10 | Rev: 2 |
|---|---|---|
| Title: Screw Levelling | Approved: JMcN | Date: 18/05/2016 |



| BORD NA MÓNA Naturally Driven | SOP: FS-BM-11 | Rev: 3 |
|---|---|---|
| Title: Pile Field Lowering | Approved: JMcN | Date: 15/07/2016 |



| Bord na Móna Naturally Driven | SOP: FS-PR-01 | Rev: 2 |
|---|---|---|
| **Title: Production Flowchart** | **Approved: PR** | **Date: 08/06/2016** |




**NOTE:** Peco stockpiles are considered full when the width is 32 feet, distance to rail bed side is 9 feet, and distance to far side is 5 feet. Such piles must be covered from 1st August each year unless designated to be sold by the end of November.

| BORD NA MÓNA Naturally Driven | SOP: FS-PR-02 | Rev: 2 |
|---|---|---|
| Title: General Milled Peat Production | Approved: PR | Date: 26/07/2012 |

**1) Purpose**

The purpose of this procedure is to describe the general arrangements for production of milled peat in Bord na Móna Energy.

**2) Scope**

The scope of this procedure is Milled Peat Production within area of responsibility.

**3) Responsibility**

Bog Operations Manager, Team Leaders**,** Operations Leader, A.E.G. Team Leaders and Area Supervisor.

**4) Related Documents**

Fire Policy
Environmental Guidelines.
Operating Procedures.

**5) Procedure**

Operations Leaders in conjunction with Team Leader/Area Supervisor will check all covered piles before stripping for production and leave covered those covered with 12 or 13m polythene until agreed with the Transport Manager.

Operations Leaders will ensure that the production equipment is checked at start of season, with particular attention to guards and fire extinguishers; and Team Leader/Area Supervisor will ensure that daily checks take place as per maintenance/safety check list.

Operations Leaders will check that the production cycle of milling, harrowing, ridging, harvesting and pile rolling is operated as outlined in procedures; so as to maximize the production of dry milled peat.

Operations Leaders will check that accurate production returns are notified before 9.00am each morning to Feedstock finance department, and that production is recorded on the production return sheet: (ref form 016A/B/C).

Operational Leaders, in conjunction with Team Leader/Area Supervisor, will ensure that fire rollers, bulldozers with lights, and a ditcher are available during production, as required by Fire Policy.

Operations Leaders will check that Team Leaders/Area Supervisors ensure that machinery is blown down & washed at end of each day

Operational Leaders will check that Team Leaders/Area Supervisors ensure that production machines are parked after wash down with separation to prevent spread of fire.

Operational Leaders, in conjunction with Team Leader/Area Supervisor, will ensure that production activity stops when winds pose a fire hazard and/or an environmental risk, and that a close fire watch is kept on piles, machinery and surrounding scrub.

Operational Leaders, in conjunction with Team Leader/Area Supervisor, will check piles regularly and ensure production ceases when full. (i.e. at size requiring 13m polythene)

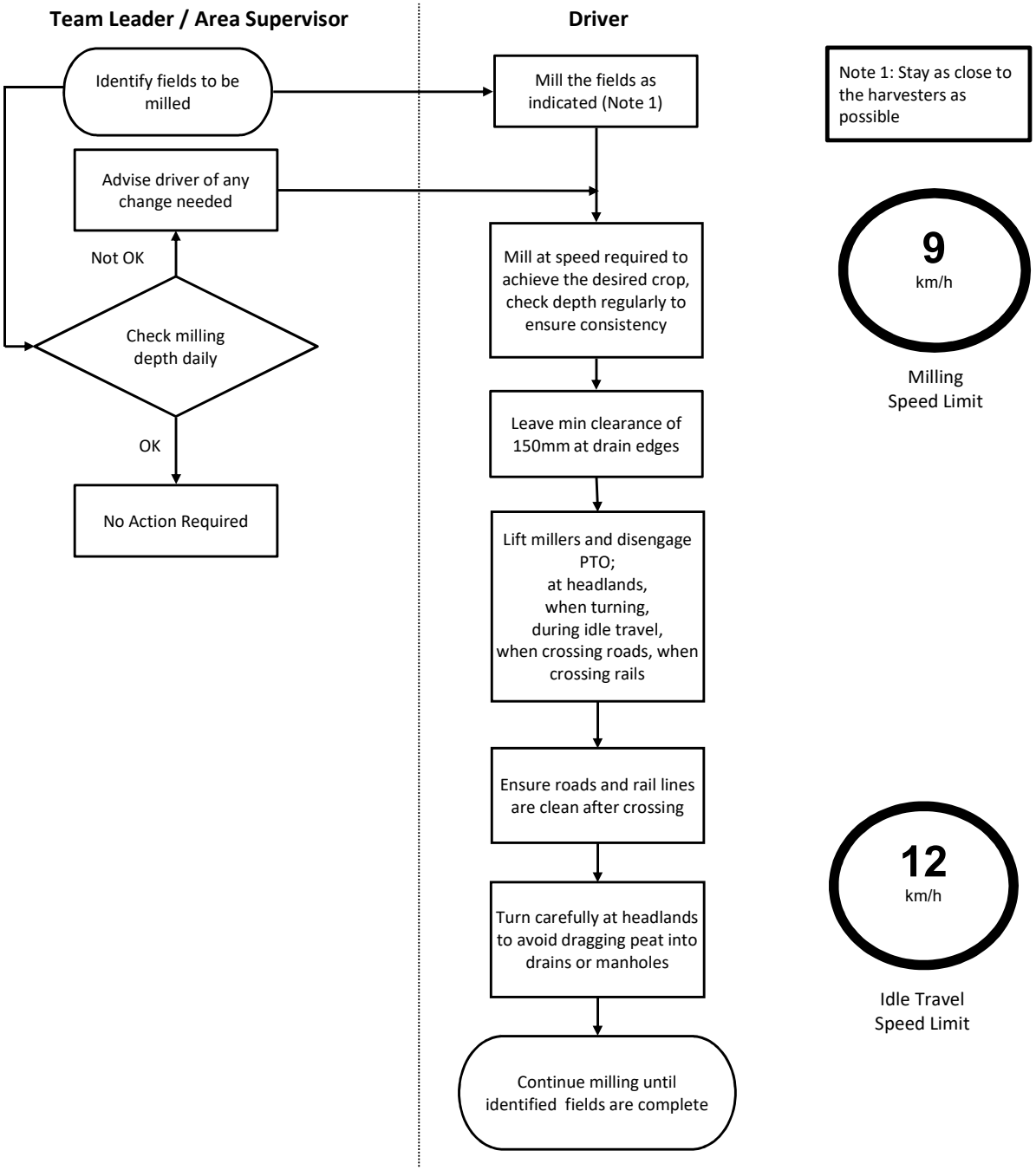
The Resource Manager in consultation with the Head of Feedstock, defines the end of the production season.

Operational Leaders will ensure that all machinery is properly blown down and washed down at end of season and is parked up as outlined in 'Production Machinery Lay-up Procedure'.

**6) Records**

Audit check lists; Production Returns, Covering Plan.

| BORD NA MÓNA Naturally Driven | SOP: FS-PR-03 | Rev: 1 |
|---|---|---|
| Title: Milling (Light or new triple miller) | Approved: PR | Date: 26/07/2012 |



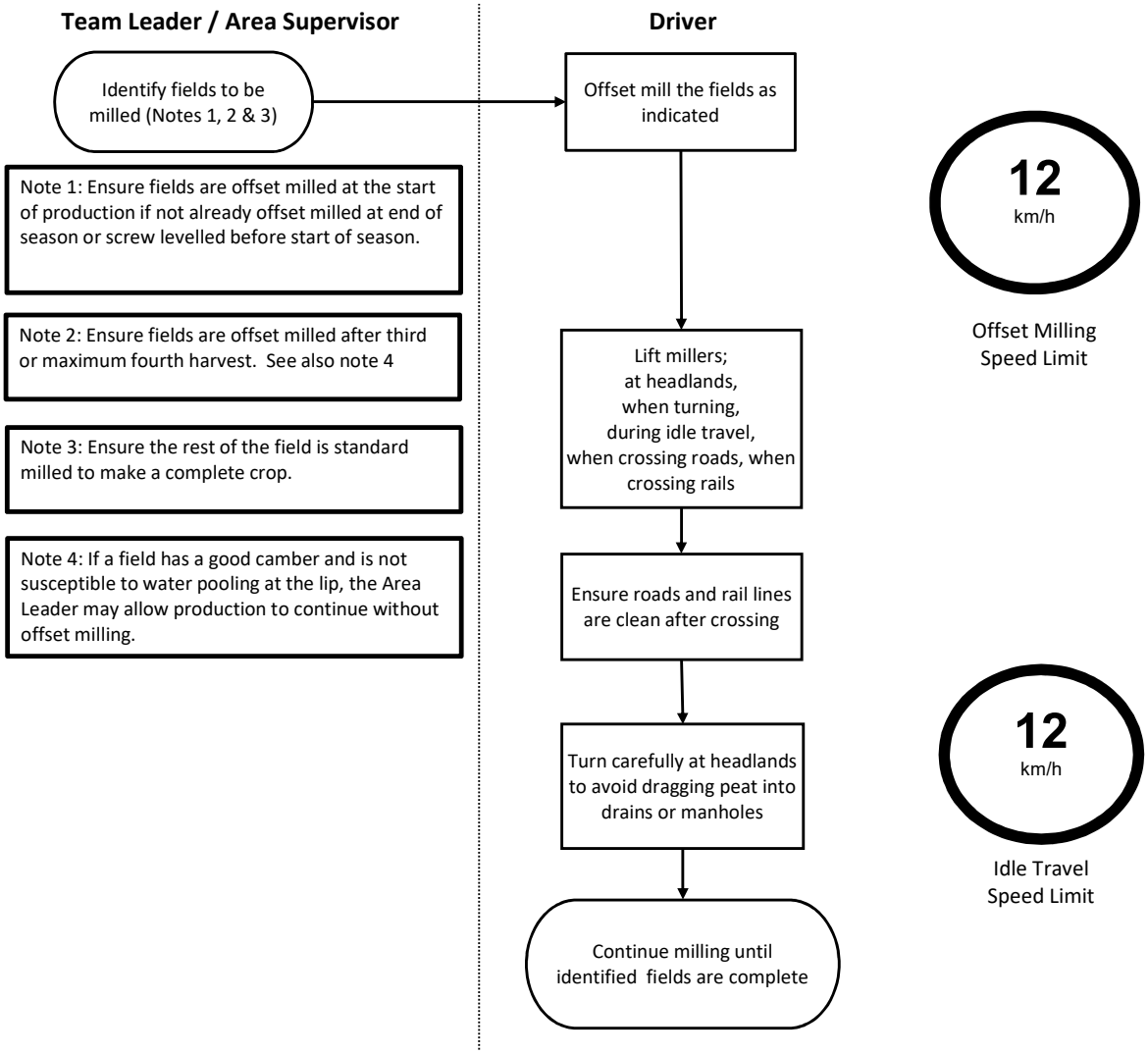

**Additional notes**

Ensure that machinery is blown down & washed at end of each day

Ensure that production machines are parked after wash down with separation to prevent spread of fire.

Ensure that daily maintenance/safety checks are carried out, with particular attention to guards and fire extinguishers

| BORD NA MÓNA Naturally Driven | SOP: FS-PR-04 | Rev: 2 |
|---|---|---|
| Title: Milling (Offset Miller) | Approved: JMcN | Date: 06/11/2015 |



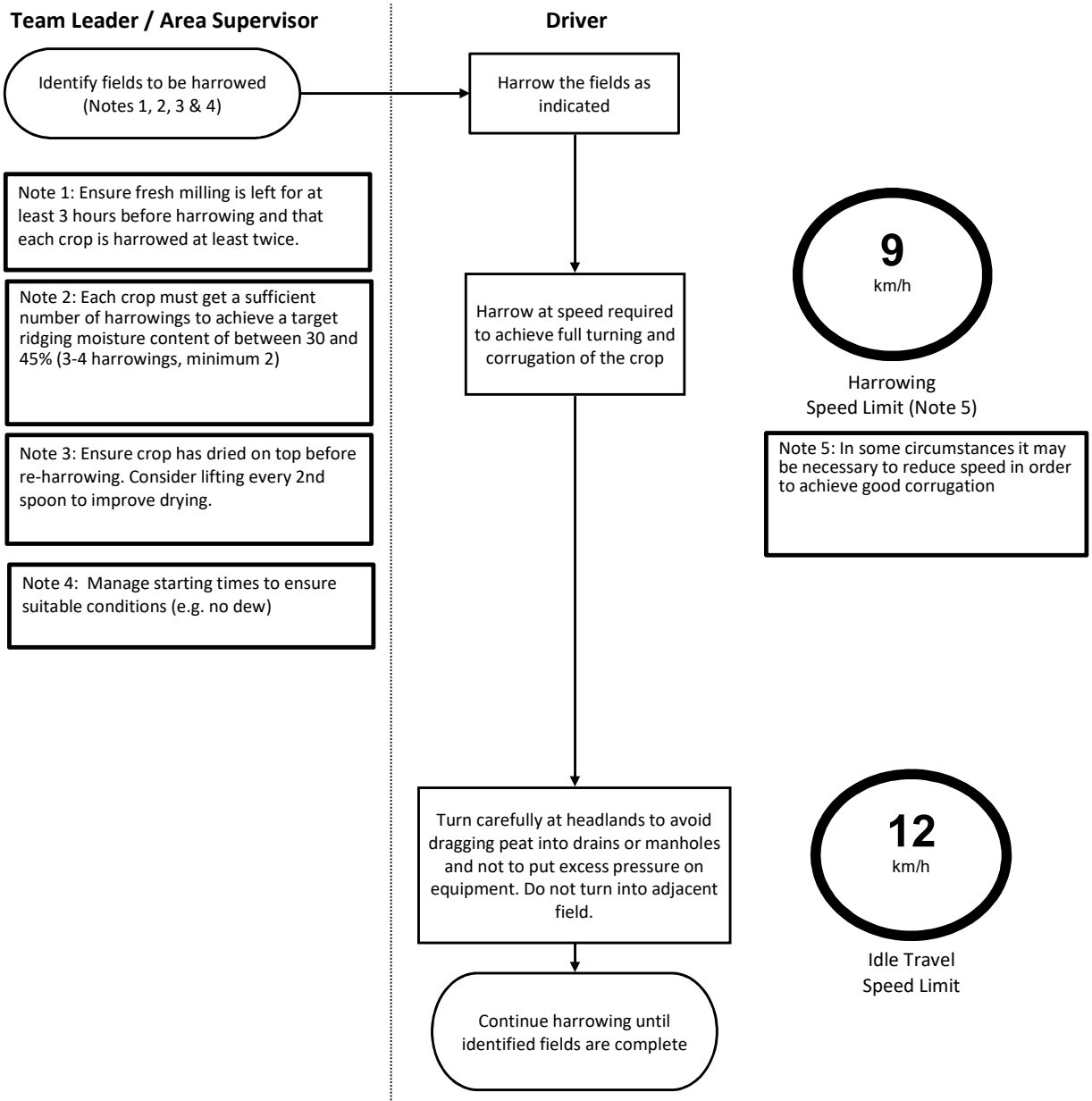

**Additional notes**

Ensure that machinery is blown down & washed at end of each day

Ensure that production machines are parked after wash down with separation to prevent spread of fire.

Ensure that daily maintenance/safety checks are carried out, with particular attention to guards and fire extinguishers

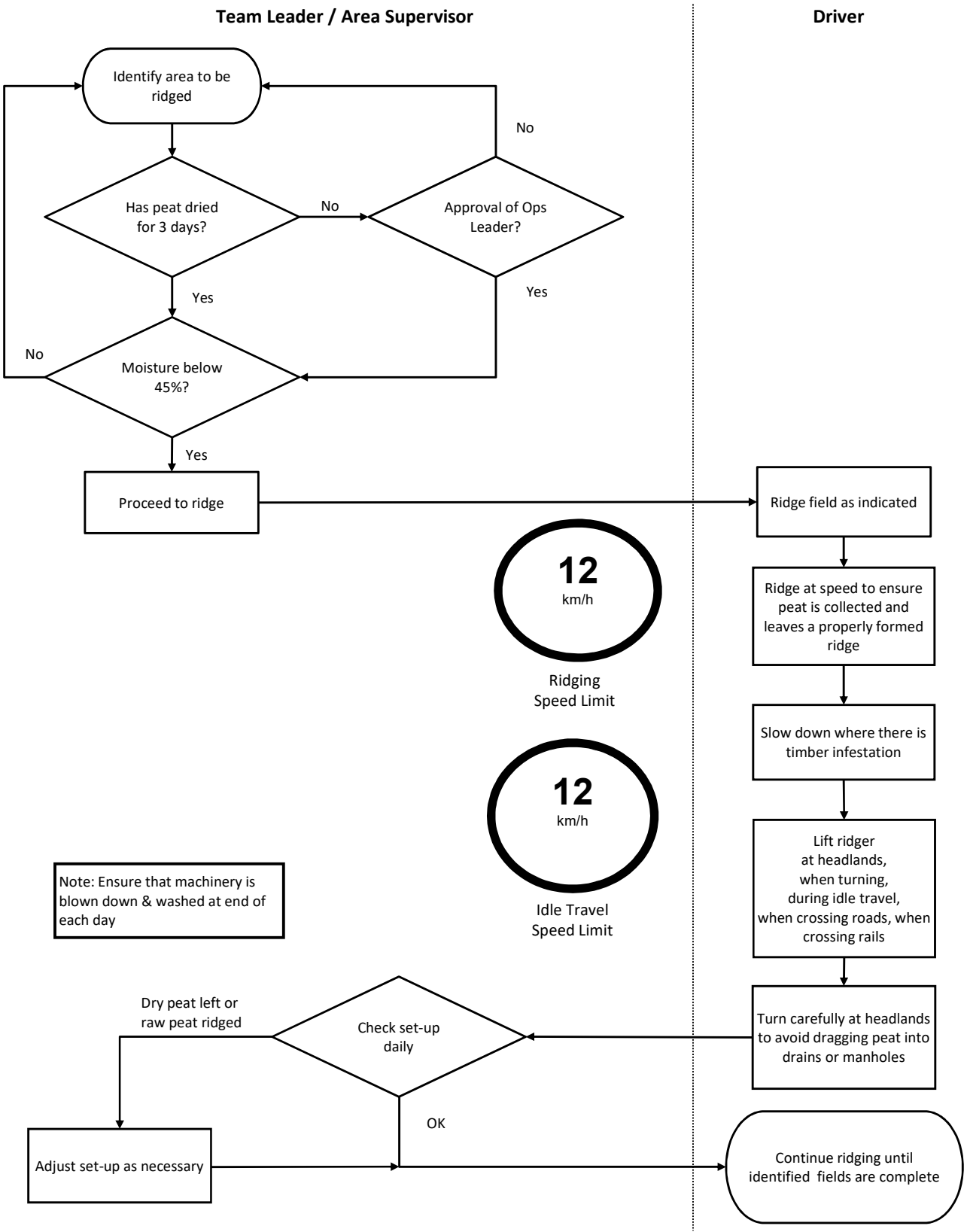
| BORD NA MÓNA | SOP: FS-PR-05 | Rev: 2 |
|---|---|---|
| Title: Harrowing | Approved: PR | Date: 26/07/2012 |




**Additional notes**

Ensure that machinery is blown down & washed at end of each day
Ensure that production machines are parked after wash down with separation to prevent spread of fire.
Ensure that daily maintenance/safety checks are carried out, with particular attention to guards and fire extinguishers
Lift hydraulic spoons during idle travel, and when crossing roads or rails
Lift standard (non-hydraulic) spoons when crossing roads
Detatch conventional harrows during idle travel.
Maintain slow speeds along headlands.
Routes should be optimised to reduce excess travel to reduce dust.

| BORD NA MÓNA Naturally Driven | SOP: FS-PR-06 | Rev: 2 |
|---|---|---|
| Title: Ridging | Approved: PR | Date: 26/07/2012 |




**Additional notes**

Ensure that machinery is blown down & washed at end of each day

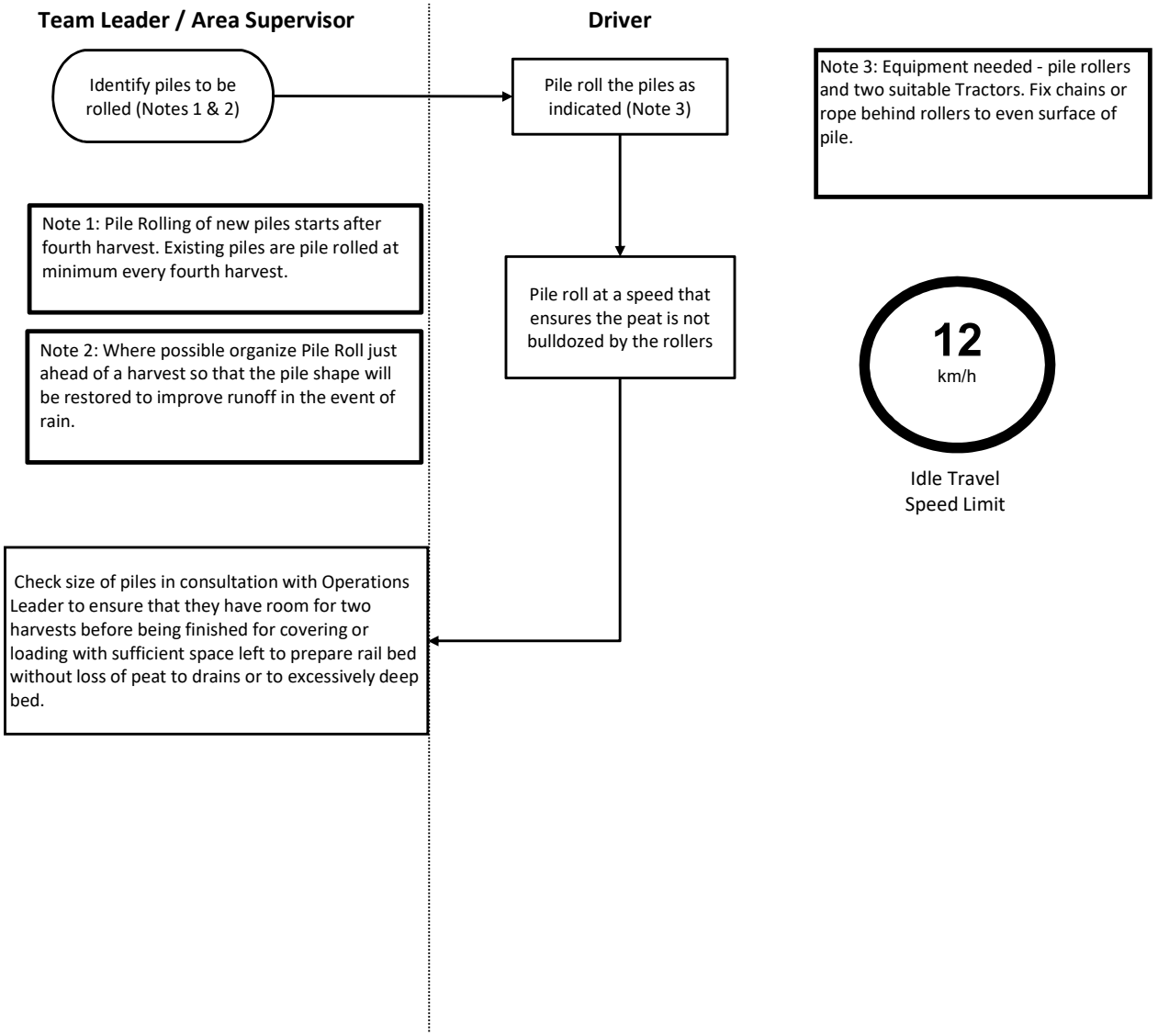
Ensure that production machines are parked after wash down with separation to prevent spread of fire.

Ensure that daily maintenance/safety checks are carried out, with particular attention to guards and fire extinguishers

Lift the blades of the ridger well in advance of leaving the field to avoid pulling peat onto the headland.

Routes to be optimised to avoid excess travel in all areas.

| BORD NA MÓNA Naturally Driven | SOP: FS-PR-07 | Rev: 1 |
|---|---|---|
| **Title: Pile Rolling** | **Approved: PR** | **Date: 26/07/2012** |



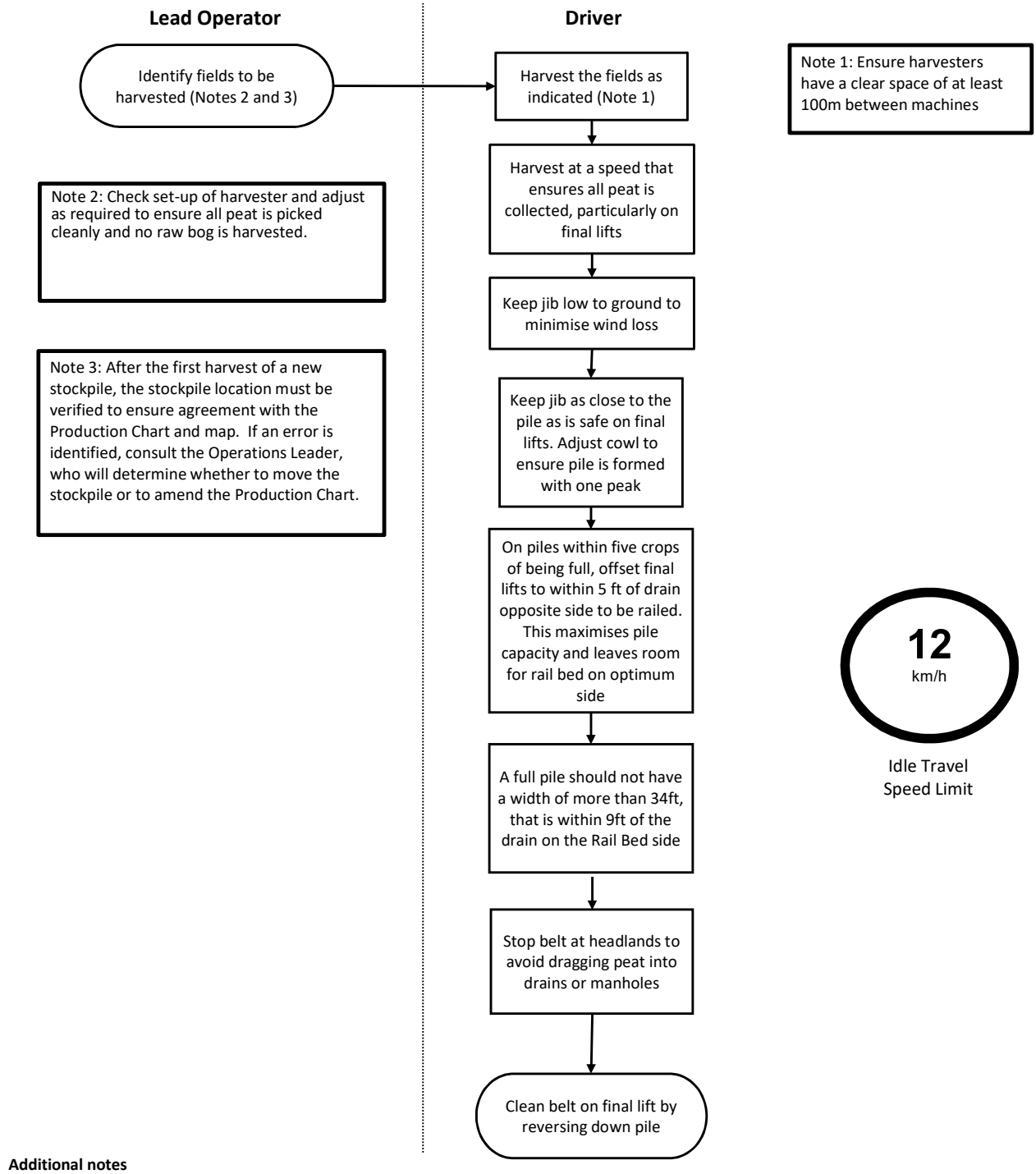

**Additional notes**

Ensure that machinery is blown down & washed at end of each day

Ensure that production machines are parked after wash down with separation to prevent spread of fire.

Ensure that daily maintenance/safety checks are carried out, with particular attention to guards and fire extinguishers

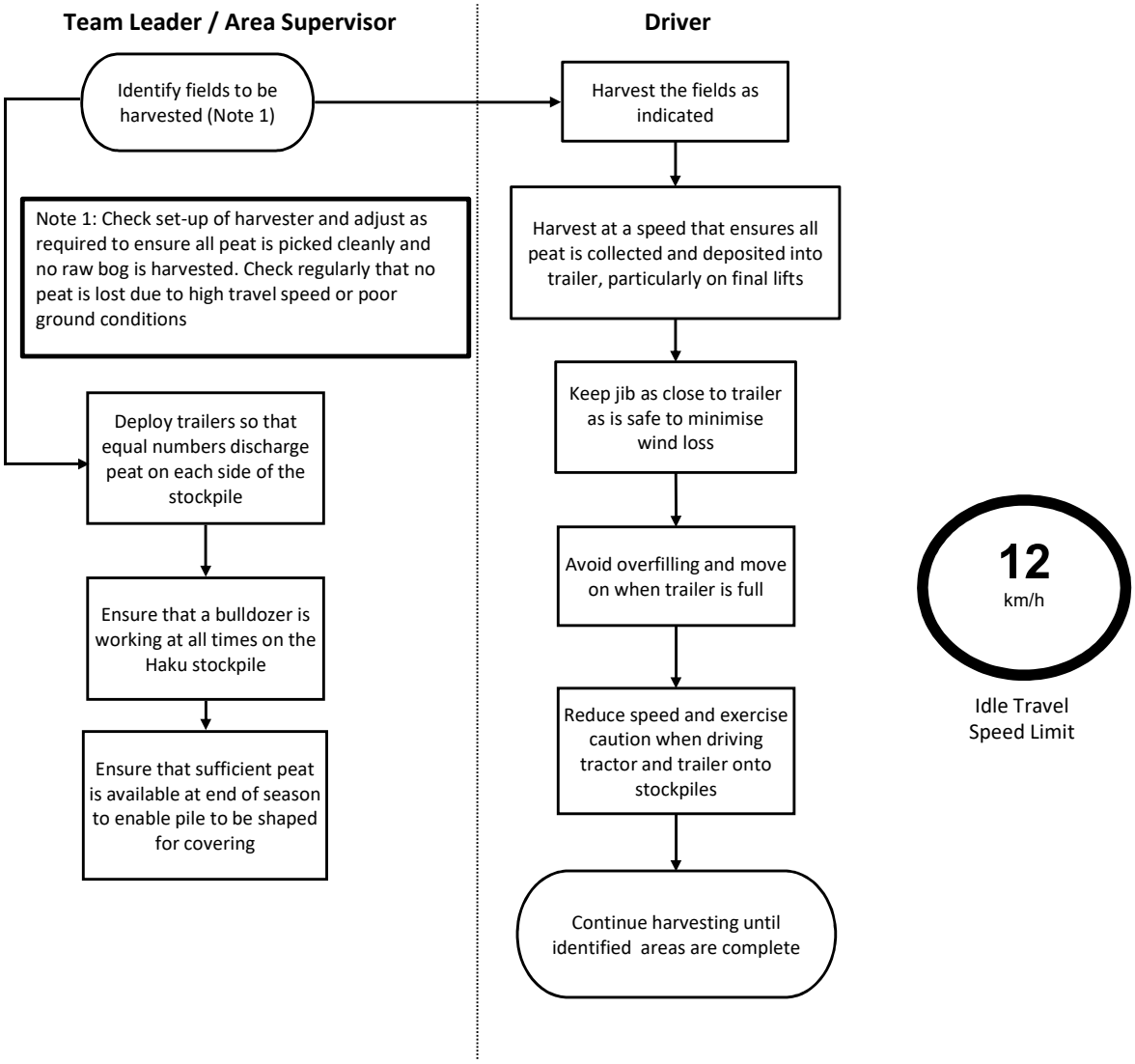
| BORD NA MÓNA Naturally Driven | SOP: FS-PR-08 | Rev: 4 |
|---|---|---|
| Title: Peco Harvesting | Approved: JMcN | Date: 14/07/2016 |




**Additional notes**

Ensure that machinery is blown down & washed at end of each day
Ensure that production machines are parked after wash down with separation to prevent spread of fire.
Ensure that daily maintenance/safety checks are carried out, with particular attention to guards and fire extinguishers
Routes to be optimised to avoid excess travel in all areas.
Discharge belt prior to exiting production field.
Ensure rubber belt seats are in place.

| BORD NA MÓNA | SOP: FS-PR-09 | Rev: 2 |
|---|---|---|
| Title: Haku Harvesting | Approved: PR | Date: 26/07/2012 |




**Additional notes**

Ensure that machinery is blown down & washed at end of each day
Ensure that production machines are parked after wash down with separation to prevent spread of fire.
Ensure that daily maintenance/safety checks are carried out, with particular attention to guards and fire extinguishers
Routes to be optimised to avoid excess travelling in all areas
Discharge belt prior to exiting production field.

| BORD NA MÓNA Naturally Driven | SOP: FS-PR-10 | Rev: 2 |
|---|---|---|
| **Title: Preparation of Production Charts** | **Approved: JM** | **Date: 19/11/2014** |

**1) Purpose**

The purpose of this procedure is to describe the general arrangements for deciding on the Production Chart for each milled peat area in Bord na Móna Feedstock Operations.

**2) Scope**

The scope of this procedure is Milled Peat Production within area of responsibility.

**3) Responsibility**

The Resource Manager is primarily responsible for this procedure, with input from the Assistant Resource Manager, Civil Data, Operations Leader, A.E.G. Team Leaders and Area Supervisor.

**4) Related Documents**

Operating Procedures
Production Chart / Production Return form form 016 A/B/C

**5) Procedure**

During September the Transport Manager will ensure that the Short Term Loading Plan(s) relevant for the works are up to date and include all stockpiles which are scheduled for sale up to the end of December.

During September the Transport Manager will provide the planned sales (tonnes from 12 Month Loading Plan) from each area in the period January to the end of March to the relevant Operations Leaders.

At the end of September each year, Civil Data will issue a map of each bog area to the works. The map will show; all individual production fields including field ID, production length, all existing stock piles including stock in tonnes and tonnes per meter. The map will highlight stockpiles which are scheduled for sale up to the end of December and covered piles.

For each area the Operations Leader, with the Team Leaders, will review and mark up the map. The objective will be to maximise the number of fields per stockpile as far as possible. The review will consider kilos to be removed because of contamination or drainage and these will be marked up on the map. This must be complete before the end of the third week in October.

Where there is an opportunity to increase fields per pile (or any other improvement) by selling particular piles, the Transport Manager will be asked to sell these piles between January and March. A list of these piles will be supplied to the relevant Transport Manager at the end of October **(form 029)**.

Over the Winter period, Civil Data obtain accurate measurements of production fields where the field length is changing. This information along with the map and the draft production chart is inputted into the GIS system.

By the end of February, Civil Data issue for each area an updated map and production chart which includes the official field lengths, updated stockpiles and stock and updated piles scheduled to be sold over the six week period from the beginning of March.

For each area, the Operations Leader, with the Team Leaders, will review the map, and modify the draft production chart based on the updated information including the field lengths provided by Civil Data. This must be complete before the end of the second week in March.

The plan is then reviewed by the Resource Manager and/or the Assistant Resource Manager, and a final production chart is created by the end of the third week in March.

A copy of the final production chart is sent to the Finance Department and Civil Data.

**6) Records**

Production charts (draft and final)

| BORD NA MÓNA | SOP: FS-PR-11 | Rev: 1 |
|---|---|---|
| Title: Updating Production Charts | Approved: PR | Date: 27/02/2013 |

**1) Purpose**

The purpose of this procedure is to describe the arrangements for updating Production Charts and starting new stockpiles in Bord na Móna Feedstock Operations.

**2) Scope**

The scope of this procedure is Milled Peat Production within area of responsibility.

**3) Responsibility**

The Operations Leaders is primarily responsible for this procedure, with input from the Team Leaders and Area Supervisors, and approval from the Assistant Resource Manager or Resource Manager.

**4) Related Documents**

Operating Procedures
Production Chart / Production return form form 016 A/B/C

**5) Procedure**

**Updating Production Charts**

The Team Leader / Area Supervisor is responsible for anticipating the requirement to update the production chart. This must be done at least 10 days before the change is due to take effect.

The Team Leader / Area Supervisor must meet with his Operations Leader to agree the proposed change(s), including the starting of any new stockpiles.

The Operations Leader amends the production chart with the proposed change(s).

The Operations Leader must obtain the approval of the Assistant Resource Manager before implementing the change(s). Where the change is approved, the revision level of the plan is identified through the date. Where appropriate, and in particular where the early sale of a pile will improve bog layout, the Assistant Resource Manager should consult with the Transport Manager and arrange for that sale.

A copy of the amended plan will be e-mailed to Civil Data, the Transport Manager, and Feedstock Finance.

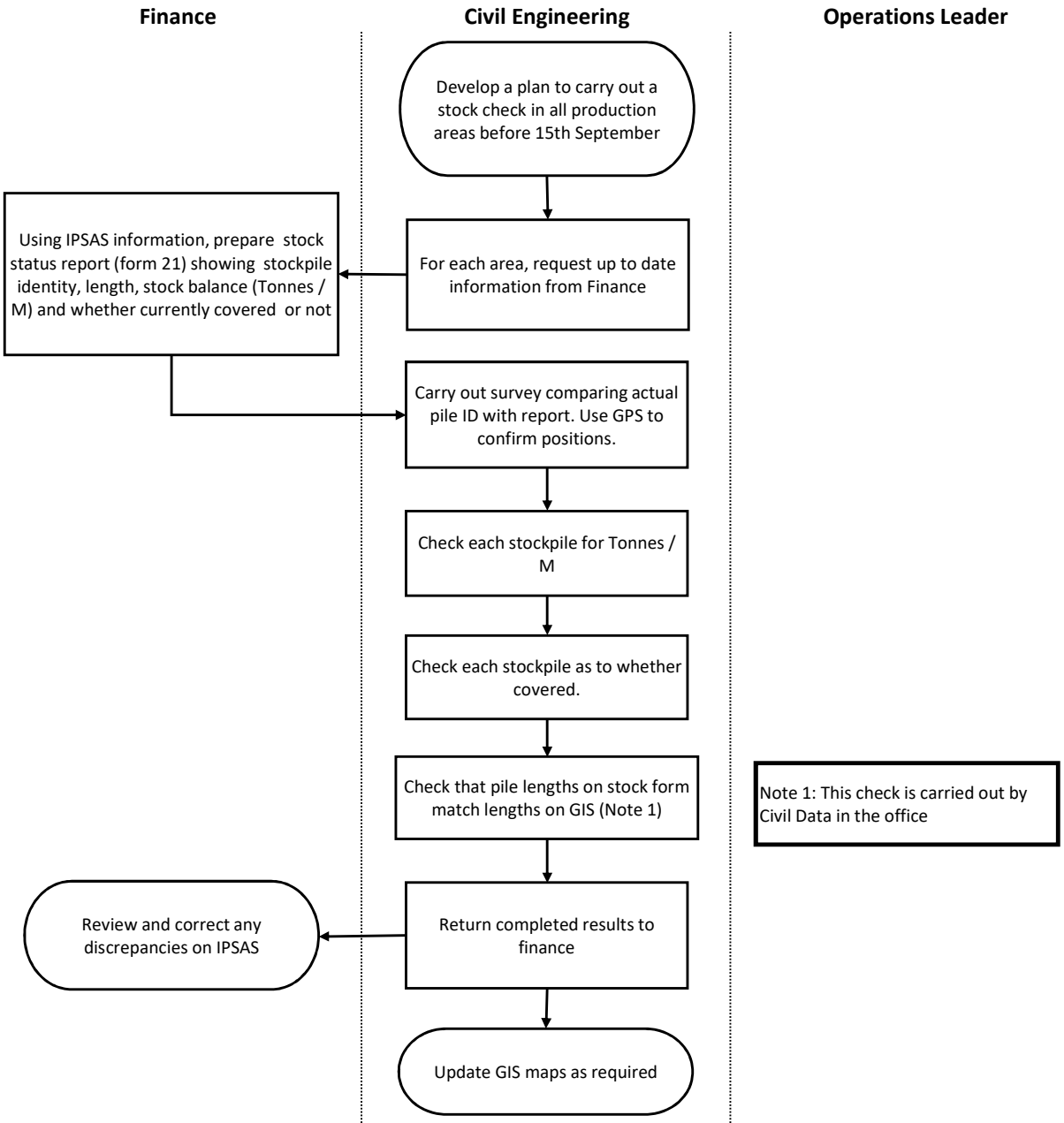
A hard copy of the amended production return form 16A/B/C will be distributed to the Team Leader / Area Supervisor.

**6) Records**

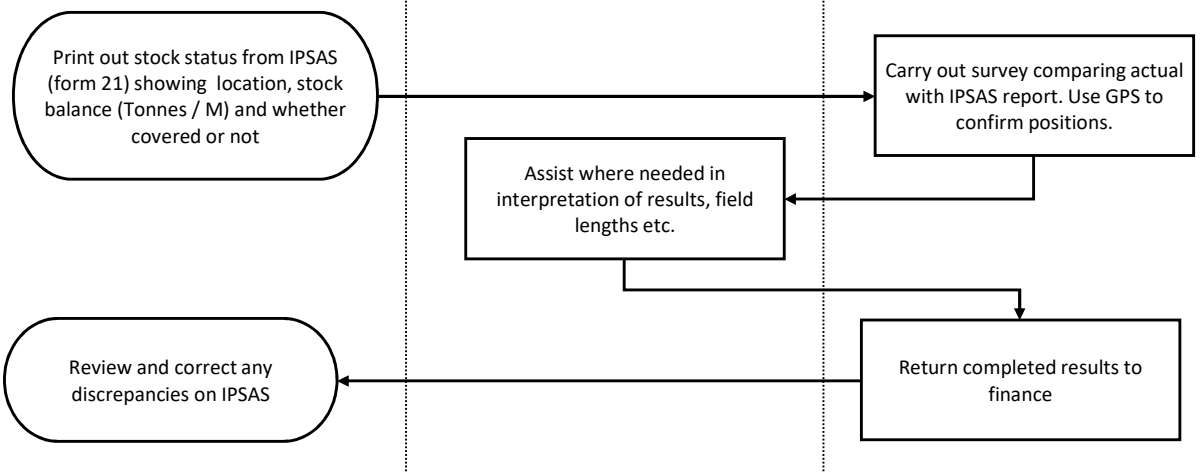
IPSAS records

| BORD NA MÓNA | SOP: FS-PR-12 | Rev: 1 |
|---|---|---|
| Title: Stockpile Inventory | Approved: PR | Date: 27/02/2013 |

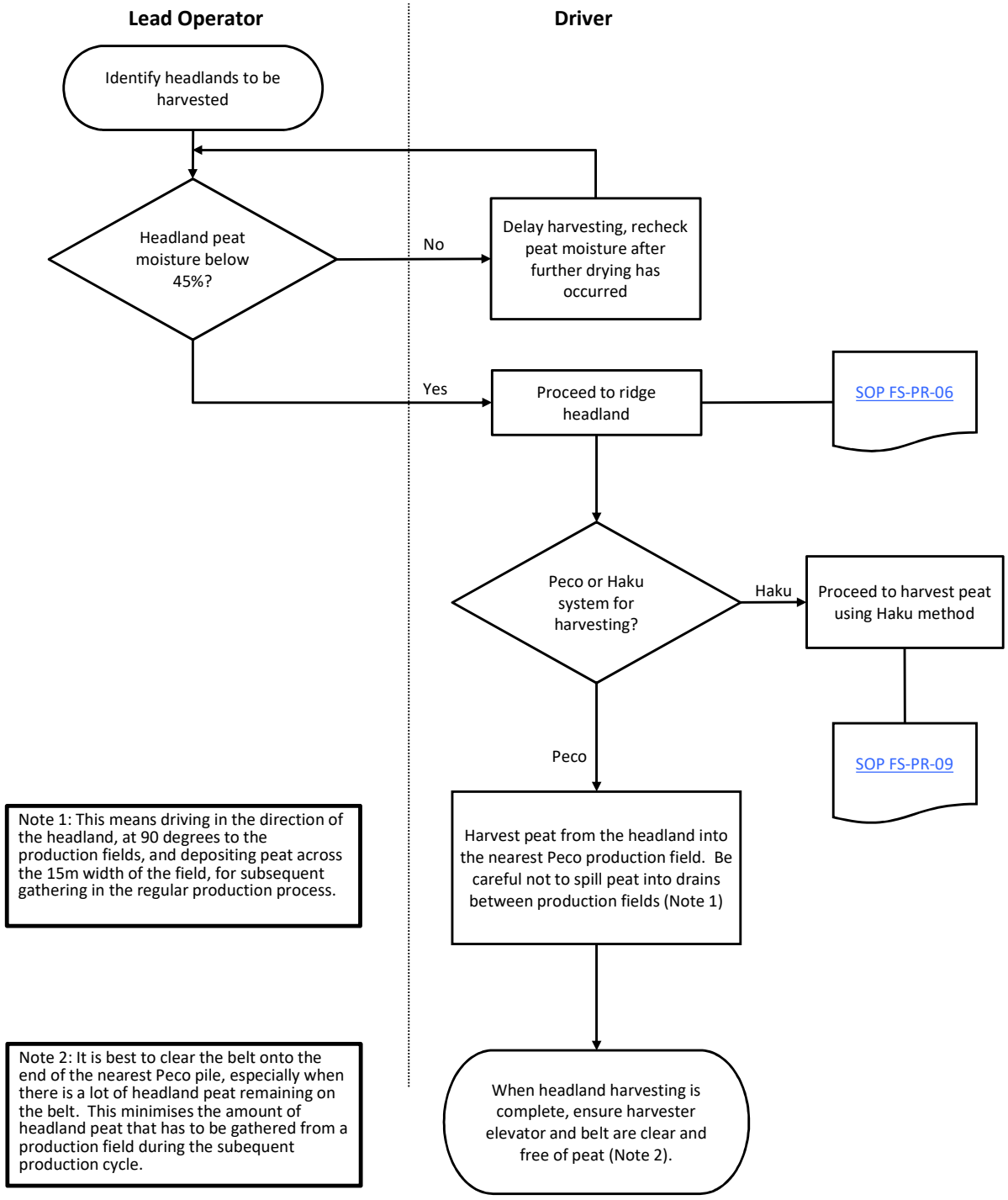
## 1) First Stock Check




## 2) March Stock Check



| BORD NA MÓNA Naturally Driven | SOP: FS-PR-13 | Rev: Draft |
|---|---|---|
| Title: Headland Harvesting | Approved: JMcN | Date: 12/05/2016 |




**Additional notes**

Ensure that machinery is blown down & washed at end of each day

Ensure that production machines are parked after wash down with separation to prevent spread of fire.

Ensure that daily maintenance/safety checks are carried out, with particular attention to guards and fire extinguishers

| BORD NA MÓNA Naturally Driven | SOP: FS-PR-14 | Rev: 1 |
|---|---|---|
| **Title: Stockpile Survey with Trimble Yuma 2 Tablet** | **Approved: JMcN** | **Date: 09/06/2016** |

**1) Purpose**
The purpose of this procedure is to describe how to conduct a stockpile survey using the Trimble Yuma 2 (stockpile survey) tablets

**2) Scope**
The scope of this procedure is Milled Peat Production within area of responsibility.

**3) Responsibility**
Civil Data, Head of Bog Operations, Bog Operations Managers, Bog Operations Area Leaders

**4) Related Documents**
IPSAS Stockpile reports

**5) Procedure**
1. Switch on the tablet (green button at bottom right of device) and if prompted, input the password (password is BOORA, all capitals)

2. In most cases the tablet will default open to the maps application. If the desktop screen appears, select the ArcPad 10 (maps) application

3. The tablet may take a minute or two to locate the user, A "no fix error" message will appear until the position is located.

4. Go to the end of a stockpile, and tap the satellite icon (top left of the screen): 

5. An attribute box/pop-up window will appear, press the dark green **OK** button

6. Repeat steps 4 and 5 for every survey location

7. If the tablet goes into "sleep mode", tap the screen with the stylus to power back up the screen

8. All survey results are automatically saved. Once the survey has been complete, turn off the tablet, recharge its battery using the charger provided, and contact Civil Data or the Quality Manager for instructions to return the tablet

9. Civil data will download the survey results. Where data is missing or incomplete, Civil Data will liaise with the relevant user and seek an extra survey. Civil data will cross check stock pile chart names and actual ground locations. Results will then be issued to Peat Division management.

**6) Records**
IPSAS Stockpile reports, Civil Data GIS database

| BORD NA MÓNA Naturally Driven | SOP: FS-PR-15 | Rev: 3 |
|---|---|---|
| Title: Ridge Sampling | Approved: JMcN | Date: 03/08/2016 |

**1) Purpose**

The purpose of this procedure is to describe the arrangements for ridge sampling by the Area Leaders during production.

**2) Scope**

The scope of this procedure is Milled Peat Production within area of responsibility.

**3) Responsibility**

The Bog Operations Area Leader is responsible for this procedure.

**4) Related Documents**

Operating Procedures

Daily Key Production Check Sheet form 22/23

**5) Procedure**

Each day when ridging is taking place, the Area Leader must sample two ridges. These ridges can be from any of his areas, but the Area Leader must ensure that all of his areas are sampled roughly equally in any one week*. The Area Leader should decide (based on his knowledge of the area), whether a single sample, or a blended sample, is required.

**For example, Area Leader 1 has three production areas. On production day 1, he samples one ridge in area 1 and one ridge in area 2; on production day 2, he samples one ridge in area 3 and one ridge in area 1; on production day 3 he samples one ridge in area 2 and one ridge in area 3.*

Samples must be a minimum of 500g, and must be stored in sealed and labelled plastic bag.

The Area Leader must ensure that the samples are tested for moisture content (either in the lab, or using an Ohaus monitor), and results are recorded on form 22/23

**6) Records**

Form 22

| BORD NA MÓNA Naturally Driven | SOP: FS-PR-16 | Rev: Draft |
|---|---|---|
| Title: End of Production Season Procedure | Approved: EMcD | Date: 14/10/2016 |

**1) Purpose**

The purpose of this procedure is to describe end of Production Season activities

**2) Scope**
The scope of this procedure is Milled Peat Production within area of responsibility.

**3) Responsibility**
Head of Bog Operations, Bog Operations Managers, Bog Operations Area Leaders and Compliance Department.

**4) Related Documents**
IPC Licences

**5) Procedure**
1. To minimise silt runoff, ensure:
a) Flood prone production fields are cleared of milled peat or else recompacted
b) Other production fields that have been milled have been ridged.
c) ALL loose peat on headlands is ridged up to a location on the headland margins, secured against washing into drains.

2. Wrap all stripped polythene and deposit at hard stand/designated collection area for removal

3. Ensure all barrels and grease drums are returned to the bunded lock up.

4. Gather up and dispose of waste in the skip or bin provided

5. Gather up any remaining polybrane and store for reuse or removal

6. Gather up and stockpile any scrap rail or metal for collection by waste contractor

7. Ensure tractors and machinery are parked in deisgnated areas, set apart to minimise risk of fire damage

8. Ensure tea centres, compounds, bunded storage and machinery are locked and secured.

9. Where primary sepric tanks are used, check tank level and arrange sludge disposal if necessary

**6) Records**
Bog Maintenance form 020

| BORD NA MÓNA Naturally Driven | Procedure: 001 | Rev: 7 |
|---|---|---|
| **Title: Document Control** | **Approved: JM** | **Date: 26/10/2016** |

## 1) Purpose

The purpose of this procedure is to describe the arrangements in Bord na Móna Peat Division for document control.

## 2) Scope

The scope of this procedure is as follows:

a) The documents associated with the Quality Management System, Environmental Management System and the Energy Management System
b) Customer specifications
c) Engineering drawings
d) Safety Data Sheets

## 3) Related Documents

Bord na Móna Peat Quality Management System (QMS) documents
Bord na Móna Peat Energy Management System (EnMS) documents
Bord na Móna Peat Environmental Management System (EMS) documents

Customer specifications
Engineering drawings
Safety Data Sheets

## 4) Procedure

The QMS, EMS and the EnMS are electronic. All QMS, EMS and EnMS documents are password controlled so that they can only be amended by the responsible person or a designated deputy. Copies of documents may be printed off at any time for training or review purposes. These are defined as uncontrolled copies, and must be destroyed after use. Where there is limited access to the IT system, the Area Leader may retain a paper version of relevant SOPs, but is responsible for their updating. Whenever SOPs are updated, the Quality Manager will send an updated version to all Managers and Area Leaders, who will then update any paper copies held.

All QMS, EMS and EnMS documents, including amendments to same, are approved by the responsible person, depending on the nature and level of the document. Records of approval can be by signature, or by email or other traceable electronic method. In order to maintain consistent best practice, changes to SOPs must be approved by the Heads of Environment/H&S, Supply Chain, Bog Operations, and/or Asset Management, as appropriate. This is done by sending an email for comment to the relevant approver with a copy of the draft amended SOP(s) attached. Approval is assumed in the absence of any comment by the date stated in the email. This method of approval may also be used for other QMS/EMS/EnMS documents at the discretion of the Quality Manager. As far as possible, copies of superseded Quality manual, Environmental manual and Energy manual chapters, procedures, flowcharts and SOPs are retained in an archive file within the PQMS Shared drive.

Customer specifications are built into contracts. The master copies are maintained by Bord na Móna Legal in Newbridge.

Engineering drawings are the responsibility of Technical Services, who issue updated drawings to the workshop. The workshop may retain marked copies of obsolete drawings for reference in connection with older machinery still in use. Safety data sheets are obtained by Procurement as part of the tendering process. Suppliers are held responsible for informing Procurement of any changes. Copies of relevant safety data sheets are available in stores, and copies are updated by Procurement after any change.

If Bord na Móna personnel need to refer to any statutory or regulatory document, they are required to check the latest version on line. There is therefore no need to retain paper copies of such documents.

## 5) Records

Evidence of approval (electronic)
Archive files

| Revision Index | | | |
|---|---|---|---|
| Revision | Date | Description of change | Approved |
| 1 | 01/12/2012 | First release | PR |
| 2 | 02/12/2013 | Added reference to form 24 | JM |
| 3 | 17/10/2014 | Amended approval arrangements and added safety data sheets | JM |
| 4 | 27/04/2016 | Added reference to retention of obsolete drawings | JM |
| 5 | 21/07/2016 | Change to job titles, organisation name, removed ref to controlled copies | JM |
| 6 | 18/08/2016 | Inclusion of Energy Management System | JM |
| 7 | 26/10/2016 | Inclusion of paper copy control by Area Leaders | JM |
| 8 | 12/01/2018 | Integration of Environmental System | SG |
| | | | |

## 1) Purpose

The purpose of this procedure is to describe the arrangements in Bord na Móna Peat Division for record control.

## 2) Scope

The scope of this procedure is as follows:

- Records required by the Bord na Móna Peat Division Quality system and Energy system.
- Additional Records required by the business.

## 3) Procedure

Records maintained by the organisation, and their locations and retention periods, are defined in the table below.

| Record | Paper / Electronic | Location | Retention period |
|---|---|---|---|
| Management review | E | Quality files | 5 years |
| Personnel files (competence) | P/E | General office | Length of service + 2 years |
| Inspection and test results | P/E | Relevant works | 5 years |
| Sales documents | P/E | General office | 7 years |
| Supplier / subcontractor ratings | E | System | 3 years |
| Corrective action requests | P/E | Quality files | 3 years |
| Corrective action log | E | System | 3 years |
| Calibration records | P/E | Quality files | 5 years |
| Internal audit reports | P/E | Quality files | 3 years |
| Internal audit schedules | E | Quality files | 3 years |
| Non-conforming product records | P/E | General office | 3 years |
| Concession requests | P/E | Quality files | 3 years |
| Concession log | E | System | 3 years |
| Purchase orders | E | System | 7 years |
| Energy audits, NCs | E | Energy files | 7 years |
| Energy Management Reviews | E | Energy files | 7 years |

The person responsible for retaining each of the above records must ensure that they are kept in such a way that they remain legible, identifiable and retrievable.

A full system back-up is carried out daily by the IT department in Bord na Móna head office.

At the end of the specified retention period, the responsible person may dispose of those records. They may be retained longer at the disposition of the responsible person.

| Revision Index | | | |
|---|---|---|---|
| Revision | Date | Description of change | Approved |
| 1 | 01/12/2012 | First release | PR |

| | | | |
|---|---|---|---|
| - | 12/09/2014 | Reviewed | JM |
| 2 | 21/07/2016 | Change to org name, amended Paper/Electronic Records, record retention | JM |
| 3 | 18/08/2016 | Inclusion of ref to Energy Management System | JM |

| BORD NA MÓNA Naturally Driven | Procedure: 003 | Rev: 4 |
|---|---|---|
| Title: Internal Audit | Approved: JM | Date: 18/08/2016 |

## 1) Purpose

The purpose of this procedure is to describe the arrangements in Bord na Móna Peat Division for internal audits.

## 2) Scope

The scope of this procedure is the requirements of the Bord na Móna Peat Division Quality Management System and Energy Management System.

## 3) Related Documents

Internal audit schedule form 009.
Internal audit checklist form 006.
Internal audit form 007.
Multi-pillar audit form 031

## 4) Procedure

The Bord na Móna Peat Quality Manager is responsible for drawing up the QMS audit schedule (form 009) and the EnMS audit schedule form EMF 07. This is done at least annually. The results of previous audits, and the importance of the process(es) being audited are taken into account when drawing up the schedules. The schedules cover all areas of the organisation, and all clauses of the Bord na Móna Peat Division Quality manual and Energy manual.

Audits may be carried out using a pre-prepared checklist (form 006), by following a specific procedure or work instruction, or by tracing a particular product item through the entire product realization process. Multi-pillar audits are carried out using form 031. Audits must be carried out by competent auditors, and auditors must not audit any area for which they are directly responsible.

All non-conformities identified during internal audits are followed up with the arrangements in procedure 005. Ensuring timely response and the verification of actions taken is done through the corrective action process and follow up audits.

The results of internal audits are summarised at least annually by the Quality Manager as an input to the management review process.

Each section of the Quality manual, the Energy manual, each quality procedure, and each energy procedure, is reviewed at least once per year by the Quality Manager to ensure its continued accuracy and relevance. Records of these reviews are kept in the associated indexes.

## 5) Records

Internal audit reports
Completed internal audit schedules

Completed corrective action requests

| Revision Index | | | |
|---|---|---|---|
| Revision | Date | Description of change | Approved |
| 1 | 01/12/2012 | First release | PR |
| - | 12/09/2014 | Reviewed | JM |
| 2 | 21/07/2016 | Change to job titles, organisation name | JM |
| 3 | 02/08/2016 | Ref to multi pillar audit – tracking system | JM |
| 4 | 18/08/2016 | Inclusion of energy Management System | JM |
| | | | |

| BORD NA MÓNA Naturally Driven | SOP: FS-HO-01 | Rev: 2 |
|---|---|---|
| Title: Hort Bogs - General | Approved: PMcK | Date: 28/07/2016 |

**1) Purpose**
The purpose of this procedure is to describe the differences (from standard Peat Division requirements) in the operation and maintenance of horticultural bogs

**2) Scope**
The scope of this procedure is Peat Division Horticultural team within area of responsibility.

**3) Responsibility**

Hort Customer Delivery Manager, Hort Area Leaders, Hort Lead Operators

**4) Related Documents**
FS-HO-02
FS-HO-03
FS-HO-04
FS-HO-05

**5) Definitions**
There are four outlets for peat from horticultural bogs. These are RHP; Professional; Non-professional; and fuel.

Professional - Low density, low weed content peat that has been designated for sale to the professional market

RHP - Professional Grade horticultural peat that has been approved by an RHP auditor as suitable for sale to RHP market.

Non-professional grade horticultural peat - Intermediate density and weed content, suitable for the non-professional market

Fuel from horticultural bogs - Any peat that does not meet the above standards may be sold as fuel, provided it meets the density and moisture requirements. For any other peat, refer to the non-conformance Procedure 004.

**6) Procedure**

Additional requirements for bog maintenance and operations on Horticultural bogs include the following:
1. Additional requirements for bog maintenance include: Identification of a buffer zone, identification of RHP zones; and maintenance of boundaries. Ref FS-HO-02.
2. All weeds and debris (including scrap polythene, concrete pipes, etc), must be removed and disposed of off-site. This must be carried out year round, reference FS-HO-03
3. Weeds and density must be controlled as per procedure FS-HO-04
4. The temperature of stockpiled horticultural peat must be monitored and reported as per procedure FS-HO-05

**7) Records**
Records required are described in the relevant procedures

| BORD NA MÓNA | SOP: FS-HO-02 | Rev: 1 |
|---|---|---|
| Title: Hort Bogs - Bog Maintenance | Approved: SG | Date: 23/07/2014 |

**1) Purpose**

The purpose of this procedure is to describe the differences (from standard Feedstock requirements) in the maintenance of horticultural bogs

**2) Scope**

The scope of this procedure is Feedstock Horticultural team within area of responsibility. This procedure is in force throughout the year, including in the production season

**3) Responsibility**

Hort Resource Manager, Assistant Resource Manager**,** Operations Leader, A.E.G. Team Leaders and Area Supervisor.

**4) Related Documents**

FS-HO-01
RHP Module 560 - Peat Horticulture

**5) Procedure**

Identification of a buffer zone. Buffer zones are in place to delineate RHP from non-RHP areas. The extent of these buffer zones is 10m, or as described in RHP Module 560 - Peat Horticulture

Identification of RHP Zones: RHP zones are to be clearly identified on maps located in the relevant bog areas, and by using RHP-approved markers on the ground.

Maintenance of Boundaries: Boundaries of RHP bogs are to be maintained with buffer zones to minimise risk of transfer of seed/weeds, and to minimise risk of debris contamination. Boundaries must be maintained in such a way as to prevent the transfer of extraneous material into RHP areas.

| BORD NA MÓNA | SOP: FS-HO-03 | Rev: 1 |
|---|---|---|
| **Title: Hort Bogs - Bog Housekeeping** | **Approved: SG** | **Date: 23/07/2014** |

**1) Purpose**
The purpose of this procedure is to describe the differences (from standard Feedstock requirements) in the housekeeping of horticultural bogs

**2) Scope**
The scope of this procedure is Feedstock Horticultural team within area of responsibility.

**3) Responsibility**
Hort Resource Manager, Assistant Resource Manager**,** Operations Leader, A.E.G. Team Leaders and Area Supervisor.

**4) Related Documents**
FS-HO-01
RHP Module 560 - Peat Horticulture
Form 26

**5) Procedure**
Operations procedures should be conducted in such a manner as to minimise contamination by viable weeds. This particularly applies to buffer zones, where precautions should be taken to avoid dragging weeds and other debris by moving plant.

The Team Leader/Area Supervisor should check the Horticultural site paying particular to any possible issues with weeds, contamination, and any other debris. This should be carried out at least weekly during the production season, and at least monthly during the non-production season.

Particular note is to be paid to Rushes, Sheep's Sorrel, P Moorgrass, and R Willowherb. For further information, see the Bord na Móna/RHP poster on display in relevant tea centres.

The Team Leader/Area Supervisor should check for

- weed growing on the site and in the surroundings (buffer zone)
- stones
- wood
- liquids such as fuel, oil, etc
- concrete pipes
- other waste

If weed or pollutants are found, the Team Leader/Area Supervisor ensures that the weeds or pollutants are removed and the area is cleaned

Where weed is found the supervisor must ensure that any products, tools or facilities which were in contact are cleaned.

A record of the check is maintained on the Housekeeping check list (Form 026)

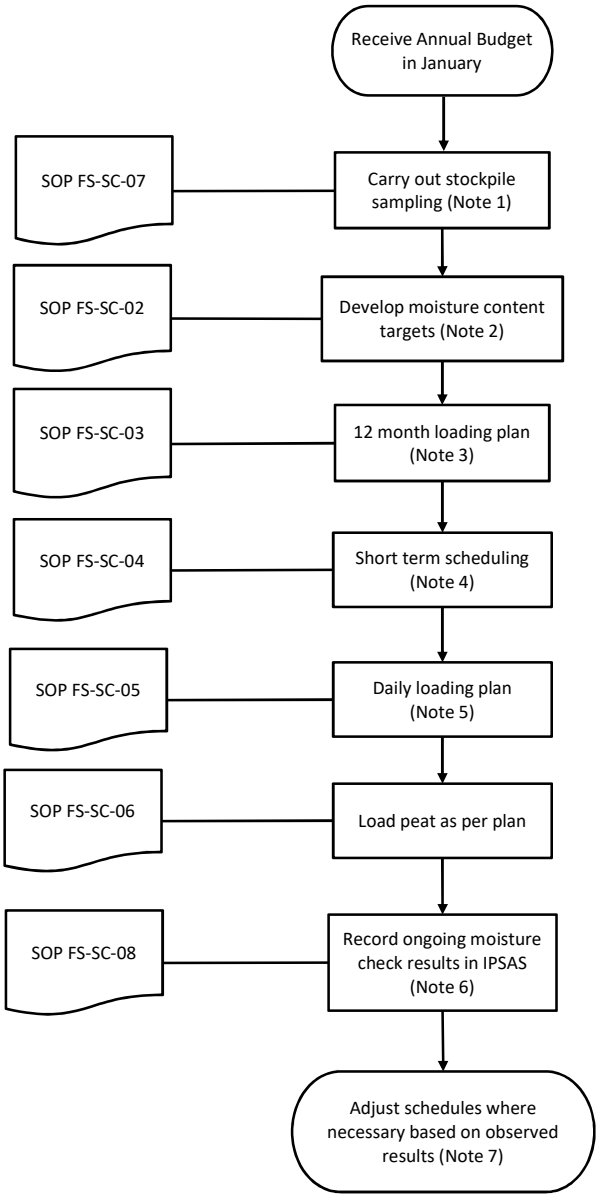
***Note the use of herbicides is not permitted***

BORD NA MÓNA
Naturally Driven

# Bog Operations Compliance Check List

| | | | | | | | | Compliant | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | v | | v | | v | | v | | | |
| **Compliance Description** | **Owner/Responsibility** | **Reporting to** | **Saved to** | **Form/Record/SOP** | **Frequency** | **Evidence** | **Comments** | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** | **Oct** | **Nov** | **Dec** |
| **Ensure Rail Plan is followed** | Eamonn Mulhall - Ignatius Kelly - Kevin Harte | | | FS-SC-10 | Weekly | | | yes | yes | yes | yes | yes | yes | yes | yes | | | | |
| **Ensure Stockpiles are opened/cut/railed according to rail plan** | Level 5 | | | FS-SC-10 | Weekly | | | | | | | | | | | | | | |
| **Inspect Silt Pond** | Level 5 | | | FS-BM-07 | Fortnightly | | | | | | | | | | | | | | |
| **Complete Bog Maintenance Report for previous month** | Level 5 | | | | (Nov-May) | | | | | | | | | | | | | | |
| **Report Bog Maintenance Plan for previous month** | Eamonn Mulhall - Ignatius Kelly - Kevin Harte | John McNiff | | FS-BM-02 | Monthly | | | | | | | | | | | | | | |
| **Work off Bog Maintenance Plan - complete previous month's work programme** | Level 5 | | | FS-BM-02 | Monthly | | | | | | | | | | | | | | |
| **Approve and issue production charts** | Eamonn Mulhall - Ignatius Kelly - Kevin Harte | | | FS-BM-02 | March | | | | | | | | | | | | | | |
| **Complete stockpile location check** | Level 5 | Finance | | FS-PR-12 | March | | | | | | | | | | | | | | |
| **Complete Polythene order form** | Eamonn Mulhall - Ignatius Kelly - Kevin Harte | Materials Manager | | FS-SP-03 and Form 18 | April | | | | | | | | | | | | | | |
| **Complete Pre-Production checks** | Level 5 | John McNiff | | FS-PR-01 | April | | | | | | | | | | | | | | |
| **Complete Key Production checks** | Level 5 | John McNiff | | FS-PR-01 and Form 22/23 | Apr-Sep | | | | | | | | | | | | | | |
| **Report Key Production checks** | Eamonn Mulhall - Ignatius Kelly - Kevin Harte | John McNiff | | FS-PR-01 and Form 22/23 | Apr-Sep | | | | | | | | | | | | | | |
| **Ensure stores has a stock of 13m rolls for early covering** | Level 5 | | | FS-SP-01 | May | | | | | | | | | | | | | | |
| **Receive form 19 from Supply Chain** | Eamonn Mulhall - Ignatius Kelly - Kevin Harte | Level 5 Bog Ops | | | July | | | | | | | | | | | | | | |
| **On non-Harvesting days, cover full stockpiles** | Level 5 | | | FS-PR-01 / FS-SP-09 and Form 19 | Aug-Sep | | | | | | | | | | | | | | |
| **Plan Covering Programme** | Eamonn Mulhall - Ignatius Kelly - Kevin Harte | | | FS-PR-01 and Form 19 | September | | | | | | | | | | | | | | |
| **When end of season is called, cover all piles** | Level 5 | | | FS-PR-01 and Form 19 | September | | | | | | | | | | | | | | |
| **Complete post-production stock check** | Level 5 | | | FS-PR-01 | September | | | | | | | | | | | | | | |
| **Agree Bog Maintenance plans** | Eamonn Mulhall - Ignatius Kelly - Kevin Harte | | | FS-BM-02 | September | | | | | | | | | | | | | | |
| **Cover all piles** | Level 5 | | | FS-SP-05 / FS-SP-06 and Form 19 | October | | | | | | | | | | | | | | |
| **Inform Supply Chain of any piles needing to be sold (eg. Heating peat)** | Eamonn Mulhall - Ignatius Kelly - Kevin Harte | Supply Chain | | FS-SP-10 | October | | | | | | | | | | | | | | |
| **Return unused polythene to stores** | Level 5 | | | FS-SP-03 / FS-SP-04 | October | | | | | | | | | | | | | | |
| **Report Bog Maintenance Plan for Management Review** | Eamonn Mulhall - Ignatius Kelly - Kevin Harte | John McNiff | | | May | | | | | | | | | | | | | | |
| **Process performance for Management Review (incl. summary of form 23 issues)** | Eamonn Mulhall - Ignatius Kelly - Kevin Harte | John McNiff | | Form 23 | Nov | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| <Add additional key business activity.> | | | | | | | | | | | | | | | | | | | |
| <Add additional key business activity.> | | | | | | | | | | | | | | | | | | | |
| <Add additional key business activity.> | | | | | | | | | | | | | | | | | | | |

| BORD NA MÓNA Naturally Driven | SOP: FS-SC-01 | Rev: 2 |
|---|---|---|
| **Title: Scheduling Flowchart** | **Approved: PR** | **Date: 29/07/2014** |




Note 1: Stockpile sampling will be carried out on all stockpiles with greater than 2 tonnes per meter at the end of each production season

Note 2: Management determine tonnes and moisture requirements by month for each customer

Note 3: Monthly schedule to be agreed by area and customer

Note 4: Information from customers and from stock are used to develop plans for stripping and laying of rails

Note 5: Information from stockpiles and expected lorry movements are used to design a delivery schedule which meets the quality targets.

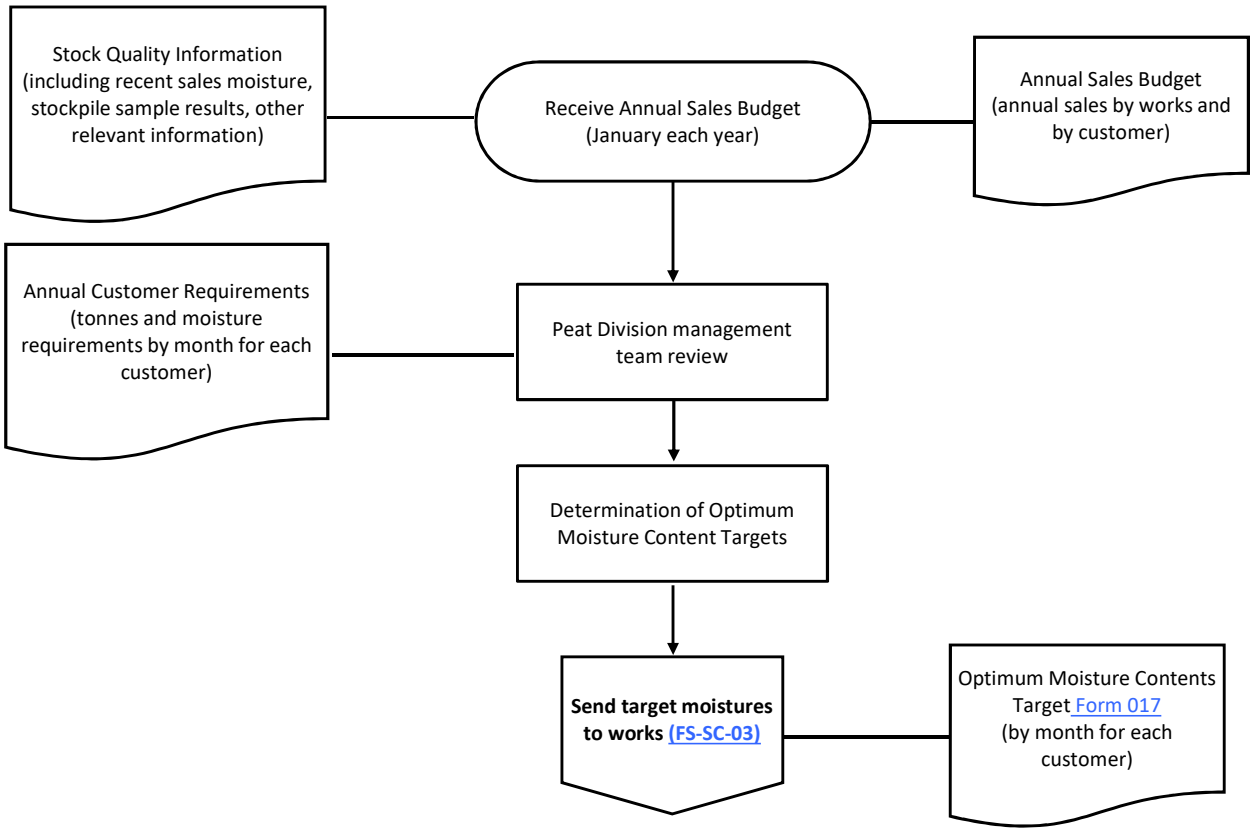
For power stations the "Daily Loading Planner" spreadsheet is used.

For briquette factories the "Blend Loading Planner" spreadsheet is used.

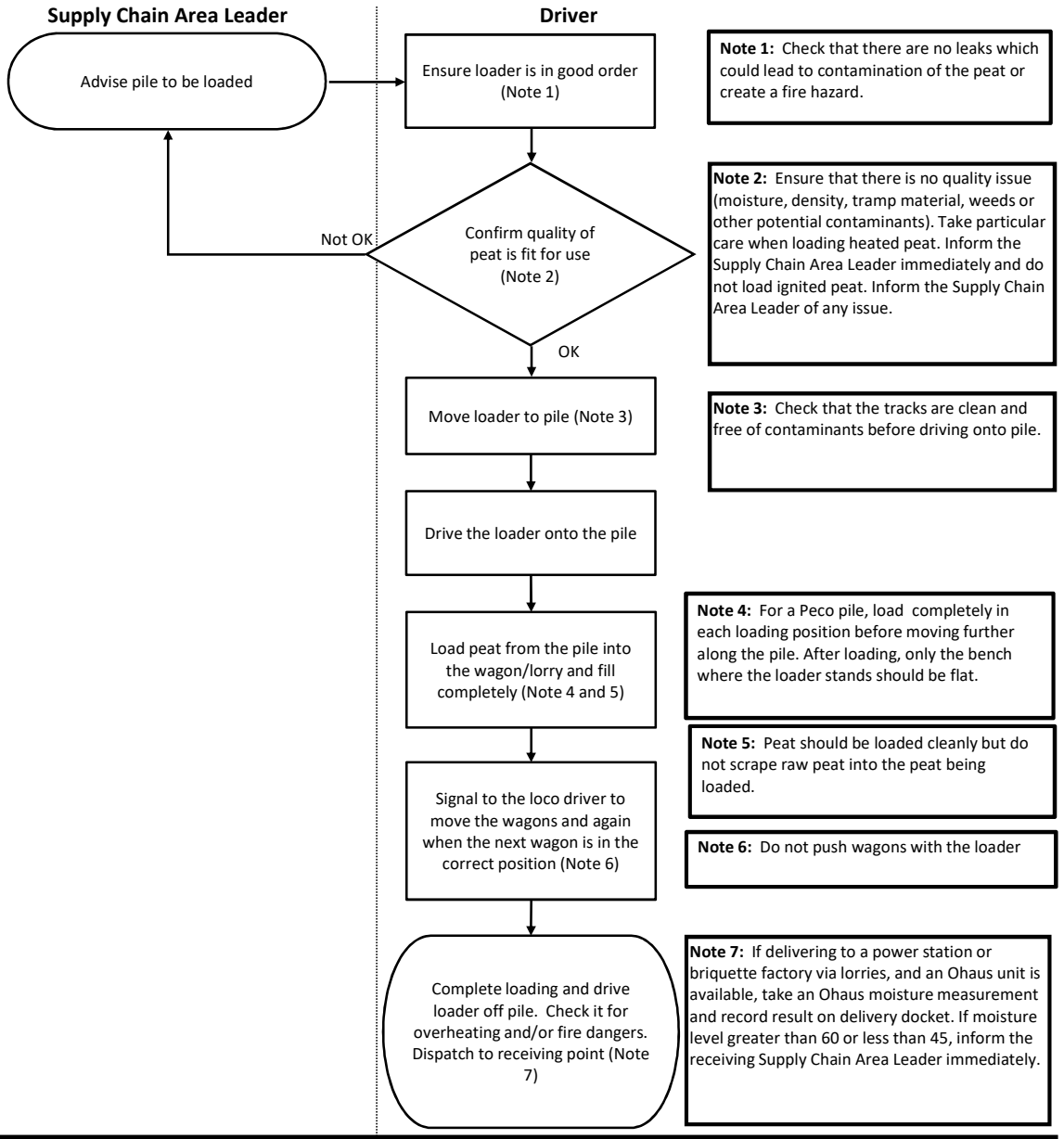
Note 6: Ohaus measurements must be taken at all points of deli very of rakes. Where there is no auto sampler, take a 1 litre sample from a depth of 2 feet into the centre wagon.

Note 7: Moisture control (General) - There are 3 sources of information regarding moisture content of peat.
Information on stockpiles in IPSAS comes from a number of sources, including stockpile sampling, and ongoing lab and Ohaus testing. This information can be used to develop the 12 month loading plan and the short term schedule.
The daily Ohaus measurements are carried out as peat is delivered in rakes, and as lorries are loaded at the bog area loading points. This information is used to develop the daily loading plans, and to adjust those plans as necessary when results differ significantly from those expected.
The on-line moisture probes in the ESB Power Stations are used to monitor the current moisture content of the primary and secondary batches. The information from these probes is used to make immediate decisions on adjustments to the delivery sequences of rakes and lorries in order to avoid moisture penalties. Where on-line moisture probes are available in other locations, they may be used to control the daily moisture content to achieve the agreed customer target.

| BORD NA MÓNA Naturally Driven | SOP: FS-SC-02 | Rev: 2 |
|---|---|---|
| **Title: Develop Moisture Targets** | **Approved: JM** | **Date: 18/07/2016** |



| BORD NA MÓNA Naturally Driven | SOP: FS-SC-06 | Rev: 2 |
|---|---|---|
| **Title: Peat Loading** | **Approved: JM** | **Date: 20/07/2016** |




**General Notes:** Where there is only a single operator, the driver should load 2 wagons and then using the loco, position the rake to load any balance of that pile section into the next wagons before starting to load from the next section. After completion of loading the rake, only the bench for the loader should be flat.

When loading from the far "opening" end of a new pile reverse the rake(s) down as far as possible to the opening end of the stockpile. (Where possible, sufficient rail should be laid to accommodate one full rake). Begin loading at the end of the pile, taking the full depth of the pile as far as possible. When the wagons within reach are loaded, the digger "tops" the pile moving along as the wagons are filled until the rake(s) are loaded. The digger is then moved back to the end of the pile and is parked off the pile to reduce the risk of fire. This process is repeated until the pile is fully opened (which should take no more than 4 double rakes.) This exposes the flattened section to getting wet, so loading this section must be prioritised.

When loading lorries move the loader along the bench to the next position to load the next portion of the trailer. Fill a walking floor trailer or tautliner along its full length but take care not to overfill as the cover has to be pulled over the load.

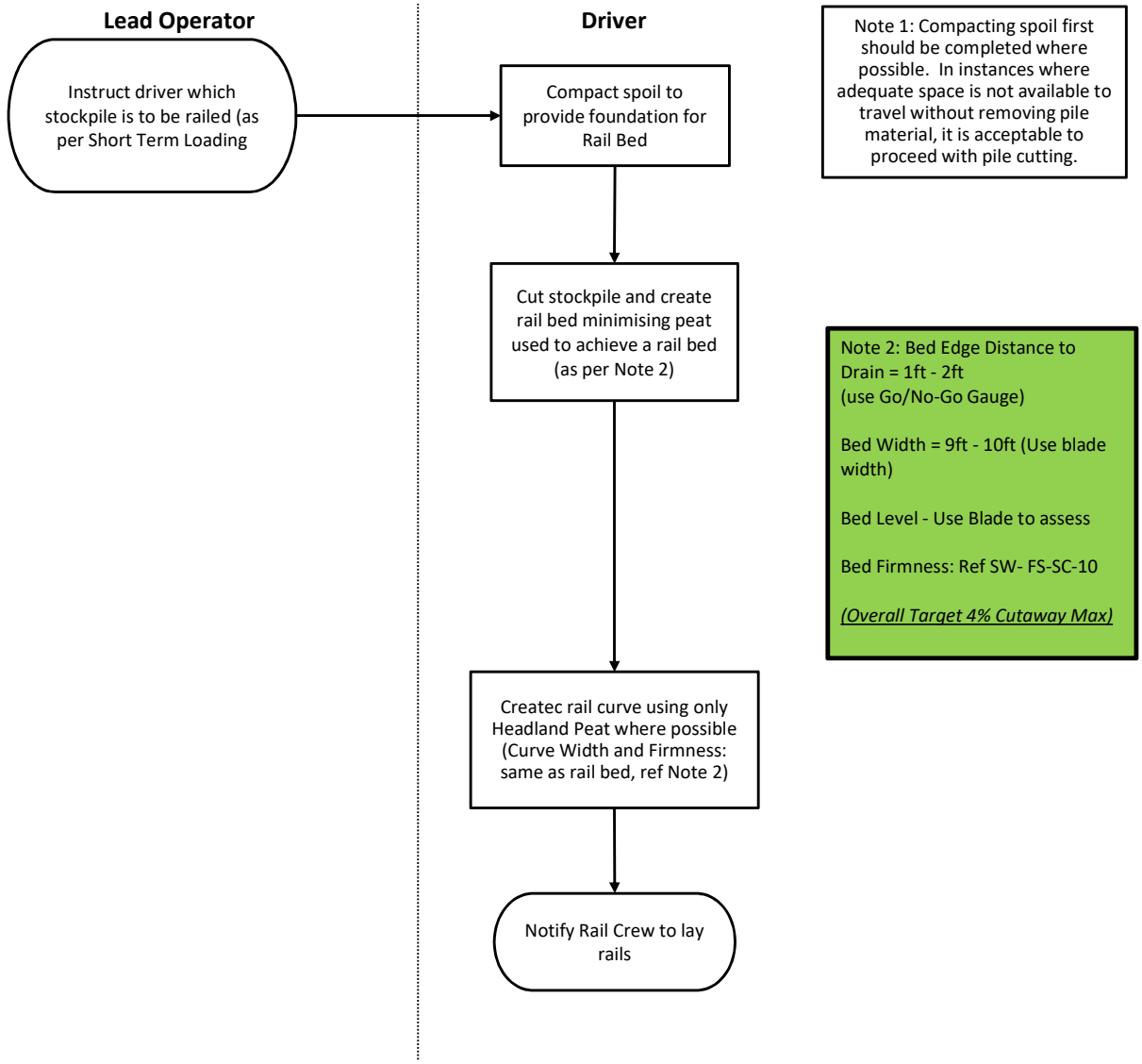
Fill a tipper trailer to approx 2/3 full then press down the peat in the trailer using the bucket to apply about 2 tonnes of pressure taking care not to hit cross ties. Top up the load and press again then top off and prepare the load for covering.

Take care when loading that no peat spills onto railways, roads or into drains.

If loading for sale for Horticulture, carry out a density measure of a representative sample of the peat which was loaded so that the volume loaded can be accurately calculated. Remember that the customer will check this.

All servicing of loading machines must be done with the machine off the pile and on the ground to prevent contamination of peat in the pile.

| BORD NA MÓNA Naturally Driven | SOP: FS-SC-10 | Rev: 1 |
|---|---|---|
| Title: Rail Bed Creation | Approved: JMcN | Date: 14/07/2016 |



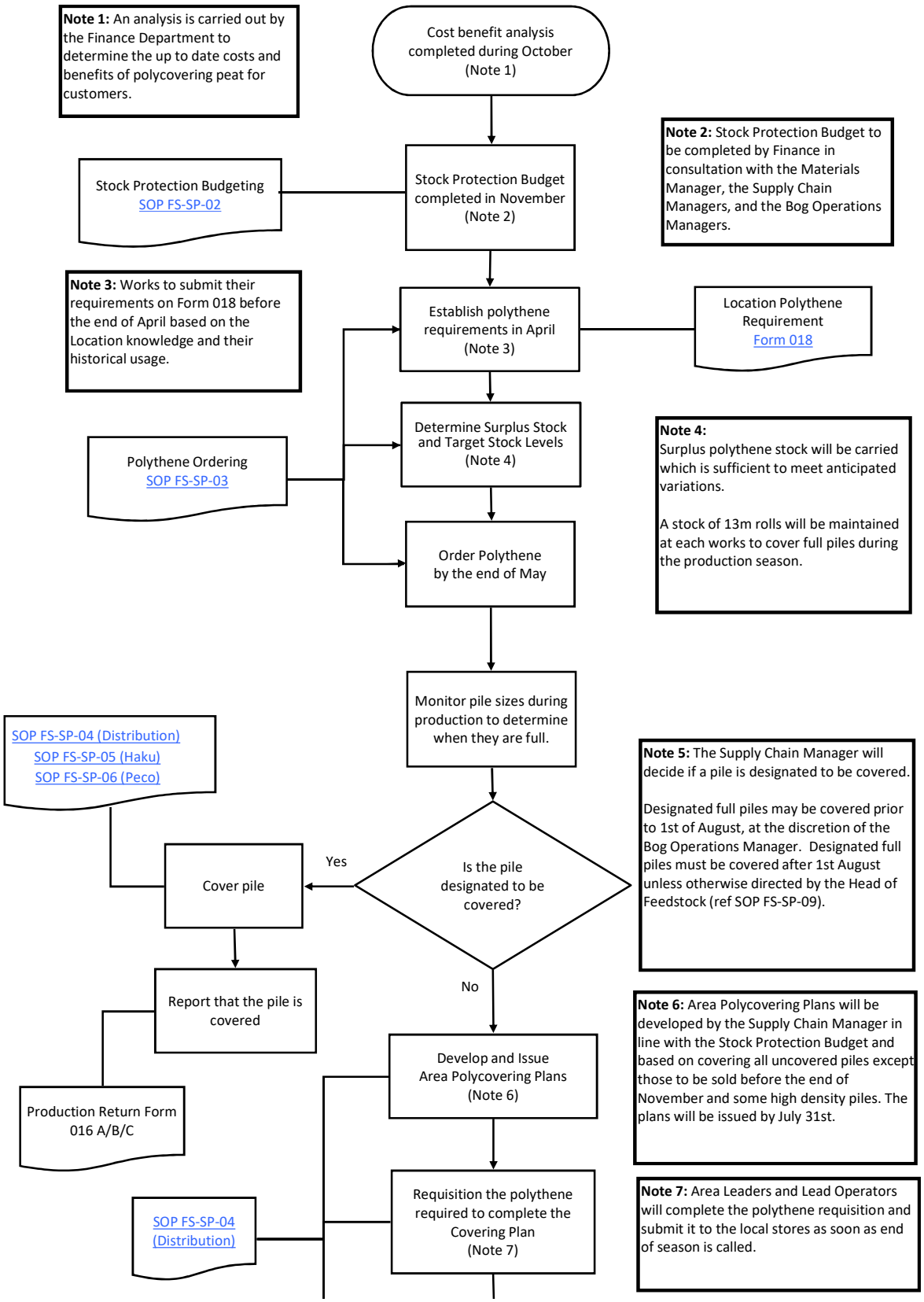

**Additional notes**

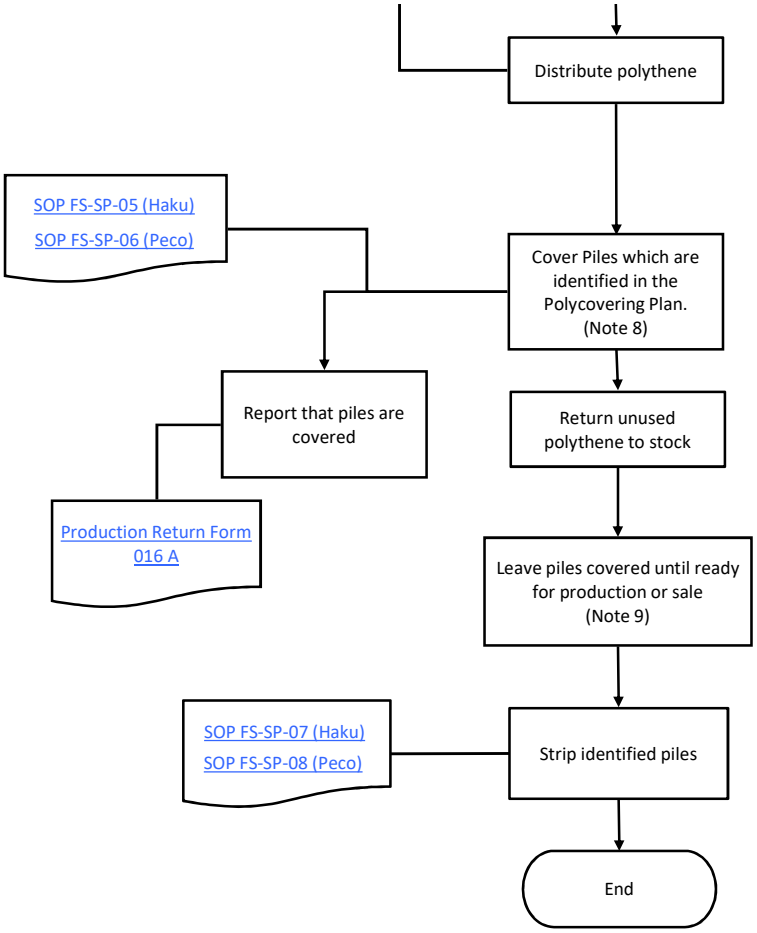
Ensure that machinery is blown down & washed at end of each day

Ensure that production machines are parked after wash down with separation to prevent spread of fire.

Ensure that daily maintenance/safety checks are carried out, with particular attention to guards and fire extinguishers

| BORD NA MÓNA Naturally Driven | SOP: FS-SP-01 | Rev: 4 |
|---|---|---|
| **Title: Stock Protection Flowchart** | **Approved: JMcN** | **Date: 15/07/2016** |






**Note 8:**
The Head of Bog Operations in consultation with the Head of Peat Divsion will issue the instruction to commence covering piles.

The Bog Operations Manager in consultation with the Head of Peat Division defines the end of the production season, at which point all uncovered piles which are planned to be covered must be covered.

In the event that it becomes clear that not all stock will be covered, priority must be given to low density stockpiles and full piles.

**Note 9:** Stripping for production should not be started until authorised by the Bog Operations Manager.

Stripping for sale should not be started until authorised by the Supply Chain Manager and no earlier than 14 days prior to commencing selling.

| BORD NA MÓNA Naturally Driven | SOP: FS-SP-03 | Rev: 2 |
|---|---|---|
| Title: Polythene Ordering | Approved: JMcN | Date: 15/07/2016 |

**1) Purpose**

The purpose of this procedure is to describe the methodology used to determine the polythene to be ordered for stock protection each year.

Because of the procurement lead-time required for polythene sheet purchase and distribution it is necessary to carry out an estimation exercise each year before the 31st of May. This is done in order to have stocks in place for the covering programme which takes place from August each year.

**2) Scope**

This procedure covers all milled peat production areas throughout the Bord na Móna Feedstock bog network.

**3) Responsibility**

The following functions are responsible for elements of the Polythene Ordering process:

Materials Manager
Bog Operations Manager
Finance Department

**4) Related Documents**

Annual production budget for the financial year in question
Annual polythene budget
Works Polythene Requirements Form 018

**5) Procedure**

**Works (determination of requirements)**

Polythene requirements are to be determined before the end of April each year in order to facilitate timely issue of purchase orders by the Materials Manager.

1. The Materials Manager issues form 018 to each Location including the estimated cost of each roll type.

2. Each Location uses its local knowledge and historical data to complete form 018. This will include:
- The width of roll
- The length of roll
- The number of rolls
- The total estimated order value based on the estimated costs, should be equal to their budgeted expenditure

3. Each Bog Operations Manager will submit his completed Form 018 to the Materials Manager by the end of April.

**Materials Manager (ordering from suppliers)**

1. Review the completed Form 018 from each Location, and calculate the total requirements.

2. Determine the targeted stock levels (targeted stock levels are the stock levels after all polythene is purchased and none has been used) for each type of roll based on the total requirements plus a sufficient stock surplus to meet unplanned requirements. The appropriate level of stock surplus for each roll type will be agreed by the Materials Manager with the Finance Department and the Bog Operations Managers each year.

3. Determine the current stock levels of each type of roll.

4. Calculate the amount of polythene to be ordered. For each type of roll this will be the targeted stock level minus the current stock level.

5. Place orders with approved suppliers before the end of May.

| BORD NA MÓNA Naturally Driven | SOP: FS-SP-04 | Rev: 4 |
|---|---|---|
| Title: Polythene Distribution | Approved: JMcN | Date: 15/07/2016 |

**1) Purpose**

The purpose of this procedure is to describe the arrangements for distributing polythene to the production areas. It aims to ensure all materials issues are recorded and charged to the correct bog area, whilst minimising the level of post season material returns.

**2) Scope**

This procedure covers all polythene distributed through the Bord na Móna Peat Division stores network.

**3) Responsibility**

The following functions are responsible for elements of the Polythene Distribution process:

The local stores team
Materials Manager
Bog Operations Manager
Lead Operator
Area Leader

**4) Related Documents**

Material requisition
Polycovering Plan Form 019

**5) Procedure**

1. The local stores team will receipt, inspect, store and detail on the inventory management system all new season polythene as per the materials receipt process.

2. The Materials Manager must arrange to have a stock of 13m rolls available at all works to facilitate earlier covering of full piles. Some of this will be distributed to production areas to facilitate early covering and the required requisitions will be provided by the Bog operations Manager.

3. When any pile is designated as full by the Area Leader, he will contact the Supply Chain Manager and determine if the pile is designated for covering.

4. If the pile is designated for covering, the Lead Operator will organise to have the pile covered using the area's polythene. If additional polythene is required, the Lead Operator will send a requisition to the local stores.

5. The Supply Chain Manager, with the approval of the Bog Operations Manager, determines which piles are to be covered taking into account piles scheduled to be sold before the end of November, and piles which are already covered. From this, the piles to be covered will be determined.

6. The Supply Chain Manager will input the piles to be covered on the form 019 for each area and have them issued to the relevant Area Leaders by **July 31st.**

7. The Area Leader and Lead Operator will complete the form 019 for the area. This will include; roll width, roll length, and number of rolls for each pile which is being covered. The Area Leader will submit the completed form to the local stores team as soon as end of season is called.

8. The local stores team will record and arrange delivery of all requirements; ensuring accurate records detailing each movement are updated through the inventory management system. All material costs will be charged to the relevant bog area at point of issue.

9. Should additional polythene be required by an area above their original order, authorisation from the relevant Bog Operations Manager will be required.

10. Where there is a shortage of a particular type of polythene, the Bog Operations Manager will work with counterparts in other Locations to manage inter-Location stocks. Where suitable polythene is not available, 13m rolls can either be used as is, or cut to the desired width.

11. Whilst the level of materials returns to stores should be minimised, the required collection of any unused reels from individual bog area to be advised to the local stores team by the relevant Area Leader as soon as the covering operation in the area has concluded.

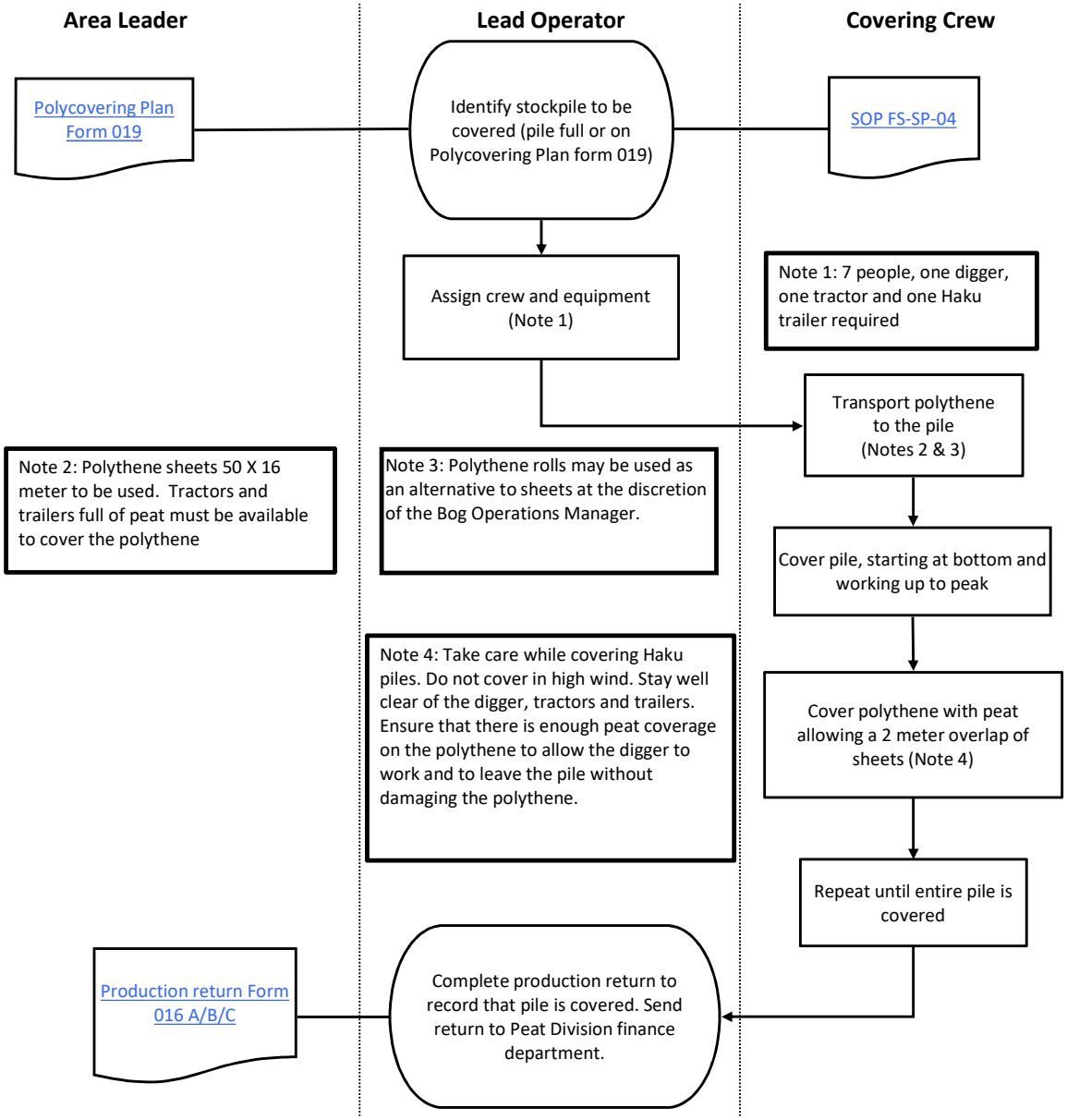
12. The local stores team must ensure any unused polythene is properly secured, and reinstated on the inventory management system by **October 31st** at the latest.

13. The Materials Manager must ensure that all surplus material from the current season is colour coded and positioned appropriately to allow FIFO distribution of such stock for the following season.

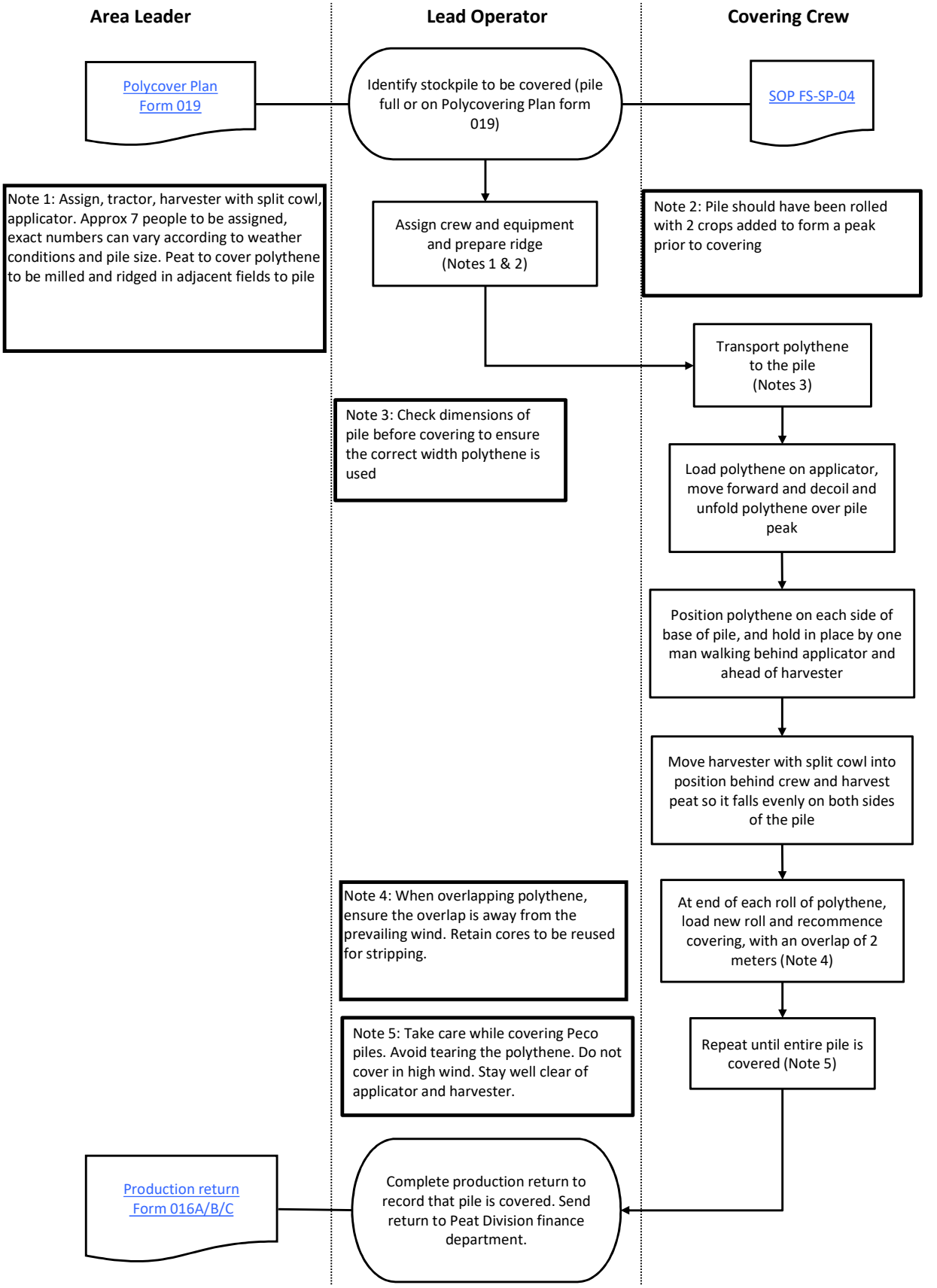
**6) Records**

Material requisitions

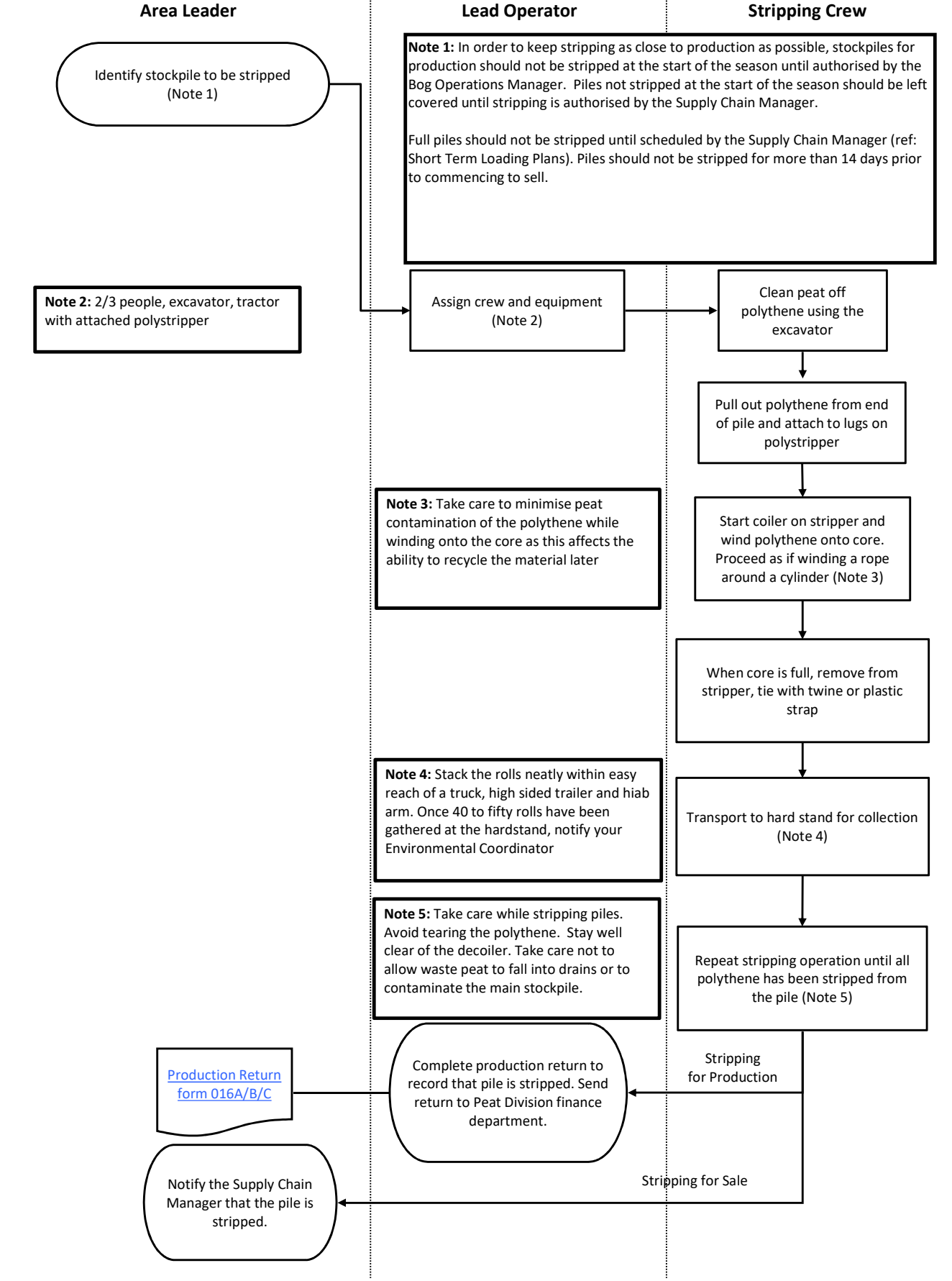
| BORD NA MÓNA Naturally Driven | SOP: FS-SP-05 | Rev: 2 |
|---|---|---|
| Title: Covering Haku Stockpiles | Approved: JMcN | Date: 15/07/2016 |



| BORD NA MÓNA Naturally Driven | SOP: FS-SP-06 | Rev: 2 |
|---|---|---|
| Title: Covering Peco Stockpiles | Approved: JMcN | Date: 15/07/2016 |



| BORD NA MÓNA Naturally Driven | SOP: FS-SP-07 | Rev: 2 |
|---|---|---|
| **Title: Stripping Haku Stockpiles** | **Approved: JMcN** | **Date: 15/07/2016** |



| BORD NA MÓNA Naturally Driven | SOP: FS-SP-08 | Rev: 2 |
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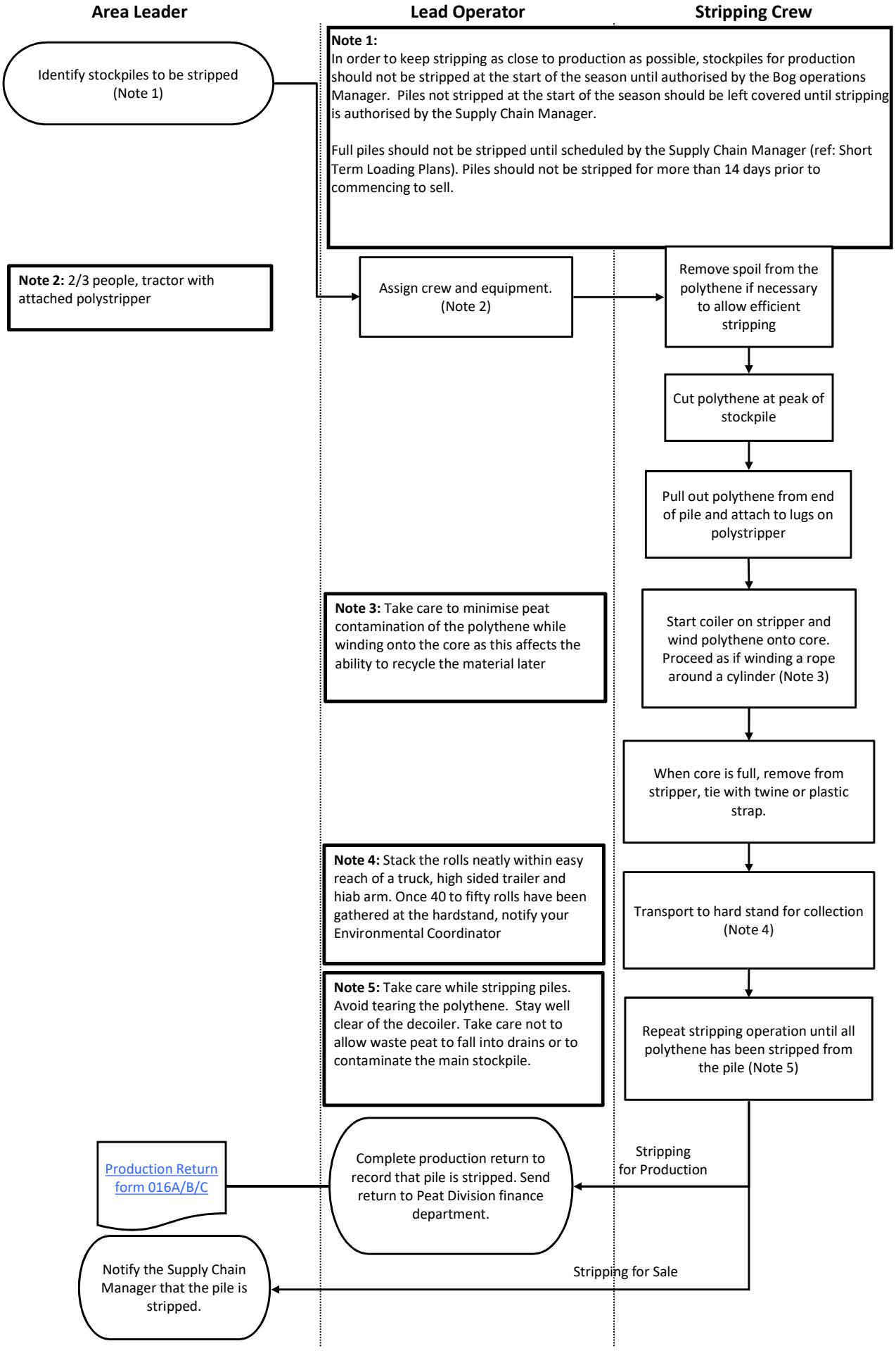
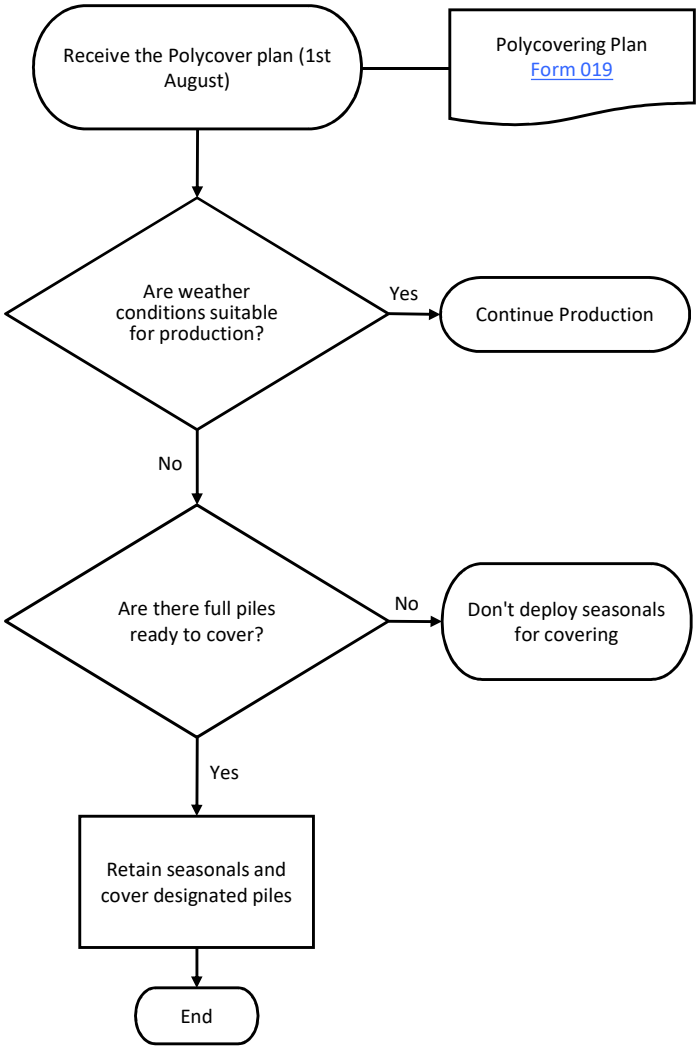
| Title: Stripping Peco Stockpiles | Approved: JMcN | Date: 15/07/2016 |



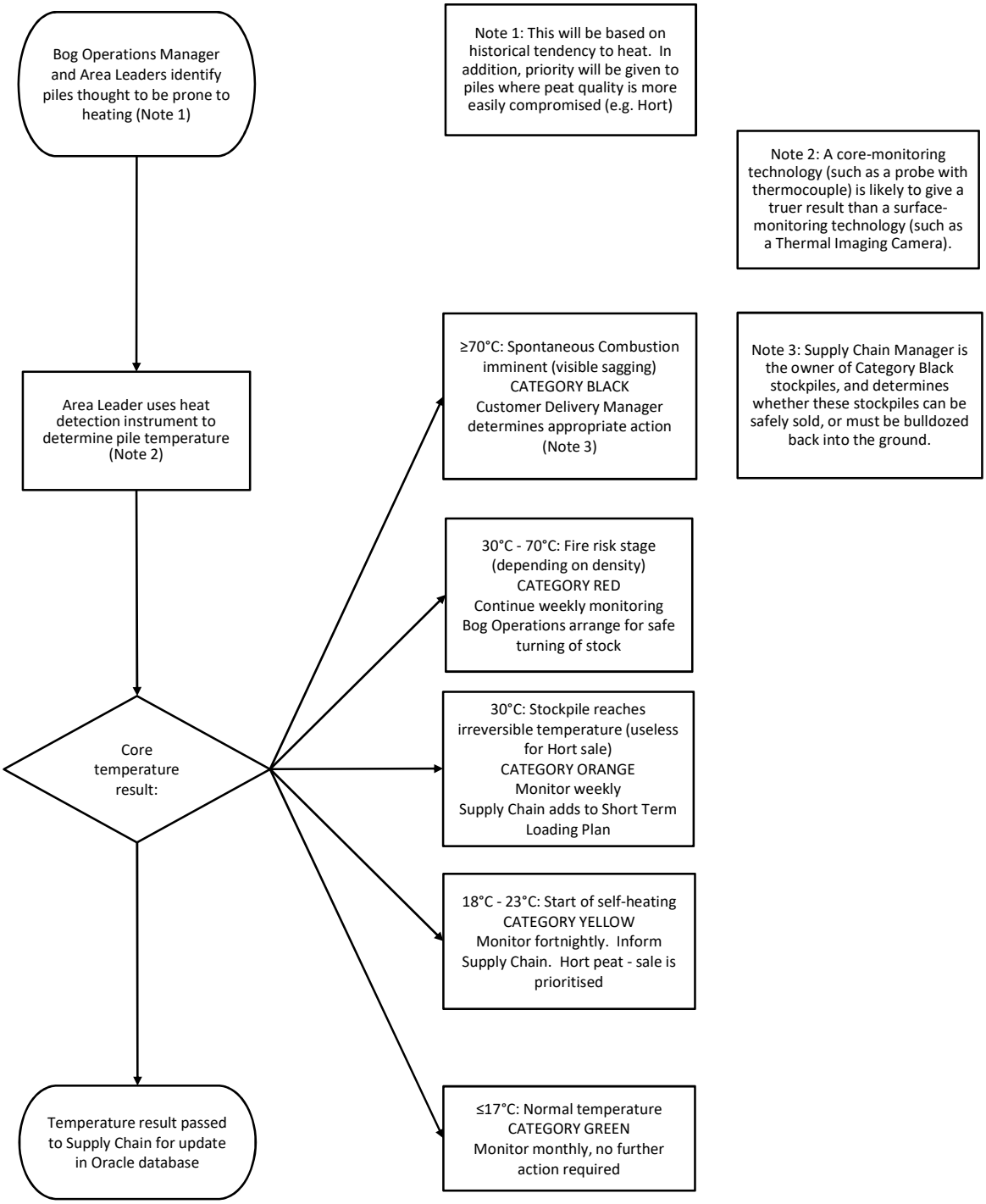
| BORD NA MÓNA Naturally Driven | SOP: FS-SP-09 | Rev: 3 |
|---|---|---|
| **Title: Covering Piles during Production** | **Approved: JMcN** | **Date: 10/4/2018** |

**Note 1:** This SOP comes into force after 1st August each year in all Locations. It is Bord na Móna (Peat Division) policy to cover full piles from 15th August or at 80% production.

**Note 2:** Peco stockpiles are considered full when the width is 32 feet, distance to rail bed side is 9 feet, and distance to far side is 5 feet.



| BORD NA MÓNA Naturally Driven | SOP: FS-SP-10 | Rev: 1 |
|---|---|---|
| **Title: Management of Heating Peat** | **Approved: JMcN** | **Date: 15/04/2016** |




**Additional notes**

Beware of fire risk - dust from heating piles entering machinery air intake

Ensure that machinery is blown down & washed at end of each day

Ensure that production machines are parked after wash down with separation to prevent spread of fire.

Ensure that daily maintenance/safety checks are carried out, with particular attention to guards and fire extinguishers

# APPENDIX 4-12

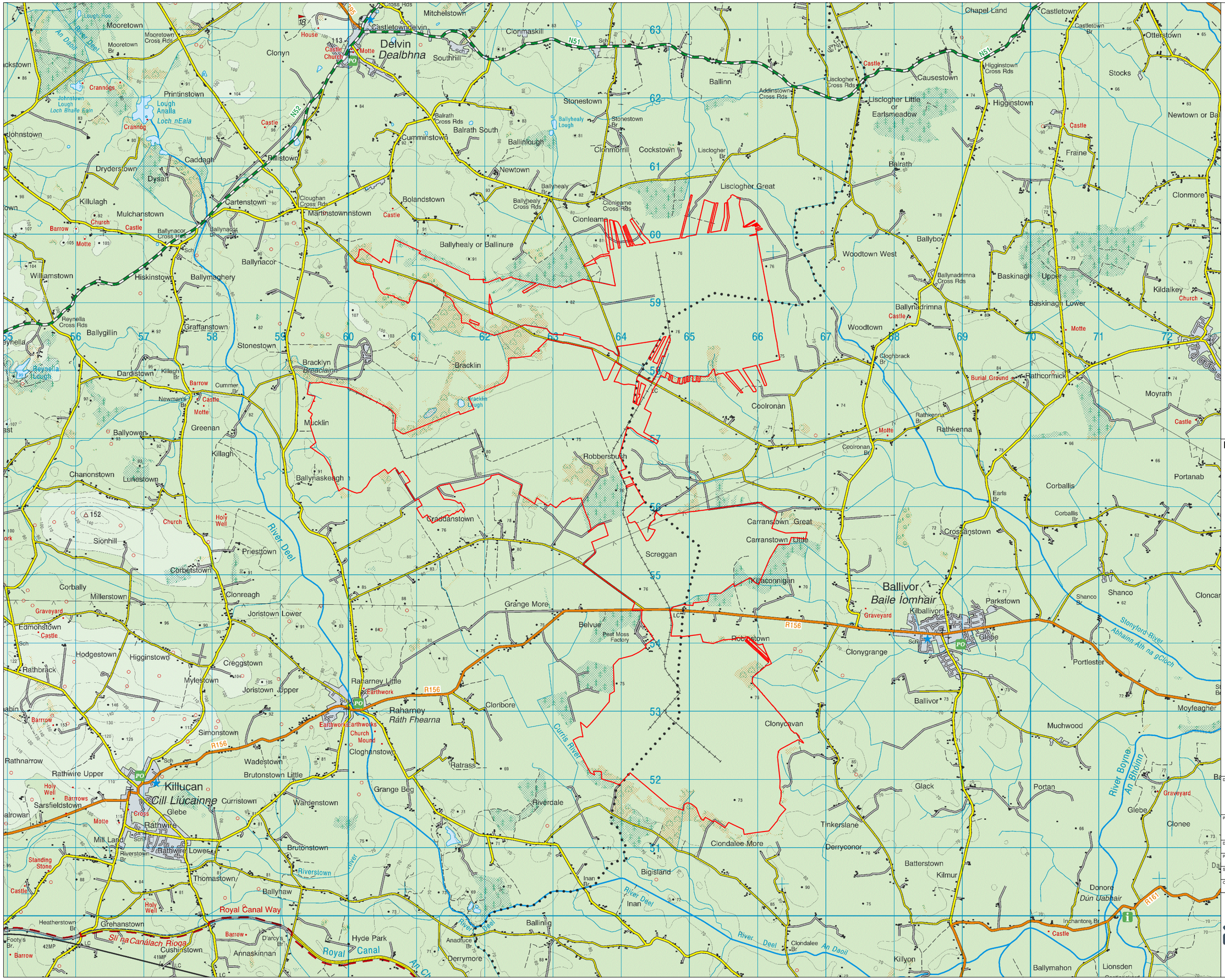
***PLANNING APPLICATION DRAWINGS***

# BnM Substitute Consent Application,
# Ballivor Bog Group
# Planning Permission Application Drawings

# Schedule of Drawings

| Drawing No. | Drawing Title | Scale |
|---|---|---|
| 191137-f – 01 | Location Context Map | 1: 50,000 @A3 |
| 191137-f – 02 | Site Location Map Keyplan | 1: 20,000 @A1 |
| 191137-f – 02a | Site Notice Location Map A | 1: 5,000 @A1 |
| 191137-f – 02b | Site Notice Location Map B | 1: 5,000 @A1 |
| 191137-f – 02c | Site Notice Location Map C | 1: 5,000 @A1 |
| 191137-f – 02d | Site Notice Location Map D | 1: 5,000 @A1 |
| 191137-f – 02e | Site Notice Location Map E | 1: 5,000 @A1 |
| 191137-f – 03 | Site Layout Key Plan | 1: 20,000 @A1 |
| 191137-f – 03a | Site Layout Sheet 1 of 12 | 1: 2,500 @A0 |
| 191137-f – 03b | Site Layout Sheet 2 of 12 | 1: 2,500 @A0 |
| 191137-f – 03c | Site Layout Sheet 3 of 12 | 1: 2,500 @A0 |
| 191137-f – 03d | Site Layout Sheet 4 of 12 | 1: 2,500 @A0 |
| 191137-f – 03e | Site Layout Sheet 5 of 12 | 1: 2,500 @A0 |
| 191137-f – 03f | Site Layout Sheet 6 of 12 | 1: 2,500 @A0 |
| 191137-f – 03g | Site Layout Sheet 7 of 12 | 1: 2,500 @A0 |
| 191137-f – 03h | Site Layout Sheet 8 of 12 | 1: 2,500 @A0 |
| 191137-f – 03i | Site Layout Sheet 9 of 12 | 1: 2,500 @A0 |
| 191137-f – 03j | Site Layout Sheet 10 of 12 | 1: 2,500 @A0 |
| 191137-f – 03k | Site Layout Sheet 11 of 12 | 1: 2,500 @A0 |
| 191137-f – 03l | Site Layout Sheet 12 of 12 | 1: 2,500 @A0 |
| 191137-f – 10 | Lisclogher Bog Section 1-1 | 1: 500 @A1 |
| 191137-f – 11 | Lisclogher Bog Section A-A | 1: 500 @A1 |
| 191137-f – 12 | Bracklin Bog Section 2-2 | 1: 500 @A1 |
| 191137-f – 13a | Bracklin West / Bracklin Bog Section B-B Sheet 01 of 02 | 1: 500 @A1 |
| 191137-f – 13b | Bracklin West / Bracklin Bog Section B-B Sheet 02 of 02 | 1: 500 @A1 |
| 191137-f – 14 | Carranstown Bog Section 3-3 | 1: 500 @A1 |
| 191137-f – 15a | Carranstown Bog Section C-C Sheet 01 of 02 | 1: 500 @A1 |
| 191137-f – 15b | Carranstown Bog Section C-C Sheet 02 of 02 | 1: 500 @A1 |
| 191137-f – 16a | Ballivor Bog Section 4-4 Sheet 01 of 02 | 1: 500 @A1 |
| 191137-f – 16b | Ballivor Bog Section 4-4 Sheet 02 of 02 | 1: 500 @A1 |
| 191137-f – 17a | Ballivor Bog Section D-D Sheet 01 of 02 | 1: 500 @A1 |
| 191137-f – 17b | Ballivor Bog Section D-D Sheet 02 of 02 | 1: 500 @A1 |
| 191137-f – 18 | Peat Extraction Layout Plan 1988 | 1: 20,000 @A1 |
| 191137-f – 19 | Peat Extraction Layout Plan 1995 | 1: 20,000 @A1 |
| 191137-f – 20 | Peat Extraction Layout Plan 2004 | 1: 20,000 @A1 |
| 191137-f – 21 | Peat Extraction Layout Plan 2020 | 1: 20,000 @A1 |
| 191137-f – 22 | Site Drainage Key Plan | 1: 20,000 @A1 |
| 191137-f – 22a | Site Layout Drainage Sheet 1 of 12 | 1: 2,500 @A0 |
| 191137-f – 22b | Site Layout Drainage Sheet 2 of 12 | 1: 2,500 @A0 |
| 191137-f – 22c | Site Layout Drainage Sheet 3 of 12 | 1: 2,500 @A0 |
| 191137-f – 22d | Site Layout Drainage Sheet 4 of 12 | 1: 2,500 @A0 |
| 191137-f – 22e | Site Layout Drainage Sheet 5 of 12 | 1: 2,500 @A0 |
| 191137-f – 22f | Site Layout Drainage Sheet 6 of 12 | 1: 2,500 @A0 |
| 191137-f – 22g | Site Layout Drainage Sheet 7 of 12 | 1: 2,500 @A0 |

| | | |
|---|---|---|
| 191137-f – 22h | Site Layout Drainage Sheet 8 of 12 | 1: 2,500 @A0 |
| 191137-f – 22i | Site Layout Drainage Sheet 9 of 12 | 1: 2,500 @A0 |
| 191137-f – 22j | Site Layout Drainage Sheet 10 of 12 | 1: 2,500 @A0 |
| 191137-f – 22k | Site Layout Drainage Sheet 11 of 12 | 1: 2,500 @A0 |
| 191137-f – 22l | Site Layout Drainage Sheet 12 of 12 | 1: 2,500 @A0 |
| 191137-f – 29 | Drainage Details | As Shown @ A3 |
| 191137-f – 30 | Settlement Pond Detail | 1:200 @ A3 |
| BNM-BR-DR-PS-01 | Cofferdam Pump Site | As Shown @ A1 |


Mooretown
Mooretown Cross Rds
Mooretown Br
Clonyn
Printinstown
Crannogs
Johnstown Lough
Loch Bhaile Eain
Lough Analla
Loch nEala
Crannog
Castle
N52
Johnstown
Caddagh
Dryderstown
Dysart
Killulagh
Church
Castle
Barrow
Motte
Mulchanstown
Ballynacor Cross Rds
Ballynacor
Williamstown
Hiskinstown
Ballymaghery
Reynella Cross Rds
Ballygillin
Graffanstown
Stonestown
Reynella Lough
Dardistown
Killagh Br
Barrow
Cummer Br
Newman's Br
Castle
Motte
Ballyowen
Greenan
Killagh
Chanonstown
Lunestown
Ballynaskeagh
Bracklyn
Breaclainn
Mucklin
Robbersbush
Craddanstown
Sionhill
Church
Holy Well
Priesttown
Corbetstown
Corbally
Millerstown
Clonreagh
Graveyard
Edmonstown
Castle
Joristown Lower
Hodgestown
Higginstown
Creggstown
Rathbrack
Mylestown
Joristown Upper
Barrow
Simonstown
Rathnarrow
Rathwire Upper
Wadestown
Brutonstown Little
Holy Well
Barrows
Sarsfieldstown
Killucan
Cill Liucainne
Curristown
Wardenstown
Motte
Cross
Glebe
Rathwire
Mill Land
Rathwire Lower
Riverstown Br
Brutonstown
Standing Stone
Castle
Thomastown
Ballynaw
Holy Well
Royal Canal Way
Heatherstown Br
Grehanstown
Sli na Canálach Rioga
Barrow
Footy's Br.
Barrow
Cushinstown
D'arcys Br
Annaskinnan
Hyde Park
Royal Canal
Graig
Raharney Little
Earthwork
Raharney
Ráth Fhearna
Earthworks
Church
Mound
Cloghanstown
Ratrass
Grange Beg
Riverdale
Cloribore
Grange More
Belvue
Peat Moss Factory
Robinstown
Kilnaconigan
Carranstown Great
Carranstown Little
Screggan
Tinkerslane
Derryconor
Clondalee More
Bigisland
Inan Br
Inan
Anadruce Br
Derrymore
Ballinlig
Clondalee Br
Killyon
Ballymahon
Lionsden
Ballymacad
Ballymacad Br
Ballymacad Lower
Ballymacad Upper
Ballymacad Cross Rds
Ballymacad Castle
Ballymacad Motte
Ballymacad Church
Ballymacad Graveyard
Ballymacad Holy Well
Ballymacad Standing Stone
Ballymacad Barrow
Ballymacad Footy's Br.
Ballymacad Heatherstown Br
Ballymacad Grehanstown
Ballymacad Sli na Canálach Rioga
Ballymacad Barrow
Ballymacad Cushinstown
Ballymacad D'arcys Br
Ballymacad Annaskinnan
Ballymacad Hyde Park
Ballymacad Royal Canal
Ballymacad Graig
Ballymacad Raharney Little
Ballymacad Earthwork
Ballymacad Raharney
Ballymacad Ráth Fhearna
Ballymacad Earthworks
Ballymacad Church
Ballymacad Mound
Ballymacad Cloghanstown
Ballymacad Ratrass
Ballymacad Grange Beg
Ballymacad Riverdale
Ballymacad Cloribore
Ballymacad Grange More
Ballymacad Belvue
Ballymacad Peat Moss Factory
Ballymacad Robinstown
Ballymacad Kilnaconigan
Ballymacad Carranstown Great
Ballymacad Carranstown Little
Ballymacad Screggan
Ballymacad Tinkerslane
Ballymacad Derryconor
Ballymacad Clondalee More
Ballymacad Bigisland
Ballymacad Inan Br
Ballymacad Inan
Ballymacad Anadruce Br
Ballymacad Derrymore
Ballymacad Ballinlig
Ballymacad Clondalee Br
Ballymacad Killyon
Ballymacad Ballymahon
Ballymacad Lionsden
Delvin
Dealbhna
Castle
Church
Motte
Castletowndelvin
Mitchelstown
Southhill
Clonmaskill
N51
Ballinn
Stonestown
Stonestown Br
Ballyhealy Lough
Balrath Cross Rds
Balrath South
Cummingstown
Ballinlough
Clonmorrill
Cockstown
Lisclogher Br
Newtown
Ballyhealy
Ballyhealy Br
Ballyhealy Cross Rds
Clonleame Cross Rds
Clonleame
Boolandstown
Martinstownnstown
Cloughan Cross Rds
Ballyhealy or Ballinure
Lisclogher Great
Addinstown Cross Rds
Lisclogher Cross Rds
Lisclogher Little or Earlsmeadow
Causestown
Higginstown Cross Rds
Higginstown
Castle
Balrath
Chapel Land
Castletown
Castletown Br
Otterstown
Stocks
Newtown or Ba
Fraine
Clonmore
Kildalkey
Church
Baskinagh Upper
Baskinagh Lower
Ballybow
Woodtown West
Ballynadrimna Cross Rds
Ballynadrimna
Castle
Woodtown
Cloghbrack Br
Burial Ground
Rathcormick
Moyrath
Castle
Rathkenna Br
Rathkenna
Motte
Coolronan Br
Coolronan
Ballivor
Baile Iomhair
Graveyard
Kilballivor
Parkstown
Glebe
Shanco Br
Shanco
Cloncar
Slonyford River
Abhainn Áth na gCloch
Portlester
Clonygrange
Ballivor
Muchwood
Moyfeagher
Glack
Portan
Graveyard
Glebe
Clonee
River Boyne
An Bhóinn
Corballis
Corballis Br
Earls Br
Portanab
Crossanstown
Inchantore Br
Castle
Donore
Dún Uabhair
R161
Batterstown
Kilmur
Shanco
Abhainn Áth na gCloch
R156
Currin River
River Deel
An Daoil
River Deel
Lough Hoo
An Daoil
River Deel
Lough Hoo
House
Castle
Church
Motte
Castle
Church
Holy Well
Castle
Motte
Castle
Church
Holy Well
Castle
Motte
Castle
Church
Holy Well
Castle

A

B

C

D

E

Lisclogher West

Lisclogher

Bracklin

Carranstown

Ballivor

Ballivor

## Drawing Legend

- Planning Application Boundary
- Landowners Boundary
- Site Notice
- Wayleaves
- County Boundary

N

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DRAWING TITLE:

# Site Location Map Keyplan

PROJECT TITLE:

**BnM Substitute Consent Application, Ballivor Bog Group**

| | |
|---|---|
| DRAWING BY: JOB/KD | CHECKED BY: Tommy Harlin |
| PROJECT No.: 191137-f | DRAWING No.: 191137-f - 02 |
| SCALE: 1:20,000 @ A1 | DATE: 30.07.2024 |
| OS SHEET No.: 2635, 2636, 2636, 2637, 2705, 2706, 2707, 2708, 2774, 2775, 2776, 2777, 2842, 2843, 2844, 2845 | |

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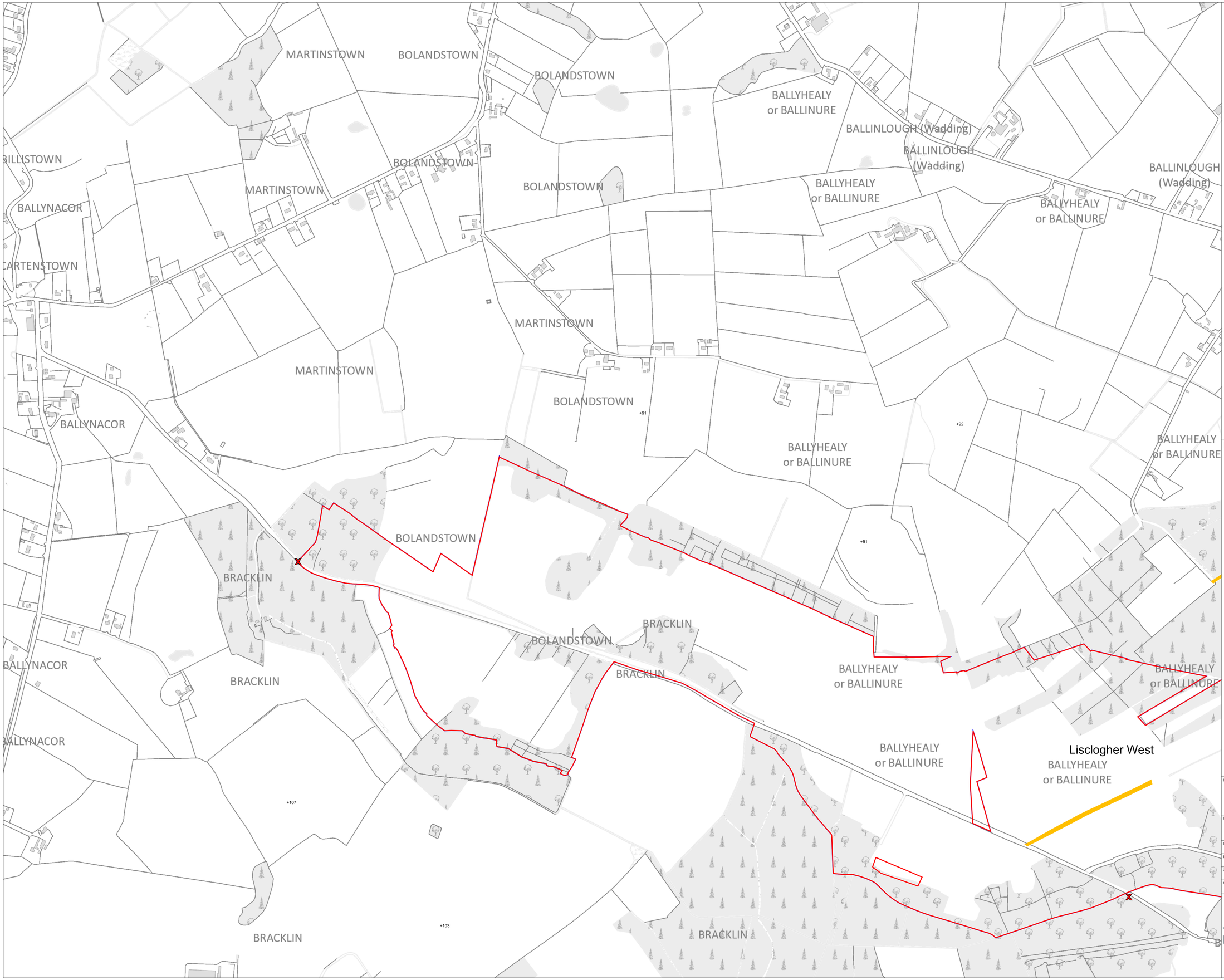


## Drawing Legend

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- County Boundary

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DRAWING TITLE:

# Site Notice Location Map A

PROJECT TITLE:

**BnM Substitute Consent Application, Ballivor Bog Group**

| | |
|---|---|
| DRAWING BY: JOB/KD | CHECKED BY: Tommy Harlin |
| PROJECT No.: 191137-f | DRAWING No.: 191137-f - 02A |
| SCALE: 1:5,000 @ A1 | DATE: 30.07.2024 |

OS SHEET No.: 2635, 2636, 2636, 2637, 2705, 2706, 2707, 2708, 2774, 2775, 2776, 2777, 2842, 2843, 2844, 2845

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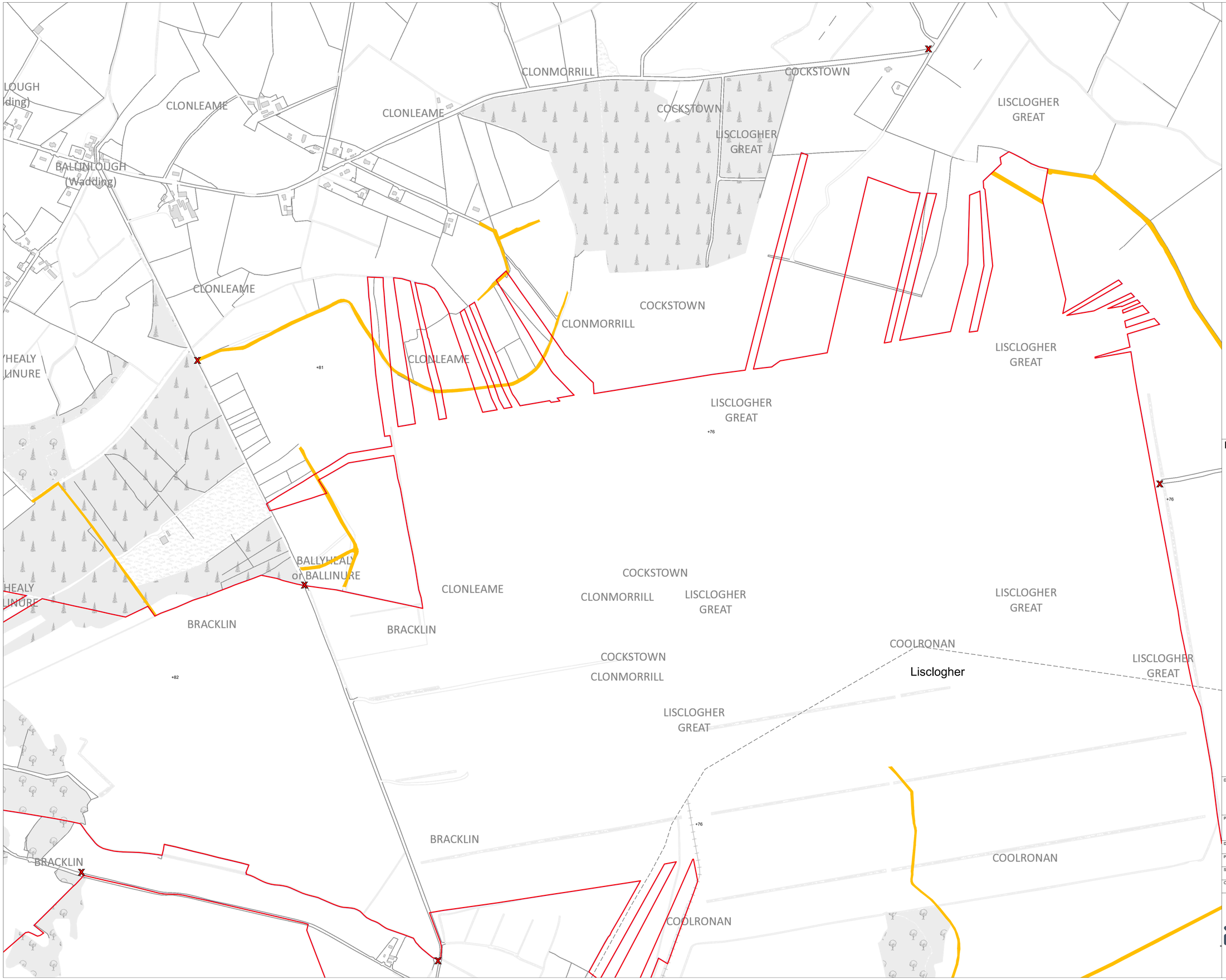


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- County Boundary

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DRAWING TITLE:

# Site Notice Location Map B

PROJECT TITLE:

**BnM Substitute Consent Application, Ballivor Bog Group**

| | |
|---|---|
| DRAWING BY: JOB/KD | CHECKED BY: Tommy Harlin |
| PROJECT No.: 191137-f | DRAWING No.: 191137-f - 02B |
| SCALE: 1:5,000 @ A1 | DATE: 30.07.2024 |
| OS SHEET No.: 2635, 2636, 2636, 2637, 2705, 2706, 2707, 2708, 2774, 2775, 2776, 2777, 2842, 2843, 2844, 2845 | |

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BRACKLIN

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+80

+107

+76

+78

+76

## Drawing Legend

- Planning Application Boundary
- Landowners Boundary
- Site Notice
- Wayleaves
- County Boundary

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N

DRAWING TITLE:

# Site Notice Location Map C

PROJECT TITLE:

**BnM Substitute Consent Application, Ballivor Bog Group**

| DRAWING BY: | CHECKED BY: |
|---|---|
| JOB/KD | Tommy Harlin |
| PROJECT No: 191137-f | DRAWING No.: 191137-f - 02C |
| SCALE: 1:5,000 @ A1 | DATE: 30.07.2024 |

OS SHEET No.: 2635, 2636, 2636, 2637, 2705, 2706, 2707, 2708, 2774, 2775, 2776, 2777, 2842, 2843, 2844, 2845

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Website: www.mkoireland.ie

COOLRONAN
COOLRONAN
COOLRONAN
RATHKEN
COOLRONAN
COOLRONAN
COOLRONAN
COOLRONAN
COOLRONAN
COOLRONAN
COOLRONAN
CARRANSTOWN GREAT
CARRANSTOWN GREAT
CARRANSTOWN GREAT
CARRANSTOWN GREAT
CARRANSTOWN LITTLE
CARRANSTOWN LITTLE
CARRANSTOWN LITTLE
GRANGE MORE
GRANGE MORE
Carranstown
KILLACONNIGAN
KILLACONNIGAN

## Drawing Legend

- Planning Application Boundary
- Landowners Boundary
- Site Notice
- Wayleaves
- County Boundary

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N

DRAWING TITLE:
# Site Notice Location Map D

PROJECT TITLE:
**BnM Substitute Consent Application, Ballivor Bog Group**

| | |
|---|---|
| DRAWING BY: JOB/KD | CHECKED BY: Tommy Harlin |
| PROJECT No.: 191137-f | DRAWING No.: 191137-f - 02D |
| SCALE: 1:5,000 @ A1 | DATE: 30.07.2024 |
| OS SHEET No.: 2635, 2636, 2636, 2637, 2705, 2706, 2707, 2708, 2774, 2775, 2776, 2777, 2842, 2843, 2844, 2845 | |

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email: info@www.mkoireland.ie
Website: www.mkoireland.ie

Carranstown

ANGE MORE

GRANGE MORE

GRANGE MORE

GRANGE MORE

GRANGE MORE

GRANGE MORE

GRANGE MORE

KILLACONNIGAN

KILLACONNIGAN

KILLACONNIGAN

KILLACONNIGAN

KILLACO

ROBINSTOWN

ROBINSTOWN

ROBINSTOWN

ROBINSTOWN

RIVERDALE

RIVERDALE

RIVERDALE

CLONYCAVAN

CLONYCAVAN

CLONYCAVAN

CLONYCAVAN

CLONYCAVAN

Ballivor

DERRYCONOR

+76

+75

+75

+70

## Drawing Legend

- Planning Application Boundary
- Landowners Boundary
- Site Notice
- Wayleaves
- County Boundary

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N

DRAWING TITLE:

# Site Notice Location Map E

PROJECT TITLE:

**BnM Substitute Consent Application, Ballivor Bog Group**

| | |
|---|---|
| DRAWING BY: JOB/KD | CHECKED BY: Tommy Harlin |
| PROJECT No.: 191137-f | DRAWING No.: 191137-f - 02E |
| SCALE: 1:5,000 @ A1 | DATE: 30.07.2024 |
| OS SHEET No.: 2635, 2636, 2636, 2637, 2705, 2706, 2707, 2708, 2774, 2775, 2776, 2777, 2842, 2843, 2844, 2845 | |

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+353 (0) 91 735611
email: info@www.mkoireland.ie
Website: www.mkoireland.ie

Note:
Please Refer to the Peat Extraction Layouts for 1988, 1995, 2004, and 2020 for further details showing the areas that were subject to drainage and peat extraction across those periods

Please refer to the Drainage Layouts, Drainage Infrastructure Sections, Settlement Pond Detail and Pump Detail drawings, for further details on the drainage infrastructure at the site

## Drawing Legend

- Planning Application Boundary
- Bord na Móna Rail Lines
- Areas Subjected to Peat Extraction 1988 - 2020
- 66m
- 68m
- 70m
- 72m
- 74m
- 76m
- 78m
- 80m
- 82m
- 84m
- 86m
- 88m
- County Boundary

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DRAWING TITLE:

# Site Layout Key Plan

PROJECT TITLE:
**BnM Substitute Consent Application, Ballivor Bog Group**

| | |
|---|---|
| DRAWING BY: JOB/KD | CHECKED BY: Tommy Harlin |
| PROJECT No.: 191137-f | DRAWING No.: 191137-f - 03 |
| SCALE: 1:20,000 @ A1 | DATE: 30.07.2024 |
| OS SHEET No.: 2635, 2636, 2636, 2637, 2705, 2706, 2707, 2708, 2774, 2775, 2776, 2777, 2842, 2843, 2844, 2845 | |

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Planning Ref 12/2067 Royal County Aeromodellers Club -two intersecting grass strips, grass carpark

Lisclogher West

## Drawing Legend

- Planning Application Boundary
- 66m
- 68m
- 70m
- 72m
- 74m
- 76m
- 78m
- 80m
- 82m
- 84m
- 86m
- 88m
- Areas Subjected to Peat Extraction 1988 - 2020

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N

DRAWING TITLE:
# Site Layout Plan Sheet 1 of 12

PROJECT TITLE:
**BnM Substitute Consent Application, Ballivor Bog Group**

| | |
|---|---|
| DRAWING BY: JOB/KD | CHECKED BY: Tommy Harlin |
| PROJECT No.: 191137-f | DRAWING No.: 191137-f - 03a |
| SCALE: 1:2,500 @ A0 | DATE: 30.07.2024 |
| OS SHEET No.: 2635, 2636, 2636, 2637, 2705, 2706, 2707, 2708, 2774, 2775, 2776, 2777, 2842, 2843, 2844, 2845 | |

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Lisclogher 1-1

Lisclogher A-A

Planning Ref 15/6135;
16/6259; 21/620
Guyed wind monitoring mast

## Drawing Legend

- Planning Application Boundary
- 66m
- 68m
- 70m
- 72m
- 74m
- 76m
- 78m
- 80m
- 82m
- 84m
- 86m
- 88m
- Areas Subjected to Peat Extraction 1988 - 2020
- Bord na Móna Rail Lines
- County Boundary

N

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DRAWING TITLE:
# Site Layout Plan
# Sheet 2 of 12

PROJECT TITLE:
**BnM Substitute Consent Application, Ballivor Bog Group**

| | |
|---|---|
| DRAWING BY: JOB/KD | CHECKED BY: Tommy Harlin |
| PROJECT No.: 191137-f | DRAWING No.: 191137-f - 03b |
| SCALE: 1:2,500 @ A0 | DATE: 30.07.2024 |
| OS SHEET No.: 2635, 2636, 2636, 2637, 2705, 2706, 2707, 2708, 2774, 2775, 2776, 2777, 2842, 2843, 2844, 2845 | |

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## Drawing Legend

- Planning Application Boundary
- 66m
- 68m
- 70m
- 72m
- 74m
- 76m
- 78m
- 80m
- 82m
- 84m
- 86m
- 88m
- Areas Subjected to Peat Extraction 1988 - 2020
- County Boundary

N

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DRAWING TITLE:
# Site Layout Plan Sheet 3 of 12

PROJECT TITLE:
**BnM Substitute Consent Application, Ballivor Bog Group**

| | |
|---|---|
| DRAWING BY: JOB/KD | CHECKED BY: Tommy Harlin |
| PROJECT No.: 191137-f | DRAWING No.: 191137-f - 03c |
| SCALE: 1:2,500 @ A0 | DATE: 30.07.2024 |
| OS SHEET No.: 2635, 2636, 2636, 2637, 2705, 2706, 2707, 2708, 2774, 2775, 2776, 2777, 2842, 2843, 2844, 2845 | |

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## Drawing Legend

- Planning Application Boundary
- 66m
- 68m
- 70m
- 72m
- 74m
- 76m
- 78m
- 80m
- 82m
- 84m
- 86m
- 88m
- Areas Subjected to Peat Extraction 1988 - 2020
- Bord na Móna Rail Lines

N

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DRAWING TITLE:
# Site Layout Plan Sheet 4 of 12

PROJECT TITLE:
**BnM Substitute Consent Application, Ballivor Bog Group**

| | |
|---|---|
| DRAWING BY: JOB/KD | CHECKED BY: Tommy Harlin |
| PROJECT No.: 191137-f | DRAWING No.: 191137-f - 03d |
| SCALE: 1:2,500 @ A0 | DATE: 30.07.2024 |
| OS SHEET No.: 2635, 2636, 2636, 2637, 2705, 2706, 2707, 2708, 2774, 2775, 2776, 2777, 2842, 2843, 2844, 2845 | |

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Bracklin B-B

Bracklin A-A

Bracklin

Drawing Legend

- Planning Application Boundary
- 66m
- 68m
- 70m
- 72m
- 74m
- 76m
- 78m
- 80m
- 82m
- 84m
- 86m
- 88m
- Areas Subjected to Peat Extraction 1988 - 2020
- Bord na Móna Rail Lines

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DRAWING TITLE:

# Site Layout Plan
# Sheet 5 of 12

PROJECT TITLE:
**BnM Substitute Consent Application, Ballivor Bog Group**

| | |
|---|---|
| DRAWING BY: JOB/KD | CHECKED BY: Tommy Harlin |
| PROJECT No.: 191137-f | DRAWING No.: 191137-f - 03e |
| SCALE: 1:2,500 @ A0 | DATE: 30.07.2024 |
| OS SHEET No.: 2635, 2636, 2636, 2637, 2705, 2706, 2707, 2708, 2774, 2775, 2776, 2777, 2842, 2843, 2844, 2845 | |

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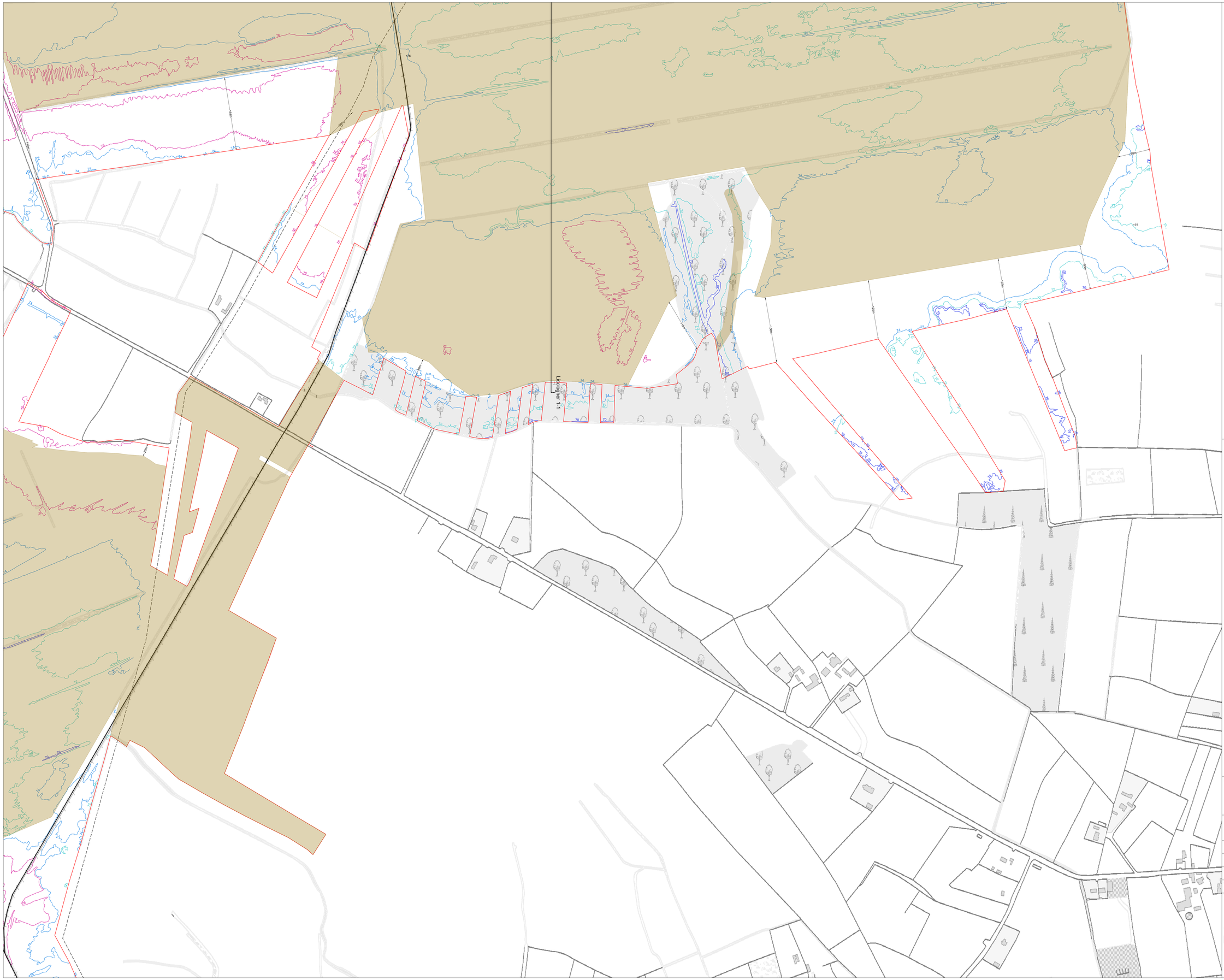


Note:
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Please refer to the Drainage Layouts, Drainage Infrastructure Sections, Settlement Pond Detail and Pump Detail drawings, for further details on the drainage infrastructure at the site

Drawing Legend

- Planning Application Boundary
- 66m
- 68m
- 70m
- 72m
- 74m
- 76m
- 78m
- 80m
- 82m
- 84m
- 86m
- 88m
- Areas Subjected to Peat Extraction 1988 - 2020
- Bord na Móna Rail Lines
- County Boundary

N

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DRAWING TITLE:
# Site Layout Plan Sheet 6 of 12

PROJECT TITLE:
**BnM Substitute Consent Application, Ballivor Bog Group**

| | |
|---|---|
| DRAWING BY: JOB/KD | CHECKED BY: Tommy Harlin |
| PROJECT No.: 191137-f | DRAWING No.: 191137-f - 03f |
| SCALE: 1:2,500 @ A0 | DATE: 30.07.2024 |
| OS SHEET No.: 2635, 2636, 2636, 2637, 2705, 2706, 2707, 2708, 2774, 2775, 2776, 2777, 2842, 2843, 2844, 2845 | |

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Bracklin B-B

## Drawing Legend

- Planning Application Boundary
- 66m
- 68m
- 70m
- 72m
- 74m
- 76m
- 78m
- 80m
- 82m
- 84m
- 86m
- 88m
- Areas Subjected to Peat Extraction 1988 - 2020
- Bord na Móna Rail Lines

N

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DRAWING TITLE:
# Site Layout Plan
# Sheet 7 of 12

PROJECT TITLE:
**BnM Substitute Consent Application, Ballivor Bog Group**

| | |
|---|---|
| DRAWING BY: JOB/KD | CHECKED BY: Tommy Harlin |
| PROJECT No.: 191137-f | DRAWING No.: 191137-f - 03g |
| SCALE: 1:2,500 @ A0 | DATE: 30.07.2024 |
| OS SHEET No.: 2635, 2636, 2636, 2637, 2705, 2706, 2707, 2708, 2774, 2775, 2776, 2777, 2842, 2843, 2844, 2845 | |

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## Drawing Legend

- Planning Application Boundary
- 66m
- 68m
- 70m
- 72m
- 74m
- 76m
- 78m
- 80m
- 82m
- 84m
- 86m
- 88m
- Areas Subjected to Peat Extraction 1988 - 2020
- Bord na Móna Rail Lines
- County Boundary

N

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DRAWING TITLE:
# Site Layout Plan
# Sheet 8 of 12

PROJECT TITLE:
**BnM Substitute Consent Application, Ballivor Bog Group**

| | |
|---|---|
| DRAWING BY: JOB/KD | CHECKED BY: Tommy Harlin |
| PROJECT No.: 191137-f | DRAWING No.: 191137-f - 03h |
| SCALE: 1:2,500 @ A0 | DATE: 30.07.2024 |
| OS SHEET No.: 2635, 2636, 2636, 2637, 2705, 2706, 2707, 2708, 2774, 2775, 2776, 2777, 2842, 2843, 2844, 2845 | |

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Carranstown 3-3

Carranstown C-C

Carranstown

Carranstown 3-3

## Drawing Legend

- Planning Application Boundary
- 66m
- 68m
- 70m
- 72m
- 74m
- 76m
- 78m
- 80m
- 82m
- 84m
- 86m
- 88m
- Areas Subjected to Peat Extraction 1988 - 2020
- Bord na Móna Rail Lines
- County Boundary

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DRAWING TITLE:

# Site Layout Plan Sheet 9 of 12

PROJECT TITLE:

**BnM Substitute Consent Application, Ballivor Bog Group**

| DRAWING BY: | CHECKED BY: |
|---|---|
| JOB/KD | Tommy Harlin |
| PROJECT No.: 191137-f | DRAWING No.: 191137-f - 03i |
| SCALE: 1:2,500 @ A0 | DATE: 30.07.2024 |
| OS SHEET No.: 2635, 2636, 2636, 2637, 2705, 2706, 2707, 2708, 2774, 2775, 2776, 2777, 2842, 2843, 2844, 2845 | |

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Carranstown D-C

Carranstown 3-3

Ballivor 4-4

Ballivor

## Drawing Legend

- Planning Application Boundary
- 66m
- 68m
- 70m
- 72m
- 74m
- 76m
- 78m
- 80m
- 82m
- 84m
- 86m
- 88m
- Areas Subjected to Peat Extraction 1988 - 2020
- Bord na Móna Rail Lines
- County Boundary

N

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DRAWING TITLE:
# Site Layout Plan
# Sheet 10 of 12

PROJECT TITLE:
**BnM Substitute Consent Application, Ballivor Bog Group**

| | |
|---|---|
| DRAWING BY: JOB/KD | CHECKED BY: Tommy Harlin |
| PROJECT No.: 191137-f | DRAWING No.: 191137-f - 03j |
| SCALE: 1:2,500 @ A0 | DATE: 30.07.2024 |
| OS SHEET No.: 2635, 2636, 2636, 2637, 2705, 2706, 2707, 2708, 2774, 2775, 2776, 2777, 2842, 2843, 2844, 2845 | |

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Ballivor

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## Drawing Legend

- Planning Application Boundary
- 66m
- 68m
- 70m
- 72m
- 74m
- 76m
- 78m
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- 82m
- 84m
- 86m
- 88m
- Areas Subjected to Peat Extraction 1988 - 2020
- Bord na Móna Rail Lines
- County Boundary

N

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DRAWING TITLE:

# Site Layout Plan
# Sheet 11 of 12

PROJECT TITLE:
**BnM Substitute Consent Application, Ballivor Bog Group**

| | |
|---|---|
| DRAWING BY: JOB/KD | CHECKED BY: Tommy Harlin |
| PROJECT No.: 191137-f | DRAWING No.: 191137-f - 03k |
| SCALE: 1:2,500 @ A0 | DATE: 30.07.2024 |
| OS SHEET No.: 2635, 2636, 2636, 2637, 2705, 2706, 2707, 2708, 2774, 2775, 2776, 2777, 2842, 2843, 2844, 2845 | |

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Ballivor

Ballivor 4-4

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## Drawing Legend

- Planning Application Boundary
- 66m
- 68m
- 70m
- 72m
- 74m
- 76m
- 78m
- 80m
- 82m
- 84m
- 86m
- 88m
- Areas Subjected to Peat Extraction 1988 - 2020
- Bord na Móna Rail Lines
- County Boundary

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DRAWING TITLE:
# Site Layout Plan
# Sheet 12 of 12

PROJECT TITLE:
**BnM Substitute Consent Application, Ballivor Bog Group**

| | |
|---|---|
| DRAWING BY: JOB/KD | CHECKED BY: Tommy Harlin |
| PROJECT No.: 191137-f | DRAWING No.: 191137-f - 03I |
| SCALE: 1:2,500 @ A0 | DATE: 30.07.2024 |
| OS SHEET No.: 2635, 2636, 2636, 2637, 2705, 2706, 2707, 2708, 2774, 2775, 2776, 2777, 2842, 2843, 2844, 2845 | |

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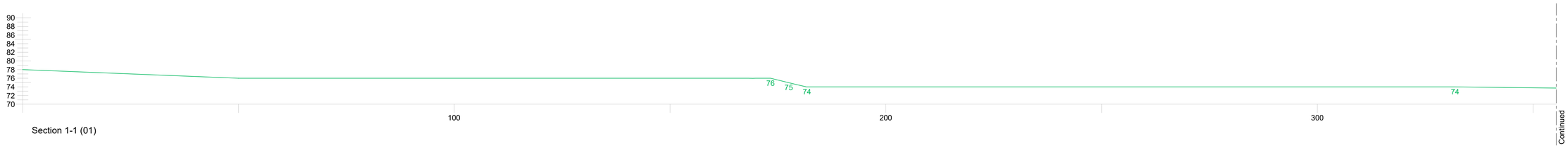
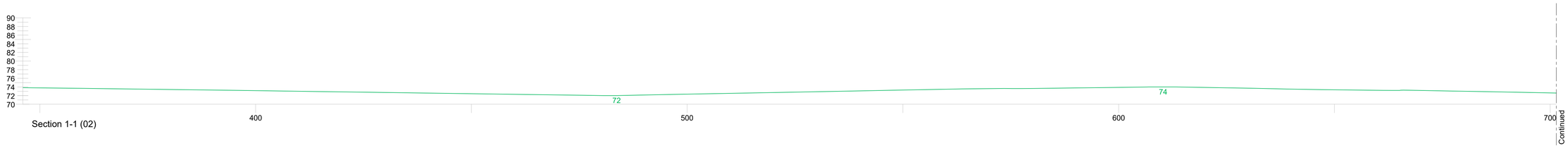


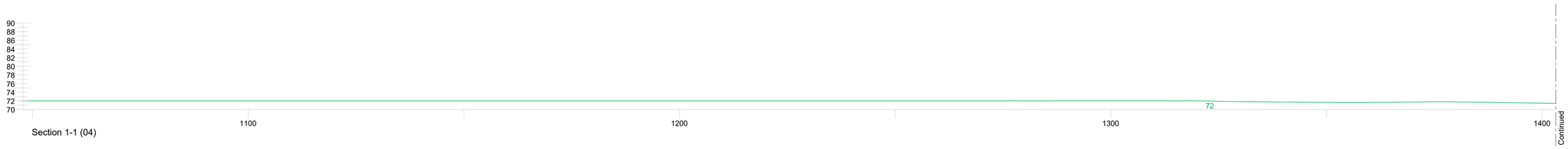

Section 1-1 (01)




Section 1-1 (02)




Section 1-1 (03)

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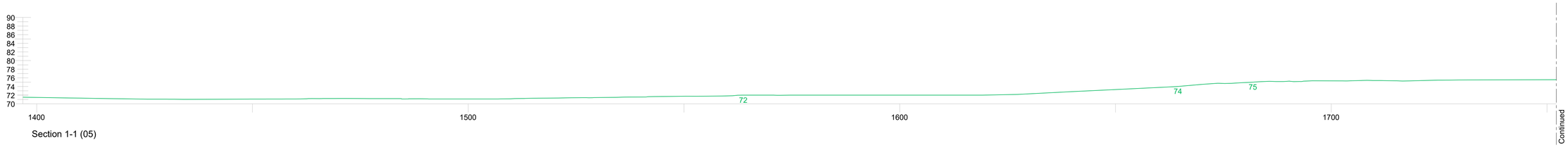


Section 1-1 (05)




Section 1-1 (06)




Key Section

## Drawing Legend

Section Line / Levels

DRAWING TITLE:

# Lisclogher Bog Section 1-1

PROJECT TITLE:

**BnM Substitute Consent Application, Ballivor Bog Group**

| DRAWING BY: | CHECKED BY: |
|---|---|
| JOB/KD | Tommy Harlin |
| PROJECT No: 191137-f | DRAWING No.: 191137-f - 10 |
| SCALE: 1:500 @ A1 | DATE: 30.07.2024 |


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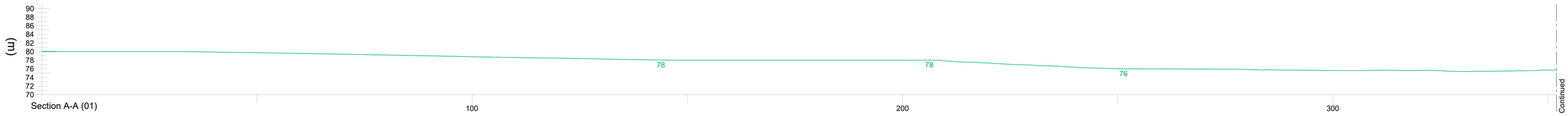


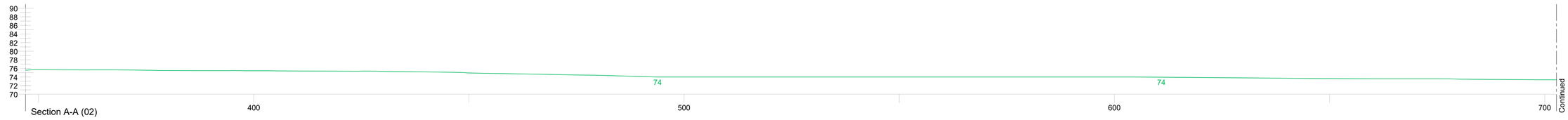





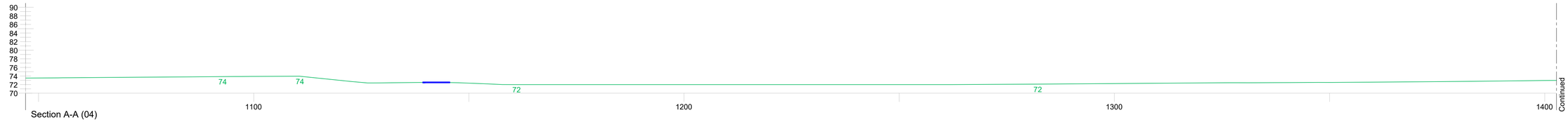





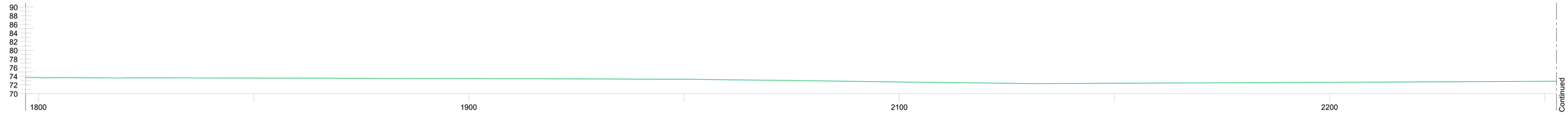


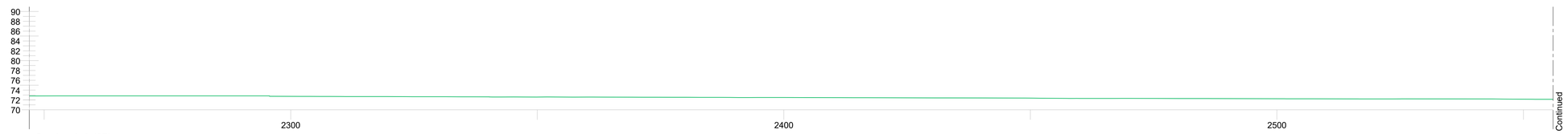








Key Section




## Drawing Legend

- Section Line / Levels
- Existing Rail Way

DRAWING TITLE:

# Lisclogher Bog Section A-A

PROJECT TITLE:

**BnM Substitute Consent Application, Ballivor Bog Group**

| DRAWING BY: | CHECKED BY: |
|---|---|
| JOB/KD | Tommy Harlin |
| PROJECT No.: 191137-f | DRAWING No.: 191137-f - 11 |
| SCALE: 1:500 @ A1 | DATE: 30.07.2024 |


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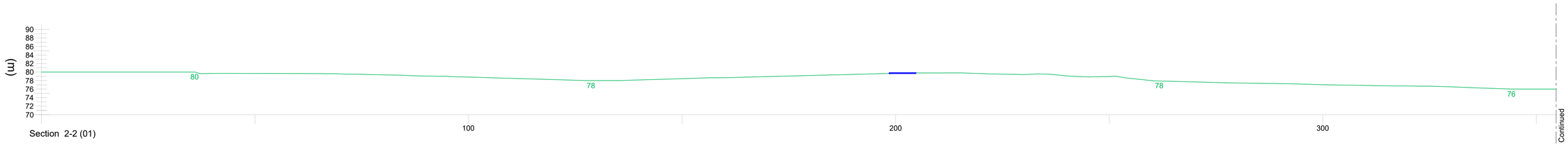
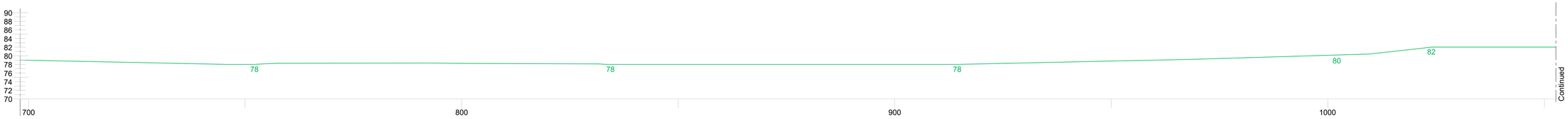


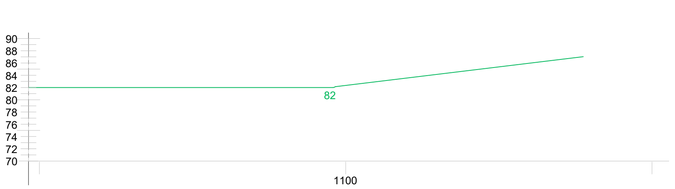

Section 2-2 (01)




Section 2-2 (02)




Section 2-2 (03)




Section 2-2 (04)




Key Section - NTS

## Drawing Legend

- Section Line / Levels
- Existing Rail Way

DRAWING TITLE:

# Bracklin Bog
# Section 2-2

PROJECT TITLE:

**BnM Substitute Consent Application, Ballivor Bog Group**

| DRAWING BY: | CHECKED BY: |
|---|---|
| JOB/KD | Tommy Harlin |
| PROJECT No.: 191137-f | DRAWING No.: 191137-f - 12 |
| SCALE: 1:500 @ A1 | DATE: 30.07.2024 |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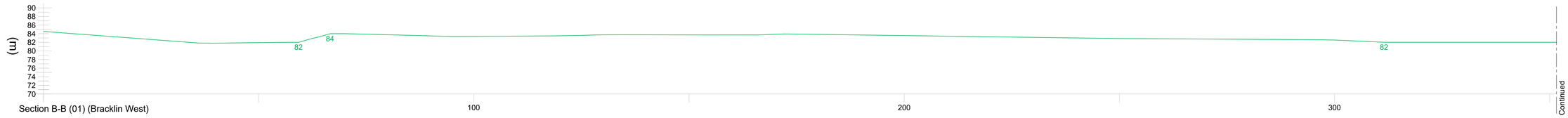


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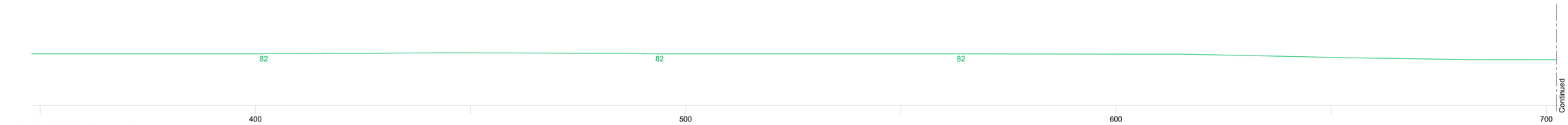


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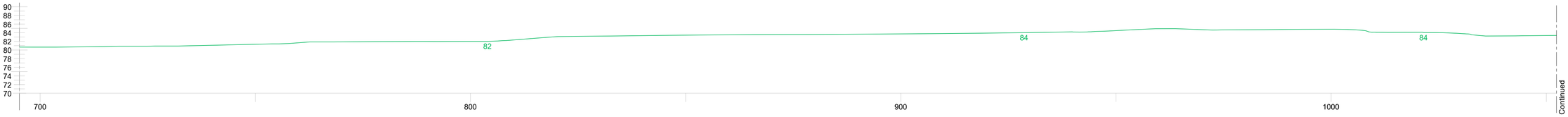


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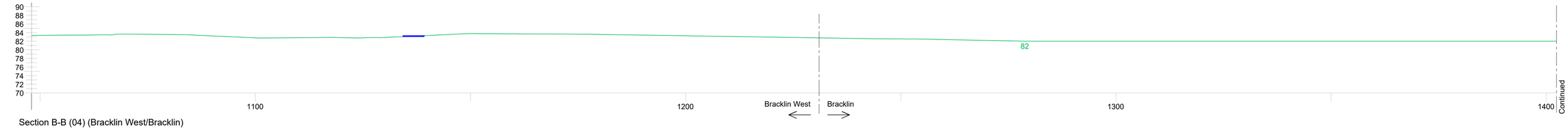
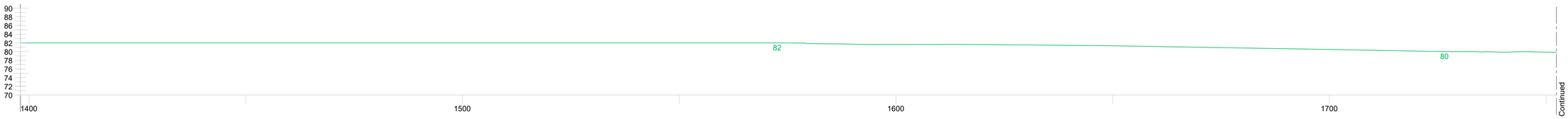



Section B-B (04) (Bracklin West/Bracklin)

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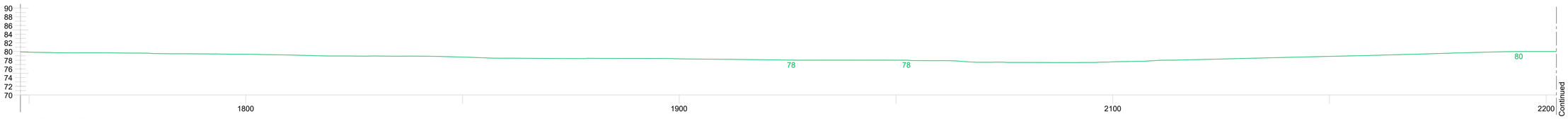
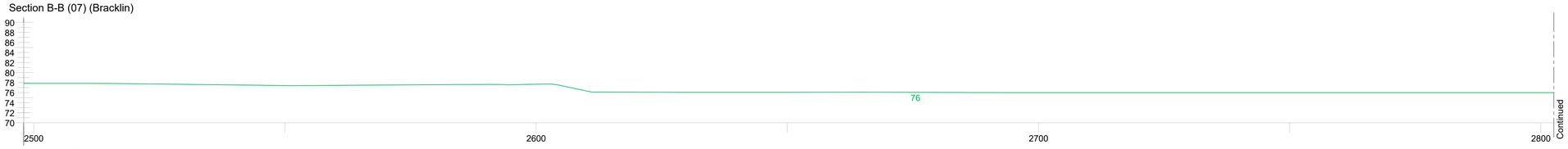


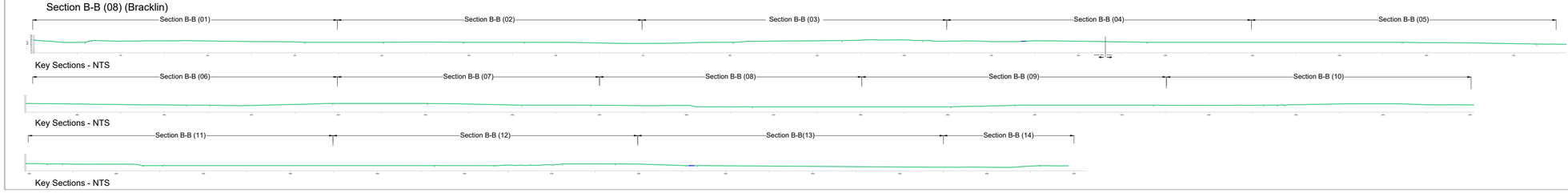

Section B-B (06) (Bracklin)




Section B-B (07) (Bracklin)




Section B-B (08) (Bracklin)




NOTE:
For Section B-B (09-14)
Refer To Drawing 191137-f-14b

Drawing Legend

- Section Line / Levels
- Existing Rail Way

DRAWING TITLE:
**Bracklin West / Bracklin Bog Section B-B Sheet 01 of 02**

PROJECT TITLE:
**BnM Substitute Consent Application, Ballivor Bog Group**

| DRAWING BY: | CHECKED BY: |
|---|---|
| JOB/KD | Tommy Harlin |
| PROJECT No.: 191137-f | DRAWING No.: 191137-f - 13a |
| SCALE: 1:500 @ A1 | DATE: 30.07.2024 |

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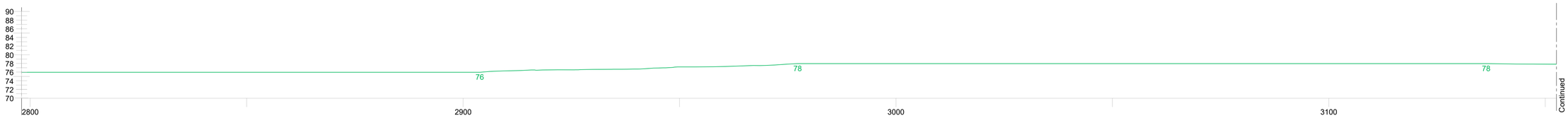
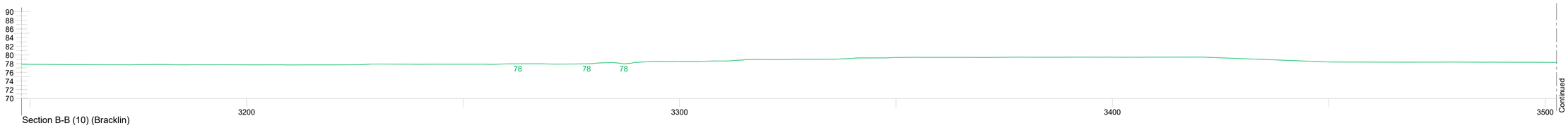



Section B-B (09) (Bracklin)

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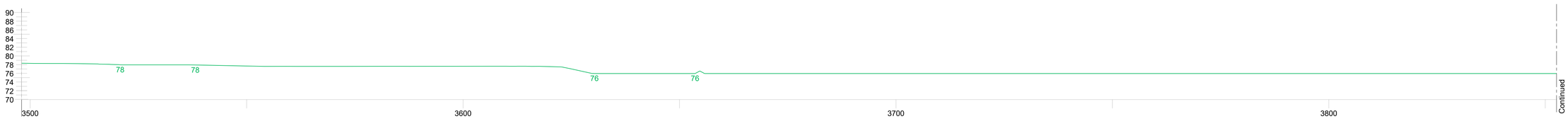


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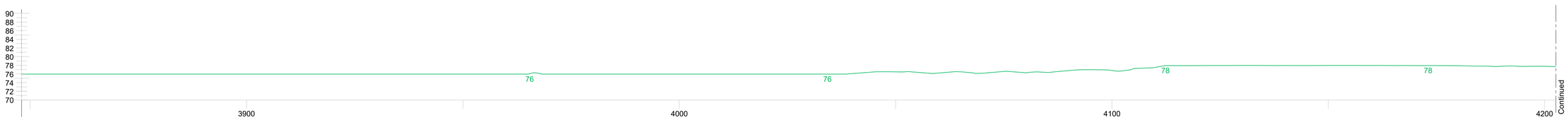


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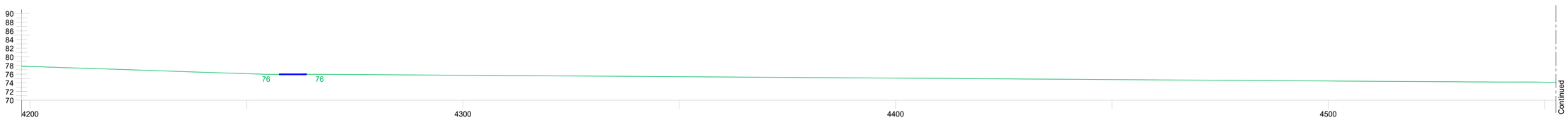


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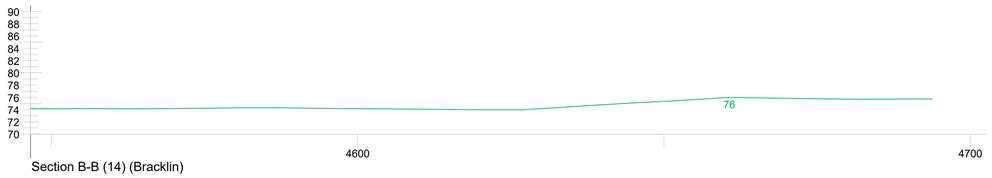
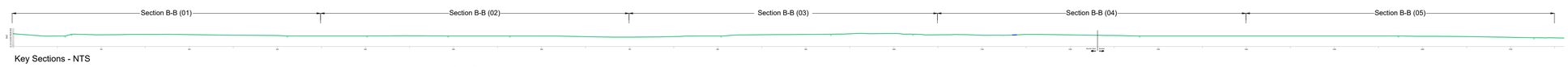
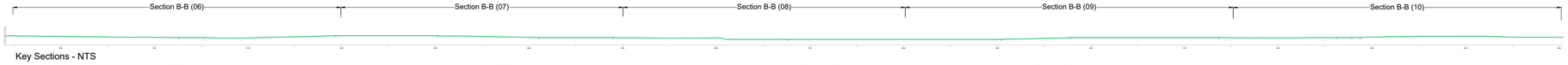



Section B-B (14) (Bracklin)

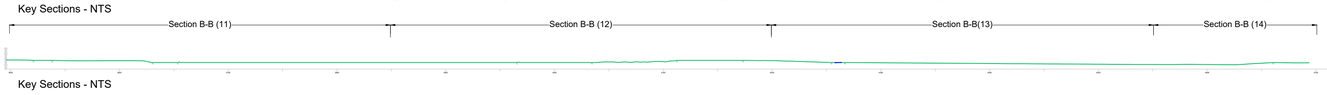
NOTE:
For Section B-B (01-08)
Refer To Drawing 191137-f-14a




Key Sections - NTS




Key Sections - NTS




Key Sections - NTS

Drawing Legend

- Section Line / Levels
- Existing Rail Way

DRAWING TITLE:

**Bracklin West / Bracklin Bog**
**Section B-B Sheet 02 of 02**

PROJECT TITLE:
**BnM Substitute Consent Application, Ballivor Bog Group**

| DRAWING BY: | CHECKED BY: |
|---|---|
| JOB/KD | Tommy Harlin |
| PROJECT No.: 191137-f | DRAWING No.: 191137-f - 13b |
| SCALE: 1:500 @ A1 | DATE: 30.07.2024 |

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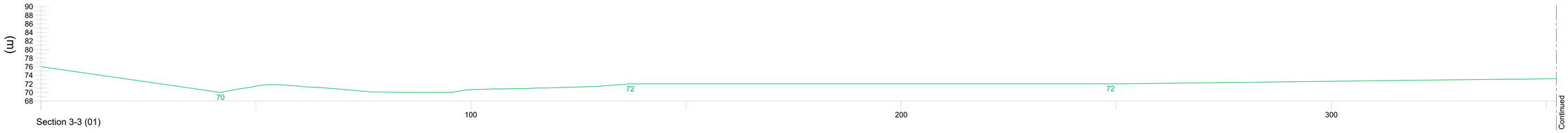
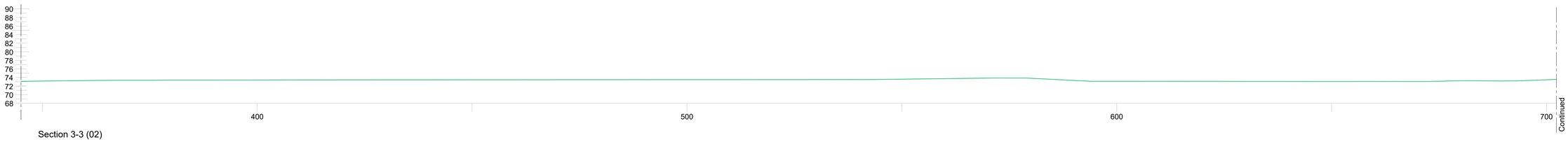



Section 3-3 (01)

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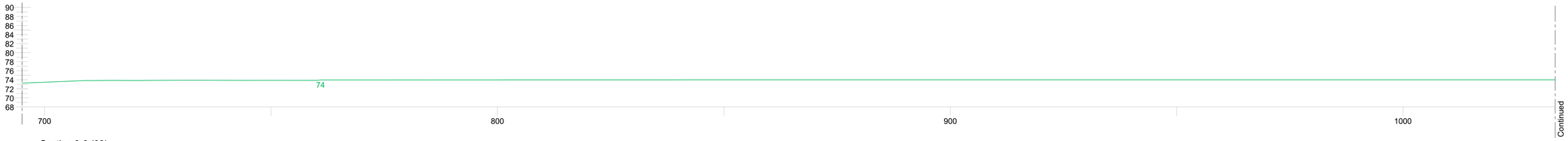
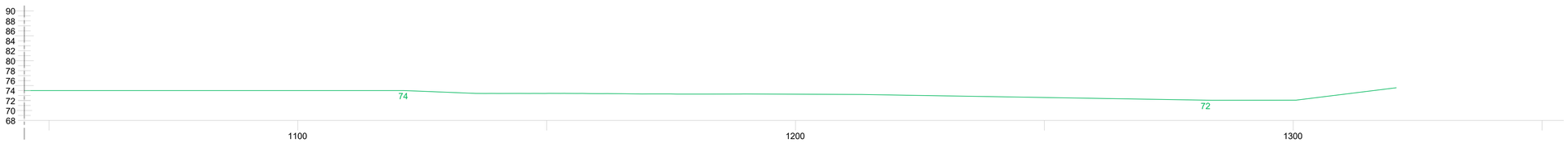



Section 3-3 (03)




Section 3-3 (04)




Key Section - NTS

Drawing Legend

Section Line / Levels

DRAWING TITLE:

# Carranstown Bog Section 3-3

PROJECT TITLE:

**BnM Substitute Consent Application, Ballivor Bog Group**

| DRAWING BY: | CHECKED BY: |
|---|---|
| JOB/KD | Tommy Harlin |
| PROJECT No.: 191137-f | DRAWING No.: 191137-f - 14 |
| SCALE: 1:500 @ A1 | DATE: 30.07.2024 |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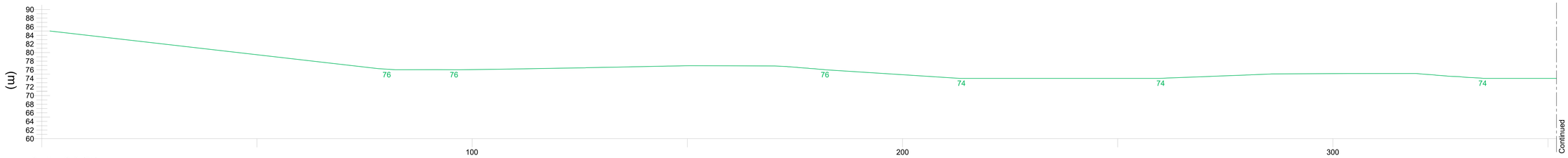


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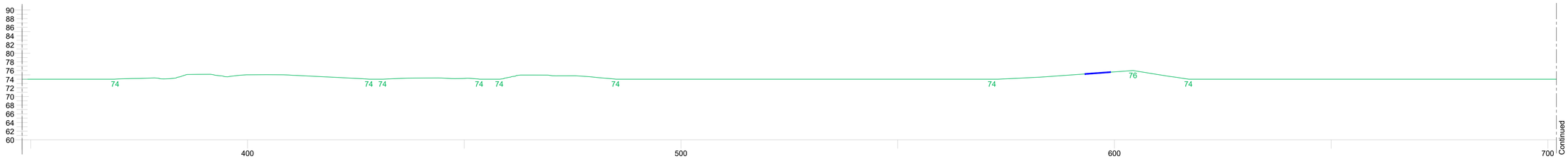


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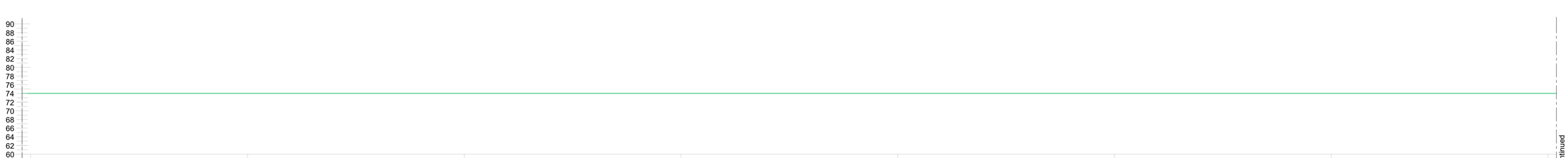


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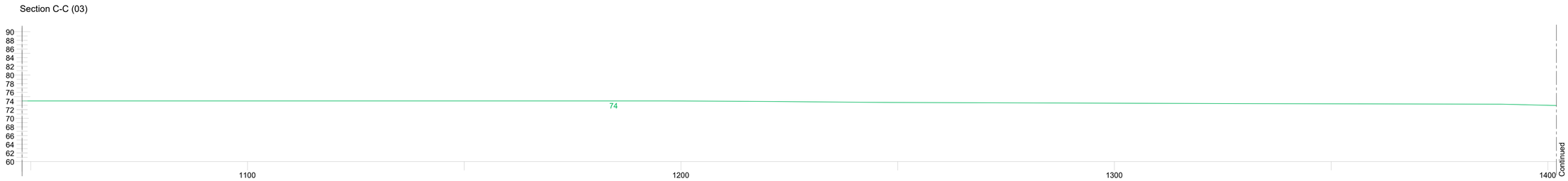


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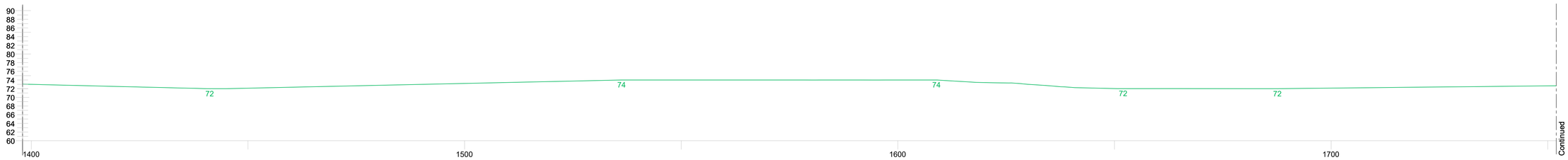
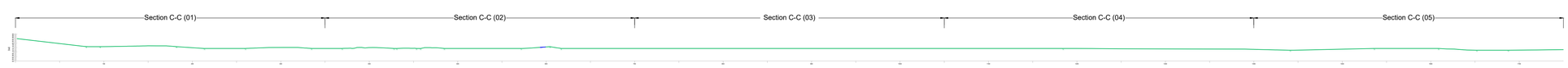



Section C-C (05)

NOTE:
For Section C-C (06-08)
Refer To Drawing 191137-f-16b




Key Section - NTS




Key Section - NTS

## Drawing Legend

- Section Line / Levels
- Existing Rail Way

DRAWING TITLE:
**Carranstown Bog**
**Section C-C**
**Sheet 01 of 02**

PROJECT TITLE:
**BnM Substitute Consent Application, Ballivor Bog Group**

| | |
|---|---|
| DRAWING BY: **JOB/KD** | CHECKED BY: **Tommy Harlin** |
| PROJECT No: **191137-f** | DRAWING No.: **191137-f - 15a** |
| SCALE: **1:500 @ A1** | DATE: **30.07.2024** |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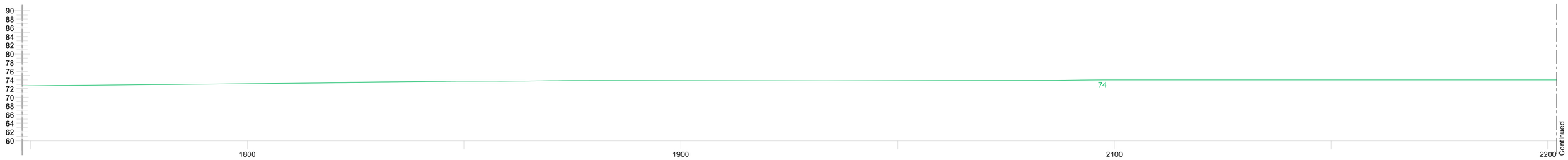


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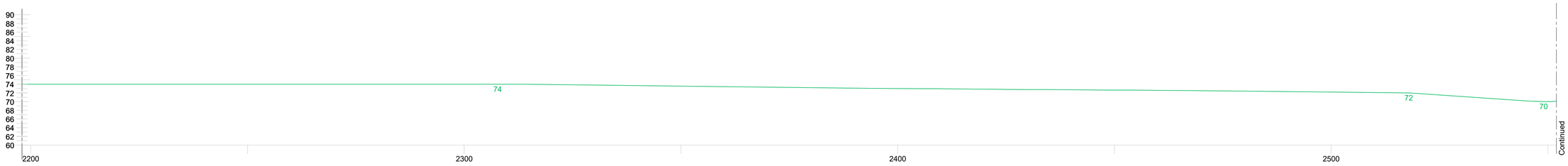


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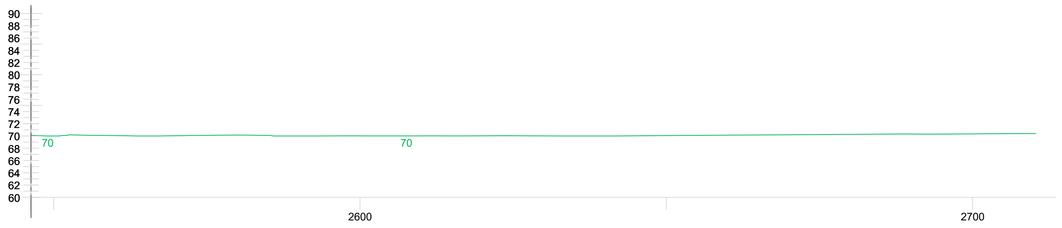
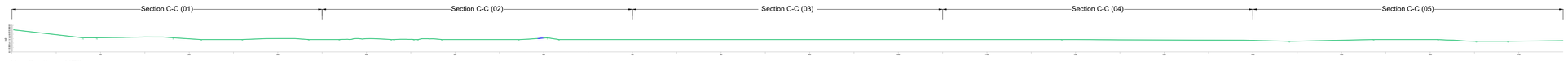
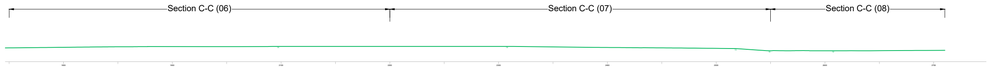



Section C-C (08)

NOTE:
For Section C-C (01-05)
Refer To Drawing 191137-f-16a




Key Section - NTS




Key Section - NTS

Drawing Legend

Section Line / Levels

DRAWING TITLE:
**Carranstown Bog**
**Section C-C**
**Sheet 02 of 02**

PROJECT TITLE:
**BnM Substitute Consent Application, Ballivor Bog Group**

| DRAWING BY: | CHECKED BY: |
|---|---|
| JOB/KD | Tommy Harlin |
| PROJECT No: 191137-f | DRAWING No.: 191137-f - 15b |
| SCALE: 1:500 @ A1 | DATE: 30.07.2024 |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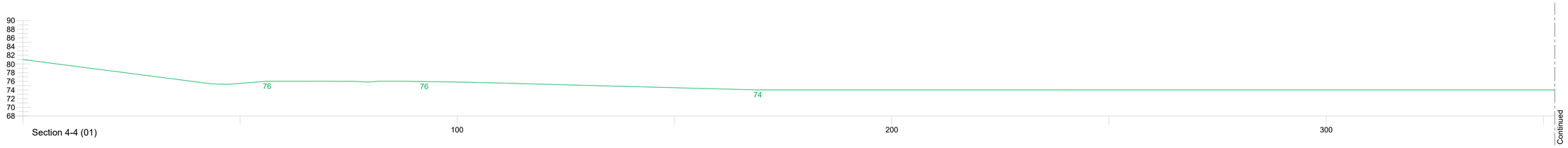
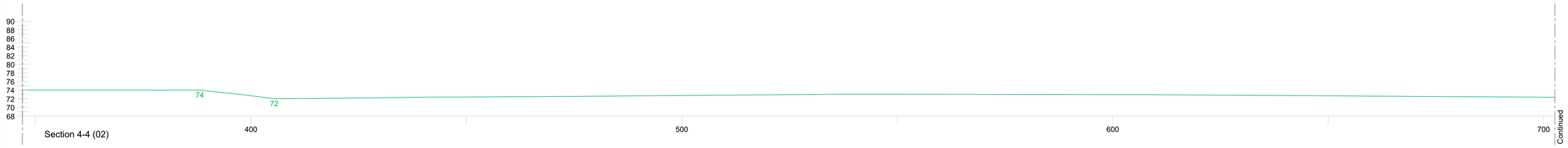



Section 4-4 (01)

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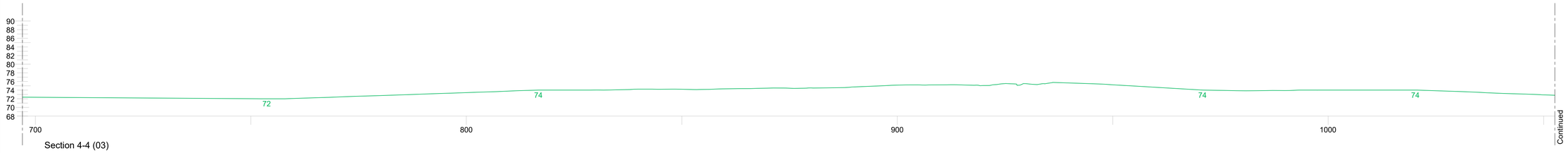


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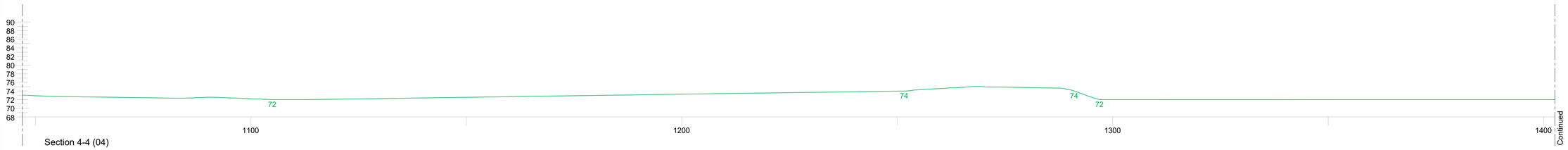


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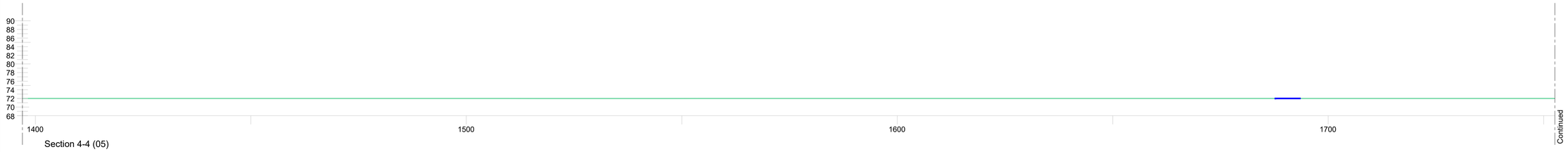
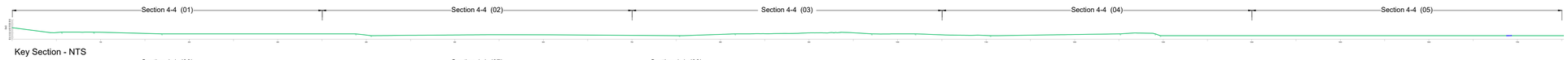



Section 4-4 (05)

NOTE:
For Section 4-4 (06-08) Refer To Drawing 191137-f-17b




Key Section - NTS




Key Section - NTS

## Drawing Legend

- Section Line / Levels
- Existing Rail Way

DRAWING TITLE:
**Ballivor Bog**
**Section 4-4**
**Sheet 01 of 02**

PROJECT TITLE:
**BnM Substitute Consent Application, Ballivor Bog Group**

| DRAWING BY: | CHECKED BY: |
|---|---|
| JOB/KD | Tommy Harlin |
| PROJECT No.: 191137-f | DRAWING No.: 191137-f - 16a |
| SCALE: 1:500 @ A1 | DATE: 30.07.2024 |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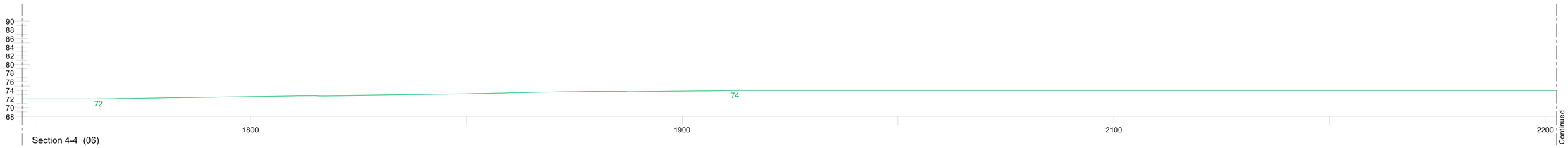
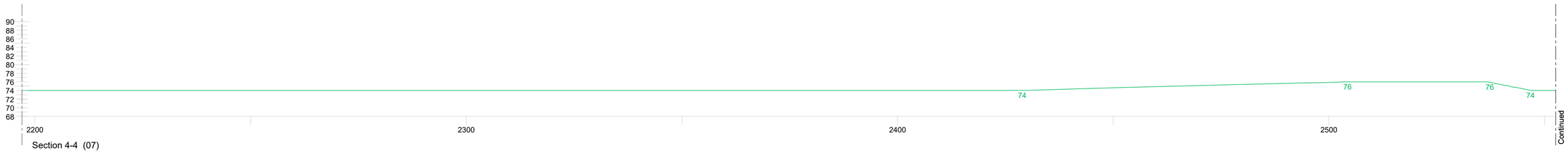
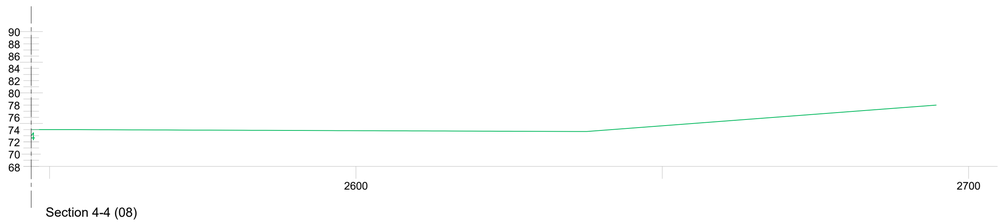



Section 4-4 (06)

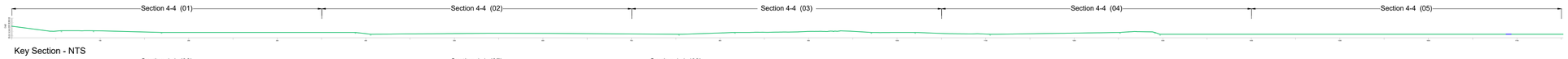



Section 4-4 (07)




Section 4-4 (08)

NOTE:
For Section 4-4 (01-05)
Refer To Drawing 191137-f-17a




Key Section - NTS




Key Section - NTS

Drawing Legend

Section Line / Levels

DRAWING TITLE:
**Ballivor Bog**
**Section 4-4**
**Sheet 02 of 02**

PROJECT TITLE:
**BnM Substitute Consent Application, Ballivor Bog Group**

| DRAWING BY: | CHECKED BY: |
|---|---|
| JOB/KD | Tommy Harlin |
| PROJECT No.: 191137-f | DRAWING No.: 191137-f - 16b |
| SCALE: 1:500 @ A1 | DATE: 30.07.2024 |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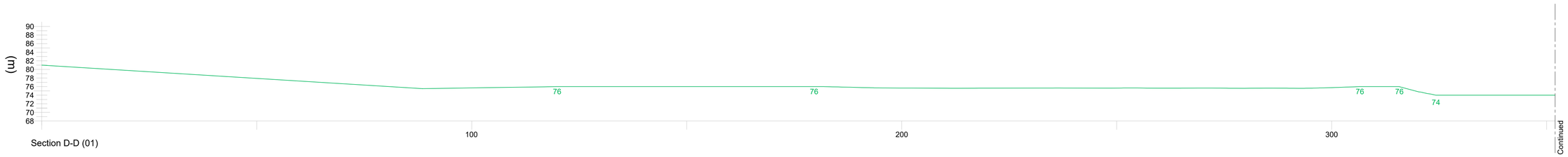
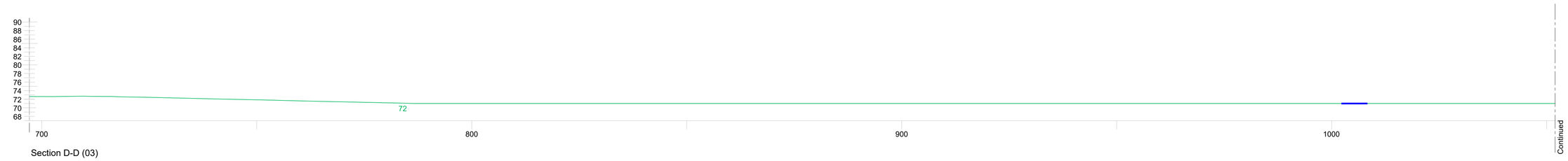


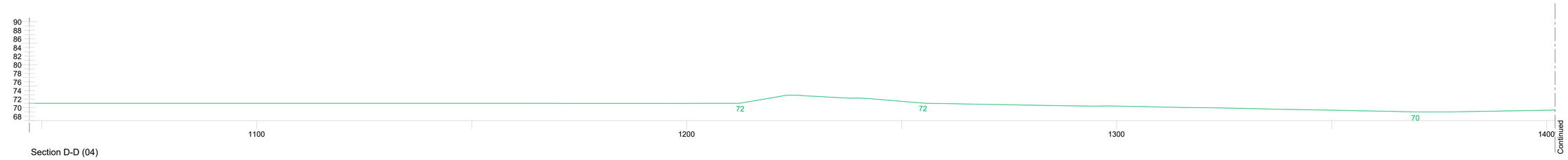

Section D-D (01)




Section D-D (02)




Section D-D (03)

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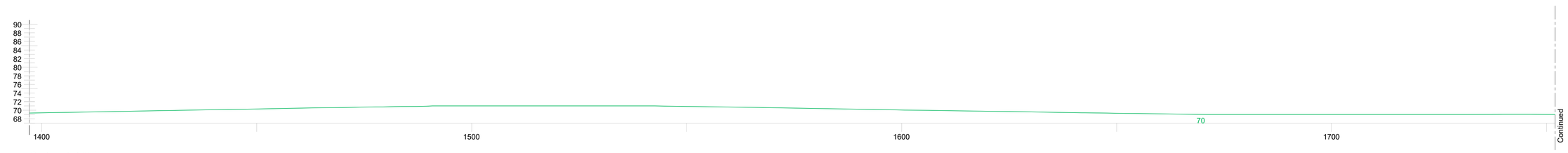


Section D-D (05)

NOTE:
For Section D-D (06-08)
Refer To Drawing 191137-f-18b




Key Section - NTS




Key Section - NTS

## Drawing Legend

Section Line / Levels

Existing Rail Way

DRAWING TITLE:
**Ballivor Bog**
**Section D-D**
**Sheet 01 of 02**

PROJECT TITLE:
**BnM Substitute Consent Application, Ballivor Bog Group**

| DRAWING BY: | CHECKED BY: |
|---|---|
| JOB/KD | Tommy Harlin |
| PROJECT No. | DRAWING No. |
| 191137-f | 191137-f - 17a |
| SCALE: | DATE: |
| 1:500 @ A1 | 30.07.2024 |


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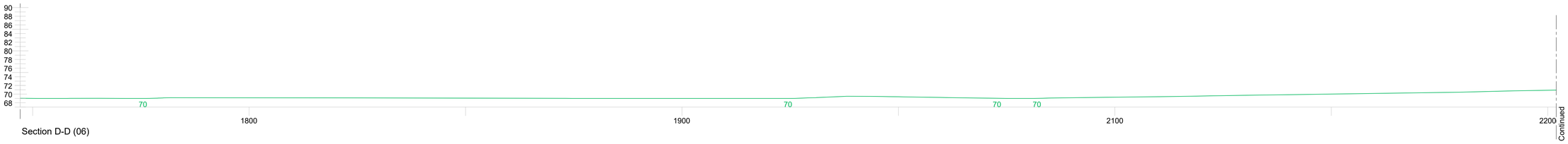
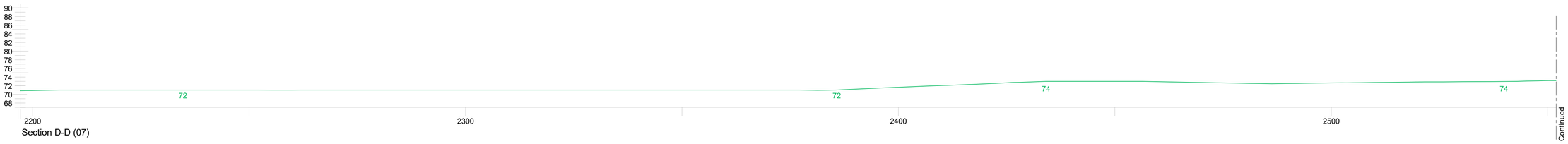
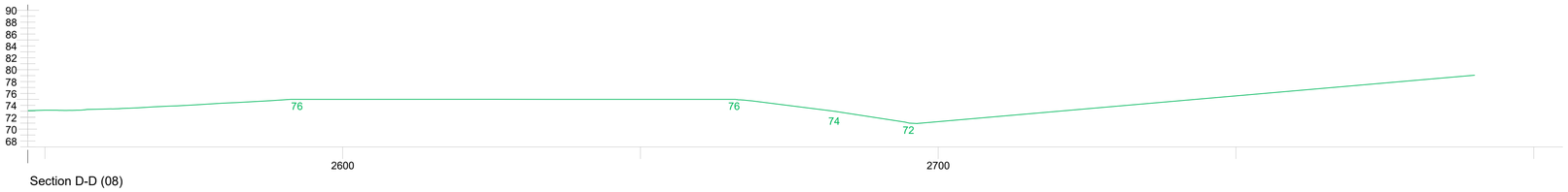



Section D-D (06)




Section D-D (07)




Section D-D (08)

NOTE:
For Sections D-D (01-05)
Refer To Drawing 191137-f-18a




Key Section - NTS




Key Section - NTS

## Drawing Legend

Section Line / Levels

DRAWING TITLE:
**Ballivor Bog**
**Section D-D**
**Sheet 02 of 02**

PROJECT TITLE:
**BnM Substitute Consent Application, Ballivor Bog Group**

| DRAWING BY: | CHECKED BY: |
|---|---|
| JOB/KD | Tommy Harlin |
| PROJECT No.: 191137-f | DRAWING No.: 191137-f - 17b |
| SCALE: 1:500@ A1 | DATE: 30.07.2024 |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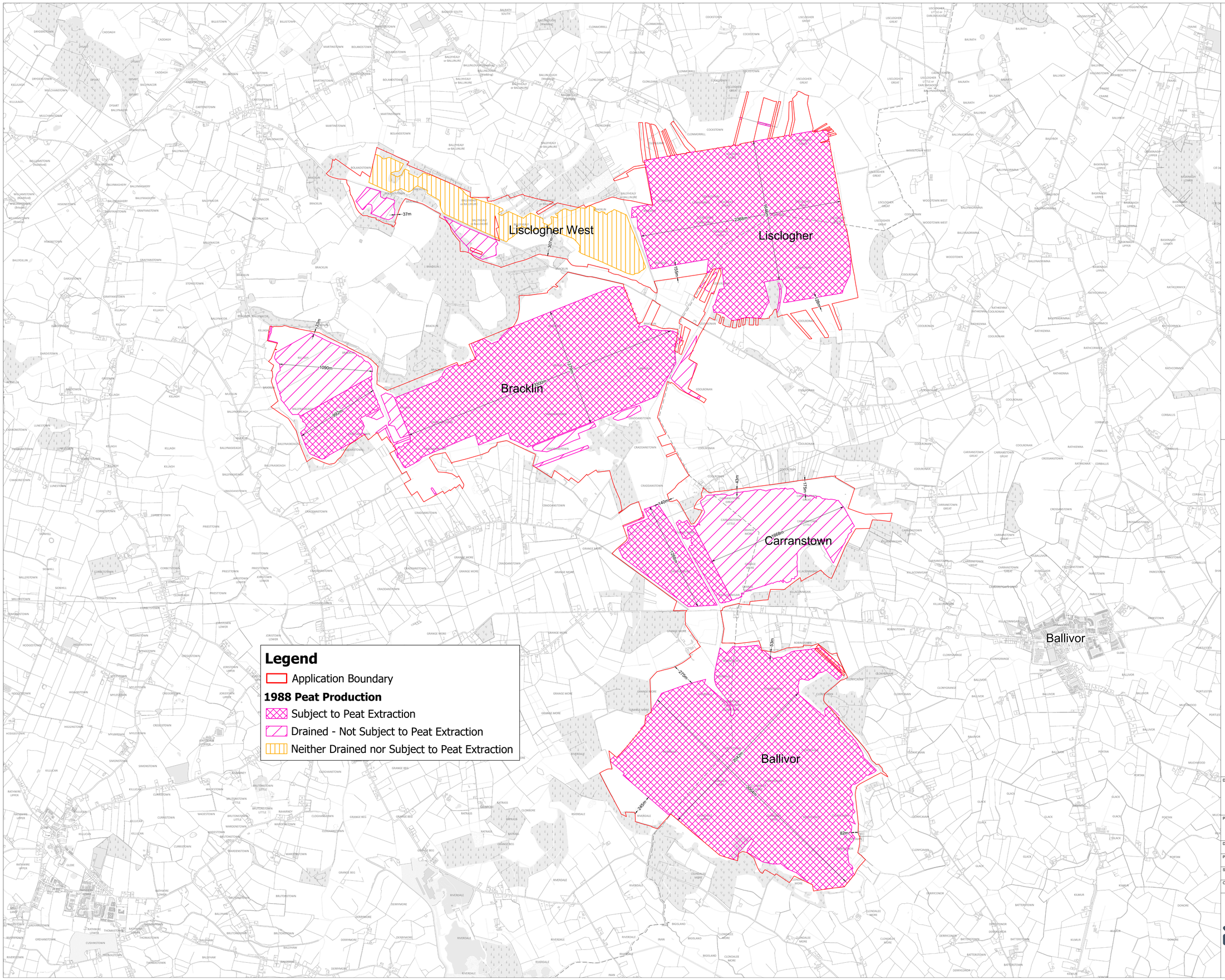


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DRAWING TITLE:

# Peat Extraction Layout Plan 1988

PROJECT TITLE:

**BnM Substitute Consent Application, Ballivor Bog Group**

| | |
|---|---|
| DRAWING BY: JOB/KD | CHECKED BY: Tommy Harlin |
| PROJECT No.: 191137-f | DRAWING No.: 191137-f - 18 |
| SCALE: 1:20,000 @ A1 | DATE: 30.07.2024 |
| OS SHEET No.: 2635, 2636, 2636, 2637, 2705, 2706, 2707, 2708, 2774, 2775, 2776, 2777, 2842, 2843, 2844, 2845 | |

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Lisclogher West

Lisclogher

Bracklin

Carranstown

Ballivor

Ballivor

## Legend

Application Boundary

**1995 Peat Production**

Subject to Peat Extraction

Drained - Not Subject to Peat Extraction

N

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DRAWING TITLE:

# Peat Extraction Layout Plan 1995

PROJECT TITLE:

**BnM Substitute Consent Application, Ballivor Bog Group**

| | |
|---|---|
| DRAWING BY: JOB/KD | CHECKED BY: Tommy Harlin |
| PROJECT No.: 191137-f | DRAWING No.: 191137-f - 19 |
| SCALE: 1:20,000 @ A1 | DATE: 30.07.2024 |
| OS SHEET No.: 2635, 2636, 2636, 2637, 2705, 2706, 2707, 2708, 2774, 2775, 2776, 2777, 2842, 2843, 2844, 2845 | |

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Lisclogher West

Lisclogher

Brackl!n

Carranstown

Ballivor

Ballivor

## Legend

Application Boundary

**2004 Peat Production**

Subject to Peat Extraction

Drained - Not Subject to Peat Extraction

N

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DRAWING TITLE:

# Peat Extraction Layout Plan 2004

PROJECT TITLE:

**BnM Substitute Consent Application, Ballivor Bog Group**

| | |
|---|---|
| DRAWING BY: JOB/KD | CHECKED BY: Tommy Harlin |
| PROJECT No.: 191137-f | DRAWING No.: 191137-f - 20 |
| SCALE: 1:20,000 @ A1 | DATE: 30.07.2024 |
| OS SHEET No.: 2635, 2636, 2636, 2637, 2705, 2706, 2707, 2708, 2774, 2775, 2776, 2777, 2842, 2843, 2844, 2845 | |

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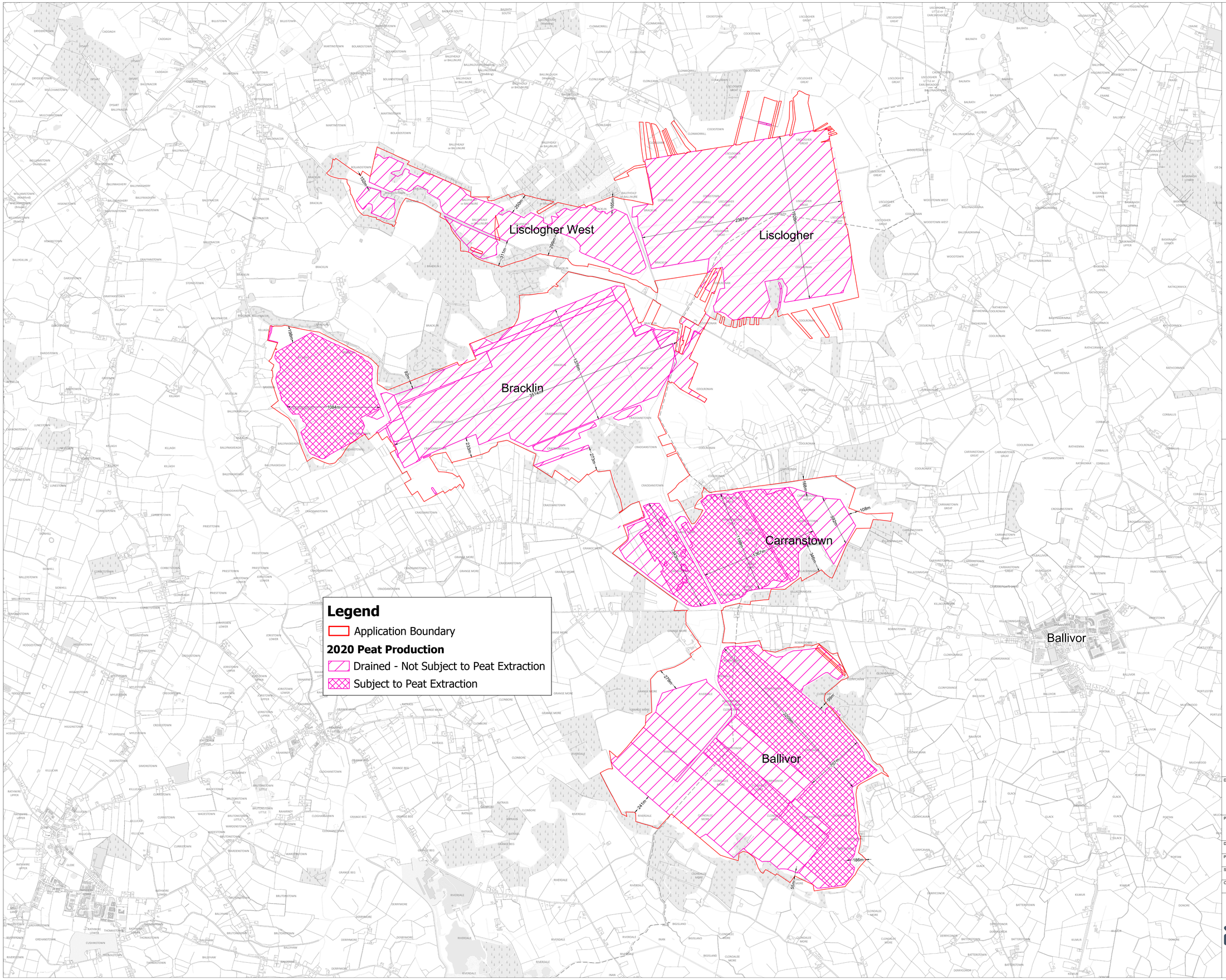


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DRAWING TITLE:
# Peat Extraction Layout Plan 2020

PROJECT TITLE:
**BnM Substitute Consent Application, Ballivor Bog Group**

| | |
|---|---|
| DRAWING BY: JOB/KD | CHECKED BY: Tommy Harlin |
| PROJECT No.: 191137-f | DRAWING No.: 191137-f - 21 |
| SCALE: 1:20,000 @ A1 | DATE: 30.07.2024 |
| OS SHEET No.: 2635, 2636, 2636, 2637, 2705, 2706, 2707, 2708, 2774, 2775, 2776, 2777, 2842, 2843, 2844, 2845 | |

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Lisclogher West

Lisclogher

Bracklin

Carranstown

Ballivor

Ballivor

1

2

3

4

5

6

7

8

9

10

11

12

## Drawing Legend

- Planning Application Boundary
- Bord na Móna Rail Lines
- County Boundary
- Drains
- PCAS Bog Cells
- Outfall Drains
- Drainage Pipes
- Main Drains
- Silt Ponds

N

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DRAWING TITLE:

# Site Drainage Key Plan

PROJECT TITLE:

**BnM Substitute Consent Application, Ballivor Bog Group**

| | |
|---|---|
| DRAWING BY: JOB/KD | CHECKED BY: Tommy Harlin |
| PROJECT No.: 191137-f | DRAWING No.: 191137-f - 22 |
| SCALE: 1:20,000 @ A1 | DATE: 30.07.2024 |
| OS SHEET No.: 2635, 2636, 2636, 2637, 2705, 2706, 2707, 2708, 2774, 2775, 2776, 2777, 2842, 2843, 2844, 2845 | |

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Planning Ref 12/2067 Royal County Aeromodellers Club -two intersecting grass strips- grass carpark

Lisclogher West

## Drawing Legend

- Planning Application Boundary
- Drains
- Silt Ponds

N

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DRAWING TITLE:
# Site Layout Drainage Plan Sheet 1 of 12

PROJECT TITLE:
**BnM Substitute Consent Application, Ballivor Bog Group**

| | |
|---|---|
| DRAWING BY: JOB/KD | CHECKED BY: Tommy Harlin |
| PROJECT No.: 191137-f | DRAWING No.: 191137-f - 22a |
| SCALE: 1:2,500 @ A0 | DATE: 30.07.2024 |
| OS SHEET No.: 2635, 2636, 2636, 2637, 2705, 2706, 2707, 2708, 2774, 2775, 2776, 2777, 2842, 2843, 2844, 2845 | |

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Note:
There was a pump located within Lisclogher Bog however it was decommissioned prior to 2000 and the exact location is unknown

MAIN DRAIN

MAIN DRAIN

MAIN DRAIN

MAIN DRAIN

Planning Ref 15/6135;
16/6259; 21/620
Guyed wind monitoring mast

## Drawing Legend

- Planning Application Boundary
- Bord na Móna Rail Lines
- County Boundary
- Drains
- Outfall Drains
- Drainage Pipes
- Main Drains
- Silt Ponds

N

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DRAWING TITLE:
# Site Layout Drainage Plan Sheet 2 of 12

PROJECT TITLE:
**BnM Substitute Consent Application, Ballivor Bog Group**

| | |
|---|---|
| DRAWING BY: JOB/KD | CHECKED BY: Tommy Harlin |
| PROJECT No.: 191137-f | DRAWING No.: 191137-f - 22b |
| SCALE: 1:2,500 @ A0 | DATE: 30.07.2024 |
| OS SHEET No.: 2635, 2636, 2636, 2637, 2705, 2706, 2707, 2708, 2774, 2775, 2776, 2777, 2842, 2843, 2844, 2845 | |

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Note:
There was a pump located within Lisclogher Bog however it was decommissioned prior to 2000 and the exact location is unknown

EXISTING BnM SETTLEMENT POND

MAIN DRAIN

COLLECTOR DRAIN

MAIN DRAIN

MAIN DRAIN

Lisclogher

## Drawing Legend

- Planning Application Boundary
- County Boundary
- Drains
- Outfall Drains
- Drainage Pipes
- Main Drains
- Silt Ponds

N

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DRAWING TITLE:
# Site Layout Drainage Plan Sheet 3 of 12

PROJECT TITLE:
**BnM Substitute Consent Application, Ballivor Bog Group**

| | |
|---|---|
| DRAWING BY: JOB/KD | CHECKED BY: Tommy Harlin |
| PROJECT No.: 191137-f | DRAWING No.: 191137-f - 22c |
| SCALE: 1:2,500 @ A0 | DATE: 30.07.2024 |
| OS SHEET No.: 2635, 2636, 2636, 2637, 2705, 2706, 2707, 2708, 2774, 2775, 2776, 2777, 2842, 2843, 2844, 2845 | |

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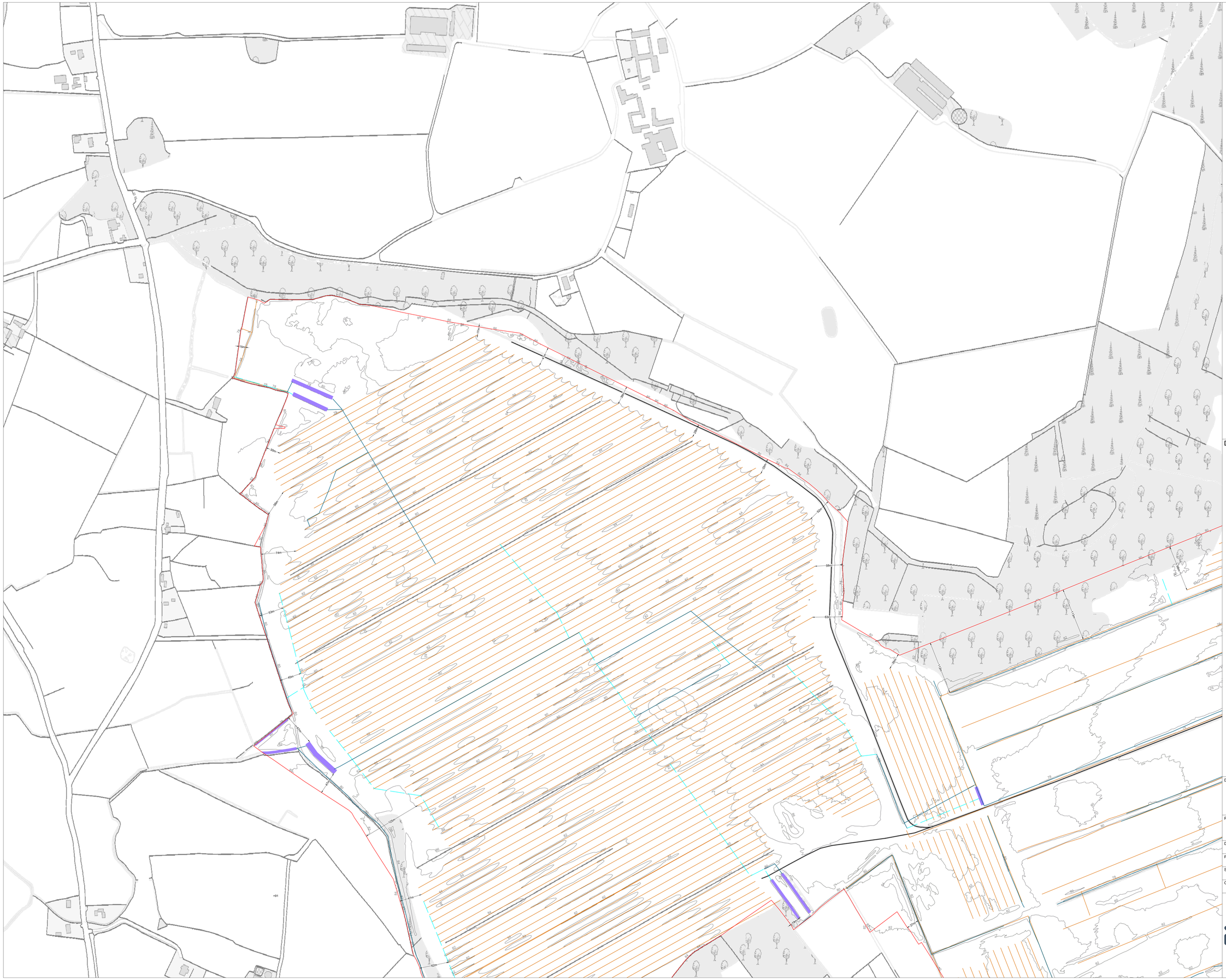

## Drawing Legend

- Planning Application Boundary
- Bord na Móna Rail Lines
- Drains
- Outfall Drains
- Drainage Pipes
- Main Drains
- Silt Ponds

N

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DRAWING TITLE:

# Site Layout Drainage Plan Sheet 4 of 12

PROJECT TITLE:

**BnM Substitute Consent Application, Ballivor Bog Group**

| | |
|---|---|
| DRAWING BY: JOB/KD | CHECKED BY: Tommy Harlin |
| PROJECT No.: 191137-f | DRAWING No.: 191137-f - 22d |
| SCALE: 1:2,500 @ A0 | DATE: 30.07.2024 |
| OS SHEET No.: 2635, 2636, 2636, 2637, 2705, 2706, 2707, 2708, 2774, 2775, 2776, 2777, 2842, 2843, 2844, 2845 | |

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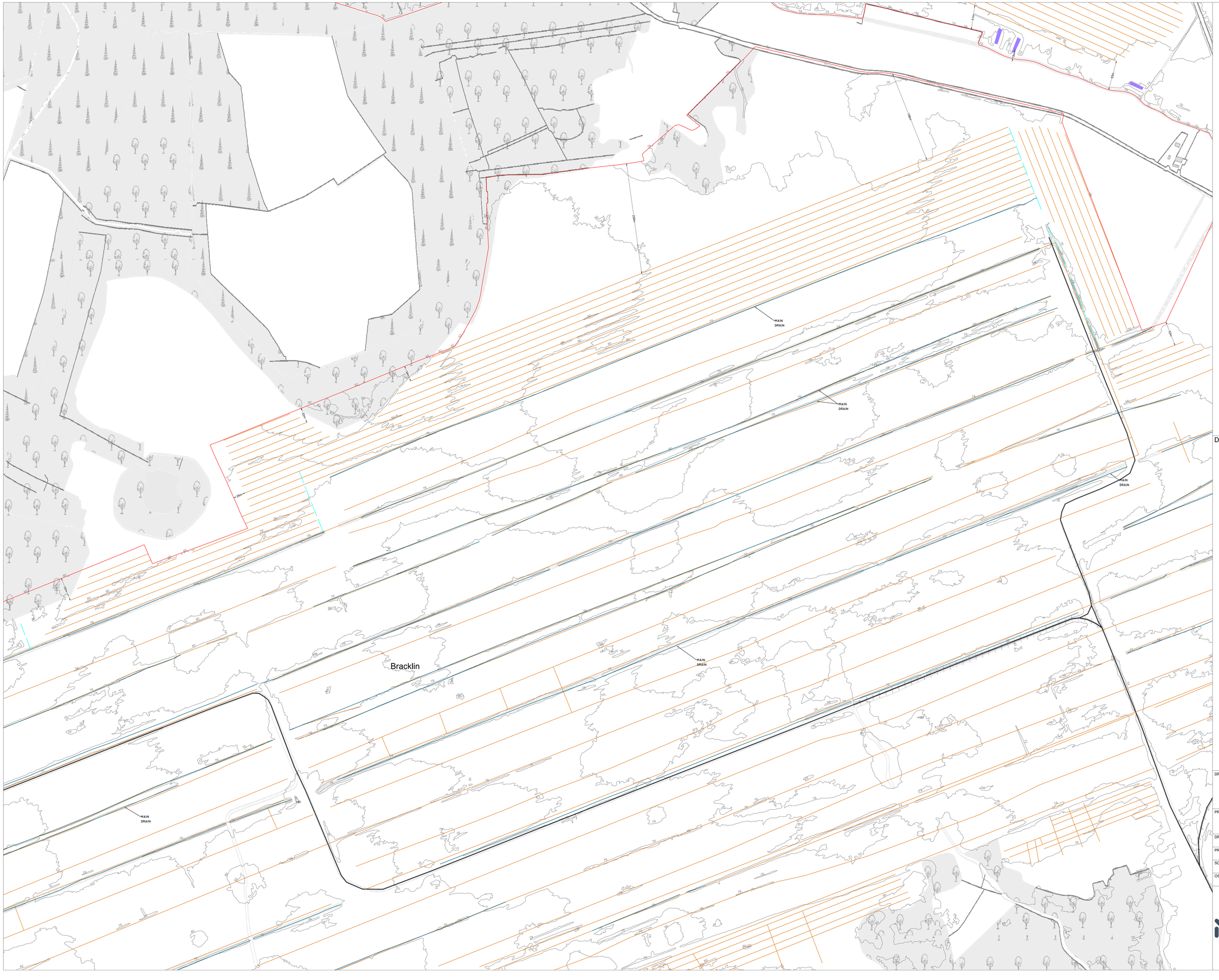


## Drawing Legend

- Planning Application Boundary
- Bord na Móna Rail Lines
- Drains
- Outfall Drains
- Drainage Pipes
- Main Drains
- Silt Ponds

N

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DRAWING TITLE:

# Site Layout Drainage Plan Sheet 5 of 12

PROJECT TITLE:

**BnM Substitute Consent Application, Ballivor Bog Group**

| | |
|---|---|
| DRAWING BY: JOB/KD | CHECKED BY: Tommy Harlin |
| PROJECT No.: 191137-f | DRAWING No.: 191137-f - 22e |
| SCALE: 1:2,500 @ A0 | DATE: 30.07.2024 |
| OS SHEET No.: | 2635, 2636, 2636, 2637, 2705, 2706, 2707, 2708, 2774, 2775, 2776, 2777, 2842, 2843, 2844, 2845 |

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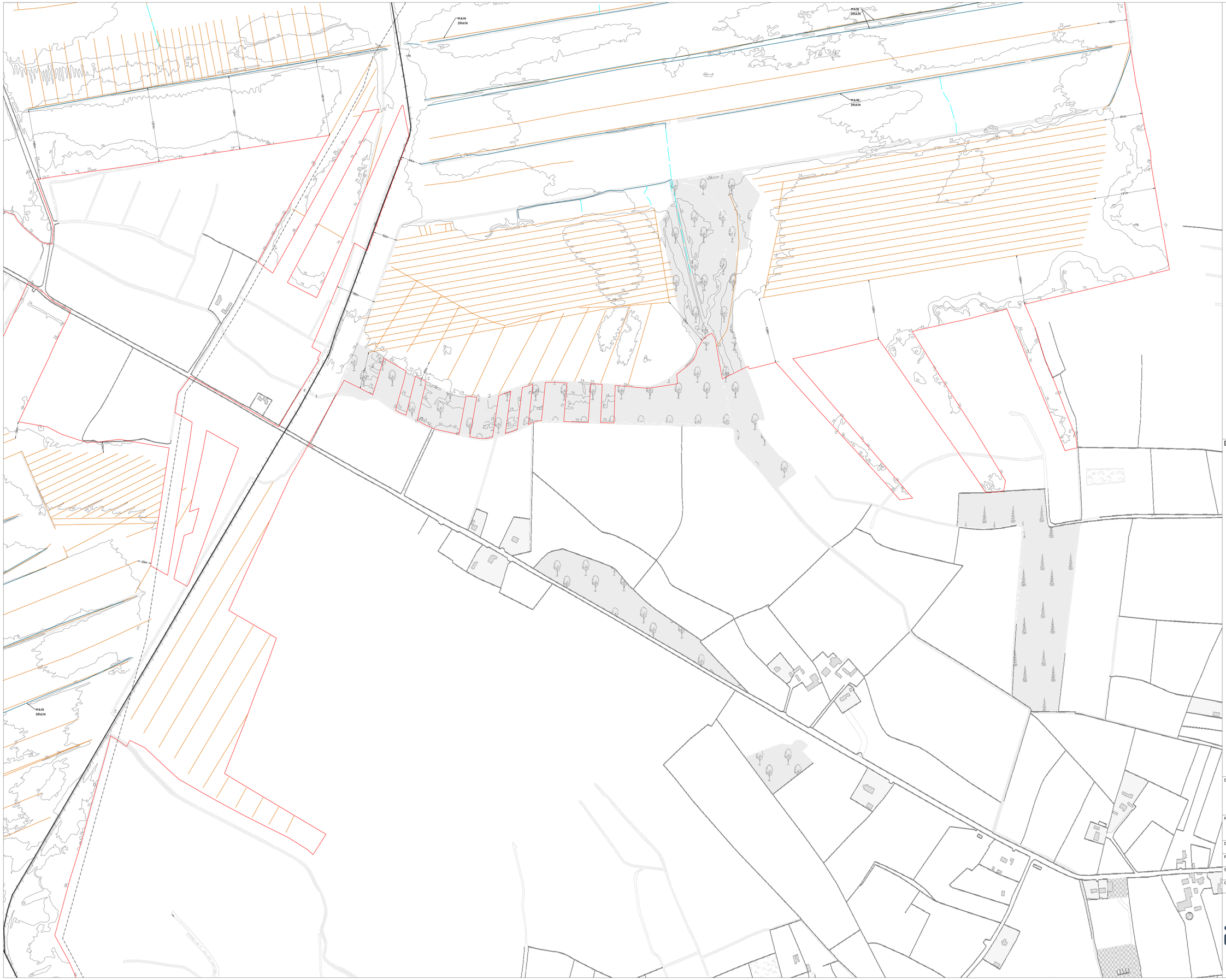


## Drawing Legend

- Planning Application Boundary
- Bord na Móna Rail Lines
- County Boundary
- Drains
- Outfall Drains
- Drainage Pipes
- Main Drains
- Silt Ponds

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N

DRAWING TITLE:

# Site Layout Drainage Plan Sheet 6 of 12

PROJECT TITLE:

**BnM Substitute Consent Application, Ballivor Bog Group**

| | |
|---|---|
| DRAWING BY: JOB/KD | CHECKED BY: Tommy Harlin |
| PROJECT No.: 191137-f | DRAWING No.: 191137-f - 22f |
| SCALE: 1:2,500 @ A0 | DATE: 30.07.2024 |
| OS SHEET No.: 2635, 2636, 2636, 2637, 2705, 2706, 2707, 2708, 2774, 2775, 2776, 2777, 2842, 2843, 2844, 2845 | |

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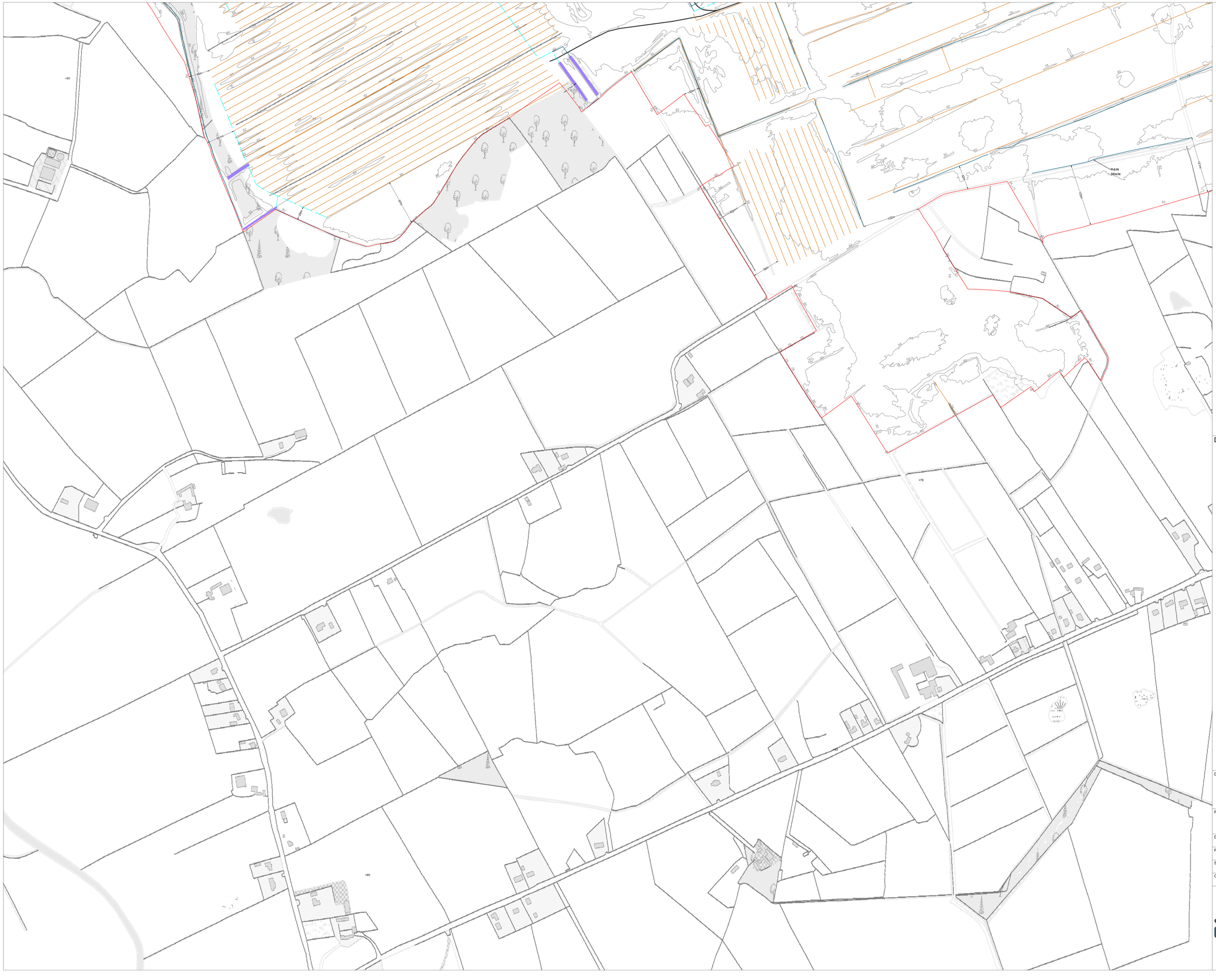


## Drawing Legend

- Planning Application Boundary
- Bord na Móna Rail Lines
- Drains
- Outfall Drains
- Drainage Pipes
- Main Drains
- Silt Ponds

N

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DRAWING TITLE:

# Site Layout Drainage Plan Sheet 7 of 12

PROJECT TITLE:

**BnM Substitute Consent Application, Ballivor Bog Group**

| | |
|---|---|
| DRAWING BY: JOB/KD | CHECKED BY: Tommy Harlin |
| PROJECT No.: 191137-f | DRAWING No.: 191137-f - 22g |
| SCALE: 1:2,500 @ A0 | DATE: 30.07.2024 |
| OS SHEET No.: 2635, 2636, 2636, 2637, 2705, 2706, 2707, 2708, 2774, 2775, 2776, 2777, 2842, 2843, 2844, 2845 | |

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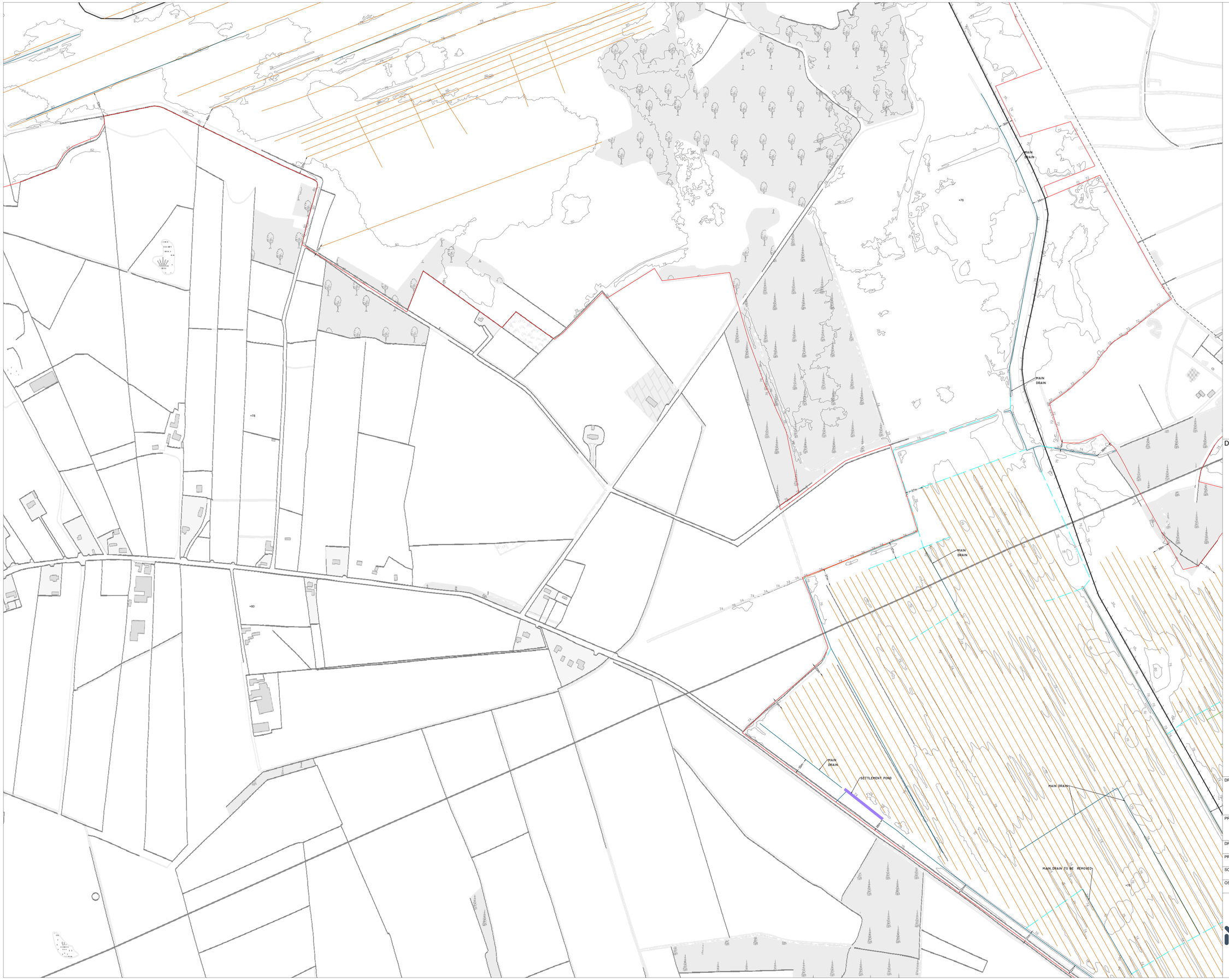


## Drawing Legend

- Planning Application Boundary
- Bord na Móna Rail Lines
- Drains
- PCAS Bog Cells
- Outfall Drains
- Drainage Pipes
- Main Drains
- Silt Ponds

N

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DRAWING TITLE:

# Site Layout Drainage Plan Sheet 8 of 12

PROJECT TITLE:

**BnM Substitute Consent Application, Ballivor Bog Group**

| | |
|---|---|
| DRAWING BY: JOB/KD | CHECKED BY: Tommy Harlin |
| PROJECT No.: 191137-f | DRAWING No.: 191137-f - 22h |
| SCALE: 1:2,500 @ A0 | DATE: 30.07.2024 |
| OS SHEET No.: 2635, 2636, 2636, 2637, 2705, 2706, 2707, 2708, 2774, 2775, 2776, 2777, 2842, 2843, 2844, 2845 | |

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Website: www.mkoireland.ie

Existing bog cells (Peatlands Climate Action Scheme) not subject of this application, refer to chapter 4 of the rEIAR (Description of Development) and Appendix 4-2 of the rEIAR (Cutaway Bog Decomissioning and Rehabilitation Plan) for further details

Carranstown

MAIN DRAIN

## Drawing Legend

- Planning Application Boundary
- Bord na Móna Rail Lines
- County Boundary
- Drains
- PCAS Bog Cells
- Outfall Drains
- Drainage Pipes
- Main Drains
- Silt Ponds

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N

DRAWING TITLE:

# Site Layout Drainage Plan Sheet 9 of 12

PROJECT TITLE:

**BnM Substitute Consent Application, Ballivor Bog Group**

| | |
|---|---|
| DRAWING BY: JOB/KD | CHECKED BY: Tommy Harlin |
| PROJECT No.: 191137-f | DRAWING No.: 191137-f - 22i |
| SCALE: 1:2,500 @ A0 | DATE: 30.07.2024 |
| OS SHEET No.: 2635, 2636, 2636, 2637, 2705, 2706, 2707, 2708, 2774, 2775, 2776, 2777, 2842, 2843, 2844, 2845 | |

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MAIN DRAIN TO BE REMOVED

Existing bog cells (Peatlands Climate Action Scheme) not subject of this application, refer to chapter 4 of the rEIAR (Description of Development) and Appendix 4-2 of the rEIAR (Cutaway Bog Decomissioning and Rehabilitation Plan) for further details

SETTLEMENT POND

SETTLEMENT PONDS

MAIN DRAIN

Ballivor

## Drawing Legend

- Planning Application Boundary
- Bord na Móna Rail Lines
- County Boundary
- Drains
- PCAS Bog Cells
- Outfall Drains
- Drainage Pipes
- Main Drains
- Silt Ponds

N

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DRAWING TITLE:

# Site Layout Drainage Plan Sheet 10 of 12

PROJECT TITLE:

**BnM Substitute Consent Application, Ballivor Bog Group**

| | |
|---|---|
| DRAWING BY: JOB/KD | CHECKED BY: Tommy Harlin |
| PROJECT No.: 191137-f | DRAWING No.: 191137-f - 22j |
| SCALE: 1:2,500 @ A0 | DATE: 30.07.2024 |
| OS SHEET No.: 2635, 2636, 2636, 2637, 2705, 2706, 2707, 2708, 2774, 2775, 2776, 2777, 2842, 2843, 2844, 2845 | |

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Ballivor

MAIN DRAIN

MAIN DRAIN

MAIN DRAIN

MAIN DRAIN

MAIN DRAIN

MAIN DRAIN

EXISTING BnM SETTLEMENT PONDS

SETTLEMENT PONDS

## Drawing Legend

- Planning Application Boundary
- Bord na Móna Rail Lines
- County Boundary
- Drains
- Outfall Drains
- Drainage Pipes
- Main Drains
- Silt Ponds
- Pumps (Decommissioned)

N

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DRAWING TITLE:

# Site Layout Drainage Plan Sheet 11 of 12

PROJECT TITLE:

**BnM Substitute Consent Application, Ballivor Bog Group**

| | |
|---|---|
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| PROJECT No.: 191137-f | DRAWING No.: 191137-f - 22k |
| SCALE: 1:2,500 @ A0 | DATE: 30.07.2024 |
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Ballivor

MAIN DRAIN

MAIN DRAIN

MAIN DRAIN

EXISTING BNM SETTLEMENT PONDS

SETTLEMENT PONDS

MAIN DRAIN

MAIN DRAIN

MAIN DRAIN

SETTLEMENT PONDS

## Drawing Legend

- Planning Application Boundary
- Bord na Móna Rail Lines
- County Boundary
- Drains
- Outfall Drains
- Drainage Pipes
- Main Drains
- Silt Ponds
- Pumps (Decommissioned)

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DRAWING TITLE:

# Site Layout Drainage Plan Sheet 12 of 12

PROJECT TITLE:

**BnM Substitute Consent Application, Ballivor Bog Group**

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| PROJECT No.: 191137-f | DRAWING No.: 191137-f - 22l |
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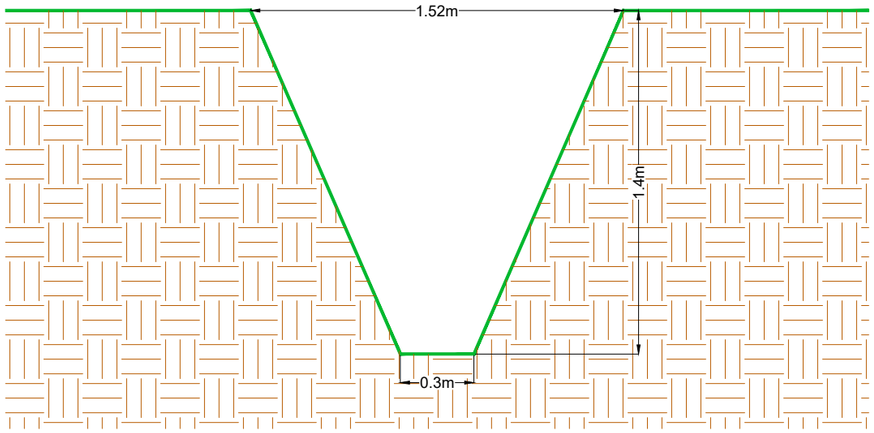


Field Drain (Milled Peat)
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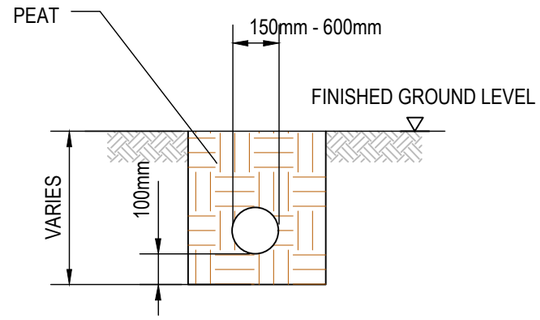


# PIPE DRAIN

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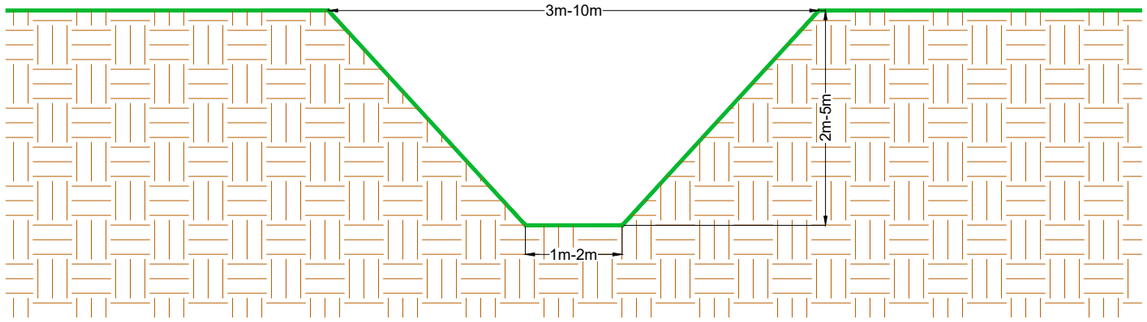


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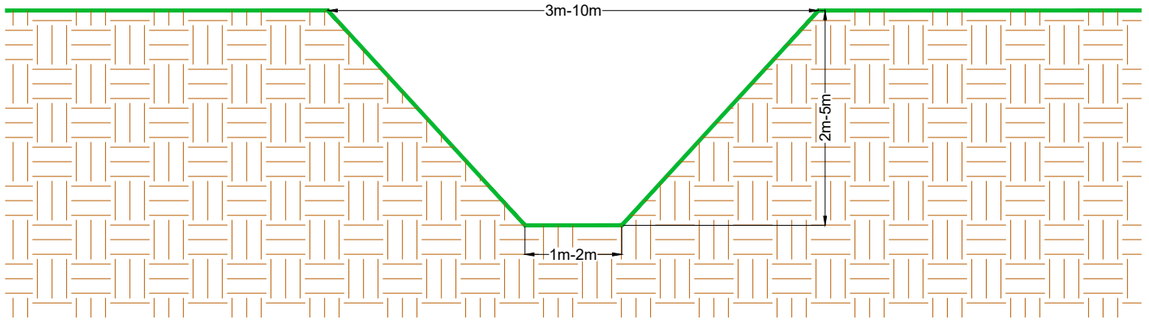


Main Drain
Scale 1:100

DRAWING TITLE:
## Drainage Details

PROJECT TITLE:
**BnM Substitute Consent Application, Ballivor Bog Group**

| | |
|---|---|
| DRAWING BY: JOB/KD | CHECKED BY: Tommy Harlin |
| PROJECT No.: 191137-f | DRAWING No.: 191137-f - 29 |
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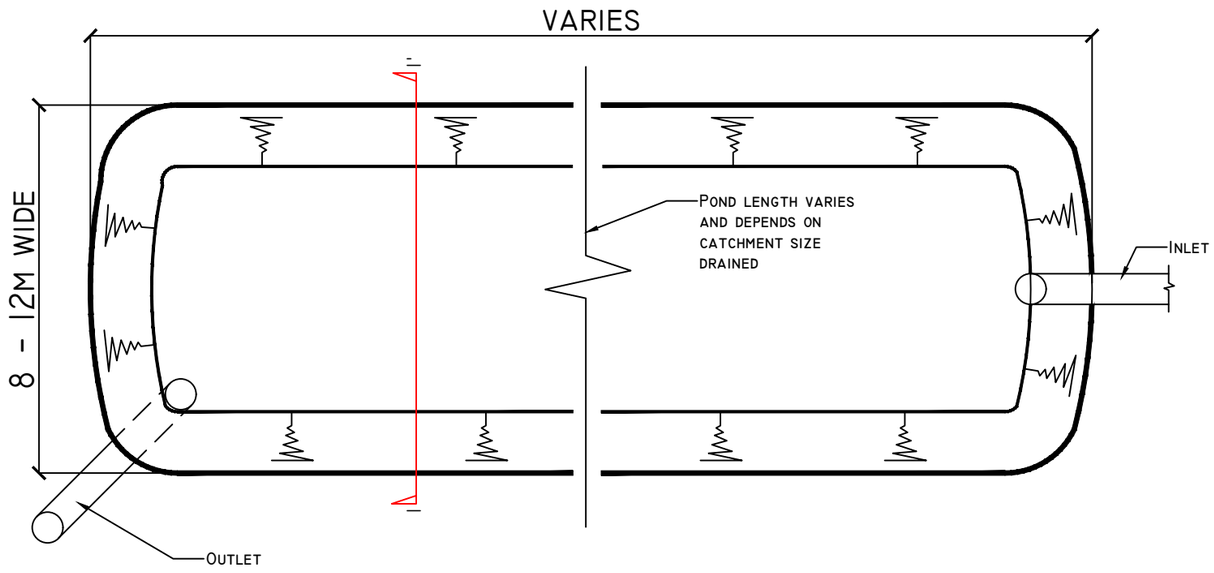
# TYPICAL BnM SETTLEMENT POND DETAIL

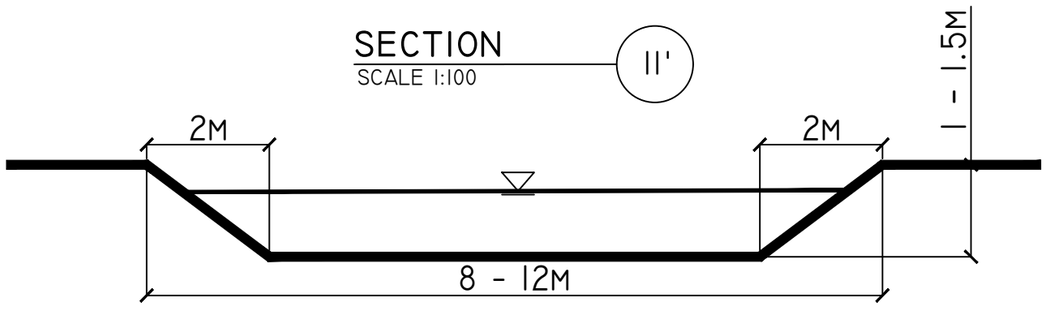
SCALE 1:200

## PLAN




## SECTION II'

SCALE 1:100




NOTES:

- ALL SETTLEMENT PONDS OPERATE TO LICENCE REQUIREMENTS 6.6 TO 6.11 OF IPPC LICENCE REG NO. 503 - BnM - ALLEN GROUP
- BASED ON ACCUMULATION OF 100 $M^3$/HA/YEAR SILT
- PONDS CLEANED MINIMUM TWICE A YEAR (I.E. SILT DESIGN CAPACITY OF LAGOONS, MIN 50 $M^3$ PER NET HA OF BOG SERVICED), ONCE BEFORE DITCHING AND ONCE BEFORE HARVESTING, OR AS INSPECTIONS MAY DICTATE
- GENERALLY - 8 - 12 M WIDE, AND 1 - 1.5 M DEEP
- VELOCITY THRESHOLD OF 0.1 M/SEC

DRAWING TITLE:

**Settlement Pond Detail**

PROJECT TITLE:

**BnM Substitute Consent Application, Ballivor Bog Group**

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|---|---|
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| PROJECT No.: 191137-f | DRAWING No.: 191137-f - 30 |
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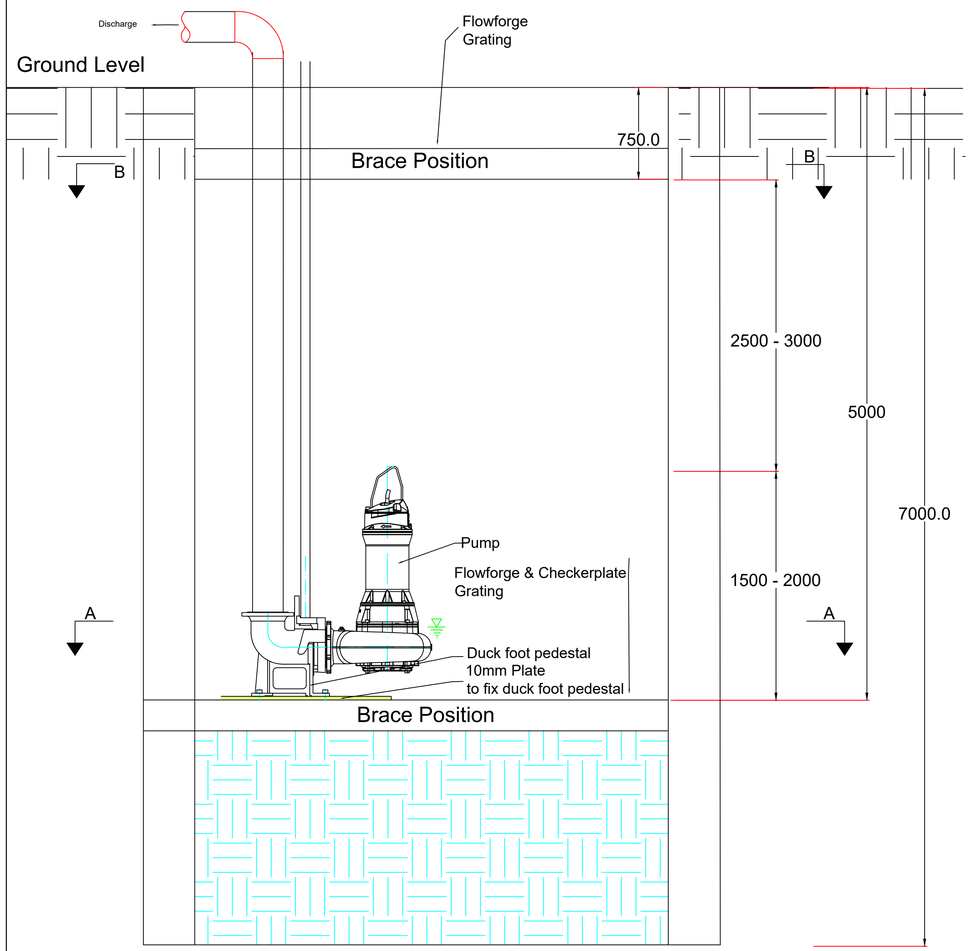


Elevation of Cofferdam

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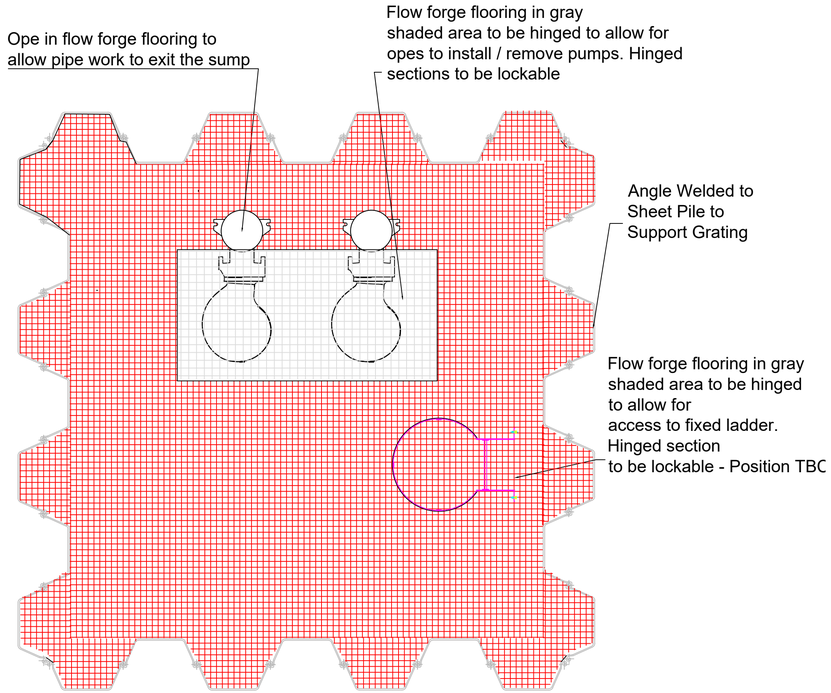
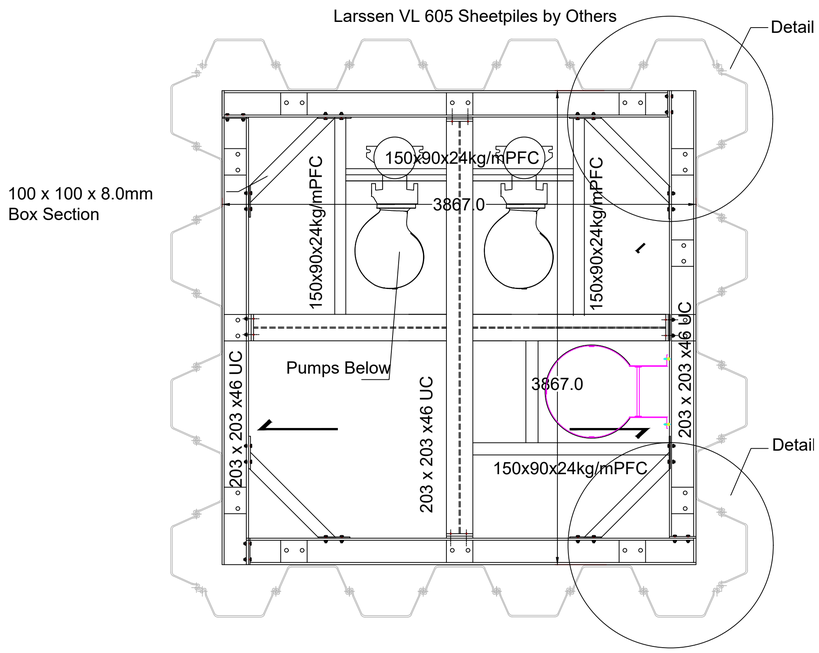



Base Frame Detail - Section B-B

Scale 1:25

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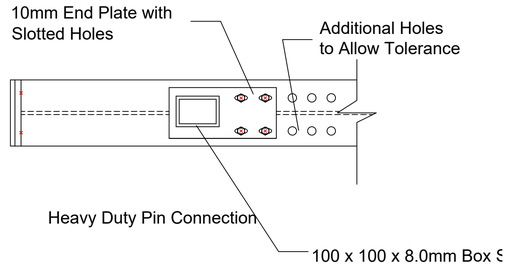
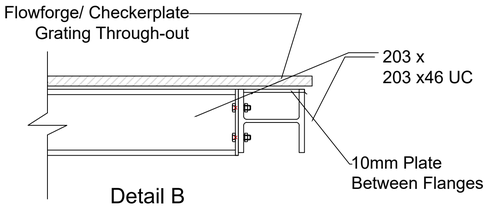


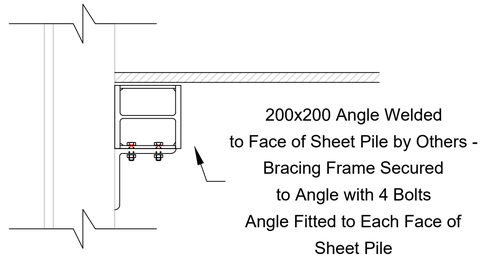

Detail A

Scale 1:10




Detail B

Scale 1:10




Bracing Support Detail

Scale 1:10


Bord na Móna

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**Project**

**BALLIVOR BOG GROUP**

**Client**

**BORD NA MÓNA**

**Drawing Title**

**COFFERDAM PUMP SITE**

**TYPICAL DESIGN**

| Date: | Scale (A1) | Drawn by | Checked by | Approved by |
|---|---|---|---|---|
| 01/07/2024 | As Shown | R.M. | | E.C. |

**Status**

PLANNING [X] FOR APPROVAL [ ]

TENDER [ ] FOR CONSTRUCTION [ ]

AS BUILT [ ]

**Dwg. No.**

**BNM-BR-DR-PS-01**

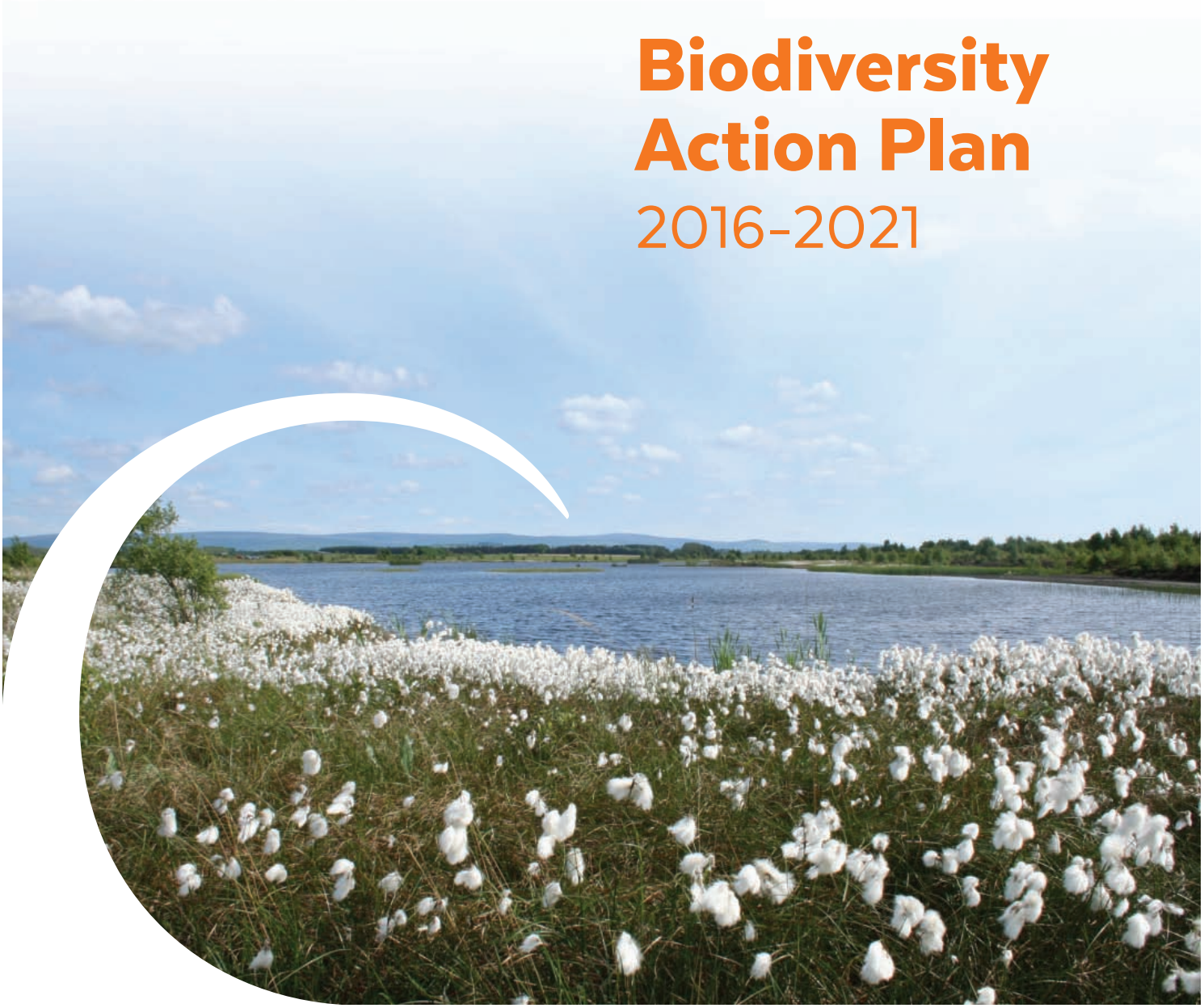
# APPENDIX 4-13

***Bord na Móna Biodiversity Action Plan 2016-2021***

BORD NA MÓNA
Naturally Driven

Biodiversity

# Biodiversity Action Plan 2016-2021













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Finnamore's Lake

Cover photos:
Main image: Bog cotton at Lough Boora
Second row: Bumble Bee on Knapweed; Marsh Fritillary; Damselfly.
Third row: Mute Swans with chicks; regenerating cutover bog.

# Foreword



**The Biodiversity Action Plan 2016-2021 is an essential component of Bord na Móna's sustainability strategy which stands on the three pillars of people, profit and planet. This means whenever we are developing or delivering business solutions we ensure they are supported by all three sustainability pillars.**

In practical terms, our strategy means making sure that, wherever possible, we do things that sustain a healthy natural environment. This includes driving down our carbon footprint, investing in renewables, developing environmentally friendly goods and services as well as rehabilitating bogs and enhancing biodiversity. This environmental aspect to sustainability, where we respect the planet we inhabit, has been an increasingly vital third element to our policy for many, many years.

In October 2015, we announced a significant change for Bord na Móna. To ensure we have a sustainable business means that between now and 2030 Bord na Móna will be in a process of profound transition. During this period we will be managing the move away from energy peat operations, into other businesses and land uses across the energy peat bogs that are part of our ca. 80,000 hectare acre landholding. This will involve the single largest change of use of land in modern Irish history. It will also mean a sizable reduction in our carbon footprint and a very substantial bog rehabilitation programme. We are confident that the investment and rehabilitation programme will collectively yield considerable environmental dividends for the people of Ireland.

Bord na Móna is an iconic State owned company so we are undertaking this transition in a way aimed at benefitting everyone in Ireland. We have also always been a 'community company' so it is important for us that our local communities and our employees will experience the tangible benefits of the new environmental goods and services that we are now developing. Delivering these benefits is a huge body of work. Indeed anyone familiar with the ecology of bogs, will understand that it will require patient work, significant investment and expertise to build this future over the period 2030 and beyond. I am confident that Bord na Móna possesses the skills, commitment and determination to achieve this ambition.

The bogs of Ireland hold a special place in the hearts and souls of Irish people. We in Bord na Móna recognise the privileged position we hold as stewards of state-owned bogs and peatlands. Our intimate appreciation of the complex value of the bogs means we understand the need to carefully plan to ensure positive, sustainable outcomes for our bogs. I am pleased that the Biodiversity Action Plan 2016-2021 developed by our Ecology Team, in consultation with a wide range of stakeholders, provides a very robust roadmap to this exciting new future for our bogs.

**Mike Quinn**
CEO Bord na Móna
March 2016

# Executive Summary

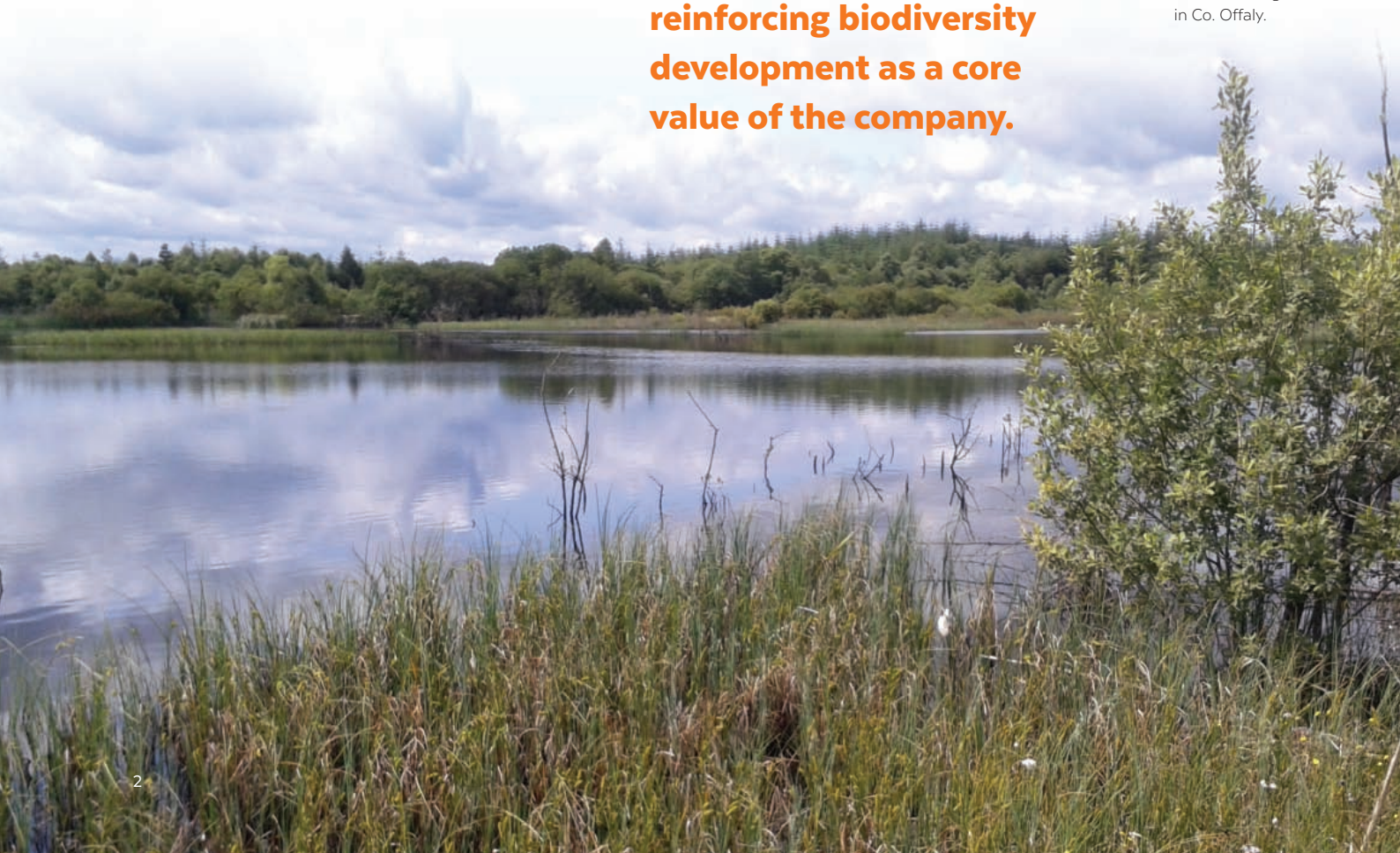
**Bord na Móna launched its first Biodiversity Action Plan 2010-2015 in 2010, the first of its kind amongst corporate entities in Ireland, and is recognised as a significant initiative by Bord na Móna. This document outlines some of the successes and challenges of the 2010-2015 plan, and sets out the actions and KPIs for the Bord na Móna Biodiversity Action Plan 2016-2021.**

The Bord na Móna Biodiversity Action Plan 2016-2021 builds on the foundation of the original core objectives and the actions set out in the 2010-2015 plan, reframing them in the current context and perspectives of peatland biodiversity management, restoration and conservation and also in the outlook for Bord na Móna as set out in the company's *Sustainability 2030* report launched in October 2015.

The company's *Strategic Framework for Future Use of Peatlands* sets out the range of current land uses active on the Bord na Móna landbank (approximately 80,000 hectares in total), the range of future uses that will be considered and the main factors influencing those uses. The framework highlights the most commercially viable after-uses for the cutaway bogs as including renewable energy projects (wind, solar, biomass), niche commercial opportunities, tourism and amenity, and biodiversity.

The Bord na Móna Biodiversity Action Plan 2010-2015 was developed under this framework by the Bord na Móna Ecology Team and comprised five core objectives underpinned by a range of actions. The objectives relate to policy and governance, understanding the baseline ecological condition of the Bord na Móna bogs, rehabilitating and restoring modified peatlands, communicating the value of biodiversity and raising awareness, and reviewing progress.

**The Biodiversity Action Plan 2016-2021 will be integral to and strengthen our transition to sustainable and renewable businesses, reinforcing biodiversity development as a core value of the company.**



Derryounce Lake near Portarlington in Co. Offaly.

## Developments and Achievements 2010-2015

The complete outcomes of the 2010-2015 Plan are outlined in this document with some of the key features highlighted here:

- Biodiversity and ecology has been incorporated into the decision making processes and daily operations of the business units in Bord na Móna
- The baseline ecology work has significantly increased our knowledge and understanding of the Bord na Móna peatland resource
- Habitats and species with legal protection have been highlighted across the Bord na Móna bogs to ensure their preservation
- In the plan period, Bord na Móna has undertaken the restoration of over 1,000 hectares of raised bog habitat and begun the implementation of a range of rehabilitation works across cutaway bog areas
- In terms of rehabilitation and restoration, when we take account of previous work prior to 2010, more than 15% of the total area of land in Bord na Móna ownership has been rehabilitated and/or restored to date in line with International, EU and National 15% targets
- Increased knowledge as to the GHG balance of cutaway bog habitats (acidic and alkaline wetland)
- The level of awareness of the value of biodiversity has been significantly increased within the company and the communities bordering Bord na Móna lands

## Key Action Areas 2016-2021

Building on continuing the actions outlined, and the success of the 2010-2015, the 2016-2021 plan maintains the core objectives and actions, while also incorporating new actions, relating to:

- Working with other State bodies to deliver on actions under the National Peatland Strategy
- Working with State nature conservation bodies and ENGOs under the *National Biodiversity Plan* to highlight biodiversity hotspots and work towards a sustainable network for nature in Ireland
- Promoting the concept of Natural Capital
- Developing a map of ecosystem goods and services for Bord na Móna lands
- Identifying information gaps in the baseline survey work to increase understanding of the biodiversity value of cutaway bogs and their future management
- Continuing with the long term rehabilitation of the cutaway bogs
- Adding to the restored raised bog network under the Bord na Móna Raised Bog Restoration programme
- Control and monitoring of invasive species
- Assimilation of the outcomes relating to rehabilitation and restoration on Bord na Móna bog areas to develop best practice guidelines that can be translated to a range of peatland types
- Supporting and working to develop GHG emission factors for Bord na Móna bog areas
- Promoting awareness and education of biodiversity on Bord na Móna bog areas through working with schools and communities
- Organisation of activities such as Bioblitz to encourage people to interact with and record biodiversity on Bord na Móna bog areas
- Prioritising actions and developing metrics to track progress over the course of the 2016-2021 plan

1.0

# Introduction

**Bord na Móna launched its first Biodiversity Action Plan in 2010. The plan covered a six year period spanning from 2010 to 2015. The development and promotion of the plan was the first of its kind amongst corporate entities in Ireland and is recognised as a significant initiative by Bord na Móna.**

The 2010-2015 Biodiversity Action Plan set out in a comprehensive way why biodiversity is important to Bord na Móna and how it intends to build on the wealth of peatland management, rehabilitation, restoration and conservation that it has built up since its establishment in the 1940s.

## ...builds

**on the foundation of the original core objectives and the actions set out in the 2010-2015 plan**



Lough Boora Discovery Park Visitor Centre, officially opened in 2014.

The objectives and actions core to the Biodiversity Action Plan 2010-2015 were outlined under five key areas:

## Objective 1

**Policy and governance**

## Objective 2

**Understanding the current baseline ecological condition of the Bord na Móna bog areas and the biodiversity present**

## Objective 3

**Developing methods to rehabilitate and restore peatland areas in the post-production use phase**

## Objective 4

**Engaging with the full range of stakeholders in relation to the management of biodiversity on Bord na Móna bogs and promoting awareness of the importance of biodiversity**

## Objective 5

**Providing a mechanism whereby the delivery and progress of the objectives outlined within the Biodiversity Action Plan could be reviewed and assessed on an annual basis.**

Each objective in the Bord na Móna Biodiversity Action Plan 2010-2015 was supported by a suite of actions and key performance indicators (KPIs) and for the greater part, all of the actions outlined in the 2010-2015 Biodiversity Action Plan have been acted upon, implemented and/or are in development. Over the course of the plan, priorities and focus changed as would be expected, but the key aspects of the plan remained relevant and continue to be relevant.

The Bord na Móna Biodiversity Action Plan 2016-2021 builds on the foundation of the original core objectives and the actions set out in the 2010-2015 plan, reframing them in the current context and perspectives of peatland biodiversity management, restoration and conservation and also in the outlook for Bord na Móna as set out in the company's *Sustainability 2030* report launched in October 2015. This document outlines some of the successes and challenges of the 2010-2015 plan, and sets out the actions and KPIs for the Bord na Móna Biodiversity Action Plan 2016-2021. While the actions build on the Bord na Móna experience to date, they are also ultimately a product of the views of the wider community as part of the engagement process carried out over the past six years, and particularly during the drafting of this Plan over the course of 2015.

# Bord na Móna Land and Property and Ecology

## Bord na Móna business units and structure

Bord na Móna is a large and diverse company with a central core of shared services that support each of the business units within the company. The main business units are Peat (all aspects of peat production for energy and horticulture), Horticulture (supply of horticultural peat and associated products such as green compost to the professional and retail markets), Powergen (electricity generation in power stations, wind farms and other renewable electricity developments), Biomass (sourcing and supply), Fuels (sales and development of low smoke and biomass fuels, distribution of briquettes, coal etc.), and Resource Recovery/AES (waste management). In association with these businesses there are a number of support services such as Finance, IT, Engineering, Procurement, Human Resources, Marketing and Communications and Business Transformation. One of the main support units is Land and Property which has a number of sub-units including the Board and Company Secretariat, Legal, Internal Audit, Commercial Land and Property, Land Title and Acquisition and Ecology.

## Developing a Strategic Framework for Future Use of Peatlands

In 2011, the company published a framework that set out the range of current land uses active on the Bord na Móna landbank (approximately 80,000 hectares in total), the range of future uses that will be considered and the main factors influencing those uses. The *Strategic Framework for Future Use of Peatlands* recognises the limited agricultural and forestry potential and highlights the most commercially viable after-uses for the cutaway bogs as including renewable energy projects (wind, solar, biomass), niche commercial opportunities, tourism and amenity, and biodiversity. The framework essentially provides the context within which future developments by the company are considered. The framework is currently being reviewed and updated (2016), and it is expected that those uses identified previously will remain the core future uses.

The Bord na Móna Biodiversity Action Plan 2010-2015 was developed under this framework and the Bord na Móna Biodiversity Action Plan 2016-2021 must also be considered within the context of the *Strategic Framework for Future Use of Cutaway Bogs*. The strategic framework clearly highlights that biodiversity will be one of a number of the land-uses for the Bord na Móna bogs into the future. In practice, a number of land-uses can co-exist on any given bog area as evidenced by the wind farm developments at Oweninny and Mountlucas. At both of these locations where the wind farm footprints are relatively small within the total area of the sites, other commercial developments, as well as biodiversity and amenity are also land-uses at ground level. Tourism and amenity are recognised as having significant potential for the Bord na Móna bogs into the future as evidenced by the great success of the Lough Boora Discovery Park and the range of community led wetland projects and walking and cycle tracks developing across Ireland.

For more about the Bord na Móna amenity and tourism developments please visit our website **www.bordnamona.ie**

## Bord na Móna Ecology

The responsibility for delivery of the Bord na Móna Biodiversity Action Plan 2016-2021 lies with the Bord na Móna Ecology Team. The Ecology Team was established in 2009 following the adoption of a formal corporate objective relating to biodiversity. This corporate objective is *"to promote the role of Bord na Móna in enhancing biodiversity and to create awareness of the values of cutaway bogs through wise-use management for biodiversity and carbon"*.

Since its establishment, the role of the Ecology Team and the services provided to the various businesses within the wider company, have become integral to the day to day business of Bord na Móna. Where required, the company also engages external ecological consultancy services and expertise, for example in relation to independent reviews for planning applications.

For more about the Bord na Móna Ecology Team please visit our website **www.bordnamona.ie**



Tom Barry and others in exhibition room, 1950s.

# Bord na Móna and Bog Conservation in Ireland

Bord na Móna was established in the 1940s from its precursor The Turf Development Board with a mission to develop the peatlands of Ireland primarily as an indigenous fuel resource. Largely concentrated in the midlands of Ireland, the bogs were industrially developed for turf in the early years, and subsequently for milled peat from the 1950s onwards. The milled peat method took bog development to a scale not experienced before in Ireland, and work in the main focused on the largest, most extensive bog areas such as the Bog of Allen complex in Kildare, the Clonsast and Derrygreenagh Bogs in East Offaly, the Boora and Blackwater complexes in West Offaly and East Galway, the Mountdillon Bog complex in Longford/Roscommon along the River Shannon and the Littleton Bogs in North Tipperary. These areas still continue to be the main focus of peat production. Former production areas include the Oweninny Works in North West Mayo.

From the days of the preceding Turf Development Board in the 1930s, up until the 1960s, the focus of the company was firmly set on peat production, providing not only an indigenous fuel resource but creating great socio-economic benefit particularly in the Midlands region. At the same time, the cutaway bogs as they emerged from production were viewed primarily with an interest in creating highly productive agricultural lands to enrich the midlands – a vision that was not found to be feasible except in focal minority areas where sub-soils and conditions favoured production of 'good land'.

In the early 1970s one of Bord na Móna's staff Mr. Tom Barry (1915-1996), Peatland Environmental Officer, recognised and advocated the need to conserve and protect the best remaining examples of bogs for future generations. Tom championed the conservation of bogs in Ireland both on the national and the international stages. He identified the best remaining examples of bogs and persuaded the Board and Management of Bord na Móna to set aside a number of bog areas for conservation. Pollardstown Fen and a suite of other well-known sites were purchased by the company purely for the purpose of conservation. These areas are preserved today because of Tom Barry's vision and foresight. Following on from those bogs put forward by the company for conservation in the 1970s, a further series of bogs followed in the 1980s and 1990s, including Clara Bog, All Saint's Bog, Mongan Bog and Bellacorick Flush. These are now in the ownership and management of the National Parks and Wildlife Service, An Taisce and others. A number of additional sites, for example Killaun Bog near Birr in County Offaly and Abbeyleix Bog in County Laois, remain in Bord na Móna's ownership but are managed for biodiversity by the local communities.

Bord na Móna's commitment to bog conservation was founded on the knowledge of Tom Barry. Today that commitment is being followed through and built upon as evidenced by the investment in the previous and current Biodiversity Action Plans and the work of the Ecology Team.

For more on the heritage of Bord na Móna see the company's community website: **www.heartland.ie**



Common Blue butterfly, Lullybeg Reserve. Photo: Jesmond Harding BCI.

2.0

# International, European and National Policy Relating to Biodiversity

**Since the writing of the initial Biodiversity Action Plan in 2010, there has been a number of changes and developments in terms of national, European and global biodiversity targets and policies. The main policy updates and the way in which Bord na Móna has responded are outlined here:**

## The Convention on Biodiversity

### New Strategic Plan for the Convention 2011-2020 – *Living in Harmony with Nature*

In October 2010 the 10th Conference of the Parties to the United Nations Convention on Biodiversity (CBD) in Nagoya, Japan adopted the new strategic plan for the period 2011 to 2020. The theme of the strategic plan is *Living in Harmony with Nature*. All countries and partners who are signed up to the CBD (this includes Ireland and the European Union) were tasked with updating their own national plans according to the targets set out in the CBD strategic plan. The plan has a long-term vision for 2050, as well as a mission for 2020.

## Living in Harmony with Nature – the vision and mission

The Strategic Plan is comprised of a shared vision, a mission, strategic goals and 20 ambitious yet achievable targets, collectively known as the Aichi Targets. The Strategic Plan serves as a flexible framework for the establishment of national and regional targets and it promotes the coherent and effective implementation of the three objectives of the Convention on Biological Diversity (CBD).

**www.cbd.int**

## The CBD Vision: "By 2050, biodiversity is valued, conserved and restored and wisely used, maintaining ecosystem services, sustaining a healthy planet and delivering benefits essential for all people".

**THE MISSION** of the CBD Strategic Plan is to ensure a coherent implementation of the Convention on Biological Diversity and achievement of its three objectives by taking "effective and urgent action to halt the loss of biodiversity to ensure that, by 2020, ecosystems are resilient and continue to provide essential services, thereby securing the planet's variety of life and contributing to human well-being and poverty eradication. To ensure this, pressures on biodiversity are reduced, ecosystems are restored, biological resources are sustainably used and benefits arising out of utilization of genetic resources are shared in a fair and equitable manner; adequate financial resources are provided, capacities are enhanced, biodiversity issues and values mainstreamed, appropriate policies are effectively implemented, and decision-making is based on sound science and the precautionary approach."

The CBD Mission has 20 headline targets for 2020, organised under five Strategic Goals which identify the different aspects of approaching the issue of biodiversity loss. These are:

- **Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society**
- **Reduce the direct pressures on biodiversity and promote sustainable use**
- **Improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity**
- **Enhance the benefits to all from biodiversity and ecosystem services**
- **Enhance implementation through participatory planning, knowledge management and capacity building**

The goals and targets provide a framework for the establishment of national targets. The United Nations has also decided, in order to further drive progress, to designate the period 2011-2020 as the UN Decade on Biodiversity.

For more information see: **www.cbd.int/doc/strategic-plan/2011-2020/Aichi-Targets-EN.pdf**

The key targets of the CBD plan have been incorporated into the EU Biodiversity Action Plan and Ireland's National Biodiversity Plan (2011-2016). These include:

- **At least halve and, where feasible, bring close to zero the rate of loss of natural habitats, including forests**
- **Establish a conservation target of 17% of terrestrial and inland water areas and 10% of marine and coastal areas**
- **Restore at least 15% of degraded areas through conservation and restoration activities**
- **Make special efforts to reduce the pressures faced by coral reefs**



**By 2050**

**biodiversity is valued, conserved and restored and wisely used, maintaining ecosystem services, sustaining a healthy planet and delivering benefits essential for all people**





The cutaway bogs are home to a number of bird species including (above left) Wheatear and Lapwing (above right).

### The EU Biodiversity Strategy to 2020

In May 2011, the European Commission adopted a new strategy to halt the loss of biodiversity and ecosystem services in the EU by 2020. The strategy is in line with the global commitments made in Nagoya in October 2010, in the context of the Convention on Biological Diversity (outlined previously).

## EU Vision and Headline Target

The EU has articulated its long-term vision as

**"by 2050 EU Biodiversity and the ecosystem services it provides – its natural capital – are protected, valued and appropriately restored for biodiversity's intrinsic value and for their essential contribution to human well-being and economic prosperity, and so that catastrophic changes caused by the loss of biodiversity are avoided".**

The EU has also published its Headline Target for progress by 2020 as *"to halt the loss of biodiversity and the degradation of ecosystems in the EU by 2020, restore them in so far as feasible, while stepping up the EU contribution to averting global biodiversity loss"*. The EU Commission published, in 2011, a communication on the new EU Biodiversity Strategy, entitled *"Our life insurance, our natural capital: an EU biodiversity strategy to 2020"*. This Communication identifies 6 main targets (supported by 20 actions):

| |
|---|
| **Full implementation of the nature directives (Habitats and Birds)** |
| **Maintain and restore ecosystems and their services** |
| **Increase the contribution of agriculture and forestry to maintaining and enhancing biodiversity** |
| **Ensure the sustainable use of fisheries resources** |
| **Combat invasive alien species** |
| **Help avert global biodiversity loss** |

For more information see: **www.eur-lex.europa.eu**

It is the role of individual countries to develop national plans for biodiversity, but they must reflect the targets set out in the EU Biodiversity Strategy. The key aspects for delivering targets on biodiversity are the Directives relating to Habitats, Birds, Water, Marine and EIA.

## Ireland's National Biodiversity Plan
Actions for Biodiversity 2011–2016

As a member of the European Union, Ireland contributes to the work of conserving biodiversity in the entire territory of the 27 Member States. Since Ireland's policies and legislation on biodiversity are strongly influenced by the EU, this Plan addresses not just national but also wider European issues. Ireland's National Biodiversity Plan has been developed in line with the EU and International Biodiversity strategies and policies. The 2011-2016 plan builds on the initial plan developed for 2002-2006 and is set out in terms of an overall vision and overarching target, underpinned by strategic objectives and actions.

### Ireland's Vision:

**"That biodiversity and ecosystems in Ireland are conserved and restored, delivering benefits essential for all sectors of society and that Ireland contributes to efforts to halt the loss of biodiversity and the degradation of ecosystems in the EU and globally".**

The Overarching Target of the plan, based on the actions which follow is: *"That biodiversity loss and degradation of ecosystems are reduced by 2016 and progress is made towards substantial recovery by 2020".*

The measures that Ireland will take in the overall strategy are presented in a series of objectives as follows:

- **To mainstream biodiversity in the decision-making process across all sectors**
- **To substantially strengthen the knowledge base for conservation, management and sustainable use of biodiversity**
- **To increase awareness and appreciation of biodiversity and ecosystems services**
- **To conserve and restore biodiversity and ecosystem services in the wider countryside**
- **To conserve and restore biodiversity and ecosystem services in the marine environment**
- **To expand and improve on the management of protected areas and legally protected species**
- **To substantially strengthen the effectiveness of international governance for biodiversity and ecosystem services**

The National Biodiversity Plan is currently being prepared for review and update (2016).

For more information see: **www.npws.ie**

Cloonshannagh raised bog remnant (bog restored in 2014).






Bord na Móna surveyors Tommy Higgins and Ray Carroll working on Paul's Lough Bog (bog restored 2014).

# Conserve and restore

## biodiversity and ecosystems in the wider countryside

Ireland's National Biodiversity Plan 2011-2016

# Bord na Móna's contribution

In terms of Bord na Móna's input to the National Biodiversity Plan (2011-2016), the company was part of the initial consultations carried out in 2008 and continued to input to the plan up to its final publication in 2011. The key specific inputs were in relation to Objective 4, Target 10 and its component actions:

**Objective 4:** To conserve and restore biodiversity and ecosystems in the wider countryside

**Target 10:** Continued rehabilitation or restoration of biodiversity elements

## Actions

| | |
|---|---|
| 10.1 | **Identify areas of biodiversity value, or biodiversity hotspots, within Bord na Móna lands by 2015** |
| 10.2 | **Continue ecological surveys, preparation of habitat maps and planning of rehabilitation for all Bord na Móna bog areas** |
| 10.3 | **Continue to develop a network of biodiversity areas within Bord na Móna sites** |

### Indicators and outcomes

Number of habitat maps and rehabilitation plans for all Bord na Móna bog areas

To date, Bord na Móna has delivered on each of the actions and will work with the National Parks and Wildlife Service to build on these actions for the next national biodiversity plan which is currently in development (2016).



Kilberry Wetlands, created in 2013 on cutaway bog.

Other aspects of the National Biodiversity Plan (2011-2016) have also been incorporated into the day to day business activity in Bord na Móna such as:

1. **Biodiversity and ecology**
   Biodiversity and ecology has been incorporated into the decision making processes and daily operations of the main business units in Bord na Móna

2. **Baseline ecology work**
   The baseline ecology work has significantly increased our knowledge and understanding of the Bord na Móna peatland resource

3. **Habitats and species**
   Habitats and species with legal protection have been highlighted across the Bord na Móna bogs to ensure their preservation

4. **Restoration and rehabilitation**
   In the plan period, Bord na Móna has undertaken the restoration of over 1,000 hectares of raised bog habitat and begun the implementation of a range of rehabilitation works across cutaway bog areas

5. **More than 15% rehabilitated and/or restored**
   In terms of rehabilitation and restoration, when we take account of previous work prior to 2010, more than 15% of the total area of land in Bord na Móna ownership has been rehabilitated and/or restored to date in line with International, EU and National 15% targets

6. **Increased knowledge**
   Increased knowledge as to the GHG balance of cutaway bog habitats (acidic and alkaline wetland)

7. **The value of biodiversity**
   The level of awareness of the value of biodiversity has been significantly increased within the company and the communities bordering Bord na Móna lands

8. **Biodiversity Action Plan**
   Bord na Móna has developed its second Biodiversity Action Plan building on the work achieved to date

**Each of these aspects is highlighted in the company's**

# Sustainability 2030

**report (2015) and will continue to be developed over the course of the Biodiversity Action Plan 2016-2021.**

# A National Peatlands Strategy for Ireland




Another significant policy development in relation to Irish peatlands in general is the development of the National Peatland Strategy. In April 2011 the Irish government decided to draw up a national strategy on peatlands conservation and management. It was developed in consultation with bog owners and other stakeholders, to deal with long-term issues including: turf cutting, land management and development, restoration, conservation, tourism potential, carbon accounting and community participation in managing the resource. The government also established a Peatlands Council to assist it in drawing up the strategy and to advise it on issues related to the management of peatlands.

Drafting of the strategy was led by the Department of Arts, Heritage and the Gaeltacht in conjunction with the Peatlands Council (which consists of the relevant Public Bodies). The Peatlands Council also assisted in preparing a succession of drafts, and two rounds of public consultation were held. The strategy, entitled *Managing Ireland's Peatlands* will be published in due course. The main sections of the strategy deal with traditional and changing views of Irish peatlands; principles, policies and actions in managing peatlands; and an implementation structure for the strategy. The actions relating to Bord na Móna include promotion of the use of biomass for power generation, development of guidelines and approaches to responsible peatland management in general and due regard to after-use, rehabilitation and restoration of cutaway bogs.

Bord na Móna made a number of submissions during the course of the strategy development and the company is represented on the Peatlands Council and the Peatlands Strategy Implementation Group. The Strategy represents a new approach to peatland management in Ireland, considering the full range of peatland types and uses.

For more information see: **www.npws.ie**

**The Strategy represents**

## a new approach

**to peatland management in Ireland, considering the full range of peatland types and uses.**



Bord na Móna wetland areas are important sites for breeding wetland birds.

# Governance.



# 3.0 Review of Biodiversity Action Plan 2010-2015 Objectives and updated actions for 2016-2021

## 3.1 Objective 1

## Carry out all works in line with best practice guidelines and relevant legislation across all Bord na Móna Bogs

**This objective underpins all of the other objectives outlined in the Bord na Móna Biodiversity Action Plan. Bord na Móna is a diverse company and in relation to the environment, there are a number of legislative regulatory mechanisms that Bord na Móna adheres to.**

The primary regulation mechanism relating to the environment and in particular peat harvesting activities is Integrated Pollution Control (IPC) licensing. IPC licensing is granted, implemented and monitored for compliance by the EPA. It is noted however that at the time of writing (March 2016) the regulation of peat harvesting activities is under review by the Department of Environment and Local Government.

There are also a number of areas regulated under Waste Licensing (such as Srahmore Peat Deposition Area and Associated facilities, Drehid Landfill, Kilberry Composting Facility) and conditions related to planning under the Planning and Development Act (such as Mountlucas and Bruckana Wind Farms). Compliance with regulatory mechanisms is reviewed and monitored by the EPA and the relevant planning authorities.

In the period 2010-2015 a number of research projects that focused on developing best practice for management and regulation of activities on peatlands were completed. This included the EPA BOGLAND project (results published in 2011) and a suite of Greenhouse Gas monitoring projects. These projects informed the development of policy documents relating to peatlands. One of the more significant developments in the area of policy has been the development of the *National Peatlands Strategy*. Another area which has grown is the integration of the concepts of *Natural Capital* and *Ecosystem Goods and Services*. Bord na Móna participated in and contributed to all of these projects and policy documents and initiatives and will continue to contribute to their implementation.

## Key Performance Indicators

Some of the key performance indicators in the period 2010-2015 were:




- Founding member of the *Irish Forum on Natural Capital* and member of the IFNC steering committee (2014 to present)
- Member of the EU *Business and Biodiversity (B@B) platform* (2015 to present) and the Irish business network *Business in the Community* (BITC)
- Direct input to the *National Peatland Strategy* and members of the Peatlands Council and Peatland Strategy Implementation Group (PSIG)
- Direct ongoing involvement in the *National Raised Bog Scientific Review* Steering Committee (2012 to present)
- Direct input to the development of the *National Biodiversity Action Plan* 2011-2016
- Participation in BirdWatch Ireland *Action Plans for Raised Bog Birds 2011-2020* and *Upland Birds 2011-2020* and support for the development of BirdWatch Ireland *Bird Sensitivity Map for Wind Farm Developments* (2015)
- Direct input to the *National Pollinator Plan* co-ordinated by the National Biodiversity Data Centre (launched in September 2015)
- Direct input of Ecology Team to planning applications for a range of Bord na Móna developments including Oweninny, Mountlucas and Bruckana wind farms (design and mitigation)
- Facilitation of discussions and development of the International Peatland Society *Strategy on Responsible Peatland Management*
- Direct input to the BOGLAND project (vegetation survey and qualitative assessment of BOGLAND project sites)
- Compliance with IPC licensing and regulation



Art and biodiversity meet at Lough Boora Discovery Park.

Building on this work the following actions can be outlined for the period 2016-2021. ***Note**: New Actions to the Biodiversity Action Plan 2016–2021 plan period are highlighted in green shading throughout.*

# Actions

**Ensure organisational awareness of changes and developments**
in relevant policies and strategies, in particular those arising from the outcome of the *National Peatland Strategy* and the *Irish Forum on Natural Capital*

**Further encourage best practice within Bord na Móna**
in terms of all aspects of the environment, from ongoing operations to future developments. This will require continued awareness of relevant environmental legislation: including EIA and SEA Directives, Habitats and Birds Directives, Water Framework Directive and other such instruments of Irish legislation such as Planning and Development Act 2010

**Ensure responsible environmental management**
in terms of operational aspects of all Bord na Móna businesses through continuation of best practice in terms of IPC Licensing (and future regulatory mechanisms as they are developed in coming years) and other similar instruments such as Waste Licenses and Waste Permits

These actions will require ongoing work including:

**Continue to deliver on actions set out in the *National Peatland Strategy***
through working on the *Peatland Strategy Implementation Group* and the *National Raised Bog Scientific Review* steering committee

**Work with the *Irish Forum on Natural Capital***
to promote accounting of ecosystem goods and services as part of an EU wide approach

**Develop a natural capital accounting system for Bord na Móna**

**Continue to work with business and biodiversity initiatives**
such as the EU B@B and Business in the Community to promote good practices in relation to biodiversity at corporate levels

**Continue to work with other initiatives**
such as the *National Biodiversity Action Plan* (currently under review) to ensure integrated planning for Bord na Móna biodiversity focus areas



## Ensure responsible environmental management in terms of operational aspects of all Bord na Móna businesses

**Track developments in national and international policies**
relating to biodiversity and peatlands in general; interact with relevant bodies and interest groups to share knowledge and contribute to policy development

**Provide input to any planning applications for developments within Bord na Móna bogs**
by contributing data and/or providing advice on best practice in terms of rehabilitation, biodiversity management and conservation

**Contribute updates on rehabilitation and biodiversity projects**
to Annual Environmental Reports on IPC Licenses to the EPA





Above left: Basil thyme growing next to the railway line at Ballycon Bog.

Above: The cutaway bogs are home to a wide diversity of spiders and other creepy crawlies.

## Key Indicators of Success

The key indicators of success of these actions will be:




**Awareness and compliance with relevant legislation and policy documents into daily operations**

**Increased awareness of the value of peatlands nationally and the benefits of investing in peatland natural capital as part of Bord na Móna's ongoing contributions in terms of restoration and rehabilitation**

**Good design and planning of proposed developments followed by implementation for Bord na Móna bogs in terms of biodiversity**

**Facilitation of ongoing core businesses and other proposed projects through continued responsible management and compliance with environmental regulatory mechanisms, present and future**

Bord na Móna Ecology Team talking to delegates of the Natural Capital Conference in April 2014 about the value of peatlands.



# Natural Capital, the economics of Nature and the Irish Forum on Natural Capital (IFNC)

## Natural Capital: An Introduction

Natural capital is the world's stocks of physical and biological resources, including air, water, minerals, soils, fossil fuels and all living things. These stocks work together to deliver ecosystem goods and services that in turn provide benefits to society. These benefits include harvestable products like food, materials and fuel, clean water for people to drink and for industry to use, purified air to breathe, the natural decomposition of wastes, the conservation and recycling of essential nutrients like nitrogen and phosphorus, medicine, pest control, pollination, flood and drought regulation and beautiful places to visit. These services matter to people because they give us things we need. But because they are 'free', we don't value them in the same way we value things we have to pay for.

## Natural Capital Accounting: Making Nature Count

A rapidly-evolving method for addressing the economic invisibility of nature is 'natural capital accounting'. This involves attributing a measurable value to our natural capital in economic terms (such as euros or dollars) and/or in ecological terms (such as the number of species in an area). Natural capital accounting is something that all EU member States have to do by 2020 (Source: EU Biodiversity Strategy to 2020), and in Ireland the process is already underway through the Mapping and Assessment of Ecosystem Services (MAES) project.

## The Irish Forum on Natural Capital

The Irish Forum on Natural Capital (IFNC) brings together a diverse range of organisations and individuals from academic, public, private and NGO sectors who are interested in the development and application of the natural capital agenda in Ireland. The Forum is structured as a broad representative group, led by a Steering Committee and administered by a Secretariat.

The IFNC emerged through the work of the Natural Capital Committee, a voluntary group that came together to organise Ireland's Hidden Wealth – the first national conference on natural capital, held at the National Botanic Gardens, Dublin, in April 2014. Further meetings and workshops were held in 2015 for members to input to the work plan for the forum.

The IFNC vision is *"for an Ireland in which natural capital and ecosystem goods and services are valued, protected and restored".*

The IFNC mission is, *"through the collaboration and leadership of our diverse members, to help to value, protect and restore Ireland's natural capital and ecosystem services. We will do this by supporting the adoption of natural capital concepts in public policy and corporate strategy, promoting informed public and private sector decision-making and assisting in the establishment of a national natural capital accounting standard".*

Bord na Móna is one of the founding members of the Natural Capital movement in Ireland and sits on the steering committee of the IFNC. The key actions relating to Natural Capital listed in this plan are:

- Develop a natural capital accounting system for Bord na Móna - to be based on the protocol currently being developed by the Natural Capital Coalition
- Develop a map of the ecosystem goods and services of Bord na Móna lands
- Continue to work as part of the Irish Forum on Natural Capital steering committee

For more information see: **www.naturalcapitalireland.com** and **www.naturalcapitalcoalition.org**


Understand.

3.2

# Objective 2

## Monitor biodiversity areas and identify and survey further biodiversity hotspots within Bord na Móna Bogs

**Bord na Móna is a major land owner in Ireland, with a significant area of peatland making up the most of the 80,000 ha in its stewardship. Understanding the ecological status of those peatland areas is critical to informing how these lands can be rehabilitated into the future.**

One of the key objectives of the original Biodiversity Action Plan 2010-2015 was to establish a baseline of the ecological condition of the full extent of the Bord na Móna peatland area. This has been successfully completed and habitat maps of each of the bog areas have been drawn up using GIS. By combining the basic habitat information with extra information such as LiDAR (a remote sensing technique that illustrates contours in an area) data, aerial photography and peat depth data from GPR (Ground Penetrating Radar), it is possible to get an indication of how each bog area will develop upon cessation of peat production and rehabilitation. Based on all of the information available, the Ecology Team has developed predictive maps, incorporating the necessary rehabilitation measures (targeted drain blocking etc.) which outline how each of the bog areas will be stabilised post peat production. Each bog is unique in terms of hydrological regime (gravity or pumped drain), peat depth and type and other influencing factors from adjoining lands which will result in its own particular future. The data has also been used to identify core biodiversity areas and/or hotspots. The work of the Ecology Team on the baseline ecological condition of the bogs has become an essential tool in managing the Bord na Móna Bogs and it will be maintained and updated as part of ongoing operations.

## Key Performance Indicators

Some of the key performance indicators in the period 2010-2015 were:




- Publication and launch of the Bord na Móna Biodiversity Action Plan 2010-2015 (left) in November 2010
- Development of a comprehensive habitat classification system for the Bord na Móna bogs to account for the variability in cutaway habitats (pioneer to complex habitats)
- Habitat mapping for the full range of Bord na Móna bogs – including a general ecology report for each site in conjunction with a species list and mapping
- Development of predictive habitat maps (following from current habitat maps) to indicate the potential extent of wetland, woodland and open habitats (grassland, heathland etc.) on cutaway areas post peat production and rehabilitation phases
- Identification of core biodiversity areas for habitats and species
- Development of an indicative biodiversity map based on data collated has been developed and is accessible to all businesses in Bord na Móna
- Input to the Bord na Móna *Strategic Framework for Future Use of Peatlands*
- Direct input to the MAES (*Mapping and Assessment of Ecosystems and their Services*) project for Ireland
- Identification of Raised Bog areas with active raised bog habitat and sites with good potential for restoration
- Identification and survey of important focal points for wintering and breeding birds, particularly those of conservation interest such as Whooper Swan, Red Grouse, Lapwing, Curlew and Hen Harrier
- Identification of important focal points for other species of conservation interest such as Marsh Fritillary and White-Clawed Crayfish
- Identification, survey and targeted management of areas identified as problematic in terms of invasive species such as Japanese Knotweed
- Sharing of species data with the *National Biodiversity Data Centre* and other interest groups
- Monitoring of biodiversity hotspots to assess status of habitats and species



The National Peatlands Council visited the restored Cuckoo Hill Bog in July 2013.

Building on this work the following actions can be outlined for the period 2016-2021.

# Actions

**Update the baseline habitat survey of all Bord na Móna bogs**

**Support and develop surveys**
to update the knowledge base where required – particularly for species and habitats of conservation interest

**Monitor existing and identify additional areas**
to be managed primarily for biodiversity into the future taking into consideration targeted habitat (primarily woodland and wetland) and species management, as well as management for pollinators

**Strengthen and enhance the network of biodiversity areas**
that connect with other recognised areas of high biodiversity value outside of the Bord na Móna bogs and explore the potential for wildlife/green infrastructure corridors

**Develop a map of the ecosystem goods and services of Bord na Móna bogs**

**Monitor existing and identify additional areas to be managed**
primarily for the eradication and control of invasive species now into the future

These actions will require ongoing work including:

**Continue the baseline ecology survey**
initiated in 2009; adding extra layers of data from targeted surveys and ongoing updates

**Maintain the GIS database of habitat maps**
and continue to update predictive mapping as peat production continues and cutaway areas develop



**Continue the baseline ecology survey... adding extra layers of data.**

**Input to the Bord na Móna *Strategic Framework for Future Use of Peatlands***
(to be reviewed 2016) to identify suitable areas to be zoned for biodiversity now and in the future

**Carry out targeted surveys in appropriate areas for species of conservation interest**
– for example butterfly and other invertebrate surveys at high biodiversity value sites; continue to work with groups such as Butterfly Conservation Ireland to inform targeted management for butterflies, moths and other invertebrates

**Explore how volunteers and citizen science, and new technologies**
such as the use of unmanned aerial vehicles (UAVs) and remote sensing methods, can be incorporated into the monitoring of Bord na Móna bogs

**Re-assess the information gaps for future surveys**
of cutaway bog and other habitats for breeding waders, similar to the survey of Bord na Móna bog areas for breeding Curlew initiated in 2014-15

**Support the BirdWatch Ireland breeding wader 5-year monitoring survey**
at Boora and other established annual surveys of Bord na Móna bogs such as the International Swan Census and I-WeBS counts at Boora





Above left: Rosebay willow herb and funnel-spider webs (above right) are commonly seen on the cutaway bogs.

Above centre: *Sphagnum squarrosum* on cutaway bog at Derryclure.

**Carry out a synthesis of ecology data gathered to date**
including ecology data collated by other parties relating to Bord na Móna bogs to determine current and possible future patterns in habitat and species distribution, considering also the potential impacts of climate change

**Where Bord na Móna bogs are adjacent to nature conservation designated areas and/or undesignated areas of high biodiversity value**
(such as *Coillte* Biodiversity Areas) work with relevant bodies to connect and mutually enhance adjoining areas

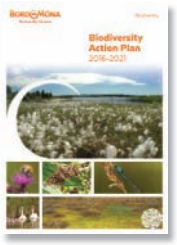
**Work with national initiatives to develop Green Infrastructure**

**Develop a map of the ecosystem goods and services of Bord na Móna bogs**
to be based on current methods used in EU MAES project

**Continue to monitor and implement control measures for invasive species,**
working with local authorities and nature conservation groups

## Key Indicators of Success

The key indicators of success of these actions will be:




Publication of the Bord na Móna Biodiversity Action Plan (following consultation with relevant bodies and interest groups); to be launched and distributed in 2016

Updated baseline ecology survey for all bogs

A current and relevant biodiversity knowledge base from which to plan for biodiversity management and conservation across the wider Bord na Móna bogs

Database and distribution maps of species of conservation interest as well as invasive species on Bord na Móna bogs; continue to share these with the National Biodiversity Data Centre

A map of potential biodiversity networks using GIS to link up Bord na Móna bogs with other high value biodiversity areas

A map of the ecosystem goods and services of Bord na Móna bogs

A zoning map of Bord na Móna bogs showing core areas of biodiversity interest with potential for biodiversity management in line with zoning for other potential uses

Long-term monitoring of habitats and species within biodiversity areas, including invasive species

# Mapping the Bord na Móna bogs

**In 2009, Bord na Móna commenced the development of a habitat classification system for the industrial cutaway and modified bogs of Ireland. While there is a recognised habitat classification system in use in Ireland, this system assigns all habitats on cutover/cutaway bog to PB4 Cutover Bog (Fossitt 2000). While this classification is useful for relatively small areas of cutover on the margins of larger intact peatland complexes it does not account for the huge variability and diversity in habitat across the 80,000 ha of Bord na Móna bogs. In response to this the Ecology Team developed a classification system (based on established systems) that would reflect the variability in habitats and different successional phases on the Bord na Móna bogs.**





Above: Ballycon Bog,showing wetland and woodland areas. Above right: Birch woodland at Turraun.

The baseline habitat survey itself was a significant undertaking and by 2012 all bog areas had the initial survey completed. Since then the maps have been updated on an ongoing basis (2013, 2014 and 2015) to reflect changes and developments in the cutaway bog areas in particular. The results of the baseline survey can be described under a number of main categories of land-use, within which there are a number of habitats. A general overview of the habitats and characteristics is presented in the table in Appendix II.

**ACTIVE PRODUCTION AREAS:** this currently accounts for up to 55% of the bog area owned by Bord na Móna and is the active footprint of peat production plus associated transport and access facilities, workshops and hardstand areas. The main habitats are bare peat, bare ground and built habitats. Hotspots for biodiversity in this category are the active railway lines which are home to a diversity of grassland species and rare plant species such as Blue Fleabane and Basil Thyme (both of which form part of the 'weed' flora recorded).

**CUTAWAY BOG AREAS:** this category currently accounts for up to 30% of the total Bord na Móna bog area and can comprise scattered sections that are out of production located amongst large parcels and/or more extensive cutaway areas such as those around Boora and the Oweninny bogs. These areas range from species-poor to species-diverse depending largely on the drainage and length of time out of peat production. The habitats can range from pioneer (wet/dry) to more complex such as diverse poor fen and rich fen habitats to established birch woodland cover. The biodiversity value is also variable as species poor areas with some cover of bare peat can be ideal habitat for feeding wintering Whooper Swans and breeding Lapwing, while more mature wetland habitats have a rich flora and are ideal for roosting Whooper Swans, breeding Teal and reed-bed habitat. Species rich grassland and wetland habitats are generally hotspots for a range of invertebrate species. This category also includes areas in other after-uses such as areas planted by Coillte, and other commercial developments.

**BOG REMNANTS AND MARGINAL AREAS:** this category accounts for up to 12% of the bog area and largely comprises areas of bog remnant (i.e. degraded raised bog with supporting habitats as well as some patches of active raised bog on larger bog remnants such as Cloonshannagh, Mostrim and Clynan) together with patches of birch woodland and cutover bog on the margins of larger active peat production areas. These areas can be of variable biodiversity value and viability, with the larger areas acting as refugia for peatland species (flora and fauna) and considered to form a significant component of the Bord na Móna biodiversity network. These remnants and margins can be local biodiversity hotspots for species of conservation interest such as breeding Curlew and *Sphagnum pulchrum* on bog remnants, Marsh Fritillary butterfly and the plants Alder Buckthorn (on cutover edges) and Basil Thyme (on marginal ground).

**DRAINED RAISED BOGS:** during the baseline survey a number of bog areas (<3% of total bog area) never developed fully for peat production were identified as being of high conservation value nationally. Some of these bogs still retained active raised bog habitat and all showed good potential for restoration of active and degraded raised bog habitat. These bogs now form the core of the Bord na Móna Raised Bog Restoration programme which has effected the restoration of over 1,000 ha of raised bog across the Irish Midlands. Most of these sites are now being considered for designation as SAC or NHA as part of the National Raised Bog Conservation review while some are relatively small and considered as bog remnants of local ecological importance. It is planned to continue this work on similar areas in coming years.

Below left: Bog pool, Ballydangan Bog. Below right: Drain blocking at Knock Bog.








Derries
## 2000
Derries Bog near Pollagh in Co. Offaly: aerial photo showing that bare peat dominates.



Derries
## 2011
Aerial photo showing that as peat production decreases, vegetation increases. With targeted rehabilitation the cutaway is stabilised and biodiversity increases.

## The Bord na Móna bogs dataset

An important aspect of the baseline habitat survey was to create a GIS database to illustrate the extent of the habitats present on each site and across the full range of the bogs. For each bog area there is a current habitat map and a land use map showing the basic uses within each bog production unit (access, watercourses etc.). Following from the habitats maps, and using Lidar data which reflects topography and surface levels, indicative maps were developed to illustrate how each bog area may develop post peat production and rehabilitation. Species distribution maps are also a work in progress and updated as new records are taken. All mapping data is available to review by request.

Maps used: OSI and Bing
Ordnance Survey Ireland Permit No. EN 0035616
© Ordnance Survey Ireland Government of Ireland.
© Bing Maps Microsoft Corporation

## For each bog area there is a current habitat map and a land use map showing the basic uses

Derries Habitat Map (right)

### 2013

Key changes to note from 2009 map: Reduced bare peat, increased vegetation cover, dominant habitats are birch/wetland mosaic.

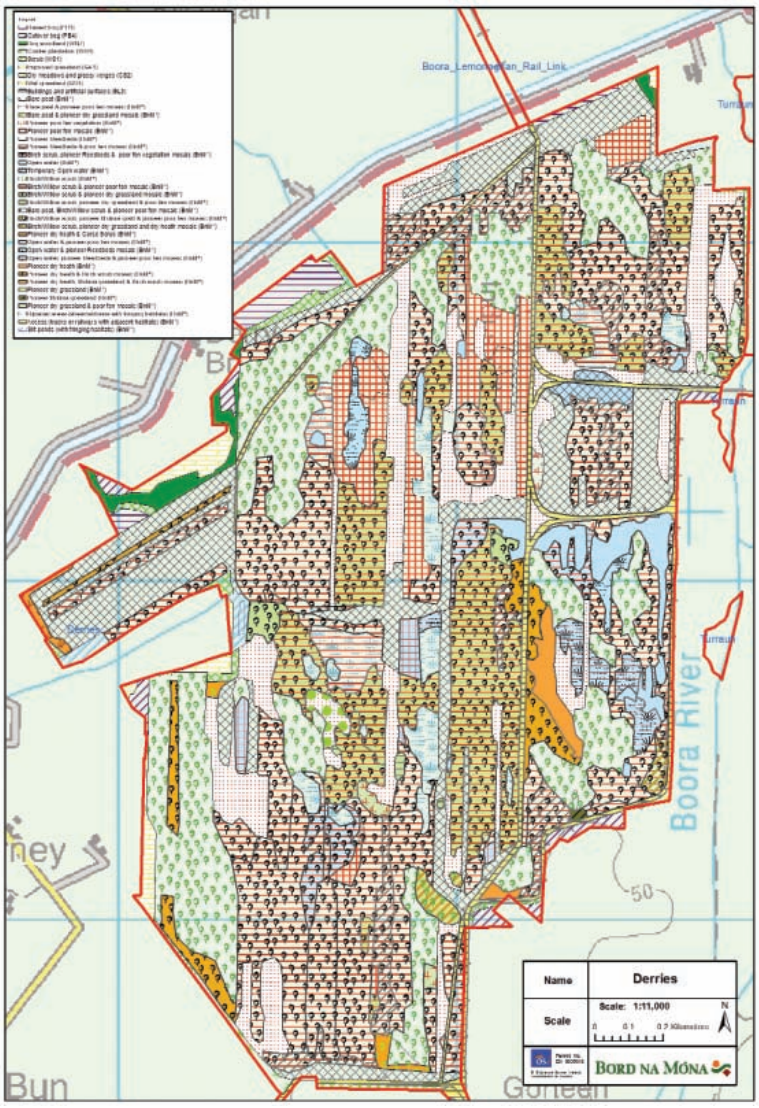
Derries Habitat Map (below)

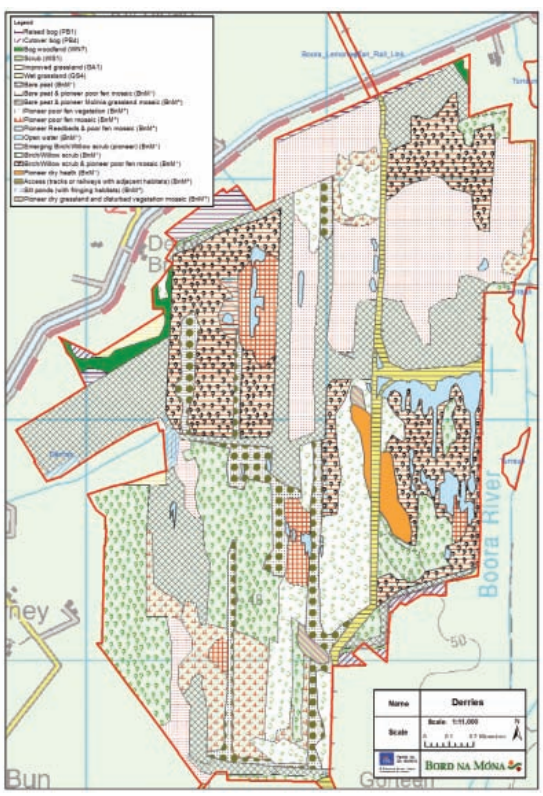
### 2009

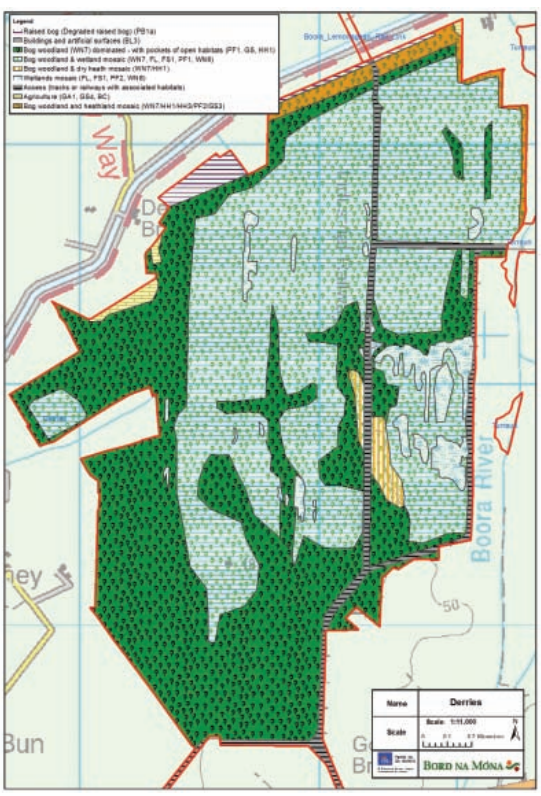
Derries Habitat Map (below right)

### Future

It is predicted that birch/wetland mosaic will develop further, dominating the site.



# Habitat creation and management on cutaway bogs

The baseline habitat survey has resulted in a significant body of data which outlines the range of habitats present on each bog as well as an informed projection as to how sites will develop post peat production and rehabilitation. While there are a number of habitats developing, it is likely that in the future the main habitats emerging on the cutaway bogs will comprise wetland and woodland types, in a mosaic pattern across each site overlain with a mix of activities such as amenity and renewables. These cutaway areas will be fringed by existing bog remnants, birch woodland and grassland habitats, the majority of sites being linked by the extensive Bord na Móna rail link.

## Wetland Habitats

Up to 50% of the Bord na Móna bogs will revert to wetland habitats post rehabilitation. These wetlands will predominantly be peatland habitats given that there will be a layer of peat remaining in the majority of sites. The wetland areas will form a mosaic with other habitats such as scrub and wet woodland, often with small patches of wet grassland and heathland intermittent, reflecting the heterogeneity within any given site.

**In the future the main habitats emerging on the cutaway bogs will comprise wetland and woodland types, in a mosaic pattern across each site**

The main aim of rehabilitation will be to rewet former production areas as much as possible without impacting on adjoining lands to maximise the benefits for biodiversity and carbon. Where fen peat remains, this will result in the development of fen habitats. Fens are influenced by groundwater and by their nature, are peat-forming, representing the precursor of ombrotrophic or rain fed peatlands such as bogs. The dominant fen type will be poor fen mixed with reed-swamp and tall herb vegetation, such as at Ballycon Bog.

Within these areas there is some open water but this will not be extensive in the future. Fens will become extensive in those areas that are currently pumped for peat production. There are some patches of rich fen habitat emerging, such as at Lullymore Wetlands, although this habitat is limited in the extent recorded to date.

Where ombrotrophic conditions (acidic peat) remains, rewetting of these areas will result in the development of bog habitats. These will range from wet heathland to 'embryonic' bog habitats – that is, habitats that comprise peat forming vegetation. They will have a number of vegetative features similar to raised bog habitats but lacking the structure and classic hydrological and vegetative character, which is likely to re-develop in the long-term.

## Woodland Habitats

The remaining 50% or so of the Bord na Móna bogs will revert to scrub/woodland habitats. Again, these areas will be largely underlain by peat soils and will be dominated by birch in the main, with patches of willow and pine emerging. The woodland areas will vary from site to site, forming mosaics with wetland areas and patches of other less abundant habitats such as grassland and heath.

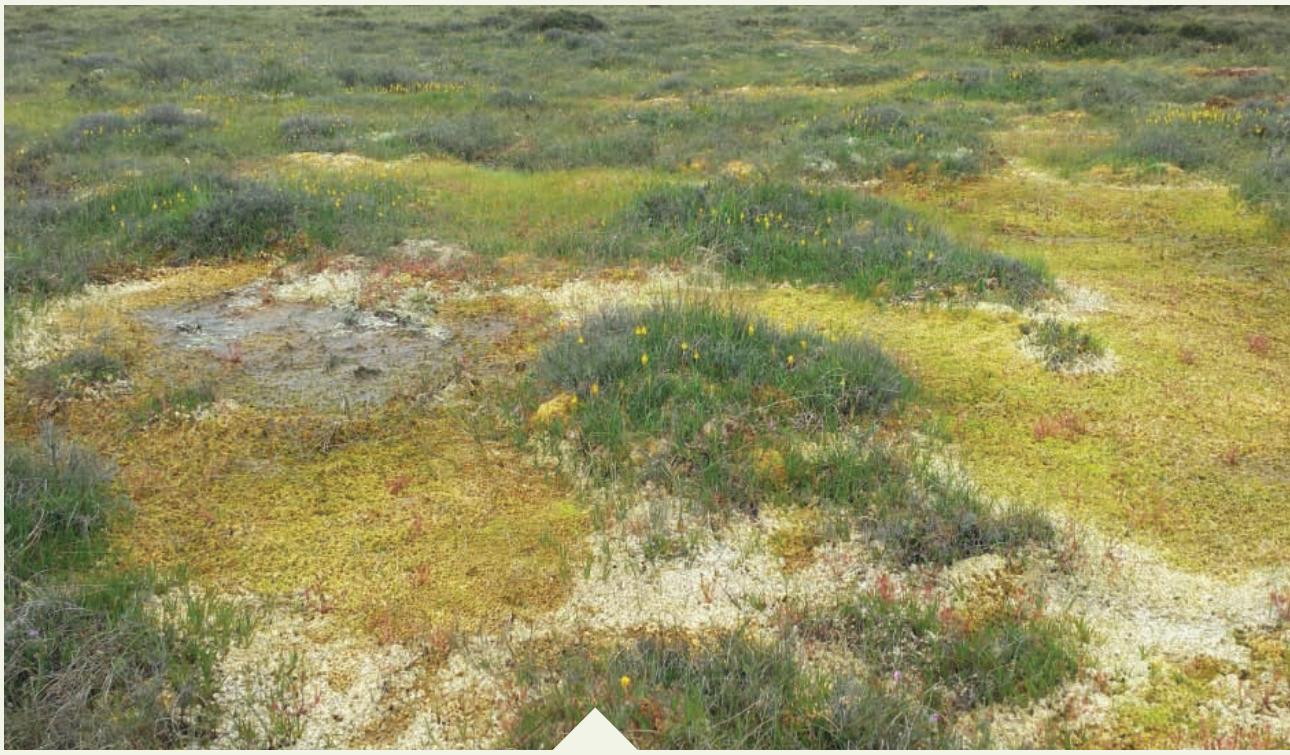
The development of these woodlands will vary, determined by the local conditions. Where wet peat soils remain, the birch exhibits patchy growth and the ground flora is dominated by wetland species. Dry birch areas are generally denser in growth and develop a closed canopy, such as at Turraun. Their long-term development will be monitored.

The future management of these woodland habitats will be of national importance, particularly given the scarcity of native woodland in the Irish countryside. Bord na Móna has already undertaken two Native Woodland Scheme projects under the guidance of Woodlands of Ireland and the Forest Service, and there is significant potential to add to these areas. While scattered areas of the Bord na Móna cutaway bog areas have also been planted by Coillte in the past with a view to commercial development of these stands, these areas are deemed largely commercially unviable. Management of these Coillte stands in will also contribute to the national native woodland resource in the future.



Woodland/wetland mosaics will dominate the cutaway bogs into the future.

# Bord na Móna biodiversity areas and hotspots



Regenerating active raised bog on restored Bord na Móna bog.

Over the course of the baseline habitat survey and as a result of the ongoing rehabilitation of cutaway bog areas since the 1990s, a number of areas of high biodiversity value have been identified. These can be categorised as:

## Raised bog areas with potential for restoration

This includes a range of raised bog areas including those prioritised for restoration under the Bord na Móna Raised Bog Restoration programme 2009-present. The first site restored was Abbeyleix Bog and this was very much a collaborative project with the local community and others including the National Parks and Wildlife Service, the Irish Peatland Conservation Council (IPCC) and Laois County Council. Following from that initial project the Bord na Móna Raised Bog Restoration programme has focused on clusters of raised bog sites with clear potential for restoration in East Galway and Roscommon.

The main conservation interest on these sites is the potential to create conditions favourable for the re-establishment of *active* raised bog habitat, a priority habitat listed under the EU Habitats Directive, by means of drain blocking and rewetting. During the baseline survey, these areas were identified with restoration potential for *active* raised bog habitat as well as having other features of biodiversity interest and nature conservation value such as use by Red Grouse, Curlew, rare plant species etc. It was subsequently agreed by all in Bord na Móna that these sites should be restored. In the interim, the National Parks and Wildlife Service has reviewed the condition of the bogs and selected the majority of the Bord na Móna sites for designation as SAC and/or NHA habitats.

The future of these bog areas will be determined by changes in climate, but for now they are clearly earmarked for biodiversity within the Bord na Móna network. The sites are monitored using the standard ecotope monitoring method employed by the National Parks and Wildlife Service.

An example of the ecotope mapping work for Abbeyleix Bog is shown overleaf.

**An example of the ecotope mapping work for Abbeyleix Bog is shown here to demonstrate how conditions can respond to drain blocking over a relatively short period of time (five years).**



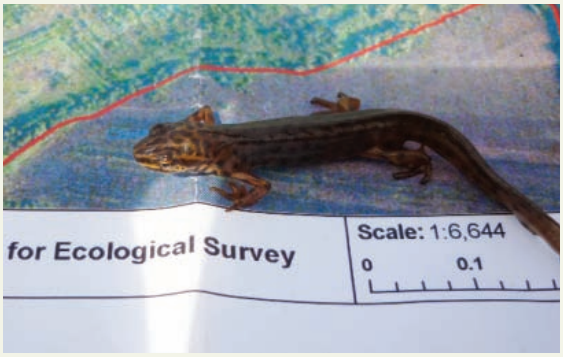

Abbeyleix Ecotope Map (right)

## 2014

Key changes to note from 2009 map: the area of sub-central ecotope (orange) which is characterised by increased cover of *Sphagnum* species, has increased on both sides of the bog.

Abbeyleix Ecotope Map (below)

## 2009




A curious newt helping out with the survey work.

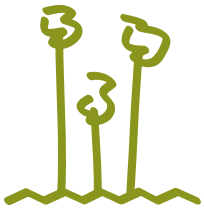



**Legend**

- Raised bog PB1 - Facebank ecotope
- Raised bog PB1 - Marginal ecotope
- Raised bog PB1 - Marginal ecotope with sub-marginal patches
- Raised bog PB1 - Sub-marginal ecotope
- Raised bog PB1 - Sub-central ecotope
- Raised bog PB1 - Inactive flush
- Raised bog PB1 - Sub-central ecotope with Sub-marginal patches
- Raised bog PB1 - Facebank/marginal mosaic

**Bord na Móna Raised Bog Restoration programme 2009 to present**

| | Year of Restoration | Name | County | Comment | High bog area ha | Total site area ha |
|---|---|---|---|---|---|---|
| 1 | 2015 -ongoing | Knock Bog (Ballydangan North) | RO | Also contains small wetland areas with fen and transition mire | 129 | 187 |
| 2 | 2015 | Mostrim Bog remnant | LO | | 41 | 41 |
| 3 | 2015 | Cranberry Lough Bog | RO | Also contains small lough and associated fen habitat | 76 | 98 |
| 4 | 2014 | Cloonshannagh Bog remnant | RO | | 36 | 36 |
| 5 | 2014 | Paul's Lough Bog | GY | | 118 | 132 |
| 6 | 2014 | Lenareagh Bog | GY | | 90 | 112 |
| 7 | 2013 | Ballydangan Bog | RO | Leased to Moore Gun Club; Red Grouse project; breeding Curlew present | 215 | 240 |
| 8 | 2012 | Moyarwood Bog | GY | Marsh Fritillary site | 171 | 197 |
| 9 | 2011 | Cuckoo Hill Bog | RO | Also contains regenerating lagg zone/ secondary fen habitats | 60 | 145 |
| 10 | 2009 | Abbeyleix Bog | LS | Leased to local community; important lagg zone habitat | 104 | 190 |
| **Total restored to date** | | | | | **1040** | **1378** |
| 11 | 2016+ | Clera Island Bog | RO | | 157 | 179 |
| 12 | | Killeglan Bog cluster | RO | Red Grouse present | 334 | 440 |
| 13 | | Clonwhelan Bog | LO/WH | Part-leased to local gun club | 132 | 162 |
| 14 | | Glenlough Bog | LO/WH | | 262 | 329 |
| 15 | | Cornaveagh Bog remnant | RO | | 21 | 21 |
| **Earmarked for restoration 2016+** | | | | | **906** | **1131** |
| **Total (overall)** | | | | | **1946** | **2509** |



# the future

**of these bog areas will be determined by changes in climate, but for now they are clearly earmarked for biodiversity within the Bord na Móna network.**

## Rehabilitated cutaway bog areas with high biodiversity value

Since the 1990s, Bord na Móna has been actively carrying out research into rehabilitation of cutaway bogs for the purposes of promoting biodiversity. This has resulted in an extensive network of cutaway bog with a range of established habitats. These cutaway bog areas illustrate how former peat production areas can be rehabilitated with a combination of natural regeneration and targeted rehabilitation to return relatively quickly to species diverse areas.

The network of rehabilitated bog areas to date includes the Lough Boora Discovery Parklands complex of bogs (c.2,500 ha cutaway bog habitats – wetland, woodland, grassland, heathland, riparian etc.), the Oweninny bog complex (~6,500 ha rehabilitated acidic cutaway with regenerating peat-forming habitats), Ballycon wetland rehabilitated in 2006 (~240 ha, fen and birch woodland habitats) and Lullymore wetland (~250 ha, rich fen and birch woodland habitat).

Further areas added to this network in the period 2010-2015 include Kilberry wetlands, Bunahinly rewetted bog and Derrycashel and Cavemount wetlands. Each of these areas are outlined in the following tables and presented on the accompanying map (pages 40 and 41).

### Bord na Móna cutaway bog rehabilitation 2010-2015

| | **Bog Name** | **County** | **Target Habitats** | **Rehabilitation/ Management** | **Comments** | **Year** | **Area** ha |
|---|---|---|---|---|---|---|---|
| 1 | Corlea cutaway – Wetlands Heritage Ireland | LD | Poor fen, scrub, wetland | Wetland creation, amenity | Lease agreement in development with local community | ongoing | 16 |
| 2 | Cavemount | OY | Poor fen, scrub | Fertiliser treatment | Rehabilitation of bare peat areas | 2015 | 47 |
| 3 | Cavemount | OY | Wetland | Wetland creation, outfall blocking, Overflow management | Hydrological management | 2015 | 9 |
| 4 | Lullymore | KE | Wetland, poor fen, scrub, woodland | Outfall blocking and maintenance | Wetland enhancement | 2015 | < 1 |
| 5 | Clooniff | RN | Wetland | Berm creation, vegetation translocation | Coolumper Reedbed trial | 2015 | < 1 |
| 6 | Mountlucas Windfarm | OY | Wetland, poor fen, scrub, grassland | Wetland creation, overflow management, re-profiling, gravel pit rehabilitation | Rehabilitation of windfarm area | 2015 | 26 |
| 7 | Bruckana Windfarm | TY | Wetland, poor fen | Wetland creation, overflow management | Rehabilitation of windfarm area | 2015 | 14 |
| 8 | Srahmore | MO | Poor fen, embryonic *Sphagnum* vegetation | Hydrological management, deep peat re-vegetation, *Sphagnum* inoculation | Rehabilitation of peat deposition area | 2010-2015 | 34 |

## Bord na Móna cutaway bog rehabilitation 2010-2015

| | Bog Name | County | Target Habitats | Rehabilitation/ Management | Comments | Year | Area ha |
|---|---|---|---|---|---|---|---|
| 9 | Lullymore | KE | Wetland, poor fen, scrub, woodland | Wetland creation, drainage re-alignment | Lease agreement with Lullymore Heritage & Discovery Centre; includes 3 ha of broad-leaved woodland on mineral island | 2014-2015 | 17 |
| 10 | Rathvilla Gravel Pit (Cloncreen) | OY | Grassland, open water, scrub | Re-profiling, retention of important ecological features | Gravel quarry rehabilitation | 2014-2015 | 9 |
| 11 | Lough Boora Visitor Centre | OY | Building, Amenity | Construction | Building, landscaping | 2014 | 2 |
| 12 | Derryhinch | OY | Poor fen, scrub | Tree planting, fertiliser application | Buffer zone along motorway | 2014 | 5 |
| 4 | Lullymore | KE | Poor fen, scrub | Fertiliser treatment | Rehabilitation of bare peat areas | 2014 | 13 |
| 13 | Mountlucas | OY | Poor fen, scrub | Fertiliser treatment | Rehabilitation of bare peat areas | 2014 | 5 |
| 14 | Derrycashel | RN | Wetland, poor fen | Berm construction, outfall blocking | Wetland creation | 2014 | 56 |
| 15 | Cloonroosk Bog | OY/KE | Raised bog | Field-drain blocking | Restoration of bog remnant | 2014 | 56 |
| 16 | Ballivor | WM | Poor fen, *Sphagnum*-dominated vegetation | Wetland creation, drain-blocking | Old sod peat cutaway; embryonic peat-forming *Sphagnum*-dominated area | 2014 | 9 |
| 17 | Kilberry | KE | Wetland, poor fen, scrub | Field-drain blocking, outfall blocking | Wetland creation | 2013-2014 | 38 |
| 18 | Ballycon | OY | Poor fen, scrub | Fertiliser treatment | Regenerating bare peat headland (former travel path) | 2013 | 7 |
| 19 | Boora | OY | Heath | Heather seeding | Heather brash trial | 2013 | <1 |
| 18 | Ballycon | OY | Heath | Heather seeding | Heather brash trial | 2013 | <1 |
| 20 | Erenagh | RN | Wetland, poor fen | Wetland creation, berm construction, hydrological management | Wetland creation | 2013 | 1 |
| 21 | Drumman | OY | Poor fen | Grass seed nursery crop | Nursery crop trial | 2013 | 1 |
| 17 | Kilberry | KE | Poor fen, Embryonic peat-forming *Sphagnum*-dominated vegetation | *Sphagnum* plot inoculation | Kilberry *Sphagnum* trial | 2012-2013 | 2 |
| 21 | Drumman | OY | Poor fen, scrub | Fertiliser treatment | Regenerating bare peat areas | 2012 | 14 |

## Bord na Móna cutaway bog rehabilitation 2010-2015

| | Bog Name | County | Target Habitats | Rehabilitation/ Management | Comments | Year | Area ha |
|---|---|---|---|---|---|---|---|
| 22 | Drinagh | OY | Wetland, poor fen | Landscaping, wetland creation, scrub removal | Drinagh breeding wader habitat trial | 2010-2011 | 31 |
| 23 | Bunahinly | OY | Regenerating raised bog | Field drains blocked | Deep peat cutaway rehab trial | 2010 | 2 |
| 24 | Kilmacshane | GY | Poor fen | Fertiliser & nursery crop trials | Kilmacshane fertiliser and nursery crop trials | 2010 | 1 |
| 21 | Drumman | OY | Poor fen, scrub | Fertiliser, lime & nursery crop trials | Drumman fertiliser and nursery crop trials | 2010 | 12 |
| 25 | Lullybeg | KE | Grassland, poor fen, scrub | Conservation management, scrub control | BCI Management agreement; diverse grassland; Marsh Fritillary site | 2010-ongoing | 9 |
| **Sub-total (rehabilitation 2010-2015)** | | | | | | | **436** |

## Pre 2009

| | Bog Name | County | Target Habitats | Rehabilitation/ Management | Comments | Year | Area ha |
|---|---|---|---|---|---|---|---|
| | **Lough Boora Discovery Park** | **OY** | **Outlined below** | **Mixed (outlined below)** | **Developed as a complex of several sites, paths and trackways around Boora (listed below are sub-sites)** | **1990s -ongoing** | **Total: 2,257** |
| 26 | Loch Clochan and wetlands (LBDP) | OY | Lake, wetland, poor fen, grassland, scrub | Lake creation, amenity development, angling, wetland creation | Area developed for local amenity; lease agreement with local fishing club | 1990s | 45 |
| 27 | Finnamores Wetlands (LBDP) | OY | Lake, wetland, poor fen, grassland, scrub | Lake creation, amenity development, landscaping, wetland creation | Area developed for local amenity; lease agreement with local fishing club; Rich floral diversity | 1990s | 37 |
| 28 | Lough Boora Lakes (LBDP) | OY | Lake, grassland, scrub | Lake creation, landscaping, amenity | Area developed for local amenity, angling | 1990s | 30 |
| 29 | Leabeg wetlands (LBDP) | OY | Wetland, poor fen, scrub | Wetland creation, amenity, outfall blocking | Area developed for local amenity, important waterbird area | 1990s | 70 |
| 30 | Tumduff wetlands (LBDP) | OY | Wetland, poor fen, scrub | Wetland enhancement, amenity, outfall blocking, managing outflows | Area developed for local amenity; cutaway bog regenerating since 1990s; diverse range of habitats, used by Whooper Swans | 1990s | 104 |
| 31 | Drinagh Lake and wetlands (LBDP) | OY | Lake, wetland, scrub | Wetland creation, outfall blocking, managing outflows | Diverse mosaic of dry and wetland habitats important waterbird area | 1990s | 236 |

## Pre 2009

| | Bog Name | County | Target Habitats | Rehabilitation/ Management | Comments | Year | Area ha |
|---|---|---|---|---|---|---|---|
| 32 | Derries wetlands (LBDP) | OY | Wetland, poor fen, scrub | Wetland creation, outfall blocking, managing outflows, amenity | Diverse mosaic of dry and wetland habitats cycle-track | 1990s-ongoing | 171 |
| 33 | Turraun (LBDP) | OY | Lake, wetland, woodland, grassland, heath | Wetland creation, outfall blocking, amenity, path maintenance | Diverse mosaic of dry and wetland habitats; diverse flora and fauna, cycle-track development | 1990s - ongoing | 176 |
| 34 | Clongawney (LBDP) | OY | Lake, wetland | Lake creation, outfall blocking | Acidic lake; colonising naturally | 1990s | 44 |
| 35 | South Boora wetlands (LBDP) | OY | Wetland | Wetland creation, outfall blocking | Developing wetland area | 1990s | 23 |
| | Various (LBDP) | OY | Conifer plantation, other broad-leaved plantation, | Conifer & broad-leaved plantation on cutaway, amenity | Plantations associated with LBDP | 1980 - 1990s - ongoing | 772 |
| 36 | Sculpture Park & Amenity trails (LBDP) | OY | Amenity, cultural | Landscaping | Sculpture Park; cycle-track development | 1990s-ongoing | 53 |
| 37 | Blackwater | OY | Wetland | Wetland creation, berm construction, drain-blocking | Important waterbird area | 1990s | 24 |
| 38 | Blackwater | OY | Lake, wetland, grassland | Lake creation, amenity | Area developed for local amenity | 1990s | 15 |
| 39 | Doire Bhile | TP | Lake, wetland, poor fen, grassland, scrub | Lake creation, amenity development, angling lake, walkway, wetland creation | Lease agreement with local community; Marsh Fritillary site | 1990s | 42 |
| 40 | Derryounce | OY | Lake, wetland, poor fen, scrub, embryonic peat-forming *Sphagnum* vegetation | Lake creation, wetland creation, angling lake, walkway | Lease agreement with local community; Managed as fishery | 1990s - ongoing | 32 |
| 1 | Corlea Trackway Visitor Centre | LD | Degraded raised and cutover bog | Bunding of bog remnant,lagoon creation, amenity | Managed as part of preservation of wooden track-way at Corlea Centre | 1990s | 16 |
| 41 | Clonfinlough (Blackwater) | OY | Wetland, rich fen, scrub | Wetland creation, berm construction, drain blocking | Adjacent to Finlough SAC area | 1990s | 33 |
| 42 | Lismanny | GY | Raised bog | Amenity | Lease agreement with local community; boardwalk; local BnM biodiversity area | 1990s | 15 |
| 43 | Killaun | OY | Cutover bog, fen, woodland | Amenity | Lease agreement with local community; boardwalk; local BnM biodiversity area | 1990s | 8 |

## Pre 2009

| | Bog Name | County | Target Habitats | Rehabilitation/ Management | Comments | Year | Area ha |
|---|---|---|---|---|---|---|---|
| 44 | Oweninny | MO | Acidic wetland, poor fen, embryonic peat-forming vegetation | Mixed | Mixed use; Bellacorick windfarm | 2001 - 2003 | 6,500 |
| 45 | O'Boyle's Bog | MO | Blanket bog | Deep-peat drain blocking | Regenerating blanket bog adjoining Knockmoyle-Sheskin Nature Reserve | 2003 | 350 |
| 9 | Lullymore | OY | Wetland, poor fen, scrub, woodland | Wetland enhancement, outfall blocking | Regenerating cutaway bog, *Cladium* fen development | 2006 | 70 |
| 46 | Ballycon wetlands | OY | Wetland, poor fen, scrub | Wetland enhancement, berm construction, drain blocking, outfall management | Important waterbird site; site utilised by Whooper Swans | 2006 | 226 |
| 47 | Turraun | OY | Woodland | Tree planting (Oak & Scot's Pine) | Native Woodland Scheme | 2008 | 5 |
| 48 | Clongawney | OY | Woodland | Tree planting (Oak & Scot's Pine) | Native Woodland Scheme | 2008 | 5 |
| 49 | Derraghan woodland | LD | Birch woodland | Naturally developing cutaway woodland | Local biodiversity area | / | 84 |
| **Sub-total (pre-2009)** | | | | | | | **9,682** |

## Woodland remnants zoned for biodiversity

| | Bog Name | County | Target Habitats | Rehabilitation/ Management | Comments | Year | Area ha |
|---|---|---|---|---|---|---|---|
| 50 | Derries woodlands, Clongawney Bog | OY | Oak-Ash-Hazel woodland | Mature woodland | Mature woodland on glacial mounds surrounded by cutaway; local biodiversity area | / | 6 |
| 51 | Derrylesk Island woodland – Mountlucas Bog | OY | Oak-Ash-Hazel woodland | Naturally developing woodland | Mineral island surrounded by cutaway bog; local biodiversity area | / | 19 |
| 52 | Derrynabroune Island | TY | Oak-Ash-Hazel woodland | Naturally developing woodland | Mineral island surrounded by cutaway bog; local biodiversity area; archaeological site | / | 3 |
| 53 | Derryarogue Island | LD | Calcareous grassland, scrub, woodland | Naturally developing woodland | Mineral island surrounded by cutaway bog; local biodiversity area | / | 12 |
| **Sub-total (woodland remnants)** | | | | | | | **40** |

## Raised bog remnants zoned for biodiversity

| | Bog Name | County | Target Habitats | Rehabilitation/ Management | Comments | Year | Area ha |
|---|---|---|---|---|---|---|---|
| 54 | Cloneragh Bog | LS | Raised bog remnant | / | Undeveloped raised bog remnant; breeding Curlew site | / | 43 |
| 55 | Derryhogan Bog | TY | Raised bog remnant, peat-forming *Sphagnum*-dominated vegetation | / | Breeding Curlew site; local biodiversity area | / | 75 |
| 56 | Cloncannon Bog Remnant (Ticknevin) | OY | Raised bog | / | Undeveloped raised bog remnant; local biodiversity area | / | 40 |
| 57 | Clonavoe Bog Remnant (Clonsast Bulge) | OY | Raised bog | / | Undeveloped raised bog remnant; local biodiversity area | / | 61 |
| 58 | Bracklin Bog Remnant | WH | Raised bog | / | Undeveloped raised bog remnant; local biodiversity area | / | 19 |
| **Sub-total (raised bog remnants zoned for biodiversity)** | | | | | | | **238** |

## Designated for nature conservation

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Overlap with other SAC, SPA, NHA sites | | Various | No management | Overlap along rivers, bogs, canal etc. | / | **821** |
| **Sub-total (designated for nature conservation)** | | | | | | | **821** |

## Forestry development on cutaway (commercial stands and trials)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Conifer plantation | | | Tree-planting, forestry development | Leased to Coillte, other conifer plantation | / | 3,269 |
| | Other forestry plantation | | | Tree-planting, forestry development | Biomass trials, BOGFOR trials | / | 139 |
| **Sub-total (forestry)** | | | | | | | **3,408** |

| **Overall Total** | **14,625** |
|---|---|



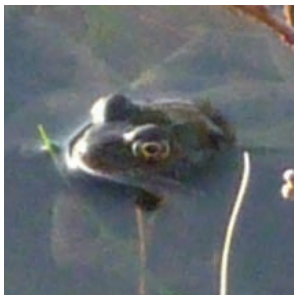
Irish Hare



Long-eared Owl chick



Bumble Bee on Heather



Common Frog

## Bord na Móna Bog Restoration and Rehabilitation Sites




**These cutaway bog areas illustrate how former peat production areas can be rehabilitated with a combination of natural regeneration and targeted rehabilitation to return relatively quickly to species diverse areas.**

Above left: Marsh Helleborine.
Above right: Reed.
Right: Meadow Brown Butterfly.


ROSCOMMON
LONGFORD
WESTMEATH
OFFALY
LAOIS
GALWAY
TIPPERARY
Legend
Bog Restoration Site
Rehabilitation Site

## Hotspots for species

Because of the extensive environmental variability presented by the Bord na Móna bog areas, there is a huge diversity of species to be found. A full list of species of conservation concern recorded on Bord na Móna bog areas to date is presented in Appendix IV.

A few of these species are highlighted below to demonstrate the importance of the Bord na Móna sites to their national populations. The species have been recorded often on discrete areas of bog that have been identified as valuable for species of conservation interest such as Littleton Bog for breeding Curlew (an area of regenerating cutaway), Lullymore and Clongawney Bogs for Marsh Fritillary (marginal areas of regenerating cutaway), as well as a number of Hen Harrier roosting sites (regenerating cutaway and bog remnants). In some cases the areas are relatively small, or they are areas with ongoing activity. These areas are managed in conjunction with the National Parks and Wildlife Service, local community groups and ENGOs. Specific site detail and information for species of conservation concern is not presented here.

> **“ Because of the extensive environmental variability presented by the Bord na Móna bog areas, there is a huge diversity of species to be found ”**

### Marsh Fritillary



Marsh Fritillary (*Euphydryas aurinia*) is considered threatened/vulnerable in many countries including Ireland. This butterfly species relies heavily on wet grassland sites where the presence of the main food plant devil’s bit scabious is essential as this is the only food plant of the larvae (caterpillars). Habitat loss has led to the decline in this species. Bord na Móna Ecology continues to identify new sites in order that appropriate habitat management can take place. Butterfly Conservation Ireland in collaboration with Bord na Móna manage an important site for this species on a cutaway bog in Co. Kildare. A further area in Kildare was transferred in the early 2000s to, and is now managed by the IPCC. The Bord na Móna bog areas currently monitored for Marsh Fritillary include Lullymore (Co. Kildare), Carrickhill (Co. Laois), Doire Bhile (Littleton, Co. Tipperary), Moyarwood (Co. Galway), Clongawney (Co. Offaly). A local community group at Ballivor Bog (Co Meath) recorded a new site for Marsh Fritillary in 2015.

### Otter



The Otter (*Lutra lutra*) is one of Ireland’s iconic wetland mammal species. They spend much of their life in and around waterbodies such as lakes, ponds, rivers and our coastline, where they eat a variety of fish. They will also eat birds’ eggs. Otter has declined across most of Europe, however their numbers appear to have remained stable in Ireland. The Otter is a shy creature and is rarely seen, however they leave distinctive signs that they have visited a site in the form of footprints and spraints (droppings). Silt ponds, streams, drainage channels and wetlands in Bord na Móna bogs are attractive for Otter and there has been widespread recording of this species across the Bord na Móna estate.



## Serrated wintergreen

In February 2015 serrated wintergreen (*Orthilia secunda*) was first observed in Ballydangan Bog, Co. Roscommon during the annual Biodiversity Action Plan review day field trip. Up until recently, this species was thought to be extinct on raised bog habitats across the Republic of Ireland, with only two small populations remaining in Co. Fermanagh. This plant is approximately 65cm tall and flowers in the summertime, with all of the flowers located on one side of the flower stem. Serrated wintergreen are semi-parasitic and rely on root interactions with mycorrhizal fungi in order to exist in the harsh environment of the bog. Bord na Móna restoration work in Ballydangan Bog was completed in 2013 and the site is home to the Ballydangan Bog Red Grouse Project. The discovery of serrated wintergreen highlights the importance of these restoration programmes in this bog and other similar bogs.

## Lapwing



Lapwing (*Vanellus vanellus*) is a species that has undergone a severe reduction in numbers in recent times and is now Red Listed as a breeding species in Ireland. They are a ground nesting bird and select open sites with low vegetation. Several Bord na Móna rehabilitated sites (such as Drinagh Bog) are used as breeding sites for Lapwing and specific rehabilitation techniques aimed at making cutaway bogs more attractive to Lapwing and other waders are in development. It is important that their breeding sites are open, without trees and scrub and that the surrounding areas contain habitats with an abundance of insects, which both the adults and chicks eat. Ballycon, Lullymore, Cavemount. Blackwater and the Lough Boora complex are all important Bord na Móna sites for breeding Lapwing.

## Curlew



Curlew (*Numenius arquata*) was once a widespread breeding species, when its haunting call was heard all over Ireland. In recent years a decline of almost 80% has been observed in the Irish breeding population. Curlew are ground nesting birds and favour wetland sites for nesting, they eat insects which they extract from the soil using their long, curved beak. Bord na Móna has a number of sites where the breeding success of Curlew is monitored in a joint project with BirdWatch Ireland which commenced in 2015. These include Ballydangan Bog (Co. Roscommon), Derryhogan Bog (part of Littleton Bog, Co. Tipperary), Blackriver Bog (Co. Kildare) and Cloneragh Bog (Co. Laois). Each of these sites in being monitored for breeding Curlew and future management measures will be developed and implemented under the continued guidance of BirdWatch Ireland as part of the rehabilitation planning for the sites.


Groundwork.

3.3

# Objective 3

## Develop and Promote Best Practice in Terms of Rehabilitation for all Bord na Móna Bogs to Stabilise Former Peat Production Areas and Enhance Biodiversity

**Almost all peatlands in Ireland have been modified to some degree and require some level of management to prevent further degradation and/or improve and enhance their condition. There is a growing recognition that investment in restoration and rehabilitation of peatlands can have enormous benefits for society both in terms of social and natural capital.**

As part of Condition 10 of IPC Licensing Bord na Móna is required to develop rehabilitation plans for all the bogs areas within the licensed areas. While it is not possible to develop final rehabilitation plans for bog areas that are still in peat production as the final drainage plan and peat depths are not yet known, in the interim, using Lidar data and peat resource data we can develop draft rehabilitation plans based on the expected future character of the bog. Final rehabilitation plans have been developed for bog areas that were never in full production and currently being restored, such as the Derrydoo Woodlough Bog cluster in Galway. And also for bog areas that are completely out of production such as the Oweninny Bog complex in Mayo.

Trials and research into best practice inform the rehabilitation measures and a number of rehabilitation measures have been tested over the period 2010-2015.

## Key Performance Indicators

Some of the key performance indicators in the period 2010-2015 were:




Draft rehabilitation plans detailed and lodged with the EPA for all bog areas. Each (draft) plan outlines the starting point (current baseline condition), sets clear aims and objectives to stabilise and rehabilitate the area, the necessary rehabilitation work based on best practice and research to date, a timeframe for completion, and the outcome of consultations with statutory and other relevant bodies to date

Final rehabilitation plans developed and implemented (completed or ongoing) for the Oweninny Bogs complex (Mayo, 2005 to 2013), Abbeyleix Bog (Laois, 2009), the Derrydoo-Woodlough bog cluster in East Galway (2012-2015) and the Clonboley Bog cluster in South Roscommon (2009 to present)

**Field trials to determine effective approaches to biodiversity enhancement established at a number of bogs**

Aspects of rehabilitation plans being trialled where possible such as in Boora Bog (Offaly – 1990s to present), Ballycon Bog (Offaly - 2006 to present), Mountlucas Bog (Offaly – 2014) and Templetuohy (Bruckana) Bog (Tipperary 2015; area under wind farm development footprint) (a complete list of areas rehabilitated is outlined in the previous section under Table X)

Field trials to determine effective and efficient approaches to biodiversity enhancement on cutaway bogs established at a number of bogs; these include drain-blocking, seeding (native and nursery species), fertiliser, reed transplant and seeding, and heather brash spreading trials

A *Sphagnum* inoculation field trial established at Kilberry Bog (2012)

An area of cutaway in Drinagh bog (31.2 ha) was developed to enhance breeding success of waders with a focus on Lapwing (2010).

Large scale rehabilitation trials established on Kilberry bog (rewetting – 38 ha in 2013) and Drumman (fertiliser and seeding approx. 30ha in 2010, 2011)

Targeted rehabilitation was carried out in parts of Derrycashel Bog (rewetting of ca. 20 ha in 2014)

Rehabilitation of the Srahmore Peat Deposition and Associated Facilities near completion

Restoration of raised bog areas identified during the baseline survey - to date 1,000 ha of raised bog has been restored (2009 to present)

Three Greenhouse Gas monitoring projects were established and funded by Bord na Móna on rewetted acidic cutaway (Oweninny), rewetted alkaline cutaway (Blackwater) and restored raised bog (Moyarwood). These projects were part of an EPA funded project – NEROS (*Network monitoring Rewetted/restored peatlands and Organic Soils for climate and biodiversity benefits*) - of which Bord na Móna was a member of the steering committee

Facilitation of a number of Masters research student projects and work experience for a number of Transition Year secondary school students

The wetlands at Finnamore's have attracted rare bird species such as Red-necked Phalarope.

Building on this work the following actions can be outlined for the period 2016-2021.

# Actions

**Continue to update draft rehabilitation plans for all bog areas,**
with a view to final plans being developed and implementation in line with areas of cutaway bog available

**Establish further rehabilitation field trials**
and build on existing knowledge in relation to habitat management and GHG emissions

**Continue to implement the Bord na Móna Raised Bog Restoration programme**

**Finalise rehabilitation of the Srahmore PDA in Co. Mayo**

**Develop habitat and species management guidelines**
to be based on rehabilitation and restoration work carried out on Bord na Móna bogs which can be translated to other peatland areas

These actions will require ongoing work including:

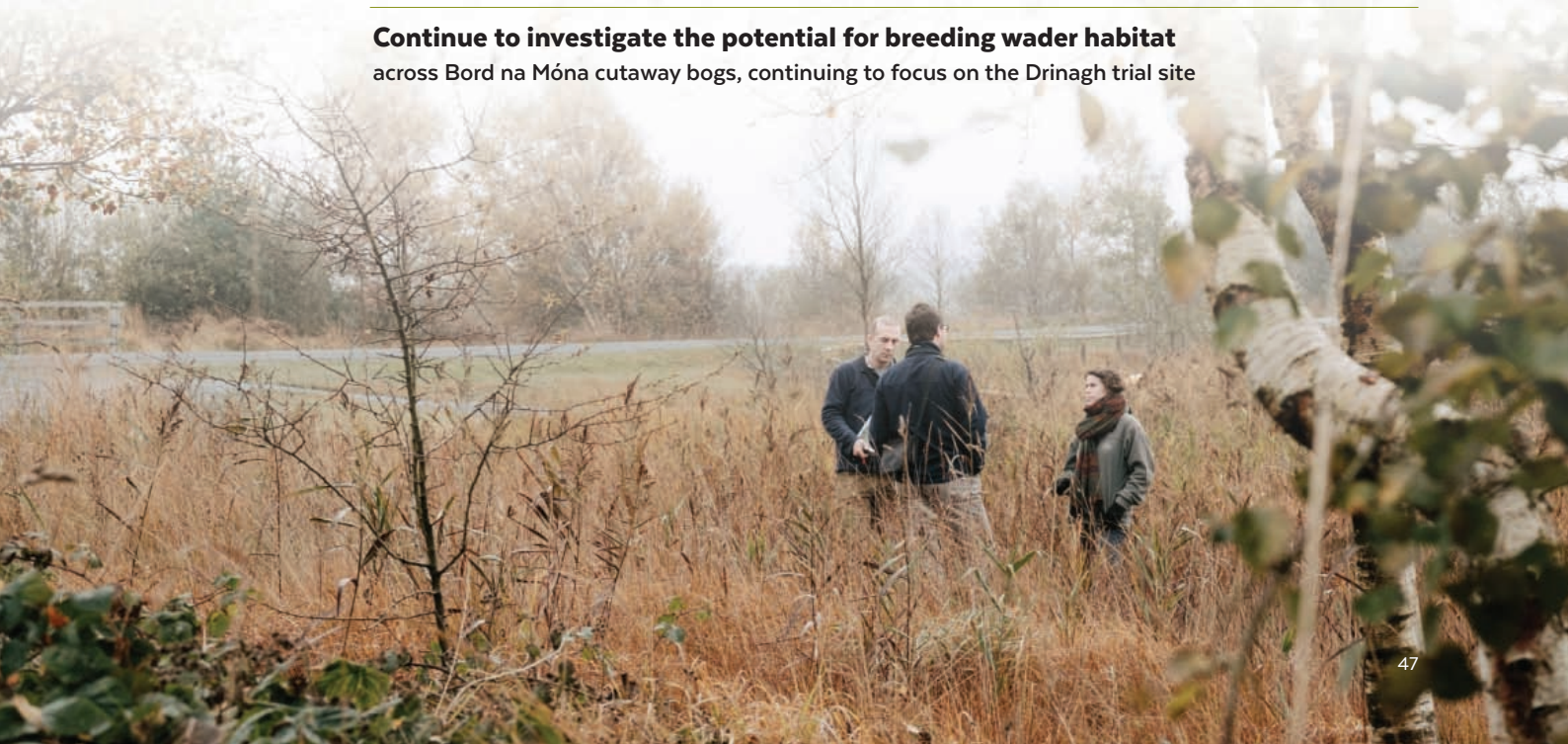
**Update draft rehabilitation plans bi-annually**
to reflect updates in baseline survey and/or other targeted surveys, as well as changes in peat harvesting projections/requirements and/or different land uses proposed

**Consider the rehabilitation plans in the context of adjoining land-uses,**
hydrology including ground water dependant terrestrial ecosystems (GWDTESs), national policies such as the National Landscape Strategy and relevant EU Directives including Habitats, Birds, EIA and Water Framework Directives

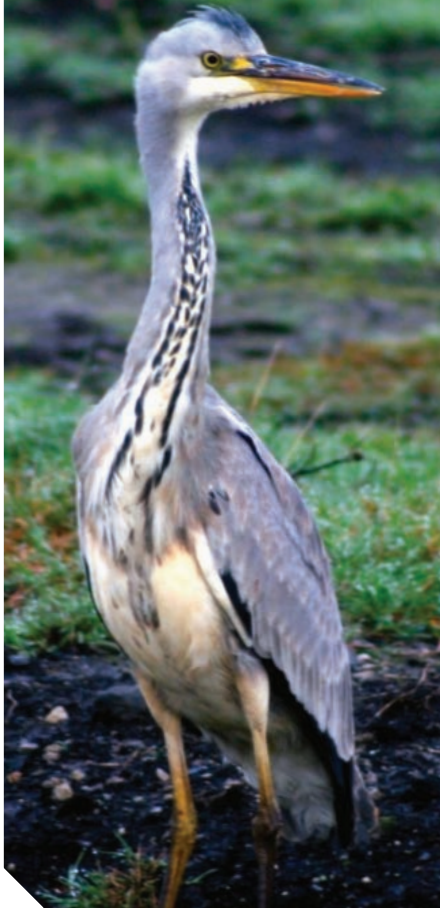
**Finalise rehabilitation plans in consultation with statutory and non-statutory consultees**
and carry out implementation as areas come available; carry out Appropriate Assessment screening for completed rehabilitation plans in accordance with EPA licensing requirements

**Establish further rehabilitation trials on cutaway bog areas:**
trials outlined for 2016-2021 include an additional *Sphagnum* inoculation trial, different establishment methods for reed and other peatland species and controlled water run-off (sluice control); establish trials specifically for targeted species and habitat management; support biomass trials as well as other potential commercial trials on appropriate cutaway bog areas

**Continue to investigate the potential for breeding wader habitat**
across Bord na Móna cutaway bogs, continuing to focus on the Drinagh trial site







Above left:
Fly Agaric Mushroom.
Centre: Hawkbit and Common Centaury.
Above right:
Grey Heron.

**Develop habitat management measures particularly for Curlew,**
building on the results of the 2015 and 2016 breeding Curlew survey

**Selection of additional research trial sites and establishment of trials**
to determine effectiveness of other potential management options for rehabilitation; facilitation of potential funding sources such as EU LIFE, LEADER and other research grants; communicate with potential project partners such as BirdWatch Ireland, Irish Peatland Conservation Council, Butterfly Conservation Ireland, National Parks and Wildlife Service, Inland Fisheries, and second and third level education and research institutions

**Continue to monitor GHG emissions from restored raised bog**
at Moyarwood Bog (Derrydoo Woodlough complex) up to 2018

**Support and work to develop GHG monitoring projects**
on woodland habitats developing on cutaway bog

**Work with the research team in Trinity College Dublin**
on the EPA funded project *"A framework for the restoration of Irish peatlands"* and continue to work with National Parks and Wildlife Service on the restoration practices for the NATURA 2000 raised bog network; this will include hydrological assessment of rehabilitation measures and options for cutaway bog areas

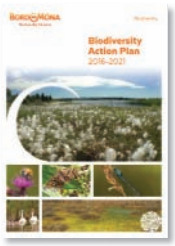
**Continue restoration work in Clonboley and Killeglan Bog cluster;**
continue with restoration work in other bogs and bog remnants identified as high conservation sites

**Monitor rehabilitation in Srahmore PDA**
and implement final rehabilitation phases

**Following on from all of the rehabilitation and restoration work,**
assimilate the data and outcomes to inform best practice guidelines for cutaway bogs and associated peatland habitats; promote the ecosystem services approach in relation to trials, rehabilitation and restoration projects

## Key Indicators of Success

The key indicators of success of these actions will be:




**Acceptance of rehabilitation plans on submission to EPA**
and other consultees

**Implementation and completion of rehabilitation plans**
where possible and monitoring programme established

**Successful establishment of further research trials and projects**
showcasing a range of rehabilitation and management options for species and habitat management and/or conservation within Bord na Móna bogs; increased area of raised bog restoration

**Established projects and successful funding applications**
for a range of projects with relevant project partners

**inform best practice guidelines for cutaway bogs and... promote the ecosystem services approach**

**Increased knowledge of GHG balance of cutaway bogs and restored bogs**

**Habitat and species management guidelines**
for Bord na Móna bogs to be based on outcome of all rehabilitation trials and monitoring

Launch of Abbeyleix boardwalk in 2014. This community-inspired project is nationally and internationally renowned.

**Increased knowledge**
**of GHG balance of cutaway bogs and restored bogs**

# Rehabilitation and the Bord na Móna Bogs

## IPC License Condition 10

The rehabilitation planning process within Bord na Móna has developed considerably over the last ten years to address the complexity of the process itself and the changing nature of the bogs as peat production continues. Condition 10 of each of the nine Bord na Móna IPC licenses relates to decommissioning and permanent rehabilitation of all bog areas. The main features of the process and how each aspect of Condition 10 has been addressed is outlined in the following sections.

It is important to recognise that peat production is an ongoing and long-term activity and will continue at a number of Bord na Móna bog areas for several years to come. During this time, the bog drainage and physical character will also change. Until then broad rehabilitation outlines can be drawn under draft rehabilitation plans, with definitive plans not being developed until peat production is within 1-2 years of cessation date. In the lead in time, there are (at minimum) annual updates with all Peat Production Managers in licensed bog areas and an ongoing baseline survey and continued research into rehabilitation methods and outcomes.

In 2013, the Ecology Team submitted draft rehabilitation plans for each of the Bord na Móna bogs. Following updates to the baseline survey and further rehabilitation trials, the plans were updated in 2015. The plans will continue to be reviewed on a bi-annual basis. The main elements required for rehabilitation post peat production are stabilisation of former bare peat areas largely attained through natural processes of revegetation which may require enhancement by targeted management such as fertiliser/seeding; surface manipulation and/or hydrological management (drain/outfall blocking). These basic features are outlined in the Bord na Móna *Biodiversity Action Plan 2010-2015* with an update on trials and methods presented here.

Extensive research has also been carried out on potential commercial development of the cutaway bogs (agriculture, forestry, renewable energy (biomass, wind farms etc.) and eco-tourism). The outcome of this work is outlined in a number of publications including the recent Bord na Móna *Biodiversity Action Plan 2010-2015* and the Bord na Móna *Strategic Framework for Future Use of Peatlands* document (currently being updated, 2016).

## Terminology

It should be noted that the terms relating to restoration, rehabilitation and after-use can be defined as follows:

**RESTORATION:** the process of assisting the recovery of an ecosystem that has been degraded, damaged or destroyed. www.ser.org

**REHABILITATION:** refers to the primary objective of environmental stabilisation of the former peat production areas or cutaway bogs. This usually involves some form of management to ensure the revegetation of former peat production fields and/or habitat creation/enhancement (as outlined in Bord na Móna Biodiversity Action Plan 2010-2015). It may also include reclamation for agriculture and/or forestry, and/or amenity use.

**REHABILITATION PLAN:** outlines the current baseline condition of the bog on cessation of peat production and the proposed work plan, time frame and costing of work required to implement appropriate rehabilitation and monitor its effectiveness. The development and implementation of a rehabilitation plan for each bog area is an assurance that when Bord na Móna withdraws from industrial peat production at any site that it will do so in an environmentally responsible way. The rehabilitation plan will take consideration of other potential after-uses (such as renewable energy projects) that are proposed for any given bog area.

**CRITERIA FOR SUCCESS OF REHABILITATION UNDER CONDITION 10 OF IPPC LICENSING:** following cessation of peat production the main criteria are stabilisation of the former peat production areas (generally comprising bare peat fields and associated travel and transport and drainage infrastructure) and mitigation of silt run-off.
These basic criteria are largely achieved by natural processes of revegetation with targeted rehabilitation work identified and implemented where required. While each cutaway bog area is rehabilitated in a manner appropriate to the environmental conditions of the site, the general rehabilitation approach is to facilitate the rewetting of cutaway where possible. Not all cutaway areas will have the capacity to be re-wetted due to environmental conditions on the site (some of the cutaway will be naturally dry and develop woodland in the future), and land-use in adjoining areas. All rehabilitation measures will have a positive impact on biodiversity in general, with some areas becoming habitat and species hotspots according to local characteristics.

**OTHER AFTER-USES:** In practice a number of after-uses may be proposed for rehabilitated peat production areas. These after-uses would generally require some form of manipulation of the site for a proposed commercial development (such as the Drehid Landfill Facility on Timahoe South Bog; the Mountlucas Wind Farm development); development of a biodiversity area for targeted species or habitats (such as at Drinagh) or an amenity area such as Lough Boora Discovery Park (walkways, cycle-paths etc.). In reality, all sites will comprise a mix of after-uses given the scale and potential of the bogs in relation to mixed use and multiple benefits, as in the case of the Oweninny Bog Group.

A number of after-uses have already been developed on parts of the Bord na Móna bogs. These include:

**Coniferous Forestry:**
areas leased to Coillte for forestry (up to 4,000ha across the land holdings); trial areas established in 2010/2012 at Killinagh and Derrybrennan (Allen Group)

**Aggregates:**
Derryarkin Sand and Gravel project, Co Westmeath (leased to Roadstone) (Derrygreenagh Group)

**Resource Recovery:**
Drehid Landfill, Composting Plant and Landfill Gas Generating Unit, (Timahoe South Bog) Co. Kildare (Allen Group)

**Composting:**
Kilberry Composting Facility, Kilberry Bog, Co. Kildare (Kilberry Group)

**Waste:**
Ash repositories for: EPL – Cloncreen, Co. Offaly (Allen Group); WOP – Area 3, Blackwater Bog, Co. Offaly. (Blackwater Group); LRP – Derraghan Bog, Co. Longford (Mountdillon Group)

**Peat Deposition:**
Srahmore Peat Deposition Area and associated facilities, Oweninny Bogs, Co. Mayo (Oweninny Group)

**Niche commercial opportunities:**
biomass trials (1980s-2000s); aquaculture trials (2014-2016)

**Wind Farms:**
Mountlucas Wind Farm, Co. Offaly (Allen); Bruckana Wind Farm, County Tipperary (Littleton); Oweninny Wind Farm, Co. Mayo (Oweninny)

**Amenity:**
Lough Boora Discovery Park, Co. Offaly (Boora); Loch Doire Bhile, Littleton (Littleton); Derryounce Walkway, Portarlington (Derrygreenagh); Mountlucas Wind Farm walkways

**Biodiversity:**
for example all bog areas restored under the Bord na Móna Raised Bog Restoration programme (2009-present), Lullymore wetlands and Butterfly Conservation Ireland site; parts of the Oweninny Bog Group and Mountlucas Wind Farm sites

Any proposed after-uses implemented to date are generally covered by specific planning and mitigation conditions and/or appropriate licenses, such as the Srahmore Peat Deposition Area (part of the Oweninny Bog Group) which is covered by Waste Licence W199-2. *The Strategic Framework for Future Use of Peatlands* (2011) sets out the range of after-uses that may be considered on any bog area and the general requirements relating to each option.

**All rehabilitation measures will have a positive impact on biodiversity in general, with some areas becoming habitat and species hotspots according to local characteristics.**

## Triggers for Final Rehabilitation Plans and Implementation

Each Bord na Móna IPC licensed area reports on progress of cutaway rehabilitation and potential future work as part of the Annual Environmental Reports (AERs) for each licensed area. This is carried out annually. Since completion of the baseline ecological work under the Biodiversity Action Plan 2010-2015 draft rehabilitation plans have been developed for all Bord na Móna sites and will be reviewed bi-annually. In terms of finalising rehabilitation plans a series of triggers can be outlined as follows:

1. **Isolated areas of cutaway bog emerge but are dispersed within larger production areas**
Even though extensive peat extraction is ongoing, at this stage a general impression of what conditions will remain on cessation of peat extraction can be attained and possible rehabilitation and after-uses identified (preliminary outline of after-uses noted). At this point a draft rehabilitation plan can be developed, outlining main features that will be assessed. Annual reviews to identify newly cutaway bog areas are carried out each January and those areas are updated on a map on the Bord na Móna GIS system (Land-Use Maps).

2. **The final peat drainage infrastructure is installed**
and a decision is taken on the timeframe for cessation of peat production within the bog unit, i.e. what further depth of peat will be extracted, what acreage of bog will be required to meet market demands, etc. Generally at this stage the operations in the bog would be winding down and/or a realistic time-plan established for closure of the bog unit. At this stage the draft rehabilitation plan will be reviewed and activated for the cutaway bog, ideally incorporating time frames, cost estimates and realistic objectives. Consultation with interested parties is conducted. This phase is represented in a number of bog areas such as the Oweninny Bogs (2003) and sites never developed fully for peat production such as Abbeyleix Bog (2009), Derrydoo-Woodlough Bog cluster (2013), and the Clonboley Bog cluster (2015).

3. **Hydrologically isolatable units of bog are available**
Rehabilitation can now commence within discrete areas of cutaway bog. For example, the Boora Parklands complex and Lullymore Bog (part of the Allen Ballydermot cluster of bogs).

4. **The entire bog out of peat production**
Only at this point can the complete rehabilitation plan be implemented, as well as decommissioning procedures for workshops and workstations. For example, the Oweninny Bog Group.

These stages and triggers will continue to apply as peat production continues in all licensed areas for all bog units in Bord na Móna ownership. Within this framework, the most appropriate rehabilitation and/or after-use is based on the most up to date research and trials conducted and the conditions required for each potential after-use, while taking all primary and secondary factors into consideration.



Ballycon wetland (rehabilitated in 2006).

# Case Study: Oweninny Bog Group (1950s to 2015)

Peat production in the Oweninny Bog Group began in the 1950s, supplying milled peat to the ESB peat-fired station adjoining the production areas at Bellacorick in North West Mayo. Bord na Móna developed two distinct bog areas – one at Bellacorick and one adjacent to Bangor Erris – which collectively covered 6,500 hectares of blanket bog. When the decision was reached to close the ESB power station in 2005, this led to the development of the Oweninny Bogs Rehabilitation Plan (2003). The plan was based on research on the emerging cutaway blanket bog carried out between 1996 and 2001 and the establishment of a number of site specific rehabilitation trials between 2001 and 2003.



Spreading *Sphagnum* on the Srahmore PDA in Co. Mayo.

A draft rehabilitation plan was circulated to consultees in 2001, with the final agreed plan in 2003. Implementation of the rehabilitation plan was carried out between 2003 and 2005, once the final drainage plan and site conditions were established. This involved an extensive programme of drain blocking and other targeted rehabilitation, carried out by the former peat production staff using the appropriate machinery.

In tandem with the rehabilitation, planning permission for an extensive wind farm was granted for the site in 2003, complementing the existing wind farm which had been built on the Bellacorick site in 1992, with a further planning application under review by the planning authorities. Furthermore, the Srahmore Peat Deposition Area and Associated Facilities was established in 2004/5 on 65 ha of the Bangor site to accommodate the spread and stabilisation of 450,000 tonnes of peat from the nearby Bellanaboy Gas Terminal site. Other more recent developments include GHG monitoring from the rehabilitated cutaway (2008-2013), the lease of 1,000 ha of the Bangor bogs to the National Parks and Wildlife Service in 2010 for the purpose of Red Grouse management, and ongoing projects with the local communities in relation to amenity use (walkway developments) of the sites.

**A number of mixed uses – wind energy, peat deposition and storage, nature conservation, amenity, turf cutting, blanket bog restoration, GHG monitoring - have been developed successfully for the Oweninny Bog Group**

Because of the scale of the site a number of mixed uses – wind energy, peat deposition and storage, nature conservation, amenity, turf cutting, blanket bog restoration, GHG monitoring - have been proposed and developed successfully together for the Oweninny Bog Group. The Ecology Team continues to monitor the rehabilitation outcomes at the site.

# Rehabilitation Trials 2010-2015

**A range of rehabilitation measures have been trialled on the cutaway bogs in the period 2010-2015. In most cases the aim has been to accelerate revegetation in areas slow to colonise, although there have been species specific measures also carried out. Some of the trials are outlined here in detail.**



## Drinagh: rehabilitation of cutaway bogs for breeding waders

Bord na Móna and BirdWatch Ireland established a trial area in 2010 on Drinagh Bog (Boora complex) in County Offaly with a view to developing management techniques for breeding waders on cutaway bog in Ireland. These techniques have been used in other countries in wet grassland and other wetland habitats.

The main objectives of this trial project were to investigate rehabilitation techniques to enhance the value of cutaway bog in the midlands for breeding waders and wintering water-birds, and where possible, to increase breeding wader numbers.

**The main rehabilitation techniques included**:

**Re-profiling of drains and drain margins:**
Bord na Móna production bog is generally laid out in a series of long fields 15 m wide, separated by drains of < 1 m wide. When production ceases, drains with vertical edges that are sometimes quite deep (< 1.5m) are still present. These drains can act as a physical barrier to unfledged chicks. Re-profiling the edges of fields and infilling drains allows chicks to move from dry areas down to wetland vegetation to forage without difficulty.

**Scrub removal:**
Maintenance of open areas and the management of scrub encroachment is also required to benefit these ground nesting bird species as they avoid any areas with emergent scrub, preferring open areas with lower incidence of predatory species such as Grey Crow.

**Wetland enhancement by drain blocking:**
The introduction of wetland habitats provides valuable foraging areas for wader chicks. Raising water-levels can also have the additional impact of limiting scrub re-growth, controlling scrub encroachment and maintaining large open areas.

The main work of scrub clearance, re-profiling and drain blocking was carried out over 30 ha between 2010 and 2011. The site has been monitored annually since. Rehabilitation management has had a significant initial visual impact on the overall landscape of the trial area, creating a large open landscape comprising a mosaic of emergent wetland vegetation, drier exposed bare peat areas and some open water. Drain-blocking has also been successful and water-levels are generally higher, with larger areas being inundated for longer periods of time. This is in contrast to the previous landscape with scattered scrub and fields with high margins.

**RESULTS 2011:** A total of 10 wader pairs were recorded in the trial area in 2011 compared to 2 pairs in 2010, prior to any rehabilitation management. Nearly all of the waders were recorded within the area cleared of scrub in 2010. The breeding wader population in 2011 comprised of Lapwing (4 pairs) (following numbers indicate pairs), Snipe (3), Redshank (2) and Ringed Plover (1). This compares to 2010 when the same area had Lapwing (1 pair) and Snipe (1 pair).

**RESULTS 2014:** The 2014 survey found that the new wetland area was still providing important bird habitat. Twenty-Eight breeding bird species were recorded in the wetland including six Red-listed Birds of Conservation Concern in Ireland (BoCCI) species, Meadow Pipit (6 territories); Black-headed Gull (5), Tufted Duck (2); Lapwing (2); Redshank (1) and Woodcock (1) were recorded, and a further five Amber-listed BoCCI species: Snipe (6 territories); Little Grebe (4); Water Rail (4); Skylark (5) and Robin (12).

The new wetland habitats developing in Drinagh are most important for a range of species of conservation concern including breeding waders and other water-bird species such as Little Grebe and Water Rail. However, factors such as predation are preventing breeding wader numbers from increasing since 2011.

The wetland area also attracts a range of wintering bird species with species recorded in the past few years including Whooper Swan, Greylag Goose, Teal, Mallard, Lapwing, Golden Plover, Tufted Duck, Merlin and Hen Harrier.



## Drumman Bog: rehabilitation of cutaway bogs for colonisation of bare peat

During the baseline survey it was noted that while natural colonisation progresses relatively quickly on cutaway bog once peat production ceases, some sites are slow to revegetate and can remain bare. A number of trials were carried out on Drumman Bog (Derrygreenagh complex) in County Offaly to investigate measures to enhance vegetation.

**The main rehabilitation techniques included**:

**Application of fertiliser to bare peat:**
This involved applying fertiliser to bare peat and establishing whether this was sufficient to kick-start seed germination and plant establishment.

**Seeding bare beat with nurse species:**
Species such as Trticale are used as nurse species to promote revegetation, dying back as native plants establish.

**Seeding bare peat with wetland/biomass crops:**
Reed canary grass is a known biomass crop and wetland species, and if established could provide a similar nurse crop function for other wetland species to establish.

The work on each trial was carried out in 2010 and monitored annually. Based on the work to date, it was concluded that a once off low-level fertiliser application to bare peat is sufficient to kick-start revegetation. This approach has been applied successfully on a number of sites now, with the focus on travel paths that tend to dry out in summer periods and areas generally slow to revegetate.

The use of a nurse species was successful for stabilisation of bare peat but it is generally accepted that nutrient levels (such as phosphorus) is the main limiting factor. The trial areas continue to be monitored. Since establishment of the trials there has been ongoing pioneer habitat succession with birch colonisation leading to scrub development in places of former bare peat areas.

**This trial has formed the basis for further targeted rehabilitation work on Ballycon Bog (2013), Lullymore (2014) and Cavemount (2015).**



# Kilmacshane Bog: rehabilitation of cutaway bog and establishment of wetland species

Kilmacshane Bog contains large areas of former production bog that are subject to the seasonal fluctuations of the River Shannon. The trial areas selected within Kilmacshane Bog are representative of the future cutaway bogs along the Shannon corridor that will be prone to seasonal inundation. The site is sufficiently dry during the growing season but wet during the winter months. A number of trials have been instigated here with the main aim of establishing vegetation cover on bare peat.

**Three main trials were used here**:

**Crop trials (2010):**
Crop trials were developed using the "nurse crop" principle where a crop is sown and fertilised in order to provide shelter for more naturalised vegetation to become established. Reed Canary Grass and Triticale were both selected as the nurse crops and received a once off application of fertiliser similar to the work in Drumman.

**Reed trials (2013):**
Reed trials where reed seed (reedmace, *Typha latifolia* and common reed *Phragmites australis*) was collected from established wetlands offsite and stored before being sown at the correct time of year.

**Seed trials (2013):**
Seed was collected along the high water mark on established wetland sites and then spread on the cutaway bog. The seed mix comprised many wetland species including sedges, reed and rushes.





Results have been mixed to date with vegetation becoming established on former areas of bare peat. The crop trials worked best with the nurse crops allowing the establishment of wetland vegetation species including marsh arrow grass, mint and bulbous rush. The reed trials have not established widespread vegetation cover, possibly due to the site drying out during the summer months and/or seed viability. Issues that have been highlighted include control of the water levels to allow more water to stay on site during drier periods, grazers such as Irish hare have also had an impact on the developing vegetation. It should be noted that Kilmacshane Bog is host to large numbers of Whooper Swans in the winter months with the highest numbers in Ireland recorded from the bog in the winter period 2014/2015.

**These trials have provided a great deal of information in relation to developing vegetation in difficult environmental conditions and they will continue to be monitored into the future.**



# Kilberry Bog:
## Sphagnum farming

There has been significant interest in recent years in a number of countries in farming *Sphagnum* to produce sustainable growing media for horticulture and other applications such as *Sphagnum* inoculation during bog restoration to increase diversity, re-establish peat bog vegetation and enhance restoration outcomes. A wide range of research has been carried out in several countries including Canada, Germany, UK and Estonia.

*Sphagnum* can be grown in suitable environmental conditions in degraded peatlands such as cutaway peatlands using paludiculture methods (production under wet conditions) as shown in Canada and Germany. With this in mind, the Bord na Móna Ecology Team established a trial at Kilberry Bog in County Kildare with the Bord na Móna Innovation Team to investigate the ability of different *Sphagnum* species to colonise and grow in suitable Bord na Móna deeper remnant peat cutaway.

Two different *Sphagnum* growth trials were set up in 2012 and 2013. Both trials implemented similar techniques as used in Canada and Germany to inoculate *Sphagnum* on cutaway bog. This involved site preparation (re-wetting), *Sphagnum* collection from a donor site, spreading *Sphagnum* fragments on the trial site and spreading straw mulch over the *Sphagnum* fragments to help water retention and protection of fragments from desiccation during colonisation. Care was taken to attempt to mimic the conditions of pioneer *Sphagnum*-dominated communities that have developed naturally in Bord na Móna cutaway thorough site selection.

The 2012 trial was set up with 24 5 m x 5 m plots in total. Five different *Sphagnum* species (*S. capillifolium, S. papillosum, S. magellanicum, S. subnitens* and *S. cuspidatum*) were used (and one blank plot). In addition there were 2 treatments, plots with straw and plots without straw. Fourteen plots were set up in 2013 (2.5m x 2.5m in size) testing 6 species (*S. capillifolium, S. subnitens, S. magellanicum, S. papillosum, S. cuspidatum* and *S. palustre*) with one blank and one replication ((6 + 1) x 2). All plots were covered in straw mulch.

Inundation during summer 2012 eventually destroyed half (12) of the original plots set up in 2012. Growth and establishment in the remaining 2012 plots has been relatively slow and only half of the plots with straw established some *Sphagnum* cover. The overall *Sphagnum* cover has also been quite low (generally < 1% with 2 plots reaching about 5% in 2015). Other vegetation has been colonising the plots (Bog Cotton, Rushes, weeds from the straw etc.) and some plots are now quite well vegetated (50-80% vegetation cover). Only 1 out of 12 plots in 2013 did not have some *Sphagnum* colonisation in 2015. However, general percentage *Sphagnum* cover values were relatively low (< 1% - 4%) in 2015. One plot (*S. palustre*) was the exception with relatively good colonisation and growth after the first year (10% cover) and continued relatively high cover in 2015 (~20% cover).

Summer inundation in 2012 and winter inundation in 2012/13 and 2013/14 has probably been the biggest constraint hindering the initial establishment of plots. Inundation acted by washing away the inoculating fragments of *Sphagnum* and the protective straw mulch. Relatively dry and hot periods such as in summer 2013 have also meant that the water levels dropped significantly, which is likely to have had a negative impact on colonisation and growth, although some *Sphagnum* has been able to survive and grow. Other environmental constraints to *Sphagnum* establishment at this site include the environmental characteristics of the residual peat. The average pH of the ground-water in the dip-wells was 6.0 in the initial dipwells and 5.3 in the newer dipwells with the average electrical conductivity being 104 µS. Sites with higher pH tend to be suited to development of poor fen and other habitats.

It would seem that the residual peat at the site in Kilberry is somewhat too decomposed and has a relatively high pH indicating that it is not optimally suited for raised bog *Sphagnum* restoration. The relatively high pH and conductivity is likely to be due in part to influence of the underlying limestone-based gravel sub-soils and the exposed fen peats. The site at Kilberry reflects the type of environmental conditions and constraints that would be found at some other potential deeper peat Bord na Móna cutaway sites. However, these sites have relatively variable remnant peat depths and environmental characteristics due to site variability, intensity of peat production etc.

**Further trials will be established using a different sites in the period 2016-2021.**

# Understanding the GHG balance in restored and rehabilitated peatlands

**Peatlands are globally important in terms of greenhouse gas (GHG) emissions as it is estimated that they comprise up to 30% of the total global soil carbon pool*. As peatlands develop, the build-up of plant and animal remains creates a store of carbon in a waterlogged and anoxic environment. Because of this waterlogged condition, there is limited scope for microbes to break down the peat and release carbon dioxide.**

When peatlands are drained, carbon is released mainly in the form of carbon dioxide and is also lost as dissolved organic carbon (DOC). This is also true for Irish peatlands and the role of managing Ireland's peatlands has been highlighted in the National Peatlands Strategy (2015) as being important for future carbon accounting at a national level.

Most of the Bord na Móna bogs have been drained at some point. Where possible Bord na Móna is restoring raised bogs to peat forming conditions – stopping further release of carbon dioxide and in time restoring the carbon sequestration function of the bog. Bord na Móna is also funding research into determining the rate at which this switch occurs, and a project monitoring GHG emissions from a restored bog (Moyarwood in East Galway) was established in 2013, and is expected to continue to 2018.

Two GHG monitoring projects have also been carried out to inform rehabilitation measures on cutaway bogs – one in the rehabilitated Oweninny Bogs and one in a rehabilitated cutaway bog in Blackwater Bog (West Offaly). Both studies show that rewetting of the cutaway and establishment of wetland habitats such as poor fen and reed bed, reduces carbon dioxide emissions and leads in time to carbon sequestration.

Each of the studies has informed national carbon accounting measures carried out by the EPA, and Bord na Móna's Carbon Working Group established in 2009, tracks policy developments and accounting approaches in consultation with the EPA Climate Action team.



Monitoring GHG at Blackwater reed bed (2011-2015).



Dr David Wilson monitoring GHG at Moyarwood Bog, (bog restored 2012).

**The key actions relating to GHG monitoring listed in this plan are**:

*__Continue to monitor GHG emissions__ from restored raised bog at Moyarwood Bog (Derrydoo Woodlough complex) up to 2018

*__Support and develop GHG monitoring projects__ on woodland habitats developing on cutaway bog

*__Work with the research team in Trinity College Dublin__ on the current EPA funded project "A framework for the restoration of Irish peatlands" and continue to work with National Parks and Wildlife Service on the restoration practices for the NATURA 2000 raised bog network; this will include hydrological assessment of rehabilitation measures and options for cutaway bog areas

*The total amount of carbon stored in global peatlands and in global soils are both subject to considerable uncertainty and wide ranges of estimates. Estimates of soil carbon range up to 3,000 Gt C, but most recent estimates are in the range 1500-2000 Gt C. Estimates of carbon in peatlands stretch up to 600 Gt C, but International Peatland Society and Wetlands International figures are probably in the range 400-450 Gt C.

**Peatlands are globally important in terms of greenhouse gas (GHG) emissions as it is estimated that they comprise up to 30% of the total global soil carbon pool**


Conversation.

3.4

# Objective 4

## Raise Awareness and Create a Greater Appreciation of the Biodiversity and Natural Heritage of Bord na Móna Cutaway Bogs and Associated Lands

**A considerable part of the Bord na Móna Biodiversity Action Plan 2010-2015 has focussed on communication and creating awareness of the value of biodiversity, and the benefits of rehabilitation and restoration of the Bord na Móna bogs. This work will continue under the next planning phase and ranges from local to international levels.**

The work to date of the Ecology Team and in particular the interaction with the wider Bord na Móna community has demonstrated the significant role that biodiversity and rehabilitation plays in our day to day business.

This interaction ranges from regular updates to senior management, peat operations managers and regular contributions to the employee magazine and company intranet.

### Key Performance Indicators

Some of the key performance indicators in the period 2010-2015 were:




**NATIONAL**

**Organisation of annual Biodiversity Action Plan review days incorporating presentations and field trips to rehabilitated sites (November 2011 Ballinasloe and Cuckoo Hill Bog; January 2013 Lough Boora Discovery Park; December 2013 Tullamore and Mountlucas wind farm; February 2015 Athlone and Ballydangan Bog)**

**Input to Irish Peatland Society annual events (Abbeyleix Bog 2009, *Peatlands – a new conversation* 2015) and other national conferences (such as *Natural Capital – Ireland's Hidden Wealth* 2014, *Environment Ireland* 2014)**

## Key Performance Indicators (continued)

Organisation and co-ordination of Lough Boora Bioblitz 2012 and associated biodiversity events over a 24 hour period (May 2012); support of Abbeyleix Bioblitz 2013

Development of a leaflet about the Bord na Móna Raised Bog Restoration programme outlining how the bogs are restored and the extent of the sites (2015)

Input to national media focusing on biodiversity projects – print (Bord na Móna *Source* magazine for employees, *Irish Times*, *Independent*, regional newspapers), radio (*Mooney Goes Wild*, regional and local stations) and television (Nationwide, Eco-Eye, RTÉ news, TG4 news)

Circulation of Bord na Móna Biodiversity Action Plan 2010-2015 to statutory and non-statutory consultees and to local and regional libraries; development of Bord na Móna Biodiversity webpages as part of the company website.

**delivery of ecology training programme to peat production managers and those involved in bog operations**

Input to Heritage Plans – national and county levels - through active participation on heritage fora; input and participation in other groups such as Woodlands of Ireland, Chartered Institute of Ecology and Environmental Management (CIEEM), etc.

Development of signage for selected biodiversity area (ongoing)

Direct ecological input to development of Lough Boora Discovery Park centre and provision of website material

**INTERNAL**

Co-ordination and delivery of an annual ecology training programme to Bord na Móna peat production managers and those involved in bog operations

Regular contributed articles to company magazine *Source*, input to annual and sustainability reports and online company intranet

**INTERNATIONAL**

Presentations about Bord na Móna Biodiversity Action Plan at seminars and workshops at international levels (includes International Peat Congress 2012 in Stockholm, IPS Annual Assemblies Finland 2010, Quebec 2011, Netherlands 2013, Riga 2014; Society of Ecological Restoration meetings France 2010, Finland 2014 and UK 2015, IUCN Peatlands event Inverness 2014)

Contributions to Food and Agriculture Organisation of the United Nations (FAO) and IUCN UK Peatland project publications on peatland restoration and biodiversity

**COMMUNITY**

Presentations and field trips with primary, secondary and third level education classes.

Organisation of biodiversity walks and talks for Biodiversity weeks 2010-2015, Heritage weeks 2010-2015, Offaly Naturalists' Field-club, Dublin Naturalists' Field-club and a range of other communications at local level

Development of Lullymore wetlands in association with Lullymore Heritage and Discovery Park, Co. Kildare

Co-ordination and chairing of Abbeyleix Bog Technical Advisory Group (TAG)

Member of Ballydangan Red Grouse project stakeholders group (South Roscommon) – sponsorship of project as well as ongoing practical assistance

Working with special interest groups such as Butterfly Conservation Ireland, Wetlands Heritage Ireland and community groups such as local game clubs to facilitate access to Bord na Móna bogs and develop partnership agreements

Member of the Community Wetlands Forum (2015 to present)

Building on this work the following actions can be outlined for the period 2016-2021.

# Actions

**Develop and promote a biodiversity awareness-raising campaign within Bord na Móna**
and to the wider public of the biodiversity value of the Bord na Móna bogs

**Identify and promote further accessible sites of biodiversity conservation interest**
on Bord na Móna bogs

**Promote increased participation in the conservation of our natural heritage**
by supporting community-led biodiversity projects such as the Lullymore Heritage and Discovery Park, Ballydangan Red Grouse project, Wetlands Heritage Ireland, Abbeyleix Bog project and/or other walkways/amenity projects

**Consult with relevant bodies and interested parties on a regular basis**
to communicate updates in the biodiversity work programme and also to identify potential partnership projects within the Bord na Móna bog and adjacent lands

These actions will require ongoing work including:

**Promote community engagement**
in relation to the full range of Bord na Móna's business activities, highlighting biodiversity and eco-tourism aspects

**Continue to organise an annual seminar and/or workshop with a field trip**
to present updates on the Bord na Móna biodiversity work programme outlined in the Biodiversity Action plan to relevant bodies and interested parties

**Circulate the next Biodiversity Action Plan 2016-2021**
to all relevant bodies and interested parties; make an electronic copy available on-line

**Re-develop the Bord na Móna website biodiversity pages**
with an overview of all projects carried out to date with information and details on access to sites

**Develop a Bord na Móna Biodiversity Facebook page**
to share photos and updates on survey and rehabilitation work

**Work with other agencies to develop fact sheets and best practice guidelines**
based on the biodiversity of the Bord na Móna bogs, but also with a view to the wider national biodiversity resource

**As new biodiversity sites are identified, establish appropriate signage**
at biodiversity areas with information on biodiversity features, management and projects at each site

**Promote Bord na Móna policy of wildlife conservation/protection**
on Bord na Móna bog areas


Butterfly orchid


Bee orchid


Fragrant orchid


Spotted orchid



## Facilitate areas where people can **access** the Bord na Móna bogs

Walking trail at Lough Boora Discovery Park.

**Participate in Heritage fora organised by local authorities**
and other biodiversity working groups for the counties within which Bord na Móna operates

**Contribute articles to local and national media;**
participate and present in workshops and conferences relating to heritage, biodiversity and other areas of relevance

**Contribute biodiversity related articles to Bord na Móna media,**
such as the company magazine (*Source*) and the intranet; arrange biodiversity awareness days and training opportunities in the form of workshops for bog operatives and managers; develop a biodiversity factsheet for all Bord na Móna employees

## Organise field trips and workshops for the public

**Continue to engage with relevant bodies and interested parties including:**
Government Departments, National Parks and Wildlife Service, National Biodiversity Data Centre, Environmental Protection Agency, Fishery Boards, County Councils, Coillte, Irish Farmer's Association, Heritage Council, BirdWatch Ireland, Irish Peatland Conservation Council, Butterfly Conservation Ireland, Irish Peatland Society and Woodlands of Ireland, and other NGO's, local and national media, research and educational institutions (primary, secondary and third level) as well as the local landowners and communities that live in close proximity to the bogs

**Interact with local communities and schools to identify potential local needs**
and projects in terms of amenity, education and/or biodiversity areas

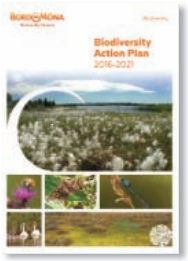
**Organise field trips and workshops for the public in conjunction with**
established Biodiversity and Heritage programmes; explore the development of a Bord na Móna Bioblitz event annually to highlight biodiversity in different bog areas

**Facilitate areas where people can access the Bord na Móna bogs**
and selected biodiversity areas, such as Lough Boora Discovery Park and other walkways initiatives

**Develop a primary schools biodiversity education system**
promoting awareness of biodiversity across Ireland which will include biodiversity on Bord na Móna lands (PILOT running Jan – June 2016, with further roll-out to 150 schools in Sept 2016 and building over a 5 year period)

**Work with the An Taisce Green Schools initiative**
This will involve corporate sponsorship of the Biodiversity section of the first Green Schools Expo in February 2016, as well as providing peatland biodiversity expertise at the expo for schools (general peatland biodiversity information and careers advice)

### Key Indicators of Success




The key indicators of success of these actions will be:

Increased awareness of biodiversity within Bord na Móna and in the wider local and national community

Archive of biodiversity related articles submitted to all relevant media to be included on Bord na Móna biodiversity website

An established and mapped network of selected biodiversity areas and walking and/or cycling routes with signage and relevant printed information about Bord na Móna and biodiversity

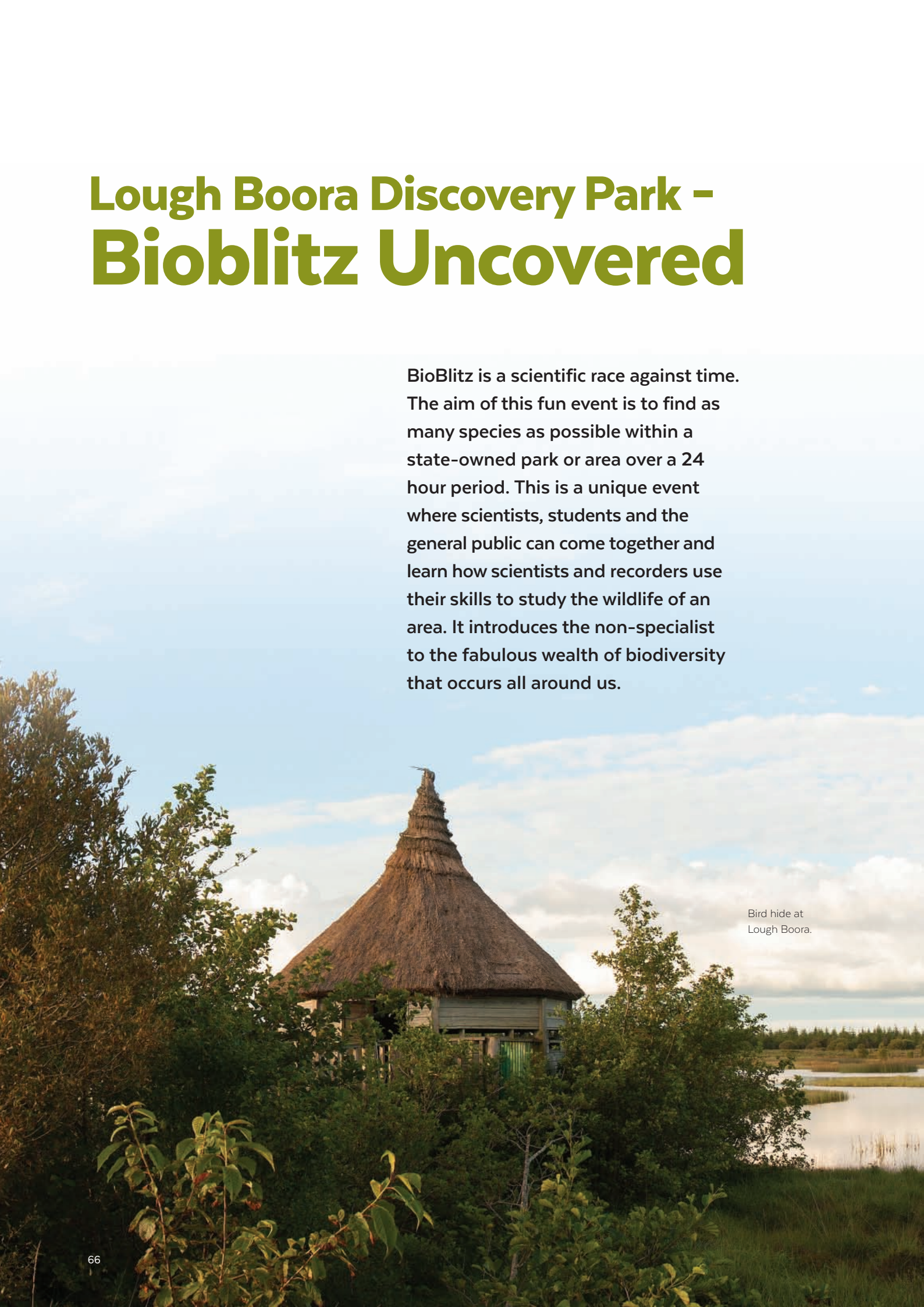
Increased access and visits to selected Bord na Móna biodiversity areas

Biodiversity awareness projects established with local schools and communities and/or other interest groups

Ongoing consultation with relevant bodies and interested parties

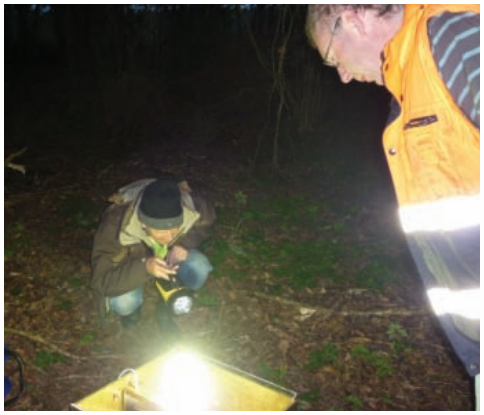
# Lough Boora Discovery Park – Bioblitz Uncovered

BioBlitz is a scientific race against time. The aim of this fun event is to find as many species as possible within a state-owned park or area over a 24 hour period. This is a unique event where scientists, students and the general public can come together and learn how scientists and recorders use their skills to study the wildlife of an area. It introduces the non-specialist to the fabulous wealth of biodiversity that occurs all around us.



Bird hide at Lough Boora.







The Lough Boora BioBlitz 2012 was a great success with many more species recorded than had been expected, with a huge turnout of professional scientists and high public participation. Nine hundred and forty species were recorded on the day, including 334 vascular plant species which was more than any other BioBlitz 2012 site. The success of the event was largely due first and foremost to the biodiversity of the rehabilitated cutaway but also to the close collaboration and hard work of a number of organisations including Bord na Móna staff from a range of businesses, the National Biodiversity Data Centre, Offaly County Council, National Parks and Wildlife Service, Coillte, Bat Conservation Ireland, Butterfly Conservation Ireland, Moths Ireland, BirdWatch Ireland, BSBI, Irish Wildlife Trust, Inland Fisheries Ireland, staff and members of NUI Galway and a number of independent ecologists.

Some of the public events over the 24 hour period included a Bat Walk on the Friday night, a Dawn Chorus led by BirdWatch Ireland, a mammal identification workshop, a moth capture demonstration, a display of aquatic creatures by Inland Fisheries Ireland and a schools wildlife art competition for primary school students local to the area.

For more information see:
**www.bioblitz2012.biodiversityireland.ie**

**Following the success of the 2012 Bioblitz**, and a similar event held on Abbeyleix Bog in 2013, Bord na Móna will explore the development of a Bord na Móna Bioblitz event annually to highlight biodiversity in different bog areas

**Nine hundred and forty species were recorded on the day, including 334 vascular plant species which was more than any other BioBlitz 2012 site.**

# Community-Led Wetland Projects

**Local communities living on the edges of the Bord na Móna bogs are the inspiration for a range of projects and initiatives. In the period 2010-2015, a number of community-led biodiversity and wetland projects have come to fore and Bord na Móna has provided support where possible. Projects such as the work of Wetlands Heritage Ireland and the Abbeyleix Bog Conservation Project have been significant developments and continue to develop with time.**

Wetlands Heritage Ireland is led by the local Keenagh community in County Longford and their interest is largely focussed on the area around the Corlea Trackway Interpretive Centre. Bord na Móna is working with the group to develop further educational and experiential facilities around the existing centre and these will progress in the period 2016-2021. This community project is aligned with the Mid Shannon Wilderness project currently being developed by Longford County Council and partners.

Abbeyleix Bog Conservation project in County Laois is led by local Abbeyleix community representatives. After completion of a comprehensive drain blocking programme in 2009, Bord na Móna leased the site to the local community and continues to provide support to the community through chairing of the bog Technical Advisory Group in conjunction with staff from the National Parks and Wildlife Service, Laois County Council and IPCC. The project is viewed nationally as a best practice case study for the future successful management of bog conservation and restoration sites in Ireland.

Two projects with potential for development between 2016 and 2021 are the Ballivor Bog project in County Meath (bog conservation and amenity) and the new IRD Duhallow (Barna Bog – Hen Harrier conservation) project in County Kerry.

## Lullymore Wetlands



Lullymore Heritage and Discovery Park is a community run project near Rathangan in County Kildare. The Park was officially launched in 1993 and tells the story of Lullymore and the bog which surrounds it through guided tours, interactive displays and exhibits. The story moves from bog formation to the arrival of Mesolithic settlers, to early Christian times through to the Irish Famine and Rebellion period, and also to the development and heritage of Bord na Móna and the boglands.

Since 2010, the Ecology Team has worked with the local Bord na Móna staff to develop a wetland area to provide a local educational resource for the group allowing them to tell their story and expand their tourism and amenity offering to national and international groups alike. This has resulted in a partnership project whereby a rehabilitated wetland and a typical Bord na Móna railway track has been laid and is now operated by the local staff. The site also supports a café and an indoor play area that encourages school children and parents to visit throughout the year.
www.lullymoreheritagepark.com

The Lullymore wetlands area itself is a larger area and is developing great interest locally and nationally from environmental groups such as Kildare BirdWatch Ireland branch and Butterfly Conservation Ireland (BCI). Part of the site is managed specifically for butterflies by BCI and is now established as a nationally significant site for butterflies and moths. Bord na Móna has zoned the site for biodiversity and it will continue to be monitored to document and inform future management.

Above: "Charlie's Boardwalk" at Lullymore.
Photo courtesy of Lullymore Heritage & Discovery Park.

# Ballydangan Red Grouse Project



Red setters are used to count Red Grouse numbers on Ballydangan Bog.

Ballydangan Bog in County Roscommon is a midlands raised bog owned by Bord na Móna and is one of the sites included in the company's Raised Bog Restoration Programme (2009-present). Drainage ditches were installed on the 218 ha site in the early 1980s in preparation for industrial peat production, but no further work carried out as the bog was deemed surplus to requirements.

**While Red Grouse numbers have remained stable since the project began, three pairs of Eurasian Curlew *(Numenius arquata)* have successfully bred on the site.**

In 2009 the local community groups living around the bog became aware that the local population of Red Grouse (*Lagopus lagopus hibernicus*) centred on Ballydangan Bog and neighbouring bog areas had dramatically declined and was on the brink of a local extinction. The Ballydangan Red Grouse project was established in 2009 and started with the local community leasing Ballydangan Bog from Bord na Móna. Following on from the production of a Red Grouse Management Plan the Department of Social Protection employed four full time local staff to facilitate the work which includes predator control, heather cutting and habitat management.

In September 2013 Bord na Móna began restoring the raised bog habitat, in tandem with the community efforts to maintain the local Grouse population. This involved a comprehensive drain blocking programme to rewet the site and over 3,744 peat dams were installed. The aim of the restoration work is to raise the water levels and facilitate the development of *active* raised bog areas. The rewetting will also improve the overall habitat for typical peatland bird species including the Red Grouse.

While Red Grouse numbers have remained stable since the project began, three pairs of Eurasian Curlew (*Numenius arquata*) have successfully bred on the site. Translocation efforts to relocate Red Grouse birds from a stable population in another county to Ballydangan were attempted in 2014 and 2015 with little success to date.

Below: Ballydangan Bog is frequently used by local schools.





# Measurement.

3.3

# Objective 5

## Monitor the Progress of the Bord na Móna Biodiversity Action Plan

**One of the many highlights for the Ecology Team over the course of delivering on the Bord na Móna Biodiversity Action Plan 2010-2015 has been the annual review days. From humble beginnings in the Tullamore Court Hotel at the launch of the plan by the late Éamon de Buitléar (1930-2013) in November 2010, the annual review days now attract academics, scientists, planners, practitioners, consultant ecologists, local community members and Bord na Móna employees from a range of interests.**

Each day presented an opportunity to present the work of that year and to outline the course of work for the coming year, with the participation of consultees and interested parties.

The Biodiversity Action Plan 2016-2021 covers a six-year period that will be updated in 2021. In terms of monitoring the outputs of the plan this will be carried out in a similar way – with an annual review and an update of the Biodiversity Action Plan in the period 2020 to 2021 for the next planning phase. As with any plan over a six year period, at varying times aspects within the plan will be prioritised, coming to the fore while also new aspects are identified. This reflects the importance of the annual review to ensure that new perspectives, new approaches and new concerns – locally, nationally and internationally - are incorporated into the plan.

### Key Performance Indicators

Some of the key performance indicators in the period 2010-2015 were:




**To date, all of the actions outlined in the Bord na Móna Biodiversity Action Plan 2010-2015 were acted upon and implemented, or are currently in development and carried over into the next planning phase**

**Organisation of the annual Biodiversity Action Plan review days provided an opportunity for a wide range of consultees to query the ongoing activities and the progress being made against each of the objectives. This allowed for the Ecology Team to amend and/or adjust focus as views and perspectives change**

**A rigorous process has been adopted for the development of the 2016-2021 plan including internal, external and public consultation phases to ensure all relevant opinions and experience are considered**

Building on this work the following actions can be outlined for the period 2016-2021.

## Actions

**Evaluate compliance by Bord na Móna with relevant legislation and development of biodiversity policy**

**Evaluate outcome of actions relating to ecology baseline survey and other surveys**

**Evaluate outcome of actions relating to rehabilitation plans**,
trials and implementation of rehabilitation plans

**Evaluate the outcome of actions relating to the awareness raising objective**

**Evaluate the process of developing the next Biodiversity Action Plan**
and integrate lessons learned from each planning cycle

The Biodiversity Action Plan Review Day in 2015 involved a number of workshops centred on the new plan for 2016-2021.





## Measurement and monitoring the progress of the Biodiversity Action Plan:

Each action of the Bord na Móna Biodiversity Action Plan is underpinned by indicators of success and these will be used to measure the effectiveness of the work and indicate how new objectives and actions can be added to the next Biodiversity Action Plan(s).

The key indicators of success outlined for each of the four objectives will be measured by answering a number of questions such as: Were each of the stated actions carried out? How were they carried out? What was the outcome? Has there been advancement in expertise in terms of knowledge base, management practice and effectiveness of work carried out? Is there an increased awareness of biodiversity in Bord na Móna? Are the biodiversity web-pages being accessed by the public? Are people visiting the selected visitor access biodiversity areas?

**Were each of the stated actions carried out? How were they carried out? What was the outcome?**

*Develop specific targets, timeframes and metrics of success for each action where possible (based on temporal, qualitative and quantitative measures), and present at each annual Biodiversity Action Plan review day; consider an interim review of the progress halfway through the set timeline of the Biodiversity Action Plan 2016-2021

Review objectives and actions annually to reflect the increasing knowledge database and other trends in best practice and policy, re-prioritising as necessary.

Provide annual updates to relevant bodies and interest groups by means of seminars and workshops

*Commission an independent review of the delivery of the Objectives and Actions prior to the development of the next Biodiversity Action Plan 2022-2027

## Key Indicators of Success



The key indicators of success of these actions will be:

A clear overview of the outcome of the Biodiversity Action Plan 2016-2021

An updated Biodiversity Action Plan for the period 2022-2027 with clear and measurable objectives building on the success of the Biodiversity Action Plan 2016-2021

Proven expertise in effectively carrying out rehabilitation work and managing Bord na Mona with best outputs for biodiversity



Site visits form an enjoyable part of the review days.
Photo courtesy of Irish Peatland Conservation Council.

4.0

# Changing Landscapes and Changing Perspectives

**In October 2015 Bord na Móna took a significant step in outlining its vision for a sustainable and profitable business for 2030. This vision is built upon changing perspectives and a continually changing landscape in terms of priorities and targets. A sustainable business is built by recognising equally the three pillars of sustainability – people, planet and profit.**

From its initial development over 80 years ago, Bord na Móna has been a major driver of social and economic development in the midlands of Ireland and indeed the west of Ireland. The move to sustainable business now means that Bord na Móna is determined to further build on its longstanding support for communities. At the local community level it will be the un-tethered vision of communities living on the edges of the bog that will ignite the inspiration and creativity for the local attractions – spaces like the Lough Boora Discovery Park in County Offaly and other community led wetland projects. These projects and initiatives require sustained energy and commitment from Bord na Móna working closely at the same time with the communities involved.

A sense of what is already happening in terms of biodiversity is reflected in the numbers of species – 940 in total – recorded at the Lough Boora Bioblitz event in 2012. As well as that the huge popularity of the Lough Boora Discovery Park - where annual visitor numbers are now approximately 100,000 – reflects the widespread appreciation of that biodiversity and the space that the cutaway bogs provide. In terms of the ecosystem goods and services provided by just this one area, we are only beginning to understand how to value this rich natural capital and judge how we can continue to do so in areas where the returns support the necessary investment. Bord na Móna can set the standard in terms of how nature and economy can sustain each other, keeping local communities vibrant, but also keeping the species and habitats upon which we rely at sustainable population levels. Initiatives like the Natural Capital Coalition, the EU Business and Biodiversity platform, and Business in the Community play a role in leading businesses to value biodiversity and ensuring it is part of their annual accounting systems. Inclusive decision making, innovation in sustainable commercial activity and constantly endeavouring to increase our positive ecological footprint will be key to any sustainable business.

With all the knowledge and experience built up since the 1990s, the company is now a major driver in terms of peatland rehabilitation and restoration, and in valuing natural capital. As the company switches progressively to renewable energy, the need for the intensive and industrial production of peat will steadily decline. This will result in a significant land use change in Ireland, in both local and national terms. As soon as peat production stops in an area, natural processes coupled with targeted rehabilitation and informed management, work to transform the former bare peat to a rich tapestry of habitats. These areas can progress relatively quickly towards valuable assets for Ireland with multiple potential uses – habitats for species marginalised in the Irish landscape today, carbon stores and sinks to help reduce and offset national carbon emissions, space for renewable energy projects and niche commercial opportunities, rich cultural landscapes for artists and observers to be inspired and to create, and a platform for amenity and tourism facilities for people to enjoy these new landscapes. The Green Infrastructure will provide a lifeline for many critically endangered and vulnerable habitats and species, and provide mutual benefits for the people using these wonderfully biodiverse areas.

Each of these aspects of rehabilitation and management of the Bord na Móna bogs – ensuring environmental stabilisation of former peat production areas, creating self-sustaining habitats for viable species populations, connecting habitat and species networks, enhancing biodiversity, understanding the GHG implications for different habitats – will be addressed over the course of this biodiversity action plan.

# Conclusion

The Biodiversity Action Plan 2010–2015 was a pioneering plan that delivered a number of key actions for Bord na Móna and biodiversity. The plan has been a key driver in determining the use of Bord na Móna's lands, and has succeeded in promoting and enhancing biodiversity while also creating awareness of the importance of this core value.

The Biodiversity Action Plan 2016–2021 builds on these significant achievements, and in the context of Bord na Móna's *Sustainability 2030* report, expands on our overall vision for biodiversity and related areas including natural capital, eco-tourism and greenhouse gas management. Part of this future will involve the integration of these activities with commercial and community use of the land within an overall strategic framework. This overall approach reflects the importance of the three pillars of sustainability - people, planet and profit - and Bord na Móna's role as stewards of the assets entrusted to it by the State.

Bord na Móna is fully committed to a sustainable approach to land use and will continue to work, with all its stakeholders, to deliver its strategic aims in accordance with this Plan.

**The Biodiversity Action Plan 2016-2021 expands on our overall vision for biodiversity and related areas including natural capital, eco-tourism and greenhouse gas management.**



Walking on the bog: Ballydangan Bog field trip (2014).
Photo courtesy of Irish Peatland Conservation Council.

# Appendix I

## List of Consulting Organisations

**A**

Abbeyleix Bog Community Group

An Taisce

**B**

Ballydangan Red Grouse Project

Barrow Trust

Bat Conservation Ireland

BCI: Butterfly Conservation Ireland

Bord na Móna: internal

BSBI: Botanical Society of the British Isles

Burren Beo Trust

BWI: BirdWatch Ireland

**C**

CELT

CIEEM: Chartered Institute of Ecology and Environmental Management

Coillte: Irish Forest company, semi-state company

Consultant Ecologists

Consultants: EACS, Earthy Matters, McCarthy Keville O'Sullivan, RPS, Tobins and others.

Countryside Alliance

Crossmolina Community Group

**D**

Dublin City Council

Dublin Naturalist's Field Club

**E**

EPA: Environmental Protection Agency

EU DG Environment

UN FAO

**F**

Forest Service

**G**

GET: Golden Eagle Trust

Girley Bog Group

Government Departments: Agriculture, Arts Heritage and Gaeltacht, Social Protection

**H**

Heritage Council: Local Heritage Officers

**I**

IFNC: Irsih Natural Capital Forum

Inland Fisheries Ireland

IMCG: International Mire Conservation Group

IPCC: Irish Peatland Conservation Council

IPS: International Peat Society

Irish Grey Partridge Conservation Trust

Irish Red Grouse Association

Irish Rural Link

IUCN

IWT: Irish Wildlife Trust

IT: GMIT, Limerick, Sligo, Waterford

**K**

Kildare Regional Gun Club

Kilteevan Community Council

**L**

Lanesborough Community

Local authorities (Councilors & Planners)

Lullymore Heritage and Discovery Park

**M**

Meath Westmeath Bog Group

Moore Gun Club

Mote Park Conservation Group

**N**

NARGC: National and Regional Gun Club

National Universities of Ireland: DCU, UCC, UCD, UCG, TCD, Maynooth

NBDC: National Biodiversity Data Centre

NBG: National Botanic Gardens

Newtowncashel Community Group

North Midlands Wilderness Park

NPBR: Irish National Platform for Biodiversity Research

NPWS: National Parks and Wildlife Service (Regional and Scientific staff)

**Q**

Queens University Belfast

**T**

Taghmaconnell Community Group

Teagasc

**V**

Vincent Wildlife Trust

**W**

WHI: Wetlands Heritage Ireland

Wetlands International

Wetlands Survey Ireland

WI: Waterways Ireland

Woodlands of Ireland

**Others:**

Monica de Bath
*Artist*

David Bellamy
*Environmentalist*

Michael Casey
*Sculptor*

John Feehan
*Author and Environmentalist*

Dick Warner
*Journalist and Environmentalist*

Paddy Woodworth
*Author and Journalist*

# Appendix II

## An Overview of the Bord na Móna Habitat Classification

| General Pioneer Community | Pioneer Community | BnM Habitat Code | Nearest Phytosociological Syntaxa | Fossitt 2000 Classification | |
|---|---|---|---|---|---|
| | Bare peat (0-50% cover) | BP | | Spoil and bare ground | ED2 |
| **Embryonic bog** | Pioneer *Eriophorum angustifolium* community (acidic) * | PBa | Oxycocco-Sphagnetea | Bog | PB |
| | *Sphagnum cuspidatum-Eriophorum angustifolium* community* | PBb | Oxycocco-Sphagnetea | Bog | PB |
| | Embryonic bog community (somewhat more diverse and developed) * | PBc | Calluno-Sphagnion | Bog | PB |
| **Poor fen** | Pioneer *Campylopus* dominated community | pCamp | Caricion curto-nigrae | Poor fen | PF2 |
| | Pioneer *Juncus effusus* community | pJeff | Caricion curto-nigrae | Poor fen | PF2 |
| | Pioneer *Eriophorum angustifolium* community (poor fen) | pEang | Caricion curto-nigrae | Poor fen | PF2 |
| | Pioneer *Juncus bulbosus* community | pJbulb | Caricion curto-nigrae | Poor fen | PF2 |
| | Pioneer *Triglochin palustris* community | pTrig | Caricion curto-nigrae | Poor fen | PF2 |
| | Pioneer *Juncus* with *Sphagnum** | pJunc | Sphagneto-Juncetum | Poor fen | PF2 |
| **Rich fen** | Pioneer rich fen community with *Schoenus nigricans* (rudimentary rich fen) | Pschon | Caricetalia davallianae | Rich fen | PF1 |
| | Pioneer *Carex viridula*/brown moss community (rich fen) | pVir | Caricetalia davallianae | Rich fen | PF1 |
| | Pioneer *Cladium* community | pCladium | Caricion davallianae | Rich fen | PF1 |
| **Emergent wetland communities** | *Carex rostrata* community (poor fen) | pRos | Cariculion rostratae | Poor fen | PF1 |
| | *Carex paniculata* community | pPan | Caricetum paniculatae | Reed and large sedge swamps | FS1 |
| | *Phragmites australis* community* | pPhrag | Scirpo-Phragmitetum | Reed and large sedge swamps | FS1 |
| | *Typha* community* | pTyp | Typhetum latifoliae | Reed and large sedge swamps | FS1 |
| | *Schoenoplectus* community | pSch | Scirpo-Phragmitetum | Reed and large sedge swamps | FS1 |
| **Open water/aquatic** | Permanent pools and lakes | OW | Isoeto-Litorelletea | Dystrophic lakes | FL1 |
| | Permanent pools and lakes | OW | Isoeto-Litorelletea | Acid-oligotrophic lakes | FL2 |
| | Charaphytes | pChar | Charetea | Limestone/Marl lakes | FL3 |
| | Temporary open water | tOW | | | |
| **Woodland and scrub** | Emergent *Betula*-dominated community (A) | eBir | Salici-Betuletum pubescentis | Scrub | WS1 |
| | Open *Betula*-dominated community (B) | oBir | Salici-Betuletum pubescentis | Scrub | WS1 |
| | Closed *Betula* scrub community (C) | cBir | Salici-Betuletum pubescentis | Scrub | WS1 |
| | *Ulex*-dominated community | eGor | | Scrub | WS1 |
| | *Betula-Salix* woodland | BirWD | Salici-Betuletum pubescentis | Bog woodland | WN7 |

| General Pioneer Community | Pioneer Community | BnM Habitat Code | Nearest Phytosociological Syntaxa | Fossitt 2000 Classification | |
|---|---|---|---|---|---|
| **Heathland** | Dry *Calluna* community | dHeath | Calluno-Ulicetalia | Dry heath | HH1 |
| | Wet Heath community | wHeath | Narthecio-Ericetum | Wet Heath | HH3 |
| | Dense *Pteridum* | dPter | Rhamno-Prunetea | Dense Bracken | HD1 |
| **Grassland** | Dry calcareous grassland | gCal | Centaureo-Cynosuretum | Dry calcareous and neutral grassland | GS1 |
| | *Antoxanhthum-Holcus-Equisetum* community | gAn-H-Eq | No close affinities to Irish syntaxa | Dry calcareous and neutral grassland | GS |
| | *Dactylis-Arrhenatherum* community | gDact-Arr | Arrhenatheritum elatioris | Dry meadows and grassy verges | GS2 |
| | *Molinia caerula*-dominated community | gMol | Junco conglomerati-Molinion | Wet grassland | GS4 |
| | Marsh - *Filipendula* and other tall herbs | Mar | Filipendulion ulmariae | Marsh | GM1 |
| **Disturbed** | *Tussiligo*-dominated community (vegetation > 50%) | DisCF | Tussilaginetum | Recolonising bare ground | ED3 |
| | *Epilobium*-dominated community (vegetation > 50%) | DisWil | Tussilaginetum | Recolonising bare ground | ED3 |
| **General** | Riparian areas (streams or drains with associated edge habitats) | Rip | | | FW2/4 |
| | Access (tracks or railways with associated edge habitats) | Acc | | | BL3 |

*indicates potentially peat forming habitat

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# Appendix IV

## Habitats and species of nature conservation value recorded from Bord na Móna sites

### Table 1.
### List of EU Habitats Directive Annex I habitats that have been found on Bord na Móna property.

Most habitats are found in cSACs/pNHAs already recognised for their conservation value and have already been listed as qualifying interests for these conservation sites (part owned by Bord na Móna)

| Habitat | Fossitt Code | National | International | Examples |
|---|---|---|---|---|
| * Active Raised bogs (7110) | PB1 | ECHR | EU HD Annex I | Clera Island Bog in Co. Roscommon (Clonboley Group); Townparks Bog (Daingean Bog NHA). |
| Degraded raised bogs still capable of regeneration (7120) | PB1 | ECHR | EU HD Annex I | Clera Island bog in Co. Roscommon (Clonboley Group); Killamuck Bog (Abbeyleix Bog), Co. Laois. |
| Blanket Bog (*if active bog) (7130) | PB3 | ECHR | EU HD Annex I | O'Boyle's Bog (Co. Mayo) |
| Depressions of the peat substrates of the Rhynchosporion (7150) | PB1 | ECHR | EU HD Annex I | Several sites within bog remnants to margins of production areas. |
| *Calcareous fens with *Cladium mariscus* and species of the Caricion davallianae (7210) | PF1 | ECHR | EU HD Annex I | Overlap with Fin Lough cSAC (Co. Offaly) |
| *Alkaline fens (7230) | PF1 | ECHR | EU HD Annex I | Overlap with Fin Lough cSAC (Co. Offaly); some regeneration at Lullymore Bog, Co. Kildare |
| Transition mires and quaking bogs (7140) | PF3 | ECHR | EU HD Annex I | Cranberry Lough bog (Cranberry Lough pNHA, Co. Roscommon) |
| *Bog woodland (91D0) | WN7 | ECHR | EU HD Annex I | Clera Island Bog in Co. Roscommon (Clonboley Group) |
| *Petrifying springs with tufa formation (Cratoneurion) (7220) | FP1 | ECHR | EU HD Annex I | Derryarogue Island in Co. Roscommon (Mountdillon Works) |
| Atlantic salt meadows (*Glauco-Puccinellietalia*) (1330) | CM1/CM2 | ECHR | EU HD Annex I | Margins of Bangor-Ballycroy (Tullaghan Bay NHA, Co. Mayo) |
| Mediterranean salt meadows (*Juncetalia maritimi*) (1410) | CM2/CM2 | ECHR | EU HD Annex I | Margins of Bangor-Ballycroy (Tullaghan Bay NHA, Co. Mayo) |
| Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometea) (*important orchid sites) (6210) | GS1 | ECHR | EU HD Annex I | Likely to be present at Derryarogue Island in Co. Roscommon (Mountdillon Works) |
| * Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-padion, Alnion incarne, Salicion albae) (91E0) | WN4 | ECHR | EU HD Annex I | Potential to be present on some riparian zones (not recorded yet) |
| European dry heaths (4030) | HH1 | ECHR | EU HD Annex I | Present on some bog remnants |

* Priority habitat - habitat types in danger of disappearance and whose natural range mainly falls within the territory of the European Union (Commission of the European Communities 2003)

## Table 2.
## List of EU Habitats Directive Annex II species that have been found on Bord na Móna property to date.

| Species | National | International | Details |
|---|---|---|---|
| Soprano Pipistrelle (*Pipistrellus pygmaeus*) 1 | ECHR, RDB (LC) & WA | EU HD Annex IV & Bern (II) | Large bat roost at Bord na Móna works, Boora, (Co. Offaly), Activity noted at other locations. |
| Common Pipistrelle (*Pipistrellus pipistrellus*) | ECHR, RDB (LC) & WA | EU HD Annex IV & Bern (II) | Activity noted around Bord na Móna property (Co. Offaly). |
| Leislers Bat (*Nyctalus noctula*) | ECHR, RDB (NT) & WA | EU HD Annex IV & Bern (II) | Roost in the Derrygreenagh bog group with activity noted around other Bord na Móna properties (Co. Offaly). |
| Daubenton's Bat (*Myotis daubentonii*) | ECHR, RDB (NT) & WA | EU HD Annex IV & Bern (II) | Activity noted around Bord na Móna property (Co. Offaly). |
| Otter (*Lutra lutra*) | ECHR, RDB (NT) & WA | EU HD, Annexes II, IV & Bern (II) | Frequently seen within Lough Boora Parklands. Activity at several other sites, including Lullymore, Lullybeg, Mayo bogs and others. |
| Pine Marten (*Martes martes*) | ECHR, RDB (LC) & WA | EU HD, Annexes II, IV & Bern (II) | Signs recorded at most sites. |
| Irish Hare (*Lepus timidus hibernicus*) | ECHR, SAP, RDB (LC) & WA. | EU HB Annex V & Bern (II) | Frequent user of cutaway and production bog. Regularly seen. |
| Red Squirrel (*Sciurus vulgaris*) | RDB (NT) & WA | Bern (III) | Recorded at numerous sites in counties Roscommon, Galway, Offaly and Kildare. |
| Hedgehog (*Erinaceous europaeus*) | RDB (LC) & WA | Bern (II) | Observed in some midland cutaway sites (Likely to be regular user of the cutaway and production bog). |
| Badger (*Meles meles*) | RDB (LC) & WA | Bern (III) | Frequent user of cutaway, production bog and intact bogs. Signs regularly recorded. |
| Fallow Deer (*Dama dama*) | RDB (LC) & WA | Bern (III) | Frequent user of cutaway, production bog and intact bogs. |
| Red Deer (*Cervus elaphus*) | RDB (LC) & WA | | Frequently recorded in the Oweninny area. |
| **Amphibians and Reptiles** | | | |
| Common Frog (*Rana temporaria*) | RDB (II) & WA | EU HD, Annex V & Bern (II) | Frequent user of cutaway bog. Regularly recorded. |
| Common Newt (*Triturus vulgaris*) | RDB (LC), WA | | Recorded at Lough Boora Discovery Park (Turraun), Lullymore/Lullybeg |
| Viviparous Lizard (*Lacerta vivipara*) | RDB, WA | | Recorded at Lough Boora Parklands, Mayo bogs and intact bogs in Roscommon and Galway. |
| **Invertebrates** | | | |
| Marsh Fritillary (*Euphydryas aurinia*) | RS, VU | EU HD, Annex I | Butterfly species is using part of Lullybeg (Co. Kildare). Site managed by Butterfly Conservation Ireland, also located on a number of other sites across the midlands. |
| Large Heath (*Coenonympha tullia*) | RS, VU | EU HD, Annex I | Butterfly species using some areas of remnant raised bog. |
| Dingy Skipper (*Erynnis tages*) | RS, NT | EU HD, Annex I | Butterfly species using some cutaway sites, such as in Lough Boora Discovery Park. |
| White-clawed Crayfish (*Austropotamobius pallipes*) | | EU HD, Annex II | Observed in watercourses in cutaway peatlands and watercourses adjacent to intact peatlands. |
| **Fish** | | | |
| Brook lamprey (*Lampetra planeri*) | RDB (LC) | EU HD, Annex II | Found in watercourses adjacent to bogs in some midland sites. |
| European Eel (*Anguilla Anguilla*) | RDB (CR) | OSPAR[7] | Found in some streams and lakes. |

| Species | National | International | Details |
|---|---|---|---|
| **Plants** | | | |
| Basil thyme (*Acinos arvensis*) | FPO<br>RDB (VU) | | Plant of eskers in midlands.<br>Found at the Long Derries cSAC, Co. Offaly. |
| Blue Fleabane (*Erigeron acer*) | RDB (VU) | | Plant of eskers in midlands.<br>Recently recorded on disturbed glacial till and along railway embankments at cutaway bog sites in Co. Offaly. |
| Marsh Saxifrage (*Saxifraga hirculus*) | FPO<br>RDB (EN) | | Plant of wet bogs in west of Ireland. Recorded at Bellacorick Iron Flush (site owned by An Taisce). |
| Serrated Wintergreen (*Orthilia secunda*) | RDB (E) | | Only known population remaining in the Republic of Ireland at Ballydangan Bog, Co Roscommon. |
| Alder Buckthorn (*Frangula alnus*) | RDB (R) | | Plant of the edges of remnant raised bog, also found on some cutaway sites. |
| **Bryophytes** | | | *To be updated as ecology survey proceeds.* |

## Table 3.
## List of Bird species that have been found on Bord na Móna property to date.

| Common name | Latin name | Breeding [1] | Wintering | EU BRq Annex I | BoCCI | Notes [2] |
|---|---|---|---|---|---|---|
| **Mute Swan** | *Cygnus olor* | Y | Y | | Amber | Regular breeder on larger wetlands |
| **Bewick's Swan** | *Cygnus columbianus* | | Y | Y | Red | Recorded; now very rare |
| **Whooper Swan** | *Cygnus cygnus* | | Y | Y | Amber | Internationally and nationally important numbers occasionally counted on Blackwater bogs (Galway/Offaly) and in Boora Parklands and associated bogs such as Lullymore and Ballycon (Offaly) |
| **Bean Goose** | *Anser fabilis* | | Y | | | Rare winter visitor |
| **Pink-footed Goose** | *Anser brachyrhynchus* | | Y | | | Occasional winter visitor |
| **Greenland White-fronted Goose** | *Anser albifrons flavirostris* | | Y | Y | Amber | Occasional winter visitor |
| **Greylag Goose** | *Anser anser* | Y | Y | | Amber | Feral breeding population around Boora; genuine wild birds regularly with wintering Whooper Swans |
| **Canada Goose** | *Branta canadensis* | | Y | | | Occasional winter visitor |
| **Barnacle Goose** | *Branta leucopsis* | | Y | Y | Amber | Occasional winter visitor |
| **Shelduck** | *Tadorna tadorna* | | Y | | Amber | Rare winter visitor |
| **Wigeon** | *Anas penelope* | | Y | | Red | Regular winter visitor |
| **Gadwall** | *Anas strepera* | | Y | | Amber | Occasional winter visitor |
| **Teal** | *Anas crecca* | Y | Y | | Amber | Nationally important wintering numbers have been counted at Blackwater, Co. Offaly; scarce and localised breeder |
| **Green-winged Teal** | *Anas crecca carolinensis* | | | | | Vagrant – one Blackwater record |
| **Mallard** | *Anas platyrhynchos* | Y | Y | | | Nationally important wintering numbers occasionally recorded at Boora Parklands, Co. Offaly [3]. Common regular breeder. |
| **Pintail** | *Anas acuta* | | Y | | Red | Nationally important wintering numbers have been counted at Blackwater, Co. Offaly [3] |
| **Garganey** | *Anas querquedula* | | | | Amber | Rare passage migrant |
| **Shoveler** | *Anas clypeata* | S | Y | | Red | Regular winter visitor; possible breeder |
| **Pochard** | *Aythya ferina* | | Y | | Red | Regular winter visitor |
| **Tufted Duck** | *Aythya fuligula* | Y | Y | | Red | Regular, localised breeder; regular winter visitor |
| **Scaup** | *Aythya marila* | | Y | | Amber | Scarce winter visitor |

| Common name | Latin name | Breeding [1] | Wintering | EU BRq Annex I | BoCCI | Notes [2] |
|---|---|---|---|---|---|---|
| **Long-tailed Duck** | *Clangula hyemalis* | | | | Red | Rare visitor |
| **Goldeneye** | *Bucephala clangula* | | Y | | Red | Scarce winter visitor |
| **Smew** | *Mergus albellus* | | | Y | | Vagrant – one Leabeg record |
| **Red-breasted Merganser** | *Mergus serrator* | | | | | Scarce visitor |
| **Red Grouse** | *Lagopus lagopus hibernicus* | Y | Y | | Red | Resident breeder on intact bog remnants |
| **Grey Partridge** | *Perdix perdix* | Y | Y | | Red | Resident breeder at Boora |
| **Quail** | *Coturnix coturnix* | S | | | Red | Scarce summer visitor; not annual, but possible breeder |
| **Pheasant** | *Phasianus colchicus* | Y | Y | | | Common resident |
| **Great Northern Diver** | *Gavia immer* | | | | Amber | Scarce winter visitor |
| **Red-throated Diver** | *Gavia stellata* | | | | Amber | Scarce winter visitor |
| **Leach's Storm Petrel** | *Oceanodroma leucorhoa* | | | | Red | Rare Vagrant (one record from Boora) |
| **Cormorant** | *Phalacrocorax carbo* | Y | Y | | Amber | Regular visitor; non-breeding |
| **Little Egret** | *Egretta garzetta* | | Y | | | Regular visitor; non-breeding |
| **Grey Heron** | *Ardea cinerea* | Y | Y | | | Resident breeder |
| **Little Grebe** | *Tachybaptus ruficollis* | Y | Y | | Amber | Nationally important numbers occasionally recorded at Boora Parklands, Co. Offaly. Regular breeder confirmed |
| **Great Crested Grebe** | *Podiceps cristatus* | Y | Y | | Amber | Localised but regular breeder |
| **White-tailed Eagle** | *Haliaaeetus albicilla* | | Y | | Red | Rare winter visitor |
| **Red Kite** | *Milvus milvus* | | | | Amber | Scarce visitor |
| **Black Kite** | *Milvus migrans* | | | | | Rare Vagrant (one record from Tumduff) |
| **Marsh Harrier** | *Circus aeruginosus* | | | Y | Amber | Scarce passage migrant. Several birds have over-wintered at Boora Parklands in the past 10 years [6] |
| **Hen Harrier** | *Circus cyaneus* | Y | Y | Y | Amber | Regularly recorded throughout the year, included regular winter roosts. Breeding confirmed in C. Mayo. |
| **Montagu's Harrier** | *Cicus pygargus* | | | | | Rare Vagrant (one record from Tumduff) |
| **Sparrowhawk** | *Accipiter nisus* | Y | Y | | Amber | Widespread resident breeder |
| **Goshawk** | *Accipiter gentilis* | | | | Amber | Rare Visitor |
| **Buzzard** | *Buteo buteo* | Y | Y | | | Widespread resident breeder |
| **Osprey** | *Pandion haliaetus* | | | Y | | Rare passage migrant |
| **Kestrel** | *Falco tinnunculus* | Y | Y | | Amber | Widespread resident breeder |
| **Hobby** | *Falco subbuteo* | | | | | Rare visitor |
| **Red-footed Falcon** | *Falco vespertinus* | | | | | Rare Vagrant (one record at Timahoe) |
| **Merlin** | *Falco columbarius* | S | Y | Y | Amber | Scarce but regular winter visitor; breeding in some sites suspected |
| **Peregrine Falcon** | *Falco peregrines* | S | Y | Y | | Regular visitor; breeding suspected |
| **Water Rail** | *Rallus aquaticus* | Y | Y | | | Localised but regular breeder |
| **Moorhen** | *Gallinula chloropus* | Y | Y | | | Widespread resident breeder |
| **Coot** | *Fulica atra* | Y | Y | | Amber | Scarce, but possible breeder |
| **Common Crane** | *Grus grus* | | | Y | | Vagrant – recorded at Leabeg and Ballycon |
| **Black-winged Stilt** | *Himantopus himantopus* | | | | | Rare Vagrant (one record from Finnamores) |
| **Oystercatcher** | *Haematopus ostralegus* | | Y | | Amber | Scarce winter visitor |
| **Ringed Plover** | *Charadrius hiaticula* | Y | Y | | Amber | Localised but regular breeder |
| **Golden Plover** | *Pluvialis apricaria* | S | Y | Y (breeding) | Red | Nationally important wintering numbers occasionally recorded at Boora Parklands, Co. Offaly; breeding suspected in Co. Mayo |
| **American Golden Plover** | *Pluvialis dominica* | | | | | Vagrant – one Blackwater record |
| **Grey Plover** | *Pluvialis squatarola* | | Y | | Amber | Rare winter visitor |
| **Lapwing** | *Vanellus vanellus* | Y | Y | | Red | Nationally important wintering numbers occasionally recorded at Boora Parklands, Co. Offaly [3]. Also recorded at Lullymore (breeding). Localised but regular breeder |

| Common name | Latin name | Breeding [1] | Wintering | EU BRq Annex I | BoCCI | Notes [2] |
|---|---|---|---|---|---|---|
| **Knot** | *Calidris canutus* | | | | Amber | Scarce passage migrant |
| **Sanderling** | *Calidris alba* | | | | | Scarce passage migrant |
| **Little Stint** | *Calidris minuta* | | | | | Scarce passage migrant |
| **Temminck's Stint** | *Calidris ferruginea* | | | | | Vagrant – one Turraun record |
| **Dunlin** | *Calidris alpine* | S | Y | Y (Breeding population) | Red | Regular passage migrant and scarce winter visitor; breeding possible in Co. Mayo |
| **White-rumped Sandpiper** | *Calidris fuscicollis* | | | | | Rare vagrant (one record from Boora Lake) |
| **Long-billed Dowitcher** | *Limnodromus scolopaceus* | | | | | Rare vagrant (one record from Boora Lake) |
| **Ruff** | *Philomachus pugna* | | Y | Y | Amber | Scarce passage migrant and winter visitor |
| **Jack Snipe** | *Lymnocryptes minimus* | | Y | | Amber | Scarce winter visitor |
| **Snipe** | *Gallinago gallinago* | Y | Y | | Amber | Widespread resident breeder reinforced by migratory winter visitors |
| **Woodcock** | *Scolopax rusticola* | Y | Y | | Red | Localised but regular breeder; winter visitor |
| **Black-tailed Godwit** | *Limosa limosa* | | Y | Y | Amber | Scarce passage migrant and winter visitor |
| **Whimbrel** | *Numenius phaeopus* | | | | | Passage migrant |
| **Curlew** | *Numenius arquata* | Y | Y | | Red | Scarce and localised breeder; regular winter visitor |
| **Common Sandpiper** | *Actitis hypoleucos* | Y | Y | | Amber | Localised but regular breeder |
| **Green Sandpiper** | *Tringa ochropus* | | Y | | | Passage migrant |
| **Spotted Redshank** | *Tringa erythropus* | | Y | | Amber | Passage migrant |
| **Greenshank** | *Tringa nebularia* | | Y | | | Passage migrant |
| **Redshank** | *Tringa totanus* | Y | Y | | Red | Localised but regular breeder |
| **Lesser Yellowlegs** | *Tringa flavipes* | | | | | Rare Vagrant (two records at Clongawny) |
| **Red-necked Phalarope** | *Phalaropus lobatus* | | | Y | Red | Very rare but possible breeder |
| **Grey Phalarope** | *Phalaropus fulicarius* | | | | | Vagrant – one Derries record |
| **Black-headed Gull** | *Larus ridibundus* | Y | Y | | Red | Regular but localised breeder; occasional winter visitor |
| **Common Gull** | *Larus canus* | Y | Y | | Amber | Very scarce breeder. |
| **Lesser Black-backed Gull** | *Larus fuscus* | | Y | | Amber | Occasional, non-breeding visitor |
| **Herring Gull** | *Larus argentatus* | | Y | | Red | Occasional, non-breeding visitor |
| **Great Black-backed Gull** | *Larus marinus* | | Y | | Amber | Occasional, non-breeding visitor |
| **Kittiwake** | *Rissa tridactyla* | | | | Amber | Rare visitor |
| **Black Tern** | *Chlidonias niger* | | | | | Rare Vagrant (one record from Drinagh) |
| **Arctic Tern** | *Sterna paradisaea* | | | | Amber | Rare visitor |
| **Common Tern** | *Sterna hirundo* | | | | Amber | Occasional, non-breeding visitor |
| **Stock Dove** | *Columba oenas* | Y | Y | | Amber | Scarce and localised resident breeder |
| **Wood Pigeon** | *Columba palumbus* | Y | | | | Common and widespread resident |
| **Collared Dove** | *Streptopelia decaocto* | | | | | Resident |
| **Cuckoo** | *Cuculus canorus* | Y | | | | Localised but regular breeder |
| **Barn Owl** | *Tyto alba* | Y | | | Red | Scarce and localised resident; breeding possible |
| **Snowy Owl** | *Bubo scandiacus* | | | | | Vagrant – one Clonbonny record |
| **Long-eared Owl** | *Asio otus* | Y | Y | | | Localised but regular breeder |
| **Short-eared Owl** | *Asio flammeus* | | Y | Y | Amber | Scarce winter visitor |
| **Swift** | *Apus apus* | | | | Amber | Summer visitor; breeding possible |
| **Kingfisher** | *Alcedo atthis* | S | Y | Y | Amber | Occasionally recorded on cutaway sites (Turraun, Ballycon, Lullymore in Co. Offaly, Drumman, Co. Westmeath & Milkernagh, Co. Longford) |
| **Magpie** | *Pica pica* | Y | Y | | | Common and widespread resident |
| **Jay** | *Garrulus glandarius* | Y | Y | | | Recorded |
| **Jackdaw** | *Corvus monedula* | Y | Y | | | Common and widespread resident |
| **Rook** | *Corvus frugilegus* | Y | Y | | | Common and widespread resident |
| **Hooded Crow** | *Corvus corone cornix* | Y | Y | | | Common and widespread resident |

| Common name | Latin name | Breeding [1] | Wintering | EU BRq Annex I | BoCCI | Notes [2] |
|---|---|---|---|---|---|---|
| **Raven** | *Corvus corax* | Y | Y | | | Common and widespread resident |
| **Goldcrest** | *Regulus regulus* | Y | Y | | Amber | Common and widespread resident |
| **Blue Tit** | *Parus caeruleus* | Y | Y | | | Common and widespread resident |
| **Great Tit** | *Parus major* | Y | Y | | | Common and widespread resident |
| **Coal Tit** | *Parus ater* | Y | Y | | | Common and widespread resident |
| **Skylark** | *Alauda arvensis* | Y | Y | | Amber | Common and widespread resident |
| **Sand Martin** | *Riparia riparia* | S | | | Amber | Common and widespread summer visitor; large migratory roosts in reedbeds |
| **Swallow** | *Hirundo rustica* | Y | | | Amber | Common and widespread summer visitor |
| **House Martin** | *Delichon urbica* | Y | | | Amber | Common and widespread summer visitor |
| **Long-tailed Tit** | *Aegithalos caudatus* | Y | Y | | | Common and widespread resident |
| **Chiffchaff** | *Phylloscopus collybita* | Y | Y | | | Common and widespread summer visitor; occasional winter visitor |
| **Willow Warbler** | *Phylloscopus trochilus* | Y | | | | Common and widespread summer visitor |
| **Blackcap** | *Sylvia atricapilla* | Y | Y | | | Common and widespread summer visitor; occasional winter visitor |
| **Whitethroat** | *Sylvia communis* | Y | | | | Common and widespread summer visitor |
| **Grasshopper Warbler** | *Locustella naevia* | Y | | | Amber | Localised but regular breeder |
| **Sedge Warbler** | *Acrocephalus schoenobaenus* | Y | | | | Common and widespread summer visitor |
| **Treecreeper** | *Certhia familiaris* | Y | Y | | | Common and widespread resident |
| **Wren** | *Troglodytes troglodytes* | Y | Y | | | Common and widespread resident |
| **Starling** | *Sturnus vulgaris* | Y | Y | | Amber | Common and widespread resident |
| **Blackbird** | *Turdus merula* | Y | Y | | | Common and widespread resident |
| **Fieldfare** | *Turdus pilaris* | | Y | | | Common winter visitor |
| **Song Thrush** | *Turdus philomelos* | Y | Y | | | Common and widespread resident |
| **Redwing** | *Turdus iliacus* | | Y | | | Common winter visitor |
| **Mistle Thrush** | *Turdus viscivorus* | Y | Y | | Amber | Common and widespread resident |
| **Spotted Flycatcher** | *Muscicapa striata* | Y | | | Amber | Common and widespread summer visitor |
| **Robin** | *Erithacus rubecula* | Y | Y | | Amber | Common and widespread resident |
| **Whinchat** | *Saxicola rubetra* | Y | | | Red | Very rare summer visitor |
| **Stonechat** | *Saxicola torquata* | Y | Y | | Amber | Common and widespread resident |
| **Wheatear** | *Oenanthe oenanthe* | Y | | | Amber | Regular passage migrant; very rare breeder |
| **Dunnock** | *Prunella modularis* | Y | Y | | | Common and widespread resident |
| **House Sparrow** | *Passer domesticus* | Y | Y | | Amber | Common and widespread resident |
| **Grey Wagtail** | *Motacilla cinerea* | Y | Y | | Red | Common and widespread resident |
| **Pied Wagtail** | *Motacilla alba* | Y | Y | | | Common and widespread resident |
| **White Wagtail** | *Motacilla alba ssp. alba* | | | | | Scarce passage migrant |
| **Meadow Pipit** | *Anthus pratensis* | Y | Y | | Red | Common and widespread resident |
| **Chaffinch** | *Fringilla coelebs* | Y | Y | | | Common and widespread resident |
| **Brambling** | *Fringilla montifringilla* | | Y | | | Scarce winter visitor |
| **Greenfinch** | *Carduelis chloris* | Y | Y | | Amber | Common and widespread resident |
| **Goldfinch** | *Carduelis chloris* | Y | Y | | | Common and widespread resident |
| **Linnet** | *Carduelis cannabina* | Y | Y | | Amber | Common and widespread resident |
| **Redpoll** | *Carduelis flammea* | Y | Y | | | Common and widespread resident |
| **Crossbill** | *Loxia curvirostra* | Y | Y | | | Scarce resident and winter visitor |
| **Bullfinch** | *Pyrrhula pyrrhula* | Y | Y | | | Common and widespread resident |
| **Yellowhammer** | *Emberiza citrinella* | Y | Y | | Red | Scarce resident |
| **Reed Bunting** | *Emberiza schoeniclus* | Y | Y | | | Common and widespread resident |

[1] Y indicates breeding confirmed, S indicates breeding probable.

[2] List compiled using records from Crowe (2005), Copland (2010a,b), Heery (2009) and internal Bord na Móna records. List likely to expand in future as more records are accumulated.

[3] Data from Crowe (2005).

[4] Data from Copland (2010a).

[5] Data from Copland (2010b) (Mayo).

[6] Data from Heery (2009).

[7] OSPAR Convention for the protection of the marine environment of the North-east Atlantic [1992]

# Notes

Back cover photos:
Main image:
Whooper Swans.
Bottom row:
Lapwing eggs and nest; Devil's- Bit Scabious; Great Sundew and Lesser Bladderwort in bog pool.



Species-rich grassland in the Sculpture Park at Lough Boora.

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# APPENDIX 4-14

***Silt Control Study– Internal Bord na Móna Report 1984***

Meamram

# Bord na Móna

| Don Manager: Coolnagun | On Chief Engineer (Civil Division) | |
|---|---|---|
| Do tag. | Ar dtag. | Ábhar | Dáta |
| | HCF/SG | SILT CONTROL | 5.1.1984 |
| Tuairgear an uimhir tagartha | | | |

As you are aware the Board has been engaged for several years in the development of a system of silt control involving the construction and maintenance of a large number of silt traps in order to reduce to an acceptable level the silt content of effluent discharged from our bogs and factories.

Silt control has now become an essential and an integral part of our drainage designs and while considerable progress has been made, the system is by no means perfect and we must continue to seek improvements in both the economics and the effectiveness of silt reduction.

The attached study, complied by Mr. Hannon, Civil Works, Head Office, considers the question in some depth and attempts to evaluate the costs involved in various possible methods of controlling silt discharge.

I will be glad to receive any suggestions you may wish to make.

E. C. Hand

Chief Engineer
(Civil Division)

Bord na Móna
Coolnagun
DATE REC'D. -6 JAN 1984
FOR ATTENTION

BORD NA MONA

CIVIL ENGINEERING DIVISION

BORD na MÓNA
COOLNASUN
DATE REC'D. -6 JAN1984
FOR ATTENTION

# Silt Control Study

## No. 1

G. Hannon,
Civil Works Section,
Head Office.

December 1983.

BORD NA MÓNA
COOLNASUN
DATE RECD. 06 JAN 1984
FOR ATTENTION

# INTRODUCTION

The objective of this report is to establish a framework for rationalisation of silt control and thereby provide a sound basis for discussion prior to making firm decisions.

It attempts also to highlight the areas where policy decisions are needed.

Comments and criticisms would be appreciated.

# I N D E X

## Introduction

Chapter


1 Quantity and Relevant Characteristics of Suspended Solids and Settled Sludge.

2 Design of Settlement Systems - General.

3 Possible Silt Control Systems Description and Comparison.

4 Comparison of Expenditure Present system - visualised systems.

5 Conclusions and Recommendations

Appendices

Figures

Graphs.

# CHAPTER I

## Quantity and Relevent Characteristics of Suspended Solids and Settled Sludge

1.1 This chapter deals with the quantity and characteristics of suspended peat solids and peat sludge relevant to silt control.

This will show:-

1. The scale of the silt control operation required to produce effluent of acceptable suspended solids concentration. *Ref Appendix I.

2. The basic principles of producing acceptable effluent, common to all feasible methods of silt control.

1.2 Quantity of Suspended Solids and Settled Sludge

Before any investigation or comparison as to the feasibility of solving the silt problem it is of course essential to estimate the quantity of silt to be dealt with.

In trying to assess finitely the capacity requirement of any type of trapping system it is imperative to be able to relate:-

1. Runoff and Rainfall.
2. Runoff and suspended solids concentration.

/.....

1.3 The problem of identifying these relationships under realistic conditions in the case of milled peat bogs are many, the main ones being:-

1. The runoff factor for other land conditions is generally quoted as a single number ranging between zero and unity. The runoff factor for milled peat bogs will have a range of values depending on the bog condition.

2. The suspended solids concentration of the runoff will be effected by machine activity especially ditching and the degree to which the concentration is effected will depend on the intensity of the machine activity and period over which it is carried out relative to sampling time.

1.4 Electronic equipment to continuously monitor flow and associated suspended solids concentration upstream and down-stream of pond system at specified intervals has been installed at settlement ponds at Culliagh (Blackwater Works) June 1983.

Examination of the results plotted by the flow monitoring device has verified the fact that the runoff factor is more complex than the normal land runoff factor, the former being a function of bog conditions and rainfall as distinct from the more optimistically hoped for dependence of runoff on rainfall with identifiable distortions due to machine activity, bog condition etc.

/.....

It is to be noted, however, that the rainfall for June, July and August (1983) was low. This meant in effect that water flowing to drains from the water table accounted for a much larger percentage of runoff flow than is normal and hence aided in rendering the distortions due to machine activity and bog conditions unidentifiable.

The suspended solids concentrations recorded were also generally very low and when compared with normal suspended solids concentrations previously recorded are not found to be truly representative.

1.5 To summarise: Testing so far has established:

1. Concentration of suspended solids varies with flow but not directly, generally when flow rate is high the suspended solids concentration is high, the converse being true also.

2. Runoff factor is not readily determinable. The effects of bog condition on runoff factor is much greater than appreciated.

1.6 The following points should be considered at this stage

1. The runoff 'equation' (as distinct from factor) will involve a large number of parameters.

2. The use of the runoff equation to determine the sludge capacity requirement of a silt trapping system would require accurate forward planning of ditching and other machine activities which would introduce many non finite elements and estimates of very doubtful reliability.

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3. The ultimate aim at this point is to relate quantity of suspended solids inflowing to trapping system to volume required for their storage. This introduces an even more illusive parameter i.e. the moisture content of settled sludge.

The points listed above are confirmed by the mathematical model and associated graph. *Ref. Appendix 2.

1.7 It is justifiable to conclude from the latter that when considering the question of sludge capacity required, neither a finite answer nor the answer's parish can be found by theoretical methods, since the variables involved can be identified but defy analysis.

The only value of the theoretical model in this case is to provide a structure for analysis of observed results.

1.8 As a result of the above conclusions we must rely heavily on experience. In this we are fortunate in that silt pond behaviour as observed by Blackwater staff suggests.

1. 1 acre produces approximately 525 $ft^3$ of sludge 4 times per year.

2. Ponds may fill within as little as a fortnight after ditching.

To state somewhat differently ponds require cleaning once every 4 months on average and once after ditching i.e. 4 times yearly.

/.....

1.9 This result may be extended to all silt trapping systems and stated generally as follows:-

1 acre produces 525 $ft^3$ of sludge 4 times yearly

The result above is used throughout the remainder of this report as the basis for silt pond/lagoon sizing.

1.10 On examination of this estimate for sludge capacity calculations *(Ref. Appendix 3) show that the equivalent of approximately 152,000 tonnes of peat at 55% moisture content are lost every year from milled peat areas.

1.11 Characteristics of suspended solids and settled sludge relevant to silt control

The following facts were established by the Laboratoire Central D'Hydraulique de France:-

1. Significant settling of peat solids from suspension occurs only when mean velocity of flow is less than 0.15 to 0.17 m/s.

2. Specific gravity of dry suspendable peat particles is in the range 1.02 to 1.04.

3. Peat sludge has no measurable cohesion and resistance to current results only from interlocking of peat fibres and not from any initial rigidity or from the viscosity of the deposits such as can be noticed in silty sediments.

/.....

1.12 The points above have many implications, the most important of which are:- *Ref. Appendix 4.

1. To allow peat solids to settle from suspension during normal flow conditions we require:-

   Ratio cross sectional area of flow in trapping system to cross sectional area flow in outfall = 8.0 minimum.

2. To allow peat solids to settle from suspension during periods of heavy flow we require:-

   Ratio cross sectional area of flow in trapping system to cross sectional area flow in outfall = 13 minimum.

3. From examples 1 and 2 when channel established through surface of sludge in trapping system, no settlement is taking place.

4. A 25 ft. wide pond with depth of flow 6 inches can at most cater for an outfall with a cross sectional area of 1.5 $m^2$ during normal flow conditions.

5. To install an efficient trapping system on a large outfall or small river of dimension 8 ft. wide with 1 ft. depth of flow during normal flow conditions, the minimum width requirement for the trapping system is 66 ft. (therefore it is inefficient if not pointless to install 27 ft. wide ponds on small rivers or large outfalls.

/.....

6. Since cohesion negligible settled sludge can only be protected from resuspension by maintaining quiescent conditions more specifically by protecting settled sludge from flooding from downstrean and heavy flows from upstream.

7. It is incorrect to compare the estimate of silt sludge produced 525 $ft^3$/acre/ 3 months with the quantity of silt which settles on river banks, farmers drains etc. where no trapping systems exist since the settling conditions are not ideal and therefore it can be said that the silt which settles on river banks etc. is only a small fraction of the actual settleable suspended solids in our outfalls.

/.....

## CHAPTER 2

## DESIGN OF TRAPPING SYSTEMS - GENERAL

2.1 This chapter deals generally with the efficient design of trapping systems.

2.2 Those involved in the location and design of treatment systems for outfalls discharging to external receiving waters are confronted by many faits accomplis adversely effecting their efforts or at least restricting their choices.

2.3 The major constraint is imposed by the fact that drainage systems are already in existance prior to consideration of silt control systems. The former generally involved getting water off the bog as quickly and as easily as possible.

2.4 Any system of silt trapping depends to a large extent on general ground level in the area of the outfall. Very often the general ground level is not suitable and is rarely ideal. Particular difficulty in choosing a silt trapping location arises where lands are susceptible to flooding.

2.5 In brief the designer often finds himself inhibited by:-

1. The efforts of his predecessor regarding drainage systems and a tendency to arrange production areas to follow the bog edge as closely as possible.

2. The efforts of his contemporary engaged in production whose immediate objective is to maximise production and minimise production costs.

/.....

2.6 At this stage some general design principles which are common to all forms of silt trapping system will be considered.

2.7 Given that the designer often finds himself in an undesirable situation due to the already existing outfall system it would be non practical to recommend generally the alteration of the bog drainage system to suit the desires of those involved in the installation of silt trapping systems as the work involved would be cost prohibitive and in many cases technically impossible.

It may be possible, however, in certain cases to rearrange drainage systems. This possibility should be examined when individual outfalls are being examined e.g. Bloomhill - Blackwater Works.

2.8 Bearing in mind that our efforts are aimed at treating bog drainage waters the temptation to treat intermediate receiving waters should be avoided if at all possible. * Ref. 1.12.

2.9 In some cases silt trapping systems have been located below flood level. Bearing in mind the ease with which settled silt may be disturbed *Ref. 1.12 it can be said that any system which is to be located below flood level must be protected by an embankment or other protection device e.g. one-way valve. **Ref. Appendix 5. Failing this approach it might well be better from the silt control point of view to neglect the installation of a trapping system rather than to install an 'unprotected' system. The reasoning being as follows: On an unprotected outfall, water with high suspended solids concentration discharges to receiving waters. However, to install a trapping system which collects peat silt and subsequently allows the silt to be discharged in bulk during periods of flooding is a step in the wrong direction.

/.....

2.11 The ease with which settled silt can be re-suspended and washed out of a trapping system must not be underestimated, e.g. Blackwater Works - Clonfert Bridge - Agricultural land damaged due to washing out of ponds by flood back up.

2.12 Bypassing of trapping system during periods of heavy rainfall involves the allowed discharge of untreated bog drainage water to receiving waters. Due to the ease with which deposited silt may be resuspended and washed out by heavy flows the work done by a silt trapping system since its previous cleaning may be completely undone. This said, we may conclude that bypassing during periods of heavy rainfall is the lesser of two evils (e.g. Blackwater Works - Clonascra Bog - ponds which were approaching full August 12th 1983 - empty August 20th 1983 following heavy rainfall August 15th 1983).

2.13 There are five methods of providing bypasses to be considered. *Ref. Appendix 6. The most practical method involves bypassing using a weir or pipe, the invert level of which is the same as that of the pipe at inlet to trapping system. During normal flow conditions (flows which allow settled silt to remain out of suspension) the pipe or weir would be closed; During periods of heavy flow the pipe forming inlet to trapping system would be closed and the bypass pipe opened.

2.14 Distribution of flow over complete settling system area:- Present practice involves feeding ponds directly from outfalls by means of open channel or piping. The flow therefore, in the initial stages of the pond is changing from outfall velocity to velocity at full pond cross sectional area. This has a number of adverse effects:-

/.....

(a) The settling area is not used to full advantage since flow velocity not below critical 'settling velocity' of 0.15 m/s in initial stages of pond.

(b) Wash out due to runoff encouraged.

(c) Channelling rendering pond ineffective is encouraged.

2.15 If the excavation of settlement ponds is to be continued the following modification should be considered.

By allowing walls running the full width of the pond to remain unexcavated the advantages would be as follows:- *Ref. Appendix 7.

(a) Channelling would be discouraged.

(b) In the event of disturbance due to high velocities caused by heavy flows shelter would be provided for settled particles below the top level of wall since velocity increase would mainly be above this level.

(c) In the event of ponds being cleaned by sludge pump these walls would simplify double pumping if such were necessary.

2.16 If weirs are to be used for purposes outlined in 2.15 they should run full width of pond and hence force water to <u>flow over</u> them. Walls which stop short will not be effective since if velocity increased at depth the effect of the wall is negatived.

/.....

2.17 Cleaning of Ponds by (a) Excavators (b) Pumping and (c) Others

(a) Present practice involves the use of excavators in cleaning ponds (generally hymac/dragline).

For any Works with its full compliment of silt ponds the main requirements are as follows:-

Due to large number of ponds at different locations requiring frequent cleaning and the nature of the material to be handled excavators are required which are fast moving, fast working and non violent. This said it is clear that the dragline excavator (being the most slow moving, violent and unreliable of the Board's excavators) is far from being the ideal machine for the task.

Hence, if the excavation of silt ponds is to be continued all future ponds should be excavated in accordance with the capabilities of the standard hymac under the prevailing ground conditions.
*Ref. Appendix 8.

Many ponds exist whose widths are excessive for cleaning by hymac. Bearing in mind the backlog of proposed ponds to be excavated, no attempt should be made at present to alter these ponds so as to render them independent of dragline maintenance as this would be premature Lilly Guilding.

Recycling of silt accumulated in ponds and subsequently emptied by excavators has two major problems which make it impracticable.

(i) Practice among excavator drivers is to continue digging until subsoil is excavated, hence, the excavated material contains subsoil.

(ii) No economic method of moving excavated material to production fields exists.

(b) The sludge pump presently under development while not fully tested may well prove to be the most economic longterm approach to the problem. The system may be briefly described as follows. A pump, incorporating an agitator and powered by a tractor, pumps agitated sludge from pond to production field or waste ground. The sludge filled drains are subsequently ditched and the sludge is left to dry. The system is as yet in the development stage.

(c) Work carried out in England on sewage involving the formation of cylindrical blocks has met with much success and praise. We are presently examining the applicability of this method to our particular problem.

2.18 Silt Pond Cross Section

The factors effecting design are as follows.

(a) Capabilities of hymac
(b) Capabilities of sludge pump
(c) Nature of bog regarding excavation
(d) Maximisation of volume available for sludge retention.
(e) Reduction of flow velocity.

Present practice involves digging ponds of almost vertical side slopes to an overall depth of approximately 7 feet so as to provide 3.5 ft. depth below invert level inlet. While excavation to a depth of 7 ft. may seem excessive in bog conditions it must be remembered that the effective depth should be measured between water surface and general ground level i.e. approx. 3.5 ft. and hence stability is not critical *(Ref. Appendix 8) therefore the use of 1 : 1 side slopes is unwarranted along with being capacity reducing.

# CHAPTER 3

## Possible Silt Control System

## Description and Comparison

3.1 Many different silt trapping systems have been discussed and written about individually.

This chapter describes and compares these systems.

3.2 The various approaches visualised may be divided into three main categories:-

A. Systems involving excavation and maintenance of settlement ponds only.

B. Systems involving provision and maintenance of lagoons only.

C. Composites of A, B.

/.....

3.3 Expanding:

| | | |
|---|---|---|
| A | A1 | Excavate ponds - clean by excavator - Rehandle spoil when dumping of new spoil becomes a problem. |
| | A2 | Excavate ponds - clean using sludge pump, pumping sludge to production area - ditch drains as required. |
| | A3 | Excavate ponds - clean using sludge pump to waste ground. |
| B | B1 | Construct lagoon - full bog lifespan capacity - abandon when full. |
| | B2 | Construct lagoon - partial bog lifespan - abandon when full and repeat. |
| C | C1 | Excavate ponds - gravity fed - form embankments from spoil to retain remaining year's sludge. |

3.4 Comparison of the various systems is complicated by the following:

1. Undefined present and future commitment with regard to expenditure on silt control.

2. Some of the methods to be compared are as yet untested or being tested.

The following realistic assumption will be made to allow comparison aimed at identifying the optimal solution:-

/.....

The optimal economic solution based on criterion of treating all outfalls so as to produce effluent of acceptable suspended solids concentration will remain the optimal solution following compromise between

1. Board policy's definition of 'reasonable expenditure'.

2. Expenditure required to produce effluent of acceptable suspended solids concentration.

3.5 In attempting to identify the optimal solution it is essential to compare like with like.

3.6 If at this stage one considers in detail the conditions prevailing at each outfall location the problem becomes indeterminate to a very high degree.

3.7 Bearing in mind the variation in nature and cost of land and often times inability to acquire the exact amount of land required without surplus the costing of land for silt ponds will be ignored during the comparison. The cost of land area required for 'lagoons' over and above the area of land required for silt ponds will be considered. The costing of this land will involve the use of an 'average cost' value. Error incurred due to surplus land will be regarded as insignificant due to the large areas required.

3.8 In the comparison stage the amount of excavation already carried out will not be considered. This is justified by the fact that existing ponds are full and hence require cleaning and spoil removal roughly equivalent to initial excavation.

/.....

3.9 The order of optimality for catchment sizes of 100, 300 and 600 acres (i.e. small, medium, large catchments) will be sought. This in turn will be applied to the outfall system at a particular Works to calculate the minimum overall cost of silt control at that Works.

3.10 The patterns of expenditure for each system applied to small, medium and large catchment sizes (i.e. 100, 300 and 600 acres) are tabulated in the following pages. The associated graphs shows a comparison between the pattern of expenditure of each system for each catchment size over a period including initialisation and subsequent 20 years.

3.11 The initialisation period is as yet undefined. For graphical purposes it is represented as one year but the implications of a longer initialisation period may be easily calculated.

/.....

3.12 For Calculations and Assumptions relating to Costing reference the following appendices:-

| Appendix No. | |
|---|---|
| 9 | Number of years before spoil rehandling essential (A1, C1). |
| 10 | Hymac hours required for pond cleaning, spoil rehandling and initial excavation (A1, A2, A3, C1). |
| 11 | Sludge pump hours required/acre/ year (A2, A3). |
| 12 | Ratio Hymac hours to sludge pump hours required for maintenance. |
| 13 | Area over which spoil to be spread and ditching hours required (A2, A3). |
| 14 | Quantity of peat recycled by sludge pumping (A2) |
| 15 | Area required for lagoon - general (B1, B2, C1). |
| 16 | Number of years spoil to produce embankment to serve remaining lifespan (C1). |
| 17 | Lagoon construction (B1, B2). |
| 18 | Initial cost adjustment for cases in which flood embankments necessary (A1, A2, A3, C1). |
| 19 | Cost of machine hours (A1,A2,A3, B1, B2, C1).<br>Cost of land<br>Profit per tonne of peat |
| 20 | Cost of pump installation and maintenance. |

The following abreviations are used:

Hymac Hours ..... HHrs
Sludge Pump Hours . SPHrs
Ditcher Hours ..... DHrs.

/.....

3.13 METHOD A1 Excavate ponds - clean by excavator. Rehandle spoil when dumping of new spoil becomes a problem.

| Year | | Catchment (Acres) | | |
|---|---|---|---|---|
| | | 100 | 300 | 600 |
| Initialisation | Excavate (HHrs) | 78 | 234 | 468 |
| 1 | Cleaning (HHrs) | 156 | 468 | 936 |
| 2 | do. | 156 | 468 | 936 |
| 3 | do. | 156 | 468 | 936 |
| 4 | do. | 156 | 468 | 936 |
| 5 | do. | 156 | 468 | 936 |
| | Rehandle (HHrs) | 130 | 390 | 780 |
| 6 | Cleaning | 156 | 468 | 936 |
| 7 | do. | 156 | 468 | 936 |
| 8 | do. | 156 | 468 | 936 |
| 9 | do. | 156 | 468 | 936 |
| 10 | do. | 156 | 468 | 936 |
| | Rehandling (HHrs) | 130 | 390 | 780 |
| 11 | Cleaning | 156 | 468 | 936 |
| 12 | do. | 156 | 468 | 936 |
| 13 | do. | 156 | 468 | 936 |
| 14 | do. | 156 | 468 | 936 |
| 15 | do. | 156 | 468 | 936 |
| | Rehandling (HHrs) | 130 | 390 | 780 |
| 16 | Cleaning | 156 | 468 | 936 |
| 17 | do. | 156 | 468 | 936 |
| 18 | do. | 156 | 468 | 936 |
| 19 | do. | 156 | 468 | 936 |
| 20 | do. | 156 | 468 | 936 |

Allowance made in cost comparison for cases in which flood embankments necessary.

/.....

3.14 METHOD A2

Excavate ponds - clean using sludge pump. Pump sludge to production area - ditch drains as required.

| Year | | Catchment (Acres) | | |
|---|---|---|---|---|
| | | 100 | 300 | 600 |
| Initialisation | Excavate | 78 | 234 | 468 |
| 1 | Sludge Pump (SPHrs) | 74 | 222 | 444 |
| | Ditching (DHrs) | 135 | 405 | 810 |
| | *Tonnes Produce (T) | 190.5 | 571.5 | 1143 |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |
| 6 | | | | |
| 7 | | | | |
| 8 | | | | |
| 9 | | | | |
| 10 | (As per year 1) | | | |
| 11 | | | | |
| 12 | | | | |
| 13 | | | | |
| 14 | | | | |
| 15 | | | | |
| 16 | | | | |
| 17 | | | | |
| 18 | | | | |
| 19 | | | | |
| 20 | | | | |

*Tonnes Produce @ 55% M.C.

Allowance made in cost comparison for cases in which flood embankments necessary.

3.15 METHOD A3 Excavate Ponds - clean using sludge pump to waste ground.

| Year | | Catchment (Acres) | | |
|---|---|---|---|---|
| | | 100 | 300 | 600 |
| Initialisation | Excavate (HHrs) | 78 | 234 | 468 |
| | Acquire Area Spreading $ft^2$ | 210,000 | 630,000 | 1,260,000 |
| | Acres | 4.82 | 14.46 | 28.93 |
| 1 | Sludge Pumping | 74 | 222 | 444 |
| 2 | AS PER YEAR 1 | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |
| 6 | | | | |
| 7 | | | | |
| 8 | | | | |
| 9 | | | | |
| 10 | | | | |
| 11 | | | | |
| 12 | | | | |
| 13 | | | | |
| 14 | | | | |
| 15 | | | | |
| 16 | | | | |
| 17 | | | | |
| 18 | | | | |
| 19 | | | | |
| 20 | | | | |

3.16 METHOD B1 Construct Lagoon - full bog lifespan capacity - abandon when full.

| Year | | Catchment (Acres) 100 | 300 | 600 |
|---|---|---|---|---|
| Initialisation | Construct Embankment (HHrs) | 922 | 1,596 | 2,257 |
| | Install Pump (IR£) | 25,000 | 32,000 | 47,000 |
| | Acquisition/ Designation $ft^2$ | 403,128 | 1, 097,592 | 2,105,832 |
| 1 | Pump Maintenance | 1,000 | 2,000 | 4,500 |
| 2 | | " | " | |
| 3 | | " | | |
| 4 | | " | | |
| 5 | | " | | |
| 6 | | " | | |
| 7 | | " | | |
| 8 | | " | | |
| 9 | | As Per Year 1 | | |
| 10 | | " | | |
| 11 | | " | | |
| 12 | | " | | |
| 13 | | " | | |
| 14 | | " | | |
| 15 | | " | | |
| 16 | | " | | |
| 17 | | " | | |
| 18 | | " | | |
| 19 | | " | | |
| 20 | | 1,000 | 2,000 | 4,500 |

*Test for Optimality Required - Irrespective of silt control; pump may be necessary for drainage purposes.

3.17 METHOD B2 Construct Lagoon - partial bog lifespan capacity* - Abandon when full - repeat

*Partial Bog Lifespan = 5 years

| Year | | Catchment (Acres) 100 | 300 | 600 |
|---|---|---|---|---|
| Initialisation | Construct Embankment (HHrs) | 460 | 797 | 1127 |
| | Install Pump (IR£ | 25000 | 32000 | 47000 |
| | Acquisition/ Designation ($ft^2$) | 44064 | 76296 | 107848 |
| | (Acres) | 1.01 | 1.75 | 2.47 |
| 1 | Pump Power (IR£) | 1000 | 2000 | 4500 |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | Pump Power (IR£) | 1000 | 2000 | 4500 |
| | Construct Embankment (HHrs) | 460 | 797 | 1127 |
| | Reposition Pump(£) | 4000 | 7000 | 10000 |
| | Acquisition ($ft^2$) | 44064 | 76296 | 107848 |
| | (Acres) | 1.01 | 1.75 | 2.47 |
| 6 | Pump Power (£) | 1000 | 2000 | 4500 |
| 7 | do. | | | |
| 8 | do. | | | |
| 9 | do | | | |
| 10 | As per year 5 | | | |
| 11 | Pump Power (IR£) | 1000 | 2000 | 4500 |
| 12 | do. | | | |
| 13 | do. | | | |
| 14 | do. | | | |
| 15 | As per year 5 | | | |
| 16 | Pump Power (IR£) | 1000 | 2000 | 4500 |
| 17 | do. | | | |
| 18 | do. | | | |
| 19 | do. | | | |
| 20 | do. | | | |

3.18 METHOD B2 Construct Lagoon - Partial Bog Lifespan Capacity* - Abandon when full.

*Partial Bog Lifespan = 10 years.

| Year | | Catchment (Acres) | | |
|---|---|---|---|---|
| | | 100 | 300 | 600 |
| Initialisation | Construct Embankment (HHrs) | 640 | 1128 | 1596 |
| | Install Pump (IR£) | 25000 | 32000 | 47000 |
| | Acquisition/Designation ($ft^2$) | 166200 | 422848 | 782592 |
| | (acres) | 3.81 | 9.71 | 17.96 |
| 1 | Pump Power | 1000 | 2000 | 4500 |
| 2 | do. | | | |
| 3 | do. | | | |
| 4 | do. | | | |
| 5 | do. | | | |
| 6 | do. | | | |
| 7 | do. | | | |
| 8 | do. | | | |
| 9 | do. | | | |
| 10 | Pump Power (IR£) | 1000 | 2000 | 4500 |
| | Construct Embankment (HHrs) | 640 | 1128 | 1556 |
| | Reposition Pump | 4000 | 7000 | 10000 |
| | Acquisition/ Designation ($ft^2$) | 166200 | 422848 | 782592 |
| | (Acres) | 3.81 | 9.71 | 17.96 |
| 11 | Pump Power (IR£) | 1000 | 2000 | 4500 |
| 12 | do. | | | |
| 13 | do. | | | |
| 14 | do. | | | |
| 15 | do. | | | |
| 16 | do. | | | |
| 17 | do. | | | |
| 18 | do. | | | |
| 19 | do. | | | |
| 20 | do. | | | |

3.19 METHOD C1

| Year | | Catchment (Acres) 100 | 300 | 600 |
|---|---|---|---|---|
| Initilis-ation | Excavate (HHrs) | 78 | 234 | 468 |
| 1 | Cleaning (HHrs) | 156 | 468 | 936 |
| 2 | do. | 156 | 468 | 936 |
| 3 | do. | 156 | 468 | 936 |
| 4 | do. | 156 | 468 | 936 |
| 5 | do. | 156 | 468 | 936 |
| | Rehandle Forming Emb. HHrs. | 260 | 780 | 1560 |
| 6 | Cleaning | 156 | 468 | 936 |
| 7 | do. | 156 | 468 | 936 |
| 8 | do. | 156 | 468 | 936 |
| | Complete Emb. Install Pump (IR£) | | 464 32000 | 928 47000 |
| 9 | Cleaning | 156 | 2000 | 4500 |
| 10 | Cleaning | 156 | 2000 | 4500 |
| | Rehandle Forming Emb. HHrs | 260 | | |
| 11 | Cleaning | 156 | 2000 | 4500 |
| 12 | Cleaning | 156 | 2000 | 4500 |
| | Complete Emb. Install Pump (IR£) | 102 25000 | | |
| 13 | | 1000 | 2000 | 4500 |
| 14 | | 1000 | 2000 | 4500 |
| 15 | | 1000 | 2000 | 4500 |
| 16 | | 1000 | 2000 | 4500 |
| 17 | | 1000 | 2000 | 4500 |
| 18 | | 1000 | 2000 | 4500 |
| 19 | | 1000 | 2000 | 4500 |
| 20 | | 1000 | 2000 | 4500 |

*Allowance made in cost comparison for cases in which flood embankments necessary.

3.20

METHOD A1
CATCHMENT = 100 ACRES

| Year | HHrs | Cost HHrs | Total Annual Expenditure | Cumulative Expenditure |
|---|---|---|---|---|
| * Initil-isation | 78 | 1799.0 | 1799.0 | 1799 |
| ** | 345 | 7955.0 | 7955.0 | |
| 1 | 182 | 4196.0 | 4196.0 | 5995 |
| 2 | 182 | 4196.0 | 4196.0 | 10191 |
| 3 | 182 | 4196.0 | 4196.0 | 14387 |
| 4 | 182 | 4196.0 | 4196.0 | 18583 |
| 5 | 182 | 4196.0 | 4196.0 | 22779 |
| 6 | 182 | 4196.0 | 4196.0 | 26975 |
| 7 | 182 | 4196.0 | 4196.0 | 31171 |
| 8 | 182 | 4196.0 | 4196.0 | 35367 |
| 9 | 182 | 4196.0 | 4196.0 | 39563 |
| 10 | 182 | 4196.0 | 4196.0 | 43759 |
| 11 | 182 | 4196.0 | 4196.0 | 47955 |
| 12 | 182 | 4196.0 | 4196.0 | 52151 |
| 13 | 182 | 4196.0 | 4196.0 | 56347 |
| 14 | 182 | 4196.0 | 4196.0 | 60543 |
| 15 | 182 | 4196.0 | 4196.0 | 64739 |
| 16 | 156 | 3597.0 | 3597.0 | 68336 |
| 17 | 156 | 3597.0 | 3597.0 | 71933 |
| 18 | 156 | 3597.0 | 3597.0 | 75530 |
| 19 | 156 | 3597.0 | 3597.0 | 79127 |
| 20 | 156 | 3597.0 | 3597.0 | 82724 |

*Flood Embankments not necessary

**Flood Embankments necessary

3.21

METHOD A1
CATCHMENT 300

| Year | HHrs | Cost HHrs | Total Annual Expenditure | Cumulative Expenditure |
|---|---|---|---|---|
| * Initilis-ation | 234 | 5,396 | 5,396 | 5,396 |
| ** | 692 | 15,957 | 15,957 | |
| 1 | 546 | 12,590 | 12,590 | 17,986 |
| 2 | 546 | 12,590 | 12,590 | 30,576 |
| 3 | 546 | 12,590 | 12,590 | 43,166 |
| 4 | 546 | 12,590 | 12,590 | 55,756 |
| 5 | 546 | 12,590 | 12,590 | 68,346 |
| 6 | 546 | 12,590 | 12,590 | 80,936 |
| 7 | 546 | 12,590 | 12,590 | 93,526 |
| 8 | 546 | 12,590 | 12,590 | 106,116 |
| 9 | 546 | 12,590 | 12,590 | 118,706 |
| 10 | 546 | 12,590 | 12,590 | 131,296 |
| 11 | 546 | 12,590 | 12,590 | 143,886 |
| 12 | 546 | 12,590 | 12,590 | 156,476 |
| 13 | 546 | 12,590 | 12,590 | 169,066 |
| 14 | 546 | 12,590 | 12,590 | 181,656 |
| 15 | 546 | 12,590 | 12,590 | 194,246 |
| 16 | 468 | 10,792.0 | 10,792 | 205,038 |
| 17 | 468 | 10,792.0 | 10,792 | 215,830 |
| 18 | 468 | 10,792.0 | 10,792 | 226,622 |
| 19 | 468 | 10,792.0 | 10,792 | 237,414 |
| 20 | 468 | 10,792.0 | 10,792 | 248,206 |

* Flood Embankment not required.

** Flood Embankment required.

METHOD A1
CATCHMENT 600 ACRES

| | Year | HHrs | Cost HHrs | Total Annual Expenditure | Cumulative Expenditure |
|---|---|---|---|---|---|
| * | Initilis-ation | 468 | 10,792.0 | 10,792.0 | 10,792 |
| ** | | 1028 | 23,705.0 | 23,705.0 | |
| | 1 | 1092 | 23,705.0 | 23,705.0 | 34,497 |
| | 2 | 1092 | 23,705.0 | 23,705.0 | 58,202 |
| | 3 | 1092 | 23,705.0 | 23,705.0 | 81,907 |
| | 4 | 1092 | 23,705.0 | 23,705.0 | 105,612 |
| | 5 | 1092 | 23,705.0 | 23,705.0 | 129,317 |
| | 6 | 1092 | 23,705.0 | 23,705.0 | 153,022 |
| | 7 | 1092 | 23,705.0 | 23,705.0 | 176,727 |
| | 8 | 1092 | 23,705.0 | 23,705.0 | 200,432 |
| | 9 | 1092 | 23,705.0 | 23,705.0 | 224,137 |
| | 10 | 1092 | 23,705.0 | 23,705.0 | 247,842 |
| | 11 | 1092 | 23,705.0 | 23,705.0 | 271,547 |
| | 12 | 1092 | 23,705.0 | 23,705.0 | 295,252 |
| | 13 | 1092 | 23,705.0 | 23,705.0 | 318,957 |
| | 14 | 1092 | 23,705.0 | 23,705.0 | 342,662 |
| | 15 | 1092 | 23,705.0 | 23,705.0 | 366,367 |
| | 16 | 936 | 21,584 | 21,584.0 | 387,951 |
| | 17 | 936 | 21,584 | 21,584.0 | 409,535 |
| | 18 | 936 | 21,584 | 21,584.0 | 431,119 |
| | 19 | 936 | 21,584 | 21,584.0 | 452,703 |
| | 20 | 936 | 21,584 | 21,584.0 | 474,287 |

*Flood Embankment not required.

**Flood Embankment required.

3.23

METHOD A2
CATCHMENT 100 ACRES

| | Year | HHrs | Cost HHrs | SPHrs | Cost SPHrs | DHrs | Cost DHrs | Recycl-ing (T) | Cost Recycl-ing | Total Annual Expend. | Cumul-ative Expend. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| * | Init. | 78 | 1798 | | | | | | | 1798 | 1798 |
| ** | | 345 | 7955 | | | | | | | 7955 | |
| | 1 | | | 74 | 2803 | 135 | 2241 | 190.5 | - 571 | 4473 | 6271 |
| | 2 | | | 74 | 2803 | 135 | 2241 | 190.5 | - 571 | 4473 | 10744 |
| | 3 | | | 74 | 2803 | 135 | 2241 | 190.5 | - 571 | 4473 | 15217 |
| | 4 | | | 74 | 2803 | 135 | 2241 | 190.5 | - 571 | 4473 | 19690 |
| | 5 | | | 74 | 2803 | 135 | 2241 | 190.5 | - 571 | 4473 | 24163 |
| | 6 | | | 74 | 2803 | 135 | 2241 | 190.5 | - 571 | 4473 | 28636 |
| | 7 | | | 74 | 2803 | 135 | 2241 | 190.5 | - 571 | 4473 | 33109 |
| | 8 | | | 74 | 2803 | 135 | 2241 | 190.5 | - 571 | 4473 | 37582 |
| | 9 | | | 74 | 2803 | 135 | 2241 | 190.5 | - 571 | 4473 | 42055 |
| | 10 | | | 74 | 2803 | 135 | 2241 | 190.5 | - 571 | 4473 | 46528 |
| | 11 | | | 74 | 2803 | 135 | 2241 | 190.5 | - 571 | 4473 | 51001 |
| | 12 | | | 74 | 2803 | 135 | 2241 | 190.5 | - 571 | 4473 | 55474 |
| | 13 | | | 74 | 2803 | 135 | 2241 | 190.5 | - 571 | 4473 | 59947 |
| | 14 | | | 74 | 2803 | 135 | 2241 | 190.5 | - 571 | 4473 | 64420 |
| | 15 | | | 74 | 2803 | 135 | 2241 | 190.5 | - 571 | 4473 | 68893 |
| | 16 | | | 74 | 2803 | 135 | 2241 | 190.5 | - 571 | 4473 | 73366 |
| | 17 | | | 74 | 2803 | 135 | 2241 | 190.5 | - 571 | 4473 | **77839** |
| | 18 | | | 74 | 2803 | 135 | 2241 | 190.5 | - 571 | 4473 | **82312** |
| | 19 | | | 74 | 2803 | 135 | 2241 | 190.5 | - 571 | 4473 | 86785 |
| | 20 | | | 74 | 2803 | 135 | 2241 | 190.5 | - 571 | 4473 | 91258 |

*Flood Embankment not required

**Flood Embankment required.

3.24

METHOD A2
CATCHMENT = 300 ACRES

| | Year | HHrs | Cost HHrs | SPHrs | Cost SPHrs | DHrs | Cost DHrs | Recycl. (T) | Cost Recycle | Total Annual Expend. | Cumul-ative Expend. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| * | Init. | 234 | 5396 | | | | | | | 5396 | 5396 |
| ** | | 692 | 15957 | | | | | | | 15957 | |
| | 1 | | | 222 | 8409 | 405 | 6723 | 571 | - 1713 | 13419 | 18815 |
| | 2 | | | 222 | 8409 | 405 | 6723 | 571 | - 1713 | 13419 | 32234 |
| | 3 | | | 222 | 8409 | 405 | 6723 | 571 | - 1713 | 13419 | 45653 |
| | 4 | | | 222 | 8409 | 405 | 6723 | 571 | - 1713 | 13419 | 59072 |
| | 5 | | | 222 | 8409 | 405 | 6723 | 571 | - 1713 | 13419 | 72491 |
| | 6 | | | 222 | 8409 | 405 | 6723 | 571 | - 1713 | 13419 | 85910 |
| | 7 | | | 222 | 8409 | 405 | 6723 | 571 | - 1713 | 13419 | 99329 |
| | 8 | | | 222 | 8409 | 405 | 6723 | 571 | - 1713 | 13419 | 112748 |
| | 9 | | | 222 | 8409 | 405 | 6723 | 571 | - 1713 | 13419 | 126167 |
| | 10 | | | 222 | 8409 | 405 | 6723 | 571 | - 1713 | 13419 | 139586 |
| | 11 | | | 222 | 8409 | 405 | 6723 | 571 | - 1713 | 13419 | 153005 |
| | 12 | | | 222 | 8409 | 405 | 6723 | 571 | - 1713 | 13419 | 166424 |
| | 13 | | | 222 | 8409 | 405 | 6723 | 571 | - 1713 | 13419 | 179843 |
| | 14 | | | 222 | 8409 | 405 | 6723 | 571 | - 1713 | 13419 | 193262 |
| | 15 | | | 222 | 8409 | 405 | 6723 | 571 | - 1713 | 13419 | 206681 |
| | 16 | | | 222 | 8409 | 405 | 6723 | 571 | - 1713 | 13419 | 220100 |
| | 17 | | | 222 | 8409 | 405 | 6723 | 571 | - 1713 | 13419 | 233519 |
| | 18 | | | 222 | 8409 | 405 | 6723 | 571 | - 1713 | 13419 | 246938 |
| | 19 | | | 222 | 8409 | 405 | 6723 | 571 | - 1713 | 13419 | 260357 |
| | 20 | | | 222 | 8409 | 405 | 6723 | 571 | - 1713 | 13419 | 273776 |

* Flood Embankment not required.

** Flood Embankment required.

3.25

METHOD A2
CATCHMENT = 600 ACRES

| | Year | HHrs | Cost HHrs | SPHrs | Cost SPHrs | DHrs | Cost DHrs | Recycle (T) | Cost Recycle | Total Annual Expend. | Cumulative Expend. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| * | Init. | 468 | 10792 | | | | | | | 10792 | 10792 |
| ** | | 1028 | 23705 | | | | | | | 23705 | |
| | 1 | | | 444 | 16818 | 810 | 13446 | 1143 | - 3429 | 26835 | 37627 |
| | 2 | | | 444 | 16818 | 810 | 13446 | 1143 | - 3429 | 26835 | 64462 |
| | 3 | | | 444 | 16818 | 810 | 13446 | 1143 | - 3429 | 26835 | 91297 |
| | 4 | | | 444 | 16818 | 810 | 13446 | 1143 | - 3429 | 26835 | 118132 |
| | 5 | | | 444 | 16818 | 810 | 13446 | 1143 | - 3429 | 26835 | 144967 |
| | 6 | | | 444 | 16818 | 810 | 13446 | 1143 | - 3429 | 26835 | 171802 |
| | 7 | | | 444 | 16818 | 810 | 13446 | 1143 | - 3429 | 26835 | 198637 |
| | 8 | | | 444 | 16818 | 810 | 13446 | 1143 | - 3429 | 26835 | 225472 |
| | 9 | | | 444 | 16818 | 810 | 13446 | 1143 | - 3429 | 26835 | 252307 |
| | 10 | | | 444 | 16818 | 810 | 13446 | 1143 | - 3429 | 26835 | 279142 |
| | 11 | | | 444 | 16818 | 810 | 13446 | 1143 | - 3429 | 26835 | 305977 |
| | 12 | | | 444 | 16818 | 810 | 13446 | 1143 | - 3429 | 26835 | 332812 |
| | 13 | | | 444 | 16818 | 810 | 13446 | 1143 | - 3429 | 26835 | 359647 |
| | 14 | | | 444 | 16818 | 810 | 13446 | 1143 | - 3429 | 26835 | 386482 |
| | 15 | | | 444 | 16818 | 810 | 13446 | 1143 | - 3429 | 26835 | 413317 |
| | 16 | | | 444 | 16818 | 810 | 13446 | 1143 | - 3429 | 26835 | 440152 |
| | 17 | | | 444 | 16818 | 810 | 13446 | 1143 | - 3429 | 26835 | 466987 |
| | 18 | | | 444 | 16818 | 810 | 13446 | 1143 | - 3429 | 26835 | 493822 |
| | 19 | | | 444 | 16818 | 810 | 13446 | 1143 | - 3429 | 26835 | 520657 |
| | 20 | | | 444 | 16818 | 810 | 13446 | 1143 | - 3429 | 26835 | 547492 |

* Flood Embankment not required.

** Flood Embankment required.

3.26 METHOD A3
CATCHMENT = 100 ACRES

| | Year | HHrs | Cost HHrs | SPHrs | Cost SPHrs | Area Spread $ft^2$ | Area Spread Acres | Cost Area | Total Annual Expend. | Cumulative Expend. |
|---|---|---|---|---|---|---|---|---|---|---|
| * | Init. | 78 | 1798 | | | 210000 | 4.82 | 7230 | 9028 | 9028 |
| ** | | 345 | 7955 | | | 210000 | 4.82 | 7230 | 15185 | |
| | 1 | | | 74 | 2803 | | | | 2803 | 11831 |
| | 2 | | | 74 | 2803 | | | | 2803 | 14634 |
| | 3 | | | 74 | 2803 | | | | 2803 | 17437 |
| | 4 | | | 74 | 2803 | | | | 2803 | 20240 |
| | 5 | | | 74 | 2803 | | | | 2803 | 23043 |
| | 6 | | | 74 | 2803 | | | | 2803 | 25846 |
| | 7 | | | 74 | 2803 | | | | 2803 | 28649 |
| | 8 | | | 74 | 2803 | | | | 2803 | 31452 |
| | 9 | | | 74 | 2803 | | | | 2803 | 34255 |
| | 10 | | | 74 | 2803 | | | | 2803 | 37058 |
| | 11 | | | 74 | 2803 | | | | 2803 | 39861 |
| | 12 | | | 74 | 2803 | | | | 2803 | 42664 |
| | 13 | | | 74 | 2803 | | | | 2803 | 45467 |
| | 14 | | | 74 | 2803 | | | | 2803 | 48270 |
| | 15 | | | 74 | 2803 | | | | 2803 | 51073 |
| | 16 | | | 74 | 2803 | | | | 2803 | 53876 |
| | 17 | | | 74 | 2803 | | | | 2803 | 56679 |
| | 18 | | | 74 | 2803 | | | | 2803 | 59482 |
| | 19 | | | 74 | 2803 | | | | 2803 | 62285 |
| | 20 | | | 74 | 2803 | | | | 2803 | 65088 |

3.27 METHOD A3
CATCHMENT = 300 ACRES

| | Year | HHrs | Cost HHrs | SPHrs | Cost SPHrs | Area Spread $ft^2$ | Area Spread Acres | Cost Area | Total Annual Expend. | Cumulative Expend. |
|---|---|---|---|---|---|---|---|---|---|---|
| * | Init. | 234 | 5396 | | | 630000 | 14.46 | 21690 | 27086 | 27086 |
| ** | | 692 | 15957 | | | 630000 | 14.46 | 21690 | 37647 | |
| | 1 | | | 222 | 8409 | | | | 8409 | 35495 |
| | 2 | | | 222 | 8409 | | | | 8409 | 43904 |
| | 3 | | | 222 | 8409 | | | | 8409 | 52313 |
| | 4 | | | 222 | 8409 | | | | 8409 | 60722 |
| | 5 | | | 222 | 8409 | | | | 8409 | 69131 |
| | 6 | | | 222 | 8409 | | | | 8409 | 77540 |
| | 7 | | | 222 | 8409 | | | | 8409 | 85949 |
| | 8 | | | 222 | 8409 | | | | 8409 | 94358 |
| | 9 | | | 222 | 8409 | | | | 8409 | 102767 |
| | 10 | | | 222 | 8409 | | | | 8409 | 111176 |
| | 11 | | | 222 | 8409 | | | | 8409 | 119585 |
| | 12 | | | 222 | 8409 | | | | 8409 | 127994 |
| | 13 | | | 222 | 8409 | | | | 8409 | 136403 |
| | 14 | | | 222 | 8409 | | | | 8409 | 144812 |
| | 15 | | | 222 | 8409 | | | | 8409 | 153221 |
| | 16 | | | 222 | 8409 | | | | 8409 | 161630 |
| | 17 | | | 222 | 8409 | | | | 8409 | 170039 |
| | 18 | | | 222 | 8409 | | | | 8409 | 178448 |
| | 19 | | | 222 | 8409 | | | | 8409 | 186857 |
| | 20 | | | 222 | 8409 | | | | 8409 | 195266 |

3.28

METHOD A3
CATCHMENT = 600 ACRES

| | Year | HHrs | Cost HHrs | SPHrs | Cost HHrs | Area Spread | | Cost Area | Total Annual Expend. | Cumul-ative Expend. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | $ft^2$ | Acres | | | |
| * | Init | 468 | 10792 | | | 1260000 | 28.93 | 43395 | 54187 | 54187 |
| ** | | 1028 | 23705 | | | 1260000 | 28.93 | 43395 | 67100 | |
| | 1 | | | 444 | 16818 | | | | 16818 | 71005 |
| | 2 | | | 444 | 16818 | | | | 16818 | 87823 |
| | 3 | | | 444 | 16818 | | | | 16818 | 104641 |
| | 4 | | | 444 | 16818 | | | | 16818 | 121459 |
| | 5 | | | 444 | 16818 | | | | 16818 | 138277 |
| | 6 | | | 444 | 16818 | | | | 16818 | 155095 |
| | 7 | | | 444 | 16818 | | | | 16818 | 171913 |
| | 8 | | | 444 | 16818 | | | | 16818 | 188731 |
| | 9 | | | 444 | 16818 | | | | 16818 | 205549 |
| | 10 | | | 444 | 16818 | | | | 16818 | 222367 |
| | 11 | | | 444 | 16818 | | | | 16818 | 239185 |
| | 12 | | | 444 | 16818 | | | | 16818 | 256003 |
| | 13 | | | 444 | 16818 | | | | 16818 | 272821 |
| | 14 | | | 444 | 16818 | | | | 16818 | 289639 |
| | 15 | | | 444 | 16818 | | | | 16818 | 306457 |
| | 16 | | | 444 | 16818 | | | | 16818 | 323275 |
| | 17 | | | 444 | 16818 | | | | 16818 | 340093 |
| | 18 | | | 444 | 16818 | | | | 16818 | 356911 |
| | 19 | | | 444 | 16818 | | | | 16818 | 373729 |
| | 20 | | | 444 | 16818 | | | | 16818 | 390547 |

3.29

METHOD B1
CATCHMENT = 100 ACRES

| Year | HHrs | Cost HHrs | Install Pump | Pump Maint. | Area Required | | Cost Area | Total Annual Cost | Cumulative Cost |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | $ft^2$ | Acres | | | |
| Init. | 922 | 21261 | 25000 | | 403128 | 9.25 | 13875 | 60136 | 60136 |
| 1 | | | | 1000 | | | | 1000 | 61136 |
| 2 | | | | 1000 | | | | 1000 | 62136 |
| 3 | | | | 1000 | | | | 1000 | 63136 |
| 4 | | | | 1000 | | | | 1000 | 64136 |
| 5 | | | | 1000 | | | | 1000 | 65136 |
| 6 | | | | 1000 | | | | 1000 | 66136 |
| 7 | | | | 1000 | | | | 1000 | 67136 |
| 8 | | | | 1000 | | | | 1000 | 68136 |
| 9 | | | | 1000 | | | | 1000 | 69136 |
| 10 | | | | 1000 | | | | 1000 | 70136 |
| 11 | | | | 1000 | | | | 1000 | 71136 |
| 12 | | | | 1000 | | | | 1000 | 72136 |
| 13 | | | | 1000 | | | | 1000 | 73136 |
| 14 | | | | 1000 | | | | 1000 | 74136 |
| 15 | | | | 1000 | | | | 1000 | 75136 |
| 16 | | | | 1000 | | | | 1000 | 76136 |
| 17 | | | | 1000 | | | | 1000 | 77136 |
| 18 | | | | 1000 | | | | 1000 | 78136 |
| 19 | | | | 1000 | | | | 1000 | 79136 |
| 20 | | | | | | | | | 80136 |

3.30

METHOD B1
CATCHMENT = 300 ACRES

| Year | HHrs | Cost HHrs | Install Pump | Pump Maint. | Area Required | | Cost Area | Total Annual Expend. | Cumul-ative Expend. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | $ft^2$ | Acres | | | |
| Init. | 1596 | 36803 | 32000 | | 1097592 | 25.20 | 37800 | 99603 | 99603 |
| 1 | | | | 2000 | | | | 2000 | 101603 |
| 2 | | | | 2000 | | | | 2000 | 103603 |
| 3 | | | | 2000 | | | | 2000 | 105603 |
| 4 | | | | 2000 | | | | 2000 | 107603 |
| 5 | | | | 2000 | | | | 2000 | 109603 |
| 6 | | | | 2000 | | | | 2000 | 111603 |
| 7 | | | | 2000 | | | | 2000 | 113603 |
| 8 | | | | 2000 | | | | 2000 | 115603 |
| 9 | | | | 2000 | | | | 2000 | 117603 |
| 10 | | | | 2000 | | | | 2000 | 119603 |
| 11 | | | | 2000 | | | | 2000 | 121603 |
| 12 | | | | 2000 | | | | 2000 | 123603 |
| 13 | | | | 2000 | | | | 2000 | 125603 |
| 14 | | | | 2000 | | | | 2000 | 127603 |
| 15 | | | | 2000 | | | | 2000 | 129603 |
| 16 | | | | 2000 | | | | 2000 | 131603 |
| 17 | | | | 2000 | | | | 2000 | 133603 |
| 18 | | | | 2000 | | | | 2000 | 135603 |
| 19 | | | | 2000 | | | | 2000 | 137603 |
| 20 | | | | 2000 | | | | 2000 | 139603 |

3.31

METHOD B1
CATCHMENT = 600 ACRES

| Year | HHrs | Cost HHrs | Install Pump | Pump Maint. | Area Required | | Cost Area | Total Annual Expend. | Cumul-ative Expend. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | $ft^2$ | Acres | | | |
| Init. | 2257 | 52046 | 47000 | | 2105832 | 48.34 | 72510 | 149556 | 149556 |
| 1 | | | | 4500 | | | | 4500 | 154056 |
| 2 | | | | 4500 | | | | 4500 | 158556 |
| 3 | | | | 4500 | | | | 4500 | 163056 |
| 4 | | | | 4500 | | | | 4500 | 167556 |
| 5 | | | | 4500 | | | | 4500 | 172056 |
| 6 | | | | 4500 | | | | 4500 | 176556 |
| 7 | | | | 4500 | | | | 4500 | 181056 |
| 8 | | | | 4500 | | | | 4500 | 185556 |
| 9 | | | | 4500 | | | | 4500 | 190056 |
| 10 | | | | 4500 | | | | 4500 | 194556 |
| 11 | | | | 4500 | | | | 4500 | 199056 |
| 12 | | | | 4500 | | | | 4500 | 203556 |
| 13 | | | | 4500 | | | | 4500 | 208056 |
| 14 | | | | 4500 | | | | 4500 | 212556 |
| 15 | | | | 4500 | | | | 4500 | 217056 |
| 16 | | | | 4500 | | | | 4500 | 221556 |
| 17 | | | | 4500 | | | | 4500 | 226056 |
| 18 | | | | 4500 | | | | 4500 | 230556 |
| 19 | | | | 4500 | | | | 4500 | 235056 |
| 20 | | | | 4500 | | | | 4500 | 239556 |

3.32

METHOD B2 - 5 YEAR LIFESPAN
CATCHMENT = 100 ACRES

| Year | HHrs | Cost HHrs | Instal Pump | Pump Maint. | Area Required | | Cost Area | Total Annual Expend. | Cumul-ative Expend. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | $ft^2$ | Acres | | | |
| Init. | 460 | 10607 | 25000 | | 44064 | 1.01 | 1515 | 37122 | 37122 |
| 1 | 92 | 2121 | | 1000 | 44064 | 1.01 | 1515 | 4636 | 41758 |
| 2 | 92 | 2121 | | 1000 | | | | 3121 | 44879 |
| 3 | 92 | 2121 | | 1000 | | | | 3121 | 48000 |
| 4 | 92 | 2121 | | 1000 | | | | 3121 | 51121 |
| 5 | 92 | 2121 | | 1000 | | | | 3121 | 54242 |
| 6 | 92 | 2121 | 4000 | 1000 | 44064 | 1.01 | 1515 | 8636 | 62878 |
| 7 | 92 | 2121 | | 1000 | | | | 3121 | 65999 |
| 8 | 92 | 2121 | | 1000 | | | | 3121 | 69120 |
| 9 | 92 | 2121 | | 1000 | | | | 3121 | 72241 |
| 10 | 92 | 2121 | | 1000 | | | | 3121 | 75362 |
| 11 | 92 | 2121 | 4000 | 1000 | 44064 | 1.01 | 1515 | 8636 | 83998 |
| 12 | 92 | 2121 | | 1000 | | | | 3121 | 87119 |
| 13 | 92 | 2121 | | 1000 | | | | 3121 | 90240 |
| 14 | 92 | 2121 | | 1000 | | | | 3121 | 93361 |
| 15 | 92 | 2121 | | 1000 | | | | 3121 | 96482 |
| 16 | | | 4000 | 1000 | | | | 5000 | 101482 |
| 17 | | | | 1000 | | | | 1000 | 102482 |
| 18 | | | | 1000 | | | | 1000 | 103482 |
| 19 | | | | 1000 | | | | 1000 | 104482 |
| 20 | | | | 1000 | | | | 1000 | 105482 |

3.33 METHOD B2 - 5 YEAR LIFESPAN
CATCHMENT = 300 ACRES

| Year | HHrs | Cost HHrs | Install Pump | Pump Maint. | Area Required | | Cost Area | Total Annual Expend. | Cumulative Expend. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | $ft^2$ | Acres | | | |
| Init. | 797 | 18378 | 32000 | | 76296 | 1.75 | 2625 | 53003 | 53003 |
| 1 | 159 | 3666 | | 2000 | 76296 | 1.75 | 2625 | 8291 | 61294 |
| 2 | 159 | 3666 | | 2000 | | | | 5666 | 66960 |
| 3 | 159 | 3666 | | 2000 | | | | 5666 | 72626 |
| 4 | 159 | 3666 | | 2000 | | | | 5666 | 78292 |
| 5 | 159 | 3666 | | 2000 | | | | 5666 | 83958 |
| 6 | 159 | 3666 | 7000 | 2000 | 76296 | 1.75 | 2625 | 15291 | 99249 |
| 7 | 159 | 3666 | | 2000 | | | | 5666 | 104915 |
| 8 | 159 | 3666 | | 2000 | | | | 5666 | 110581 |
| 9 | 159 | 3666 | | 2000 | | | | 5666 | 116247 |
| 10 | 159 | 3666 | | 2000 | | | | 5666 | 121913 |
| 11 | 159 | 3666 | 7000 | 2000 | 76296 | 1.75 | 2625 | 15291 | 137204 |
| 12 | 159 | 3666 | | 2000 | | | | 5666 | 142870 |
| 13 | 159 | 3666 | | 2000 | | | | 5666 | 148536 |
| 14 | 159 | 3666 | | 2000 | | | | 5666 | 154202 |
| 15 | 159 | 3666 | | 2000 | | | | 5666 | 159868 |
| 16 | | | 7000 | 2000 | | | | 9000 | 168868 |
| 17 | | | | 2000 | | | | 2000 | 170868 |
| 18 | | | | 2000 | | | | 2000 | 172868 |
| 19 | | | | 2000 | | | | 2000 | 174868 |
| 20 | | | | 2000 | | | | 2000 | 176868 |

3.34 METHOD B2 - 5 YEAR LIFESPAN
CATCHMENT = 600 ACRES

| Year | HHrs | Cost HHrs | Install Pump | Pump Maint. | Area Required | | Cost Area | Total Annual Cost | Cumulative Cost |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | $ft^2$ | Acres | | | |
| Init. | 1127 | 25988 | 47000 | | 107848 | 2.47 | 3705 | 76693 | 76693 |
| 1 | 225 | 5188 | | 4500 | 107848 | 2.47 | 3705 | 13393 | 90086 |
| 2 | 225 | 5188 | | 4500 | | | | 9688 | 99774 |
| 3 | 225 | 5188 | | 4500 | | | | 9688 | 109462 |
| 4 | 225 | 5188 | | 4500 | | | | 9688 | 119150 |
| 5 | 225 | 5188 | | 4500 | | | | 9688 | 128838 |
| 6 | 225 | 5188 | 10000 | 4500 | 107848 | 2.47 | 3705 | 23393 | 152231 |
| 7 | 225 | 5188 | | 4500 | | | | 9688 | 161919 |
| 8 | 225 | 5188 | | 4500 | | | | 9688 | 171607 |
| 9 | 225 | 5188 | | 4500 | | | | 9688 | 181295 |
| 10 | 225 | 5188 | | 4500 | | | | 9688 | 190983 |
| 11 | 225 | 5188 | 10000 | 4500 | 107848 | 2.47 | 3705 | 23393 | 214376 |
| 12 | 225 | 5188 | | 4500 | | | | 9688 | 224064 |
| 13 | 225 | 5188 | | 4500 | | | | 9688 | 233752 |
| 14 | 225 | 5188 | | 4500 | | | | 9688 | 243440 |
| 15 | 225 | 5188 | | 4500 | | | | 9688 | 253128 |
| 16 | | | 10000 | 4500 | | | | 14500 | 267628 |
| 17 | | | | 4500 | | | | 4500 | 272128 |
| 18 | | | | 4500 | | | | 4500 | 276628 |
| 19 | | | | 4500 | | | | 4500 | 281128 |
| 20 | | | | 4500 | | | | 4500 | 285628 |

3.35

METHOD B2 - 10 YEAR LIFESPAN
CATCHMENT = 100 ACRES

| Year | HHrs | Cost HHrs | Install Pump | Pump Maint. | Area Required | | Cost Area | Total Annual Expend. | Cumulative Expend. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | ft.$^2$ | Acres | | | |
| Init | 640 | 14758 | 25000 | | 166200 | 3.81 | 5715 | 45473 | 45473 |
| 1 | 64 | 1475 | | 1000 | 166200 | 3.81 | 5715 | 8190 | 53663 |
| 2 | 64 | 1475 | | 1000 | | | | 2475 | 56138 |
| 3 | 64 | 1475 | | 1000 | | | | 2475 | 58613 |
| 4 | 64 | 1475 | | 1000 | | | | 2475 | 61088 |
| 5 | 64 | 1475 | | 1000 | | | | 2475 | 63563 |
| 6 | 64 | 1475 | | 1000 | | | | 2475 | 66038 |
| 7 | 64 | 1475 | | 1000 | | | | 2475 | 68513 |
| 8 | 64 | 1475 | | 1000 | | | | 2475 | 70988 |
| 9 | 64 | 1475 | | 1000 | | | | 2475 | 73463 |
| 10 | 64 | 1475 | 4000 | 1000 | | | | 6475 | 79938 |
| 11 | | | | 1000 | | | | 1000 | 80938 |
| 12 | | | | 1000 | | | | 1000 | 81938 |
| 13 | | | | 1000 | | | | 1000 | 82938 |
| 14 | | | | 1000 | | | | 1000 | 83938 |
| 15 | | | | 1000 | | | | 1000 | 84938 |
| 16 | | | | 1000 | | | | 1000 | 85938 |
| 17 | | | | 1000 | | | | 1000 | 86938 |
| 18 | | | | 1000 | | | | 1000 | 87938 |
| 19 | | | | 1000 | | | | 1000 | 88938 |
| 20 | | | | 1000 | | | | 1000 | 89938 |

3.36

METHOD B2 - 10 YEAR LIFESPAN
CATCHMENT = 300 ACRES

| Year | HHrs | Cost HHrs | Install Pump | Pump Maint. | Area Required | | Cost Area | Total Annual Expend. | Cumulative Expend. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | $ft^2$ | Acres | | | |
| Init | 1128 | 26011 | 32000 | | 422848 | 9.71 | 14565 | 72 576 | 72576 |
| 1 | 113 | 2605 | | 2000 | 422848 | 9.71 | 14565 | 19170 | 91746 |
| 2 | 113 | 2605 | | 2000 | | | | 4605 | 96351 |
| 3 | 113 | 2605 | | 2000 | | | | 4605 | 100956 |
| 4 | 113 | 2605 | | 2000 | | | | 4605 | 105561 |
| 5 | 113 | 2605 | | 2000 | | | | 4605 | 110166 |
| 6 | 113 | 2605 | | 2000 | | | | 4605 | 114771 |
| 7 | 113 | 2605 | | 2000 | | | | 4605 | 119376 |
| 8 | 113 | 2605 | | 2000 | | | | 4605 | 123981 |
| 9 | 113 | 2605 | | 2000 | | | | 4605 | 128586 |
| 10 | 113 | 2605 | 7000 | 2000 | | | | 11605 | 140191 |
| 11 | | | | 2000 | | | | 2000 | 142191 |
| 12 | | | | 2000 | | | | 2000 | 144191 |
| 13 | | | | 2000 | | | | 2000 | 146191 |
| 14 | | | | 2000 | | | | 2000 | 148191 |
| 15 | | | | 2000 | | | | 2000 | 150191 |
| 16 | | | | 2000 | | | | 2000 | 152191 |
| 17 | | | | 2000 | | | | 2000 | 154191 |
| 18 | | | | 2000 | | | | 2000 | 156191 |
| 19 | | | | 2000 | | | | 2000 | 158191 |
| 20 | | | | 2000 | | | | 2000 | 160191 |

3.37 METHOD B2 - 10 YEAR LIFESPAN
CATCHMENT = 600 ACRES

| Year | HHrs | Cost HHrs | Install Pump | Pump Maint. | Area Required | | Cost Area | Total Annual Expend. | Cumulative Expend. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | $ft^2$ | Acres | | | |
| Init | 1596 | 36803 | 47000 | | 782592 | 17.96 | 26940 | 110743 | 110743 |
| 1 | 160 | 3689 | | 4500 | 782592 | 17.96 | 26940 | 35129 | 145872 |
| 2 | 160 | 3689 | | 4500 | | | | 8189 | 154061. |
| 3 | 160 | 3689 | | 4500 | | | | 8189 | 162250 |
| 4 | 160 | 3689 | | 4500 | | | | 8189 | 170439 |
| 5 | 160 | 3689 | | 4500 | | | | 8189 | 178628 |
| 6 | 160 | 3689 | | 4500 | | | | 8189 | 186817 |
| 7 | 160 | 3689 | | 4500 | | | | 8189 | 195006 |
| 8 | 160 | 3689 | | 4500 | | | | 8189 | 203195 |
| 9 | 160 | 3689 | | 4500 | | | | 8189 | 211384 |
| 10 | 160 | 3689 | 10000 | 4500 | | | | 18189 | 229573 |
| 11 | | | | 4500 | | | | 4500 | 234073 |
| 12 | | | | 4500 | | | | 4500 | 234073 |
| 13 | | | | 4500 | | | | 4500 | 243073 |
| 14 | | | | 4500 | | | | 4500 | 247573 |
| 15 | | | | 4500 | | | | 4500 | 252073 |
| 16 | | | | 4500 | | | | 4500 | 256573 |
| 17 | | | | 4500 | | | | 4500 | 261073 |
| 18 | | | | 4500 | | | | 4500 | 265573 |
| 19 | | | | 4500 | | | | 4500 | 270073 |
| 20 | | | | 4500 | | | | 4500 | 274573 |

3.38

METHOD C1
CATCHMENT = 100 ACRES

| | Year | HHrs | Cost HHrs | HHrs Rehandle | Cost HHrs | Install Pump | Total Annual Expend. | Cumul-ative Expend. |
|---|---|---|---|---|---|---|---|---|
| * | Init | 78 | 1798 | | | | 1798 | 1798 |
| ** | | 345 | 7955 | | | | 7955 | |
| | 1 | 156 | 3597 | 52 | 1199 | | 4796 | 6594 |
| | 2 | 156 | 3597 | 52 | 1199 | | 4796 | 11390 |
| | 3 | 156 | 3597 | 52 | 1199 | | 4796 | 16186 |
| | 4 | 156 | 3597 | 52 | 1199 | | 4796 | 20982 |
| | 5 | 156 | 3597 | 52 | 1199 | | 4796 | 25778 |
| | 6 | 156 | 3597 | 52 | 1199 | | 4796 | 30574 |
| | 7 | 156 | 3597 | 52 | 1199 | | 4796 | 35370 |
| | 8 | 156 | 3597 | 52 | 1199 | | 4796 | 40166 |
| | 9 | 156 | 3597 | 52 | 1199 | | 4796 | 44962 |
| | 10 | 156 | 3597 | 52 | 1199 | | 4796 | 49758 |
| | 11 | 156 | 3597 | 52 | 1199 | 25000 | 29796 | 84350 |
| | 12 | | | | | 1000 | 1000 | 85350 |
| | 13 | | | | | 1000 | 1000 | 86350 |
| | 14 | | | | | 1000 | 1000 | 87350 |
| | 15 | | | | | 1000 | 1000 | 88350 |
| | 16 | | | | | 1000 | 1000 | 89350 |
| | 17 | | | | | 1000 | 1000 | 90350 |
| | 18 | | | | | 1000 | 1000 | 91350 |
| | 19 | | | | | 1000 | 1000 | 92350 |
| | 20 | | | | | 1000 | 1000 | 93350 |

*Flood Embankment not required.

**Flood Embankment required - not included in Cumulative Cost.

3.39 METHOD C1
CATCHMENT = 300 ACRES

| | Year | HHrs | Cost HHrs | HHrs Rehandle | Cost HHrs | Install Pump | Total Annual Expend. | Cumul-ative Expend. |
|---|---|---|---|---|---|---|---|---|
| * | Init | 234 | 5396 | | | | 5396 | 5396 |
| ** | | 692 | 15957 | | | | 15957 | |
| | 1 | 468 | 10792 | 156 | 3597 | | 14389 | 19786 |
| | 2 | 468 | 10792 | 156 | 3597 | | 14389 | 34175 |
| | 3 | 468 | 10792 | 156 | 3597 | | 14389 | 48564 |
| | 4 | 468 | 10792 | 156 | 3597 | | 14389 | 62953 |
| | 5 | 468 | 10792 | 156 | 3597 | | 14389 | 77342 |
| | 6 | 468 | 10792 | 156 | 3597 | | 14389 | 91731 |
| | 7 | 468 | 10792 | 156 | 3597 | | 14389 | 106120 |
| | 8 | 468 | 10792 | 156 | 3597 | 32000 | 46389 | 152509 |
| | 9 | | | | | 2000 | 2000 | 154509 |
| | 10 | | | | | 2000 | 2000 | 156509 |
| | 11 | | | | | 2000 | 2000 | 158509 |
| | 12 | | | | | 2000 | 2000 | 160509 |
| | 13 | | | | | 2000 | 2000 | 162509 |
| | 14 | | | | | 2000 | 2000 | 164509 |
| | 15 | | | | | 2000 | 2000 | 166509 |
| | 16 | | | | | 2000 | 2000 | 168509 |
| | 17 | | | | | 2000 | 2000 | 170509 |
| | 18 | | | | | 2000 | 2000 | 172509 |
| | 19 | | | | | 2000 | 2000 | 174509 |
| | 20 | | | | | 2000 | 2000 | 176509 |

*Flood Embankment not required.

**Flood Embankment required - not included in cumulative cost.

3.40 METHOD C1
CATCHMENT = 600 ACRES

| | Year | HHrs | Cost HHrs | HHrs Rehandle | Cost HHrs | Pump Install | Total Annual Expend. | Cumul-ative Expend. |
|---|---|---|---|---|---|---|---|---|
| * | Init | 468 | 10792 | | | | 10792 | 10792 |
| ** | | 1028 | 23705 | | | | 23705 | |
| | 1 | 936 | 21584 | 312 | 7194 | | 28778 | 39570 |
| | 2 | 936 | 21584 | 312 | 7194 | | 28778 | 68348 |
| | 3 | 936 | 21584 | 312 | 7194 | | 28778 | 97126 |
| | 4 | 936 | 21584 | 312 | 7194 | | 28778 | 125904 |
| | 5 | 936 | 21584 | 312 | 7194 | | 28778 | 154682 |
| | 6 | 936 | 21584 | 312 | 7194 | | 28778 | 183460 |
| | 7 | 936 | 21584 | 312 | 7194 | | 28778 | 212238 |
| | 8 | 936 | 21584 | 312 | 7194 | 47000 | 75778 | 288016 |
| | 9 | | | | | 4500 | 4500 | 292516 |
| | 10 | | | | | 4500 | 4500 | 297016 |
| | 11 | | | | | 4500 | 4500 | 301516 |
| | 12 | | | | | 4500 | 4500 | 306016 |
| | 13 | | | | | 4500 | 4500 | 310516 |
| | 14 | | | | | 4500 | 4500 | 315016 |
| | 15 | | | | | 4500 | 4500 | 319516 |
| | 16 | | | | | 4500 | 4500 | 324016 |
| | 17 | | | | | 4500 | 4500 | 328516 |
| | 18 | | | | | 4500 | 4500 | 333016 |
| | 19 | | | | | 4500 | 4500 | 337516 |
| | 20 | | | | | 4500 | 4500 | 342016 |

*Flood Embankment not required.

**Flood Embankment required -
not included in cumulative cost.

3.41 For Graphical Representation of Cumulative Expenditure versus year for systems A1, A2, A3, B1, B2, C1

Reference Graphs 2, 3 and 4.

3.42 Due to undefined initialisation period identification of the optimal solution based on both initial capital cost and subsequent expenditure is not possible.

For the moment therefore the following definitions of optimality are considered.

1. Optimal Solution = Solution incurring lowest total cost (i.e. sum of expenditure during initialisation and subsequent 20 years).

2. Optimal Solution = Solution incurring lowest initial capital cost.

3.43 <u>By Definition 1*</u>

Optimal Solution 100 acre catchment - A3
" " 300 acre catchment - B1
" " 600 acre catchment - B1

<u>By Definition 2*</u>

Optimal Solution 100 acre catchment - A1
" " 300 acre catchment - C1
" " 600 acre catchment - C1

*Ref. Graph 2, 3 and 4.

3.44 EXAMPLE:

Application of Optimal Solutions based on definition 1 to Outfall System at Blackwater Works

| | |
|---|---|
| Catchment sizes ranging between taken as "100 acres" | 1 - 200 acres |
| Catchment sizes ranging between taken as "300 acres" | 201 - 450 acres |
| Catchment sizes ranging between taken as "600 acres" | 451 - 1000 acres |

For Blackwater Works (excluding Cornafulla, Drumlosh)

| | |
|---|---|
| No. 100 acre catchment areas | = 36 |
| No. 300 acre catchment areas | = 14 |
| No. 600 acre catchment areas | = 10 |

For the moment it will be assumed that optimal solutions are technically possible at each location. Adjustments will be introduced later to take account of necessity at some locations for flood embankments.

3.45 Optimal Solution = Solution incurring lowest total cost

| Year | A3 | | B1 | | B1 | | Total Annual | Cumulative |
|---|---|---|---|---|---|---|---|---|
| | 1 No. 100 acre | 36 No. 100 acre | 1 No. 300 acre | 14 No. 300 acre | 1 No. 600 acre | 10 No. 600 acre | | |
| Init | 9,028 | 325,008 | 99,603 | 1,394,442 | 149,556 | 1,495,560 | 3,215,010 | 3,215,010 |
| 1 | 15,185 | 546,660 | 2,000 | 28,000 | 4,500 | 45,000 | 619,660 | 3,834,670 |
| 2 | 2,803 | 100,908 | 2,000 | 28,000 | 4,500 | 45,000 | 173,908 | 4,008,578 |
| 3 | 2,803 | 100,908 | 2,000 | 28,000 | 4,500 | 45,000 | 173,908 | 4,182,486 |
| 4 | 2,803 | 100,908 | 2,000 | 28,000 | 4,500 | 45,000 | 173,908 | 4,356,394 |
| 5 | 2,803 | 100,908 | 2,000 | 28,000 | 4,500 | 45,000 | 173,908 | 4,530,302 |
| 6 | 2,803 | 100,908 | 2,000 | 28,000 | 4,500 | 45,000 | 173,908 | 4,704,210 |
| 7 | 2,803 | 100,908 | 2,000 | 28,000 | 4,500 | 45,000 | 173,908 | 4,878,118 |
| 8 | 2,803 | 100,908 | 2,000 | 28,000 | 4,500 | 45,000 | 173,908 | 5,052,026 |
| 9 | 2,803 | 100,908 | 2,000 | 28,000 | 4,500 | 45,000 | 173,908 | 5,225,934 |
| 10 | 2,803 | 100,908 | 2,000 | 28,000 | 4,500 | 45,000 | 173,908 | 5,399,842 |
| 11 | 2,803 | 100,908 | 2,000 | 28,000 | 4,500 | 45,000 | 173,908 | 5,573,750 |
| 12 | 2,803 | 100,908 | 2,000 | 28,000 | 4,500 | 45,000 | 173,908 | 5,747,658 |
| 13 | 2,803 | 100,908 | 2,000 | 28,000 | 4,500 | 45,000 | 173,908 | 5,921,566 |
| 14 | 2,803 | 100,908 | 2,000 | 28,000 | 4,500 | 45,000 | 173,908 | 6,095,474 |
| 15 | 2,803 | 100,908 | 2,000 | 28,000 | 4,500 | 45,000 | 173,908 | 6,269,382 |
| 16 | 2,803 | 100,908 | 2,000 | 28,000 | 4,500 | 45,000 | 173,908 | 6,643,290 |
| 17 | 2,803 | 100,908 | 2,000 | 28,000 | 4,500 | 45,000 | 173,908 | 6,827,198 |
| 18 | 2,803 | 100,908 | 2,000 | 28,000 | 4,500 | 45,000 | 173,908 | 7,001,106 |
| 19 | 2,803 | 100,908 | 2,000 | 28,000 | 4,500 | 45,000 | 173,908 | 7,175,014 |
| 20 | 2,803 | 100,908 | 2,000 | 28,000 | 4,500 | 45,000 | 173,908 | 7,348,922 |

3.46 Optimal Solution = Solution incurring lowest capital cost

| | | A1 | | C1 | | C1 | | Total Annual | Cumulative |
|---|---|---|---|---|---|---|---|---|---|
| | | 1 no. 100 acre | 36 no. 100 acre | 1 no. 300 acre | 14 no. 300 acre | 1 no. 600 acre | 10 no. 600 acre | | |
| * | Init | 1799 | 64764 | 5396 | 75544 | 10792 | 107920 | 248228 | 248228 |
| ** | | 7955 | 286380 | 15957 | 223398 | 23705 | 237050 | 746828 | |
| | 1 | 4196 | 151056 | 14389 | 201446 | 28778 | 287780 | 640282 | 888510 |
| | 2 | 4196 | 151056 | 14389 | 201446 | 28778 | 287780 | 640282 | 1528792 |
| | 3 | 4196 | 151056 | 14389 | 201446 | 28778 | 287780 | 640282 | 2169074 |
| | 4 | 4196 | 151056 | 14389 | 201446 | 28778 | 287780 | 640282 | 2809356 |
| | 5 | 4196 | 151056 | 14389 | 201446 | 28778 | 287780 | 640282 | 3449638 |
| | 6 | 4196 | 151056 | 14389 | 201446 | 28778 | 287780 | 640282 | 4089920 |
| | 7 | 4196 | 151056 | 14389 | 201446 | 28778 | 287780 | 640282 | 4730202 |
| | 8 | 4196 | 151056 | 46389 | 649446 | 75778 | 757780 | 1553282 | 6288484 |
| | 9 | 4196 | 151056 | 2000 | 28000 | 4500 | 45000 | 224056 | 6512540 |
| | 10 | 4196 | 151056 | 2000 | 28000 | 4500 | 45000 | 224056 | 6736596 |
| | 11 | 4196 | 151056 | 2000 | 28000 | 4500 | 45000 | 224056 | 6960652 |
| | 12 | 4196 | 151056 | 2000 | 28000 | 4500 | 45000 | 224056 | 7184708 |
| | 13 | 4196 | 151056 | 2000 | 28000 | 4500 | 45000 | 224056 | 7408764 |
| | 14 | 4196 | 151056 | 2000 | 28000 | 4500 | 45000 | 224056 | 7632820 |
| | 15 | 4196 | 151056 | 2000 | 28000 | 4500 | 45000 | 224056 | 7856876 |
| | 16 | 3597 | 129492 | 2000 | 28000 | 4500 | 45000 | 202492 | 8059368 |
| | 17 | 3597 | 129492 | 2000 | 28000 | 4500 | 45000 | 202492 | 8261860 |
| | 18 | 3597 | 129492 | 2000 | 28000 | 4500 | 45000 | 202492 | 8464352 |
| | 19 | 3597 | 129492 | 2000 | 28000 | 4500 | 45000 | 202492 | 8666844 |
| | 20 | 3597 | 129492 | 2000 | 28000 | 4500 | 45000 | 202492 | 8869336 |

# CHAPTER 4

## Comparison of Expenditure on Present System with Expenditure on Visualised Systems

4.1 In the previous chapters the various visualised systems of silt control have been costed and the optimal solution identified for small, medium and large catchment sizes. The question still remains, however, as to whether the most economical of the visualised systems remains economical when compared to the present system. To facilitate this comparison the present system must be costed.

4.2 Costing of Present System

Present expenditure in the area of silt control may be viewed under three main headings:-

a. Expenditure on installation and maintenance of silt control systems.

b. Expenditure on 'clean up operations' i.e. to placate farmers.

c. Compensation to farmers, sports clubs etc.

d. Cost of damaged public relations*

4.3 It is possible to record relatively clearly expenditure on excavation and maintenance of silt ponds.

Similarly it would be relatively easy to record expenditure in the form of compensation.

Expenditure on 'clean up' operations however, which represents a major fraction of the total expenditure on silt control is not readily identifiable since due to the present subhead system expenditure, in this area loses identity

*Cost of damaged public relations not considered as it is outside scope of this report.

amid expenditure on drainage. Any such work is a direct consequence of the inefficiencies of our approach to silt control and as such should be regarded as expenditure on silt control.

4.4 Rather than trying to assess finitely the amount of expenditure presently incurred due to silt control the following approach may be adopted:

The present system is optimal if the amount of expenditure presently incurred is less than the expenditure which would be incurred if the most economic of the visualised systems were adopted; bearing in mind the difference in efficiency.

4.5 Example:

Blackwater Works

Period June to September 1983

| | | | |
|---|---|---|---|
| Total no. of Hymac hours to silt control (maintenance only) | approx. | = 640 | HHrs |
| Expected total no. of Hymac hours for 1 year | | = 2,560 | HHrs |
| Equivalent annual expenditure | | = £59,033 | |
| Lowest possible annual expenditure to maintain system which produces acceptable suspended solids concentrations at all outfalls* | | =£640,282 | |

4.6 From this it follows that if more than £580,000 is spent annually in the present system by way of compensation etc. (i.e. expenditure on silt control excluding silt pond maintenance expenditure) that the present system is non optimal. This is clearly not the case and hence it is reasonable to conclude that the present system is optimal.

*Ref. 3.46

4.7 It should be noted however that the comparison above compares (a) visualised system which is designed to produce acceptable suspended solids effluent to all outfall locations with (b) present system which is not 100% efficient.

4.8 At this point it is necessary to distinguish between two definitions of silt control.

| | | |
|---|---|---|
| 1. | Rational/ Preventative | To produce effluent of acceptable suspended solids concentrations at all outfalls. |
| 2. | Corrective | To rely for the most part on siltation 'cleanup operations' where complaints are received or anticipated. |

4.9 Due to the present budgetary system arrangements expenditure on silt control effectively raises production costs. If it is intended to rationalise silt control it will be essential to introduce some form of budgetary separation. Evidence of the latter is already available from the low degree of priority which Works Managers (find it possible to) afford silt control. This low degree of priority is in turn reflected in the shortage (oftentimes virtual absence) of machinery available for silt control.

# CHAPTER 5

## Conclusions and Recommendations

### Conclusions:

1. When considering the question of sludge capacity required neither a finite answer nor the answers parish can be derived by theoretical methods based on monitoring since the variables involved while identifiable defy analysis (ref. 1.2 - 1.7 inc.)

2. Silt trapping systems which allow for accumulation of 525 $ft^3$ of sludge/acre 4 times per year function satisfactorily (ref. 1.8 - 1.9 inc.).

3. The quantity of suspended solids to be dealt with in attempting to produce effluent of acceptable suspended solids concentration is generally underestimated.

   The amount of silt giving rise to complaints from external individuals and bodies represents only a small fraction of the overall suspended solids discharged via our outfalls.

   Unfortunately to prevent this small proportion from giving rise to complaints it would be necessary to trap almost all suspended solids (ref. 1.12.7).

4. The equivalent of approx. 152,000 tonnes of milled peat at 55% M.C. is discharged annually from milled peat production areas in the form of suspended solids (ref. 1.10).

5. The ease with which settled peat solids may be put back into suspension is generally underestimated (ref. 1.11).

6. The installation of trapping systems which are not protected against heavy flows from upstream and/or flooding from down-stream is futile. Protection may be afforded by means of by-passing, valves, embankments etc. (ref. 1.11; 1.12; 2.9, 2.10; 2.11; 2.12; 2.13).

7. When flow through a trapping system is in the form of a narrow channel no settlement of suspended solids is taking place (ref. 1.12.2).

8. It is grossly inefficient to install settlement ponds on large outfalls or rivers (ref. 1.12.5).

9. It is generally cost prohibitive and/or technically impossible to rearrange existing bog drainage systems.

10. The dragline is not suitable for silt pond maintenance (ref. 2.17). The hymac is suitable for silt pond maintenance (ref. 2.17).

11. The recycling of sludge removed from silt trapping systems by excavator is non practicable (ref. 2.17).

12. The use of 1 to 1 side slopes to silt pond is unwarranted (ref. 2.18).

13. The existance of "walls" would be highly beneficial as regards efficiency and quiescent conditions (ref. 2.14; 2.15).

14. The present system involving reliance to a large extent on cleanup operations and compensation costs less than any rationalised method of producing acceptable effluent at all outfall locations.

The above statement does not take account of costs incurred by damaged public relations or responsibility toward protection of the environment.

15. The optimal rationalised system has been identified. In the light of paragraph 2 of conclusion 14 it is outside the scope of this report to identify the overall optimal solution (ref. 4.1-4.9 inc.).

16. To adopt a rationalised approach the following points must be clarified.

    (a) identification of the overall optimal solution

    (b) Finite cost of the present system (ref. 4.1-4.9 inc.).

17. The present budgetary system does not facilitate

    (a) Accurate costing of the present system

    (b) Rationalised approach (ref. 4.9).

18. The maintenance of silt ponds by sludge pumping may prove to be more economical than the present method. The system is as yet untried.

## Recommendations

1. Trapping systems should be designed on the basis of 525 ft.$^3$ of sludge accumulating four times per year (ref. conclusion 2).

2. Trapping systems should not be installed unless adequate protection to ensure against resuspension of the settled particles and regular maintenance can be provided (ref. conclusion 5 and 6).

3. Future trapping systems should be modified in accordance with 2.15 (ref. conclusions 7 and 13).

4. In general settlement ponds should not be installed on large outfalls or rivers (ref. conclusion 8).

5. Trapping system designs based on overall re-arrangement of outfall systems should not be entertained. Consideration should, however, be given to localised re-arrangement of outfall system when individual outfalls are being considered for silt removal (ref. conclusion 9).

6. The practice of providing trapping systems, the dimensions of which are based on capabilities of the dragline excavator rather than the hymac, should be discontinued.

7. As an essential starting point for the rationalisation of silt control, consideration should be given to conclusions 14, 15, 16 and 17.

8. Development of the sludge pump should be continued.

9. Prior to a rationalised plan for a Works being discussed and decided upon, no. 7 above should be complied with.

# APPENDIX 1

## Acceptable Suspended Solids Concentration

Following the 1977 Water Pollution Act threshold values for maximum allowable suspended solids concentration are left by and large to the discretion of the local authorities involved.

The "Eight Report of the Royal Commission on Water and Sewage" (1912) recommended that "maximum suspended solids concentration" be regarded as 30 ppm (in the case of peat solids = 30 mg/l) assuming an outfall to receiving water flow rate ratio of 1 : 8.

Although the situation is not clarified, it is reasonable to assume that suspended solids concentrations of the order of 100 mg/l should be deemed acceptable by the authorities since the outfall to receiving water flow rate ratio in our case is rarely less than 1 : 25.

The outlet suspended solids concentration of functioning silt ponds rarely exceeds 100 mg/l and is often considerably less.

The retention time required to provide acceptable effluent is less critical than the lifespan requirement when the length and volume of silt ponds is being considered.

Our legal obligation to treat drainage waters with high suspended solids concentration is presently being investigated in the light of the 1977 Water Pollution Act and the 1946 Turf Development Act.

## APPENDIX 2

### Mathematical Expression for Lifespan of Trapping System

Trapping System = Settlement Pond, Say

| Parameter | Symbol | Units |
|---|---|---|
| Top Width Pond | W | m |
| Overall Depth Pond | D | m |
| Effective Depth Pond | H | m |
| Length of Pond | L | m |
| Relative Density Dry Solids | g | - |
| % Suspended Solids which settle | 100 E | - |
| Annual Average Rainfall | R | mm/yr |
| Run off Equation | X | - |
| Area Catchment | A | acres |
| Average M.C. settled sludge | M | - |
| Inflow to Pond | Qi | $m^3/hr$ |
| Lifespan Pond | C | days |

$$Qi = \left(\frac{R}{(24 \times 365.25)\ (10^3)}\right) \left(\frac{A \times 0.00405}{10^{-6}}\right) \left(\frac{X}{1}\right)$$

$$= RAX\ (4.62012 * 10^{-4})$$

Weight solids inflowing to pond in 1 hour

$$= (RAX)\ (4.62012 \times 10^{-4})\ (S_1 \times 10^3)\ mg$$

Volume of solids inflowing to pond in 1 hour =

$$\left(\frac{RAX}{1}\right) \left(\frac{S_1}{g}\right) \left(\frac{4.62012 * 10^{-10}}{1}\right) \quad m^3/hr$$

Volume sludge formed in 1 hour =

$$\left(\frac{RAX\ S_1}{(1-m)\ (g)}\right) \left(\frac{e}{1}\right) \left(\frac{4.62012 * 10^{-10}}{1}\right) \quad m^3$$

Volume available for sludge deposition =

$$(\ (W-2D + H)\ *\ (H.L.)\ )$$

$$\text{Lifespan} = C = \frac{\text{vol. available for sludge deposition}}{\text{vol. required for sludge deposition per unit time.}}$$

$$C = \frac{\left( (W-2D+H)\ (H.L.) \right)}{\left(\frac{RAX\ S_1}{(1-m^{-1})}\right)\left(\frac{e}{g}\right)\left(\frac{4.62012 * 10^{-10}}{1}\right)\left(\frac{24}{1}\right)} \text{ days}$$

Demonstration of sensitivity of capacity to moisture content sludge.

Assume 1. Runoff equation (X) can be evaluated and has value 0.7.

2. W = 8; D = 3; H = 2; g = 1.5;
$S_1$ = 800 mg/l A = 100; e = 0.85;
R = 1320 mm/yr*; C = 120; m, L variable.

R = Average yearly rainfall calculated by assuming monthly rainfall equal to average monthly rainfall based on wettest three months of year (value above for November, December, January at Ahascragh, Co. Galway - Derryfadda.

General Equation Derived above:-

$$C = \frac{(W-2D+H)\ (H.L)}{\left(\frac{RAX\ s,\ e}{((1-m)\ g)}\right)\left(\frac{4.62012 * 10^{-10}}{1}\right)\left(\frac{24}{1}\right)} \text{ days}$$

For values listed above.

$$120 = \frac{(8-2(3)+2)\ (2 * L)}{\left(\frac{(1320)\ (100)\ (0.7)\ (800)\ (0.85)}{(1-m)\ (1-5)}\right)(4.62012*10^{-10})\left(\frac{24}{1}\right)}$$

L =

Values of L for various values of m

| m | (1-m) | L |
|---|---|---|
| 0.81 | 0.19 | |
| 0.83 | 0.17 | |
| 0.85 | 0.15 | |
| 0.87 | 0.13 | |
| 0.89 | 0.11 | |
| 0.91 | 0.09 | |
| 0.93 | 0.07 | |
| 0.95 | 0.05 | |
| 0.97 | 0.03 | |
| 0.99 | 0.01 | |

Ref. Graph 1

L (Pond Length)

Vs m (Moisture Content)

# APPENDIX 3

## Estimated Peat Losses

525 $ft^3$/acre/3 months

i.e. 2100 $ft^3$/acre/year at 95% moisture content

$= \frac{2100}{20}$ $ft^3$/ at 0% moisutre content

$= \frac{100}{45} \left(\frac{2100}{20}\right)$ $ft^3$ at 55% moisutre content.

Density of peat at 55% M.C. = 18 lbs/$ft^3$ i.e. 2204 lbs = IT.

Therefore $\left(\frac{100}{45}\right) \left(\frac{2100}{20}\right) \left(\frac{18}{2204}\right)$ = 1.905 tonnes/acre/year

Total milled peat production area = 80,000 acres.

Therefore (80,000) * (1.905) = 152,000 T milled peat at 55% M.C. lost every year.

Assuming average lifespan for all milled peat bogs = 20 years

Total losses = 152,000 * 20

= 3,040,000 tonnes at 55% M.C. from all milled peat areas in 20 years.

## APPENDIX 4

### Implications of Findings of Laboratoire Central D'Hydraulique de France

Continutity Equation

(Flow Rate) = (cross sectional Area Flow) * (Mean Flow Velocity)

Normal flow conditions : Mean Velocity flow O/F = 1.25 m/s
Heavy flow conditions : Mean Velocity flow O/F = 2.00 m/s
Hence: for normal conditions and efficiency:

$$\frac{\text{Cross Sectional Area Flow Trapping System}}{\text{Cross Sectional Area Flow O/F}} = \frac{1.25}{0.15} = 8.3$$

For Heavy Flow Conditions and Efficiency

$$\frac{\text{Cross Sectional Area Flow Trapping System}}{\text{Cross Sectional Area Flow O/F}} = \frac{2.00}{0.15} = 13.3$$

For 25 ft. wide pond with depth of flow = 6 inches
i.e. cross sectional area flow pond = 12.5 $ft^2$.

During normal conditions and efficiency

$$\text{max. cross sectional area flow O/F} = \frac{12.5}{8.3} = 1.5\ ft^2$$

For large O/F or small river with flow
Dimensions 8 ft * 1 ft. trapping system with
flow depth = 1 ft efficient only when

$$\text{Width of flow in trapping system} = 8\ \left(\frac{1.25}{0.15}\right) = 66\ \text{ft.}$$

# APPENDIX 5

## Protection of Silt Ponds from Flooding

Ref. Figure 1:

In the case of the unprotected system settled peat particles are resuspended and settle on surrounding land. The problem may be solved by providing flood embankments with pond outlet piped underneath and fitted with a simple flap valve. The rise in water level upstream of the embankment is caused solely by runoff. No additional flooding is caused upstream of the embankment since if hydrostatic pressure upstream of the embankment becomes greater than the hydrostatic pressure downstream a flow will take place through valve until hydrostatic pressures balance. Any resuspension and subsequent settling of peat particles takes place within the area surrounded by embankment. A valve in the form of a hinged lid would suffice requiring virtually no maintenance.

# APPENDIX 6

## Bypassing

There are five methods to be considered:-

1. Surge storage - I.L. storage inlet = I.L. pond inlet
2. " " - I.L. storage inlet I.L. pond inlet
3. Bypassing - I.L. Bypass inlet I.L. pond inlet
4. Bypassing - I.L. Bypass inlet I.L. pond inlet
5. Bypassing - Small diam. pond inlet pipe to restrict heavy flows by causing backup.

Considering 1 and 2 : Storage capacity required excessive. Solutions 1 and 2 impracticable.

Considering 3 : During normal conditions the flow would be via the pipe with the lower I.L. and hence through trapping system. During periods of heavy rainfall the flow would be partly through the pipe with lower I.L. and partly through the pipe with the higher invert level.

This system is not suitable because
(a) during periods of heavy flow the cross sectional area of flow passing through pond inlet pipe may be equal to cross sectional area flow during normal conditions but head and consequently velocity is greater and hence danger of resuspending settled peat particles not reduced to degree required.

(b) The relative invert levels involved would be critical. The very nature of the bog does not lend itself to this type of technology.

Considering 4: This method would involve the installation of a bypass pipe/weir the invert level of which would be equal to that of the pond inlet pipe. During normal flow conditions the bypass weir/pipe would be shut off. During heavy rainfall the bypass weir/pipe would be open and the inlet pipe to pond shut. This method although not automatic is practicable.

Considering 5: The use of small diameter pipes under bog conditions is not practical due to blockages.

## APPENDIX 7

### Provision of Walls in Silt Ponds

Fig. 2 (a) shows the effect on the velocity pattern through pond due to presence of wall. It can be clearly seen that the presence of a wall at the inlet is of advantage in producing uniform flow velocity across the full width of pond while not interfering with the flow rate and consequently providing greater pond efficiency and off-setting the onset of channeling.

Fig. 2 (b) shows how quiescent conditions may be maintained during high flow conditions due to presence of walls.

Fig. 2 (c) shows how cleaning of pond by pumping can be achieved in cases where part of the pond is out of reach (pump capability wise) of area onto which sludge is to be pumped.

## APPENDIX 8

### Stability of Silt Pond Excavation

Fig. 3 (a) shows the result of excessive excavating and reason for failure.

Fig. 3 (b) shows stability diagram for the case of a water or sludge filled pond.

It should be noted that if flow through pond is stopped during cleaning and pond completely emptied (sludge and water) that failure may result.

## APPENDIX 9

### Number of years before silt pond spoil rehandling essential

Max. allowable cross sectional area spoil = A

$A = 45 * 6 = 270 \text{ ft}^2$

Vol Sludge to be removed from pond/year/acre

$= 525 * 4 = 2100 \text{ ft}^3$

Moisture Content Sludge = 95%

Specific Gravity Dry Peat Particles = 1.0

Vol. spoil at 0% M.C. accumulating/year/acre $= 2100 * (1-0.95)$

$= 105 \text{ ft}^3$ @ 10% M.C.

Moisture Content Spoil = 70%

Vol. spoil @ 70% M.C. accumulated/year/acre $= 105 * \frac{(100)}{(30)}$

$= 350 \text{ ft}^3$ @ 70% M.C.

Length available for deposition of spoil/acre $= \frac{(150)}{(25)} * 2$

Cross sectional area spoil @ 70% M.C./year/acre $= \frac{350}{12} * 2$

$= 58.32 \text{ ft}^2$

therefore number of years before spoil rehandling essential $= \frac{270}{58.32}$

$= 4.6$ years

say 5 years.

Vol. of spoil and length over which it is to be distributed vary linearly with catchment size.

i.e. TIME AT WHICH SPOIL REHANDLING ESSENTIAL IS SAME FOR ALL CATCHMENT AREAS = 5 YEARS.

## APPENDIX 10

### Hymac Hours (HHrs) Required for Pond Cleaning, Spoil Rehandling and Initial Excavation

Rate of Excavation 30 $ft^3$/min. @ 75% efficiency
= 1350 $ft^3$/hr.

Time to clean 100 acre pond/year = $\frac{(525)\ (100)\ (4)}{(1350)}$

= 156 HHrs

Time to rehandle spoil - 100 acre pond/year = $\frac{(100)\ (350)}{1350}$

= 25.92 HHrs/year
= 130 HHrs/5 years

Time for initial excavation 100 acre pond assuming overall depth = 7 ft. = $\frac{(525)\ (2)\ (100)}{1350}$

= 78 HHrs.

# APPENDIX 11

## Sludge Pump Hours (SPHrs) Required/Acre/Year

Quantity to be pumped/acre/year = $(525)^4$

= 2100 $ft^3$

Spec. Pumping Rate = 780 IMPG.P.M. @ Total Head = 50 ft.

Pumping Rate = 780 G.P.M. @ 50% Efficiency

= 7,511 $ft^3$/hr. @ 50% Efficiency

= 3,756 $ft^3$/hr.

Time to clean 100 acre pond/year = $\frac{(525)\ (4)\ (100)}{3,756}$

= 74 SPHrs

# APPENDIX 12

## Ratio Hymac Hours - Sludge Pump Hours Required for Maintenance

Hymac Cleaning Rate = 1350 $ft^3$/Hr.

Sludge Pump Cleaning Rate = 3756 $ft^3$/Hr.

$$\text{Ratio} = \frac{3756}{1350} = 2.78$$

APPENDIX 13

## Area over which spoil from sludge pump to be spread

## Ditching Hours Required

Vol. sludge produced per acre/year = (525) (4)
= 2100 $ft^3$

Initial depth sludge after pumping = 3 ins.

Area covered by sludge from one acre/cleaning $= \frac{(2100)}{(4)} (4)$

= 2100 $ft^2$

If area for sludge spreading square : 2100 $ft^2$ = 46 * 46 ft.
Area in which ditching necessary after pond cleaning
- 100 acre catchment 460 * 460 ft.

Drains @ 45 ft. centres
Total length ditching/cleaning/100 acres = 460 * 11
= 5060 ft.

Ditching rate = 300 ft./Hr @ 50% efficiency
= 150 ft/Hr.
Ditching Hours (DHrs)/Cleaning/100 acres $= \frac{(5060)}{(150)}$
= 33.7 DHrs
Ditching Hours required/year/100 acres = 135 DHrs

Ratio spreading area to catchment area = $\frac{210,000}{4,356,000}$ = 4.8%

## APPENDIX 14

### Quantity of Peat Recycled by Sludge Pumping

Quantity of Sludge Pumped per 100 acres/year

$$= (100)\ (4)\ (525)\ ft^3 \text{ @ } 95\% \text{ M.C.}$$

$$= \frac{(100)\ (4)\ (525)\ ft^3 \text{ @ } 0\% \text{ M.C.}}{20}$$

$$= \frac{(100)}{(45)}\ \frac{(100)\ (4)\ (525)\ ft^3}{20} \text{ @ } 55\% \text{ M.C.}$$

$$= 23{,}333\ ft^3 \text{ @ } 55\% \text{ M.C.}$$

Density of peat @ 55% M.C. = 18 lbs/$ft^3$
(2204 lbs = 1 tonne)

$$23{,}333\ ft^3 \text{ @ } 55\% \text{ M.C.} = \left(\frac{18}{2204}\right)\ (23{,}333) = 190.5 \text{ tonnes}$$

i.e. 190.5 tonnes peat @ 55% M.C. from 100 acres/year.

# APPENDIX 15

## Area Required for Lagoon - General

Ref. Figure 5

For Cost comparison area required for Lagoon = Area required lagoon less area required for ponds

A = Surface area lagoon + Plan area embankment - area pond system.

$$= (S.A.) + (34).\ 1 - 6(25 + 60 + 90)*\text{Catchment Area}$$

Catchment Area = x

$$A = (S.A.) + (34)(1) - (1050)\ (x)$$

Area required for Lagoons to Method C1

$$\text{Area} = \begin{matrix}(\text{Surface}) \\ (\text{Area}\ )\end{matrix} + \begin{matrix}(\text{Emb.}\ ) \\ (\text{Length})\end{matrix}\ \begin{matrix}(34) \\ (\ )\end{matrix} - 1050\ x$$

100 acres:

$$S.A. = \frac{(8)\ (525)\ (4)\ (100)}{10} = 168{,}000$$

$$L = (\ S.A.\ )\ (4)$$
$$= (409.87)*\ (4)$$
$$= 1639$$

$$A = (168{,}000) + (1{,}639)\ (34) - (1050)\ (100)$$
$$= 223{,}726 - 105{,}000$$

Area required for lagoon  area required for ponds

Therefore area to be acquired/designated = zero.

300 acres:

$A = (S.A.) + L.34 - 1050 x$

$(S.A.) = \frac{(12)\ (525)\ (4)\ (300)}{10}$

$= 756,000$

$L = (756,000)\ (4)$

$= 3,477$

$A = (756,000) + (3,477)\ (34) - (1,050)\ (300)$

$= 874,218 - 315,000$

Area required for Lagoon area required for ponds

Therefore area to be acquired/designated = zero

600 acres:

$A = (S.A.) + L.34 - 1050 x$

$S.A. = \frac{(12)\ (525)\ (4)\ (600)}{10}$

$= 1,512,000$

$L = (1,512,000)\ (4)$

$L = 4918.0$

$A = 1,512,000 + (4,918)\ (34) - (1,050)\ (600)$

$A = 1,049,212$

## APPENDIX 16

### Number of years spoil to produce embankment to serve remaining bog lifespan

Lifespan = 20 years

Catchment = x acres

No. years Spoil = y

Quantity of spoil available for embankment construction after y years from x acre catchment $= \frac{(350)\ (x)\ (y)}{1}$

Cross sectional area embankment $= 240\ ft^2$

Length embankment from x acres after y years constructed from available spoil $= \frac{350\ xy}{240}$

$= \frac{3}{2}\ xy$

If embankment square, capacity $= \left(\frac{\frac{3}{2}\ xy}{4}\right)^2 * 10$

Capacity required for (20-y) years = (20-y) (4) (525) (x)

= (2100) (20-y) (x)

Compatability: $(2100)\ (20-y)\ (x) = \left(\frac{3xy}{8}\right)^2 * 10$

$42{,}000\ x - 2100\ yx = \frac{(9)\ (10)}{(64)}\ x^2\ y^2$

$9x^2\ y^2 + 13{,}440\ xy - 268{,}800\ x = 0.$

For 100 acres:

$x = 100; \quad y = ?$

$9x^2y^2 + 13,440xy - 268,800x = 0$

$90,000y^2 + 1,344,000y - 26,880,000 = 0$

$90y^2 + 1,344y - 26,880 = 0$

$$y = \left( \frac{(-1344) \pm (1344)^2 + 4(90)(26,880)}{180} \right)$$

$$= \left( -\frac{1344 \pm 3388}{180} \right)$$

$$= 11.35$$

For 300 Acres:

$x = 300; \quad y = ?$

$9x^2y^2 + 13,440xy - 268,800x = 0$

$810,000y^2 + 4,032,000y - 80,640,000 = 0$

$810y^2 + 4032y - 80,640 = 0$

$$y = \left( \frac{-4032 \pm (4032)^2 + 4(810)(80,640)}{1620} \right.$$

$y = 7.79$

For 600 acres:

$9x^2y^2 + 13,440xy - 268,800x = 0$

$1620y^2 + 8064y - 161,280 = 0$

$$y = \left( \frac{-8064 \pm (8064)^2 + 4(1620)(161,280)}{3240} \right.$$

$y = 7.78$ years

Optimal year for completion of embankment:

| | | |
|---|---|---|
| 100 acres | - | 12th |
| 300 acres | - | 8th |
| 600 acres | - | 8th |

Quantity Material:

100 acres - (100) (12) (350) = 420,000 $ft^3$
300 acres - (300) ( 8) (350) = 840,000 $ft^3$
600 acres - (600) ( 8) (350) =1,680,000 $ft^3$

Rate of Construction 675 $ft^3$/HHr.

Hymac Hours Required:

100 acres - $\frac{(420,000)}{(675)}$ = 622 HHrs

300 acres - $\frac{(840,000)}{(675)}$ = 1,244 HHrs

600 acres - $\frac{(1,680,000)}{(675)}$ = 2,488 HHrs

# APPENDIX 17

Lagoon Construction:-

Cross sectional area embankment
= 24 * 10 = 240 $ft^2$

Embankment length = L

Vol. material to embankment = (240) (L) $ft^3$

Lagoon capacity for 100 acres/year = (100) (525) (4)
= 21,000 $ft^3$

Average height embankment = 10 ft.

Rate of construction = $\frac{1350}{2}$ = 675 $ft^3$/HHr

Bottom width embankment = 34 ft.

Top width embankment = 14 ft. (to facilitate hymac/dozers)

Area required = surface area + (L) (34) - area required
*Ref. 3.7 for ponds.

= S.A. + L.34 - 1050 Catchment Area.

| Catch-ment (Acres) | Capac-ity $_3$ ($ft^3$) | Surface Area ($ft^3$) | Square Dims. (ft x ft) | Embank. Length ft. | Embank. Material $ft^3$ | Hymac Hours | Area ($ft^2$) | Area (Acres) | |
|---|---|---|---|---|---|---|---|---|---|
| 100 | 1050000 | 105000 | 324 x 324 | 1296 | 311040 | 460 | 44064 | 1.01 | 5 year |
| 300 | 3150000 | 315000 | 561 x 561 | 2244 | 538560 | 797 | 76296 | 1.75 | |
| 600 | 6300000 | 630000 | 793 x 793 | 3172 | 761280 | 1127 | 107848 | 2.47 | Lagoon |
| 100 | 2100000 | 210000 | 450 x 450 | 1800 | 432000 | 640 | 166200 | 3.81 | 10 year |
| 300 | 6300000 | 630000 | 793 x 793 | 3172 | 761280 | 1128 | 422848 | 9.71 | |
| 600 | 12600000 | 1260000 | 1122 x1122 | 4488 | 1077120 | 1596 | 782592 | 17.96 | Lagoon |
| 100 | 4200000 | 420000 | 648 x 648 | 2592 | 622080 | 922 | 403128 | 9.25 | 20 year |
| 300 | 12600000 | 1260000 | 1122 x1122 | 4488 | 1077120 | 1592 | 1097592 | 25.20 | |
| 600 | 25200000 | 2520000 | 1587 x1587 | 6348 | 1523520 | 2257 | 2105832 | 48.34 | Lagoon |

## APPENDIX 18

Adjustment for Method A1, A2, A3, C1 for cases in which flood embankment necessary ref. Fig. ____.

Variation in Shannon at Blackwater Works approx. = 8½ ft.
Allowing 1½ ft. = difference G.G.L. to normal S.L. Shannon
Therefore 8 ft. high embankment gives 1 ft protection.

Cross sectional area embankment = 8 * 22 = 176 $ft^2$

If embankment to run three sides:-

for 100 acres - length = 1025 ft.
for 300 acres - length = 1755 ft.
for 600 acres - length = 2150 ft.

Volume material required and time to construct:-

| | | | | |
|---|---|---|---|---|
| 100 acres | - 1025 * 176 = 180,400 $ft^3$ | -- | 267 HHrs |
| 300 " | - 1755 * 176 = 308,880 $ft^3$ | -- | 458 HHrs |
| 600 " | - 2150 * 176 = 378,400 $ft^3$ | -- | 560 HHrs |

## APPENDIX 19

## Cost Machine Hours

| | | |
|---|---|---|
| **Hymac Hour:** | | |
| Internal hireage rate Hymac | = | 9.50 |
| Cost of 1 man-hour | = | 10.00 |
| Cost of fuel (consumption @ 9 litres/hour) | = | 3.56 |
| Total cost 1 Hymac hour | = | 23.06 |
| **Sludge Pump Hour:** | | |
| Internal hireage rate pump | = | 2.42 |
| Internal hireage rate tractor | = | 1.50 |
| Cost of 3 man hours | = | 30.00 |
| Cost of fuel to tractor (consumption @ 10 litres/hour) | = | 3.96 |
| Total cost 1 sludge pump Hr | | 37.88 |
| **Ditcher Hour:** | | |
| Internal hireage rate ditcher (Merri) | = | 1.14 |
| Internal hireage rate tractor | = | 1.50 |
| Cost of 1 man-hour | = | 10.00 |
| Cost of fuel to tractor | = | 3.96 |
| Total cost 1 ditcher hour | | 16.60 |

Land Purchase/acre approximate average = £1,500.00

Profit/Tonne Peat @ 55% M.C. approximately = £3.00

## APPENDIX 20

### Cost of Pump Installation and Maintenance

The following cost estimates for provision of pumps at treatment sites are based on most accurate figures available to date.

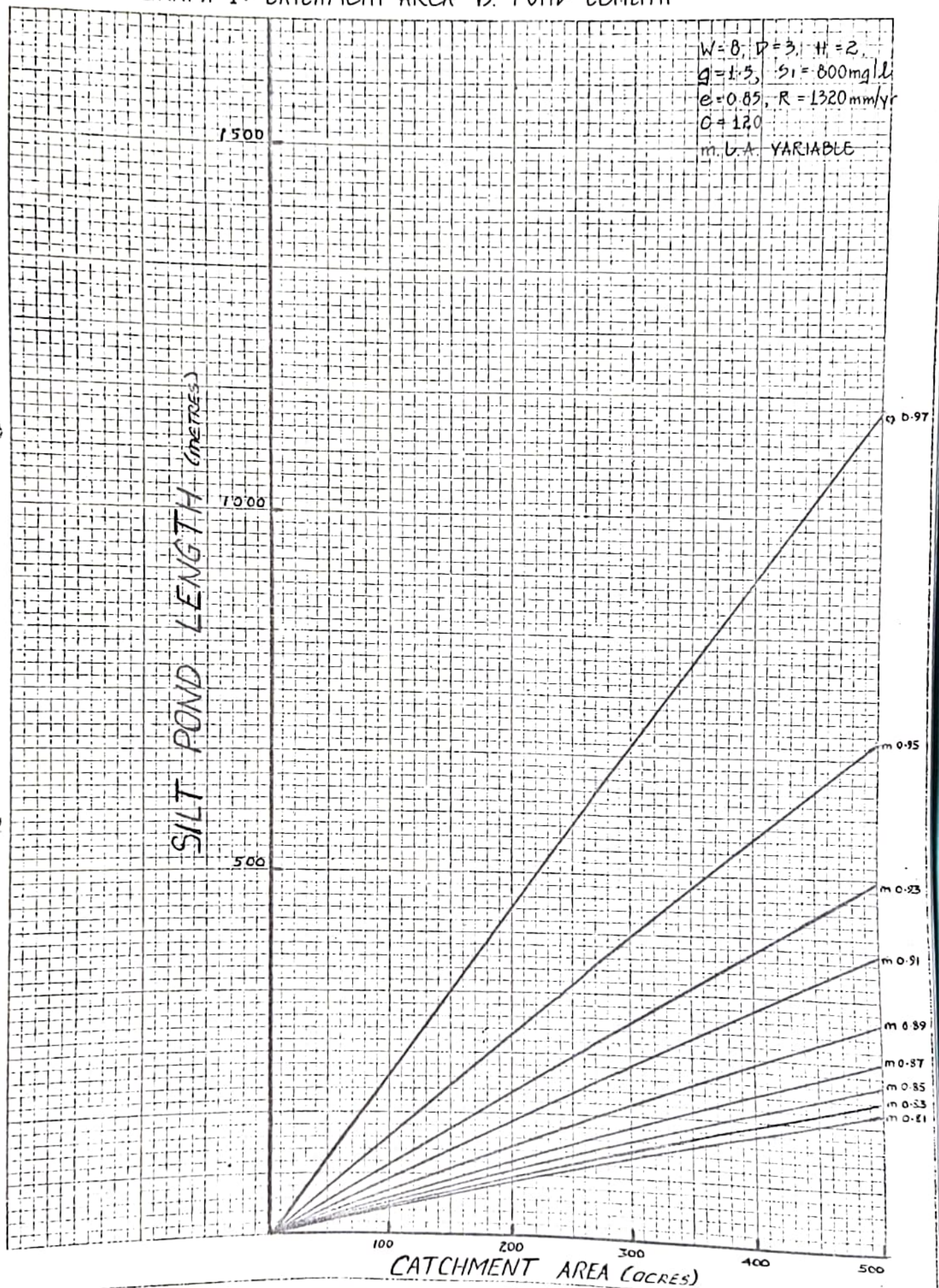
Inaccuracies may arise due to the following:

1. Pump may be necessary for bog drainage purposes now or at sometime in the future; the cost is attributed to silt control.

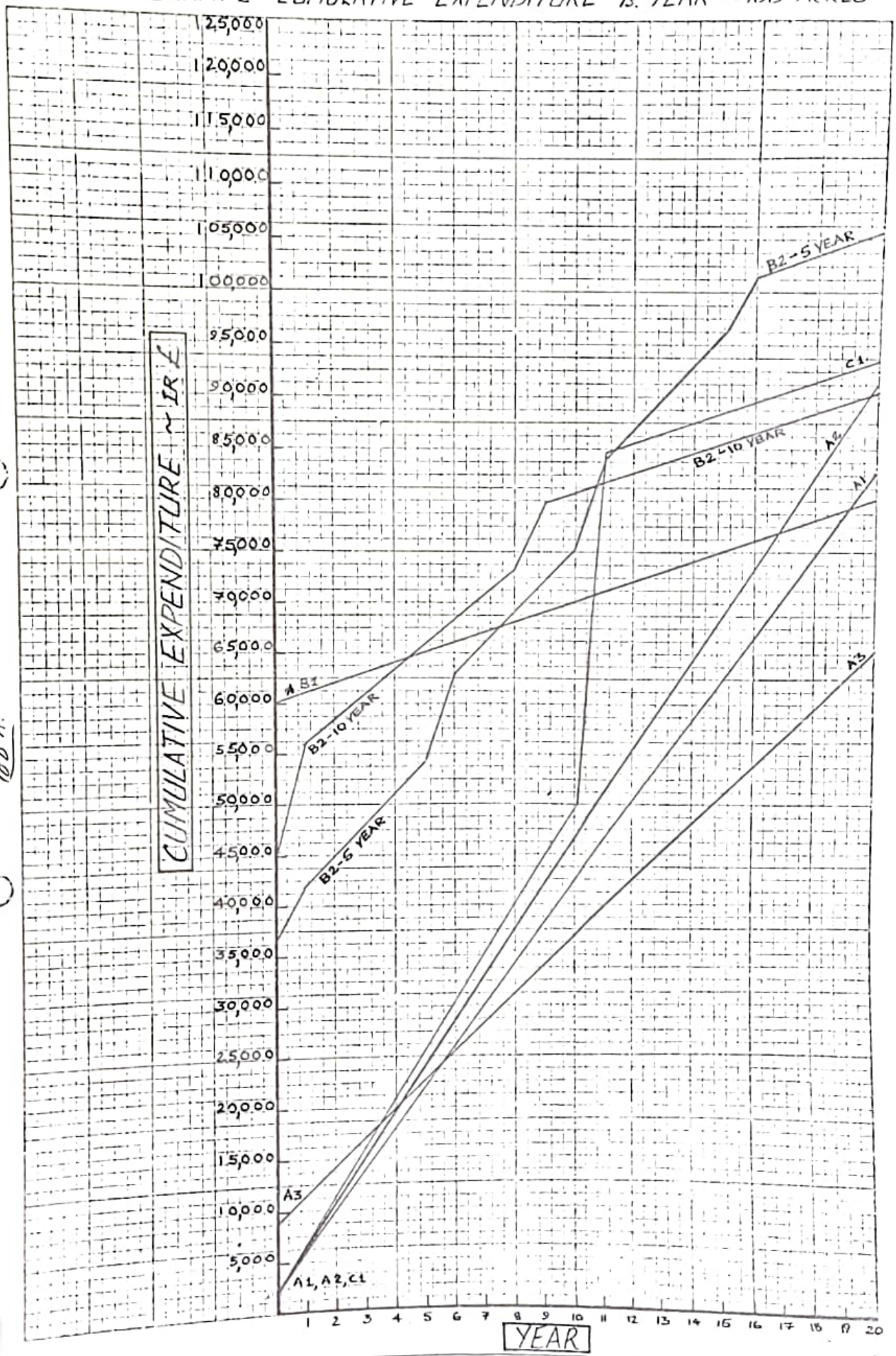
2. The distance over which power lines must be provided for each pump is taken as 1½ miles.

| | Catchment (acres) | | |
|---|---|---|---|
| | 100 | 300 | 600 |
| Power Line 1½ miles @ £10,000/mile | 15,000 | 15,000 | 15,000 |
| Pump Cost | 6,000 | 10,000 | 22,000 |
| Installation: | | | |
| Materials | 2,000 | 3,500 | 5,000 |
| Labour | 2,000 | 3,500 | 5,000 |
| Total : | £25,000 | £32,000 | £47,000 |
| Repositioning | 4,000 | 7,000 | 10,000 |
| Power Units (P.A.) | 1,000 | 2,000 | 4,500 |

# GRAPH 1:- CATCHMENT AREA Vs. POND LENGTH

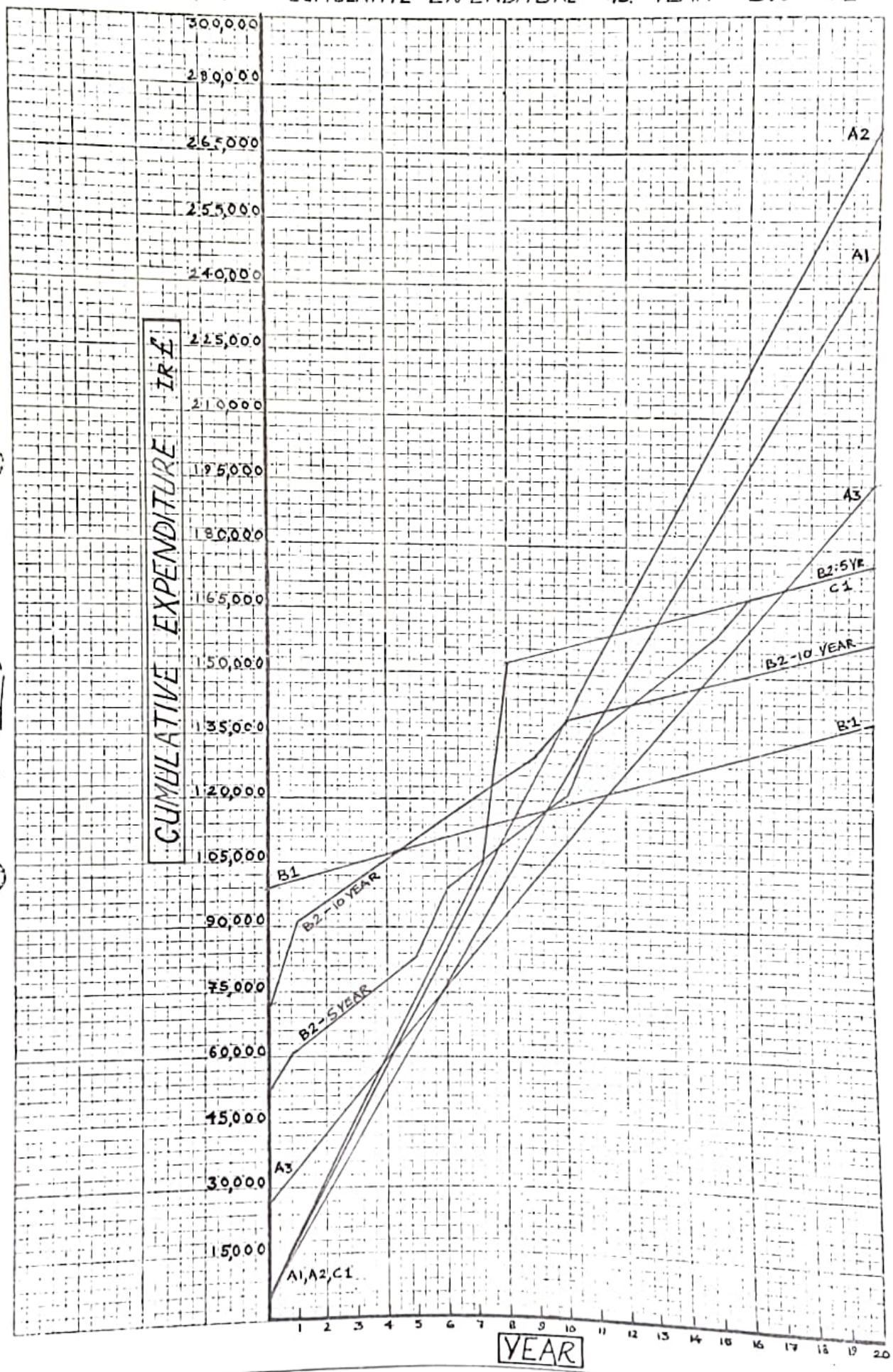


# GRAPH 2:- CUMULATIVE EXPENDITURE Vs. YEAR ~ 100 ACRES

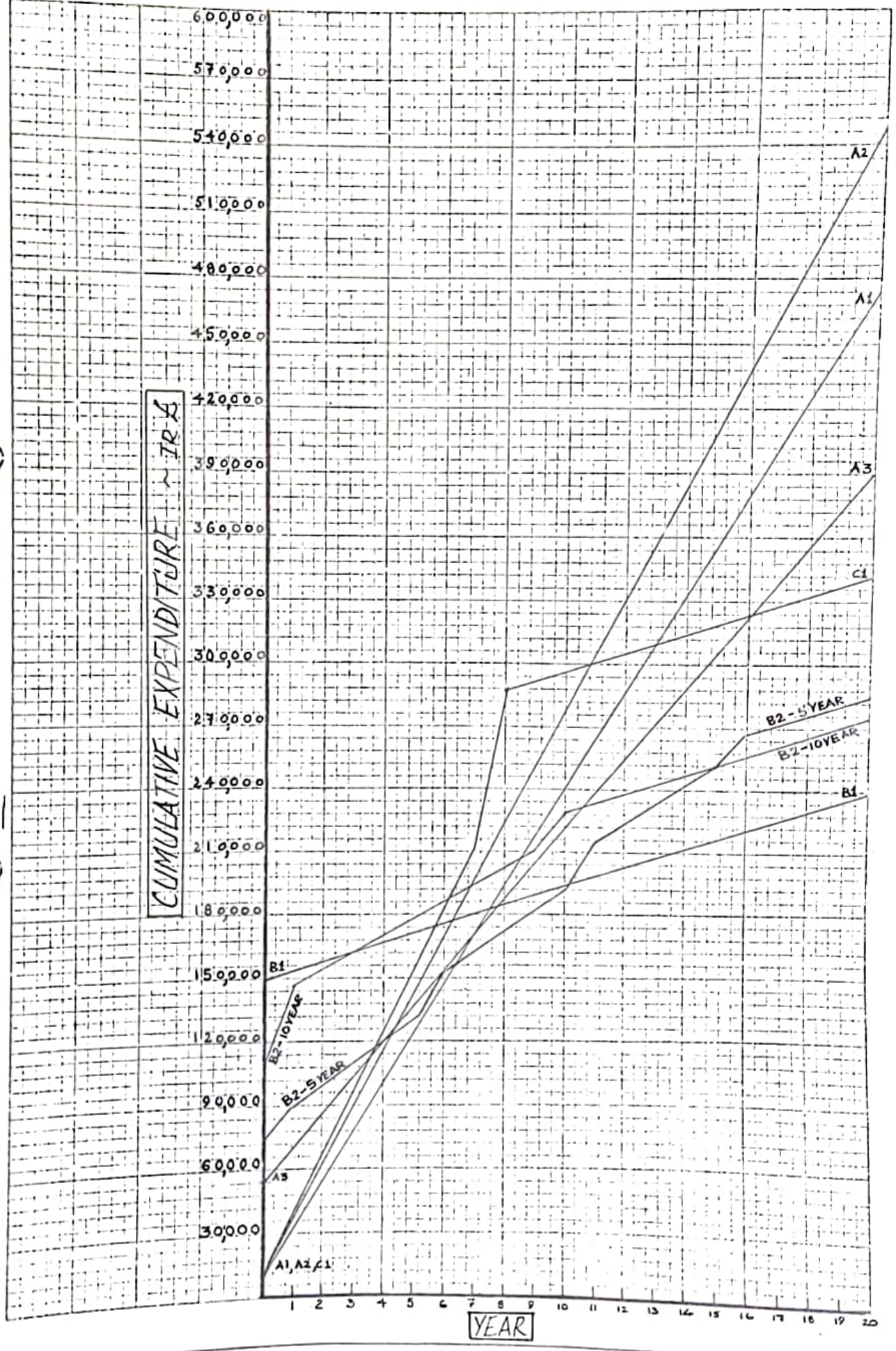



100 A.

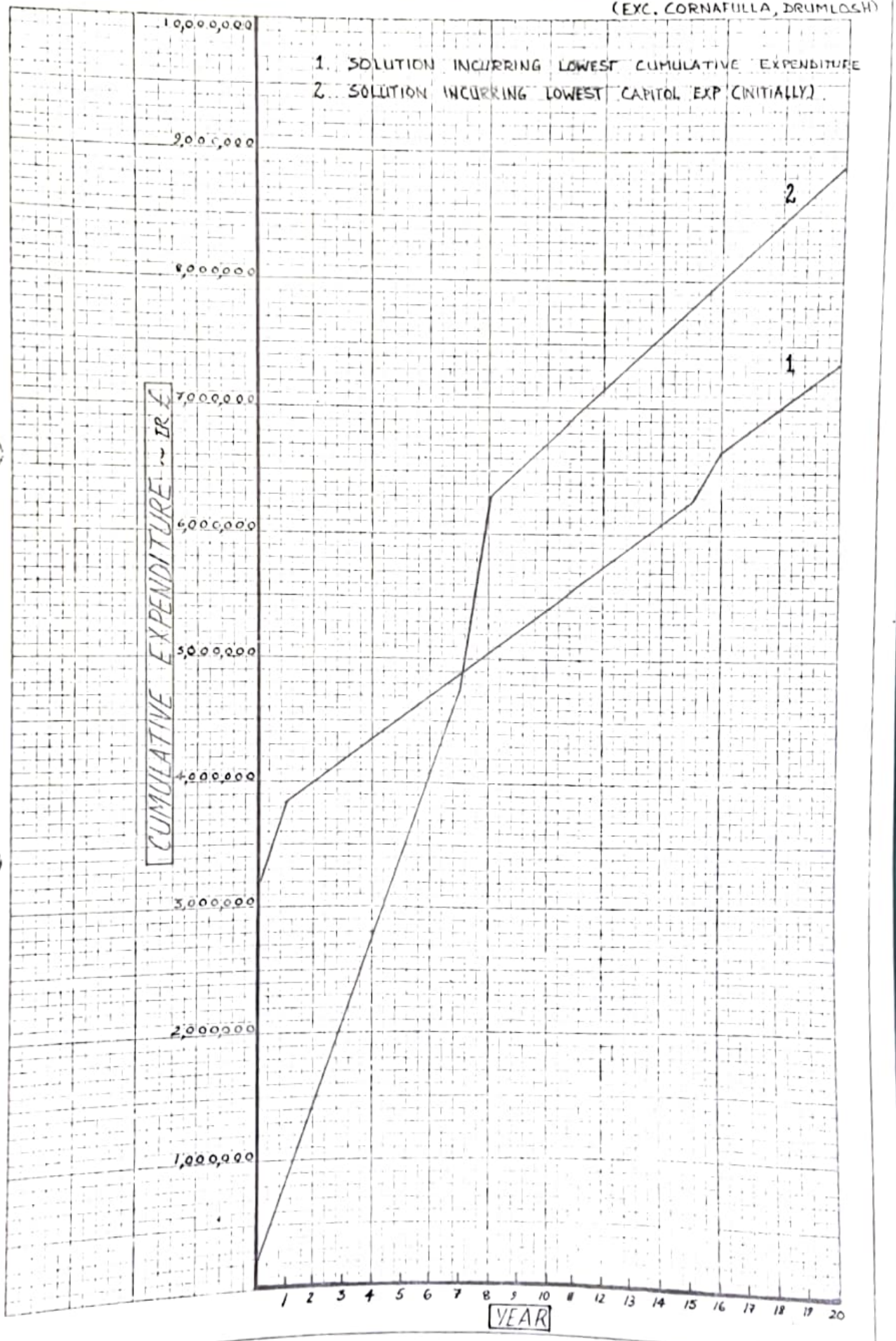
# GRAPH 3 :- CUMULATIVE EXPENDITURE Vs. YEAR ~ 300 ACRES



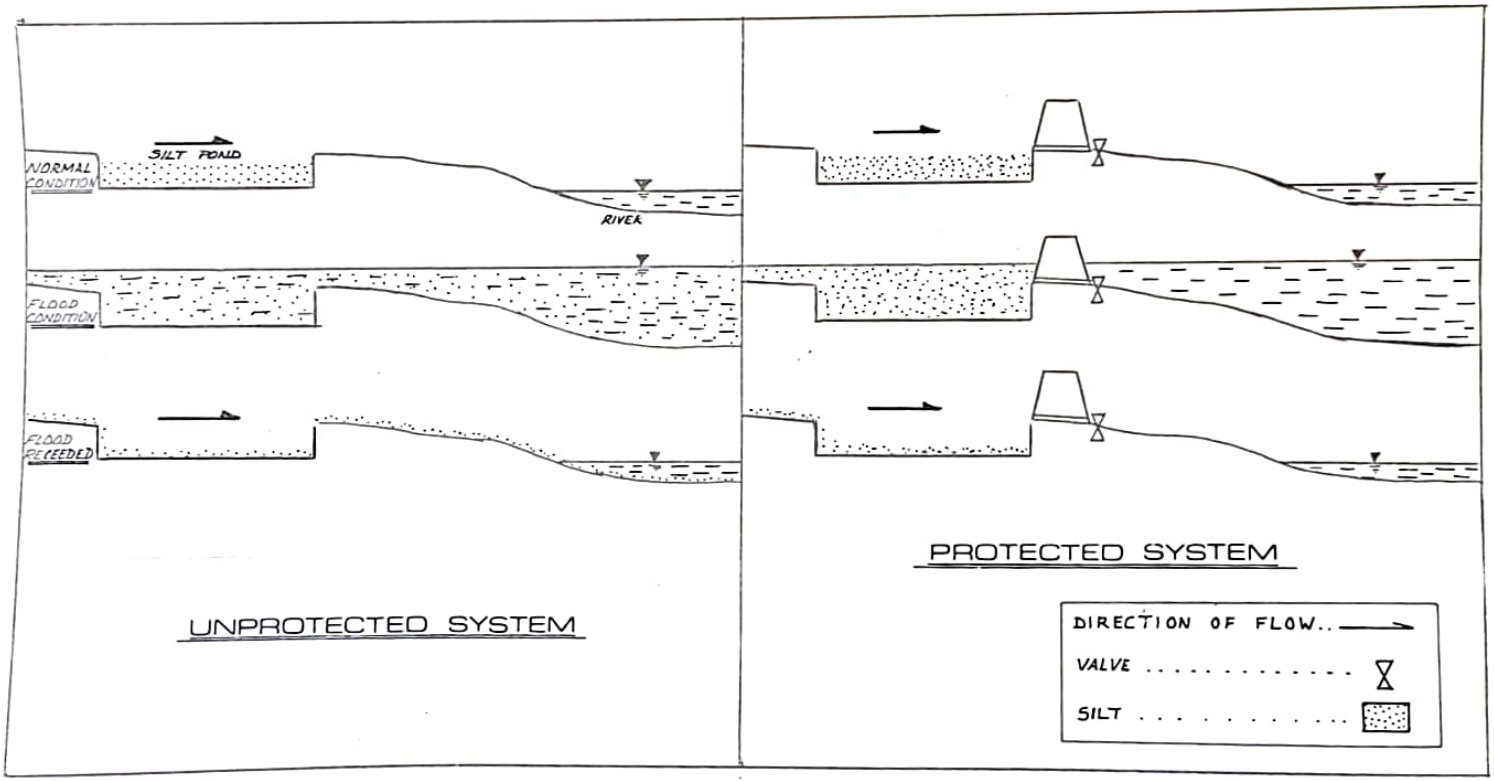
# GRAPH 4 :- CUMULATIVE EXPENDITURE Vs. YEAR ~ 600 ACRES



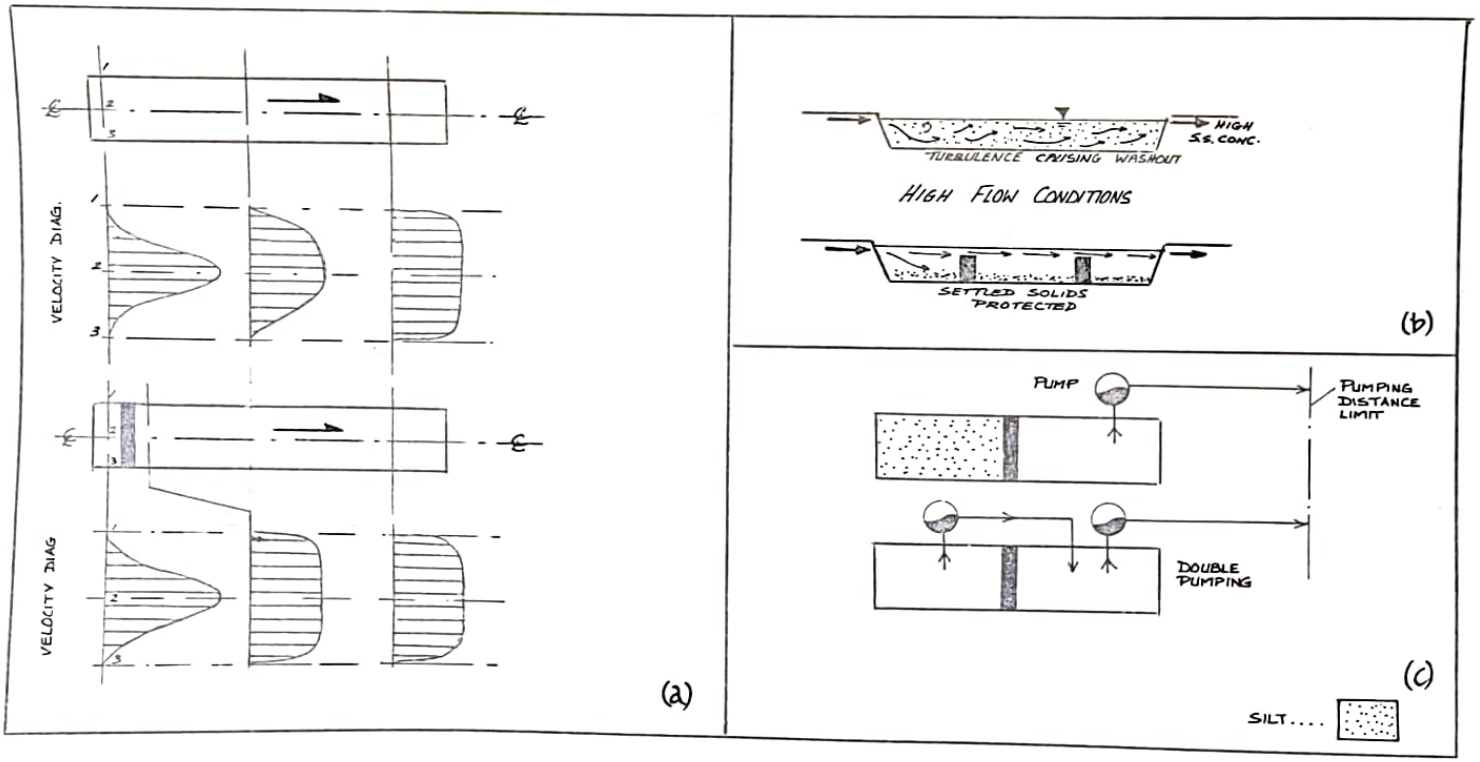
GRAPH 5:- CUMULATIVE EXPENDITURE V6. YEAR ~ BLACKWATER WORKS
(EXC. CORNAFULLA, DRUMLOSH)



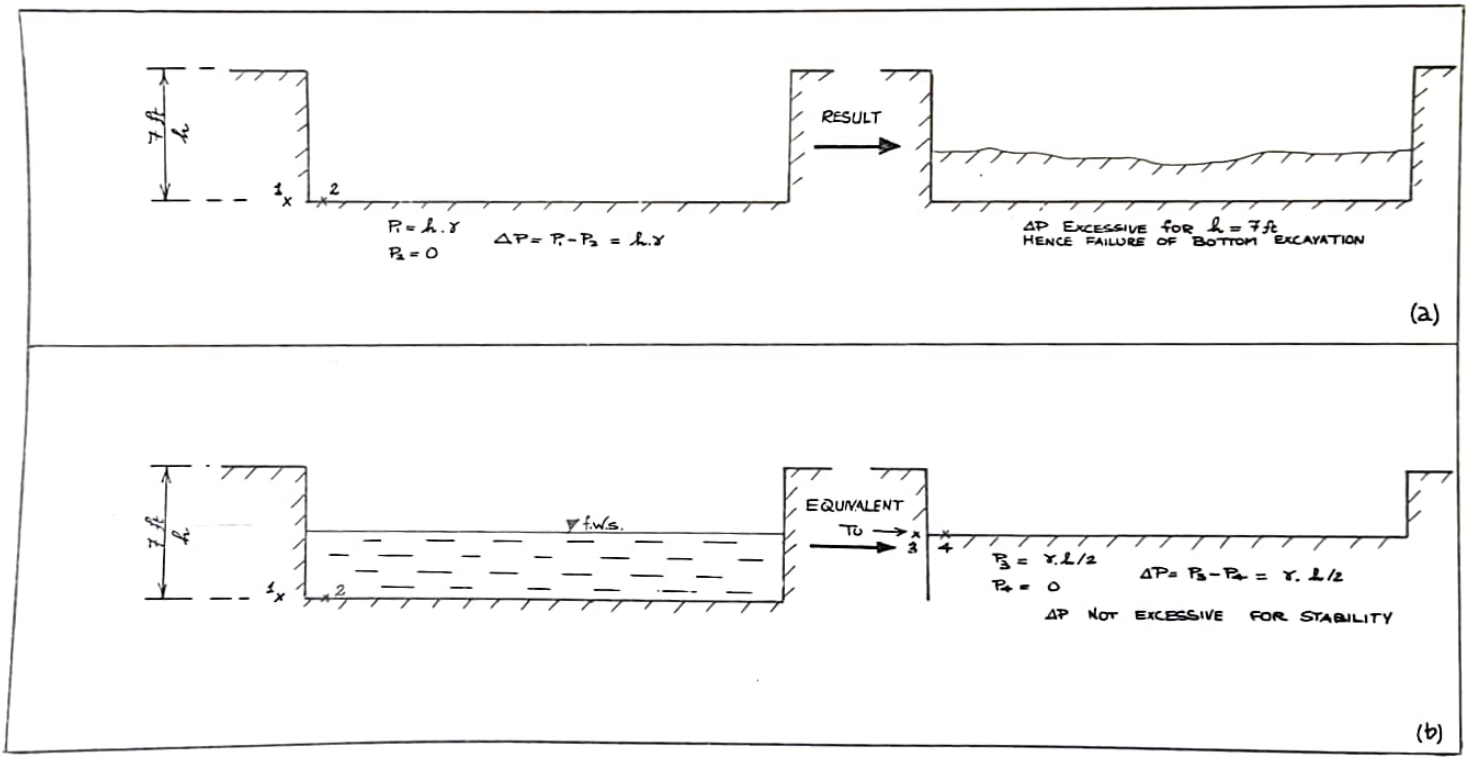
# FIG. 1 PROTECTION OF TREATMENT SYSTEM FROM FLOODS



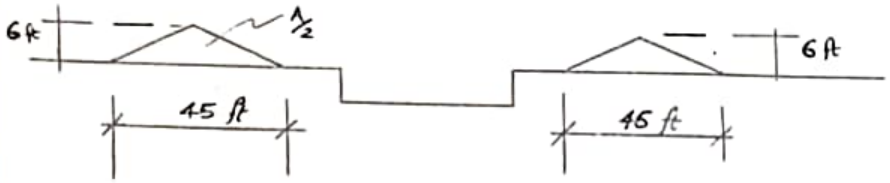
# FIG. 2 PROVISION OF WALLS IN SILT PONDS



# FIG. 3 STABILITY OF POND EXCAVATION



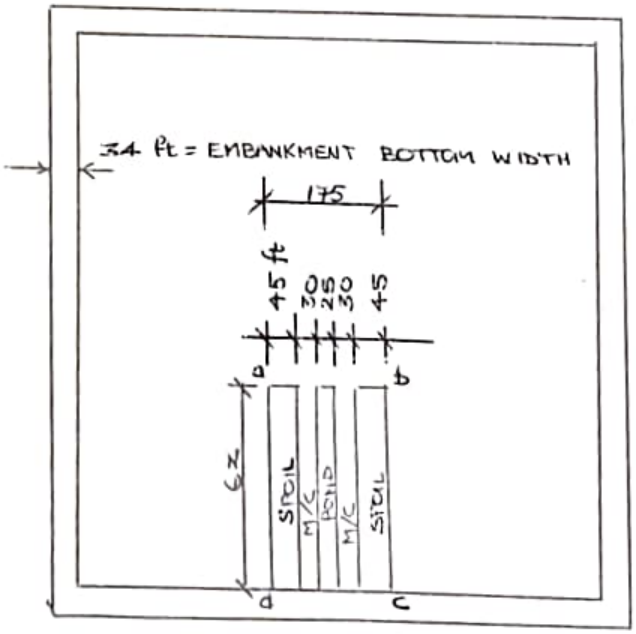
## FIG. 4 MAX. ALLOWABLE X-SECTIONAL AREA SPOIL




$A = 6 \times 45 = 270\ ft^2$

CATCHMENT AREA = x acres

AREA abcd = $1050x\ ft^2$ = AREA REQUIRED FOR SILT POND




## FIG. 5 AREA REQUIRED FOR LAGOON

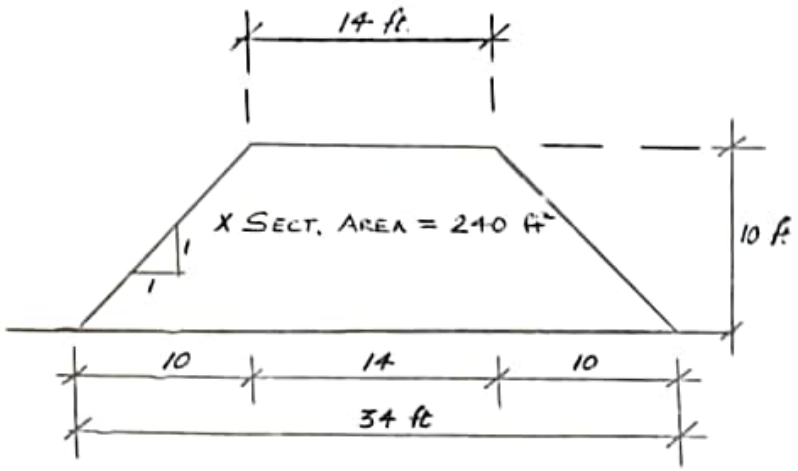



FIG. 6 CROSS SECTIONAL AREA – LAGOON EMBANKMENT

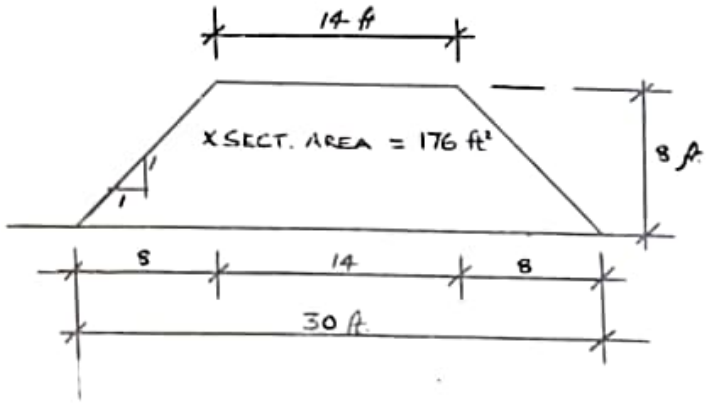



FIG. 7 CROSS SECTIONAL AREA – FLOOD EMBANKMENT

# APPENDIX 4-15

***Drainage Study with Particular Reference to Pumping – Internal Bord na Móna Report 1984***

Meamram

# Bord na Móna

Don Manager: Coolnagun | Chief Engineer (Civil Division)

| Do Tag. | Ar dTag. | Ábhar | Dáta |
|---|---|---|---|
| | HCF/CO'K | Pumped Drainage | 03.01.1984 |
| Tuairgear an uimhir tagartha | | | |

Heretofore, pumped drainage has been confined almost entirely to Sod Peat Bogs. However, in the coming years, pumping will be necessary on an ever increasing proportion of our Milled Peat Acreage. Consequently, it is important that works personnel be fully aware of, and participate in developments in this field.

I attach herewith a study of pumping compiled by Mr. O'Beirne, Civil Works, Head Office, and look forward to any comments or suggestions you may have to offer on the subject.

J. C. Hood

Chief Engineer (Civil Division)

Encls.

BORD NA MONA
Coolnagun
DATE REC'D. -6 JAN1984
FOR ATTENTION

BORD NA MONA

CIVIL ENGINEERING DIVISION

# Drainage Study with particular reference to Pumping

No. 1

D. O'Beirne,
Civil Works Section,
Head Office.

December 1983.

# Drainage Study

The following study is a summary of the approach adopted to considering the problem of bog drainage, particularly where pumping is involved. It does not deal with everything considered in relation to drainage, but is, rather, an indication of the thinking, assumptions, conclusions and methods adopted to drainage design.

The ideas and assumptions are generally based on methods and values already in use. Information was obtained from reports (e.g. P.V. McGill's report), memos, catalogues etc. or from those dealing with drainage related aspects. The methods, values and assumptions used are by no means binding and can be changed if they are invalidated in the future. It is hoped that readers will correct any misconceptions they become aware of and endorse any assumptions if they know them to be valid.

A detailed look at Clooniff Bog in the Athlone Bogs (Blackwater Works) is included as an appendix. This is by way of giving an example of the type of method involved.

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# A NOTE ON BOG DRAINAGE

There are many complex aspects which have to be considered when dealing with bog drainage design. Although many bogs are similar in production terms it is not ideal to consider drainage aspects under the same categories. It is more appropriate to label bogs for drainage according to their major outfall system. There are two main types; those which drain directly into a major river and those which drain into a minor river/stream which flows into a major, but at a much lower level than the bog.

The former type of bog presents most problems. Flooding, pumping, drain patterns and embankments are major considerations usually, since the water level is at some time or always above the proposed final bog surface level. Examples of this type of bog are those which bank the Shannon or Suck (Blackwater - Garryduff, Clooniff, Cornaveagh, etc; Derryfadda; Mountdillon, etc.).

The second type of bog can usually be drained by gravity. However this does not mean that no drainage problems arise. Often the length of external outfall needing deepening may be too long and/or go through private land. In this case it is possible that the entire bog may require pumping. Usually, though, local pumping of basins within the bog are more likely to be the case. In some instances pumping may be used where it is not absolutely necessary. This may be to prevent problems associated with excavation of subsoil within the bog (e.g. Bracklin bog in Ballivor Group). Examples of this type of bog are Ballivor; Littleton; Templetuohy; Bellair; Monettia; etc.

The approach adopted to drainage is to consider each stage of drainage (initial, production and final) as seperate conditions; each depending on what has previously been done, with the ultimate drainage system being considered at each stage.

Most bogs have already undergone initial drainage which, in general, follows the bog floor contours in such a way as to minimize internal problems and maximize the available bog. For some bogs good drainage pattern and field layout drawings are available (e.g. Blackwater) whereas for other bogs, particularly newer ones, such drawings are not yet available. These drawings are invaluable in determining the drainage characteristics of the bog area.

Initial drainage patterns are carried through to the production period of the bog. Hence only ditching of existing drains and deepening of cross drains is required. As production progresses a stage may be reached where flooding occurs during the production season. This is the time when either pumping or excavation downstream of bog are needed (unless production is decreased or stopped). It is important to determine when this will occur so proper planning can evolve.

The expected life span of bog production is insignificant when compared with that of the land on which the bog lies. Where this is below flood level two basic alternatives exist. The bog can either be left to flood whereupon it has little or no agricultural use; or measures can be taken to prevent flooding. This would entail major arterial drainage downstream of bog or the construction of embankments. Letting the area flood could be put to practical use, for example, as a means of flood control of major rivers (e.g. Shannon) and this option should not be ruled out. However, it is probably desirable to put the land to some agricultural or other use. To this end, flood prevention will apply long after production has ceased; whether Bord na Mona retains possession of the land or not. It seems right therefore that drainage related design should cater for the case that 'usable' bog has been stripped, leaving a small cover, and the bog is still being drained to an appropriate degree. At this point the bog floor contours almost become the surface contours. The 'appropriate degree' of drainage will depend on what the land is to be used for in the future. This will determine the size of pumps, embankments, excavations of outfalls, etc. This aspect will be considered in more detail in the future so that realistic assumptions can be made.

So the three stages of drainage; initial, production and final; are all inter-related and cannot be realistically (or economically) considered in isolation. Some of the problems encountered are mentioned above (embankments; pumping, excavations; land use; etc.). There are many other related aspects which are not so obvious (e.g. silt control; lowering of water table; gradients for trains; construction methods; short term flood control etc.). All these considerations have to be kept in mind in all aspects of drainage design.

## METHOD FOR DRAINAGE DESIGN

### Stage 1

a. Look at bog surface and floor contour maps and, if necessary, any relevant cross-sections. Consult survey reports; particularly conclusions on drainage. An initial estimate of size and type of bog can be made and the pre-drainage depth can be determined. From the bottom contours the final level of bog surface can be ascertained.

b. Get details of internal outfalls, outfalls at edges of bogs, external outfalls and the river into which outfalls flow. Determine final drainage pattern using drainage plans/ field layout drawings and locate exact course of each outfall to be used. Find existing invert and water levels of external outfalls and the distance downstream available for excavation.

c. Evaluate maximum flood levels for Summer and Winter, and mean flows in rivers if possible. Get relevant details of catchments of external outfalls.

d. Check validity of surveys and water levels. (Often these are superceeded, e.g. O.P.W. drainage).

From the above we get:

1. Catchment area considered for drainage (not necessarily acquisition area). A planimeter is used to measure this. The boundary lines are got by interpreting bottom contour maps.

2. Find final surface level of bog at each point, after production stops. The worth of producing in isolated pockets (e.g. between two marl hills) should be evaluated roughly. For large pockets or basins a more accurate economic appraisal could be done but initially inspection should suffice.

3. Flood levels for Summer and Winter can be evaluated by assuming backwater condition from known levels downstream of bog or from directly available data. It would be possible to estimate a flood of a given return period for any bog using the 'flood studies' methods which might give a more realistic level but this would involve much data collection.

4. Final internal and external outfall levels can be found. A slope of 1:1500 to 1:2000 (depending on size) for external outfalls and 1:1000 for internal outfalls is assumed to be the minimum acceptable slope achievable. During production the slope of cross-drains will probably vary from, say, 1:500 to 1:2000 but this is more controllable as the depth of bog is reduced.

5. The average depth of bog available can be estimated, i.e. initial depth of bog.

Stage 2:

a. Different approaches are adopted within the Board to determine the expected 'life' of a bog. For good planning, and to avoid unnecessary spending, it is important to estimate how long a bog will last. Ideally this could be done by looking at the moisture content of the undrained peat and evaluating the shrinkage and production levels based on the density of the peat. However this would involve a massive data collection program and would still not be absolute. Hence it is better to estimate the shrinkage due to drainage. The progressive shrinkage must be used to estimate the bog surface level in any particular year. An overall shrinkage of 40% (approx) in depth is assume (roughly equivalent to a 4% reduction in moisture content). As much of this shrinkage probably occurs due to initial drainage it is correct to assume that the moisture content is reduced relatively more in this period than subsequently in each production year. But since initial drainage only goes down a certain depth, only the upper part of the bog is effectively drained. take a value of 40% shrinkage of the top 50% of the bog due to initial drainage (i.e. 20% overall).

When production commences the annual shrinkage rate decreases as better quality peat is reached. Hence it would not be uncommon for a reduction of up to 7 inches to occur in the first few years decreasing to 3 inches eventually.

A rational method to approach this is as follows:-

20% initial shrinkage (overall depth)
(3 in. + 40%) shrinkage per annum for top 25% of bog after initial shrinkage.
(3 in. + 30%) shrinkage per annum for next 50% of bog after initial shrinkage.
(3 in. + 25%) shrinkage per annum for next 25% of bog after initial shrinkage.

Whilst the above method yields a realistic average reduction each year it must be remembered that shrinkage varies from bog to bog and, indeed, field to field. This averages out at 40% reduction per year over the full life of the bog.

The value of 3 inches production is based on ¼ inch per harvest and 12 harvests per year. This yields a surface level estimate for any future year of production.

b. When the surface level of the bog, as evaluated by above method, corresponds to flood level this gives the number of years of production until pumping or excavation of external outfalls is required.

a. Knowing the area of catchment for each outfall the amount of water to be drained can be estimated. It is general practice to use a pump capacity value of 1.5 cubic ft./min./acre. This could possibly be evaluated more realistically for each bog either by direct measurement of by 'flood studies' methods.

b. The head (of water) difference between required final water level and existing flood level is calculated. From this the depth of excavation and/or pumping head can be evaluated.

c. Particular attention should be given to any external catchments draining through bog or into the same outfalls as the bog drains. An allowance of x cu. ft./min./ acre could be made depending on the size and type of catchment. Where large catchments (e.g. major tributaries of rivers) are involved the flow should not have to go through bog. If necessary the flow should be re-routed around bog. Obviously it is not desirable to have this flow through silt ponds so this is often done anyway.

d. If pumps are required then due consideration to the type and position of each pump is needed. In some bogs it may be better to have several smaller pumping installations pumping into one or more external outfalls. In other areas, particularly smaller bogs, it may be desirable to bring all drainage through one larger pump site. This is usually determined by the initial drainage plan though ultimately drains could be re-routed if required. If a pump is required within a bog then the optimum position should be used.

The type and method of pumping is important in that it can determine the operating costs of any pumping installation. The Spaans Screw Pump is widely used but may not be the most ideal in all cases. This type of pump allows, to an extent, for any inflow water level down to the base level of the screw so this is not a major problem. However, this system of pumping relies on a fixed outflow (downstream) level, and consequently a fixed head. Hence unnecessary head (and power use) exists when the full design flood is not the downstream condition. There are ways to overcome this but usually these involve extra capital costs. For example, a second, smaller, screw pump system could be installed for Summer floods; or an axial flow pump and flap valve system could be used. Ideally a pump with a variable upstream and a variable downstream head level would be suitable.

It might be worth investigating in detail various pumping systems and their merits for different types of bog drainage conditions.

e. Whether external catchments flow through bog or not a bypass of any pump site will be required. This is needed for two main reasons. Firstly, there is the danger that one or more pumps at any installation may be out of action and so full capacity drainage is not attainable. Secondly, depending on what size flood is catered for, it is possible that a greater flood will occur.

   Each pump site should, if possible, have a bypass to another pump site.

f. Power supply and consumption is a major determinant in estimating costs. The power required should be worked out in kW. The length of supply cables needed should then be estimated and costed. Alternatives such as wind power might be worth considering particularly in remote areas.

Stage 4:

a. Knowing the pumping requirements a more detailed examination of any embankments can be made. General practice is to allow an extra 2 ft. (600 mm) above maximum flood level for flood control embankments. This allows for surges and slight settlement not designed for otherwise. The extent and size of embankment required generally involves complex calculations based on good survey and field data along line of embankment.

b. Other aspects not already dealt with should be considered at this stage. These include silt control, construction problems, peat recovery problems, etc. Some of these will have to be dealt with earlier in the design process and this will depend on the particular bog.

Stage 5:

a. At this stage estimates can be done for any alternatives available. This is not a simple matter as it is based on price speculation of both costs (of pumps, excavations, etc.) and also on the value of peat (embankments etc.). From these estimates return periods can be worked out for any alternatives.

b. If the estimated costs are unrealistic or inappropriately high then the process can be repeated with a different set of parameters. At this stage a different 'design flood level' or design runoff figure could be adopted.

c. Finally part or all of any alternative proposed can be adopted for each bog area.

Note: The above five stage system for drainage design outlines the necessary thinking behind a bog drainage system. For particular areas, particular problems will arise and these may change basic concepts to some degree. However, in order to exercise proper budget control then a basic policy has to be adopted.

## METHOD FOR DETERMINING DRAINAGE REQUIREMENTS

1. Choose boundary of area. Determine natural and developed drainage pattern and bog contour details.
From this the required minimum drainage level and available fall, (using 1 ft. for every 1000 ft. in bog and 1 ft. for every 1500 ft. externally), can be evaluated.

2. Look at major external outfall (generally main river) and find water level details. Maximum flood and Summer flood levels are estimated. Mean and minimum Summer levels are also noted if known.

3. The average depth of bog is evaluated using top and bottom contours from original survey.

4. The depth of bog after initial drainage is calculated, i.e. 40% of top half of bog is assumed to shrink.

5. 'Years of Production' is estimated based on an average rate of 3 inches milling and x% shrinkage each year. A floor cover of 2 ft. is assumed.

6. The number of years until pumping is required is calculated for Summer and Winter floods.

7. The area of catchment considered for drainage, for each outfall, is determined.
Allowance is made for any external catchment draining through bog.

8. The volume of water to be drained is estimated for each pump site considered. A value of 1.5 cu. ft./min./acre is used to determine design runoff.

9. The head difference between bog drainage level and outfall level is computed for maximum and 'Summer' floods.

10. The equivalent pump head (Spaans pump head) is determined.

11. Pump size is determined for any pumps required.

12. Power requirements are determined for pumping system.

Notes:

For final drainage a water level 2 ft. below surface level is assumed. As 2 ft. bog floor cover is allowed for then the final drainage level (minimum drainage level) is taken as the bog floor level.

Where a bog hasmore than one outfall each is considered as serving a separate catchment area. Hence each outfall location is a potential pump site if required. Where the outfalls flow into each other at some point downstream, outside the bog, an allowance is made.

Consideration is given to possible pump sites (or pump catchment areas) within bog. This might be to see if the number of years until pumping is required can be increased and hence the most economical arrangement can be determined.

The previously described method can be readily presented in tabular form and this makes comparison of different alternatives easier.
Subsequent cost estimates, bearing in mind practical considerations and feasibility, can becarried out to determine the most suitable pumping arrangement.

In considering pumping requirements particular attention is given to a memo derived from a discussion at Blackwater in August 1980 where the Spaans pump system was dealt with in detail. Some of the main points are listed below.

1. 1½ cu. ft./min./acre discharge is equivalent to 60% of one inch of rainfall falling in 24 hours.

2. Two pumps, a bypass to another pump location and an upstream reservoir (if possible) should be made available at each pump site.

3. Downstream flood level should be increased by 1 ft. to allow for "the future case of a flood (or whatever)".

4. Power requirements, costings and installation problems are mentioned.

5. A detailed method of computing Spaans pump head is given.

## APPENDIX A

Note on practical considerations:

While it is important to devise a concise drainage plan for each bog for development and costing purposes it must be remembered that the span of any drainage plan can be up to 50 years for most Irish bogs. During the construction phases many problems will arise. A brief note on some problems envisaged at each construction phase is given below.

Initial: Maximum runoff occurs here, so many drains are required. This leads to high drain maintenance costs. Maximum surface movements occur in this phase so design grades for pipes and channels are difficult to maintain. Silt problems are great at this stage due to a large amount of outfalls.

Production: Drains tend to clog up with peat silt quite easily. Machines for drain maintenance and development are involved in other production situations. Cross drains tend to be laid down quickly and inaccurately so production is not interfered with. Manpower is not available to deal with many drainage problems. Intended design proposals often need to be changed or adapted to cope with remedial drainage problems.

Final: While other parties are involved here the cutaway bog is under Bord na Móna supervision for some time after peat is used up. If agriculture is involved then local drainage schemes may need to be thought up not envisaged in the original drainage plan. Minor gravel hills are a big problem here.

Note: Most of these and other problems can lead to very high interim costs. A chief objective of a drainage plan should be to minimize costs by choosing the most suitable scheme while keeping probable problems in mind.

## APPENDIX B

### Worked Example for Blackwater Group

Note on 'Athlone Group of Bogs/Blackwater'

Note on example

Drainage Report : Clooniff Bog

- Tables
- Sub-Appendices

Note on 'Athlone Group of Bogs/Blackwater'

(Feb. 1983)

The following report goes into some detail with regard to Clooniff Bog. This bog is one of the collective 'Athlone Group of Bogs' connected to Blackwater Works. This group lies along the West Bank of the Shannon between Shannonbridge and Athlone. The bogs in the group considered are (from South to North):

1. Cornaveagh
2. Clooniff
3. Cloonbeggaun
4. Coolumber
5. Cornafulla
6. Dromlosh
7. Carrickynaghton
(8. Creggan)

Although the report concentrates on just Clooniff, most of the findings and assumptions apply equally to some or all of the other bogs in the group because of their proximity to the Shannon.

The tables of the report relate only to Clooniff but similar tables for Cornaveagh,Coolumber and Cloonbeggaun can readily be produced since all the data is prepared.

This report is more detailed than would normally be the case. It is hoped that a brief description; the tables; a map and a conclusion would normally form the report.

Subsequently, details of embankments; exact pump sites; future land use etc. would have to be added and any changes (in method or data) would have to be included.

From the above one global report on each group of bogs (e.g. Athlone group; Derryfadda - Suck Group; etc.) could be established.

The tables etc. are mainly in imperial units of measurement. This is because contour maps, levels, etc. are also. It would be a simple matter to convert all values to metric if required.

## NOTE

The report on Clooniff Bog is based on a drainage plan of 1977 (drawing S697). Since the calculations were done a more recent drainage plan (S988) based on existing outfall layout was sent to Head Office by Blackwater Works. This does not mean that the conclusions in the report are invalid but further work could be done based on the new drainage plan. As production progresses the layout may change and it is possible then an outfall layout as used in the report will become the case. Indeed it is probable that only one external outfall will be used when pumping is needed. No detailed calculations of pumping requirements have yet been carried out at Blackwater Works. A copy of the most recent outfall layout (December 1982) is included as an appendix to the report.

Drainage Report: Clooniff Bog - Athlone Group/Blackwater

February 1983

Clooniff Bog banks the west side of the River Shannon some 4 km north of Shannonbridge. It is not yet in production but should be within the next few seasons. It is proposed that it will, along with the other Athlone Group bogs, supply milled peat for Shannonbridge E.S.B Power Station.

The bog is divided into two distinct areas by a stream which acts as the only outfall for both bogs and flows into the Shannon. These areas are Clooniff 1 and Clooniff 2. Clooniff 1 being the larger area to the South of the stream (see Appendix **1b**).

Clooniff 1 covers an area of approximately 515 acres with an average depth of 22 ft. (6.7 m). Clooniff 2 covers an area of approximately 250 acres with an average depth of 20 ft. (6.1 m). These depths relate to the original survey before any Bord na Mona drainage had occurred. The contour maps show that the floor of each bog is quite uniform in level with only a relatively small ridge and a depression in Clooniff 1.

A field layout and drainage plan from Blackwater Works as of November 1975 is available (Drawing S697) and, assuming that the cross-drain system is laid as shown, this considers the bottom contours. Hence a suitable final drainage layout exists. As can be seen (Appendix **1b**) the bogs drain into a minor tributory of the Shannon which flows directly into the very nearby Shannon. It seems appropriate to collect all bog drainage to the one outfall point for each bog, as is the case. Water and flood levels used in calculations are taken as those estimated for the Shannon at this point. Before final decisions are made it would be worth contacting the O.P.W. to check if any previous or near-future remedial drainage works have invalidated these figures. When considering long term requirements, it might be more desirable to use proposed water levels for the Shannon. Shannon drainage is so uncertain, though, that using proposed levels might not give realistic results.

From these levels and the bog floor contours it is obvious that much of the bog is below max. flood level and, allowing for gravity drainage fall to Shannon, pumping will be required even when mean Summer flow exists in the Shannon.

There are many possible sites for pumps. The most obvious places are where the internal outfalls join the main external stream outfall. This is also the location of proposed silt ponds. These sites are 4 and 5, 4 being for Clooniff 1. (the site numbers relate to the overall drainage of the Athlone Group, 1, 2 and 3 being in Cornaveagh bog). Possible sites for pumps within bog are considered for Clooniff 1

only. These are 4a, 4b, 4c and 4d (see Appendix 1b). Clooniff 2 does not lend itself to this consideration because of the field layout.

As each of the main sites, 4 and 5, cater for quite a large area, it is not easy to state which part of the bog is likely, to require pumping first. Hence more than one set of 'minimum fall to pump site' are considered. The worst case will be the one which yields the least number of years until pumping is required.

The size of the external catchment served by the external outfall stream is not known. Hence no consideration has yet been given to gravity draining both bogs to stream and then using one pump installation to pump both bogs and external catchment. If external catchment is small then it might be worth considering this. (Flow measurements of stream upstream of bogs would determine this).

The following is the water level data, based on backwater estimates from Shannonbridge.

| | | | |
|---|---|---|---|
| Maximum flood level | : | 126.0' | O.D. |
| Mean Summer level | : | 119.0' | O.D. |
| High Summer level (assumed) | : | 121.0' | O.D. |

An allowance of 1' above these levels is made. As can be seen in Appendix 1a the gravity fall (based on a 1:1500 slope) to the Shannon from just downstream of the main pump sites, is 0.7 ft. (Clooniff 2) and 1.7 ft. (Clooniff 1). If external catchment to stream is included then these heads have to be included - otherwise subtract from values in Appendix 1a. Hence

| | | | |
|---|---|---|---|
| Max. flood level | : | 127.0' | O.D. |
| Max. Summer level | : | 121.0' | O.D. |

Table 1 of this report gives required and available levels and the years of production before pumping is required for the various cases.

From this we see that Clooniff 1 needs pumping 11½ years after start of production and Clooniff 2 needs it after only 6½ years. This, of course, is if no flooding ever is to occur on bog. Obviously it is not desirable to totally prevent Winter flooding as this is costly and unnecessary in terms of bog production (ultimately complete drainage, Summer and Winter will probably be required).

Pumping in Summer will be required after 29 years in Clooniff 1 and after 24½ years in Clooniff 2. It might be decided to cater for some flow between max. flood and max. Summer flood (e.g. Average Winter/Spring flow). In this case pumping would be needed after 8 to 20 years depending on what water level was picked. This could readily be determined.

Note: As discussed earlier it would be feasible to put smaller pumps in Clooniff 1 (4a, b, c, d). This would mean that the Embankment (mentioned below) would have to be brought back onto bog and a section of the bog north of 4a, 4b, would be liable to flooding. Each of the 'in bog' pumps would be of much smaller capacity than the single installation at outfall (4). This would also mean that deep drains would not be needed to achieve the maximum 1 : 1000 slope as the length of drains to pumps would be reduced.

Note on Embankments: Obviously an embankment would be needed in the long term if flooding is to be prevented. This could be placed around the edge of the bog; in the bog as mentioned above; or along the bank of the Shannon. The latter case would require different pumping requirements than those computed here.

Having decided where to position the pumps and embankment the next step is to determine the area of catchment for each pump and the head against which the pump has to operate. From this the discharge and consequently pump size and power requirements can be evaluated.

Table 2 gives the computed values for pumping.

The static lift is based on water level using max. flood (from table 1) as downstream head and bog floor level less expected field drain drop as the upstream head. Obviously after production ceases it should be possible to achieve 1 : 1500 fall in surface drains.

The capacity is based on 1.5 cubic feet/min./acre, which is equivalent to 0.042 cubic metres/min./acre.

From Table 2 values, the exact size of pumps required can be evaluated. Depending on the pump type being used the pump head can be calculated and an ex-catalogue pump size to suit the capacity; allowing for two or more pumps at any location, can be picked.
The power requirements can then be estimated.

In the case of Clooniff, embankment systems have not been designed here so the type of pump is not obvious. Spaans' pumps are not necessarily the most appropriate since pumping through the embankment is not easy with this type of pump.

However, for the present, calculations for pump sites 4 and 5 using Spaans screw pumps, are done. Hence a comparison can be made with other areas (e.g. Suck Group) where this type of pump is already in use. Table 3 gives details.

As can be seen 2 no. 11 $m^3$ x 4.45 m lift pumps would be required for Clooniff 1 and 2 no. 5.5 $m^3$ x 4.91 m lift pumps for Clooniff 2.

These values are of the same order of other pumps in the Blackwater group.

Installation problems are not dealt with at this stage.

Costings:

At the time of writing of this report adequate information was not available for complete detailed costings. Establishing pumping costs is a major objective and this aspect will be dealt with in great detail subsequently.

Of course such items as embankments; timing of installations; power supply; etc. add substantially to drainage costs and each would demand particular attention to obtain optimum solutions. On this point, it would be worth considering alternatives such as wind power.

Based on the pump sizes in table 3, a rough cost estimate based on Spaan's pump costs can be done. For example a 10 $m^3$ by 4.3 m lift capacity pump costs approximately £10,300; and a 7 $m^3$ by 4.1 m capacity pump costs £8,500. One could estimate that the required pumps would cost £8,000 (pump site 5) and £11,000 (pump site 4) each. These prices refer to the pump units only and do not include power supply lines etc.

Conclusion:

This report has tried to give a preliminary judgment of the drainage requirements of Clooniff Bog(s). The amount of and time to commencement of pumping is tabulated for various possible pump sites. Further investigation, particularly with regard to embankments and exact pump location and type, is required. This bog is just one of the Athlone group and it should be considered in this global respect particularly where costings are concerned.

| | A | B | C | D | E | F | G | H | I | J | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Area No. | Min Fall to Pump Ft. | Reqd Final Water Level Ft. OD. | Max. Flood Ft. OD. | Summer Flood Ft. OD. | Avg. Depth of Bog Ft. | Depth after Initial Drainage Ft. | Years of Production | Years to Winter Pumping | Years to Summer Pumping | Catchment Area Acres | |
| 4. | 6.5 | 122 | 127 | 121 | 22 | 17.6 | 47 | 18 | 36 | 515 | |
| | 6.0 | 122 | 127 | 121 | 22 | 17.6 | 47 | 19½ | 38 | 515 | |
| | 4.9 | 118 | 127 | 121 | 22 | 17.6 | 47 | 11½ | 29 | 515 | * |
| 4a. | 2.4 | 118 | 127 | 121 | 24 | 19.2 | 52 | 23 | 41 | 150 | |
| 4a. | 0.2 | 115 | 127 | 121 | 26 | 20.8 | 57 | 25 | 44 | 150 | |
| 4b. | 2.5 | 118 | 127 | 121 | 23 | 18.4 | 50 | 20 | 39 | 140 | * |
| 4b. | 2 9 | 120 | 127 | 121 | 22 | 17.6 | 47 | 23 | 41 | 140 | |
| 4c. | 1.8 | 121 | 127 | 121 | 22 | 17.6 | 47 | 29 | NEVER | 85 | |
| 4d. | 1.6 | 120 | 127 | 121 | 22 | 17.6 | 47 | 14 | 45½ | 70 | |
| 5 | 5.2 | 120 | 127 | 121 | 20 | 16 | 42 | 11 | 29 | 250 | |
| | 4.7 | 118 | 127 | 121 | 20 | 16 | 42 | 6½ | 24½ | 250 | * |

CLOONIFF BOG : PRODUCTION YEARS TO PUMPING

TABLE 1

| | K | | | | L | M | | N | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Area No. | Required Water Level Ft. OD. | Pump Upstream Water Level Ft. OD. | Max. Flood Ft. OD | Summer Flood Ft. OD | Static Head (Max) Ft. | Static Head (Summer) Ft. | Drainage Catchment Area acres | Pump Capacity required $ft^3/min$ | Pump Capacity required $m^3/min$ | Remarks |
| 4 | 118 | 114·7 | 127 | 121 | 12·3 | 6·3 | 515 | 772·5 | 21·9 | |
| 4a | 118 | 115·6 | 127 | 121 | 11·4 | 5·4 | 150 | 225 | 6·4 | |
| 4b. | 118 | 115·5 | 127 | 121 | 11·5 | 5·5 | 140 | 210 | 5·9 | |
| 4c. | 120 | 118·3 | 127 | 121 | 8·7 | 2·7 | 85 | 127·5 | 3·6 | using these and 4 would reduce excavation |
| 4d. | 120 | 118·4 | 127 | 121 | 8·6 | 2·6 | 70 | 105 | 3·0 | |
| 5. | 118 | 113·2 | 127 | 121 | 13·8 | 7·8 | 250 | 375 | 10·6 | |

CLOONIFF BOG : PUMP REQUIREMENTS

TABLE 2.

## EXPLANATION OF DERIVATION OF PARAMETERS IN TABLES:

a. Min. fall to pump: based on slope of 1:1000. (ft.)

b. Final water level: from bottom contour map.

c. Max. flood: data.

d. Summer flood: data or estimate.

e. Avg. depth of bog: from contour maps and survey report.

f. Depth after initial drainage = e -(e/2 x 0.4).

g. Years of production = (f - 2) feet x (12) inches / (3+x%) inches per year.

h. Years to Winter pumping = (b + f) - a - c) x 12/(3+x)

i. Years to Summer pumping = (b + f) - a - d) x 12/(3+x)

j. Catchment area: data (planimeter). (acres)

k. Pump upstream water level: b-(max. relevant a).

l. Static head (max.) = c - k.

m. Static head (Summer) = d - k.

n. Pump capacity = (1.5 cubic feet/min.) byj.

p. Spaans Head = $\ell$ or m (in m) + 0.7 (approx.).

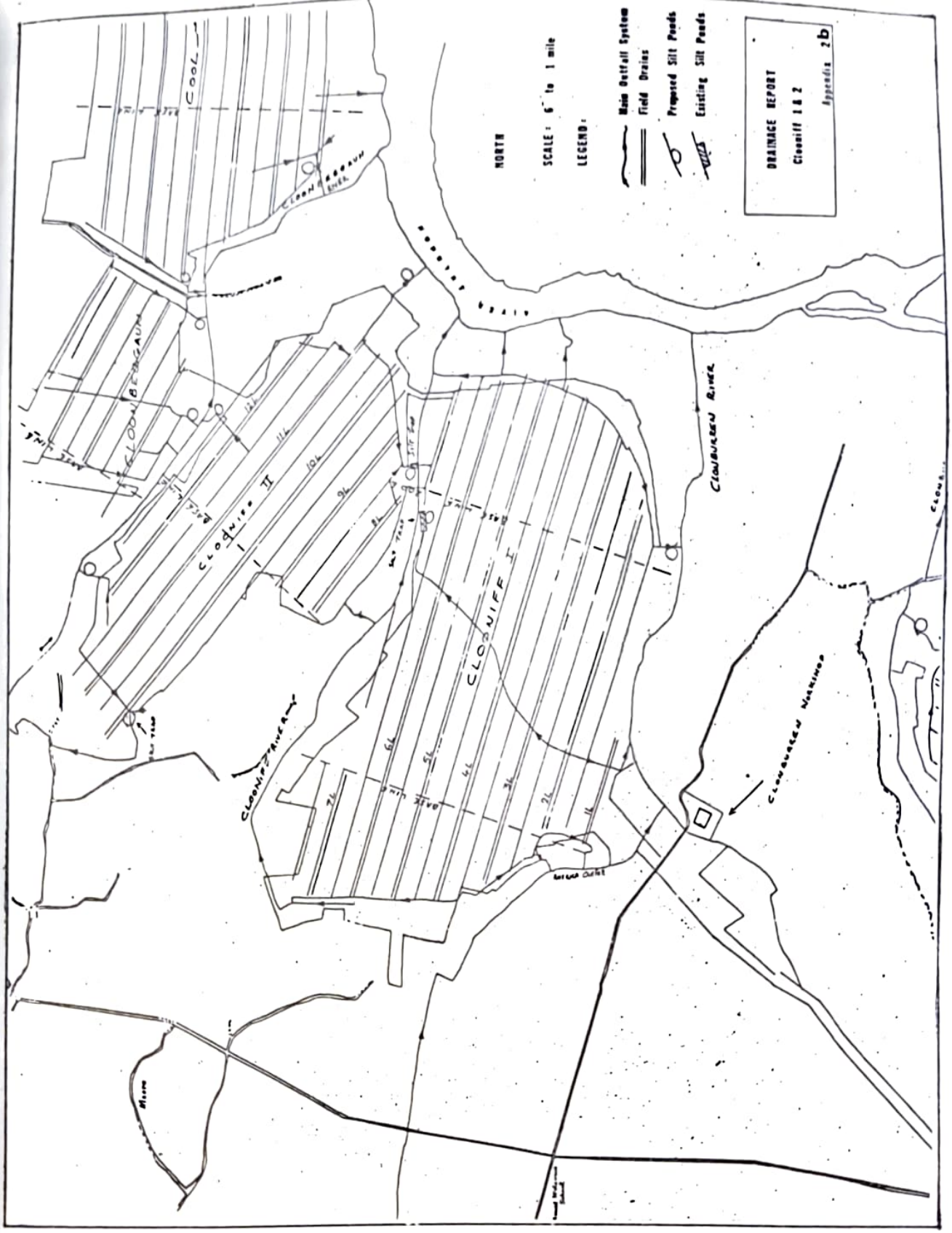
q. Pump size: 2 pumps x half (j) each approx. ($2 \times m^3/min \times lift\,(m)$)

r. Horse power of pump = q (one pump) ÷ 2. (hp)

s. kW each pump = 0.746 x r.

t. Total kW = 2 x s.

Scale reduced to 3" to 1 mile




Scale reduced to 3" to 1 mile

# APPENDIX 4-16

***Peco Harvester Tests – Internal Bord na Móna Report 1986***

BORD NA MONA

RESEARCH & DEVELOPMENT

DROICHEAD NUA

CO. KILDARE

# PEAT HARVESTER TESTS 1986

DECEMBER 1986

M. GILL
P. COFFEY

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## SUMMARY

The objectives of the project were to assess the performance and cost effectiveness of four harvesters at Cloncreen, Derrygreenagh.

The Peco Trailed Paddle Harvester was the best machine of the four tested.

This harvester had a high forward speed, excellent turning capacity, a high output performance and was very reliable.

Preliminary cost analysis showed that the Peco was the most cost effective machine.

The Type VI elevator performed next to the Peco followed by the Type VII elevator and the BnM Trailed unit.

1. OBJECTIVES

1.1 To evaluate the performance of four harvesters:-

(i) Type VI Elevator,

(ii) Type VII Elevator,

(iii) Peco Trailed Paddle. - Tractor Landini (14,500)

(iv) BnM Trailed Screw. - Tractor Landini (14,500) initially.
Ferguson (2720) finally.

The following criteria were used to evaluate the performance of each harvester:-

(a) Forward speed, k/h,

(b) Output, t/h @ 55% m.c.,

(c) Losses, t/km/lift @ 55% m.c.,

(d) Mechanical Reliability,

(e) Limitations,

(f) Cost Analysis

1.2 To identify the most efficient and cost effective harvester using the above criteria.

## 2. Experimental Design

### 2.1 Test Location and Layout

Derrygreenagh (i) Cloncreen
- Railway 2W
- Railway 8W

(ii) Ballycon

The design of the tests provided for evaluating the harvesters in poor/medium quality peat in Cloncreen and in good quality peat (peat quality greater than 250g/1 p.d.) in Ballycon. However, due to the poor weather encountered in June, July, August, it was decided that the Ballycon tests should be cancelled as the disruption to the harvesting operation and the corresponding production losses could not be countenanced in such a difficult year.

Two clear railways were selected for the tests. These railways were separated sufficiently in the production cycle so as to ensure that harvesting and testing would be done on different days. This plan was most efficient in the use of test equipment, tractors, and manpower.

The two railways selected were similar in peat density and bog condition - hence cross-comparisons could be made between machines being tested on different railways.

The standard of machines (Miller, Harrows, Ridgers, Harvesters) was most satisfactory and the drivers were helpful and co-operative.

The offset milling operation was not carried out during the period when tests were being conducted.

### 2.2 Layout of Plots

Five 150m plots were set out on each field on 2W and six plots were set out on 8W.

The plots were selected across all 10 fields with the view to achieving the same degree of contour, peat quality and bog condition, but it will be appreciated that due to the differences which occur between high fields and low fields, as well as the variability which occurs in peat across any railway, a high degree of uniformity is difficult to achieve.

## 2.3 Test Procedure

This is outlined in Fig. 1, page 5, and is similar to the procedure followed in the 1983 Harvester Tests.

The Type VI was tested against the Type VII on railway 2W and the Peco Trailed was tested against the BnM Trailed on railway 8W.

In order that cross-comparisons could be made between a harvester being tested on 2W with a harvester being tested on 8W, it was decided that the Type VII would be tested against the Peco Trailed on railway 8W on at least two harvests.

The test procedure was as follows:- on 2W harvest 1, the Type VI (Harvester A in Fig. 1) was tested on fields 1-5 while the Type VII (Harvester B) was tested on fields 6-10.

To obviate bias occurring in the tests due to differences in peat quality, ridge size, field condition, etc., between fields 1-5 and fields 6-10, the test harvesters were transposed on alternate harvests, i.e. on 2W harvest 2, the Type VI was tested on fields 6-10 while the Type VII was tested on fields 1-5.

The same test procedure was applied to the two trailed harvesters tested on railway 8W.

On 2W, harvest 1, the type VI lifted the ridge on field 1 and was returned to start on field 2 by idle travelling (or lifting) an adjacent production (non test) field; this procedure was repeated for lifts 2, 3, 4 and 5.

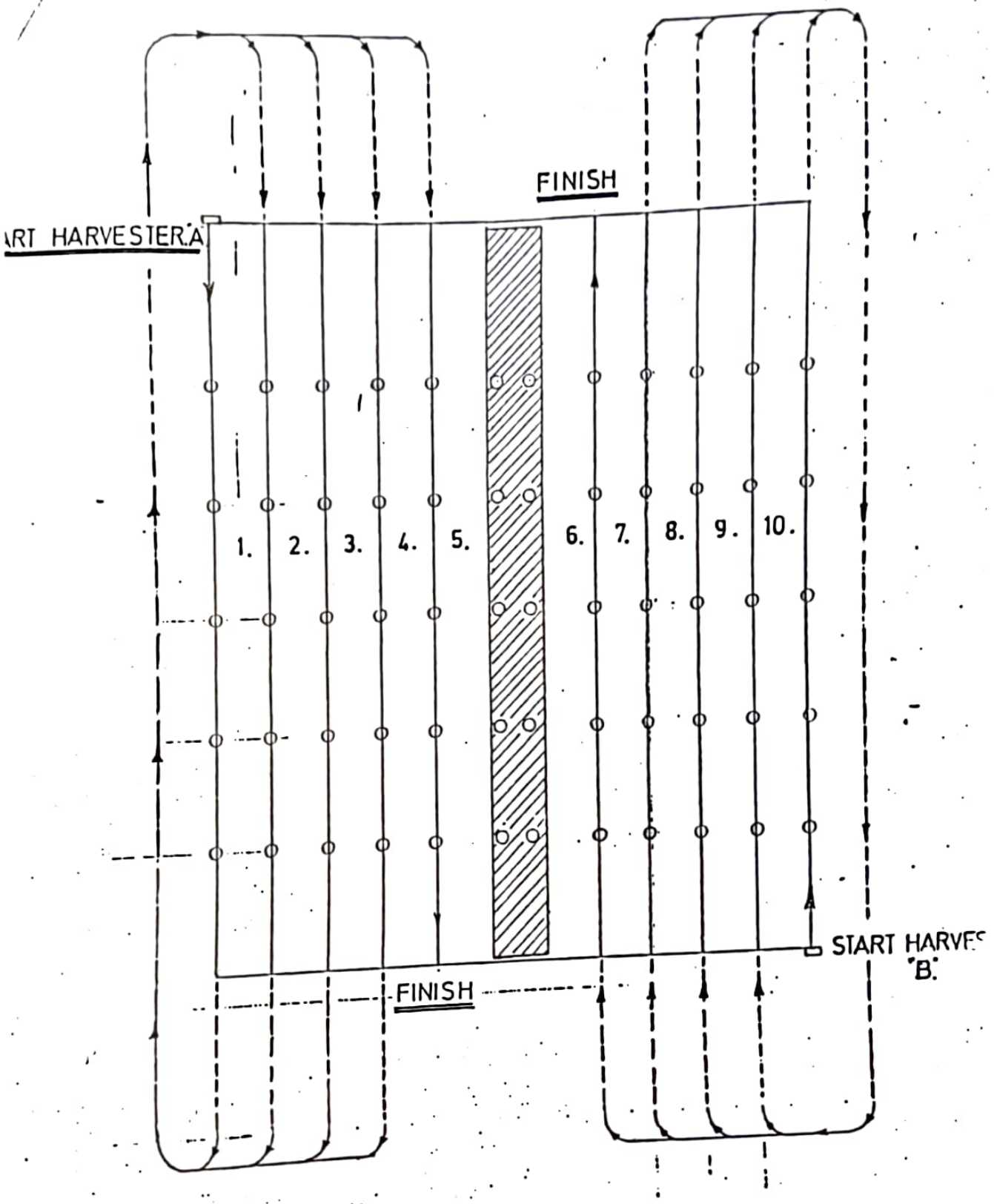
## 2.4. Work Study Measurements

Work Study personnel travelled in the cabs of the test harvesters during every test and drivers were required to drive their machines at optimum speed - that is, in accordance with standard work-study timing procedures.

The machines were timed through all 150m test plots to give the rate of travel in basic minutes per kilometer.

The turning ability of the four machines was measured to give rate of travel including turns in a standard 1km railway. Turning times measured were valid in assessing and comparing the turning performance of the four test machines,

Fig. 1.




TEST RAILWAY. LENGTH APPROX 1km.

HARVESTER "A" VERSUS HARVESTER "B"

SAMPLING POINTS – o.

but since the test procedure differed from the standard production harvesting operation, the times measured are not necessarily the same as that measured in the production situation.

## 3. FIELD WORK

### 3.1 Sampling Method

(i) Forward and turning speeds for the four test harvesters were measured by Work Study personnel.

(ii) Gross tonnage after milling was determined by selecting two strips across each field and estimating the tonnage per kilometre at 55% m.c. on the field. (A strip consisted of an imaginary 0.5m width extending across each field from drain to drain at a position selected within the plots for sampling).

Four samples were taken from each strip at 3m, 5m, from each drain edge using the $0.25m^2$ frame provided. All the peat within the frame was collected and weighed. The peat was returned to the area sampled and was mixed twice. A random sample of not less than 0.5L was taken and was placed in a plastic bag for moisture content determintion. Hence, four separate estimates of gross after milling tonnage on the field at 55% m.c. was determined per strip.

In order to preserve the validity of comparisons between two test harvesters on a given test railway (e.g. 2W) it was important that there was no real difference between the tonnage milled on fields 1-5 as compared to fields 6-10.

(iii) Ridge Size measurements were taken on plots 2 and 4 on railways 2W and 8W using the ridge divider frame (0.5m long). Two measurements were taken per plot and samples were taken for m.c. and b.d. determinations. From these data the tonnes per kilometre ridge @ 55% m.c. were calculated. These data were used to test if a significant difference existed between the quantity of peat in ridges on fields 1-5 as compared to the quantity on field 6-10 prior to harvesting.

(iv) Output of a test harvester was measured as follows:-

As the harvester travelled on field 1, plot 1, the peat which was transferred to field 2, plot 1 was collected in a specially designed bag, previously placed on the single ridge on field 2. The bag was weighed using the electronic gear fitted to the tractor attachment and a sample of 1.5L was taken from the bag for m.c. and b.d. determination. From these measurements the tonnage per kilometre lift at 55% m.c. was determined. The output was measured in each plot on fields 2, 3, 4, 5 and fields 7, 8, 9 and 10.

Final Lifts - Since the output measurements of final lifts could not be measured by this method as it would have entailed the placing of bags on stockpiles and subsequently weighing the bags (this would have been highly impractical), the following procedure was adopted. Prior to harvesting a test railway, sampling of the single ridge on fields 5 and 6 was carried out on selected plots 1-5 on 2W (and 1-6 on 8W). At each sampling point, a 0.5m length of ridge was separated by a special dividing frame and all the peat within the frame was collected and weighed and a sample was taken for m.c. The surplus peat was returned to the sampled area and the ridge was reformed.

The output for the final lift was determined by adding the 4th lift output to the weight of peat in the single ridge on field 5 and subtracting the losses measured on field 5 (see next section on measurement of losses).

The m.c. of the final lift was taken from the peat transferred to the stockpile.

(v) Losses - Prior to the harvesting operation, the locations to be sampled for harvester losses were selected and a band on either side of the ridge 1.5m wide and 2.0m long was swept clean of ridger losses. This was done so that harvester losses would be accurately determined.

Harvester losses were measured after the harvesting operation was completed, on all plots and on all test fields, where output measurements were carried out.

An $0.5m^2$ frame (0.5m x 1m) was used to collect the losses. The losses from a 0.5m length of lift were transferred to a plastic bin and weighed. The contents of the bin were mixed in the bin and a mimimum sample of 1.5L was taken at random from the mix for m.c. and b.d. determination.

3.2. Equipment

2; $0.5m^2$ frames (0.5m x 1m),
2; $0.25m^2$ frames (0.5m x 0.5m),
2; Plastic bins,
2; Sets of ridge dividers (0.5m long),
2; Sets of special weighing bags 0.75m x 3m and total volume $1.25m^3$,
Bags had metal frames with woven polypropylene fabric attached,
2; Tractors with special attachments for weighing the bags.

All above equipment designed and made by B. Carty, R&D.

2: Sets of weighing scales,
2; Sets of electronic weighing gear designed to weigh the bags.
Designed and fitted to tractor attachment with digital meters fitted in cabs by S. Kindregan and J. Dolan, R&D

3.3 Logistics

(Number of samples and tests per railway per harvest).

| | RLY 2W | (RLY 8W) |
|---|---|---|
| After Milling | 80 weighings | (120) |
| | 80 m.c's | (120) |
| Ridge Size | 40 weighings | (40) |
| | 40 m.c.'s & B.D's | (40) |
| Harvester Output | 40 weighings | (48) |
| | 50 m.c.'s & B.D's | (60) |
| Losses | 50 weighings | (60) |
| | 50 m.c.'s & B.D's | (60) |
| Total per railway per harvest | 170 weighings | (228) |
| | 170 m.c's | (228) |
| | 90 B.D.'s | (108) |

3.4 Manpower

1 Engineer
2 Work Study
6 Assistants.

3.5 Other Equipment

2 tractors - complete with cabs and transport boxes for transporting personnel and samples.
1 Bog Hut.

3.6 Supporting Machines

Milling on 2W and 8W was done exclusively by the flexi miller.

# 4. DISCUSSION AND RESULTS

## 4.1 Statistical Analysis

The method used was the analysis of variance with two sources of variation. The SPSS statistical package wasn't able to handle ANOVA with three sources of variations as required in the project.

Statistical Analysis was done on:-

After milling tonnes per km @ 55% m.c. on fields 1-5 and fields 6-10,

Ridge sizes in tonnes per km ridge at 55% m.c., on fields 1-5 and fields 6-10.

All harvester speeds, output, and losses data

## 4.2 Design of Tests

The design of the tests was satisfactory.

Five full tests were done between the Type VI and Type VII harvesters. However, one of the tests (harvest 9) had to be eliminated from the final evaluation because there was a real difference in the quantity of peat on fields 1-5 as compared to fields 6-10, prior to harvesting.

One double test was done on railway 2W, harvest 7 using the Type VI harvester - this was done due to breakdown of the Type VII machine.

Two tests were completed between the Peco Trailed and BnM Trailed harvesters - (See sub-section 4.3 below).

Two tests were done in the comparison of the Peco Trailed and Type VII harvesters but one of these tests was eliminted (harvest 10) because there was a real difference between the quantities of peat on fields 1-5 as compared to 6-10, prior to harvesting.

Two double tests were done on railway 8W where the Peco Trailed was used to harvest the full railway (harvests 5, 9) - this was due to the non-availability of the BnM Trailed because of breakdown. Even though significant differences were found between quantities of peat on fields 1-5 as against fields 6-10 prior to harvesting (both harvest 5, 9) the average speed, output and losses were found per harvest and these data were used in the final evaluation.

## 4.3 Prototype Machines

The Bnm Trailed Screw Harvester was unsatisfactory as a test machine as it was unavailable for many of the tests and in some cases it wasn't sufficiently reliable to complete the five lifts necessary for a full test.

It is our opinion that, in future, such machines should be developed to the production stage before they are included in a full scale test against production machines.

## 4.4 Tests in Good Quality Peat

As stated earlier (2,1), the design of tests provided for the testing of the four harvesters on two railways of good quality peat in Ballycon. It had been agreed with the Manager, Derrygreenagh that when the tests in Cloncreen were completed the test machines would be transferred to two railways in Ballycon. However, due to the production difficulties experienced in 1986, it was decided that the tests on good quality peat should be cancelled.

The results of the harvester tests in 1986 are therefore valid for machines operating on poor to medium quality peat.

## 4.5 Forward Speed (B.mins/km)

### Type VI and Type VII

There was no significant difference between the Type VI and Type VII through the test plots (i.e. excluding turns) on lifts 1 and 2, but the type VI was significantly faster on lifts 3, 4 and 5. (See Table 1, page 21).

However, analysis of forward speed, including turns (see table 2A below), showed the Type VII was significantly faster on lifts 1 and 2, there was no difference between the speeds of the two machines on lifts 3 and 4, but the Type VI was significantly faster on lift 5. (Also see table 2, page 21).

Table 2A. Average forward speed on lifts 1 to 5.

| | Lift Number | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | Average |
| Type VI | 11.17 | 11.36 | 11.74 | 12.39 | 13.19 | 11.97 B.mins/km |
| Type VII | 9.69 | 10.14 | 11.52 | 13.83 | 18.26 | 12.69 B.mins/km |

The above results show that the Type VII harvester is basically a faster machine during the early lifts but could not be driven to its optimum forward speed on litts 4 and 5 as the driver was constrained to a reduced belt pump pressure to avoid jamming of the conveyor belt. This problem was caused by increased friction between belt and jib on the heavier lifts. Examination of the early lift data shows that the type VII and Type VI are equally fast on straight forward speed but the Type VII is much faster when turning speed is included.

The overall results of the tests show there is no real difference between the average speeds of the Type VI and VII machines (11.97 versus 12.69 basic mins per km respectively). However, the Type VI was very much faster over the final lift (13.19 versus 18.26 B.min/km).

Peco Trailed Vs BnM Trailed

The Peco was significantly faster than the BnM harvester both in straight forward speed and when turning speeds were included (See Tables 3 and 4, page 22).

The slowness of the BnM Trailed Harvester is probably attributable to the fact that it is a heavier machine and also the spiral consumes more power than the paddle.

Peco Trailed Vs Type VII

The available data was limited due to the fact that harvest 10 was eliminated from the analysis. The one valid comparison of these two machines showed that the Peco and Type VII were equally fast on lifts 1 and 2 but in lifts 4 and 5 the Peco was by far the faster machine. (See Table 5 and 5A, page 23).

Peco Trailed Vs Type VI

Even though these machines were not compared on the same test railway the fact that the Type VII was tested on both 2W and 8W and showed no real difference in speed shows that bog characteristics were similar in the two railways. This provides a basis for comparing the speeds per lift of the peco and type VI machines. See table 6A below which shows that speeds of both machines are similar. (See also table 6, page 24).

Table 6A. Forward Speed (including turns)

| | Lift Number | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | Average |
| Peco | 10.09 | 10.15 | 11.94 | 11.94 | 12.79 | 11.38 B.mins/km |
| Type VI | 11.19 | 11.31 | 11.86 | 12.37 | 13.39 | 12.02 B.mins/km |

## 4.6 Output (t/h)

### Type VI Vs Type VII (t/h)

There was no real difference between the output of these harvesters on lift 1 but the type VI had a higher output on lifts 4 and 5 (See Table 7 on page 25).

### Peco Trailed Vs Bnm Trailed (t/h)

The output of the Peco Trailed Machine was equal, or superior, to the BnM on almost all lifts (See Table 8 on page 25).

### Peco Trailed Vs Type VII (t/h)

Even though only one valid comparison is available, the results show no real difference between these machines on the early lifts, but there is a highly significant difference in favour of the Peco on lift 5. (See Table 9 on page 26).

### Type VI Vs Peco (t/h)

As stated earlier in 4.5 the bog characteristics of the two railways were similar. Hence the outputs per lift of the two machines can be compared (see table 10A below).

Table 10A. Harvester Output (t/h)

| | Lift Number | | | | | Average |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | |
| Type VI | 177 | 285 | 353 | 462 | 523 | 360 t/h |
| Peco | 139 | 280 | 351 | 450 | 534 | 351 t/h |

No significance tests were carried out on the above data but the figures show there is no real difference between the outputs of the type VI and Peco machines (see also table 10, page 26).

## 4.7 Losses t/km @ 55% m.c.

### Type VI Vs Type VII

The type VI had lower losses than the Type VII. The averages are given below:- (See also Table 11, page 27).

| | Av. Losses t/km @ 55% m.c. |
|---|---|
| Type VI | 5.5 |
| Type VII | 8.2 |

Since both harvesters have elevator collectors this represents a very big difference in pick up efficiency.

It was observed during the tests that the losses from the Type VI were low, while those from the Type VII appeared to be much higher. The photographs fig. 2, page 30 show the high level of losses left by the Type VII which was largely due to poor sealing between the two side wings and the base of the elevator.

### Peco Trailed Vs BnM Trailed

The Peco had lower losses than the BnM machine. The averages are given below (See also Table 12, page 27).

| | Av. Losses t/km @ 55% m.c. |
|---|---|
| Peco | 7.5 |
| BnM | 16.1 |

Since the BnM harvester is a prototype machine, it probably is not surprising that the losses are exceptionally high. Also it would have been expected that the screw collector would be less efficient than the Paddle.

The Peco Paddle had higher losses than the type VI harvester. In photograph fig. 3, page 31 it will be seen that there is a considerable space between one of the side wings and the paddle which resulted in a ridge of losses from this area - improved sealing would reduce losses. Also it will be seen in photograph fig. 4, page 32, that the belt sealing can be improved as there is a continuous loss of peat falling on the return belt and contributing to overall losses.

Type VI Vs Peco

Even though these machines were not tested on the same railway, it is interesting to compare the average losses per lift for both machines (See table 13A below) see also Table 13, page 28).

Table 13A.

| | Losses t/km @ 55% m.c. | | | | |
|---|---|---|---|---|---|
| | Lift Number | | | | |
| | 1 | 2 | 3 | 4 | 5 |
| Type VI | 4.6 | 4.4 | 5.8 | 5.9 | 5.3 |
| Peco | 9.2 | 6.0 | 7.4 | 9.5 | 7.7 |

It will be seen that the Type VI is by far the better machine on all lifts. However, as stated on the previous page, losses from the Peco can be reduced if the sealing is improved.

## 4.8 Performance

The performance of the four test harvesters is based on net output (including turns) and mechanical efficiency (i.e. mechanical hours over worked plus mechanical hours).

Performance of Harvesters

| | Net output t/h (Av. of 5 litts) | Mech. Efficiency % | Performance Index t/h |
|---|---|---|---|
| Type VI | 360 | 87 | 313 |
| Peco | 351 | 88 | 309 |
| Type VII | 287 | 78 | 224 |
| BnM | 221 | 70 * | 155 |

* This figure is inaccurate as it doesn't represent all modifications to this prototype machine.

The above table shows there is no difference in the performance of the type VI and Peco harvesters while the type VII performed poorly by comparison.

## 4.9 Reliability

The mechanical performance of the four test machines is given, together with performance data from Boora and Blackwater of production machines:-

| MACHINE PERFORMANCE | | | | | | |
|---|---|---|---|---|---|---|
| Machine | Worked | | Mechanical | | Performance (%) | |
| | Test m/cs | Boora/ B.water | Test m/cs | Boora/ B.water | Test m/cs | Boora/ B.water |
| VI | 521 | 339 | 81 | 135 | 87 | 72 |
| VII | 453 | 322 | 131 | 194 | 78 | 62 |
| Peco Trailed | 557 | 544 | 76 | 96 | 88 | 85 |
| BnM Trailed | 55 | 343 | 24 | 141 | 70 | 71 |

The Peco trailed was marginally the best of the test machines and also performed best in the Boora/Blackwater returns.

## 4.10 Limitations

Peco

- Tracks, The plates used to bolt the swamp shoes onto the tractor tracks were of poor design resulting in breakage of shoes from the machine.

- Sharp turns, when turning sharply to the right, the roller on the machine frame occasionally caught the right hand track of the tractor causing swampshoes to be broken from the track.

- Belt Seal, Peat was lost due to inadequate sealing of the belt for a length of approximately 2m.

- Paddle Seal, There was a considerable space between the side-wing and paddle which resulted in a ridge of losses from this area.

Type VI - Very slow to turn.

Type VII

- Belt, In heavier lifts the driver was constrained to drive at reduced speed to avoid jamming of the belt. This was due to excessive friction between the belt and seal.

- Castor wheel - The outside castor wheel occasionally twisted and was dragged along the bog resulting in field damage.

- Elevator Seal - There was a considerable space between the side-wings and the base of the elevator - this resulted in excessive losses from this area.

BnM Trailed Unit

- Bellhousing, The driver experienced great difficulty in controlling the level of the bellhousing. This resulted in losses which were excessively high in some places, to tearing raw bog in other parts of the field.

- Sinkage, This harvester was prone to sinkage.

## 4.11 Cost Analysis

Preliminary costings are presented for the four harvesters. However, variable costs are not available and would take considerable time to extract at the different works as harvesters are considered as a group rather than individual types.

In the absence of these data it has been assumed that fuel, labour and maintenance (including overhaul) costs are similar for the four harvesters. This assumption would appear to be biased against the Peco machine as the maintenance costs of this harvester would be expected to be significantly lower than the type VI and type VII as it is a far less complex machine.

The table below gives capital costs of the four machines which have been written off over a ten-year period. The speed and reliability of the type VI, VII and Peco machines have been taken as being the same (this is favourable towards the type VII as this was a less reliable machine).

The cost per hectare and per tonne per annum are presented:

COST ANALYSIS £

| Capital Costs | Type VI | Type VII | Peco Trailed | BnM Trailed |
|---|---|---|---|---|
| Trailed Unit | | | 42,800 | 34,000 |
| Tractor | | | 27,500 | 27,500 |
| Cantone Tracks | | | 10,500 | 10,500 |
| Total | 104,800 | 110,300 | 80,800 | 72,000 |
| Cost/ha | 55 | 57 | 42<br>(32) | 90<br>(66) |
| Cost/t | 0.30 | 0.31 | 0.23<br>(0.17) | 0.49<br>(0.36) |

Data in brackets exclude costings for 50% of tractor and cantone outlay.

The above table clearly shows that the Peco is the more cost effective machine. The Peco becomes even more attractive if half the cost of tractor and cantone tracks are apportioned to this machine on the basis that the tractor can be utilised on other work for half of each year.

## 5. Conclusions

5.1 The Peco Trailed Paddle Harvester was the best overall machine.

This harvester had a high forward speed, excellent turning capacity and had a high output performance. It was a very reliable machine (most problems were caused by cantone tracks) and was the most cost effective of the four harvesters tested.

Losses were relatively high but these can be reduced by improved sealing along the conveyor belt and in the area between the paddle and side-wing.

5.2 The Type VI elevator performed next best to the Peco Trailed unit.

This machine had a high forward speed but had a poor turning capacity. It had a high output performance and the lowest level of losses of the machines tested. The test harvester was very reliable but was much less cost effective than the Peco.

5.2 The Type VII elevator is a very fast machine with excellent turning capacity. It had more mechanical problems than the Peco or Type VI and the friction problem between the belt and jib affected its performance (speed and output) on the heavier litts.

Losses were relatively high but these could be reduced by improved sealing between the two side-wings and the base of the elevator. Preliminary cost analysis showed this machine to be marginally less cost effective than the Type VI harvester.

5.4 The BnM Trailed Screw performed very poorly in all respects. Such machines should be developed to a more advanced stage before they are included in field-scale tests.

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The contribution made by personnel or groups listed below, in setting up the project, designing equipment, implementing the tests, analysing the samples, data analysis and report preparation, is much appreciated.

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# APPENDIX


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TABLE 1

FORWARD SPEEDS (EXCLUDING TURNS)

TYPE VI V TYPE VII (BMs/KM)

| HARVEST | | LIFT NUMBER | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | AVERAGE |
| 8 | VI | 8.8 | 9.01 | 9.23 | 9.55 | 10.95 | 9.5 |
| | VII | 7.93 | 9.37 | 11.15 | 13.03 | 18.48 | 11.99 |
| 10 | VI | 8.55 | 8.77 | 9.71 | 10.67 | 10.61 | 9.66 |
| | VII | 8.49 | 9.41 | 9.87 | 13.19 | 17.25 | 11.64 |
| 11 | VI | 8.61 | 8.83 | 9.07 | 9.33 | 10.27 | 9.22 |
| | VII | 8.85 | 8.47 | 9.64 | 10.8 | 16.84 | 10.92 |
| 12 | VI | 8.56 | 8.67 | 8.77 | 9.85 | 10.76 | 9.32 |
| | VII | 8.88 | 8.71 | 10.83 | 13.69 | 15.88 | 11.6 |
| AV. | VI | 8.63 | 8.82 | 9.20 | 9.85 | 10.65 | 9.43 |
| | VII | 8.54 | 8.99 | 10.37 | 12.68 | 17.11 | 11.54 |
| | | NS | NS | S | HS | HS | |

TABLE 2.

FORWARD SPEEDS (INCLUDING TURNS)

TYPE VI v TYPE VII (BMs/KM)

| HARVEST | | LIFT NUMBER | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | AVERAGE |
| 8 | VI | 11.34 | 11.55 | 11.77 | 12.09 | 13.49 | 12.05 |
| | VII | 9.08 | 10.52 | 12.30 | 14.18 | 19.63 | 13.14 |
| 10 | VI | 11.09 | 11.31 | 12.25 | 13.21 | 13.15 | 12.21 |
| | VII | 9.64 | 10.56 | 11.02 | 14.34 | 18.40 | 12.79 |
| 11 | VI | 11.15 | 11.37 | 11.61 | 11.87 | 12.81 | 11.76 |
| | VII | 10.00 | 9.62 | 10.79 | 11.95 | 17.99 | 12.07 |
| 12 | VI | 11.10 | 11.21 | 11.31 | 12.39 | 13.30 | 11.86 |
| | VII | 10.03 | 9.86 | 11.98 | 14.84 | 17.03 | 12.75 |
| AV. | VI | 11.17 | 11.36 | 11.74 | 12.39 | 13.19 | 11.97 |
| | VII | 9.69 | 10.14 | 11.52 | 13.83 | 18.26 | 12.69 |
| | | HS | HS | NS | NS | HS | NS |

TABLE 3.

FORWARD SPEEDS (EXCLUDING TURNS)

PECO TRAILED V BNM TRAILED (BMs/KM)

| HARVEST | | LIFT NUMBER | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | AVERAGE |
| 4 | P | 8.44 | 8.43 | 10.95 | 10.63 | 10.93 | 9.87 |
| | BNM | 10.8 | 17.12 | 17.55 | 21.67 | - | 16.78 |
| 8 | P | 8.62 | 8.77 | 10.86 | 10.72 | 10.75 | 9.94 |
| | BNM | 17.75 | 18.53 | 22.42 | 27.63 | 30.83 | 23.43 |
| AV | P | 8.53 | 8.60 | 10.91 | 10.68 | 10.84 | 9.91 |
| | BNM | 14.28 | 17.83 | 19.98 | 24.65 | 30.83 | 21.51 |
| | | NS | HS | HS | HS | HS | |

TABLE 4

FORWARD SPEEDS (INCLUDING TURNS)

PECO TRAILED V BNM TRAILED (BMs/KM)

| HARVEST | | LIFT NUMBER | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | AVERAGE |
| 4 | P | 9.58 | 9.57 | 12.09 | 11.77 | 12.07 | 11.02 |
| | BNM | 12.39 | 18.71 | 19.14 | 23.26 | - | 18.38 |
| 8 | P | 9.76 | 9.91 | 12.01 | 11.91 | 11.89 | 11.10 |
| | BNM | 19.34 | 20.12 | 24.01 | 29.22 | 32.42 | 25.02 |
| AV | P | 9.67 | 9.74 | 12.05 | 11.84 | 11.98 | 11.06 |
| | BNM | 15.87 | 19.42 | 21.58 | 26.24 | 32.42 | 23.11 |
| | | HS | HS | HS | HS | HS | HS |

TABLE 5

FORWARD SPEEDS (EXCLUDING TURNS)

PECO TRAILED v TYPE VII (BMs/KM)

| HARVEST | | LIFT NUMBER | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | AVERAGE |
| 11 | P | 8.65 | 8.79 | 11.18 | 10.64 | 12.55 | 10.36 |
| | VII | 7.95 | 8.92 | 12.58 | 14.93 | 19.75 | 12.83 |
| | | HS | NS | S | HS | HS | |

TABLE 5A

PECO-TRAILED V TYPE VII (BMs/KM) (INCLUDING TURNS)

| HARVEST | | LIFT NUMBER | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | AVERAGE |
| 11 | P | 9.79 | 9.93 | 12.32 | 11.78 | 13.69 | 11.50 |
| | VII | 9.10 | 10.07 | 13.73 | 16.08 | 20.90 | 13.98 |
| | | NS | NS | S | HS | HS | |

Table 6

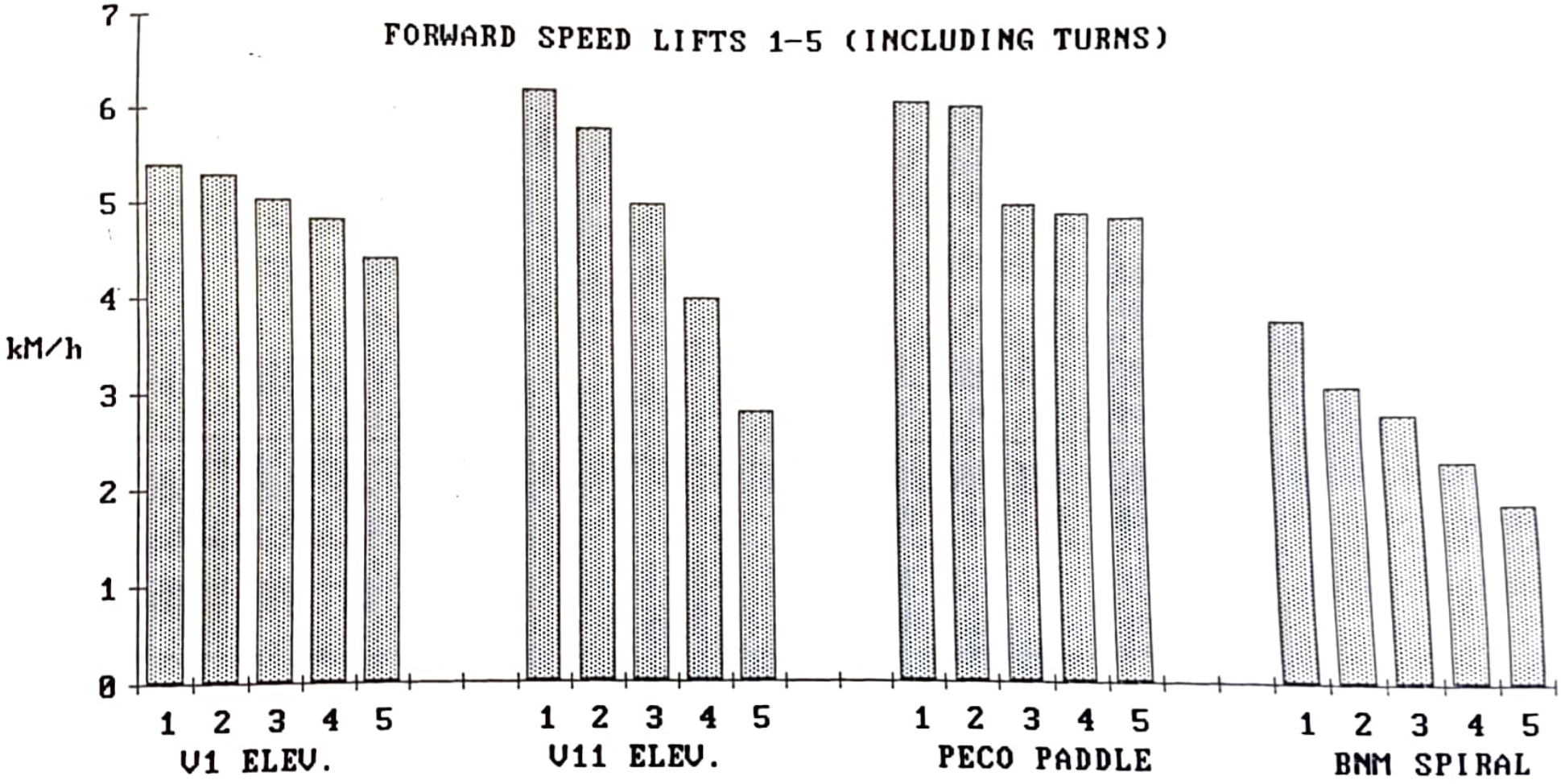

FORWARD SPEED LIFTS 1-5 (INCLUDING TURNS)
kM/h
7
6
5
4
3
2
1
0
1 2 3 4 5
V1 ELEV.
1 2 3 4 5
V11 ELEV.
1 2 3 4 5
PECO PADDLE
1 2 3 4 5
BNM SPIRAL

TABLE 7.

HARVESTER OUTPUT - T/H AT 55% M.C.

TYPE VI v TYPE VII

| HARVEST | | LIFT NUMBER | | | | | AVERAGE |
|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | |
| 8 | VI | 219 NS | 326 NS | 384 NS | 393 NS | 477 NS | 360 |
| | VII | 267 | 210 | 271 | 413 | 322 | 300 |
| 10 | VI | 137 NS | 284 NS | 324 NS | 429 HS | 513 HS | 337 |
| | VII | 165 | 241 | 273 | 313 | 276 | 254 |
| 11 | VI | 140 NS | 217 NS | 339 NS | 464 NS | 501 HS | 332 |
| | VII | 159 | 247 | 373 | 396 | 374 | 310 |
| 12 | VI | 200 NS | 349 S | 440 HS | 555 HS | 608 HS | 430 |
| | VII | 163 | 276 | 328 | 320 | 349 | 287 |
| Av. | VI | 174 NS | 294 S | 377 S | 461 HS | 525 HS | 366 |
| | VII | 188 | 245 | 311 | 360 | 330 | 287 |

TABLE 8

HARVESTER OUTPUT - T/H AT 55% M.C.

PECO TRAILED v BNM TRAILED

| HARVEST | | LIFT NUMBER | | | | | AVERAGE |
|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | |
| 4 | P | 109 HS | 257 NS | 332 NS | 520 HS | 566 | 357 |
| | BNM | 220 | 213 | 271 | 284 | - | 247 |
| 8 | PI | 173 NS | 340 NS | 365 HS | 468 HS | 627 | 395 |
| | BNM | 103 | 172 | 208 | 245 | 250 | 196 |
| Av | P | 141 NS | 299 HS | 349 HS | 499 HS | 596 HS | 376 |
| | BNM | 161 | 192 | 239 | 265 | 250 | 221 |

TABLE 9.

HARVESTER OUTPUT - T/H (INCLUDING TURNS)

PECO TRAILED V TYPE VII

| HARVEST | | LIFT NUMBER | | | | | AVERAGE |
|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | |
| 11 | P | 147 NS | 257 NS | 273 S | 386 NS | 476 S | 310 |
| | VII | 130 | 290 | 314 | 441 | 383 | 312 |

TABLE 10

OUTPUT (T/H) (INCLUDING TURNS)

PECO V TYPE VI

| HARVEST | | LIFT NUMBER | | | | | AVERAGE |
|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | |
| 4 | P | 109 | 257 | 332 | 520 | 566 | 357 |
| 5 | P | 131 | 244 | 368 | 452 | 502 | 339 |
| 7 | VI | 139 | 209 | 295 | 446 | 476 | 313 |
| | VI | 225 | 327 | 335 | 487 | 560 | 387 |
| 8 | P | 173 | 340 | 365 | 468 | 627 | 395 |
| | VI | 219 | 326 | 384 | 393 | 477 | 360 |
| 9 | P | 136 | 291 | 418 | 422 | 498 | 353 |
| 10 | VI | 137 | 284 | 324 | 429 | 513 | 337 |
| 11 | P | 147 | 267 | 273 | 386 | 476 | 310 |
| | VI | 140 | 217 | 339 | 464 | 501 | 332 |
| 12 | VI | 200 | 349 | 440 | 555 | 608 | 430 |
| Av. | P | 139 | 280 | 351 | 450 | 534 | 351 |
| | VI | 177 | 285 | 353 | 462 | 523 | 360 |

TABLE 11.

- HARVESTER LOSSES (T/KM AT 55% M.C.)

TYPE VI v TYPE VII

| HARVEST | | LIFT NUMBER | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | AVERAGE |
| 8 | VI | 5.3 | 4.4 | 9.2 | 9.2 | 5.3 | 6.2 |
| | VII | 12.4 | 8.4 | 7.7 | 9.4 | 11.2 | 9.8 |
| 10 | VI | 2.2 | 2.6 | 6.4 | - | - | 3.7 |
| | VII | 8.2 | 9.0 | 6.7 | - | - | 8.0 |
| 11 | VI | 3.5 | 4.8 | 6.7 | 4.9 | 6.6 | 5.3 |
| | VII | 5.0 | 5.8 | 12.2 | 15.2 | 4.8 | 8.7 |
| 12 | VI | 7.1 | 3.5 | 5.6 | 4.5 | 6.2 | 5.4 |
| | VII | 6.7 | 5.6 | 4.8 | 6.6 | 7.5 | 6.2 |
| AV. | VI | 4.5 HS | 3.8 HS | 6.4 NS | 6.2 HS | 6.0 | 5.5 |
| | VII | 8.1 | 7.2 | 8.0 | 10.4 | 7.8 | 8.2 |

TABLE 12

HARVESTER LOSSES - T/KM AT 55% M.C.

PECO TRAILED v BNM TRAILED

| HARVEST | | LIFT NUMBER | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | AVERAGE |
| 4 | P | - | 5.4 | 7.9 | 9.0 | 8.4 | 8.4 |
| | BNM | - | - | 19.3 | 12.9 | 16.2 | 16.1 |
| 8 | P | - | 3.9 | 5.6 | 12.7 | 4.2 | 6.6 |
| | BNM | - | 12.3 | 13.9 | 21.8 | 16.2 | 16.1 |
| AV. | P | - | 4.6 HS | 6.8 HS | 10.8 NS | 6.3 HS | 7.5 |
| | BNM | - | 12.3 | 16.6 | 17.4 | 16.2 | 16.1 |

TABLE 13

HARVESTER LOSSES T/KM AT 55% MOISTURE CONTENT

TYPE VI v PECO TRAILED

| HARVEST | | LIFT NUMBER | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | AVERAGE |
| 4 | P | – | 5.4 | 7.9 | 9.0 | 8.4 | 7.7 |
| 5 | P | 9.3 | 7.5 | 8.1 | 6.2 | 6.8 | 7.6 |
| 7 | VI | 4.7 | 5.0 | 5.5 | 4.0 | 2.9 | 4.4 |
| | VI | 4.5 | 6.3 | 3.9 | 7.1 | 5.6 | 5.5 |
| 8 | VI | 5.3 | 4.4 | 6.9 | 9.2 | 5.3 | 6.2 |
| | P | - | 3.9 | 5.6 | 12.7 | 4.2 | 6.6 |
| 9 | P | 11.5 | 7.6 | 8.0 | 12.9 | 11.1 | 10.2 |
| 10 | VI | 2.2 | 2.6 | 6.4 | - | - | 3.7 |
| 11 | VI | 3.5 | 4.8 | 6.7 | 4.9 | 6.6 | 5.3 |
| | P | 6.8 | 5.6 | 7.6 | 6.5 | 8.0 | 6.9 |
| 12 | VI | 7.1 | 3.5 | 5.6 | 4.5 | 6.2 | 5.4 |
| Av. | VI | 4.6 | 4.4 | 5.8 | 5.9 | 5.3 | 5.1 |
| | P | 9.2 | 6.0 | 7.4 | 9.5 | 7.7 | 7.8 |

TABLE 14

AVERAGE PRESS DENSITY (G/L) OF BOTH TEST RAILWAYS
(AVERAGES TAKEN OVER3 HARVESTS).

| RAILWAY | FIELD | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Av. |
| RLY 2W | 226 | 221 | 220 | 208 | 204 | 197 | 188 | 184 | 188 | 214 | 205 |
| RLY 8W | 223 | 206 | 203 | 193 | 178 | 162 | 157 | 146 | 145 | 189 | 180 |

# APPENDIX 4-17

***Distribution and Nature of Mineral 'Ash' Material in a Milled Peat Stockpile – Internal Bord na Móna Report 1982***

BORD NA MONA
SCIENTIFIC OFFICE
DROICHEAD NUA
CO. KILDARE

SUBJECT: Distribution and Nature of Mineral "Ash" Material in a Milled Peat Stockpile.

P. J. COFFEY

SEPTEMBER, 1982.

BORD NA MÓNA
COOLNASUN
DATE RECD. -3 NOV 1982
FOR ATTENTION

# DISTRIBUTION AND NATURE OF MINERAL 'ASH' MATERIAL IN A MILLED PEAT STOCKPILE

An investigation was carried out on a stockpile in Clonsast (TR 10 SW) to establish the following:-

a) The distribution of ash in the profile, that is, if the ash content of the peat was uniform throughout the profile or if there was a significantly higher ash content at the lower 'pile levels.

b) The nature of the mineral material which constitutes ash in milled peat. This was classified and investigated as follows:

(i) Pebbles - hard mineral material (i.e. stones) not breakable by hand.

(ii) Visible mineral material present as aggregates, grit or fines, the aggregates breakable by hand.

(iii) Non-visible inherent mineral material.

BORD NA MÓNA
COOLNAGUN
DATE REC'D. -3 NOV 1982
FOR ATTENTION

PROCEDURE

In discussions with the manager, Clonsast, it was decided that stockpile on TR 10 SW was typical of high ash 'piles as the ash ranged from 8.7% to 23.8%. See Table No. 9.

The history of production on this was:-

| | | | |
|---|---|---|---|
| | 1977 | - | 9 harvests |
| | 1978 | - | 8 harvests |
| | 1979 | - | 9 harvests |
| | 1980 | - | 8 harvests |
| | 1981 | - | 13 harvests |
| Total | Total | - | 47 harvests |

As the number of lifts per harvest was considerably less (~3 fields) than a standard 11 field system, this 'pile was equivalent to ~14 harvests from an 11 field system.

Ditching was last done in the autumn of 1980 and was done each winter prior to that.

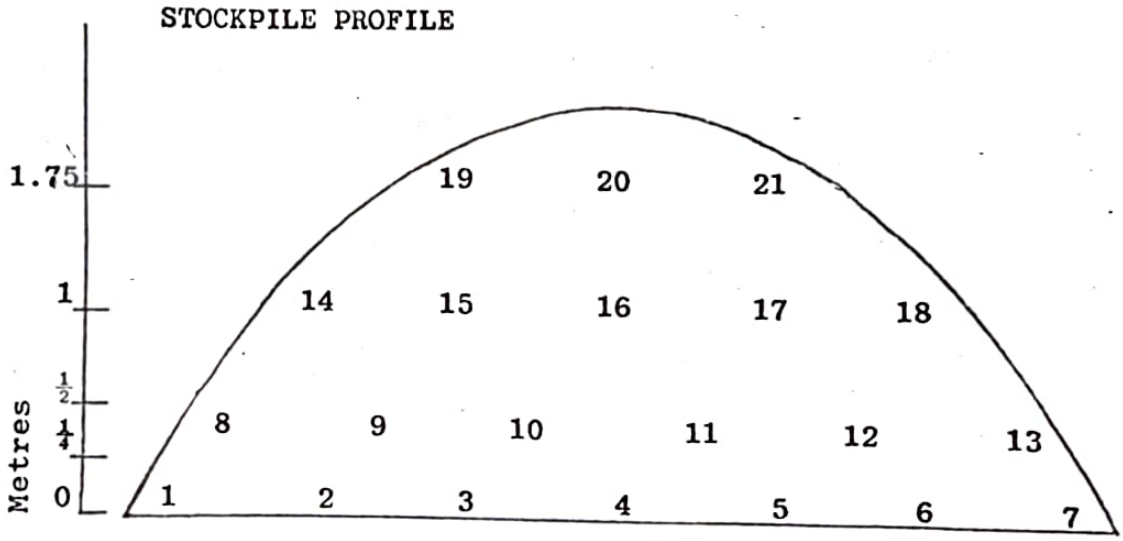
From the ash survey done on this pile at 25yd intervals (see Table 9) it was decided to open the 'pile by hymac at 2800S, 3025S, 2625S, that is, where the average ash contents were 9.8%; 15.6%; 17.9%. It was originally intended to investigate the 'pile at 3050S where the ash content was 23.8%, but as the 'pile was very small at this point it was not intensively sampled and point 3025S was selected instead.

It was decided to sample the two exposed 'pile profiles at each of the yardage points mentioned above, the

distance between the adjacent profiles was approx. 2 m. This provided a complete set of samples from each of 6 profiles.

Samples were taken as per the illustration below using a half cylindrical cowl 

which was pushed into the profile at the sampling point and the peat within the cowl was taken as the sample. A total of 21 samples were taken from each profile. From the illustration below, it will be seen that 7 samples were taken from the base or lower $\frac{1}{4}$ m. of the 'pile; 6 were taken in the $\frac{1}{4}$ to $\frac{1}{2}$ m. level; 5 were taken at approx. 1 m. level and 3 from $1\frac{1}{2}$ - 1.75 m. level.




Sample locations shown 1 - 21 above.

## ANALYSES

(a) Moisture content (%)

(b) Bulk density (g/l)

(c) Ash content - exclusive of pebbles. This includes inherent mineral material in the peat and visible mineral breakable material. See Tables1 - 7.

(d) Pebble content per litre of milled peat. Size, number and weight measurements taken. See Tables 1 - 7.

(e) Visible mineral material. Samples were classified as having zero, small, medium and large quantities of this present i.e. 0, 1, 2, 4 were the classification numbers used. See Tables 1 - 7.

## DEFINITIONS

### Ash Content

This includes inherent invisible mineral material in the peat and visible mineral aggregates, grit and fines. Pebbles are excluded in the ash result in tables 1 - 7.

### Pebbles

Stones which were unbreakable by hand and were mainly of limestone composition.
Size varied from > 1½mm to < 63.5mm.

### Visible mineral material

Aggregates (breakable by hand) grit or fines.
Sizes were approx. as follows:

| | | |
|---|---|---|
| Aggregates | < | 25.4 mm |
| Grit | < | 1.5 mm |
| Fines | < | 850.0 microns (0.85mm) |

### Invisible mineral material

Defined as inherent mineral material in the peat.

## DISCUSSION & RESULTS

Tables 1 - 6 give the results of Ash, Pebbles and Visible mineral contents for each of the 6 profiles.

1N, 1S represent the two adjacent profiles exposed at 2625 S.

2N, 2S represent the two profiles at 2800 S.

3N, 3S represent the profiles at 3025 S.

Table 7 gives a summary of results i.e. averages of ash, pebble and visible mineral material for the 6 profiles 1N to 3S.

Table 8 shows the distribution of pebble sizes.

Table 9 shows results of initial ash survey.

Table 10 gives general results.

## ASH CONTENTS

Tables 1 - 6 show that the ash content was lowest at the base of the 'pile and highest at the middle or top. This may be explained by the fact that the later harvests in the stockpile (i.e. peat in the mid to top region of the 'pile) included a higher proportion of peat from the lower bog 0.5m stratum where the average ash content is approx. 9.0%. Also, ash contents in the 9.0% to 15.0% ash range and higher are due to a higher proportion of mineral sub-soil contamination due to ditching, milling etc. Tables no. 1 - 7 support this view.

PEBBLE CONTENT

Table 8 shows the distribution in the size of pebble - the highest number was found in the $\frac{1}{4}$" - $\frac{3}{8}$" interval. The average pebble diameter (excluding 6 stones which were > 1") was 0.9 cms (0.35"). The average pebble weight was 1.0g which gave a pebble density of approx. 2.6g/cc. The large stones gave a density of 2.7g/cc. Chemical tests and density Measurements confirm that these were mainly limestone material.

It will be seen from Tables 1 - 6 and Table 7 that the number of pebbles per litre of peat was lowest at the base and was highest at the middle and top of the stockpile. This was an unexpected finding as it was felt prior to this investigation, that the pebbles and stones would separate during the final lift operation when the peat is dropped onto the 'pile and that the greater number would be found at the 'pile base or the lower regions, but the contrary was the case. The larger numbers at the middle and top are the result of increased sub-soil contamination due to ditching and milling operations.

VISIBLE MINERAL MATERIAL

Tables 1 - 6 and Table 7 show that the base of the 'pile had the lowest level and the middle and top the highest level of material. There is a close correlation between the distribution of ash and visible mineral material from base to top of 'pile.

An examination of work done on bog profiles in Timahoe, Ballydermot, Clonsast etc. confirms that the following average ash contents are typical of undisturbed raised bog peats for the bog depths quoted.

< 2% ash:- ash content in the poorly decomposed upper stratum of raised bog.

2% - 5% ash:- ash content in the upper to middle region.

5% - 9% ash:- ash content in the middle to lower region.

9% ash:- ash content in the lower 0.5 metre stratum.

> 9.0% ash:- ash content in peat contaminated by sub-soil mineral material due mainly to ditching and milling operations. (this peat would be expected to include a high proportion of peat from the lower 0.5m bog stratum which has an ash content of 9.0%)
Therefore the following ranges are relevant:

| Ash Content | Mineral Material |
|---|---|
| 9.0% | Inherent in peat at lower 0.5 m. |
| 11.3% | Includes the above, plus visible mineral material due to ditchings, millings, etc. |
| 11.8% | Includes the above, plus pebbles < 25.4mm. |
| 13.7% | Includes the above, plus stones > 25.4mm. i.e. includes all mineral material. |

## CONCLUSIONS

1. The total ash content was lowest at the base of the stockpile and was highest at the middle or top of the 'pile.
   The increase in ash in the later harvests is due to the increased quantities of sub-soil mineral material from ditching and milling operations which were harvested onto the stockpile.

2. A breakdown of the ash constituents, such as, inherent ash in the peat, visible mineral contamination and pebbles/stones contents are given together with the contribution each of these makes to the total ash content of milled peat.

| Ash Content | Origin of Ash |
|---|---|
| 9.0% | Inherent in peat 0.5m above sub-soil. |
| + 2.3% | Sub-soil contamination in the form of breakable mineral material e.g. calcarious muds. |
| 11.3% | |
| + 0.5% | Further sub-soil contamination due to pebbles < 25.4 mm. |
| 11.8% | |
| + 1.9% | Additional sub-soil contamination due to pebbles > 25.4 mm. |
| 13.7% | |

It will be seen from the above that 9.0% ash is the average ash content of peat from the lower 0.5 m stratum without any sub-soil contamination.

A further 2.3% is due to sub-soil contamination due to breakable mineral material which can be in the form of aggregates, grit or fines.

An additional 2.4% ash is due to pebbles and stones.

Hence, uncontaminated lower bog stratum peat will have an ash content as high as 9.0% and sub-soil contamination due to breakable mineral material such as calcareous mud contributes as much to the total ash content (+ 2.3%) as do pebbles and stones (2.4%).

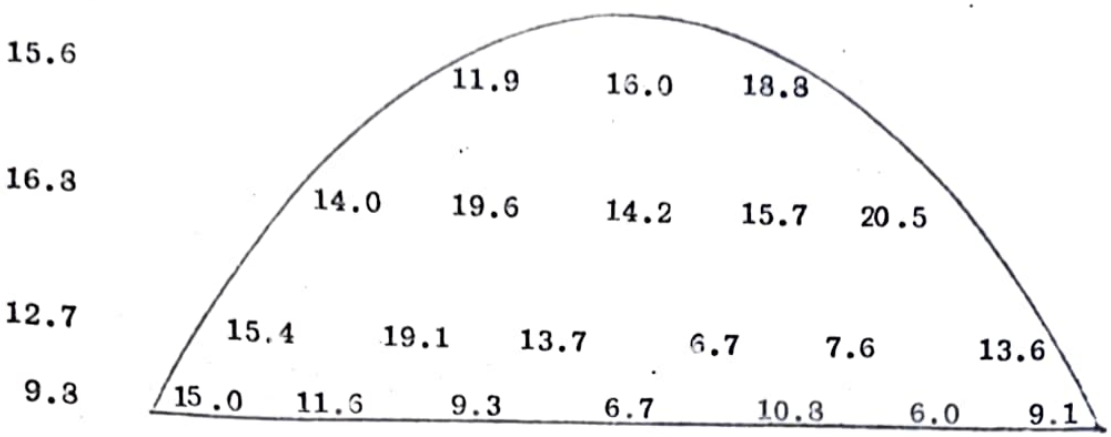
TABLE 1

IN

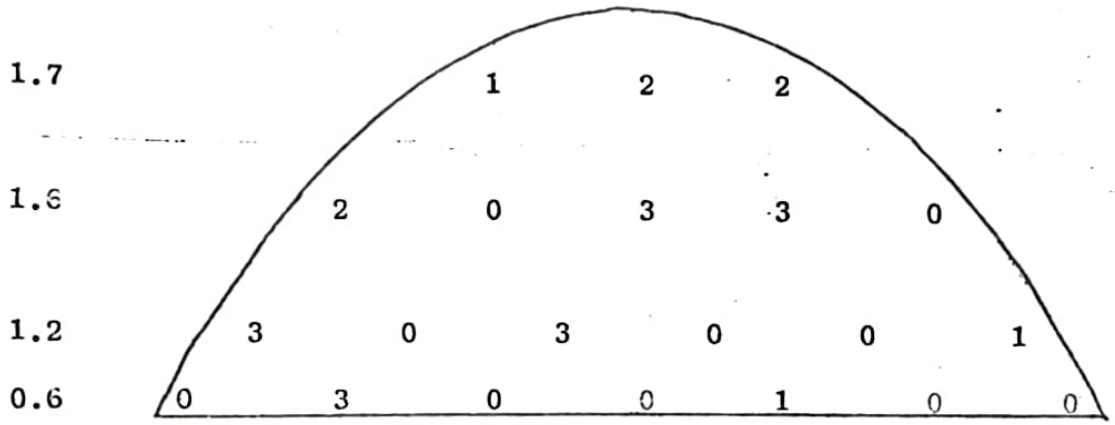
Average

Per Level

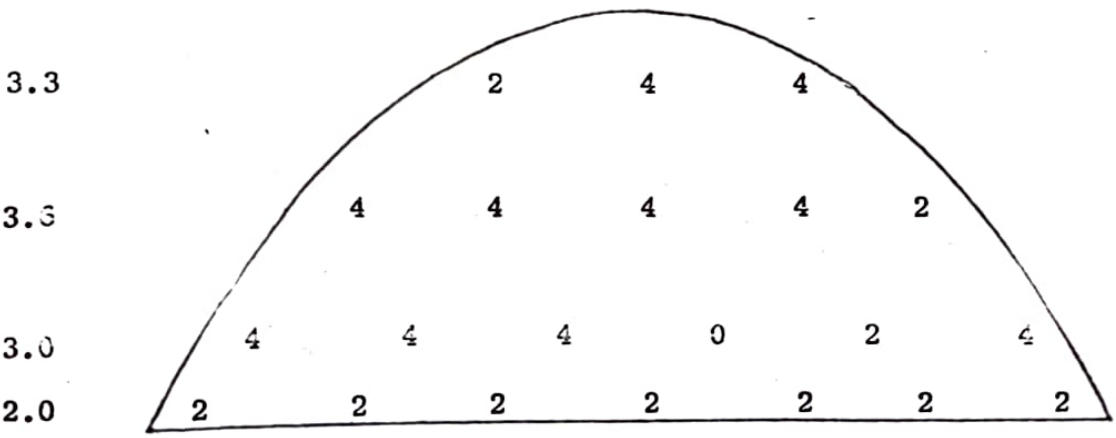
ASH (Exclusive of Pebbles)




PEBBLES (Number per Litre Peat)




MINERAL (Visible)




Legend for Visible Mineral Material/litre.

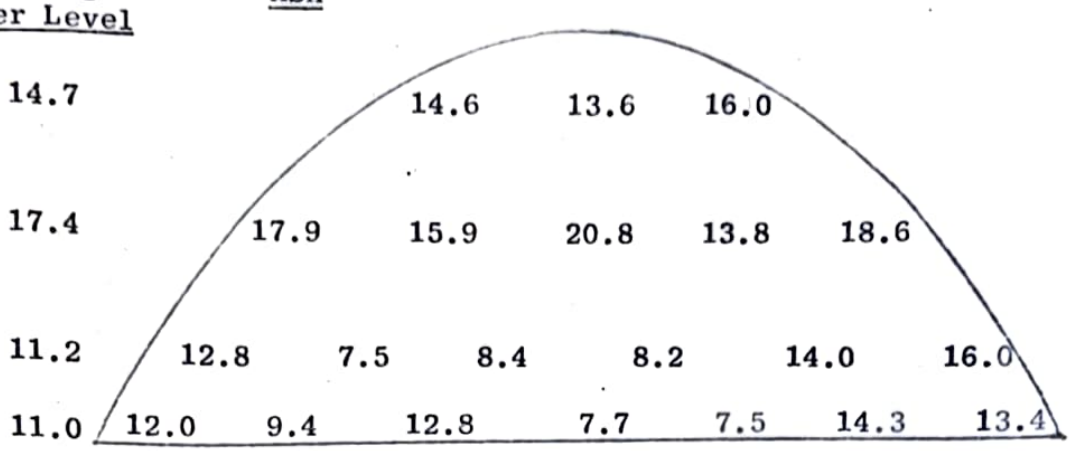
0 = zero in sample of 1 litre. I = small; 2 = medium; 4 = large

TABLE 2

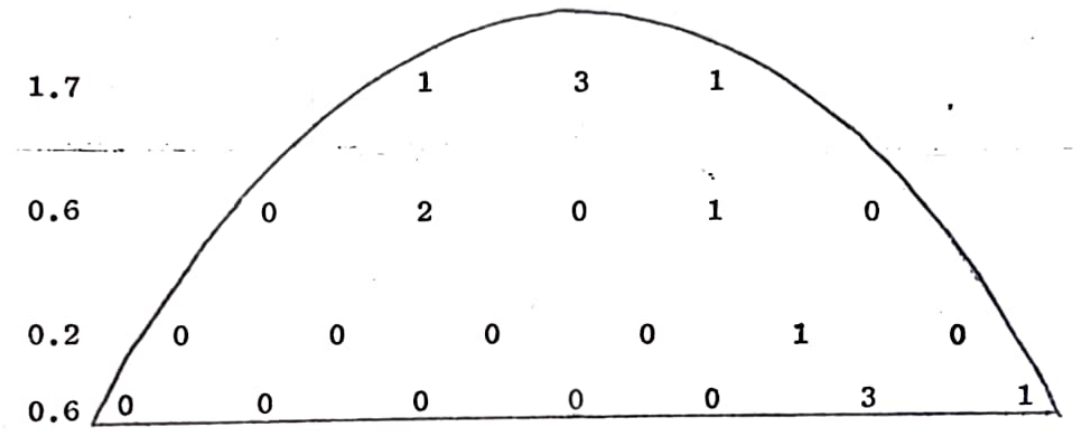
IS

Average Per Level

ASH




PEBBLES




MINERAL

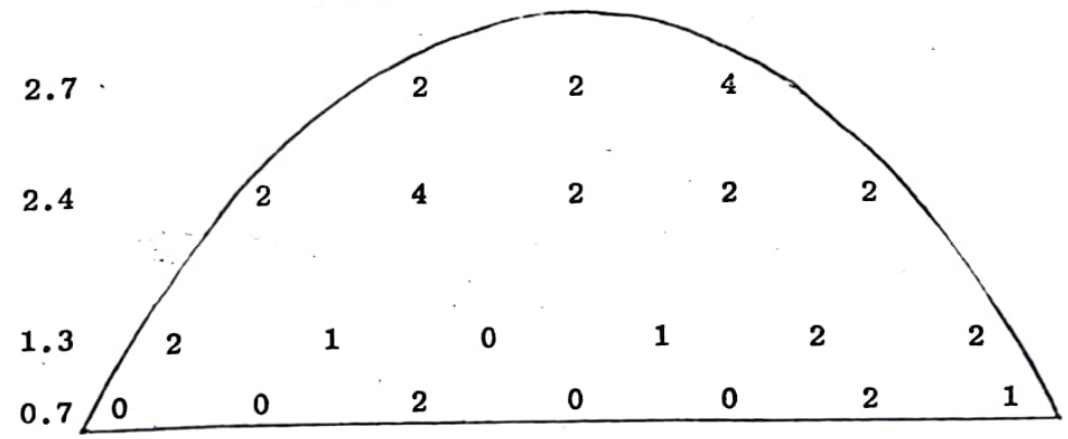


TABLE 3

2N

Average Per Level

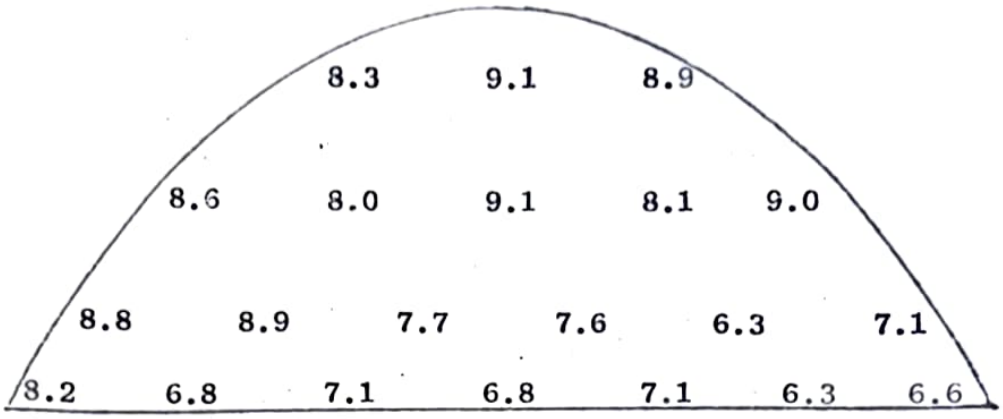
## ASH

8.8

8.6

7.7

7.0



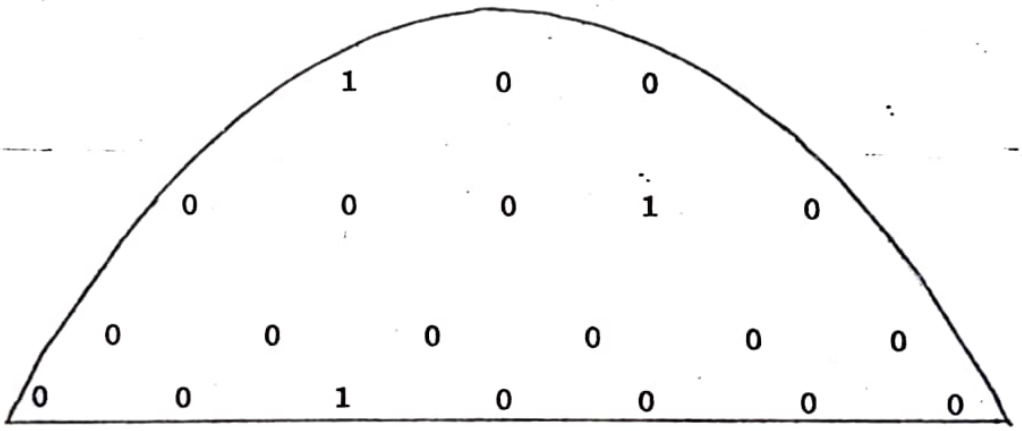

## PEBBLES

0.3

0.2

0

0.1




## MINERAL

1.3

2.4

1.5

0.3

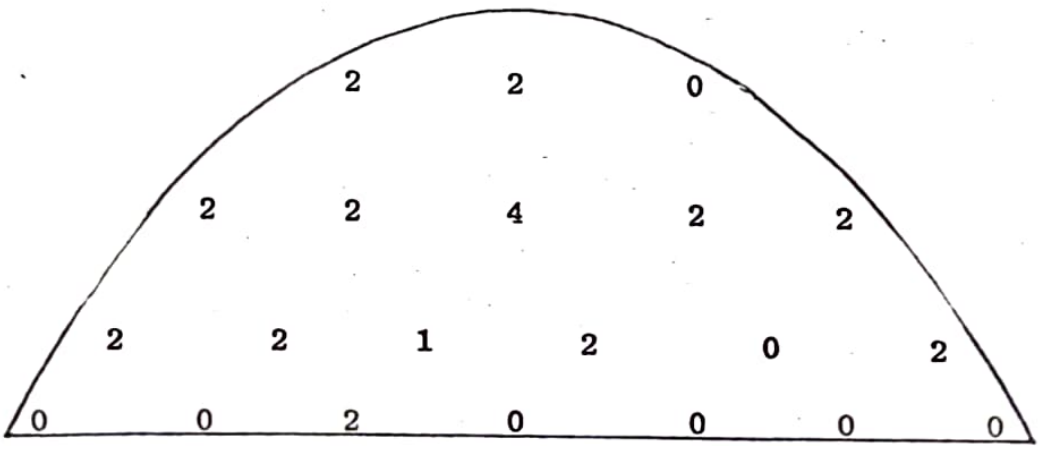
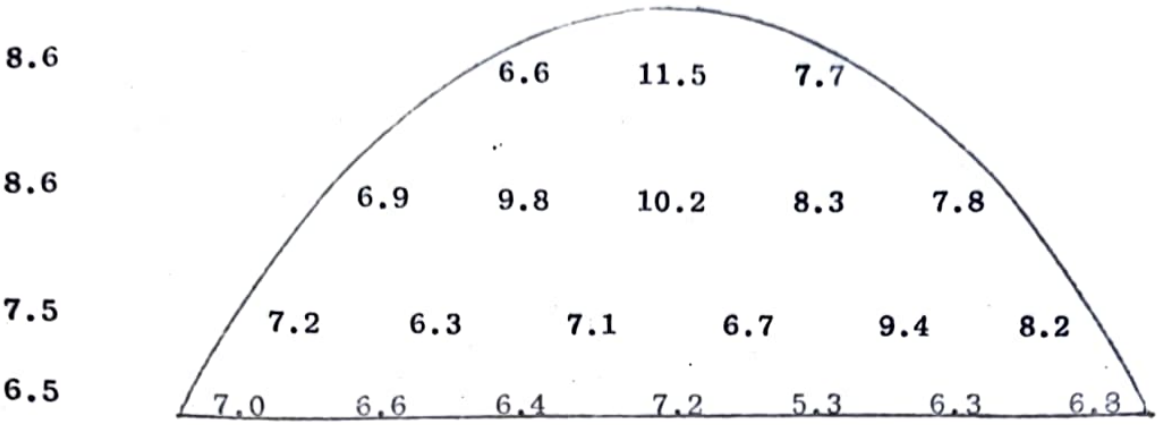


TABLE 4

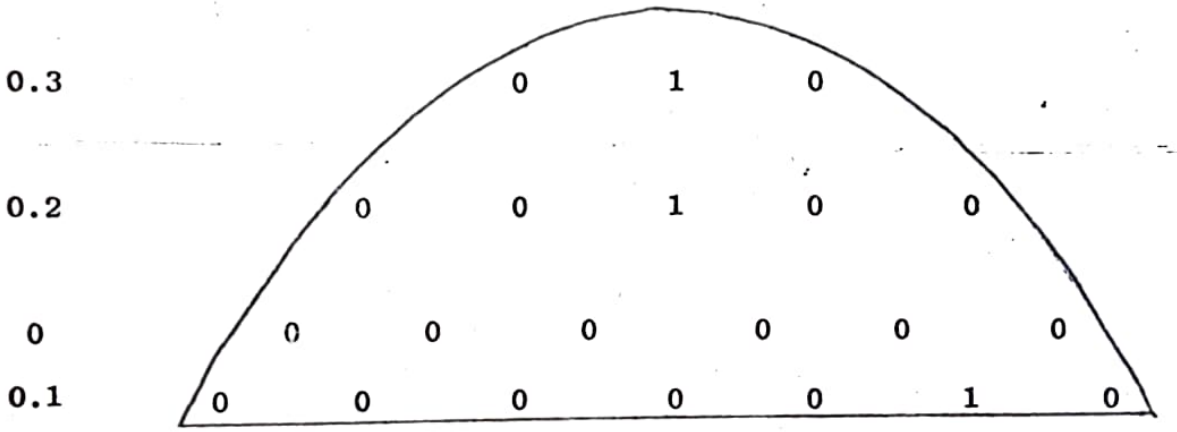
2S

Average Per Level

ASH




PEBBLES




MINERAL (Visible)

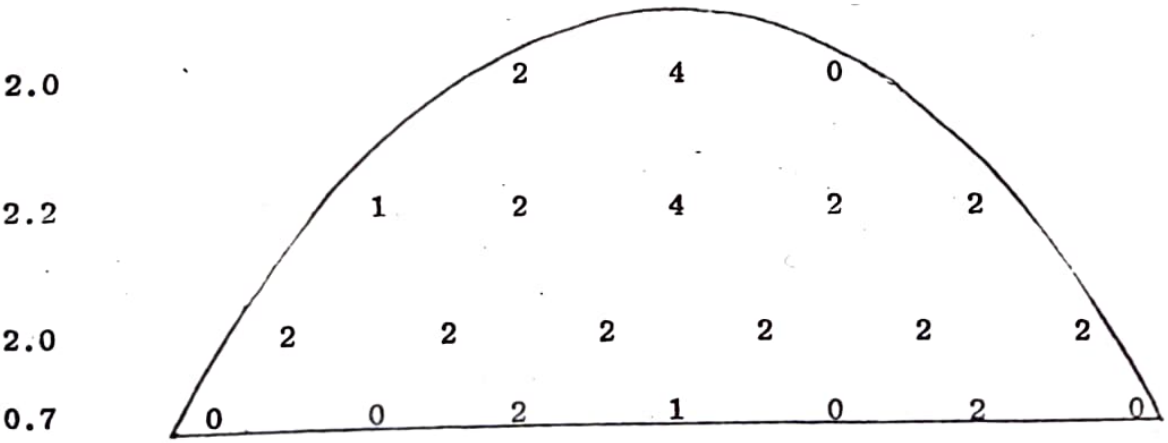


TABLE 5

3N

Average Per Level

ASH

| | | | | | | |
|---|---|---|---|---|---|---|
| 16.2 | | | 24.1 | 11.5 | 13.0 | |
| 14.3 | | 15.7 | 13.0 | 11.8 | 11.9 | 21.6 |
| 9.4 | 9.3 | 13.1 | 7.8 | 7.5 | 7.7 | 10.9 |
| 9.7 | 21.4 | 8.4 | 7.7 | 8.2 | 6.9 | 5.7 | 9.7 |

PEBBLES

| | | | | | | |
|---|---|---|---|---|---|---|
| 0.7 | | | 2 | 0 | 0 | |
| 0.8 | | 0 | 1 | 2 | 1 | 0 |
| 0.7 | 0 | 3 | 0 | 1 | 0 | 0 |
| 0.4 | 1 | 1 | 0 | 0 | 0 | 0 | 1 |

MINERAL

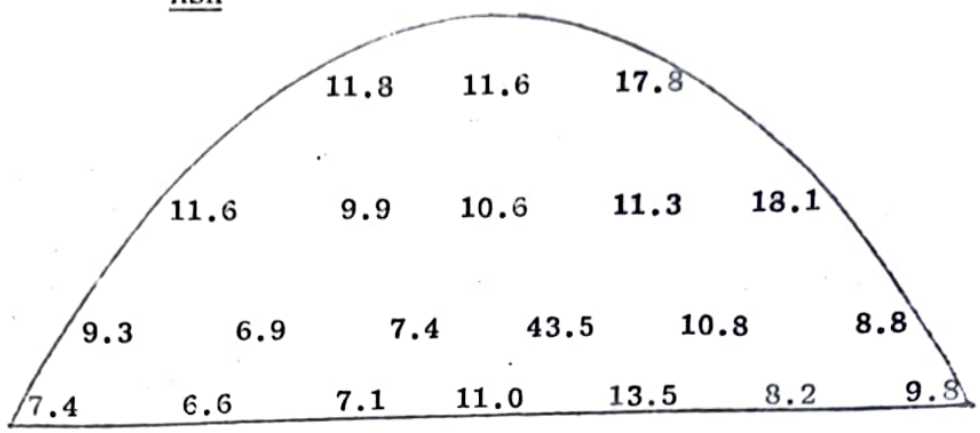
| | | | | | | |
|---|---|---|---|---|---|---|
| 2.0 | | | 4 | 2 | 0 | |
| 2.3 | | 4 | 2 | 2 | 4 | 2 |
| 2.3 | 2 | 4 | 2 | 2 | 2 | 2 |
| 1.7 | 2 | 2 | 1 | 2 | 2 | 1 | 2 |

**TABLE 6**

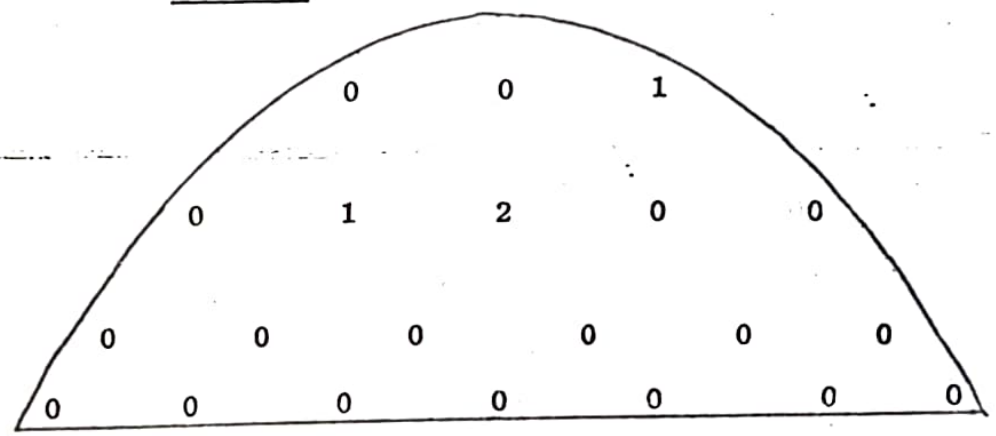
**3S**

**Average Per Level**

ASH




PEBBLES




MINERAL (Visible)

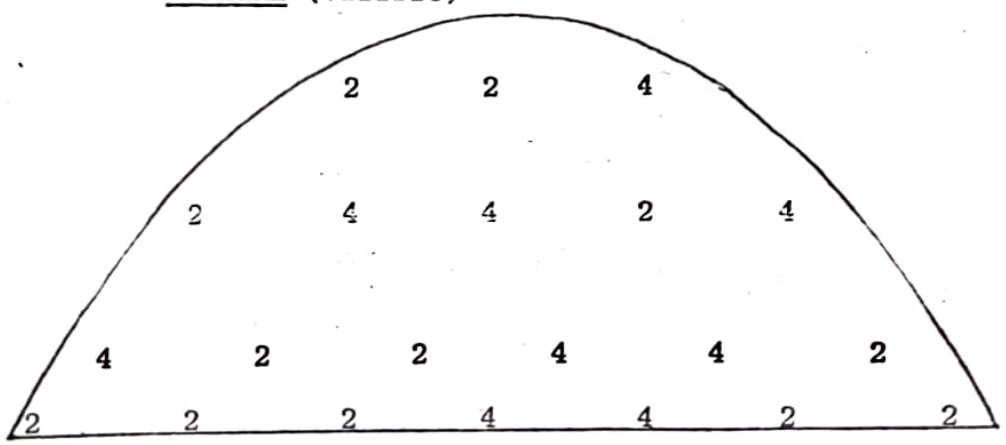


TABLE 7

## SUMMARY OF RESULTS

### AVERAGES AT PILE LEVELS

ASH

| PILE LEVEL | PROFILE | | | | | |
|---|---|---|---|---|---|---|
| | IN | IS | 2N | 2S | 3N | 3S |
| TOP | 15.6 | 14.7 | 8.8 | 8.6 | 16.2 | 13.7 |
| MIDDLE | 16.8 | 17.4 | 8.6 | 8.6 | 14.8 | 12.3 |
| UPPER BASE | 12.7 | 11.2 | 7.7 | 7.5 | 9.4 | 14.5 |
| BASE | 9.8 | 11.0 | 7.0 | 6.5 | 9.7 | 9.1 |

PEBBLES

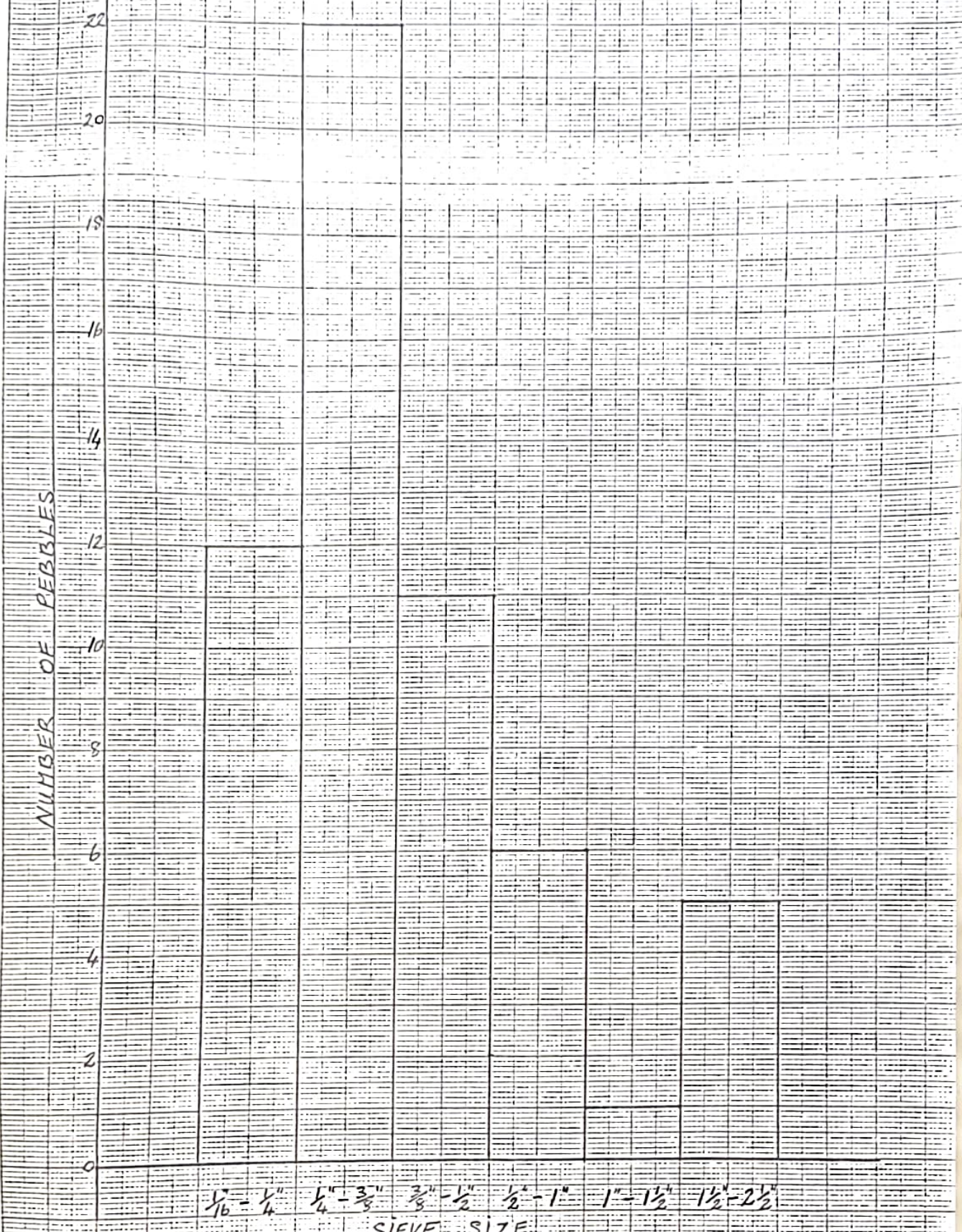
| | IN | IS | 2N | 2S | 3N | 3S |
|---|---|---|---|---|---|---|
| TOP | 1.7 | 1.7 | 0.3 | 0.3 | 0.7 | 0.3 |
| MIDDLE | 1.6 | 0.6 | 0.2 | 0.2 | 0.8 | 0.6 |
| UPPER BASE | 1.2 | 0.2 | 0 | 0 | 0.7 | 0 |
| BASE | 0.6 | 0.6 | 0.1 | 0.1 | 0.4 | 0 |

VISIBLE MINERAL

| | IN | IS | 2N | 2S | 3N | 3S |
|---|---|---|---|---|---|---|
| TOP | 3.3 | 2.7 | 1.3 | 2.0 | 2.0 | 2.7 |
| MIDDLE | 3.6 | 2.4 | 2.4 | 2.2 | 2.8 | 3.2 |
| UPPER BASE | 3.0 | 1.3 | 1.5 | 2.0 | 2.3 | 3.0 |
| BASE | 2.0 | 0.7 | 0.3 | 0.7 | 1.7 | 2.6 |

TABLE 8

## DISTRIBUTION OF PEBBLE SIZES




| SIEVE SIZE | >1/16 <1/4 | >1/4" <3/8" | >3/8" <1/2" | >1/2" <1" | >1" <1 1/2" | >1 1/2" <2 1/2" |
|---|---|---|---|---|---|---|
| NO. OF PEBBLES | 12 | 22 | 11 | 6 | 1 | 5. |

# MILLED PEAT ANALYSIS.

TABLE 9

FROM: Scientific Officer,
Droichead Nua,
Co.Kildare.

TO: Manager,
Clonsast,
Portarlington,
Co. Laois.

NO. OF SAMPLES: 22

NAME OF BOG:

DATE RECEIVED: 3.3.82.

AREA NO: T.R. 10. S.W.

| Railway No. | Sample No. | M.C. % | A.C. % | B.D. g/l | P.D. g/l |
|---|---|---|---|---|---|
| 2550$^{S}$ | | 47.0 | 12.9 | 333 | 286 |
| 2575$^{S}$ | | 60.5 | 13.7 | 384 | 294 |
| 2600$^{S}$ | | 51.8 | 14.2 | 371 | 306 |
| 2625$^{S}$ | 2 Profiles Sampled | 55.4 | 17.9 | 357 | 283 |
| 2650$^{S}$ | | 56.4 | 18.8 | 389 | 309 |
| 2675$^{S}$ | | 48.1 | 15.4 | 349 | 297 |
| 2700$^{S}$ | | 35.3 | 12.3 | 318 | 307 |
| 2725$^{S}$ | | 51.3 | 15.3 | 348 | 287 |
| 2750$^{S}$ | | 56.0 | 14.0 | 393 | 314 |
| 2775$^{S}$ | | 59.2 | 9.2 | 357 | 272 |
| 2800$^{S}$ | 2 Profiles Sampled | 59.5 | 9.8 | 352 | 267 |
| 2825$^{S}$ | | 60.3 | 9.2 | 330 | 245 |
| 2850$^{S}$ | | 56.0 | 10.2 | 309 | 240 |
| 2875$^{S}$ | | 57.5 | 8.7 | 344 | 266 |
| 2900$^{S}$ | | 49.1 | 14.1 | 346 | 292 |
| 2925$^{S}$ | | 57.7 | 17.1 | 356 | 276 |
| 2950$^{S}$ | | 43.2 | 13.1 | 311 | 279 |
| 2975$^{S}$ | | 57.7 | 11.9 | 357 | 277 |
| 3000$^{S}$ | | 49.9 | 16.3 | 358 | 300 |
| 3025$^{S}$ | 2 Profiles Sampled | 43.3 | 15.6 | 342 | 291 |
| 2050$^{S}$ | | 46.1 | 23.8 | 365 | 317 |
| 3075$^{S}$ | | 56.6 | 15.2 | 382 | 302 |
| | | | | | |
| MEAN | | 52.9 | 14.0 | 352 | 287 |

TABLE 10

## GENERAL RESULTS

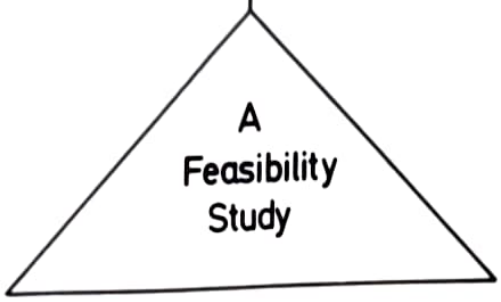
| | | |
|---|---|---|
| Average ash content (excluding pebbles) | = | 11.3% |
| Average M.C. | = | 45.8% |
| Average bulk density (g/l) | = | 372.7 |
| Average anhydrous solids (g/l) | = | 202.0 |
| Total weight pebbles & stones | = | 605.6g |
| Average wt. pebbles per litre | = | 4.8g |
| Ash due to pebbles | = | 2.4% |
| Wt. pebbles per $m^3$ | = | 4.8kg |
| Number pebbles per $m^3$ | = | 452 |
| Ash due to pebbles 0.9cm diameter excluding stones $>$ 25.4mm | = | 0.5% |
| Wt. stones $>$ 25.4mm | = | 479.3g |
| Wt. pebbles $<$ 25.4mm | = | 126.3g |
| Average wt. pebbles per litre | = | $\frac{126.3}{126}$ = 1.0g |
| Ash due to pebbles $\frac{1.0 \times 100}{202}$ | = | 0.5% |
| Hence ash excluding pebbles | = | 11.3% |
| Ash plus 0.9cm pebbles | = | 11.8% |
| Total ash including all pebbles and stones | = | 13.7% |

# APPENDIX 4-18

***Regional Administration in Relation to Milled Peat Operation – Internal Bord na Móna Report 1988***

BORDNAMÓNA

# REGIONAL ADMINISTRATION IN RELATION TO MILLED PEAT OPERATIONS




**Circulation**

Mr. P. Hughes

B. Ruttledge

_____

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Prepared For

Task Force

Date

17th June 1988

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## INTRODUCTION

This report was commissioned by the Task Force under the Chairmanship of Mr. Paddy Hughes.

The Terms of Reference were to conduct a Feasibility Study to ascertain the economies or other advantages which would accrue if the Administrative support function for Milled Peat was organised on a regional rather than a Works basis. The main framework of the report on Moss Peat Operations, was to form the basis for this study, with some further examination of the management structure to supervisor level. We have repeated for the convenience of readers, our findings in the moss peat study, where appropriate to this milled peat report.

The group members were -

Brendan Ruttledge (Chairman)
Brian Callagy
Brendan McEvoy
Oliver Molloy
John Cunningham (Secretary)

## SUMMARY

The feasibility study was to ascertain economies or other advantages which might accrue if the administrative support function for Milled Peat was organised on a regional rather than a works basis.

Computerisation and fast and reliable methods of communication both verbal and physical would play very significant roles in administration, and the careful co-ordination of our internal road transport system with Fastrack and Courier Services would be essential.

Our findings in the previous study of Moss Peat were applied and were applicable in the Milled Peat Works with the exception of sales. Sales clerical work in milled peat bogs is minimal.

Our main comments are as follows -

- It would be impractical to move any of the existing functions, with their deficiencies, to a regional structure.
- Existing functions need to be reviewed and modernised as a matter of course.
- The present philosophy of servicing local needs through a main frame computer system is inappropriate.
- Computerisation plays the single most significant role if improvements or regionalisation is to take place.
- Some elements would then be more readily regionalised and some would by their nature remain at works.
- The absence of any continuous systems review has led to ad-hoc developments.
- We need to define the information we require from our systems and examine the present sources of this information with a view to improving recording methods.
- Cost benefit analysis of the workshop work measurement system (M.C.C.) needs to be undertaken.
- Each works needs a single authorative figure.
- Decisions should be made as close as possible to the workplace where they arise.
- Regional payment of wages, revolves around fast transmission of the information from works to region.

We examined other works areas not directly addressed in our previous report. In general it would seem that job titles have emerged over the years and minor accumulations of duties have been allocated to these title holders, e.g. Bog Records - Works Assistant and Technical Assistant/Surveyor

Our conclusion is that it is possible to regionalise some elements of the administrative support functions for Milled Peat.

Local Works improvements would reduce staff numbers from 259 to 183 or 28%.

Regionalisation would reduce this to 155 which is a further saving of 12%.

The overall reduction is 39%.

## MAIN REPORT

The study commenced on 31st May 1988 and consisted of an examination of current computerisation developments of wages and costing systems, with Mr. Andy Boilson at Ballivor and discussions and analysis at Newbridge, of the five milled peat works at Boora, Derrygreenagh, Blackwater, Montdillon and Oweninny. Derryfadda was included with Blackwater.

Sales to the E.S.B. and Briquette Factories were included with the General Accounts function, where the clerical time involved is minimal.

All our other comments, in the Moss Peat report, remain valid and we again show under the various functions, the improvements that should be made in the existing works structure, and any further saving in personnel which would accrue from regionalisation, as compared with this improved works situation.

## GENERAL ACCOUNTS FUNCTION

1. Introduction

The General Accounts function is administered by six Works Accountants. A total of seventeen clerical staff are employed in the five milled peat works at a cost of £186,000.

2. The total numbers employed at these five works are as follows -

| Permanent | Seasonal | Total |
|---|---|---|
| 1742 | 948 | 2690 |

Staff numbers in this area were examined on the basis set out in the Moss Peat Report.

Local Works improvements as outlined (See Appendix A) would reduce total numbers of clerical staff by seven (i.e. from 17 to 10).

In a regionalised structure a further four clerical staff would be saved (Appendix A).

The current plans of Management Services on wages payments, envisages an optical mark reader at each Works. Input would be transmitted to the Regional Office for final processing and pay cheques would be returned to the Works.

Verification of data on the sheet would now be done at Works level by the Foremen. Exceptions report checking would take place in the Regional Office.

It would be the responsibility of the Regional Accountant to audit works time sheets on a basis which would ensure that each man's pay was monitored twice per annum.

# COSTING

1. Introduction

The costing function is administered by six Works Accountants,

Eight clerical staff are employed at a cost of £105,000.

2. Improvements in the works structure with computerisation would reduce this to five. This is a saving of three clerical staff.

If costing is regionalised we are of the opinion that a clerical staff of two would suffice. This assumes that the fully computerised micro system being developed in Ballivor at present is in place.

This would give a further saving of three clerical staff.

## Workshops - Administration

1. Introduction

The milled peat workshops are presently administered by (5) Superintendents (7) Workshop Foremen, (33) Assistant Foremen, (23) Chargehands, (5) Workshop Planners, (20) Work Measurement Analysts and (13) Assistants. The total cost of this administration is IR£1,429,000 per annum.

2. It is proposed that a new position of Workshop Manager, be created which would incorporate the function of both the existing Mechanical Superintendant and Workshop Foreman and encompassing the enhanced role as envisaged in the main report. A number of Foremen would report to the Workshop Manager as detailed in Appendix A.

3. It is our opinion that supervision should be undertaken by Foremen with a minimum of 10 to 12 skilled men per Foreman. This figure would be regarded as conservative and in the longer term a figure of 20 must be the objective, with further systems improvements.

4. The existing mix of both Assistant Foreman and Chargehands in the supervisory role, and ensuing overlap of duties is considered to be inefficient.

   Non-working Chargehands should not be utilised.

   Where direct Foreman supervision is not warranted it may be necessary to appoint working Chargehands e.g. Lemonaghan (5 skilled) and Monettia (4 skilled). For the purpose of this study Chargehands are included with the skilled workforce. See Appendix A.

5. Appropriate systems for work measurement, unit costing, preventative maintenance etc. should be handled by a Regional Engineering Department in conjunction with the Workshop Managers. For this purpose a position is to be maintained at each works, and one in the region.

6. No significant changes appear in the regionalised situation over the improved works position.

## STORES

1. Introduction

The Stores function is administered by six Works Accountants. Six Stores Supervisors, thirteen clerical staff, seven Storemen and twenty two Issuers are employed at a total cost of £500,000.

2. Improvements in the Works structure would reduce this to five Supervisors, ten Clerical staff, five Storemen and twenty Issuers. This would give a total saving of eight persons, i.e. one Stores Supervisor, three Clerical staff, two Storemen and two Issuers (See Appendix A).

This is based on the volume of orders, receipts and issues as compared with volume studied in the Moss Peat Report.

3. In a regional structure this would be administered by one Regional Stores Manager.

We would visualise significant improvements, by this office, in the efficient co-ordination of internal and external transport of material and the proper deployment of stores stocks in the milled peat area.

Clerical staff from the Works would move to the regional office but would be reduced to six.

One clerk in the region would be fully employed on Purchasing and Progress Chasing.

However, some minor element of local purchasing for real emergencies would exist at each local Works. Subsequent clearance by Local Order and Petty Cash payment by the Regional Office would give adequate latitude for these situations.

Each Works Stores would have a Supervisor. Some of the existing duties and responsibilities (e.g. ordering, progress chasing, payment certification) have been removed to the Region. This indicates a grade of supervisor at a point between current Supervisor and Storeman grades.

The number of Stores personnel required at Works to receive, check, issue and complete computer inputting of issues would total 25.

This total of 37 would be a further reduction of three persons. See comparative chart (Appendix A).

# SECRETARIAL

1. Introduction

This function is administered by six Works Accountants. A total of nine secretarial staff are employed at a total cost of £87,000.

2. Works improvements would show five at the Works with some element of assistance from clerical staff. To achieve this reduction of four, all Works telephone exchange systems would need to be modernised.

3. Regionalisation would not change this local requirement of five, but would give rise to one extra Secretary, in the Regional Office.

# WORKS ASSISTANT/BOG RECORDS KEEPER

1. Introduction

This function is administered by six Production Assistants. Five Works Assistants and four Bog Records Keepers are employed at a cost of £113,000.

2. The following is a brief description of their main duties.

| Works Assistant | Bog Records Keeper |
|---|---|
| Sign on Seasonal Employees | Production and Sales Records, including Charting and Reports |
| Road Transport | Phone Communications |
| Supervise - Watchmen Groundsmen Canteen Operatives | Radio Communications |
| Liaise with H.O. and local bodies on visits etc. | Liaise between Bog employees and wages office |
| Supervise visitors | Absentee Records |
| Visit absent employees | Deputise for Works Assistant |

Evaluation of these duties would indicate that some could be transferred to other areas, e.g. road transport to stores.

An amalgamation of these roles, with help from the secretarial or clerical staff when necessary would reduce personnel in this area from nine to five or a saving of four people.

3. The "Fleet Management" system and computerisation will take some duties away from this area (e.g. Log Sheets, Road Transport Records, Charting Stock Records etc.)

This function will not change in a regional structure.

# TECHNICAL ASSISTANTS/SURVEYORS

1. Introduction

This function is administered by six Production Assistants. Six Technical Assistants and three Surveyors are employed at a cost of £113,000.

2 Their main duties are -

a. Liaise with Land Purchase Section.

b. Handle complaints from farmers and other landowners.

c. Organise silt control.

d. General survey duties

Other duties may include

A. Control Turf Bank Licences

B. Control Civil Works Maintenance

C. Control Plant operating on Silt Control

There seems no obvious reason why the work content cannot be handled by one person at each Works - a reduction of four.

3. A regional team of four Surveyors with no works presence would lead to a further saving.

# MATERIAL DESPATCH CONTROLLER

1. Introduction

This function is administered by six Production Assistants. One Material Despatch Controller is employed at each of the four works, Boora, Blackwater, Derrygreenagh and Mountdillon at a cost of £60,000.

2. This Quality Control function must be located at each Works and no change can be envisaged.

# SUPERVISORS

1. Introduction

This function is carried out by 166 Supervisors (see chart below) at a total cost of £2,000,000 approx.

| Works | Supervisors | Employees | Average |
|---|---|---|---|
| Boora | 38 | 206 | 5.4 |
| Blackwater | 41 | 199 | 4.8 |
| Derrygreenagh | 34 | 172 | 7.2 |
| Mountdillon | 29 | 184 | 6.3 |
| Oweninny | 24 | 122 | 5.1 |
| Totals | 166 | 883 | 5.3 |

The average no of employees per Supervisor is five and the average at peak employment of seasonals is eleven.

2. This appears a very low figure but certainly indicates a seasonal element in supervision.

## AREA FOREMAN

1. Introduction

There are twenty five Area Foremen as follows -

| | | | |
|---|---|---|---|
| Boora | .... | .... | 6 |
| Blackwater | .... | .... | 5 |
| Derrygreenagh | .... | .... | 5 |
| Mountdillon | .... | .... | 5 |
| Oweninny | .... | .... | 4 |

2. This is unlikely to change

# BOG FOREMEN

1. Introduction

There are currently five Bog Foremen at four milled peat works at a total cost of £86,000 approx. Oweninny does not have a Bog Foreman.

2. The function or role of this particular post is duplicated by the Production Assistant and should not exist.

3. The reduction of these locally to nil, would lead to direct reporting by each Area Foreman to the Production Assistant.

This would shorten the reporting line and give a saving of five persons.

## PRODUCTION ASSISTANTS

1. Introduction

There are currently six Production Assistants at five Milled Peat Works.

2. Derryfadda area should be included with Blackwater and administered by the Production Assistant Blackwater, with one Area Foreman in Derryfadda.

3. We have made some general observations about this role which are summarised on page 21.

## ACCOUNTANTS

1. Introduction

There are currently six Works Accountants at the five Milled Peat Works at a cost of £113,000.

2. Derryfadda area should be included into Blackwater - a reduction to five.

3. In a regional structure this function would be administered by one Accountant in the region or a saving of four persons.

4. There was no committee agreement on a job specification for the Regional Accountant other than a belief that his role would have a significant change in emphasis.

## MANAGERS

1. Introduction

There are currently five Works Managers at the five milled peat at a cost of £140,000.

2. It is considered that the size of each Works leads to the necessity of an overall authority at local level.

3. We have made some general observations about this role which are summarised on Page 21.

## CONCLUSIONS

- Rationalising the current works structures would lead to staff reductions -

| | | |
|---|---|---|
| Total Current Works Structure | .... | 257 |
| Total Improved Works Structure | .... | 183 |
| Total Regionalised Structure | .... | 155 |

- Wages payment can be regionalised with a saving of four persons.

- Workshop Administration cannot be regionalised.

- Stores could operate at regional level with some reporting difficulties. The staff saving would be three persons.

- Costing can operate at regional level but would have implications for local Management Services. There would be a saving of three persons.

- Regionalising the Accounts function would require one Regional Accountant with a saving of four persons.

- Regionalising the Work Measurement System would reduce manpower in this area by fourteen persons.

- The role of Surveyors at each works is not justified, with the decline in the Third Programme. A regional mobile team of Surveyors should be adequate to meet works requirements.

## RECOMMENDATIONS

- Undertake rationalisation and improvements at works level.

- Systems reviews should be undertaken on a regular basis.

- A network of computers at Works level to cope with local requirements, with the compatability to integrate at works, region and main frame as required.

  There must be adequate back-up to sustain the system. Separate software development must be in parallel with the network development.

- The wages payment system must be fully computerised with automatic print-out of all routine statutory and other deductions and automation of bonus payments.

  The system and necessity of putting pay-cheques in envelopes should be re-examined.

- A separate study of purchasing is required to examine Head Office and local orders, and address the high level of local purchasing with a view to rationalisation.

- The methods used to transport information and materials inter-works needs to be examined for proper co-ordination and cost reduction.

- Automate fuel issuing system.

- The Workshop Mnager as proposed must have the ability to implement a more cost effective service.

- The back-up services to implement this programme must be provided i.e. computer facility and re-training of supervisory staff.

## GENERAL OBSERVATIONS

- In a Milled Peat Regional Structure, the role of the Works Manager will change.

  The elements of this function which were in the main of a corporate rather than an operational nature, would be handled at a higher level if a region was in place.

  It is the Committees considered view, that the person in charge of the production operation, should have line authority at works level to ensure that all works operations are efficiently co-ordinated.

- Payment of employees each fortnight in an alternating week plan, would reduce clerical work-time by 50%.

- Inter-regional sharing of specialist services would be possible e.g. Management/Financial Accounting.

- Size and geographical locations play an important role in regionalisation.

- The implications of placing stores under workshop supervision should be examined.

- It is necessary to review the present demarcation on electrical work on machines on the bog, as the main electrical components are now exchange units and no element of safety is in question. A fuller examination may show that Electricians are required at the re-wiring stage only. Considerable benefits wold accrue in the regional situation if such a policy was adopted.

Appendix A

## COMBINED MILLED PEAT WORKS ADMINISTRATION

| | Current Works | Improved Works | Regional Structure |
|---|---|---|---|
| Manager | 1 | 1 | 1 |
| Accountant | 4 | 1 | 1 |
| Production Asst | 4 | 1 | 1 |
| Dog Foreman | 1 | [illegible] | [illegible] |
| Assistant | | | |
| Dog Foreman | [illegible] | [illegible] | [illegible] |
| Material | | | |
| Deep Clerk | 4 | 1 | 1 |
| Costing | 8 | 1 | 1 |
| Wages | [illegible] | [illegible] | 4 |
| Secretary | 8 | 1 | 8 |
| Works Asst / | | | |
| Dog Records | 8 | 1 | 1 |
| Tech Asst / | | | |
| Surveyor | 8 | 1 | 8 |
| **STORES** | | | |
| Stores Controller | | | 1 |
| Supervisor | 4 | 1 | 1 |
| Clerical | [illegible] | [illegible] | 4 |
| Storeman | 1 | | |
| Issuer | [illegible] | [illegible] | [illegible] |
| **WORKSHOP** | | | |
| Workshop Manager | | 1 | 1 |
| Mech Supt | 1 | | |
| Workshop Foreman | 1 | [illegible] | [illegible] |
| Asst Workshop Foreman | [illegible] | | |
| Farmer | | [illegible] | [illegible] |
| Workshop Chargehand | [illegible] | | |
| Workshop Planner | 1 | 1 | 1 |
| MCI Analysis | [illegible] | [illegible] | 4 |
| MCI Assistant | [illegible] | 1 | 1 |
| OVERALL TOTAL | [illegible] | [illegible] | [illegible] |

| | Boora | | Derrygreenagh | | Blackwater | | Mountdillon | | Oweninny | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Current | Improved | Current | Improved | Current | Improved | Current | Improved | Current | Improved |
| Manager | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Accountant | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 |
| Production Asst. | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 |
| Bog Foreman | 1 | nil | 1 | nil | 1 | nil | 1 | nil | 1 | nil |
| Asst. Bog Foreman | 6 | 6 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 4 |
| Material Despatch Clerk | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | - | - |
| Costing | 2 | 1 | 2 | 1 | 2 | 1 | 1 | 1 | 1 | 1 |
| Wages | 3 | 2 | 4 | 2 | 4 | 2 | 3 | 2 | 3 | 2 |
| Secretary | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 1 | 1 |
| Works Asst./ Bog Records | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 1 | 1 |
| Tech. Asst./ Surveyor | 2 | 1 | 1 | 1 | 3 | 1 | 2 | 1 | 1 | 1 |
| **Stores** | | | | | | | | | | |
| Supervisor | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 |
| Clerical | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 2 | 2 | 2 |
| Storeman | 1 | 1 | 1 | 1 | 2 | 1 | 2 | 1 | 1 | 1 |
| Issuer | 4 | 4 | 5 | 4 | 5 | 4 | 4 | 4 | 4 | 4 |
| **Workshops** | | | | | | | | | | |
| Mech. Supt. | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Workshop F'man | 1 | nil | 1 | nil | 3 | nil | 1 | nil | 1 | nil |
| Asst. W'shop F'man | | | | | | | | | | |
| Foreman | nil | 7 | nil | 8 | nil | 8 | nil | 7 | nil | 4 |
| Chargehand | 2 | nil | 6 | nil | 5 | nil | 8 | nil | 2 | nil |
| Workshop Planner | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| MCC Analysts | 4 | 4 | 4 | 4 | 5 | 5 | 4 | 4 | 3 | 3 |
| MCC Assistant | 2 | 1 | 2 | 1 | 4 | 1 | 3 | 1 | 2 | 1 |
| OVERALL TOTAL | 53 | 38 | 53 | 38 | 63 | 39 | 51 | 37 | 37 | 31 |
| | | -15 | | -15 | | -24 | | -14 | | -6 |

# APPENDIX 4-19

***Industrial Cutaway Bog Land-Use Studies (Clonsast) – Internal Bord na Móna Report 1978***

# INDUSTRIAL CUTAWAY BOG LAND-USE STUDIES

(A Bord na Mona Series)

## Cutaway Study No. 1, 1978

## CLONSAST

# SUMMARY

## CLONSAST CUTAWAY STUDY - 1978

### Objective

This study is a first exercise in the planning of the long term use of the cutaway bog following fuel peat production by Bord na Mona.

### Abstract

All the known data on 2,325 hectares of Bord na Mona cutaway bog at Clonsast, Co. Offaly are co-ordinated. The fuel production life of the area with the resulting emergence pattern of the cutaway bog is calculated.

Research work conducted on the potential of this land is summarised as is the development work done by Bord na Mona to date. Using these facts various land use options are suggested and the financial and social implications examined.

From these conclusions a policy for development in the immediate future by Bord na Mona is recommended.

### Background

Total peat area of the country is estimated at 1.29 million hectares. Bord na Mona is producing peat from 68,826 ha. The area under study is thus 3% of the total Bord na Mona area and 0.05% of the total peat area of the country.

### Definition of Area

According to the 1936 survey the average depth of peat in the undrained Clonsast bog was 8 metres. Production of sod peat commenced in 1936 and is now beginning to decline.

Survey of the sod peat cutaway in 1977 showed that there is an average of 1.4 metres of peat remaining, varying from 0.5m to 4m consisting of a layer of top strippings over forest, fen or reed swamp peat. Survey of the subsoil highlighted three main types, glacial drift at the higher contour levels, glacial sand at a lower level and shell marl in the depressions.

It is now planned to harvest milled peat from the deeper areas of the sod peat cutaway. This will prolong the fuel life of the bog by 12 years and yield an extra 3.6 million tonnes of peat. The average depth of peat remaining will be 0.5 metres ranging from 0 - 2 metres. We estimate that 10% of the area will have 2 metres of peat after milling in areas ranging from 20 to 80 ha. It is calculated that 76 m.m. of this peat (mainly fen) will yield an annual output of 187 tonnes per ha. The area of milled peat cutaway available for development can be calculated as follows:

| | | |
|---|---|---|
| 1978 | 109 | hectares (already developed) |
| 1985 | 334 | " |
| 1990 | 578 | " |
| 1995 | 978 | " |
| 2000 | 1333 | " |

## Research

Research on the potential of milled peat cutaway bog has been going on for 20 years and concludes that grass is the best crop. It also recommends that for vegetables deeper peat is required due to the annual wastage. It has also been shown that forestry will do well on cutaway bog with minimum peat.

## Development

In the study area Bord na Mona has developed 109 ha. of grassland which is used for the production of beef both from summer grazing and winter feeding of silage.

Cutaway areas other than Clonsast developed are 80 ha. at Derrygreenagh used for a beef breeding herd, 130 ha. at Oweninny, Co. Mayo (blanket bog) for sheep production, 15 ha. at Lullymore for beef production, 52 ha. at Boora for cereal production. Problems encountered to date are:

(a) timber (old forest trees and stumps) emerging through the grassland, (mainly in the deeper peat areas).

(b) uneven subsidence and shrinkage.

(c) cracking on drying out.

(d) poor trafficability and poaching in deeper peat areas.

These problems will be overcome by:

(a) Milling the deeper areas and extracting the timber.

(b) Using cereals as a first crop (3/4 years) so that all settling will be complete before grassing.

(c) watertable control to prevent drying out.

(d) Deep ploughing and subsoil mixing to give better water movement.

All these solutions are being tested.

Nutritional problems are confined to copper deficiency in the herbage mainly affecting breeding animals. Preventative measures by feeding supplementary copper are in operation. Vegetables growing on deep (2 metre) fen peat is in progress since 1970 with disappointing yields and quality. This will continue and every

effort made to overcome the production problems. Recent measurements indicate that there is a loss of 58 m.m. of peat annually with vegetable growing which must be compared with a loss of 76 m.m. per year in milled peat production.

Recent surveys have also shown that there is at present approximately 12,000 ha. in the Bord na Mona production area with peat depths of 2 metre or more (classified as the most suitable for vegetable production). This area will increase over the next 15 years. If the vegetable production problems are overcome and if market conditions change a large area can be taken out of fuel production and used for this purpose.

## Land Use Planning

Considering the physical data of the 2,325 ha. of cutaway bog (milled peat cutaway with 0.5 m. of peat remaining) and the research findings and the experience gained by Bord na Mona to-date, the following are the options for the use of this land.

### Option 1

| | | |
|---|---|---|
| Grassland | - 91% | 2116 ha. |
| Road structure | - 4% | 93 ha. |
| Shelter and amenity planting | - 5% | 116 ha. |

The grassland could be used for beef production by Bord na Mona as at present. If suitable, it could also be subdivided for private farming by sale or leasing in the long term.

### Option 2

Grassland, commercial forestry and amenity use.

| | | |
|---|---|---|
| Grassland | - 60% | 1395 ha. |
| Commercial forestry and lakes | - 36% | 837 ha. |
| Roads | - 4% | 93 ha. |

The better areas of peat and subsoil would be sown to grass and the deeper and more difficult peat sections sown with forestry. Some of the major depressions could be flooded for lake areas.

### Option 3

Grassland, arable and vegetable production, shelter and amenity use.

| | | |
|---|---|---|
| Grassland | - 61% | 1418 ha. |
| Arable Cropping - 10% of total area plus the North Bog | - 20% | 465 ha. |
| Roads | - 4% | 93 ha. |
| Lakes, shelter and amenity planting | - 15% | 349 ha. |

This is a combination of all uses retaining the deeper peat areas for vegetable production.

Option 4

Commercial forestry only.

The main factor militating against this option is its low labour requirement and subsequent fall off in employment.

Option 5

Biomass production.

This option is the use of the area for short rotation forestry as a source of energy. This concept is being researched in 1978 in co-operation with An Foras Taluntais.

Peripheral Area

This area between the Bord na Mona bog and the main road boundaries is 1,854 hectares. It is divided up as follows:-

| | | |
|---|---|---|
| Mineral soil | - | 770 ha. |
| Developed cutaway bog | - | 500 " |
| Undeveloped | - | 236 " |
| High bog | - | 208 " |
| Forestry on peat | - | 140 " |

The peat areas are typically poorly drained and fragmented and should be developed in association with Bord na Mona cutaway in Clonsast.

Financial Implications

Cost of developing grassland is estimated at £887 per hectare.

Total capital costs up to the year 2000 for a system of cereals for four years, followed by grassland and beef production (employing one man per 40 hectares) would be:-

| | | |
|---|---|---|
| Development | £1.1 million | |
| Buildings, Machinery | 1.0 " | |
| Total: | £2.2 " | |
| Production cost | £4.8 million | (or £345/ha. per annum) |
| Livestock purchases | 2.3 " | |
| Total Sales | 8.4 " | |

This plan has an operating surplus each year but the difficulty would be to carry out the plan from our own resources or commercial borrowing due to high interest charges, mounting overdraft and the compounding of interest.

The Forestry option, while much less capital intensive, gives no return for 15 years and employs only 1 man per 400 hectares.

## Social Implications

The Economic & Social Research Institute was retained by Bord na Mona to conduct a survey of employees at Clonsast and E.S.B. employees at Portarlington Power Station to determine the following:

(a) the characteristics of the workers

(b) the implications for the workforce of the run-down of fuel peat production

(c) the implications for the total employment in the catchment area of a run-down of operations

(d) to obtain the opinions of all workers as to how the cutaway bog should be utilised.

A total of 292 out of 375 Bord na Mona employees and 59 out of 119 E.S.B. employees were interviewed.

The report concludes that

(a) the surrounding area is very dependent on Bord na Mona and the E.S.B. for employment and income. Wages and salaries in 1977 were £1.5 million

(b) fewer workers than in peat production will be employed in farming the cutaway regardless of how it is worked or owned

(c) alternative employment must be provided, particularly for the younger generation in the area, by Bord na Mona in association with the E.S.B. and the I.D.A.

Particularly surprising was the small number of employees (9%) who are part-time farmers.

## Conclusions

In the present situation production of energy from native resources is important and it is thus desirable to produce the maximum amount of fuel from our bogs. In the undrained state the bogs were of no use and fragmented. There is now an opportunity of producing good agricultural land from the cutaway bogs using optimum planning and management methods.

From research and development work to date, the options for its use are: grassland, vegetable production, forestry and amenity use.

Social and economic aspects need frequent review.

## Programme

All emerging cutaway bog (which will have an average of 0.5 metres of peat) will be developed for grassland after an initial period in cereal production. The methods of developing and

utilising this grassland will be perfected in association with all interested parties. Further research will be carried out by An Foras Taluntais with a proper inter-organisational structure. The long term use of this land cannot yet be determined. No specific areas of deep peat will be retained for vegetable production in the foreseeable future but growing trials will continue.

# INDUSTRIAL CUTAWAY BOG LAND-USE STUDIES

(A Bord na Mona Series)

## Cutaway Study No. 1, 1978

CLONSAST

## OBJECTIVE

This study is a first exercise in planning the long term use of the land left following fuel peat production by Bord na Mona.

## ABSTRACT

In this report all the known information such as peat types and depth, sub peat mineral soil types, drainage pattern etc. on 2,325 hectares of Bord na Mona cutaway bog at Clonsast Works, Cushina, Co. Offaly is presented. The studies made to determine the fuel production life of the area with the resulting cutaway emergence pattern are described.

A summary is made of Research and Development work to date in developing Bord na Mona cutaway bog for agricultural purposes.

Using all this data various land use options are put forward and suggestions made as to how this land might be used in the future.

The financial and social implications of the change from fuel production to other uses are examined.

From the conclusions a policy for Bord na Mona development of this land in the immediate future is recommended.

# INTRODUCTION

## Background

In a survey conducted between 1810-14 it is recorded that there was then over 1.29 million hectares of peat covered land in Ireland or 15% of total area.

This was sub-divided as follows:-

0.65 million ha. mountain bog (50%)
0.34 million ha. blanket bog (26%)
0.30 million ha. raised bog (24%)

Harvesting of peat by hand has been practised in Ireland for generations but it is difficult to measure what quantity has or is being produced. It can be clearly seen that in the intervening years large areas have been harvested and some of the cutaways developed for various agricultural purposes.

The first State involvement in peat production began in 1936 with the setting up of the Turf Development Board. This Board was replaced by Bord na Mona in 1946 to facilitate the more extensive development of the country's peat resources. During the intervening thirty years the Board has purchased 68,826 ha. of virgin bog which it has drained, developed and worked for peat production in units ranging from 8,100 - 240 hectares. Up to 1977 Bord na Mona has produced a total of 75 million tonnes of peat. Output in 1976 was 5 million tonnes plus over 1 million cubic metres of moss peat, realising a sales revenue of £27 million and employing 5,385 people. Some 56% of this fuel output went into the generation of 25% of the nation's electricity and the remainder to the domestic fuel market as sod peat or briquettes. This output of peat fuel represents a saving on imported energy in the form of oil of £50 million in 1976.

While this contribution by Bord na Mona to national progress is substantial there is another and even greater contribution to be made in the development of the cutaway bogs when fuel production ceases.

Some trial development work is in progress at a number of locations. The first large area of worked-out bog will be at the Clonsast Works near Portarlington.

## Clonsast Works

Clonsast bog is located five miles north of Portarlington and lies on 7° 9' West latitude and 53° 15' North longitude. Height above sea level varies between 64-76 metres. The average annual rainfall is 855 mm. and the average annual temperature is 48.4°F. The Clonsast group consists of Garryhinch, Derryounce, Derrylea, Clonsast main bog, North bog and the Bulge. The gross area involved is 4,343 hectares. This study is confined to the latter three bogs, namely, Clonsast main bog, North bog and the Bulge,

comprising an area of 2,325 hectares, which is approximately 3% of the total area that will become available from Bord na Mona operations over the next forty years and 0.05% of the total peatland area in the country.

Bog development commenced at Clonsast in 1936 with the acquisition by the Turf Development Board of about 1,619 hectares of virgin bog. Production was begun in 1939 with one cutting machine. Over the years the operation has been mechanised and employment which was running at 600 per annum in the 1950s is now down to 330.

Since 1939 Clonsast works has produced six million tonnes of sod peat. Over the past five years production and sales have been as follows - tonnes:-

| | Production | E.S.B. Sales | Total Sales |
|---|---|---|---|
| 1973/74 | 224,590 | 155,009 | 202,586 |
| 1974/75 | 219,281 | 162,276 | 226,333 |
| 1975/76 | 221,186 | 192,443 | 254,020 |
| 1976/77 | 177,089 | 170,000 | 226,300 |
| 1977/78 | 210,000 | 120,000 | 200,000 |

A 25 M.W. generating station was built at Portarlington by the E.S.B. in 1948 and during the early 1960s a further 12.5 M.W. was added. This power station employs almost 100 people and takes 60% of the Clonsast peat output. At present this generating station forms part of the E.S.B's. base load capacity and will continue to do so up to the early 1990s when it will be phased out.

## Definition of Area

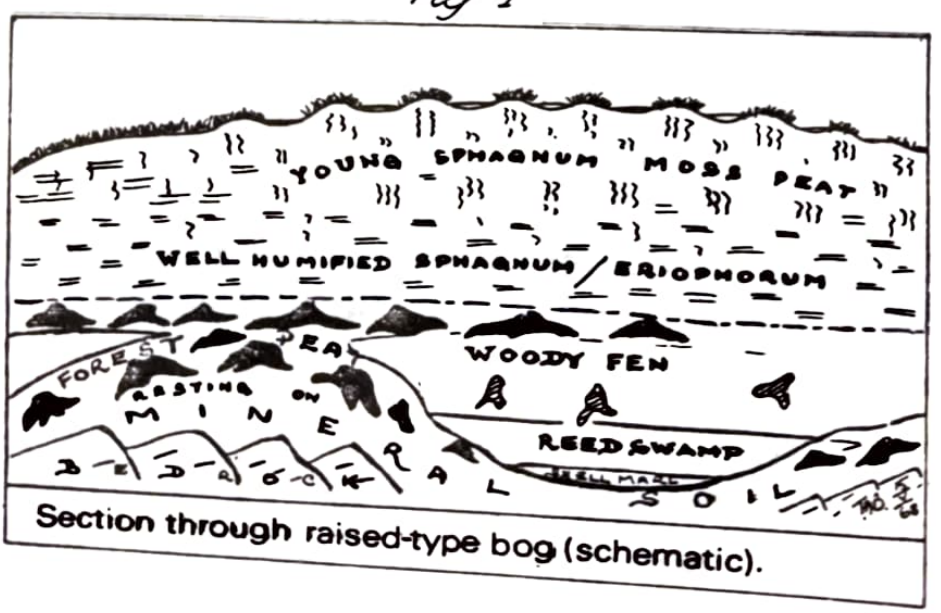
This is Hochmoor or raised-type bog typical of the Central Plain of Ireland. According to the 1936 survey the average depth was 8 metres undrained (10 metres maximum and 3.6 metres minimum). The average moisture content in Ireland of this type of bog is 96% before drainage.

Peat in general is an accumulation of organic residues originating under more or less water-saturated conditions through the incomplete decomposition of plant remains. The peat type varies with the plant species that formed it.

Raised bogs overlie layers of fen peat or forest peat of variable thickness. These developed from about 8000 B.C. in areas subject to prolonged waterlogging such as lake margins and river flood plains. Fen peat is mainly derived from plants such as reeds and sedges, which during their period of growth were more dependent on nutrient-rich groundwater than on rain water for their moisture supply. It frequently includes the fragmented remains of birch and alder. Fen peat comprised mainly of non-Sphagnum mosses and containing a significant proportion of wood fragments is frequently termed "woody fen". Due to their relatively high base content, fen peats are only marginally acid.

As fen peat gradually increased in thickness over about six thousand years the living vegetation on their surface became further removed from the influence of groundwater and more dependent on rain for its moisture supply. This resulted in a complete change in their flora to plants such as heather, bog cotton and Sphagnum mosses, which are more suited to the acid conditions prevailing. The partially decomposed remains of these and other plant species eventually resulted in the development of what are today termed "raised bogs".

*Fig 1*




Section through raised-type bog (schematic).

Fig 2

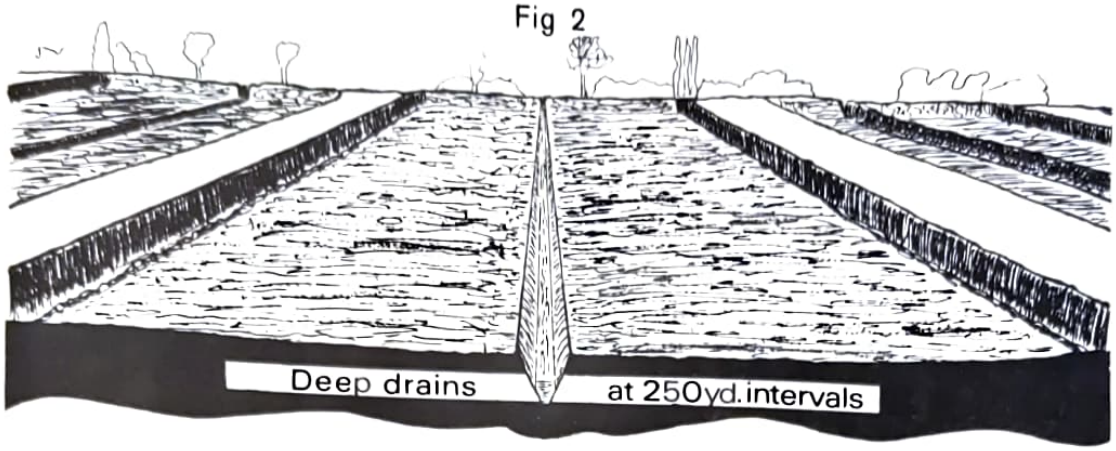
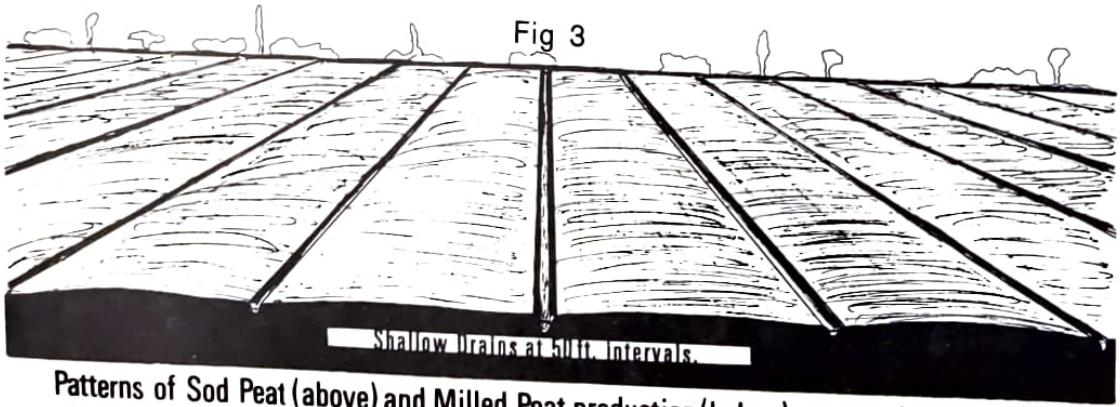



Fig 3




Patterns of Sod Peat (above) and Milled Peat production (below) compared. Schematic.

Throughout the study area bog peat proper consisting of younger and older Sphagnum and Eriophorum, spp. overlies forest peat consisting of forest debris found only on the higher levels of the floor. On slopes it overlies woody fen or forest peat. Over convexities in the floor it overlies reed swamp, with or without a woody fen layer at the transition level.

## Sod Peat Production

Sod peat is produced by excavating two metre wide strips of bog along a drainage trench vertically to a maximum of four metres of the bog profile. The top half metre (Sphagnum moss) is first stripped and left on the cutaway. Initially the surface of the bog is used as a spreading and drying ground. As cutting proceeds the area of uncut bog decreases and the area of cutaway increases and is used for spreading and drying. Sod peat cutaway is thus required as a spreadground until the total bog is cut out. (Fig.2)

## Sod Peat Cutaway

The sod peat cutaway, surveyed in 1964, was found to consist of a layer of top stripping, mainly young Sphagnum peat 25-50 mm. thick, lying on one or more of the other peat types which were undisturbed except where levelling operations, in preparation of the cutaway as spreadground for sod peat, had mixed the materials in the top 50 mm. or more (1).

The deeper stripping layers lay over the deep reed swamp; the least depth of stripping over the shallow forest peat on convexities and on high ground generally.

Correlations between peat types and depths were found as follows (undisturbed peat in cutaway):

(a) 0.3 - 0.5 m. of forest debris on all major convexities.

(b) 0.5 - 1.5 m. of woody fen peat, most often found on slopes (depths more variable than at the other levels).

(c) 1.5 - 3.0 m. of reed swamp in the major hollows.

(d) 3.0 m. plus as for (c) but with shell marl under the reed swamp.

These correlations were found to hold good over a total of 8100 hectares of machine sod peat cutaway subsequently surveyed in the Clonsast, Ballydermot, Timahoe and Mountdillon groups. They were, therefore, used as a basis for a 'natural regions' sub-division of all the surveyed bogs. This classification received further support later when it was found that there was a reasonably good correlation with subsoil variations also. The regions were lettered A, B, C and D (Map I).

## Subsoils

The sub-peat mineral soils of Clonsast were investigated for Bord na Mona in 1961/64 (2). They were found to be as follows:-

S.1 - well developed relict soil, sandy loam to loam.

S.2 - moderately developed soil, loam.

S.3 - undeveloped soil, highly calcareous shallow silt loam over calcareous glacial drift, etc.

S.4 - undeveloped soil. Glacial clay, sand, gravel. Find sands and silty clays (calcareous).

S.5 - shell marl.

## Cutaway Soil Maps

Recent discussions have produced agreement on the following simplification of the above nomenclature and classification of sub-peat mineral soils of Clonsast, - solely for the purpose of producing a more simple soils map to assist in our present study.

S.1 and S.2 soil types, being more or less weathered and matured soils, with some degree of decalcification towards their former surfaces, are coupled and termed WEATHERED SOILS.

S.3 and S.4, unweathered and immature soils materials, are together termed UNWEATHERED SOILS.

S.5 stands as before - SHELL MARL.

Map 2 carries the simplified notation of the mineral soils referred to above.

Data from the cutaway peat survey and from the mineral soils survey (simplified version) were then combined in Map 4 in order to show whatever correlations exist and to assist in sub-dividing the general area into possible planning regions.

It must be emphasised, however, that the boundaries between these regions are by no means firm. They may alter with the particular form of land use envisaged and with changing circumstances, e.g. eventual depths of peat remaining after fuel peat removal.

## Peat Depth

During 1976/77 the area was surveyed for peat depth - excluding the portions of high bog which have still to be utilised for sod peat production. Map 6 shows these depths in detail and there is a much greater depth of peat on the cutaways of the North bog and Bulge than on the Clonsast main bog area. This is

because the former two areas had greater peat depths and came into production later. Analyses of the peat depths from the soundings taken are as follows:-

| Peat Depth Range (metres) | Percentage of Area within depth range | Approx. Hectares within depth range (Peat Production Area) |
|---|---|---|
| **Main Bog:** | | |
| 0 - 0.5 | 12.06 | 173 |
| 0.5 - 1.5 | 32.73 | 470 |
| 1.5 - 3.0 | 31.53 | 452 |
| 3.0 and over | 23.68 | 340 |
| **North Bog:** | | |
| 0 - 0.5 | Nil | Nil |
| 0.5 - 1.5 | 5.3 | 10 |
| 1.5 - 3.0 | 16.7 | 33 |
| 3.0 and over | 78.0 | 155 |
| **Bulge:** | | |
| 0 - 0.5 | 4.8 | 16 |
| 0.5 - 1.5 | 4.8 | 16 |
| 1.5 - 3.0 | 16.7 | 61 |
| 3.0 and over | 73.7 | 308 |

Average depth of peat on the cutaway within the study area is 1.4 metres.

As already explained this cutaway peat consists of a layer of Sphagnum strippings overlying either forest debris, woody fen or reed swamp peat. It was assumed that this would be the composition of cutaway bog available for development and on which development has been in progress since 1972.

## Milled Peat Production

The term 'milled peat' is used to describe peat in crumb or powder form. It is produced over the entire working area by milling and drying a shallow layer of peat each harvest. In an average season twelve crops are harvested giving 187 tonnes per hectare. The boç is serviced by drains at 15.2 metre centres. With this system all the peat is harvested and there is no top stripping left on the cutaway as in sod peat production. (Fig.3)

Milling continues until the subsoil appears in the field drains. This occurs haphazardly due to the undulating nature of the subsoil. When a subsoil outcrop occurs in a production area milling must stop to avoid mixing stones, etc. with the peat which makes it unsuitable for burning. It is thus not possible to leave a uniform depth of residual peat. In practice an average of 0.5 metres is left with approximately 10% of the cutaway having depths of 2 metres or more over areas of 20-80 hectares. Milled peat cutaway bog is peculiar to Bord na Mona area and will not be found in any other peat areas of the country.

Trial milled peat harvesting of the deeper areas of sod peat cutaway were successfully conducted over the past three years at Clonsast. All sod peat cutaway with more than 0.5 metres of peat will now be used for milled peat production. The advantages of this for fuel production are obvious because harvesting can be undertaken immediately on a drained and developed area. The amount of harvestable peat will be discussed in the next chapter. Milling also aids cutaway development because:-

(a) it removes the old sod peat stripping which is not a good medium for agriculture

(b) it reduces the area of very deep peat (2-3 metres) which is also problematic for agriculture

(c) it disposes of timber (old forest trees and stumps) which occur in the lower layers of peat (described in Chapter II).

This cutaway bog available for development over the next twenty-three years is in the Main bog only and accounts for all fuel production area there. No cutaway will be available on either the North bog or the Bulge in that time span due to greater peat depth and it is estimated that milling will continue on those two areas for a further six years, i.e. until the year 2006.

While the areas becoming available for development over the next twenty years are substantial it must be remembered the emergence of these areas is haphazard and it will be many years before any large block of developed land will be available.

## Drainage Pattern

Map 5 shows the flow pattern and final drainage plan now operating in the study area. No further drainage is necessary for fuel production and it must be assumed that this will be the drainage pattern for cutaway development. The eight pumping stations pinpointed are necessary to facilitate peat production at the lower contour levels. The area requiring pumping at present is estimated at a total of 405 ha. and for future development, unless this area is flooded for amenity purposes, these pumping stations must be maintained to keep a low water table level and allow agricultural operations.

It can be seen that there are three catchments in the area flowing into the three Barrow tributaries, namely, the Philipstown river to the north, the North river flowing through the Main bog and the Cushina river to the south. These three tributaries meet at Monasterevan and flow into the river Barrow. Levels to ordnance datumshow the break points on each trench together with levels at key points on all outfalls and pumps (entry and exit).

The permanent railway system is also shown on this map but it is visualised that this railway will have no part to play in the cutaway utilisation for which a system of roads will be constructed.

The red lines on Map 5 indicate the subsoil contours.

## Peripheral Area

In the course of the study the peripheral area between the Bord na Mona bog and the main road boundaries was surveyed (Map 6). This area is 1,854 hectares consisting of:-

| | | |
|---|---|---|
| Mineral land | - | 770 hectares |
| Developed cutaway | - | 500 |
| Undeveloped cutaway | - | 236 |
| Undeveloped high bog | - | 208 |
| Forestry (on peat) | - | 140 |

As most of this area is serviced by the outfalls developed by Bord na Mona since 1939 it could be very easily drained and developed. The active 'facebanks' (for hand harvesting turf) numbered 131 from which an estimated 3,000 tonnes of turf was produced in 1977. There is also a private machine turf cutting

enterprise producing an estimated 2,500 tonnes per annum. On the peat area depth varies from 0.15 m. to 3.9 m. - averaging 1.4 m. (Map 6).

This peat area in private ownership should be developed and restructured in conjunction with the Bord na Mona cutaway bog and a land use plan be drawn up for the total area of 3,269 hectares of bogland excluding forestry.

**Summary**

From the foregoing it is now possible to define the nature of the cutaway bog in this study area.

It will consist of an average of 0.5 metres of peat of either forest debris, woody fen or reed swamp type, overlying one of the three types of sub peat soil - weathered relict soils, unweathered silty loams etc. or shell marl. Using these combinations it is possible, for planning purposes, to divide the Bord na Mona cutaway bog area into three regions, as in Map 4.

# CHAPTER 3

## RESEARCH AND DEVELOPMENT

### Research

The first growing trials on cutaway bog were started in 1955 at Clonsast by the Department of Agriculture. Here for a period of six years investigations were carried out into the growing of grass, kale and potatoes.

Phosphate, potash and nitrogen were found to be essential for growth, but yields were generally low in the second and subsequent cropping years. Grass and potatoes were the most suitable. (3)

Research work also commenced at Lullymore in 1955 on milled peat cutaway and was continued by An Foras Taluntais from 1958. Preliminary results showed that grass was the only crop which grew satisfactorily on shallow peat and basal soil. It was also shown that arable cropping should be located on deeper peats and that Sphagnum peat in situ or as a waste product of sod peat harvesting and basal soil are unsatisfactory media for arable crops. (4)

From 1962 research on cutaway bog was confined to grassland for which Bord na Mona developed and allotted to An Foras Taluntais 32 ha. of milled peat cutaway and 10 ha. of sod peat cutaway at Lullymore and Timahoe respectively.

Until 1972 work was confined to beef production from grass (summer grazing). Results from 1968 showed that satisfactory liveweight gains could be obtained. This was verified over the following years when gains of 0.8 kg. per day were achieved. Mineral levels in both animal and herbage were monitored and no advantage was observed from feeding supplementary copper. (5)

In 1972 an agreed programme of research for four years was undertaken at Lullymore to observe the performance of breeding animals on cutaway bog and identify problems associated with minor element deficiencies and their effect on fertility. Parasitic behaviour on this land was also investigated. It was concluded that animal fertility was normal but severe copper deficiency was observed and a system of supplementary copper feeding was necessary. Parasitic (Strongolides) build-up was also associated with copper deficiency and required special treatment. (6)

### Research on Vegetable Growing

1967/68 growing trials of vegetable crops on deep (2 m.) fen peat at Derrybrennan gave considerably higher yields than the national average. While the addition of high levels of major nutrients and of some minor ones, such as boron and copper, was necessary and while weed control was a problem it was concluded that deep fen peat had many advantages for horticultural production. (7)

## Forestry

Results from trial plantings made on Trench 14 (within the study area) by the Forest and Wild Life Service of the Department of Lands in 1955 suggest that cutaway bog has a high potential for timber production. Yields of 25 cu. metres per hectare per annum have been recorded. (8) Recent examination has shown yields above national average for nine out of eleven species compared. Root development is satisfactory. On shallow peat roots of one species (Abies grandis) have penetrated into the calcarous subsoil. (9)

## Development and Utilisation to date

Bord na Mona commenced the development of cutaway bog in 1972. The first development of 48 hectares took place on the study area. This consisted of two sod peat spreadgrounds 120 metres wide and 2.4 kilometres long, serviced by one of the 14 main drains which runs through the bog. Over the length of the developed area the depth of this drain varied between 1 and 4 metres and for most of its length it was cut into the mineral subsoil. The average depth of residual peat was 1.5 metres and this was typical of sod peat cutaway, consisting of a layer of Sphagnum stripping overlying forest peat to the north and fen peat in the remainder of the area. The mineral subsoil contained all three types already described, i.e. weathered glacial drift to the north, unweathered silty clay for about two-thirds of the area and a small portion in the centre overlying shell marl. The peat on the east side of the drain contained a large quantity of drain excavated subsoil.

All surface timber was extracted. The total area was levelled and graded to an approximate gradient of 1% towards the main drain. No intermediate tile drains were used.

The pH of the cutaway varied from 3.5 - 7.5, the higher figure being obtained where subsoil was more prevalent. Quantities of lime varying from 0 - 15 tonnes per hectare were applied to neutralise the acidity and raise the pH to an average level of 5.5. The other nutrients applied and the seed mixture used are given in Tables 1 and 2.

Grass establishment was excellent even on areas where sub peat mineral soil was exposed.

During 1973 the pasture was used both for summer grazing and for silage making. A satisfactory liveweight gain of .60 kg. per animal per day was obtained during the grazing season from June-October. The silage yield of 15 tonnes per acre was also satisfactory and there was no problem with mechanised operations.(10)

Accommodation for over-wintering 400 bullocks was built adjacent to the grass area. In the first winter silage mixed with barley and minerals was fed to 300 animals and a liveweight gain of .66 kilos per day was obtained.

The animal slurry was collected during the winter, stored in steel tanks and applied to the grass area in 1974.

Soil analyses (Table 3) demonstrate that while a very high initial application of nutrients is required to obtain the desirable fertility level subsequent applications are somewhat similar to those for mineral soil to maintain that level of fertility. The average annual application of nutrients is given in Table 4.

While the response to nitrogen application is very evident the deficiency of this element is quickly observed by the orange and green discoloration of the grass tips accompanied by a marked drop in yield.

The analyses of both herbage and silage (Tables 5, 6 and 7) indicate that good quality material can be grown on and ensiled from cutaway bog.

A point worth noting is the consistently low level of copper in both herbage and silage. This low level of copper is further complicated by an abnormally high level of molybdenum which can aggravate copper deficiency by making the copper that is present unavailable. However, animal performance in this unit does not seem to be affected by this imbalance of minor elements. This is borne out by the satisfactory levels of nutrients found in the samples of animal blood and liver analysed (Table 8).

To date a total of 120 ha. of grassland has been developed at Clonsast Works and is used for the production of beef by summer grazing and over-wintering. While most of this grassland is on cutaway bog some marginal areas on the periphery of the bog have been taken in and developed also.

## Other Developments

Over the past five years the Board has developed other areas of cutaway bog as follows:

### Derrygreenagh:

80 ha. of grassland established on milled peat cutaway bog. The peat depth on this area was approximately 0.7 metres of reed swamp overlying very porous glacial outwash gravels. This combination of peat and subsoil will not be encountered in the study area at Clonsast. The 80 ha. of grassland has been used for the maintenance of a single-suckling herd of 150 cows and the production of beef animals for finishing at Clonsast.

### Oweninny:

130 ha. of grassland developed from milled peat cutaway. This is blanket type peat peculiar to the west of Ireland and will not be encountered in the study or any midland area. This grassland has been used for the maintenance of a flock of 1,000 ewes and the production of mid-summer lamb for three years.

There is some summer grazing with lightweight cattle which are later brought to Clonsast for finishing as beef. It was always envisaged that the development of cutaway bog in Mayo would be difficult due to the prevalent peat type and adverse climatic conditions. This has been borne out in practice and the performance of livestock in this area is still unsatisfactory.

Lullymore:

At this works an area of 15 ha. of milled peat cutaway bog has been developed as grassland and used in conjunction with 64 ha. of mineral soil for the production of beef and for cereal growing.

Boora:

52 ha. of milled peat cutaway has been developed at Boora and used for the production of wheat and barley over the past two years.

Blackwater:

12 ha. of marginal mineral soil has been used for growing wheat in the 1977 season.

In total the Board will be working in 1978:- 346 ha. grassland, 220 ha. cereals, 4 ha. vegetables. Some 52 ha. will also be planted for shelter and amenity.

## Problems Encountered

### Nutrition:

With the grazing and over-wintering of beef animals no major nutritional problems have been encountered. While we have recorded some erratic performances from time to time we are convinced that these are due to factors other than nutrition. Among the breeding animals at Derrygreenagh numerous cases of copper deficiency have been encountered and a system of copper supplementation is constantly practised. The copper level in animal tissue is continuously monitored in co-operation with An Foras Taluntais with a view to perfecting this supplementation programme. All analytical data from the sheep flock indicate that its nutrient and minor element status is satisfactory to date.

### Parasites:

No parasite problems have arisen with beef animals, but as was found by other research (4), parasite infestation in combination with copper deficiency in the breeding herd has been difficult to control. A system of preventative treatment has been undertaken in association with research scientists of An Foras Taluntais and the Veterinary Research Laboratory of the Department of Agriculture. In the sheep flock, with the climatic conditions prevailing at Oweninny, parasite control is one of the major factors affecting production levels and an elaborate system of preventative treatment is in operation there. To date a build-up of infection has been prevented but further experience is required before an extension of this project will be undertaken.

## Physical Problems

The physical problems encountered in utilising grass from established grassland on cutaway bog have been substantial over the past five years and can be summarised under the following headings:-

### 1. Timber Emergence

The degree of tree cover prior to bog formation varied throughout the country. The area under study was covered by a very dense forest and as a result the cutaway bog contains a high proportion of tree trunks and stumps of pine, oak and yew.

The area developed for grassland contains an average of 0.75 m. of peat varying from 12 mm - 3 metres. During development all visible timber was extracted, but due to subsidence in the intervening years the timber below the surface has emerged through the grassland and caused serious problems in utilising this grass. It has been a major hindrance to machine operation both in the application of fertilisers and in harvesting of grass and has necessitated timber extraction every year for the past three years. This extraction and pasture renewal has reduced output and made proper management difficult.

### 2. Uneven Subsidence

When cutaway bog is levelled, graded, drained and sown down to grass uneven subsidence immediately occurs due to the variations in peat depth and types particularly in the case of sod peat cutaway. This again makes mechanical operations difficult and reduces output.

### 3. Cracking

This phenomenon too is associated with the drying out process in developed cutaway bog and varies with the degree of drainage and also with the peat type. While cracking is not a major problem at Clonsast it has been very widespread at Derrygreenagh where reed swamp peat overlies a porous subsoil. Proper management has been difficult and we estimate that production has been reduced by over 50% on most of the area. It will be necessary to renew the grass on all this area in the coming years.

Again at Oweninny cracking is a problem but does not affect the management of sheep to the same extent.

It must be remembered that the past three summers have been exceptionally dry and have aggravated the three problems mentioned. It is not possible to say at this stage whether they will recur to the same extent in the future.

Solutions

(a) Milled Peat Production on the Sod Peat Cutaway

The taking of milled peat from sod peat cutaway at Clonsast will alleviate to some extent the timber emergence problem as most of this timber will be extracted in the milling process.

(b) Cereal Growing

To avoid uneven subsidence, and to some extent eventual cracking, cereals have been used as a first crop on the cutaway bog at Boora Works for two years. Our purpose in doing this was to ensure that all levelling and subsidence would be completed before permanent pasture is established. While the yield of these cereals and the quality of grain has been below average, the operation is having the desired effect and will be continued. It is now envisaged that in future cereals will be grown on all cutaway bog for a number of years before grass is sown.

(c) Watertable Control

It was always expected that the drainage of cutaway bog would be a problem but, from our experience over the last three years in particular, we are now of the opinion that certain areas may be over-drained and that watertable control may be necessary for future development. An area of 80 hectares of cutaway being developed at Boora will be used to test the feasibility of controlling the watertable level by pumping.

(d) Deep Ploughing and Subsoil Mixing

Deep ploughing and mixing the residual peat on the cutaway bog with the subsoil was tested in 1977. Twenty hectares was treated at Clonsast and a further 14 hectares at Derrygreenagh. Preliminary observations indicate it to be of benefit but further tests will be conducted in the coming year in association with the Soil Physics Dept. of An Foras Taluntais so that a full appraisal can be made. We expect this pulverisation of peat layers and subsoil will give deeper root penetration and better water conductivity and thus a reduction in drying out and cracking. It should also have the effect of reducing peat wastage and subsidence and allow more even settling.

4. Trafficability

Bog drainage is designed to cater for fuel harvesting over the major portion of the area. Due to the varying contour levels it is not possible to drain every portion fully and some areas of deep peat at lower contour levels will always have a high water-table. These pockets of peat (generally overlying shell marl) will always cause problems in cutaway development and must receive special attention. One such area has been developed at Clonsast and has been very difficult to manage due to poaching by livestock and difficulty in machine operations

## Shelter

In our experience the provision of shelter is important for satisfactory animal performance and is deficient in our operations to date. We realise that shelter must be provided many years before actual cutaway development takes place and is of prime importance in any land use plan. Tree planting is also of prime importance from an amenity aspect in reducing the monotony of the landscape and providing a habitat for wild life.

## Horticulture

Bord na Mona is investigating the potential of deep fen peat for horticultural production at Derrygreenagh since 1971. An area of 28 ha. was taken out of milled peat production and redeveloped for arable cropping. It had an average depth of 1.5 to 2.0 metres of woody fen and phragmite peat overlying a free draining gravel subsoil - a combination which is not found in the study area.

After grading, levelling and draining, nutrients were added to raise the fertility to the desired level.

In the intervening years a complete range of crops have been grown but yields have not been spectacular as can be seen from the following table.

| Crop | Years Grown | Yield (Tonnes/Ha.) | Experimental Yields A.F.T.1967, 1968 |
|---|---|---|---|
| Potatoes | 6 | 26.65 | 47.5 |
| Onions | 4 | 41.40 | 72.5 |
| Carrots | 4 | 28.00 | 72.5 |
| Carrots - early | 3 | 11.75 | 43.7 |
| Cauliflower | 6 | 2.50 | - |
| Calabrese | 2 | 2.75 | 8.5 |
| Celery | 4 | 18.10 | 165.0 |
| Barley | 4 | 3.30 | - |

Not only are the yields disappointing but poor quality produce has been obtained with many crops.

The reasons given for this poor performance are many and varied, but the trial growings will continue in an effort to obtain better yields and quality so that the deeper areas of suitable peat left after fuel production may be utilised for this purpose. From figures available at present 10% of the cutaway bog will have 2 metres or more of peat remaining. This deep peat area could form a very substantial vegetable enterprise if production problems are solved and market conditions are favourable.

## Overall Picture

From our surveys conducted on Bord na Mona sod peat cutaways in the late '60s and from calculations made on the milling process over the last 25 years we estimate that approximately 12,000 hectares of its production area at present has a depth of 2 m. of peat or more. As production increases (only 1/3rd of the peat deposits of the Bord na Mona bogs have as yet been exploited) this area with 2 m. of peat will increase for approximately another 15 years before it will begin to decrease, (Graph 1). It is obvious that at any time over the next 25 years a very large area of deep fen peat can be taken out of fuel production and retained for this purpose if required. Also assuming that Bord na Mona will develop 80,000 hectares of bog for fuel production it will have 80,000 hectares of cutaway peat and 10% of this will have a depth of 2 m. or more of peat. Therefore, 8,000 hectares of Bord na Mona cutaway peat will have peat depths suitable for vegetable production.

## Peat Subsidence

It should be noted that the loss in depth under vegetable production since commencing in 1970 is 58 m.m. per year and for cost/benefit purposes must be compared with a loss in depth of 76 m.m. to produce 187 tonnes of milled peat per hectare per year. A worldwide comparison of peat loss under various croppings and over varying periods can be seen in Appendix 1.

## Summary

Development work to date has been generally confined to shallower peat areas overlying the better subsoil types. Some experience has also been gained from small areas of deep peat overlying the more difficult subsoils both in the study area and elsewhere. However, at this stage it is our opinion that we have not yet created the perfect pasture or arable cropping programme from cutaway bog. The problems encountered have been highlighted and will be tackled and solved by further development.

Research to date does not allow us to be dogmatic as to the suitability of any particular area for any one specific land use. The broad recommendation is that grass is the most suitable crop for shallow peat and that for arable cropping and vegetable production greater peat depths are required. Our experience to date is in line with this conclusion.

# CHAPTER 4

## LAND USE PLANNING

From the preceding chapters on peat and subsoil type it is evident that the area under study is of a complex nature and is therefore unlikely to be suitable for any single form of land use.

For this reason we have to approach land use planning using a number of hypotheses, the validity of which remain to be proved.

Assuming that an average depth of 0.5 metres of peat will remain on the study area the following are the options in land use as we see them now:-

1. Total area sown to grassland, less 5% for shelter and amenity planning and 4% for roads.

2. Sowing down the more suitable peat and subsoil areas to grass and commercial forestry on other areas plus amenity planting to include the creation of lakes by flooding.

3. The shallow peat area sown down to grass, the deeper peat areas for arable and vegetable production, 10% for shelter and amenity planting and a further 10% of low-lying areas flooded for amenity.

4. Afforestation of the entire area.

5. Use of the total area for Biomass production that is short rotation forestry for fuel.

## OPTION 1

(Grassland Only)

Here it is assumed that all areas will be equally suitable for development as grassland after an initial period of cereal production. Map 7 shows this plan with 5% tree planted and a further 4% allocated to roads and buildings. This gives a total pasture area of 2,000 hectares.

This area of grassland will be developed gradually over a period of 25-30 years as the cutaway emergence plan shows in Chapter 2. This would entail the retention of the eight existing pumping stations to maintain the low water level necessary for agricultural operations in the lower contour areas (Map 4, Region 3 and Region 2 North).

If, as at present, the grass were used by Bord na Mona for beef production by grazing and winter feeding, three centralised serving units would be sufficient. These units would include cattle housing, slurry storage, grain storage and processing, fertiliser and machinery storage.

The-long term aim would be to maximise silage use for over-wintering and reduce summer grazing to a minimum. This would create an outlet locally for young cattle in the autumn and be complementary to local farming. It might also be possible to arrange contract winter feeding for part of the livestock of neighbouring farmers.

Possible alternatives within this system would be grass meal production - using peat-fired dryers, grass juice extraction (for protein production) prior to grass drying, or silage, slurry treatment with the addition of peat for the production of an organic fertiliser to be marketed in conjunction with moss peat, etc. These alternatives (subject to economic appraisal) would raise the employment level above that of a straightforward grass/beef production system estimated at 50 for this area, that is one man per 40 hectares.

A further alternative use for such grassland is private farming. This could be done on a short or long-term lease basis, without buildings, or by sub-division into economic holdings, with provision of farm buildings to selected qualified individuals. Such a suggested sub-division is indicated by the red numbers on Map 7, giving 36 farms of approximately 50 ha. each, plus an area to service the existing cattle unit (No. 24). This suggested sub-division is dependent on the assumption that we will create the land and conditions suitable for private farming.

## OPTION 2

(Grassland, Commercial Forestry and Amenity Uses)

This option is shown in Map 8. All the better subsoil areas ( Map 2) are used for grass production as are the poorer subsoil areas covered by the better type peat, i.e. forest debris and woody fen. Regions 1 and part of 2, (Map 4) are under grass. Commercial forestry would be established on the remaining deeper areas of reed swamp peat. Amenity and shelter planting would be established on the lower contour areas (Region 3) eliminating the need for pumps.

Under option 2 the area would be divided as follows:-

| | | |
|---|---|---|
| Commercial forestry, lakes and shelter belts | - | 36% - 837 ha. |
| Roads and buildings | - | 4% - 93 ha. |
| Net usable grassland | - | 60% - 1395 ha. |

The alternatives for the use of this grassland are as in Option 1. Similarly the long-term alternatives would be farming by Bord na Mona, or leasing or sale. The red numbers on Map 8 indicate how this grassland could be sub-divided into 21 individual farms of approximately 50 ha. each plus an area to service the existing cattle unit.

## OPTION 3

(Grassland, Arable and Vegetable Production, Shelter and Amenity)

This option as shown in Map 9 entails the sowing of all shallow areas to grass and the retention of the deeper areas for arable cropping and vegetable production. As stated in Chapter 2 it will not be possible to mill all the area down to a depth of 0.5 m. and we visualise 10% of the area having 2 m. or more of residual peat. Most of this deep peat will be in the lower contour areas some or all of it requiring pumping to control the watertable level. At this stage we think this may be an advantage in avoiding moisture deficiency and fast subsidence. Some of these areas could be flooded for amenity use and also to facilitate irrigation, which we believe is necessary for successful vegetable growing on deep peat.

If present vegetable production and marketing problems are overcome consideration could be given to the preservation of all the deep peat in the North bog area (196 ha.) in conjunction with the other similar areas designated for this purpose. From the cutaway emergence pattern it is evident that the North bog will not be available for milling for another 20 years leaving ample time for this decision.

With this option the following could be the land use plan:-

| | | | |
|---|---|---|---|
| Grassland | 61% | - | 1418 hectares |
| Roads and buildings | 4% | - | 93 hectares |
| Arable cropping (10% of total area plus the North bog) | 20% | - | 465 hectares |
| Lakes, shelter and amenity planting | 15% | - | 349 hectares |

### Peripheral Area

The breakdown of the peripheral area (1,854 hectares) between the Bord na Mona bog and main road boundaries is given in the last chapter and can be seen on Map 6. We would like to think that the peat sections (944 hectares) of this area could be drained, developed and restructured in conjunction with the development of the cutaway bog in the study area. The options for the use of this area would be similar to those listed under 1, 2 and 3. If the total area is suitable for grassland it would allow the creation of say 19 x 50 ha. farmlets well developed and conveniently laid out. Again some of the deeper peat would be suitable for arable and vegetable cropping when drained and some of the high bog would be suitable for milled peat production and forestry.

## OPTION 4

(Commercial Forestry Only)

This is a straightforward land use plan for planting the total area as it becomes available with commercial forestry. Research has shown (Chapter 3) that yields higher than the national average could be obtained from forestry on cutaway bog.

By augmenting the commercial plantations with those ornamental species which grow best on the different peat types and depths and combining the planting with the flooding of the main depressions, the total area could become an important tourist attraction, for wild life, shooting, boating, fishing etc. The main factor militating against this option is its low labour requirement and subsequent fall of employment in the area.

## OPTION 5

(Biomass - short rotation forestry)

There is much concern at present at the rate world energy reserves (coal, oil and peat) are being exhausted. For example the oil reserves which took 100 million years to form are to be used up in a single century. It is obvious that provision must be made for the future.

Peat is our main source of natural energy and this will be exhausted within another 40-50 years. It is thus more important than ever for us to provide for our future energy needs.

Formation of carbohydrates by photosynthesis in plants is one way of converting solar energy (which is largely under-utilised) into a combustible fuel. This process is now referred to as "Biomass" conversion. The theory is that by planting specially selected fast growing trees, cutting them every 3-5 years, allowing them to coppice (regrow) and cutting again 3-5 years later, a continuous fuel supply will be available. There are many unknown factors in the efficiency of this process but it may have possibilities for our future energy supply.

Plantings are in progress, in association with An Foras Taluntais, to test Biomass growth rate, output and harvesting techniques and the results of these will determine whether large scale plantings will be made on cutaway in the years ahead.

# CHAPTER 5

## FINANCIAL IMPLICATIONS

## OPTION 1

This option assumes the development as grassland of the cutaway areas becoming available up to the year 2000.

The plan and cost projections are based on development work carried out to date.

### CAPITAL COSTS

While development is geared to areas available from cutaway emergence, it is planned to proceed at a rate which makes the most efficient use of manpower and machines. For example, we have allowed for the purchase and employment of one bulldozer wholetime for the first nine years (until 1987) at which stage the workload justifies a second machine throughout the remaining years of this development cycle.

The plan provides for the establishment of a suitable road structure comprising eight miles of tarmac roads and nine miles of spur roads.

It also includes 48 hectares of shelter belts and 16 hectares of amenity planting which in conjunction with the 3 hectares already planted amount to 5% of the total area.

We have allowed for the necessary supply of power and water and for the initial costs of fencing, liming, fertilising and grassing.

The project requires the wholetime use of bulldozers, and hence, we have included in the development charge the repair and overhaul costs of these machines based on their working age and on historical maintenance costs of similar machines in Clonsast.

Direct overheads are related to projected labour on development; the charges for administration and technical services provided by the local Works are in line with the similar charge per hectare for farm production.

While our estimates as a whole seem higher than the development costs hitherto associated with grassland establishment they account for the range of capital outlay which a project of this type and scale entails. In a series of possible land use options the opportunity cost of capital employed must be highlighted and each option assessed on the total commitment of resources involved.

Total projected expenditure on developing this area is £1,146,540 analysed as follows:

| | Total Cost | Cost per Ha. |
|---|---|---|
| | £ | £ |
| Materials | 648,073 | 491.34 |
| Wages | 437,677 | 331.82 |
| Overheads | 60,790 | 46.09 |
| Total | 1,146,540 | 869.25 |

In addition to the foregoing outlay on development the following capital expenditure is required for beef and grain production.

| | £ |
|---|---|
| Plant and machinery | 548,000 |
| Buildings | 491,500 |
| | 1,039,500 |

Total capital expenditure is £2,186,040.

## PRODUCTION PLANS

The plan for developed areas is four years initially on cereal crops - first year under wheat followed by three years under barley, and then sown to grass.

Grass utilisation is based on a calf to beef system over a two-year cycle. In addition, where available grassland is not sufficient to justify a further cattle house at that stage we have provided for summer grazing of heavy store cattle in order to maximise the return from the grasslands.

## PERFORMANCE STANDARDS

Expected standards are higher than what we have achieved so far but they are attainable targets which are necessary for the viability of this kind of enterprise.

Outputs on this scale are being achieved generally in the country and we are projecting them as realisable standards in our plan.

(1) Liveweight gains

| | Average daily gain per head | Liveweight total per head |
|---|---|---|
| | Kg. | Kg. |
| Purchase (calf) | | 50 |
| Summer 1 | 0.7 | |
| Winter 1 | 0.5 | |
| One year old | | 275 |
| Summer 2 | 0.8 | |
| Winter 2 | 0.85 | |
| Sale (bullock) | | 575 |
| Heavy stores - summer grazing | 1.0 | |

The overall gains over the duration of the plan (1978-2000) average 853 Kg. per hectare.

(2) Livestocking rates

1 livestock unit per 0.6 hectare
Heavy stores - 1850 kg. per hectare on summer grazing.

(3) Mortality rates - calf to bullock

| | Rate % |
|---|---|
| Up to 3 months | 5.0 |
| + 3 months - 12 months | 2.5 |
| + 1 year - 2 years | 0.5 |

(4) Cereal Crops - grain yields

| | | |
|---|---|---|
| Wheat | 4.45 | tonnes per ha. |
| Barley | 3.95 | " " " |

The plan provides for the use of our own grain in the barley soya compound produced in the grain complex.

PRODUCTION COSTS

Labour and material charges are based on current rates and likewise the revenue from sale of livestock and grain.

The costs from year to year are determined by the nature and range of the planned operations and are linked primarily with livestock numbers and crops.

The following is a summary of production costs (excluding cattle purchases) over the period:

| | Total Cost | Cost per Ha. |
|---|---|---|
| | £ | £ |
| Materials | 2,827,130 | 202.65 |
| Wages | 1,300,200 | 93.20 |
| Overheads | 633,150 | 45.38 |
| Total | 4,760,480 | 341.23 |

Note: There is no provision for rates in this projection but our present rateable valuations would likely be increased if we engage in large scale agriculture.

CATTLE TRADING

The plan provides for purchase of calves in the spring at £80 per head and sale after two years at £75 per 100 kg. live-weight.

| | Total - £ |
|---|---|
| Sales | 7,425,070 |
| Purchases | 2,288,790 |
| Net trading revenue | 5,136,280 |

Allowing for the value of unsold stock the gain on trading over the period is £5,428,210 which is equivalent to £562 per hectare of grassland.

SALE OF CROPS

Gross return on cereal crops, allowing for retention of feeding barley required for compound mix, is £1,014,740.

Summary Cash Flow

| | £'000 | |
|---|---|---|
| Cattle sales | 7,425 | |
| Crop Sales | 1,015 | 8,440 |
| Capital expenses | 2,186 | |
| Production expenses | 4,760 | |
| Cattle purchases | 2,289 | 9,235 |
| Cash flow | | (795) |

The following schedule (No. 1) shows for each year and in total the projected revenue, expenditure, cash flow, finance required and interest charges.

These figures illustrate the impracticality of funding this plan from our own resources or from borrowing on commercial terms. The main militating factor is the high cost of servicing the investment because of the mounting overdraft and the compounding of the interest. Total interest charges at 9% p.a. amount to £3,515,240.

Projecting the position at year 2000 when development of this area is completed and working on beef production only the enterprise at present rates would yield a return of £90,800 per annum which allows for the average cost of plant replacement.

## OPTIONS 2 AND 3

We have not costed these specifically for the following reasons:

1. We have strong reservations regarding the use of standards supplied by the Forestry and Wildlife Section to the more difficult cutaway areas. We have not got performance data for commercial forestry on reed swamp peat.

2. To date our performances in arable and vegetable production have not given commercially successful yields.

This area of peat agriculture needs further research and trial before we can plan production based on attainable outputs and quality necessary for its commercial viability and the constraints of the market.

In addition to these factors we would also have the problem of funding capital expenditure as outlined in Option 1 for utilisation and expansion of the grassland areas (about 60% of total area).

The funding difficulty would be accentuated by the absence of any return from forestry for the initial fifteen years.

## OPTION 4

This plan refers to commercial forestry only. Schedule 2 attached shows the results of a pilot study of this area completed by Forestry Officials.

As no back-up figures were supplied we are unable to verify the authenticity of these figures on a basis which would provide comparability with our grassland study.

We have however doubts about some of the criteria used in arriving at the forestry results, particularly the high yield class (22) and a ½% p.a. wood price increase. We understand from Forestry that they too have reservations about this yield from one-half metre of peat.

## OPTION 5

There are no available details on Biomass production on which we can make a commercial assessment.

As stated in Chapter 4 this is still in the experimental stage of development.

# CHAPTER 6

## SOCIAL IMPLICATIONS

The Economic and Social Research Institute was retained by Bord na Mona to conduct a comprehensive survey of Bord na Mona employees at Clonsast and the E.S.B. employees at Portarlington Power Station to determine the following:-

(a) the characteristics of the workers

(b) the implications for the work force of the run-down of fuel peat production operation

(c) the implications for the total employment in the catchment area of a run-down of operations

(d) to obtain the opinions of all workers as to how the cutaway bog should be utilised.

The remainder of this chapter is a brief summary of the E.S.R.I. report:

Since its establishment in 1946 the Clonsast Works have proved to be a major source of non-agricultural employment in the Portarlington area. However, over this period the average number of workers employed annually at the works has declined as is seen from the following table.

### Employees at Clonsast Works classified by occupation in selected years since 1959/60 ≠

| Year | Occupation | | | | |
|---|---|---|---|---|---|
| | Administrative | Supervisory | Skilled | Semi and unskilled | Total |
| | | | No. | | |
| 1959/60 | 15 | 36 | 39 | 496 | 586 |
| 1965/66 | 11 | 31 | 56 | 366 | 464 |
| 1970/71 | 11 | 23 | 79 | 217 | 330 |
| 1976/77 | 17 | 18 | 68 | 216 | 319 |
| Change in number 1959 - 1977 (%) | +2 | -18 | +29 | -283 | -267 |
| | +(13.3) | -(50.0) | +(74.3) | -(57.1) | -(45.6) |

≠ The figures for 1976/77 were supplied by Bord na Mona and the remainder were taken from Fell (1971). They do not include seasonal workers (mainly unskilled) whose numbers have declined substantially.

There are at present 319 full-time workers employed by Bord na Mona at Clonsast of whom about 70 are skilled workers, mainly fitters and electricians. A further 60/70 seasonal workers are employed in turf saving activities during the summer. In addition the E.S.B. employs 120 workers. Wages and salaries and local spending for other goods and services for 1976/77 was £1.5 million. Hence, when turf production ceases, economic activity in the area will be seriously affected unless alternative industries can be introduced either by the I.D.A. or through diversification policy by Bord na Mona.

The catchment area for Bord na Mona and E.S.B. workers extends over an area of about 58,400 hectares (230 sq. miles) but because it is covered by extensive deposits of bogland it is not a particularly good farming area and lacks features capable of attracting tourists.

The total population of all the region concerned in 1971 was about 17,000 people, of which the rural population was 8,000 and that of the towns about 9,000. Between 1966 and 1971 there was a 3% increase in the population of the region. The phasing out of Bord na Mona and E.S.B. operations would certainly have a serious effect on our future growth in population. Portarlington in particular would suffer very much.

The total number of Bord na Mona workers interviewed was 292 out of a total of 375 (including both seasonal and permanent employees) and in the Power Station interviews were conducted with 59 out of 119 employees. The remainder either refused to co-operate or were unavailable for interview throughout the survey period.

The overall response rate was 71%. In view of this high percentage we believe that the samples given give an accurate representation of the circumstances and views of the workers involved.

Occupation of Workers

The occupation of workers classified by age are given in Table 9. The first part of the Table shows that of the total interviewed 14.2% had administrative, clerical or supervisory posts; 23.1% were skilled manual; 33.9% were semi-skilled manual and 28% were unskilled workers. The second part of Table 9 shows that 7% of the workers interviewed were under 20 years of age; 31% were 50 years of age and over while 18% were over 55 years of age.

The E.S.B. workers are mainly in the middle age groups. None were under 20 years of age and only 10% were over 55 years of age.

The third section of Table 9 shows that 80% of the workers in the sample were full-time, about 2% were part-time and 18% were seasonal workers.

## Marital Status, Relationship to Head of Household and the Size of Household

Table 10 shows the marital status of employees classified by occupation and relationship to head of household. As can be seen from the first section of this Table about 64% of all employees are married and 35% are single.

## Education and Training of Employees

The percentage of employees classified by occupation, by age on completion of full-time education, and by type who are attending is shown in Table 11. The first section of this Table shows that 41% of the workers finished full-time education at 14 years of age or later, 16% finished at 15 years of age, another 16% at 16 years of age, 14% at 17 years and 11% at 18 years and over. In all about 87% of sample left full-time schooling between 14 and 17 years of age. The second section of Table 11 shows that over half the sample did not go beyond primary school.

## Salaries and Wages

The total gross wage and salary for Bord na Mona and E.S.B. for workers residing in the Clonsast area for year ending 31st March 1977 was £1.5 million and when deductions such as P.A.Y.E., Social Welfare, Superannuation remain nett receipts of workers were £1.25 million. These are very substantial receipts for a rural area of this size.

## Job Satisfaction

Over 90% of the employees were satisfied with their job arrangements to and from work and a similar number said that Bord na Mona and the E.S.B. were good firms to work for and that the hours worked were convenient. Almost equally high proportions stated that their present jobs were the only ones they could get if they wished to stay in the area and that they were very happy in their present jobs. A high proportion also stated that their work was interesting, that the pay was good and that they were given a chance to do the things they want.

## Employees' plans for the Future

On this question 37% of the employees thought that Bord na Mona or the E.S.B. would provide other jobs in the Clonsast areas when present jobs ceased. A further 16% said that they would get jobs from Bord na Mona or E.S.B. elsewhere. The people who were most confident of obtaining other jobs with Bord na Mona or the E.S.B. in Clonsast were the semi-skilled and unskilled workers. Very few workers (3.7%) hoped to become full-time farmers when the present work ceased in the Clonsast area.

## Experience of Farming

Some questions on farming experience were included in the questionnaire and the answers are given in Table 12. The first part of this Table shows that about 9% of the sample owned and operated farms, a further 1.4% operated rented land while 6% helped on family farm. Almost 84% of the sample did not work on farms at the time of the survey. The second part of this Table which gives the size of the farms operated, shows that 35% of operators worked on farms of less than 15 acres, 26% operated on 15-30 acre farms, 21% on 30-50 acre farms and 17.5% on farms of 50 acres and over. The third section of this Table shows that about 70% of all employees had some experience of farming.

## Options as to best use of Cutaway Bog

About half the sample thought that root and vegetable crops would be most suited to cutaway bog, 11% favoured dairying and 17% thought that dry cattle rearing would be more suitable while only 6% spoke in favour of forestry.

Options varied widely as to the number of acres of cutaway bog with which to make an economic holding. Most thought that 50-100 acres would suffice but 4% felt that 200 acres would be needed while another 4% thought that less than 30 acres would do.

When questioned as to who should farm the cutaway bog about half the respondents said that Bord na Mona should farm it themselves. About 1/5 suggested that it should be farmed on a co-operative basis by Bord na Mona or E.S.B. employees, 1/6 thought that it should be divided into farmland and sold or let on a long-term basis to Bord na Mona or E.S.B. employees while 6% only were in favour of dividing it among local farmers.

When asked about selling or renting the cutaway bog to local farmers over 60% said that it would be a very bad idea. Giving reasons of this view about 1/3 said that the locals were not using their own holdings well and therefore, would not be expected to do otherwise with cutaway bog. About 1/5 said that local farmers lacked training and almost half thought they lacked the capital equipment required for such an operation.

About 60% of all the respondents said they would be prepared to become full-time farmers on cutaway bog and that their wives and family would be prepared to go along with the idea.

Those who said that they would be prepared to become full-time farmers on cutaway bog were asked to state the amount per acre they would be prepared to pay either to purchase or rent the land. Purchase prices ranged from £20 - £1,000 per acre, the average respondent being £205 per acre. Rental prices ranged mainly from £5 - £100 per acre, the average being £33 per acre.

## Other Industries

When employees were asked to suggest other industries which might be set up in the Clonsast area if Bord na Mona and E.S.B. had wound down their operations about 1/5 of the workers thought that a grassmeal factory would be suitable. Another 1/5 thought that vegetable processing would be best while about 1/8 suggested engineering. The amount of employment which workers thought the different industries would give varied considerably among the different groups. About 7% thought that there would be jobs for less than 100 people, about 39% thought that over 300 could be employed.

## Industrial Development Authority

The recent job creation performance of the cluster of towns incorporating the Clonsast region is of some interest. The ideal regional planning for the period 1973-1977 set a target of 750 nett new jobs. During 1973 and 1976 only 300 new jobs were actually created. A further 200 new jobs are expected in 1977 leaving a shortfall of 250 nett new jobs for the period as a whole.

The I.D.A. have taken this disappointing performance of 1973/77 period into account in setting up a job creating target of 750 new jobs for this cluster of towns in 1978/81 period. Special efforts are being devoted in job creating in this region in view of the fact that Bord na Mona and E.S.B. (the largest employers in the area) would be scaling down on their operations. Furthermore, it is hoped to persuade a large industry which will eventually employ over 1,000 workers to establish at Portarlington.

As part of the effort to create employment in the area the I.D.A. has stated that it is willing to co-operate with Bord na Mona in:

(a) supporting the development of new products suitable to the resources and skills available in the area through its Research and Development Programme.

(b) through its project identification programme the I.D.A. co-operating with the Board will help identify products which can be produced using the skills available in the area. It will provide financial support where appropriate towards the establishment of industry to produce such products.

(c) making services available in arranging joint ventures between the Board and another party and providing financial support to such ventures as appropriate.

(d) supporting the establishment of small industries in the area. This programme is particularly suitable for skilled employees to set up an industry of their own.

Conclusions by the E.S.R.I.

The Clonsast area is heavily dependent both directly and indirectly on the operations of Bord na Mona and the E.S.B. for the provision of employment and income. The survey results showed that even with phased closure of operations over a number of years large numbers of jobs would be lost. Furthermore, the survey showed that very few of the workers had income other than from their present jobs. Particularly surprising was the small number of workers who were engaged in part-time farming.

It seems clear that if the Clonsast area is not to suffer great economic and social costs following the cessation of operations by Bord na Mona and E.S.B. alternative employment would have to be found. Unfortunately the prospects for such alternative employment do not appear especially bright at present. Indeed, if alternative employment were available, it is likely that some workers (notably those in the older age groups possessing little or no skills) would find it difficult to obtain such employment. This situation is further exacerbated by the fact that large numbers of young, relatively well educated people are entering the local labour force for the first time. In addition to the direct effect on the Bord na Mona and E.S.B. workers and their family, the indirect effect of a closure on other persons in the area must be considered. The income earned by those working on the bog and those working in the Power Station is spent mainly in the Clonsast area, thereby generating further income and employment. Recipients of this secondary income would also suffer when the Bord na Mona and E.S.B. operations in the area cease. Given the heavy dependence in the area on Bord na Mona and E.S.B. it is not surprising that our survey showed that workers looked on these bodies to alleviate the difficulties that would arise when the bog finally is exhausted.

It is obvious that alternative employment must be provided in the Clonsast area. However, the economic feasibility of any venture needs to be thoroughly investigated as well as its technical feasibility. It is not enough to know that an enterprise can produce a particular item, one must also know that production is profitable and that the product will be a marketable one. It is also true that the method of organisation of any venture may influence its economical feasibility. Hence it is necessary to distinguish clearly between the potential value of a venture under the perfect conditions and the value likely to be realised under actual real world conditions.

We believe that considerabl fewer workers could be employed in farming the cutaway bog than are at present in Bord na Mona and the E.S.B. irrespective of the ownership or type of farming adopted. It might be possible to employ considerable numbers in ancillary processing industries but economic viability of such industries would have to be carefully assessed before any recommendation could be made.

# CHAPTER 7

## CONCLUSIONS

Fuel peat production is very important to the Irish economy in reducing energy imports, creating exports and gainfully employing people in rural areas. There is now a greater need than ever to produce as much energy as possible from native resources and it is thus desirable to produce as much peat as possible from our bogs.

Agriculture is vital to the Irish economy and every effort should be made for its expansion. The development of good agricultural land from Bord na Mona cutaway bog is thus a very important consideration, and the long-term use of this land will not be sacrificed for short-term fuel gain.

Research work which has been going on for over 20 years recommends that grass is the most suitable crop for cutaway bog and that for vegetable and arable cropping a greater depth of peat is required.

The development work by Bord na Mona since 1972 verifies this general finding but also highlights the necessity for further work for different combinations of peat and subsoil types before one can say what each area is best suited for.

Planning the long-term use of this land now, the options available to us are:-

Grassland

Arable and Vegetable production

Forestry

Biomass production

and the combination of all those with amenity areas for tourist attraction. The capital requirement for the development is substantial and must be planned in advance.

The social considerations in changing from labour intensive fuel production to other operations must get serious consideration. Alternative employment must be found within this area regardless of the long-term use or ownership of the lands.

### Recommendations

The first decision to be made is what depth of peat should be left after fuel production. The development of the cutaway as grassland or for forestry allows maximum fuel to be extracted. If arable cropping and vegetable production are to be practised greater depths of peat are required. It has been shown that both fuel production and vegetable production use up the peat deposits at approximately the same rate. It is thus a question

of cost benefit between the two operations. It has been demonstrated that if our vegetable production problems are solved and if market conditions change in the future a decision can then be made to retain suitable areas of deep peat for this use. In the meantime fuel production should continue, leaving an average of 0.5 metres of peat and the resulting cutaway should be developed for agricultural purposes, mainly grassland. Amenity and shelter belt planting which has already begun should be accelerated.

More time and experience is required to solve our present problems. Further research will also be required into many aspects such as watertable control, deep ploughing etc. and An Foras Taluntais with a proper inter-organisational structure has a special position for this purpose. The place of cereals in the initial development of cutaway bog will have an important place and further work is necessary to maximise their yield and reduce disease. The economics of the development will need annual review.

Plans must now be implemented to safeguard the future of all existing employees of Bord na Mona and the E.S.B. in this area by the creation of alternative employment. New opportunities must be created for the younger generation.

Although the study area is no more than 3.0% of that accruing from Bord na Mona operations over the next forty to fifty years it is the first time in the history of the State that such an acreage of potentially good land can be properly planned and managed in the national interest from the start.

Development of this and all emerging cutaway bog should continue by Bord na Mona alongside further research and in co-operation with all interested parties so that the best long-term plan can be devised and implemented in good time.

## TABLE 1

Initial Nutrients applied to cutaway bog

76.3 Kg. N per hectare
76.3 Kg. P per hectare
152.7 Kg. K per hectare
31.0 Kg. Cu $SO_4$ per hectare
3.25 Kg. Co per hectare

## TABLE 2

Grass Seed Mixture Used

| | | |
|---|---|---|
| 18.25 Kg./ha. | | New Zealand Perennial Ryegrass |
| 13.63 | " | Sceempter Perennial Ryegrass |
| 4.3 | " | R.V.P. Ryegrass (Italian) |
| 1.7 | " | New Zealand White Clover |

## TABLE 3

| | pH | % | | p.p.m. | | | | |
|---|---|---|---|---|---|---|---|---|
| | | P | K | Cu. | Mo. | Mn. | Fe. | Zn. |
| Pre-development 1972 | 4.5 | 1 | 24 | .75 | 2.5 | 280 | 270 | 1.3 |
| September 1973 | 7.3 | 9 | 86 | 3.0 | 2.6 | 300 | 270 | 1.5 |
| September 1977 | 6.5 | 7 | 74 | 2.6 | 2.6 | 310 | 240 | 1.6 |

## TABLE 4

Average Annual application of nutrients (Kg/ha)

| N | P | K |
|---|---|---|
| 450 | 75 | 300 |

TABLE 9

Employees in the sample classified by occupation, employing organisation, age and whether full time, part-time or seasonal

| | Occupation (BnM and ESB combined) | | | | | | Sub-group totals | |
|---|---|---|---|---|---|---|---|---|
| | Non-Manual | Skld. Manual | Semi-Skld. | Un-Skld. | Total | | BnM | ESB |
| | % | % | % | % | % | No. | % | % |
| Employing Organisation | | | | | | | | |
| Bord na Mona | 13.7 | 21.2 | 38.7 | 26.4 | 100.- | 292 | - | - |
| E.S.B. | 16.9 | 32.3 | 10.2 | 40.7 | 100.- | 59 | - | - |
| All workers | 14.2 | 23.1 | 33.9 | 28.8 | 100.- | 351 | 83.2 | 16.8 |
| Age groups | | | | | | | | |
| 15 - 19 | 2.0 | 16.0 | 0.0 | 10.9 | 7.1 | 25 | 8.6 | 0.0 |
| 20 - 29 | 16.0 | 43.2 | 14.3 | 16.8 | 21.9 | 77 | 22.9 | 16.9 |
| 30 - 39 | 14.0 | 17.3 | 19.3 | 19.8 | 18.2 | 64 | 14.7 | 35.6 |
| 40 - 49 | 22.0 | 11.1 | 27.7 | 21.8 | 21.4 | 75 | 20.9 | 23.7 |
| 50 - 54 | 20.0 | 1.2 | 19.3 | 12.9 | 13.4 | 47 | 13.4 | 13.6 |
| 55 and over | 26.0 | 11.1 | 19.3 | 17.8 | 17.9 | 63 | 19.5 | 10.2 |
| Total | 100.0 | 100.- | 100.- | 100.- | 100.- | 351 | 100.- | 100.- |
| Full-time, part-time or seasonal | | | | | | | | |
| Full time | 100.- | 97.5 | 81.5 | 65.3 | 83.2 | 292 | 80.1 | 98.3 |
| Part time | 0.0 | 1.2 | 3.4 | 3.0 | 2.3 | 8 | 2.4 | 0.0 |
| Seasonal | 0.0 | 1.2 | 15.1 | 31.7 | 14.5 | 51 | 17.5 | 1.7 |
| Total(Percentage) | 100.- | 100.- | 100.- | 100.- | 100.- | - | 100.- | 100.- |
| Total (Number) | 50 | 81 | 119 | 101 | - | 351 | 292 | 59 |
| Bord na Mona | 40 | 62 | 113 | 77 | - | 292 | - | - |
| E.S.B. | 10 | 19 | 6 | 24 | - | 59 | - | - |

# APPENDIX 1

## DEPTH LOSS IN MILLED PEAT PRODUCTION

Representative samples from the study area were analysed to determine the average depth of peat required to produce 187 tonnes of milled peat per hectare (Bord na Mona's average annual production from 12 harvests).

The following chart is a summary of the results.

| Depth Metre | Moisture Content | Density | Peat Solids per litre (grams) | Yield at 55% m.c. Tonnes/hectare/ 25 mm. |
|---|---|---|---|---|
| 0 - 0.15 | 79.18 | .939 | 145.25 | 110.2 |
| 0.15 - 0.30 | 82.28 | .936 | 165.53 | 93.4 |
| 0.30 - 0.45 | 84.53 | .949 | 147.08 | 82.7 |
| 0.45 - 0.60 | 86.95 | .953 | 125.24 | 70.0 |
| 0.60 - 0.75 | 89.08 | .965 | 105.38 | 59.4 |
| 0.75 - 0.91 | 89.13 | .987 | 107.60 | 60.7 |
| 0.91 - 1.06 | 90.30 | .992 | 96.20 | 54.3 |
| 1.06 - 1.21 | 89.95 | .992 | 99.70 | 56.2 |
| 1.21 - 1.37 | 90.10 | .979 | 97.20 | 54.8 |
| 1.37 - 1.52 | 88.95 | .994 | 109.70 | 61.9 |
| 1.52 - 1.67 | 88.o0 | 1.008 | 114.90 | 64.8 |
| 1.67 - 1.82 | 88.80 | 1.013 | 113.50 | 64.0 |
| Average | 87.32 | 0.975 | 123.02 | 69.4 |

This shows that each 25 mm. of peat depth will yield 69.4 tonnes of milled peat per hectare. Thus to obtain the average output of 187 tonnes per hectare would require 68 mm. of depth in the study area. However, this is a nett figure and it is found in practice when losses etc. are taken into consideration that a depth of 76 mm. is required.

It is obvious that the lowest moisture contents and the highest yields per hectare are found in the shallow peat areas. The moisture content increases and the yield decreases as the peat becomes deeper, until the lower depths are reached which are influenced by subsoil drainage. When the results for bog moisture contents are plotted against calculated milled peat yields at 55% moisture content, the relevant regression line is shown on the graph. This enables yield from a bog area to be predicted when its mean moisture content level is known. It must be remembered that this average yield of 69.4 tonnes per hectare refers only to the area under study and is not an average for the total Board working area.

A comparison can be made here of the loss in peat depth under agriculture and horticulture in various parts of the world from the following chart.

## RATE OF PEAT SUBSIDENCE UNDER CROPPING

| Location | Original Depth Metre | Years in use | Subsidence mm/year |
|---|---|---|---|
| Holme Fen England | 6.6 | 84 | 38 |
| | 6.6 | 22 | 110 |
| | 6.6 | 103 | 33 |
| Everglades (grassland) | 2.7 | 41 | 31 |
| Everglades | 3.3 | 20 | 71 |
| | 3.3 | 50 | 45 |
| Michigan | - | 5 | 42 |
| Holland Marsh (Canada) | - | 1 | 28 |
| Ireland A.F.T. Lullymore (Grass) | 0.50 | 7 | 21 |
| B.N.M. Lullymore (Grass) | 0.75 | 2 | 137 |
| B.N.M. Derrygreenagh (Vegetables) | 2.00 | 7 | 58 |
| Russia | .46 | 46 | 4 |
| | 1.10 | 46 | 11 |
| | 2.10 | 46 | 25 |

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# APPENDIX 5-1

***Fire Prevention & Fire Fighting Procedures for Peat Production Bogs***



BORD NA MÓNA

Feedstock Operations

# Fire Prevention & Fire Fighting Procedures for Peat Production Bogs



# Fire Prevention & Fire Fighting Policy for Production Bogs

The main focus of Bord na Mona in the prevention and management of bog fires is the safeguarding of members of the public, employees and property external to and within the ownership of the company. In addition, management recognise any legal obligations placed upon them relating to fire safety.

Management are therefore committed to the implementation and maintenance of systems to ensure, in so far as is practicable, the prevention of bog fires, and in the event of a fire occurring, the management and control of such fires so as to protect the safety and health of persons who may be affected.

The Feedstock management team will act as the fire committee for the Feedstock Business Unit and will hold two meetings per year. The function of the committee is to discuss and deliberate on all matters relating to fire prevention and fire fighting within the business unit.

Management will ensure the provision of adequate and appropriate resources to implement and maintain the fire plan including: Personnel; Training; Equipment; PPE and Communications.

Additional welfare facilities will be provided in the event of significant fires.

Communication channels with relevant emergency services will be established and maintained and appropriate maps provided.

Fire prevention and fire fighting will take precedence over all other operations.

All significant fires will be reported to the business unit manager in addition to health and safety and environmental personnel.

Management will ensure that the appropriate fire warning signs are in place and maintained as necessary.

All areas will be provided with maps and aerial photographs.

This policy will be communicated to all appropriate personnel and will be included in relevant training programmes.



**Head of Feedstock Operations**

# Fire Protection Priorities

Feedstock management acknowledges that in undertaking activities to prevent and fight fire, priority will be placed as follows:

- Protection and safety of employees and members of the public
- Protection of external property
- Protection of Bord Na Mona property.
- Protection of Habitats and Biodiversity.





# Fire Sources

There are two recognised sources of fire on bogs;
External and Internal

## External Sources

- Burning of gorse / heather / brush
- Cigarettes and matches
- Trespass of quad bikes and motorbikes

## Internal Sources

- Heating Peat
- Machinery
- Cigarettes and Matches
- Hot work – Production areas and Rail Lines



# Fire Prevention Plans

## Externally Sourced Fires

The following measures are implemented to endeavour to prevent fires on Bord Na Mona bogs which may be caused by external sources:

- An annual campaign to promote public awareness regarding bog fires.
- Liaison with local land owners and fire services to prevent fires / burning on properties adjacent to Bord Na Mona Land.
- Ensure fire warning and trespassing signage present in high risk locations.
- Appropriate control of public access.
- All employees to maintain vigilance at boundaries during periods of high fire risk.

## Internally Sourced Fires

The following measures are implemented to endeavour to prevent fires on Bord Na Mona bogs which may be caused by internal sources:

- All employees to maintain vigilance on bog areas at all times, but particularly during production season and during high fire risk periods.
- Fire prevention and awareness training to be provided to all employees as part of induction training. Refresher training provided periodically. Specific fire training provided to all relevant employees.
- Machines must be inspected and washed / blown down on a daily basis.
- Peat Piles prone to heating must be closely monitored.
- Smoking is restricted to designated areas and is prohibited in machines and on bog areas.
- In order to minimise the risk of fire, peat sales plans should take account of piles prone to heating.
- Areas must be left safe from the threat of fire following hot work carried out on bog or on rail lines.
- Fire watch will be carried out (minimum period of one hour) by members of production team at the end of each production day.
- Fire patrols will be organised by local management / operations leaders during periods of high fire risk.
- Production operations will be suspended as necessary during periods of high fire risk.

# Fire Fighting Plans

## External Fires

In the event of fires on non Bord Na Mona property which may be threatening Bord Na Mona property, the following actions will be taken:

- The relevant operations leader will contact the land owner / occupier where possible as well as the fire service.
- Bord Na Mona employees may need to access the external property in order to deal with the fire. Permission can be granted by the land owner / occupier or the fire service.

## Control and Management of Bog Fires

Resource managers will designate control persons for fire fighting.

Their responsibilities will include:

- Management of persons (including members of the public) entering and leaving sites under control.
- Co-ordination of persons on sites under their control.
- Liaison with Fire and other emergency services as necessary.
- Organisation of welfare facilities.
- Resource managers will establish and maintain frequent contact with relevant external organisations and local fire services.

Each Bog Area operation leader / team leader / supervisor must ensure the following:

- Fire fighting machinery is available and ready for use if required.
- Minimum of one fire roller unit (Tractor with attached roller) is available and ready for use in each area.
- Lights are working on all machines.
- Flashing beacons are ready, and are placed on all relevant machines during fire fighting activities.
- All machines have appropriate numbers of fire extinguishers.
- Fire extinguishers checked daily and a reserve number are kept.
- All tractors have fire buckets and shovels, and all dozers have a fire bucket.
- Water sources on or adjacent to bog are appropriate, maintained and available for use during fire fighting.
- Fire signs are in place and maintained.
- Maps and aerial photographs provided to areas are in place and maintained.

Emergency contact numbers for each area in place

# Fire Fighting Measures for Bog Fires

Fire fighting measures used for bog fires are as follows :

**Small Fires**

Extinguished immediately using fire shovel and bucket, and fire beaters if available.

**Large Fires**

Larger fires are managed using a combination of the following:

- Ditching piles and fields.
- Dozing piles and fields.
- Deep milling fields.
- Use of water to wash down machines and dampen fringe areas.






***The Use of Water on Peat Bog fires is largely ineffective and can actually contribute to the spread of such fires.***

## Equipment available for deployment in event of fire.

**Available Equipment:**



- Dozer
- Ditcher
- Digger / Excavator
- Screw Leveller
- Peat Miller
- Water Tanker
- Fire Roller unit
- Fire buckets and shovels
- Fire Pumps, hoses and ancillary equipment
- Fire beaters
- Flashing beacons
- First aid kit and stretcher
- Stock of additional fire extinguishers
- Towing chains and slings
- PPE

## Training

Fire Safety awareness is provided as part of Bord Na Mona's general safety induction with refresher training occurring every three years.

Training in relation to fire safety awareness, fire prevention and fire fighting is provided to all relevant personnel.

Fire Safety Training includes the following:

- General Fire safety awareness and fire detection / prevention.
- Use of fire extinguishers.
- Use of machinery in fire fighting.
- Use of pumps, floatation pumps and fire rollers.
- Fire prevention for machinery, including washing and blowing down.
- Use and maintenance of PPE used in fire fighting.
- Dealing with small fires.
- General Health and Safety, including Hazard Identification and Risk Assessment.

# Recommended Procedure to Minimize Fire Hazards on Machinery

## General

- Machinery to be parked in a manner that allows them to be moved in an emergency.
- Machinery to be parked a reasonable distance apart from each other to avoid the risk of a fire spreading to adjacent machines.
- For driver occupied machinery, ensure the cab is kept clean and tidy.
- Smoking is prohibited both within all machinery and bog areas, smoking is permitted in designated areas only.
- All machines to be washed down following: a fire, replacement of a hydraulic pipe, oil leak, build up of peat, after exposure to the use of cutting and welding equipment.





## Tractors

- Use correct procedure for shutting down engine to reduce temperature and prevent fires.
- Twice daily (or as often as is necessary) using compressed air remove peat from :-
  - Radiators, oil cooler grill and surrounding areas.
  - Around the engine, manifold, injectors, diesel tank and filler cap.
  - Around top of the transmission underneath the cab.
  - Behind instrument panel.
  - Around battery.
  - Over back axles.
- Fire bucket and shovel, one or two fire extinguishers depending on tractor size are carried on suitable external brackets, fully charged and in working order.

# Recommended Procedure to Minimize Fire Hazards on Machinery

## Harvesters

- Inspect Harvester after each shift for accumulation of dry peat and friction hot spots, Remove dry peat where assessable. :-
  - o Inspect tracks for accumulations of peat.
  - o Inspect conveyor belts and belt rollers, for hot spots from seized rollers and misaligned belts.
  - o Inspect support frame for accumulations of peat.





## Excavators

- Remove excavator from pile and park at a safe distance.
- Use correct procedure for shutting down engine to reduce temperature and prevent fires.
- Inspect excavator after shutting down :-
  - o Lift engine hood, checking exhaust system, manifolds, turbocharger, and engine hot spots for residue of dry peat. Remove dry peat with brush where assessable.
  - o Inspect radiators and oil cooler for peat clogging.
  - o Inspect around slewing motor / gearbox and hydraulic pumps.
  - o Inspect around tracks and rollers.

***The Use of Water on Peat Bog fires is largely ineffective and can actually contribute to the spread of such fires.***

# Recommended Procedure to Minimize Fire Hazards on Machinery

## Rail Layer and Dozers

- Use correct procedure for shutting down engine to reduce temperature and prevent fires.
- Inspect Machine after shutting down.:-
  - Open engine doors, checking exhaust system, manifolds, turbocharger, and engine hot spots for residue of dry peat.
  - Inspect radiators and oil cooler for peat clogging.
  - Check for peat build up under engine.
  - Inspect around hydraulic pumps and related components.
  - Inspect around tracks and rollers.





## Locomotives

- Use correct procedure for shutting down engine to reduce temperature and prevent fires.
- Inspect Locomotive after shutting down :-
  - Check exhaust system, manifolds, and engine hot spots for residue of dry peat. Remove dry peat with brush where assessable.

## Other Production Area Machinery

- At the each of each shift and following activities that can increase the risk of fire, clean accumulations of peat and thoroughly wash down machine.

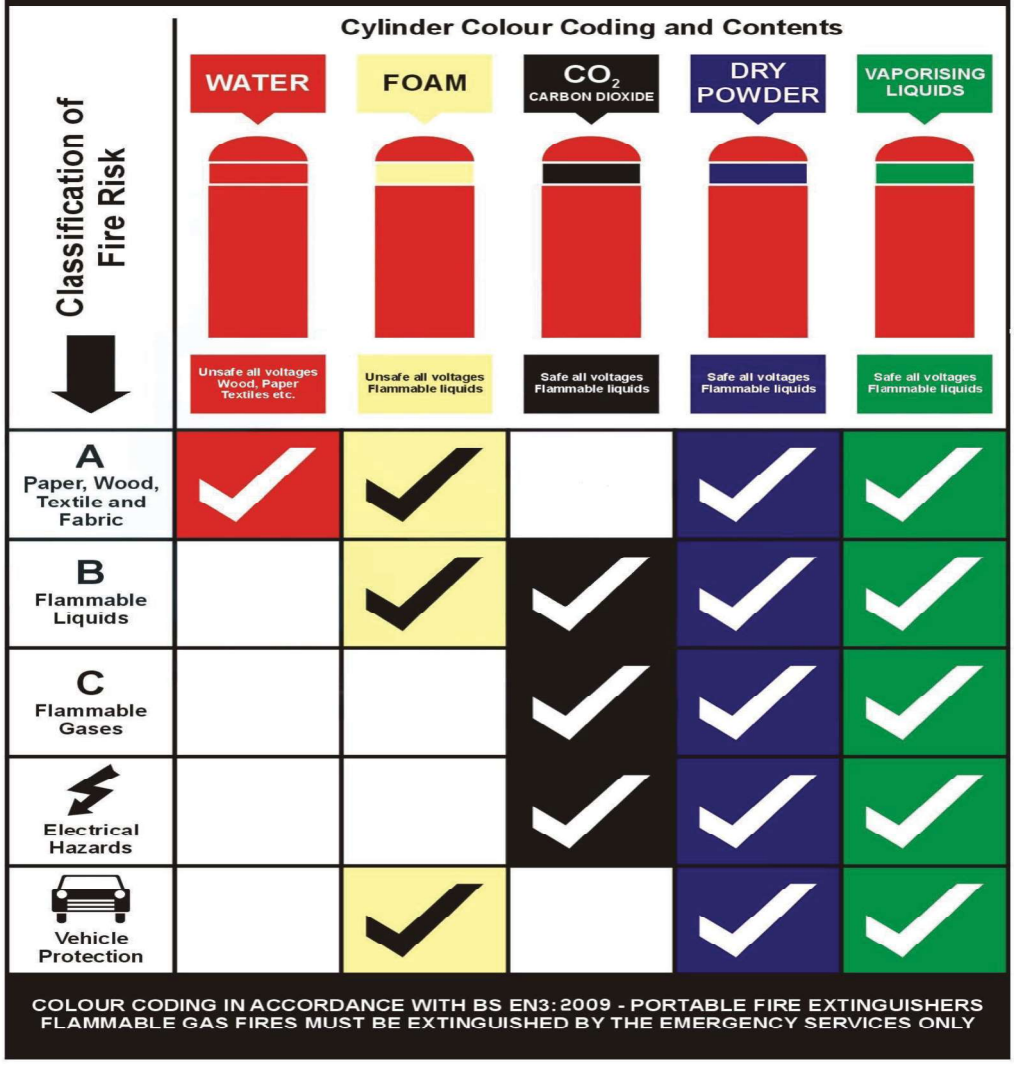
***The Use of Water on Peat Bog fires is largely ineffective and can actually contribute to the spread of such fires.***

# Deployment of Fire Extinguishers

| Location | Machine Type | Extinguisher | | |
|---|---|---|---|---|
| | | Size. | No. | Type. |
| **Machines** | Tractors up to 100 HP | 4.5 Kg | 1 | **ABC** Dry Powder or Foam |
| | Tractors over 100 HP | 4.5 Kg | 2 | **ABC** Dry Powder or Foam |
| | Bulldozers | 4.5 Kg | 1 | **ABC** Dry Powder or foam |
| | Excavators | 4.5 Kg | 2 | **ABC** Dry Powder or Foam |
| | Locomotives | 4.5 Kg | 1 | **ABC** Dry Powder or Foam |
| | Road vehicles, forklifts, loading shovels. | 1.5 Kg | 1 | **ABC** Dry Powder |
| **Tea Centres** | General<br>Electrical equipment | 4.5 Kg<br><br><br>2.5 Kg | 1<br><br>1<br>1 | **ABC** Dry Powder<br>Fire blanket<br>CO2 |

**Ensure that Used or Partially Used Fire Extinguishers are IMMEDIATELY Returned for Re-Filling / Replacement.**

# KNOW YOUR FIRE EXTINGUISHER COLOUR CODE




COLOUR CODING IN ACCORDANCE WITH BS EN3: 2009 - PORTABLE FIRE EXTINGUISHERS
FLAMMABLE GAS FIRES MUST BE EXTINGUISHED BY THE EMERGENCY SERVICES ONLY

# APPENDIX 5-2

***Bord na Móna Health and Safety Statement***

# Bord na Móna

## Health & Safety Policy

Bord Na Móna Plc and its subsidiaries ("The Company") recognises the proper management of safety, health and welfare as a core business value. It acknowledges its obligations, both legal and moral, as an employer to manage and protect the safety, health and welfare of its employees and others who may be affected by its activities, and in doing so, commits to achieving and maintaining the highest standards of Health and Safety reasonably practicable. To meet these objectives we must all, employer, employee, contractor and service provider strive to work together as a team to ensure that safe working continues to be an integral part of our organisational culture. The safety statement sets out arrangements to secure and manage safety, health and welfare at places of work within the company.

1. The Company will comply fully with all applicable Health and Safety legal requirements and with other requirements as so determined by The Company that relate to The Company's Health and Safety hazards.
2. The safety statement sets out arrangements to secure and manage safety, health and welfare at places of work within Bord Na Móna Plc and its business units.
3. The Company will provide competent advice and support on health, safety and welfare and any necessary means and resources to effectively manage workplace safety, health and welfare.
4. All persons working under the control of The Company will be made aware of their obligations in relation to health and safety.
5. In implementing the safety statement, Bord Na Móna management, so far as is reasonably practicable will provide and maintain:
   - A safe place of work, plant and machinery, access and egress, and systems of work
   - Competent Persons
   - Welfare facilities
   - Information, instruction and training in a manner and language understood by the trainee, and supervision to enable employees to perform their work safely and effectively and any other persons affected by its activities.
   - Provision of suitable and appropriate Personal Protective Equipment where hazards cannot be otherwise minimised or eliminated
   - Emergency management
   - Contractors and service provider management to comply with company safety requirements
6. Identify all workplace hazards, assess the associated risks, implement appropriate control measures, taking account of the principles of prevention, to eliminate where possible or minimise such risks to acceptable levels, and monitor their effectiveness. Communicate all risk assessments to relevant persons as part of the required consultation process.
7. Protect, so far as is reasonably practicable, persons not employed by the company who may be affected by our activities.
8. Continuously improve health and safety management based on performance monitoring in line with changes in legislation and best practice.
9. The Company will establish specific H&S Objectives and Targets and review regularly.
10. Build on its safety culture and continue to raise health and safety awareness amongst employees.
11. The Company recognises that co-operation and participation are required by all to whom the safety statement relates to ensure its successful implementation.
12. Consult with employees and contractors on matters of health, safety and welfare and take account of representations made by employees on such matters.
13. Facilitate the participation of workers in the planning, implementation and monitoring of safety arrangements to assist in the continuous improvement of the overall safety system.
14. This Policy and the Company Safety Statement will be reviewed as per legislative requirements, and to ensure their validity and effectiveness.

DocuSigned by:

CEO: Tom Donnellan 408F314D54C342D Date : April 2024

Head of Land & Habitats Ger Breen Date : 2 April 2024

# SAFETY STATEMENT

## Bord Na Mona
## Land & Habitats

| Document Name | Bord Na Mona Land & Habitats Safety Statement | Revision No. | Issue Date | Review Date |
|---|---|---|---|---|
| Document Reference | POHS A 0019 | 3 | 04/04/2024 | 04/04/2025 |
| Document Owner | Health & Safety | | | |

| Document Review | Date | Document Approval | Designation | Date |
|---|---|---|---|---|
| John Mc Namara | 02/04/2024 | Ger Breen _____ | Head of Bord Na Mona Land & Habitats | 04/04/2024 |
| Peter Quinn | 02/04/2024 | Garvan Hickey _____ | Operations Manager | 04/04/2024 |
| | | Connor English _____ | Land Use Manager | 04/04/2024 |
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# Distribution List

| Document Name : Bord Na Mona Land & Habitats Safety Statement | POHS A 0019 |
|---|---|

| Site Location | Document Location | Site Location | Document Location |
|---|---|---|---|
| Blackwater | Reception Area | | |
| Blackwater | Workshop | | |
| Derrygreenagh | Reception Area | | |
| Derrygreenagh | Workshop | | |
| Boora | Reception Area | | |
| Boora | Workshop | | |
| Mountdillon | Reception Area | | |
| Mountdillon | Workshop | | |
| Lough Boora Parklands | Gift Shop | | |
| Bogs (PCAS) | Crew H&S Folder | | |
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# Part 1 SCOPE OF THE SAFETY MANAGEMENT SYSTEM (SMS)

The Safety Management System to which this Safety Statement relates to is the Bord Na Móna Land & Habitats business and applies to its activities, facilities and operations.

The Safety Management System is based on the core values and commitments of The Company, as outlined in the Health and Safety Policy.

The Safety Management System is aligned to the requirements of international safety system standards and based on the Plan-Do-Check-Act model, understanding that this standard drives a system of continuous improvement in Occupational Health & Safety performance.

## 1.1 Bord Na Móna Health and Safety Policy

# Bord na Móna

## Health & Safety Policy

Bord Na Móna Plc and its subsidiaries ("The Company") recognises the proper management of safety, health and welfare as a core business value. It acknowledges its obligations, both legal and moral, as an employer to manage and protect the safety, health and welfare of its employees and others who may be affected by its activities, and in doing so, commits to achieving and maintaining the highest standards of Health and Safety reasonably practicable. To meet these objectives we must all, employer, employee, contractor and service provider strive to work together as a team to ensure that safe working continues to be an integral part of our organisational culture. The safety statement sets out arrangements to secure and manage safety, health and welfare at places of work within the company.

1. The Company will comply fully with all applicable Health and Safety legal requirements and with other requirements as so determined by The Company that relate to The Company's Health and Safety hazards.
2. The safety statement sets out arrangements to secure and manage safety, health and welfare at places of work within Bord Na Móna Plc and its business units.
3. The Company will provide competent advice and support on health, safety and welfare and any necessary means and resources to effectively manage workplace safety, health and welfare.
4. All persons working under the control of The Company will be made aware of their obligations in relation to health and safety.
5. In implementing the safety statement, Bord Na Móna management, so far as is reasonably practicable will provide and maintain:
   - A safe place of work, plant and machinery, access and egress, and systems of work
   - Competent Persons
   - Welfare facilities
   - Information, instruction and training in a manner and language understood by the trainee, and supervision to enable employees to perform their work safely and effectively and any other persons affected by its activities.
   - Provision of suitable and appropriate Personal Protective Equipment where hazards cannot be otherwise minimised or eliminated
   - Emergency management
   - Contractors and service provider management to comply with company safety requirements
6. Identify all workplace hazards, assess the associated risks, implement appropriate control measures, taking account of the principles of prevention, to eliminate where possible or minimise such risks to acceptable levels, and monitor their effectiveness. Communicate all risk assessments to relevant persons as part of the required consultation process.
7. Protect, so far as is reasonably practicable, persons not employed by the company who may be affected by our activities.
8. Continuously improve health and safety management based on performance monitoring in line with changes in legislation and best practice.
9. The Company will establish specific H&S Objectives and Targets and review regularly.
10. Build on its safety culture and continue to raise health and safety awareness amongst employees.
11. The Company recognises that co-operation and participation are required by all to whom the safety statement relates to ensure its successful implementation.
12. Consult with employees and contractors on matters of health, safety and welfare and take account of representations made by employees on such matters.
13. Facilitate the participation of workers in the planning, implementation and monitoring of safety arrangements to assist in the continuous improvement of the overall safety system.
14. This Policy and the Company Safety Statement will be reviewed as per legislative requirements, and to ensure their validity and effectiveness.

DocuSigned by:

CEO: Tom Donnellan — Date : April 2024

406F314D54C3420

Head of Land & Habitats: Ger Breen — Date : 2 April 2024

# Part 2 DESCRIPTION OF BORD NA MONA PLC AND IT'S SUBSIDIARIES

Bord Na Móna plc operates five Businesses, Renewable Energy, Land & Habitats, Resource Recovery Consumer Products and New Business. Bord Na Móna plc's Head Office is based in Newbridge which consists of administration support for the Business Units and Lean Centre Services. This Safety Statement covers all activities carried out within the Land & Habitats business.

**Renewable Energy**
Bord Na Móna's strategy is to grow our power generation business by developing renewable energy infrastructure which is consistent with government policy. This will be achieved by leveraging Bord Na Móna's land assets, project development skills, and operation and maintenance capabilities. Renewable Energy will be a leading low-carbon electricity generator, with a diverse portfolio of generating assets which will include wind and solar energy, biomass, biogas and other renewable energy technologies supported by flexible thermal assets designed to support power system flexibility on the road to delivering a net zero power system.

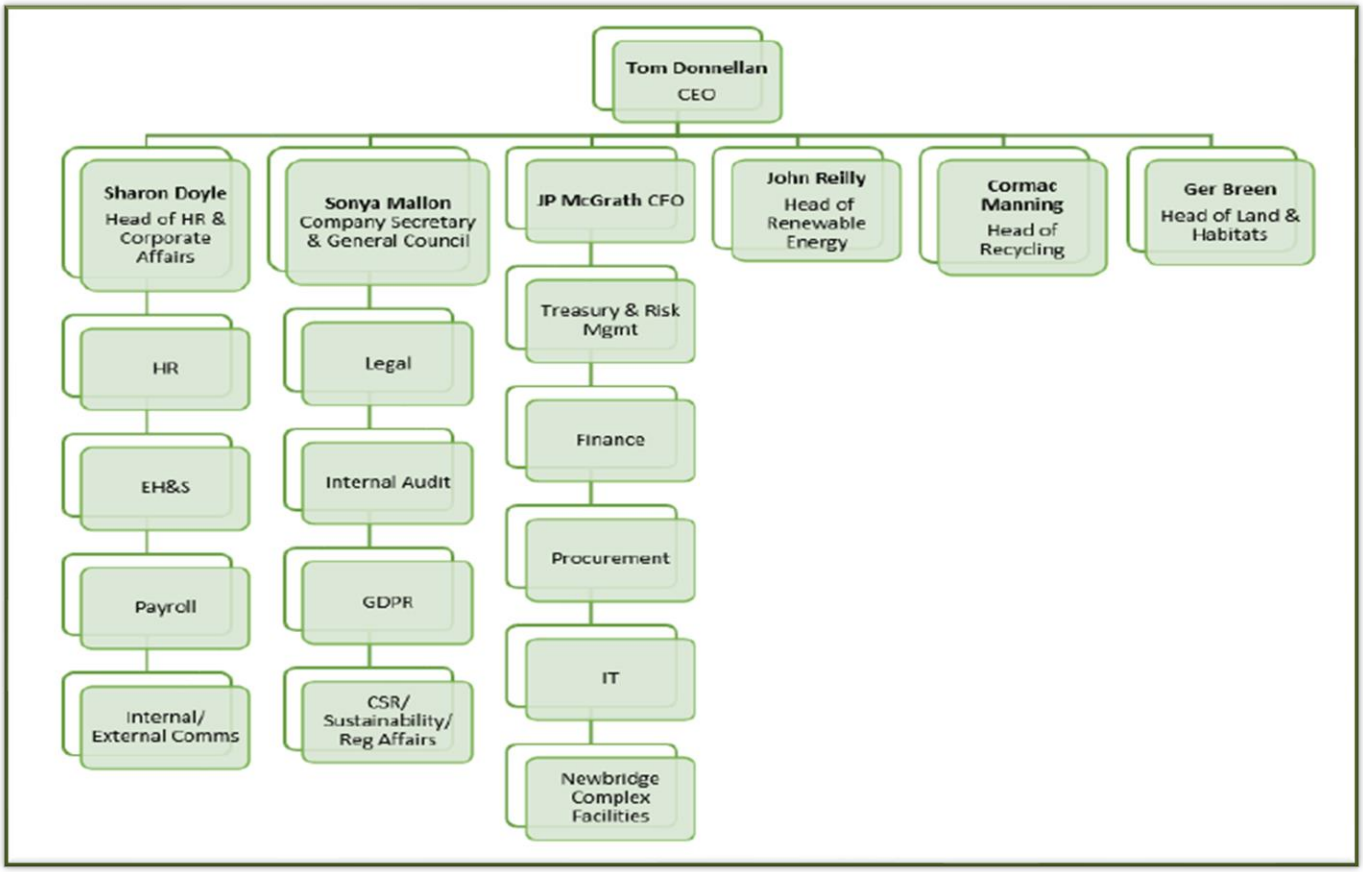
**Resource Recovery**
Consists of Bord Na Móna's Waste collection services, Waste Management and Landfill and Gas Utilisation with approx. 10 WRF and 1 Landfill sites across the country.

**Land & Habitats**
The Land & Habitats is responsible for Bord Na Móna's operating business on the enhanced decommissioning and restoration of designated bog lands (Peat Climate Action Scheme), disposal of surplus mobile plant and equipment, rental or disposal of surplus properties and managing the Peatland Estate through boundary management and the care & maintenance of the land bank resource.

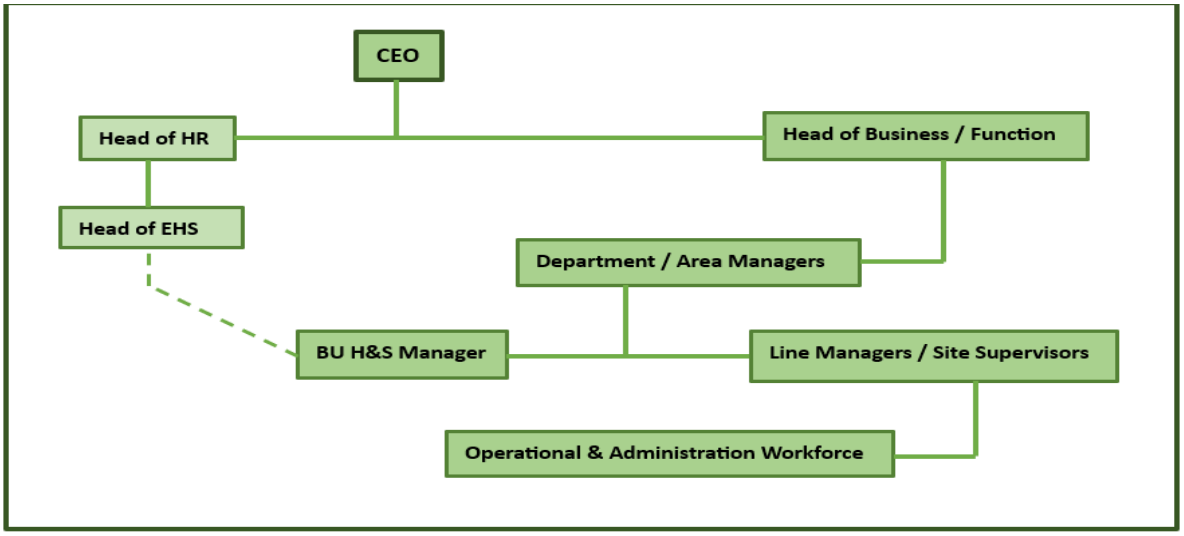
**New Business**
Bord Na Móna is committed to creating a sustainable business and supporting jobs in the Midlands. New business supports this objective. Working with partners to enable the establishment of enterprises in the midlands, using our assets and collaborating with businesses enabling employment and new opportunities .

## 2.1 Management Structure of Bord Na Móna Plc

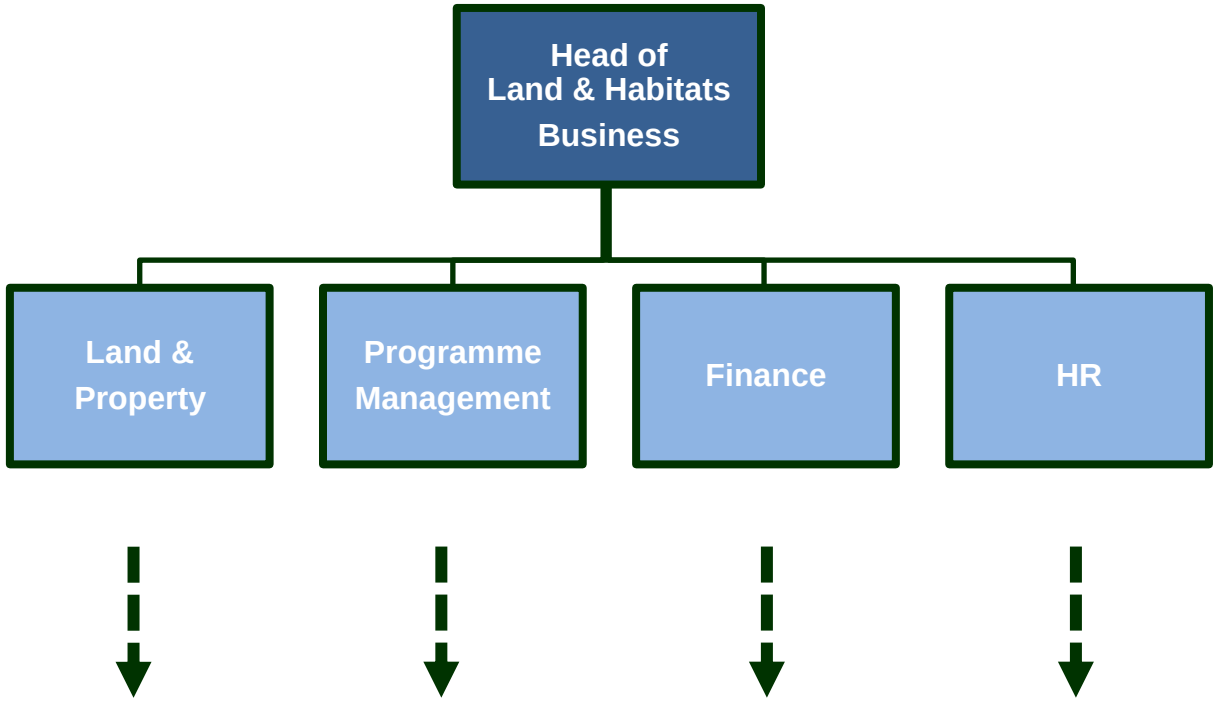
### BnM Senior Leadership Team




## 2.2 Organisational Structure for Health & Safety



## 2.3 Organisation Structure - Bord Na Móna Land & Habitats



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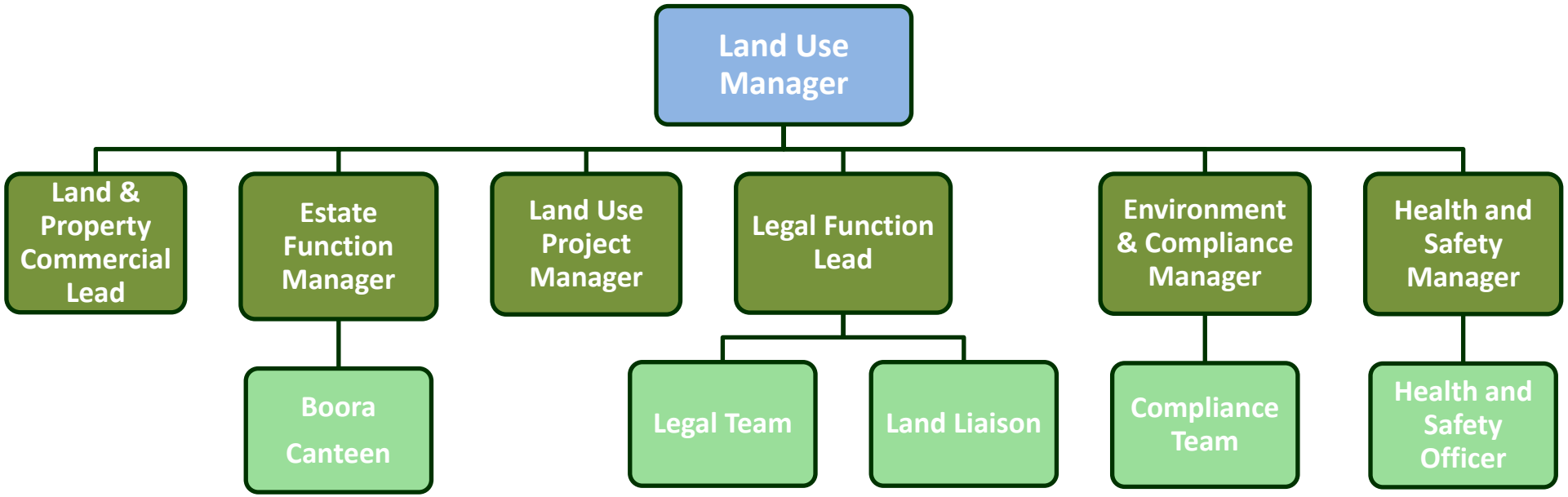
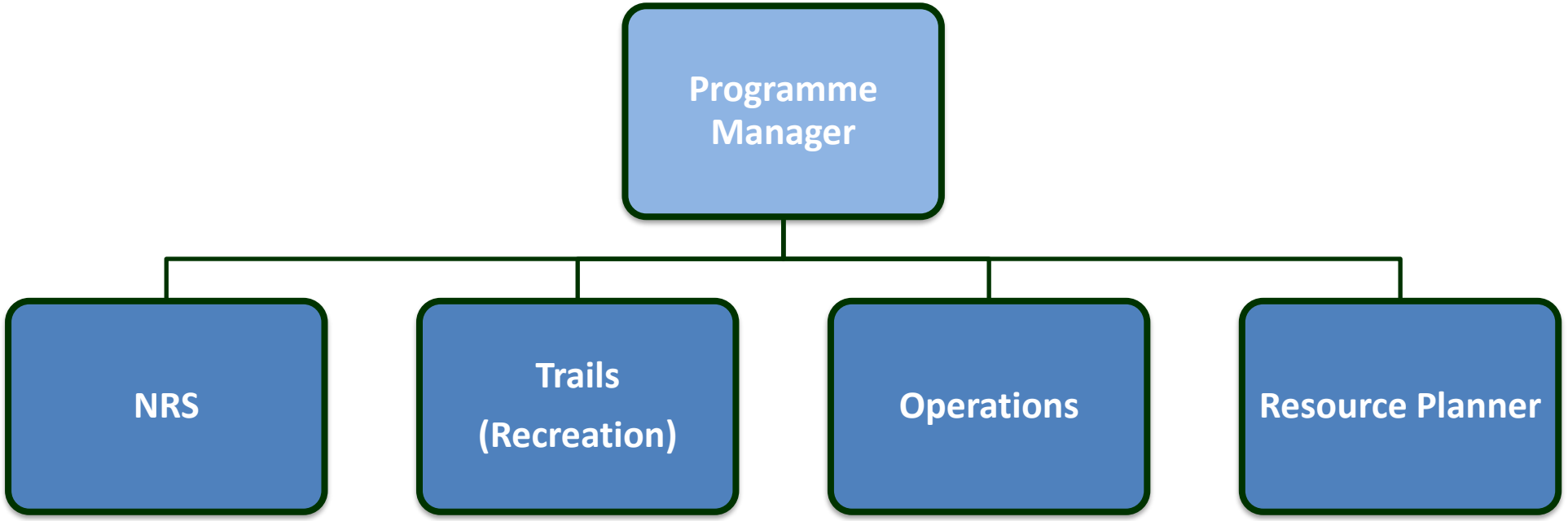
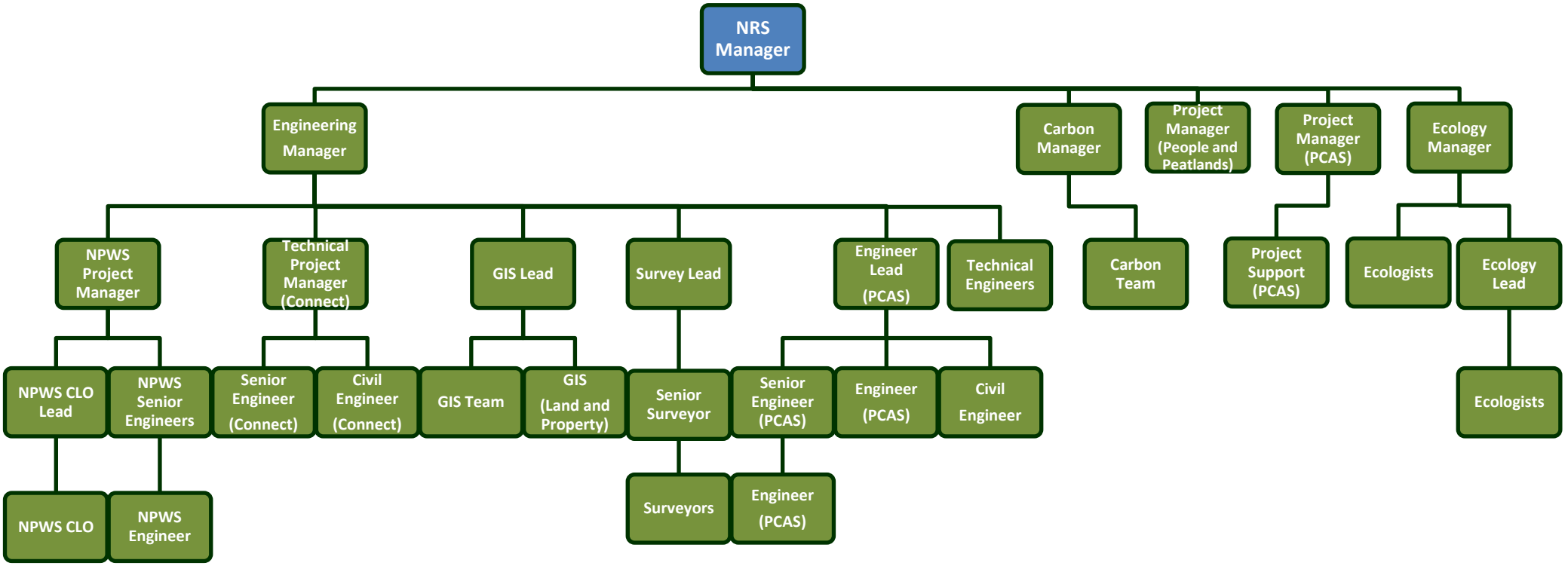


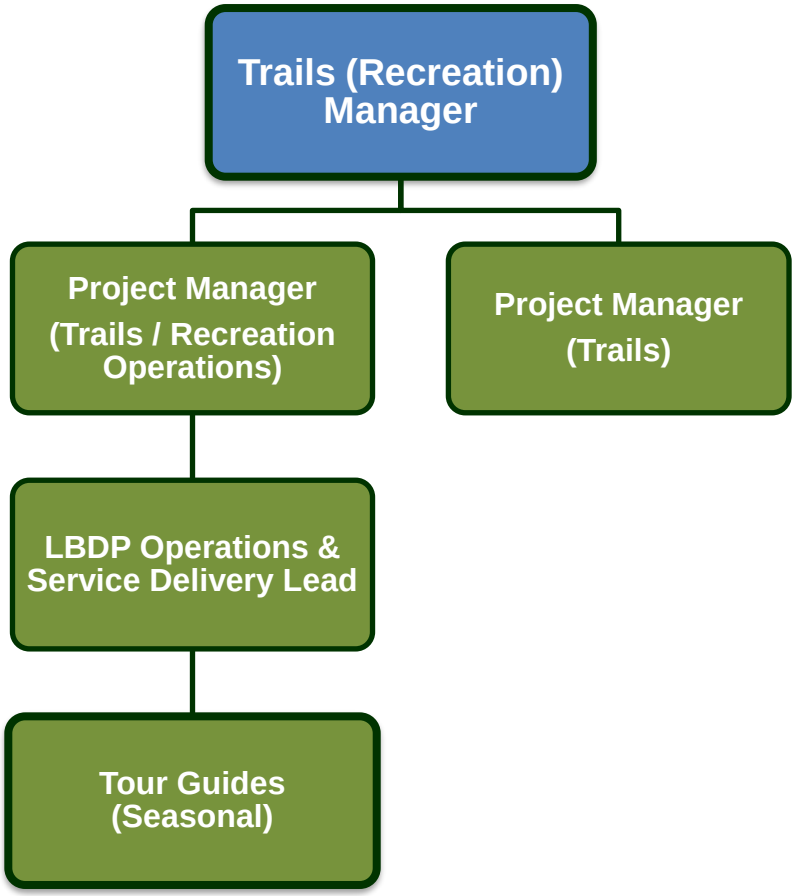
# Programme Management



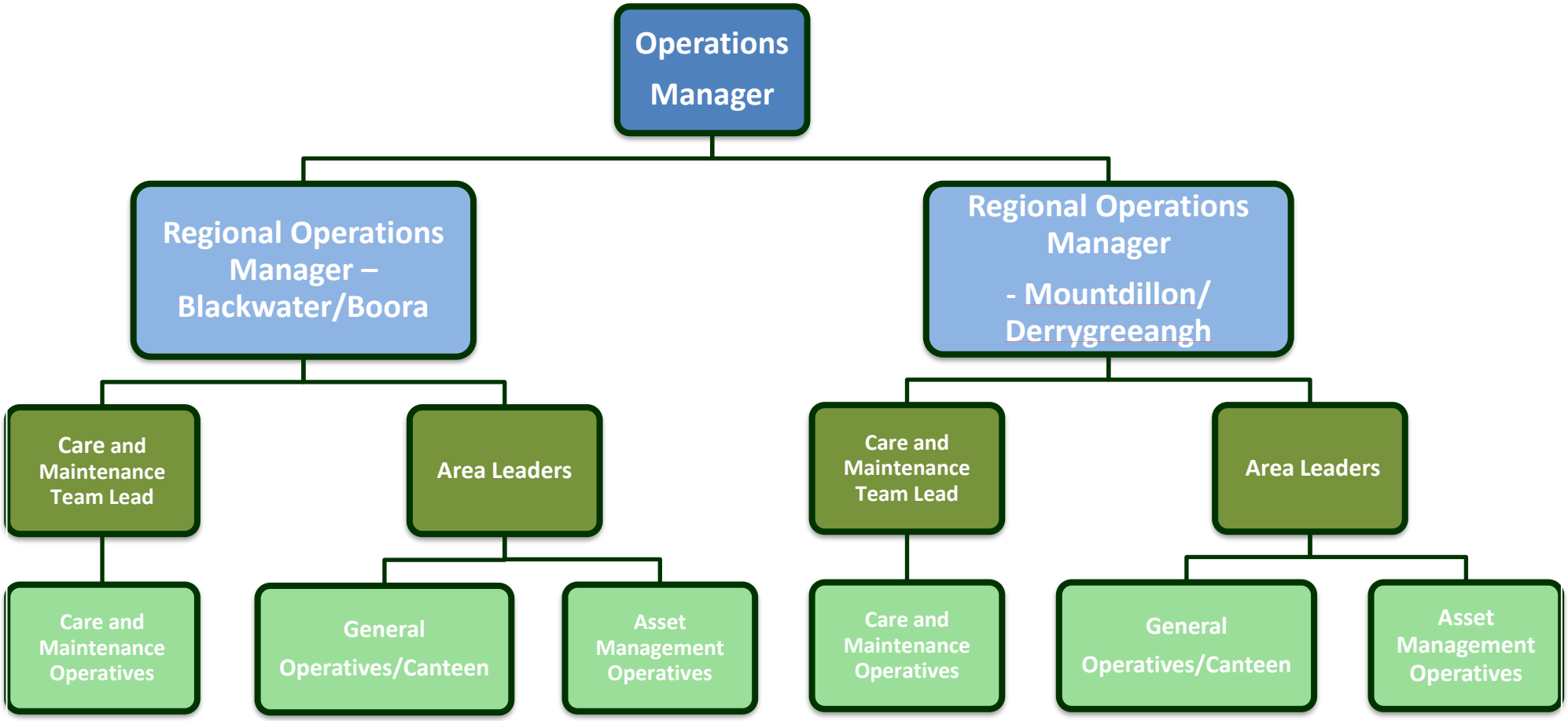
# Natural Resource Services



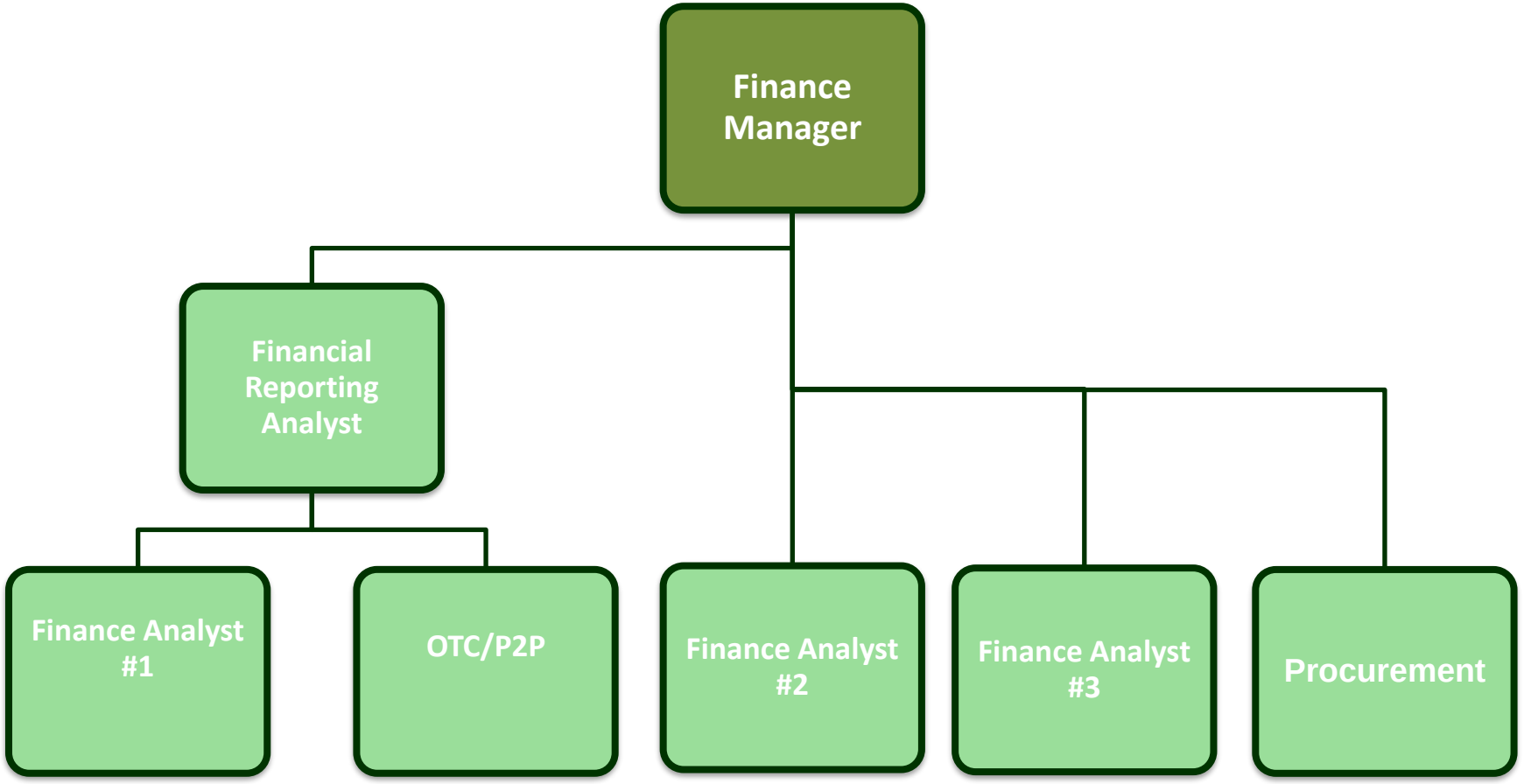
# Trails (Recreation)



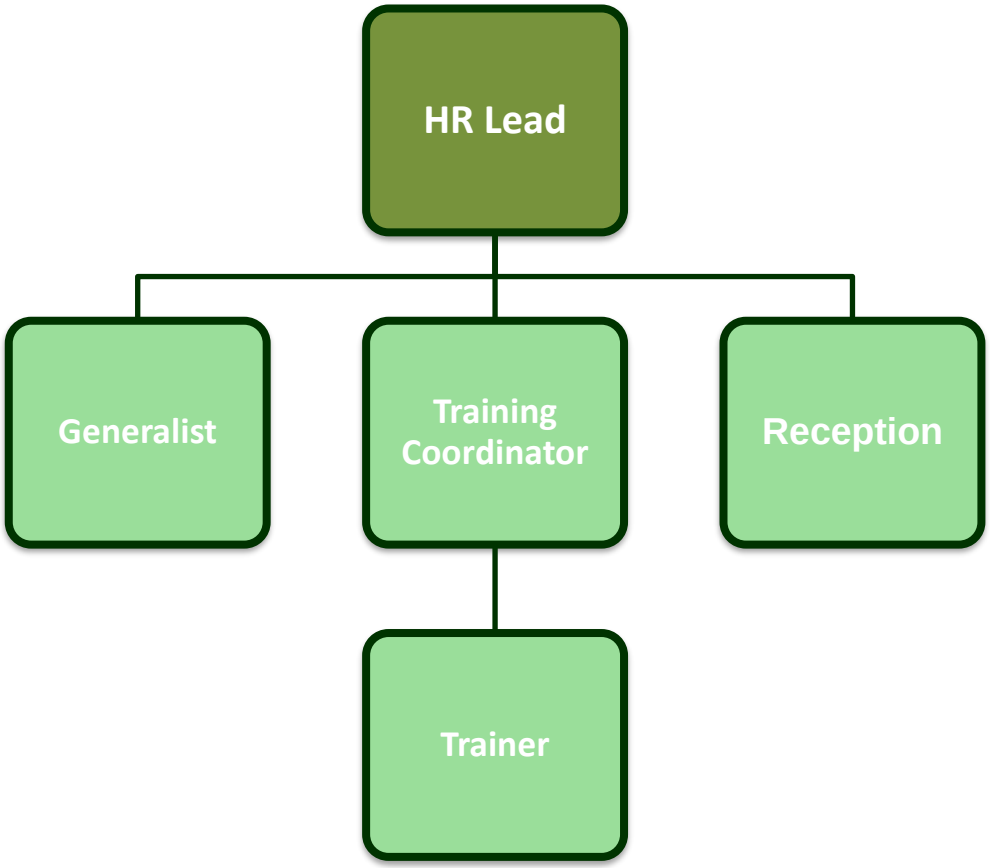
# Operations


Operations Manager
Regional Operations Manager – Blackwater/Boora
Regional Operations Manager - Mountdillon/ Derrygreeangh
Care and Maintenance Team Lead
Area Leaders
Care and Maintenance Team Lead
Area Leaders
Care and Maintenance Operatives
General Operatives/Canteen
Asset Management Operatives
Care and Maintenance Operatives
General Operatives/Canteen
Asset Management Operatives

# Finance


Finance Manager
Financial Reporting Analyst
Finance Analyst #1
OTC/P2P
Finance Analyst #2
Finance Analyst #3
Procurement

## HR


HR Lead
Generalist
Training Coordinator
Reception
Trainer

# Part 3 RESOURCES, ROLES AND RESPONSIBILITIES

## 3.1 Aims and Objectives

It is the aim of Bord Na Móna to ensure that employees, agency workers, contractors and service providers are provided with as safe and healthy a workplace as far as is reasonably possible. Each employee must therefore make a judgement as to the safety requirements in individual situations. Bord na Móna are committed to minimising risks to employees in these situations by identifying hazards and eliminating risks or if this is not possible, by providing appropriate protective equipment and training.

In accepting responsibility to provide safe and healthy working conditions for its employees the organisation aims are to:

- Ensure legal requirements are met.
- As part of our health and safety management this Safety Statement is part of our health and safety aims and consultation process and it is important to note that everybody has a duty to peruse this safety statement in conjunction with other safety statements, risk assessment, safety booklets and policies applicable to their worksite.
- Provide information to employees on safety legislation, standards and codes of practice and such material which would assist safe working.
- Continue to develop and operate safe working practices and procedures.
- Identify all workplace hazards, assess the associated risks, implement appropriate control measures, taking account of the principles of prevention, to eliminate where possible or minimise such risks to acceptable levels, and monitor their effectiveness.
- Develop awareness in each individual of his/her personal responsibility for the safety of himself/herself and fellow employees, through information, training, supervision and consultation.
- Engage the assistance of any technical or medical services deemed necessary to ensure acceptable standards within the company.
- Strive to continuously improve health and safety management based on performance monitoring and in line with changes in legislation and best practice.
- Communicate the contents of the safety statement to all employees at all times and ensure the safety statement is acceptable to them at all times.

To ensure these objectives are met, the C.E.O. and Management at all levels are committed to playing an active role in the implementation of the safety statement and undertake to review and update the statement as per legislative requirements and to ensure their validity and effectiveness.

## 3.2 The Company Board

The Board to ensure commitment to health and safety and to ensure the provision of safe working conditions throughout Bord Na Móna and its business units. The Board wish to outline clearly the responsibilities for the maintenance and improvement of health and safety conditions within Bord Na Móna.
All board members and officers of undertakings who authorise or direct any work activities must understand their legal responsibilities and their roles in governing safety and health, upholding core safety and health values and setting good safety and health standards for their business.

Board Members can do this by:

- Ensuring that safety and health is an integral part of the management process
- Setting clear safety and health values and standards
- Thinking strategically about corporate safety and health responsibilities
- Being open and constructive about safety and health regulation
- Rewarding good safety and health behaviour
- Creating a culture of integrity about and responsibility for safety and health matters

The most senior management in the organisation must ensure that all board members have a clear understanding of the key safety and health issues for the Bord Na Móna and its business units and are continually appraised fully of the safety issues or risks likely to arise. Whatever role board members play in the running of the undertaking, they must have, or ensure the availability to the undertaking of, the basic knowledge and safety and health competence that their role requires.

It is important for the board to remember that, although safety and health responsibilities can and should be delegated to senior managers, the legal responsibility for safety and health rests with the employer.

- Each board member and senior manager must accept his/her individual role in providing safety and health leadership for the undertaking.
- Strong leadership is vital in delivering effective safety and health risk control.
- Everyone in the undertaking must believe that the board is committed to the continuous improvement of safety and health performance and must know what its expectations are of them and how they should deliver what is expected of them.
- By involving all staff in the development and maintenance of safety and health, the issue of safety and health becomes everyone's business.

The key tasks that board members should carry out in ensuring that they accept collective responsibility and meet their legal safety and health obligations include:

- Reviewing and, where appropriate, endorsing the safety statement when prepared by the senior management team.
- Receiving regular reports on progress, performance and implementation of safety and health plans.
- Ensuring sufficient resources are made available to achieve and implement these safety and health plans.
- Ensuring that the senior managers and the workforce are actively involved in the management of safety and health.
- Developing a communications plan to show the board's commitment to its safety and health policy.
- Making sure the necessary organisational structures exist to ensure that safety and health is properly managed.
- Keeping aware of all matters in relation to safety and health, especially major incidents and changes in legislation.
- Ensuring safety and health audits are undertaken to monitor all aspects of safety and health policy implementation.

## 3.3 Chief Executive Officer (CEO)

The CEO and the senior management team shall establish a broad strategic direction on safety and health management and this should be set and approved by the Board. They should determine how the management of workplace safety and health should happen at the workplace interface and are responsible for ensuring that good practices are followed.

The Chief Executive Officer of Bord Na Móna retains ultimate responsibility for the implementation of the Company's Health & Safety Policy and management of Health, Safety and Welfare in Bord Na Móna and its business units, so far as is reasonably practicable.

The Chief's Executive's responsibilities are summarised as follows;

- Being fully familiar with the Group Safety Statement and any subsequent revisions.
- Ensure the safety considerations are included as an integral part of the company's activities.
- Demonstrating, through personal behaviour that proactive management of Health and Safety is a key business value, and only the highest standards of Safety are acceptable.
- Ensure that an Effective Company Safety Statement has been prepared and that appropriate arrangements are made to ensure the Company's Health and Safety Policy is implemented and communicated.
- Reviewing periodically personal competency and that of business unit managers regarding their health and safety responsibilities.
- Protect their own Safety and Health and that of any other persons that may be affected by their acts or omissions in the workplace.
- Ensuring as far as practicable the provision of a safe place of work, safe plant and equipment, safe systems of work, competent staff, sufficient resources and appropriate materials are available to meet the requirements of all safety legislation.
- Ensuring provision of appropriate resources to deal with emergency situations, accident and dangerous occurrence investigation.
- Ensuring efforts are made to continuously improve the Health and Safety performance of the company.
- Ensuring arrangements are in place for consultation with, and participation and representation by employees in relation to health, safety and welfare.
- Ensuring that sufficient & adequate structures and personnel are in place in relation to the management of health, safety and welfare within the company.
- Ensure the company Safety Statement is reviewed on an ongoing basis and updated as required.
- To report to the board of Directors on any relevant health, safety and welfare matters within the Company as they arise.
- Ensuring the inclusion in the report of the directors of Bord na Móna, under section 158 of the Companies Act, of an evaluation report on the extent to which the safety statement has been fulfilled.

**The Chief Executive Officer of Bord na Móna is : Tom Donnellan**

## 3.4 Head of Land & Habitats

The Head of Bord na Móna Land & Habitats has responsibility for ensuring the proper management of Health, Safety and Welfare throughout the Land & Habitats business, so far as is reasonably practicable.

These responsibilities include;

- Demonstrating, through personal behaviour that proactive management of Health and Safety is a key business value, and only the highest standards of Safety are acceptable.
- Approval of the Health and Safety Policy for Bord na Móna Land & Habitats, and ensuring sufficient resources are provided to implement same.
- Ensuring the safety, health and welfare of persons directly under their control.
- Ensuring the Health and Safety policy, Safety Statement and other established Health and safety policies and systems are implemented, reviewed and communicated as required and appropriate.
- Ensuring an appropriate risk assessment system is in place for all activities in the business, ensuring that all hazards within their business are identified, risk assessed and adequately controlled.
- Ensuring efforts are made to continuously improve the Health and Safety performance of the Bord na Móna Land & Habitats business.
- Ensuring arrangements are in place for consultation with, and participation and representation by employees in relation to health, safety and welfare.
- Ensuring as far as practicable the provision of a safe place of work, safe plant and equipment, safe systems of work, competent staff, sufficient resources and appropriate materials are available to meet the requirements for the management of health, safety and welfare according to the legislation.
- Ensuring the provision of adequate and appropriate training, information and supervision for employees in the business.
- Ensuring appropriate procedures and resources are in place to deal with emergency situations and accident and dangerous occurrences are investigated with a view to determining the cause and prevent recurrence.
- Reviewing periodically personal competency and that of business unit managers regarding their health and safety responsibilities.
- Ensuring that sufficient competent persons are in place in relation to health, safety and welfare.
- Reporting on Health and Safety performance of Bord na Móna Land & Habitats at corporate level.
- Carry out regular documented safety inspections/walks.

**The Head of Bord na Móna Land & Habits is : Ger Breen**

## 3.5 Business Unit Managers

**Land Use Manager; Programme Management Manager, Finance & Human Resource Managers**

Bord na Móna **Land & Habitats** consists of four sections: **Land & Property, Programme Management, Finance & Human Resources.**
The manager of each Business section has responsibility for ensuring the proper management of Health, Safety and Welfare within their operational Business section in so far as is reasonably practicable.

- Demonstrating, through personal behaviour that proactive management of Health and Safety is a key business value, and only the highest standards of Safety are acceptable.
- Ensuring the Health and Safety policy, safety statement and other established Health and safety policies and systems are implemented, reviewed and communicated as required and appropriate within the Operational Business section for which they are responsible.
- Ensuring appropriate and adequate resources for:
  - Hazard Identification and risk assessment and implementation of mitigation measures.
  - Provision of adequate and appropriate training, information, instruction and supervision for employees.
  - Arrangements are in place to deal with emergency situations.
  - Reporting and investigation of accidents and incidents.
  - Provision of suitable welfare facilities
- Ensuring efforts are made to continuously improve the Health and Safety performance of the Business section for which they are responsible.
- Ensuring arrangements are in place for consultation with, and participation and representation by employees in relation to health, safety and welfare.
- Reporting on Health and Safety performance of Bord na Móna Land & Habitats Business section for which they are responsible.
- Ensuring the safety, health & welfare of persons directly under their control.
- Ensuring regular documented safety inspections / walks are carried out in their Business section.

## 3.6 Section / Department Manager / Managers

This manager is responsible for managing and conducting activities within their control, in accordance with the requirements of the Health and safety Policy, so as to secure, so far as is reasonably practicable, the safety, health and welfare of employees.

Responsibilities include:

- Ensuring the provision and maintenance, as far as is reasonably practicable, of a place of work, including any plant and equipment and substances therein, that is safe and without risk to employee safety, health or welfare.
- Ensuring the site safety statement is implemented, reviewed and revised as necessary, and communicated in an appropriate manner to employees and those who may be affected by the facility activities.
- Ensuring workplace hazards are identified, assessed and the associated risks eliminated / mitigated, so far as is reasonably practicable, taking account of the principles of prevention.
- Ensuring arrangements are in place for the protection of persons not employed by the business, including, contractors, visitors and members of the public.
- Provision and maintenance of safe systems of work to ensure protection of employee safety, health and welfare.
- Ensuring that employees under their control receive appropriate information, training, instruction & supervision to enable the safe and competent performance of their tasks.
- Ensuring that arrangements are in place to facilitate the safe undertaking of work by contractors and service providers.
- Ensuring that adequate Emergency plans and procedures are in place; that all employees are aware of actions to be taken in case of emergency and appropriate training is given.
- Ensuring arrangements are in place for employee consultation and representation in relation to safety, health & welfare matters.
- Provision and maintenance of adequate welfare facilities and that good housekeeping standards are maintained.
- Ensuring procedures are implemented in the event of accidents and dangerous occurrences, and the subsequent reporting and investigation of such events are undertaken.
- Provision of sufficient trained occupational first aid personnel and first Aid equipment.
- Ensuring the safety, health & welfare of persons directly under their control.
- Ensuring effects are made to continuously improve the Health & Safety performance of the Business.
- Carrying out regular documented safety inspections / walks in his/her area.

## 3.7 Supervisors / Area Leaders / Lead Operators

- Day to day responsibility for ensuring the safety, health and welfare of employees under their control, in accordance with this safety statement.
- Ensure compliance with risk assessments, procedures and systems of work associated with activities within their areas of control in so far as is reasonably practicable.
- Ensure employees under their control receive required and appropriate instruction, information, training and supervision.
- Ensuring that Emergency plans and procedures are implemented as required; that all employees are aware of actions to be taken in case of emergency.
- Ensuring procedures are implemented in the event of accidents and dangerous occurrences, and the subsequent reporting and investigation of such events are undertaken.
- Ensuring adequate coordination and control of contractor personnel on site.
- Ensuring that good housekeeping standards are maintained.
- Ensuring the safety, health & welfare of persons directly under their control.
- Carrying out regular documented safety inspections / walks in his/her area.

## 3.8 Bord na Móna - Head of Environmental, Health and Safety (EHS)

Establish, implement, maintain and continually improve a Safety Management System (SMS) for Bord Na Móna Plc and its subsidiaries including but not limited to:

- Report to Head of HR, SLT and Board Sub-Safety Committee on Safety Performance and performance of the SMS including accident/ incidents and pre-determined KPI's.
- Interpret and advise Business units on the implications and implementation of specific legislation relating to H&S compliance.
- In conjunction with the H&S Team in all Business Units, ensure compliance with statutory and regulatory approvals, permissions, and licences.
- Development, consultation and communication of H&S Policies and procedures, and document control system for all Lean Centre driven H&S Documentation.
- Primary H&S point of contact for key external stakeholders e.g. H.S.A, Lost adjusters etc.
- Promote and foster H&S and employee wellbeing, as a priority in the business.
- Management of appropriate systems to monitor safety performances of the Business.
- Management of a central accident reporting system.
- Assist H&S Team with risk assessment requirements, reporting and investigation of Incidents, Accidents, and dangerous occurrences to minimise such occurrences.
- In cases of high and immediate risk, pro-actively intervene and put measures in place to ensure employee safety and welfare is protected.
- Management of Safety on the Newbridge Complex.
- Lead and Monitor the execution of the H&S Strategy Plan.
- Provision of advice and guidance to all Businesses on matters relating to Health & Safety Compliance.
- Development of formal communications relating the Health & Safety.
- Governance on compliance of all Businesses with the Bord Na Mona SMS through documented auditing, inspecting and verification checks.

- COVID19 Lead Worker Representative

## 3.9 Land & Habitats Health & Safety Manager & Officers

Provide advice to management and employees on matters relating to safety, health and welfare.

- Monitor overall health and safety performance within the business and communicate results to management and employees including reporting and investigating accidents and dangerous occurrences and completing and reporting on H&S Inspections.
- Maintenance, management and tracking of the Business Action Log which facilitates safety con-conformity tracking and communication of same at regular intervals with management and Head of EHS.
- Liaise with Bord na Móna Land & Habitats Management in the development and implementation of plans or systems for the management of health and safety and welfare within Bord na Móna Land & Habitats.
- Liaise with Head of EHS regarding Safety, Health and Welfare, Formulate monthly reports for submission to the Head of EHS.
- Communicate companywide activities relating to safety, health and welfare to management and personnel within business unit.
- Participate in / coordinate the preparation, maintenance & revision of safety documents, safe systems of work and safety management systems.
- Report any major non-compliance and significant hazards to the Head of Land & Habitats and Section Managers in the first instance, and to the Head of EHS.
- Keep up to date with new health and safety and other relevant legislation and communicate as necessary to relevant persons.
- Report any major non-compliance and significant hazards to the Head of Business in the first instance, and to the Head of EHS.
- Liaise with external bodies / authorities as necessary relating to matters of workplace safety health and welfare.
- Ensure a Site-Specific Safety Plan is completed prior to any Construction work commencing on site, and ensuring all activities during works are in compliance as per requirements of Safety, Health and Welfare at Work (Construction) Regulations 2013.

## 3.10 Duties of the Employer

The *Safety, Health and Welfare at Work Act (2005) Section 8-11* place duties, on every employer, to employees including the provision of adequate training for all employees in relation to Health and Safety.

Bord Na Móna management, with the aim of providing a safe working environment for all persons affected by its operations, recognises its responsibility to fulfil the following duties:

- Provide and maintain a safe and healthy place of work and working conditions, competent employees and to develop and maintain safe systems of work.
- Ensure adequate resources, structures and systems to effectively manage workplace safety, health and welfare.
- Identify all workplace hazards, assess the associated risks, implement appropriate control measures, taking account of the principles of prevention, to eliminate where possible or minimise such risks to acceptable levels, and monitor their effectiveness.
- Provide information, instruction and training - in a manner and language understood by the trainee - and supervision to enable employees to perform their work safely and effectively.
- Provide necessary protective equipment and safety devices and supervise their use.
- Protect, as far as is reasonably practicable, persons not employed by the company who may be affected by our activities.
- Ensure contractors and service providers comply with company safety requirements.
- Strive to continuously improve health and safety management based on performance monitoring and in line with changes in legislation and best practice.
- Build on its safety culture and continue to raise health and safety awareness amongst employees.
- Consult with employees and contractors on matters of health, safety and welfare and take account of representations made by employees on such matters.
- Review this policy and the safety statement, as per legislative requirements, and to ensure their validity and effectiveness.

## 3.11 Duties of Employee's

The *Safety, Health and Welfare at Work Act (2005) Section 13-15* places duties on every employee and Persons in Control of Places of Work.

All employees are expected to co-operate fully with all provisions taken by the company for ensuring Health and Safety, and Welfare of co-employees and members of the public using the premises, and to:

- Take reasonable care for his own Safety, Health and Welfare and that of any other person who may be affected by his/her acts or omissions while at work.
- Co-operate with management and any other person to such extent as will enable management or the other person to comply with any of the statutory provisions.
- Comply with any information, instruction, training and supervision given in order to work safely.
- Use, in such a manner so as to provide the protection intended, any suitable appliance, protective clothing, equipment, guarding, or any means or item provided for securing his/her Safety, Health and Welfare while at work
- Report to management or his/her supervisor, without unreasonable delay, any defects in plant, equipment, place of work, which might endanger safety, health or welfare, of which he/she becomes aware.
- Report all accidents or dangerous occurrences, whether they cause injury or damage or not.
- Must not be under the influence of any intoxicant or drugs at work to the extent that they could be a danger to themselves or others.
- Shall not misrepresent themselves, as regards their level of training, on entering into a contract of employment with their employer.
- Be familiar with emergency procedures, fire and assembly points, and escape routes relevant to their work.
- Any employee who does not adhere to company Health and Safety rules will be subject to appropriate disciplinary procedures.
- All employees are reminded that they have a specific statutory duty as outlined in Chapter 2 under section 13 and 14 of the Safety, *Health and Welfare at Work Act 2005* and also have duties under the *Safety, Health and Welfare at Work (General application) Regulations 2007*.
- Each employee is advised to make themselves familiar with the contents of the Safety Statement and health and safety policies and risk assessments.
- Participate in Safety & Health training.
- Comply with all workplace safety rules.

## 3.12 Contractors / Persons entering the Workplace

### 3.12.1 Contractors & Service Providers

The Health and Safety Legislation Section 13 of the *Safety, Health and Welfare at Work Act 2005* outlines the duty of employers to Contactors / Service Providers. All Contractors / Sub Contractors must receive a full site induction prior to the commencement of any work.

- Contractors may be employed to undertake work in Bord na Móna in a number of ways including, under the management of BnM Engineering & Services; directly by Bord na Móna Land & Habits management, or via central procurement contracts.
- Contractors must comply with the obligations set out in Bord na Mona's Policy for Contractors, Site rules, and any further instructions given by Bord na Móna Land & Habitats personnel.
- Contractors must provide safety statement, specific method statements, risk assessments, training records and certification as required, for the work they are contracted to undertake. Such documentation must be submitted in advance of work commencing and is subject to review by health & safety personnel.
- Contractors must undergo site safety induction and have read & accepted relevant safety rules.
- Contractors may only work on the premises if covered by adequate employers and public liability insurance. Contractors Insurance Policies must be submitted to Bord na Móna for examination prior to commencing work to ensure that they conform to the company's requirements.
- Contractors, where required, will be issued with a permit to work and must adhere to all requirements of the permit.
- All contractor activities must be supervised / controlled by appropriate host.

Any person engaging a contractor to complete work for or on behalf of Bord Na Móna must ensure all necessary H&S requirements are fulfilled in advance of commencement of work. Minimum requirements for contractors are outlined in the **REF-BnM-H&S-008 Internal Management of Construction and Maintenance Contractors Policy**. H&S Team members should be consulted for any new / existing contractor. Compliance with BNM Safety Rules is mandatory. Non-compliance will result in the contractor receiving disciplinary as per REF-BnM-H&S-008.

Basic Contractor / Service Provider rules:

- Smoking is forbidden except in specifically designated areas. Smoking or naked flames could cause an explosion and/or fire.
- Comply with permit systems and safe work systems. Do not introduce or use unsafe tools or equipment.
- Mandatory use of protective clothing and safety equipment in specific areas.
- Safety procedures and equipment must be used for entry to confined spaces. Always consult with the liaison person to ensure that all possible risks are identified and precautionary measures adopted in advance.
- In the event of accidents or fires, notify the liaison person immediately of an accident/incident or fire.
- Action in the event of the fire alarm sounding, evacuate immediately to the designated assembly point and await further instructions.

- Do not introduce or use any potentially dangerous chemical or substance (e.g. adhesives, chemicals or cleaning agents) on to this site without prior consultation with liaison person. Waste material or rubbish should be disposed of as per regulations.
- Do not borrow or use tools, equipment or property of Bord na Móna.
- Stay in your own work area. Do not wander throughout the site.
- Observe speed limits and traffic control.
- Do not introduce or use intoxicants or narcotics on Bord na Móna premises, this is strictly forbidden.

### 3.12.2 Visitors

A Visitor is defined as any person not employed on the Bord na Móna site this also includes Bord na Móna Land & Habitats employees from other sites. Visitors are managed through **REF-BnM-H&S-005 Visitors Policy**.

- It is the policy of Bord na Móna Land & Habitats Management to ensure, in so far as is reasonably practicable, that persons not in their employment but who may be affected by their operations, are not exposed to risks to their safety, health or welfare.
- Persons visiting Bord na Móna Land & Habitats premises by invitation, or on official business, not in receipt of a site safety induction, must be accompanied by a Bord na Móna employee at all times while on site.
- Bord na Móna Land & Habitats employee's visiting Bord na Móna sites of which they are not a direct employee must notify the Bord na Móna person responsible for the area they are visiting in advance of their visit.
- Visitors must comply with all relevant site safety rules and instructions given by Bord na Móna personnel while on site.
- It is the responsibility of all Bord na Móna employee's to familiarise themselves with REF-BnM-H&S-003 "Use of Personal Protective Equipment" and make any visitor aware of such requirements.
- Visitors must not intentionally or recklessly interfere with or misuse any protective device or equipment used for securing safety, health or welfare of persons at work.
- It is the policy of the company that no unauthorised persons are allowed onto our work sites.

## 3.13 New Employees to Bord Na Móna

The following must be carried out by the Manager or competent person of the direct workplace where the new employee will be required to work. Safety Induction of new employees must be documented and include but not limited to:

- Briefing on the content and location of the current Safety Statement, explain its purposes and ensure employee is aware of his/her responsibility.
- Briefing on the Health and Safety Handbook for Employees/ Contractors and ensure that the new employee signs the acknowledgement slip at the back of the handbook.
- New employees must be made aware of any hazards / risks associated with the workplace.
- Advise and issue new employee with suitable protective clothing or equipment necessary and identify the locations where it is required and mandatory to use.
- How to report an accident and safety observation and to who.
- Emergency briefing including first aiders, contact details, fire evacuation accident reporting etc.
- Manual Handling training must be arranged as soon as possible for all new employees.

# Part 4 GENERAL SAFETY ARRANGEMENTS

## 4.1 Consultation and Representation

Management recognises that employee involvement in Health and Safety in the workplace is an integral part of ensuring that high standards are reached and maintained.

Bord na Móna is also committed to complying with the requirements of *the Safety, Health and Welfare at Work Act 2005 Section 26* specifies that an employer must consult with employees and take account of any health and safety representations made by the employees for the purpose of given effect to the employer's statutory duties. This mandatory and consultation mechanism must be provided.

Employees will be consulted in matters relating to their safety, health and welfare in compliance with the *SHWW Act 2005*.

Equally employees may at any time consult management on steps taken to secure their safety, health and welfare.

Employees are encouraged to consult management on steps to improve any aspect of safety, health and welfare.

Employees will be consulted on any modifications to this safety statement that may be required to take account of changes in the business and also upon review of this safety statement.

To facilitate consultation and representation within the Bord na Móna Land & Habits business, each works has a safety committee; its members include representatives from amongst employees and management.

### 4.1.1 Safety Committee

The Safety Committee may hold a minimum of four meetings per year.

The safety committee has the following functions:

The safety committee provides a forum through which management and employees can communicate in relation to matters of safety, health and welfare in the workplace.

The safety committee may identify hazards and raise safety, health & welfare issues relating to the work place, and put forward recommendations to management to improve safety.

The safety committee may also assess the effectiveness of implemented safety measures, and report their findings to management.

### 4.1.2 Safety Representative

Employees may elect from amongst themselves a safety representative, who, once elected, will undergo appropriate training as a representative.

Management will consult with the safety representative on matters of safety, health and welfare and consider any reasonable representation made by him / her.

Provisions shall be made for the safety representative to carry out inspections of the workplace and to be provided with information relating to safety, health and welfare of persons in this workplace.

The safety representative, where elected, has a number of rights as set out in the *Safety, Health and Welfare at Work Act, 2005, Section 25*.

A safety representative may:

- Carry out inspections having given reasonable notice to the manager or immediately following an incident.
- Investigate accidents and dangerous occurrences, provided these do not interfere with the performance of statutory functions.
- Investigate complaints regarding safety, health and welfare, upon reasonable notice to the employer.
- Accompany an inspector, except where the inspector is investigating an accident or dangerous occurrence.
- Accompany an inspector, at the discretion of that inspector, who is investigating an accident or dangerous occurrence.
- Attend the interview, at the discretion of the inspector, where an inspector is interviewing an employee relating to an accident or dangerous occurrence.
- Make representation to the employer in relation to Safety, Health and Welfare which must be considered by the employer.
- Make oral or written representations to inspectors in relation to safety and health at work, including in relation to accident / dangerous occurrence investigation.
- Receive advice and information from an inspector in relation to safety and health issues.
- Receive time off as may be reasonable without loss of remuneration in order to
  (a) Acquire knowledge to carry out his functions.
  (b) To carry out those functions.
- He must be informed when an inspector is on the premises for the purpose of carrying out an inspection.
- The employer and safety representative will agree a schedule of inspections which may be carried out taking account of the hazards and risks at the place of work.

The name of the current Safety Representatives and their contact details can be found on all notice boards throughout the company's work locations.

## 4.2 Training and Instruction

Training needs and functions within Bord na Móna Land & habitats are coordinated by an in-house training specialists in conjunction with management and health & safety personnel. Where appropriate, training is provided by in-house trainers.
The services of competent persons / organisation are employed, where necessary, to carry out all other required training.

All members of staff are required to co-operate fully in attending any training courses identified. Training is provided in a language and manner which is understood by the recipients.

All employees receive training and instruction to ensure that they fully understand the hazards of their work area, the control measures put in place to minimise the risks and the emergency procedures at the facility.

Training is repeated periodically as appropriate.

All new employees must complete the BnM EHS Induction & Manual Handling Induction.

New employees will be made aware of the location of relevant safety documentation, including this Safety Statement.

Additional training will be provided in the following circumstances as necessary;-

- A change in work practices.
- The introduction of new systems of work.
- A change in equipment / machinery.
- The introduction of new technology.

Training is given to management to ensure that they have all the necessary skills and knowledge to organise and control work safely and without risks to health.

Training records for individuals are retained both at local works and at a centralised location.

## 4.3 Personal Protective Equipment

Bord na Móna makes every effect to eliminate any hazards in the workplace by use of appropriate procedures and controls. The company recognises that P.P.E. is provided as a last line of defence, where other measures to eliminate or reduce an unavoidable hazard are not reasonably practicable.

It is the policy of Bord na Móna to provide and replace, when necessary, train in use of, and supervise the wearing of required protective equipment in accordance with current regulations.

It is the policy of Bord na Móna that suitable PPE is provided for employees and a documented policy is in place detailing the type of PPE to be worn in each work location area. It is a strict requirement that all persons must wear PPE.
**REF-BnM-H&S-003 "Use of Personal Protective Equipment"** outlines PPE to be used in all areas of Bord na Móna.

Critical pieces of PPE requiring a thorough inspection, such as lifejackets and harnesses are inspected by a competent person and fitted with a tag detailing the date of inspection and next inspection date.

Certain areas within Bord na Móna Land & Habitats have requirements for mandatory wearing of PPE:

Other P.P.E. requirements are determined by the hazard and associated control measures in place, and are documented in risk assessments.

## 4.4 Fire Safety

The *Safety, Health and Welfare at Work Act, 2005, Safety, Health and Welfare at Work (General Application) Regulations 2007 and Fire Services Act 1981 & 2003* require that employers prepare and plan for an emergency.

Fire safety within Bord na Móna Land & Habitats is managed in two main areas: Fire safety in Peat Bog Areas and fire safety at offices / works.

The ***Fire Prevention & Fire Fighting Policy for Production Bogs*** highlights Bord na Móna Land & Habitats Management commitment to and outlines overall arrangements for fire safety in peat bog areas.

The ***Fire Prevention & Fire Fighting Procedures for Production Bogs,*** in addition to the ***Bord na Móna Fire and Environmental plan,*** detail plans for fire prevention and fighting in peat bog areas and works locations.

It is the intention of Bord na Móna Land & Habitats management to take all practicable measures to prevent outbreak of fire by means of ensuring:

- Implementation of above policy and procedures.
- Activities are risk assessed to identify potential fire hazards and allow for implementation of suitable control measures to eliminate or reduce to a minimum the associated risks.
- Selection of suitable equipment & machinery which is used appropriately and adequately inspected and maintained by competent personnel.
- Maintenance of good house-keeping practices.
- Installation of appropriate fire detection and alarm systems, emergency lighting, and fire-fighting equipment which are adequately inspected and maintained by competent personnel according to *Fire Services Act 1981 & 2003*.
- Proper use, storage and disposal of flammable materials.
- Use of permit to work system, as appropriate, for hot work to be undertaken.

In the event of an outbreak of fire, and to reduce the potential for injury, Bord na Móna Land & Habitats management aims to ensure:

- All personnel receive periodic instruction / training in the use of fire-fighting equipment.
- All personnel have received periodic training in and are aware of emergency procedures, including participation in evacuation drills at least twice a year.

A Fire Safety Register will be maintained by the Works Manager for each office / factory site.

## 4.5 Vehicle Safety

All company vehicles are subject to the requirements of the Bord na Móna Road Traffic Manual. Relevant extracts of the manual may be retained in vehicles to which they relate.

The requirements of relevant sections of the Road Traffic Manual must be brought to the attention of all users of company vehicles.

Personnel must have an appropriate licence / training for each category of company vehicle which they operate.

Company vehicles should carry safety equipment as outlined in the traffic manual. Vehicles are subject to periodic checks by drivers and routine maintenance undertaken by competent personnel.

All vehicles entering company work sites must adhere to site traffic management arrangements, such as signs, road markings etc.

All drivers of company vehicles must obey the rules of the road as laid down in the *Road Traffic Act 1961* and also comply with site traffic rules.

Driving for work within Bord na Móna is managed via **REF-BnM-HS-0012 Driving for Work Policy** . All persons who drive for work, both their own personal vehicles and company vehicles are required to complete a Driver Declaration form, all drivers are responsible for ensuring the information on their Driver Declaration form is up to date at all times whilst driving for work.

## 4.6 Machinery and Equipment

A wide range of machinery and equipment is in use in Bord na Móna Land & Habitats. This machinery and equipment includes but is not limited to, tractors, general construction machinery and mobile plant, manufacturing equipment including automated conveying and handling systems, powered portable tools, hand tools, etc.

In selecting work equipment, account is taken of the specific working conditions, characteristics and hazards in the place of work having regard to the safety and health of the employees and any additional hazards posed by the use of such work equipment.

It is the intention of management of Bord na Móna Land & Habits to ensure that

- All work equipment and machinery is:
    - Suitable and safe for its intended use, taking account of risks involved in such use.
    - Used only for the purpose for which it was intended and under suitable conditions.
    - Maintained in good working order, according to appropriate Health & Safety legislation requirements, including the *SHWW (General Application) Regulations 2007*, as amended, and where applicable, the *SHWW (Construction)* Regulations 2013.

- All personnel using such equipment and machinery are provided with adequate information, instruction and training, enabling them to do so safely and competently
- Machinery and equipment are clearly marked, where required, with appropriate safety warnings.
- First aid boxes and fire extinguishers are provided in all BnM vehicles.
- Any PPE required is provided, maintained and worn when using equipment or machinery.

#### 4.6.1 Work at Height and Lifting Equipment

Lifting equipment is inspected as per *General Application Regulations 2007, Schedule 1 Part B* for lifting accessories including chains, ropes, rings, hooks shackles, clamps etc.
Along with pre-use checks, the maintenance and inspection and certification of lifting and working at height equipment as per statutory regulations are carried out at required intervals by a competent external company.
Tags are fitted to each piece of equipment detailing the date of inspection and next inspection date.
Working at Height work requires a job specific Method Statement and Risk Assessment.
Employees working at height must be trained and certified to use working at height equipment.(See 4.12)

#### 4.6.2 Electrical Equipment

Under the Safety Health and Welfare at Work General Application Regulations 2007 Part 3 sections 74-93 Bord na Móna Land & Habitats Management and Operatives shall ensure all electrical devices and machinery to be used on site are approved, designed, installed, maintained and used and inspected by a competent person on a regular basis to ensure safety and health in the workplace.
Such equipment shall be protected and of the type suitable for the purpose, the degree of inspection according to the local standard, and to the correct rating and voltage as is specified under current and applicable legislation.

The electrical cables shall be installed and arranged so that they do not impede or endanger the operatives moving around.

Electrical cables on the ground/above the passages, in particular, shall be protected effectively by collective means i.e. conduits, designated cable run etc.
The electric power supply board, light fittings or other electric equipment installed are not allowed to be removed, changed or repaired without permission and where such repairs are deemed necessary, this repair shall be carried out by trained electrical personnel.
The use of broken or damaged electrical devices and cables is strictly prohibited.
Damaged devices will be removed from use for repair immediately upon discovery.
Only a qualified person is permitted to carry out maintenance on the electrical installations.
Unauthorised entry/access to electrical rooms, transformer housing, fuse boxes, sealed/secured electrical installations or components is prohibited.

## 4.7 House keeping

Poor house-keeping in a workplace leads to accidents. It is therefore imperative that a high standard of tidiness and cleanliness is maintained at all work locations within the business.
House-keeping practices at Bord na Móna Land & Habitats work locations include:

- Adequate and appropriate storage for all equipment and materials on site.
- Provision of suitably located bins appropriate for the collection of the various waste streams produced on site.
- Timely removal of waste from collection areas to avoid fire hazard potential and unhygienic conditions.
- Periodic site audits to monitor site cleanliness / tidiness and implement corrective actions where required.
- Peat Handling locations where there is an extra fire risk requiring extra prevention such as;
    - Ensuring no build-up of peat under plant and conveyors.
    - Cleaning up of peat spillage as they occur.
    - Regular cleaning schedules.

## 4.8 Welfare Facilities

It is the policy of Bord na Móna management to ensure provision of adequate welfare facilities for all employees in accordance with requirements of the *Safety Health and Welfare at Work Act 2005 and the Safety Health and Welfare at Work (General Application) Regulations 2007, as amended*.

The following personal hygiene and general welfare facilities are provided for work locations. Employees are obliged to take reasonable care of these facilities.

- Sanitary and washing facilities.
- Personal lockers – workshops, factories.
- Designated Rest Break Area maintained at a suitable temperature.
- Canteen Area with tea/coffee making / cooking facilities.
- Drinking water supply of suitable drinking quality conveniently accessible to all employees.
- First Aid Provision including stocked first aid kits and presence of trained first aider(s) on site.

All work areas are kept in a clean state and accumulations of dirt, refuse, trade refuse and waste are removed at least once every day by a suitable method and the floor of every workroom is cleaned on a regular basis by a suitable method.

All employees have reasonable opportunities for sitting without detriment to their posture or where a substantial proportion of any work done by employees can properly be done sitting, suitable facilities for sitting are provided and maintained for their use.

In all offices the quality, type and arrangement of work tables/surfaces and work chairs are selected, as far as is reasonably practicable, to avoid undue discomfort, back strain and eye strain.
All offices areas are regularly cleaned and maintained. All office areas are heated.

It is in everyone's interest that the facilities are provided, maintained and respected. Any fall in standards is to be reported without delay.

## 4.9 Site Security

During business hours, each work location is under the control of a Location Manager / Area Leader / Supervisor / Lead Operator responsible for the work location.

On close of daily business, buildings / bog centers and access gates to the works will be locked.

Office, Workshop, and Factory alarm systems are also used for further security.

Contractors entering Bord na Móna Land & Habitats sites to undertake work must have a site contact or host, who is responsible for controlling the movement & activities of contractors while on site. All persons entering / leaving Bord na Móna Land & Habitats office locations are also required to sign an Admissions register.

## 4.10 Hazardous Substances

A register of hazardous substances used within the Bord na Móna Land & Habitats business is retained at each stores and factory site. In addition, safety data sheets are kept for all hazardous substances and are used to risk assess their use and storage.

Where possible, Bord na Móna Land & Habitats will endeavour to eliminate the use of or replace hazardous substances with less hazardous alternatives.

More often today we find the use of corrosive and toxic substances, ranging from oils, acids, resins and solvents playing a major part in work related activities. The following points are to be considered when using chemicals;

- Always wear the appropriate gloves when handling any chemical and apply personal hygiene practices.
- Read the instructions on the container and follow said instructions, noting any precautions advised.
- If one is unsure of the nature of a chemical or compound or whether it is correct for the task in hand – DO NOT USE.
- If any chemical or compound does not have adequate information supplied with it (usually on the container) it should not be accepted onto site. This should be brought to the attention of the stores personnel, management immediately.
- The basic information required is
  - What chemicals does it contain?
  - What are the appropriate safety precautions?
  - What action is required if there is accidental contamination?

- In addition, a Safety Data Sheet should be available for any chemical / compound used and suppliers are required by law to provide such to users upon request. In certain circumstances it might be simpler to obtain an SDS direct from the Manufacturer or the distributing agent, who are subject to the same legal onus as the supplier to provide an SDS.
- Ensure the work area in which the substance is to be used is well ventilated.
- Where possible avoid inhaling the substance – use Respiratory Protective Equipment.
- Do not put any material or rags which have been soaked in the substance in your pockets or next to your skin.
- Always wash your hand after using chemicals especially before meals.

## 4.11 Manual Handling

Employees working in the Bord na Móna Land & Habits are involved in the manual handling of loads in one form or another as part of their daily working duties. Hazards that are associated with Manual Handling include back pain, back injury, strains or sprains of the arm, back or legs due to over-exertion as well as foot injuries from falling loads.

It is the policy of Management that no person will be expected to lift a load that would be likely to cause him/her injury.
Mechanical lifting equipment is available and these must be utilised, in preference to manual handling, in any situation where it is feasible to do so. If this is not possible, then consideration must be given to the weight of the load and proper manual handling techniques must be used.

Training in manual handling is given to all employees. This training is to meet the requirements of the *Safety, Health and Welfare at Work (General Application) Regulations 2007 (Manual Handling).* Safety footwear is provided for and must be worn by all employees when engaged in manual handling.

Every employee must be familiar with the correct lifting techniques. These may be summarised as follows:

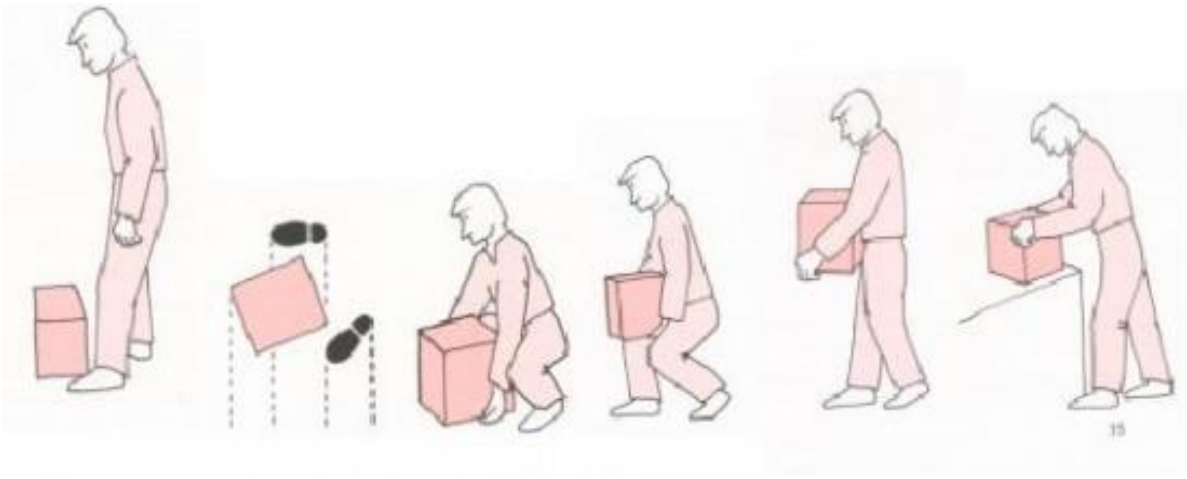
Manual Handling Task

- Size up the job.
- Only lift what you are capable of lifting.
- Where possible use mechanical lifting equipment.
- Do not carry a load that you cannot see over.

When lifting, lowering or transferring a load always bend your knees, keep back straight, elbows close to the body to maintain stability and hold the load close to the body and avoid twisting the body

- Check for sharp edges, splinters or nails;
- Lift in easy stages - floor to knee then from knee to carrying position;
- Hold weights close to body;
- Don’t jerk, or twist body;
- Grip load with palms - not fingertips;

The risk from manual handling can further be reduced by having each employee ensure that the working environment is maintained in a safe condition. This includes yards, passageways and floors kept in a good condition and free from obstruction.



## 4.12 Working at Height

Where possible all works at height are to be avoided.

Where such works are unavoidable, equipment and other measures to prevent falls are to be put in place. Where such works cannot eliminate the risk of a fall, equipment and other measures should be in place to minimise the distance and consequences of a fall should one occur.

- All work at height must be properly planned, organised and those involved in such works should be competent.
- A Dynamic Risk Assessment should be carried out for each working at height activity and only appropriate equipment should be selected, which is regularly inspected and maintained.
- The Management should ensure that during the execution of work the surrounding area is maintained in an orderly and tidy condition and that loose material of any kind is not left in working areas.
- Safe access to all work must be provided in the form of proper scaffolding, mobile elevated work platforms, ladders, steps, walkways etc.
- A mid-rail is required wherever there is a guardrail.
- The bottom support of any scaffold is to be placed on a proper base plate on timber sole planks spanning two standards to prevent slipping or sinking.
- Scaffolding shall, wherever possible, be approached by ladders direct from the ground. Ladders must extend a minimum of 1 metre above the landing platform and be adequately secured to the scaffold by their stiles, not by the rungs.
- Records of scaffold erection and 7 day inspections must be carried out by a designated competent person and details kept on file.
- Safety harnesses, crawling boards for access to fragile roofs and similar safety equipment and arrangements should be employed.
- There will be protection in place to protect operatives from falling objects and to restrict unauthorised entry into potential danger zones.
- When working close to the edge of roofs or girders, guardrails or safety harnesses or both should be used.
- Ladders are only to be used where the risk is low and where there is no reasonable alternative platform possible.

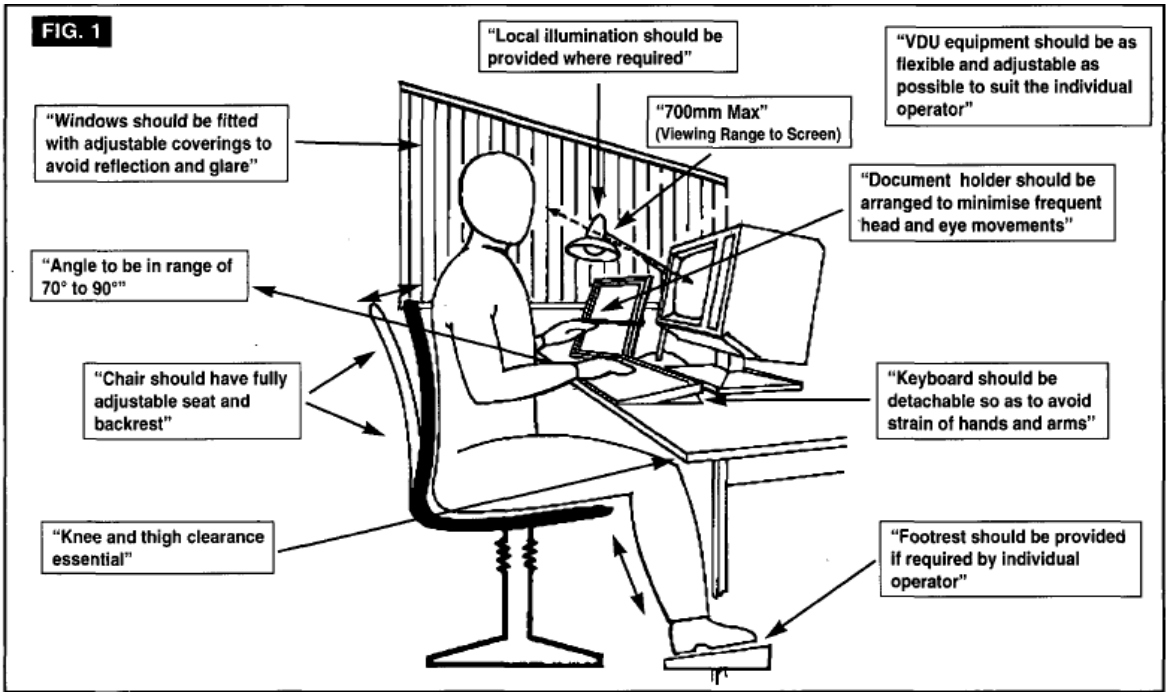
## 4.13 Visual Display Unit (VDU)

Bord na Móna complies with *Chapter 5 of Part 2 (Display Screen Equipment) of the Safety, Health and Welfare at Work (General Application) Regulations 2007 and Section 9 & 10 of the Safety Health and Welfare at Work Act 2005* instruction, information and training in the use of workstations and VDUs.

A user is defined as a person for whom use of the display screen forms a significant or substantial part of his/her working time, therefore:

- The workstation for each individual user shall be assessed to see if it is set up appropriately for the work (chairs, desks etc.).
- All users and non-users are required to report any defects in environment or equipment or personal health status which could affect their ability to work safely and in comfort.
- Appropriate breaks are catered for, and the nature of the work is such that naturally occurring breaks occur.

- While using a VDU does not cause eye damage, BNM provides eye tests to all users.




## 4.14 Lone Working

Bord na Móna acknowledges that some employees are required to work alone carrying out a diverse range of activities.
Employees who work by themselves without close or direct supervision and who are physically isolated from colleagues and without access to immediate assistance are recognised as lone workers.
When employees work alone, all hazards associated with lone working will be identified, the risks assessed, control measures identified and implemented to ensure to ensure the safety and health of employees and those affected by such activities.
**REF_BnM-H&S-007 Lone Working Policy** outlines how lone working is managed, the general hazards, Risks and control measures associated with Lone Working in Bord na Móna.

## 4.15 Robbery / Theft

Bord na Móna will ensure that all employees whose role involves the handling of cash are protected in the event of robbery. Cash handling training is provided along with security systems. Management have in place a cash handling policy.
In the event of a robbery taking place employees should:

- Remain calm and observe as much as you can.
- Speak only if you need to answer the offender(s).
- Do not reach for pockets or handbag, keep hands visible.
- Control movements carefully.
- Unnecessary risks should not be taken.
- Raise the alarm only when safe.
- Secure the premises once the offender(s) have left.
- Call the Gardai and ask witnesses to remain.
- Close the premises and place a notice on the entrance stating the location is closed due to robbery.
- Do not interfere with any traces left or touch anything left behind by the robber(s).

## 4.16 Pregnant Employees.

Because there are various hazards in the workplace which may affect either the health of the woman or her developing child, a risk assessment must be carried out on each work practice to conform to guidelines laid down in *Safety, Health and Welfare at Work (General Application) Regulations 2007*.

The Regulations
(a) Identify a list of conditions known to affect a pregnant woman, a breast feeding woman or the developing child.
(b) Outline the ways to manage health & safety of the pregnant (or breast-feeding) woman during this period.

### 4.16.1 Responsibilities of Pregnant Employees & their Supervisor

**Employees**

- Report their pregnancy to their Supervisor/Manager as soon as confirmed to the employee by a medical practitioner.

**Supervisor/Manager**

- Risk assess the work been undertaken by the pregnant Employee and make any changes necessary in work undertaken by pregnant/breast-feeding Employees.
- Maintain regular contact with the Employee through the course of the pregnancy to ascertain the Employees changing condition.
- Review all notification reports.
- Conduct periodic consultation with the employee regarding their wellbeing.

### 4.16.2 Considerations regarding Pregnant Employee Work Duties

**Standing Tasks**
Consideration must be given to relocate a pregnant Employee from tasks that require long periods of standing. It is worth noting that a pregnant Employee may experience difficulty in sitting during the last weeks of pregnancy and may express a preference to stand at this stage.

**Work Involving Chemical Exposures**
Chemical substances are not typically used but if introduced then a risk assessment must be carried out to determine any additional Hazards to the pregnant employee.

**Manual Handling**
Consideration must be given to relocating a pregnant Employee from tasks that include excessive periods of manual handling.

**Other Factors (Non-exhaustive list)**
Other factors to include in consideration of work undertaken by a pregnant or breast-feeding woman include potential for:

- Physical Shocks including direct blows to abdomen.
- Exposure to extremes of noise, cold or heat.
- Extremes of non-ionising radiation (magnetic fields, X rays).
- Biological Agents (viruses, bacteria etc.)

## 4.17 Work Environment

During the course of work due consideration will be paid at all times to the current environmental conditions. Bord na Móna Land & Habitats recognises that adverse conditions can have a detrimental effect on employees and on securing their safety. Particular attention should be paid to;

- Temperature – too hot or too cold –physical wellbeing.
- Ventilation – insufficient air supply.
- Lighting – poor visibility, trip/fall hazards.
- Noise – Lack of attention, noise induced hearing loss, deafness.

A dramatic rise or fall in any of these may affect Bord na Móna's personnel, their wellbeing and ultimately the carrying out of the work safely. It is everybody's responsibility to monitor these and to bring to management's attention any drastic or sudden changes likely to affect the safety of our employees.

## 4.18 Noise at Work

Under the *Safety Health and Welfare at Work (General Application) Regulations 2007* an employer must assess the noise levels in the workplace. At 80dB [A] the employer must make available hearing protection to employees. At 85 dB [A] the employer must ensure that hearing protection is provided and worn. The Maximum Exposure Limit Value for noise is 87dB [A] and this limit should not be exceeded for any operative.

- Exposure Action Values means that the daily noise exposure level which if exceeded for any employee requires specific action to be taken, Furthermore:
  - If the exposure to noise varies from days to day, for the purpose of the exposure limit and values, a weekly noise exposure level can be used instead of a daily one.
  - The exposure limit can be measured at the ear but the reduction in noise level provided by hearing protection must be taken into account.

- When the First Action Level of 80dB [A] is present, the following actions will be taken;
  - A Risk Assessment must be carried out. This will entail measurement of the noise levels to which there is exposure. Risk Assessments should be carried out by competent persons and recorded. These Risk Assessments should be carried out at regular intervals.
  - All measures are to be taken to eliminate or reduce exposure.
  - Hearing Protection PPE is to be provided.
- When the Second Action Level of 85 dB [A] is reached, the following will be carried out;
  - A Risk Assessment is to be undertaken. This will entail measurement of the noise levels to which there is exposure. Risk Assessments should be carried out by competent persons and recorded. These Risk Assessments should be carried out at regular intervals.
  - The identified Noise Hazard Areas are to be demarcated with suitable warning signs posted.
  - The use of Hearing Protection PPE supplied is to be enforced.
- All employees are to be consulted on site with regards to identified noise hazards.
- Information and training to be provided to employees with regards to identified Noise Hazards.
- Measures will be taken by Bord na Móna Land & Habitats to eliminate or reduce such exposure to noise hazards whether by design, layout of the workplace, technical noise reduction measures and work organisation means.

- Health Surveillance is to be made available to employees who by Risk Assessment are revealed to be susceptible to the risk by their exposure.

## 4.19 Vibration at Work

Mechanical vibrations at work can expose Bord na Móna Land & Habitats employees to hand-arm vibration and/or whole-body vibration.

The body is more vulnerable to vibration at certain frequencies. Low-frequency motion, from about 5 to 20 Hertz (cycles per second), is thought to be potentially more damaging than higher frequency motion. Vibration at frequencies below 2 Hz and above 1,500 Hz is thought to be less damaging.

Hand-arm Vibration is caused by the use of work equipment and work processes that transmit vibration into the hands and arms of employees. It can be caused by hand-held power tools such as hammer drills, sanders, grinders, impact tools, etc.
Long-term, regular exposure to Hand-arm Vibration is known to lead to potentially permanent and debilitating health effects known as hand-arm vibration syndrome (HAVS), such as vibration white finger and carpal tunnel syndrome.

Whole-body Vibration is caused by vibration transmitted through the seat or the feet by workplace machines and vehicles. It can be caused by off-road vehicles, e.g. tractors, when driven over rough surfaces; locomotive travelling over rail; by excavators when excavating difficult ground; and by standing close to powerful, fixed machines.
Regular, long-term exposure to high levels of Whole-body Vibration is linked to lower back pain.

Under the *Safety Health and Welfare at Work (General Application) Regulations 2007 Chapter 2 of Part 5* and Safety, Health and Welfare at Work (Control of Vibration at Work) Regulations 2006.

The damage caused by vibration is related to the total vibration exposure a person is exposed to during the working day.

The exposure **limit** value (ELV) is the maximum daily level of vibration an employee may be exposed to.

- For Hand-arm Vibration the daily exposure limit value standardised to an eight-hour reference period is 5 $m/s^2$.
- For Whole-body Vibration the daily exposure limit value standardised to an eight-hour reference period is 1.15 $m/s^2$.

The exposure **action** value (EAV) is the level of daily exposure to vibration for any employee which, if exceeded, requires employers to take action to reduce risk.

- For Hand-arm Vibration the daily exposure action value standardised to an eight-hour reference period is 2.5 $m/s^2$.
- For Whole-body Vibration the daily exposure action value standardised to an eight-hour reference period is 0.5 $m/s^2$.

Bord na Móna Land & Habitats subject to *Safety Health and Welfare at Work (General Application) Regulations 2007 Chapter 2 of Part 5* and Safety, Health and Welfare at Work (Control of Vibration at Work) Regulations 2006 shall ensure that;

- Employees are not exposed to mechanical vibration above the relevant exposure limit value.
- If, despite the measures taken to comply with these regulations, the exposure limit value is exceeded, Bord na Móna Land & habitats shall;
  - Take action to reduce exposure to mechanical vibration to below the exposure limit value.
  - Identify the reason for that limit being exceeded, and
  - Amend the technical and organisational measures taken to prevent it being exceeded again.

Bord na Móna Land & Habitats shall reduce exposure of employees to Whole-body and Hand-arm vibration by considering;

- The level, type and duration of exposure, including any exposure to intermittent vibration or repeated shocks.
- Safe working practices to minimise exposure to mechanical vibration.
- The choice of work equipment of appropriate ergonomic design which taking account of the work to be done, produces the least possible vibration.
- The provision of auxiliary equipment which reduces the risk of injuries caused by vibration, such as seats that effectively reduce whole-body vibration and handles which reduce the vibration transmitted to the hand-arm system.
- The choice of work equipment of appropriate ergonomic design which taking account of the work done, produces the least possible vibration.
- The provision of auxiliary equipment which reduces the risk of injuries
- Adequate information and training to instruct employees to use work equipment correctly, safely and without risk to health in order to reduce their exposure to mechanical vibration to a minimum.
- A limitation of the duration and intensity of exposure to mechanical vibration.

- All employees are to be consulted on site with regards to identified vibration hazards.
- Information and training to be provided to employees with regards to identified Vibration Hazards.
- Measures will be taken by Bord na Móna Land & habitats to eliminate or reduce such exposure to vibration hazards whether by design, layout of the workplace, technical noise reduction measures and work organisation means.

- Health Surveillance is to be made available to employees who by Risk Assessment are revealed to be susceptible to the risk by their exposure.

## 4.20 Dust

The principle effect reported from exposure to peat dust is primarily nuisance.

In order to reduce the risks of personal exposure to peat dust, the following arrangements and controls are necessary.

- All areas of the site should be cleaned on a regular basis paying particular attention to areas where the accumulation of peat dust is frequent. Cleaning should be performed either by blowing or wet methods.
- Sources of dust should be investigated and those identified should be controlled by appropriate means e.g. Ventilation, Suppression or Wetting etc.
- Suitable and sufficient respiratory protective equipment should be provided as a short term means of controlling personal respirable peat dust exposure or where exposure is only for short, infrequent periods, (for example, maintenance activities, cleaning).

## 4.21 Work at or near Water

All work at or near water must be fully risk assessed by the responsible person directing the work.
No persons are permitted to work in proximity of or over open water without the use of an approved and inspected life jacket, of which the users must be trained in its use by a competent person.
Consideration must be given if/ when using multiple controls to ensure compatibility (e.g. use of life jacket and harness if working from a MEWP over water).
It is important that Bord Na Mona Land & Habitats take all-practicable precautions to mitigate the potential for drowning particularly if work is carried out in poor visibility, lone working or at night. This should include adequate protection around any large or deep expanse of water and the provision of adequate signage and lifesaving equipment.
All relevant equipment must be inspected by a competent person.

## 4.22 Safe Systems of Work

In order to carry out our activities in a safe manner, a safe system / method is required. Safe Systems of Work are the integration of people, machinery and materials in a safe environment in order to provide the safest possible conditions for work.

Hazard identification and the resulting risk assessment are the initial step to a safe workplace. Having identified the hazard and assessed the risks then suitable control measures can be put in place in order to achieve a safe place of work, in as far as it is reasonably practicable. Systems themselves may be viewed as control measures that are recommended in order to reduce the risk potential from being realised.
It is therefore imperative that all personnel follow the requirements of the control measures listed in the risk assessments.

### 4.22.1 Lock Off / Hold Off System

Bord na Móna land & Habitats staff requiring to safely isolate equipment are trained in the use of the Lock off Hold Off procedure and use a personal Hold Off Card.

The piece of equipment to be worked on must be padlocked off by the Supervisor in charge and details logged on the Safe System Lock Off Log.
The Supervisor who locks off the main isolator hangs a Locked Off Card on the Isolator and checks to see that the piece of equipment is isolated.
Each employee working on the machine must then hang their own personal Hold Off Card on the isolation switch before work commences.
When the work is complete each employee removes their own Hold Off Card. The Supervisor checks the piece of equipment to see all cards are removed and that no one is working on it. He then checks the machine to see if it is safe to start and if satisfied removes the Lock Off Card.
The Padlock is then removed from the isolator switch. The machine is again checked and if satisfied, the machine is switched on. A detail of the removal of the lock off card is recorded on the Safe System Lock Off Log.
Under no circumstances must a Hold Off Card be removed by anyone other than the person that placed the Card / person named on the Hold Off Card.

## 4.23 Bullying, Harassment, Aggression and Assault

Bord na Móna fosters a collaborative work environment based on teamwork, accountability, and respect for the dignity and value of each employee. All employees are entitled to be treated with dignity and respect in the workplace and have a duty of care to treat others with dignity and respect.

Bord na Móna subject to *Safety Health and Welfare at Work Act 2005 Section 8* have a duty to manage and conduct their activities to prevent any improper conduct or behaviour which might affect the safety and welfare of employees. *Safety Health and Welfare at Work (General Application) Regulations 2007 Section 13 also imposes a corresponding duty on employees.*

Under no circumstances will any inappropriate behaviour such as bullying and harassment in the workplace be tolerated and it is the duty of Bord na Móna Land & Habitats management at all levels to prevent such behaviour.
**RA-BnM-H&S-005 Violence / Assault / Aggression / Bullying / Harassment Risk Assessment** outlines the hazards, risks and control measures associated with violence / assault / aggression / Bullying / Harassment in Bord Na Mona.

**Workplace Bullying:**
Is repeated inappropriate behaviour, direct or indirect, whether verbal, physical or otherwise, conducted by one or more persons against another or others at the place of work and/or in the course of employment which could reasonably be regarded as undermining the individual's right to dignity at work.
An isolated incident of the behaviour described in this definition may be an affront to dignity at work but as a once off incident is not considered to be bullying.

The following acts by an individual or group of individuals, irrespective of position with the Bord na Móna Land & Habitats business, shall be construed as violence/assault/aggression/harassment or bullying. These acts apply to both workplace and work sponsored functions outside of the premises.

- Using violence or the threat of violence towards another's person or property.
- Persistent, aggressive behaviour towards another.
- Repeated verbal harassment (e.g. picking on a person as the butt of jokes.
- Uncomplimentary remarks and/or use of songs/jokes or laughter as a form of ridicule.
- Repeated ridicule by the display of circulation of words, pictures or material.
- Repeated physical harassment (e.g. picking on a person or behaviour designed to ridicule, humiliate or terrorise an individual).
- Continued and deliberate staring, obstruction or other non-verbal physical behaviour.
- Showing hostility through sustained unfriendly contact or exclusion.
- Repeated unfair selection for difficult or unpleasant tasks.
- Theft or damage of individual property.

**Harassment**
On the nine grounds, other than gender, is defined as:

Words; gestures; production, display or circulation of material, that is unwanted by the recipient, related to any of the discriminatory grounds, and being conduct which has the purpose or effect of violating a person's dignity and creating an intimidating, hostile, degrading, humiliating or offensive environment for the person.

The Acts define sexual harassment as acts of physical intimacy; requests for sexual favours; words or gestures; production, display or circulation of written words or pictures; which are unwelcome to a person and which have the purpose or effect of violating a person's dignity and creating an intimidating, hostile, degrading, humiliating or offensive environment for the person. Same sex sexual harassment is also covered by the Equality Acts 1998-2011.

The HR Anti-Bullying and Harassment policy outlines the steps to be taken if anybody feels that they are being bullied or harassed in the workplace.

It is the impact of the conduct on the recipient and not the intent of the perpetrator that determines if the behaviour is unacceptable.

## 4.24 Workplace Stress

It is recognised that stress resulting from workplace pressures is of increasing concern to all and as such Bord na Móna Energy intends to be vigilant in its monitoring of management and staff in relation to this.

Workplace stress may arise when demands of the work and the surrounding environment on the person exceeds their capacity to meet them.

In order that Bord na Móna Land & Habitats may minimise the risk of occurrence of workplace stress;

It is intended to continually monitor all staff work duties, with particular reference to the following;

- Hours of Work – breaks, start and finishing times.
- Communications – between management and staff.
- Control – is the employee in control of their work.
- Role – do they understand their expected role.
- Repetition – is there provision for change in duties.
- Demanding – are target levels set too high, unrealistic.
- Worker/public interaction – are employees able to cope.
- Violence - has there been any indication of or potential for violence.

Stress can become a significant problem for individuals and can be a contributory factory to ill health such as heart disease or to accidents by reducing concentration. Individuals can be affected by stress in different ways and many sources of stress are not related to work.

Bord na Móna Land & Habitats management will monitor workloads of employees to ensure that they do not exceed reasonable expectations. Employees facing difficulties outside work, which may affect their ability to deal with their work effectively are encouraged to discuss their working arrangements with Bord na Móna Land & Habitats management.

## 4.25 Occupational Health

In line with the companies Health & Safety Strategy Plan to provide an Occupational Health Service for its employee's, **REF-BnM-HS-006 BnM Occupational Health Service Policy** outlines the core elements to the Service with a primary focus on prevention rather than cure.

The policy includes information on:

**Employee Assistance Programme (EAP)** provides employees and their family members with confidential counselling services that assist with personal, work, financial or legal issues.

**Health Screening** is a proactive approach to your own personal wellbeing and the wellbeing of our employees. Health screening aims to help people identify risk factors, signs, and symptoms of common conditions, which if not detected early could result in serious health issues.

**Health surveillance** means the periodic review, for the purpose of protecting health and preventing occupationally related disease, of the health of employees, so that any adverse variations in their health that may be related to working conditions are identified as early as possible. Health surveillance may be included as part of the Health Screening programme.

**Medical Fitness to Work assessments** are carried out to assess the candidate's fitness to do the job, to ensure that they can work without causing undue risk to themselves or others and to advise on any modifications required to enable the candidate perform the job safely and effectively. Pregnancy related assessments may also take place.

**Pre-employment medical assessments** are carried out to establish a candidate's fitness to perform the job without undue risk to themselves or others. It helps identify if workplace modifications or adjustments are required due to a disability. It also establishes a baseline against which future health changes can be compared.

**Occupational Injuries** personal injury resulting from an occupational accident.

**Long-term sickness absence** and return to work medical assessments are usually carried out after a period of continuous absence.

### 4.26 COVID-19 & Future Outbreaks

Coronavirus (COVID-19) is a new illness that can affect your lungs and airways. It is caused by a virus called coronavirus. The outbreak of Coronavirus (COVID-19) has evolved. The Government is leading the response in Ireland to this national public Health Risk and providing up to date information and advice at www.gov.ie. Bord Na Mona are following all guidelines in relation to COV-19 and will follow government instructions regarding future pandemic outbreaks.

Exposure to COVID-19 may present a health risk to Workers and other persons in the workplace. Employers are advised to follow the latest public health advice.

Bord na Mona's COVID-19 Response plan to deal with COVID-19 sets out arrangements to secure and manage safety, health and welfare at places of work within the company during the COVID-19 pandemic.

### 4.27 Health & Safety Policies

It is the intention of Management of Bord na Móna Land & Habitats to adopt and adhere to any corporate level health and safety policies in existence or which may be established in the future.
As may be required, Bord na Móna Land & Habitats management will draft relevant health and safety policies, in conjunction with safety personnel, for the business unit.

Copies of health and safety policies will be retained at work locations, and are also available on the company intranet.

## Part 5 EMERGENCY & ACCIDENT ARRANGEMENTS

### 5.1 Emergencies

It is the intention of management to identify the potential for, and take all practicable measures to prevent the occurrence of an emergency situation. However in the event of such an occurrence, in order to minimise potential for injury and ensure safe evacuation of persons, emergency procedures will be prepared, implemented, maintained and periodically reviewed.

**BnM L&H Emergency Procedures POHS B 0043** details emergency responses within the Land & Habitats Business.

Emergency contacts lists are posted on safety notice boards at each work location.

## 5.2 Accidents

Bord na Móna Land & Habitats Management acknowledge that all workplace accidents are preventable, and are committed to taking all practicable measures to avoid the occurrence of such accidents.

However if an accident does occur, the Accident & Dangerous Occurrence Reporting and Investigation procedure **REF-BnM-H&S-001** will be implemented. Provision of appropriate first aid (see s. 5.4 below) and medical treatment where required, is of primary importance in the event of an accident.

- All accidents at work must be reported to Bord na Móna Land & Habitats management so that appropriate measures can be taken to prevent their reoccurrence.
- Fatal accidents in a workplace will be reported immediately to Bord na Móna Land & Habitats management and to the Health and Safety Authority (HSA) on (01) 6147000 (Mon – Friday 9am -4pm) in addition to the Gardaí so that the necessary action, including any investigation by the HSA, can take place. Subsequently, the formal accident report form will be submitted to the HSA within five working days of the death.
- The Bord na Móna Accident report form **SOP-BnM-H&S-001-F1(a)** must be completed as soon as possible following an accident and within 48 hours and sent to the H&S Central Reporting System and Health and Safety team.
- Accident Investigation must be carried out by a designated accident investigator lead by Health and Safety Personnel within 7 working days of the accident using **SOP-BnM-H&S-001-F1(b)** and sent to the H&S Central Reporting System and Health and Safety team.
- Following the accident investigation, the Health and Safety Investigator and Bord na Móna Land & Habitats management must establish the “root cause” and complete the Remedial Actions Form **SOP-BnM-H&S-001-F1(c)** within 10 working days of the accident and sent to the H&S Central Reporting System and Health and Safety team.
- Where necessary an **I.R.1** Form must be completed by Bord na Móna Land & Habitats management and sent to the Health and Safety Authority (HSA) within 10 working days.
- Details from accident reports are recorded on the H&S Central Reporting System and used to carry out analysis in order to identify potential trends and implement appropriate measures to prevent further similar accidents.
- Where the occurrence of an accident at a particular work location may have an impact at other work locations, an Accident alert form will be completed and sent to those relevant locations.

Accident procedures and forms are maintained electronically. Paper copies are retained in suitable locations to allow access when required. All personal information gathered during dangerous occurrence/incident reporting and subsequent investigation is considered privileged and confidential and will be handled according to Bord Na Mona’s Data Protection Policy.

## 5.3 Dangerous Occurrences

Management acknowledge the importance of recording and investigating workplace incidents which had the potential to, but did not cause injury, for the purpose of preventing the occurrence of further similar incidents resulting in injury. It is therefore the policy of the company to report and, where necessary, investigate fully such dangerous occurrences in the place of work.

When a Dangerous Occurrence does occur, the Accident & Dangerous Occurrence Reporting and Investigation procedure **REF-BnM-H&S-001** will be implemented.

- All Dangerous Occurrences at work should be reported to Bord na Móna Land & Habitats management so that appropriate measures can be taken to prevent their reoccurrence.

- The Bord na Móna Dangerous Occurrence report form **SOP-BnM-H&S-001-F2** must be completed as soon as possible following an accident and within 48 hours and sent to the H&S Central Reporting System and Health and Safety team.
- Dangerous Occurrence Investigation using **SOP-BnM-H&S-001-F1(b)** and remedial actions using **SOP-BnM-H&S-001-F1(c)** must be carried out by a designated accident investigator lead by Health and Safety Personnel within 1 month of the incident occurring and sent to the H&S Central Reporting System and Health and Safety team.
- Where necessary an **I.R.3** Form must be completed by Bord na Móna Land & Habitats management and sent to the Health and Safety Authority (HSA) within 10 working days.
- Details from dangerous occurrence reports are recorded on the H&S Central Reporting System and used to carry out analysis in order to identify potential trends and implement appropriate measures to prevent further similar accidents.
- Where the occurrence of a dangerous occurrence at a particular work location may have an impact at other work locations, an incident alert form will be completed and sent to those relevant locations.

Dangerous Occurrence procedures and forms are maintained electronically. Paper copies are retained in suitable locations to allow access when required. All personal information gathered during dangerous occurrence/incident reporting and subsequent investigation is considered privileged and confidential and will be handled according to Bord Na Mona's Data Protection Policy.

## 5.4 First Aid

It is the intention of the management of Bord na Móna Land & Habitats to provide and maintain appropriate first aid equipment and adequate numbers of trained Occupational First Aid personnel at the workplace, as required by *part 7, chapter 2 of the Safety, Health and Welfare at Work (General Application) Regulations 2007, as amended and Regulation 163 of the 2007 Regulations.*

Occupational First aid personnel will receive refresher training as required.

Each work location will have at least one person trained as PHECC First Responders (including use of AED). First Aid kits are provided in all work locations and in all work vehicles.
In addition AED units are provided in suitable locations.

All hybrid workers are required to complete the "Emergency First Aid" training via Go Contractor to increase first aid awareness amongst staff in the unlikely event that an PHECC First Responder is not present onsite due to the Hybrid Working model.

A list of first Aid personnel will be posted on the safety notice board at each work location.

# Part 6 HAZARD IDENTIFICATION & RISK ASSESSMENT

Management acknowledge the critical importance of hazard identification and risk assessment in endeavouring to secure the safety, health and welfare of employees and others at the work place, and thus prevent accidents at work.

Therefore management of Bord na Móna Land & Habitats are committed to establishing and maintaining a process to identify workplace hazards, assess the associated risks and identify, implement and monitor appropriate control measures to eliminate the risks where possible, or reduce them to acceptable levels. All risk assessments will be documented.

The hazard identification and risk assessment process is carried out in compliance with The *SHWW Act 2005, The SHWW (General Application) (Amendment) regulations 2007, as amended*, and any other relevant legislation.

The Bord na Móna Land & Habitats risk assessment process uses a numerical matrix system (BnM Peat Risk Rating Sheet **POHS C 0011**) to assess the level of risk associated with identified hazards taking account of control measures in place; the risk level or factor is a product of the severity of the consequence of exposure to the hazard and the probability that this exposure will occur.

**Risk factor (RF) = Severity (S) x Probability (P)**

**Risk Rating**

| | Severity (S) | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| | Probability (P) | Very Minor / No Injuries | Moderate Injuries | Lost Time Injuries | Serious Injuries / Permanent Disabilities | Fatalities |
| 1 | Extremely unlikely | 1 | 2 | 3 | 4 | 5 |
| 2 | Very unlikely | 2 | 4 | 6 | 8 | 10 |
| 3 | Unlikely | 3 | 6 | 9 | 12 | 15 |
| 4 | Likely | 4 | 8 | 12 | 16 | 20 |
| 5 | Very likely | 5 | 10 | 15 | 20 | 25 |

**Risk Factor (RF) = Probability (P) x Severity (S)**

**Severity of Accident Occurrence**

| Severity | Guidance |
|---|---|
| 1 | Minor Cuts & Bruises, Eye irritation from Dust, Superficial injuries |
| 2 | Serious Sprains, Minor Fractures, Concussion, Burns, Lacerations, |
| 3 | Fractures, Poisoning, Head and Back Injuries, Burns, |
| 4 | Amputation, Lose of Eye, Deafness, |
| 5 | Fatality |

| Risk Factor | Level | Priority | Action Required |
|---|---|---|---|
| 1-3 | Very Low | Not urgent | No further controls needed - Proceed with Caution |
| 4-6 | Low | Not urgent | Monitor existing controls |
| 8-9 | Medium | Action needed | Further Controls to Reduce Risk required where possible & practicable |
| 10-12 | Medium - High | Action needed | Further controls to reduce risk required as soon as practical |
| 15-16 | High | Urgent Action needed | Further controls to reduce risk required immediately |
| 20-25 | Very High | Urgent Action needed | Work Prohibited / Ceased until risk reduced |

Based on the risk level calculated, existing control measures are either deemed appropriate to eliminate / reduce risks to acceptable levels, or additional control measures may need to be identified and implemented. Details are set out on Risk assessment form **POHS C 0010**.

Risk assessments are reviewed periodically and amended as necessary following a significant change to activities to which the risk assessments relate. In addition, relevant risk assessments will be reviewed following accidents / dangerous occurrences.

Risk assessments will be retained electronically at a central point, and in paper copy in locations to which they relate.

### Dynamic Risk Assessments

Dynamic risk assessment is something we are often doing without realising – when crossing the road, driving a car, etc. What we are doing is identifying the hazards that might cause us injury, assessing the likelihood of an accident occurring and then taking the appropriate precautions so that we don't get hurt.

The Dynamic risk assessment template is designed to support you to fully assess your work area and identify all hazards. The hazards can then be removed, or other actions called Control Measures can be taken to prevent personal injury and damage to the environment.

The Dynamic risk assessment template summarises the types of hazards that may be encountered and key points to prevent injury and damage.

It is important that you fully assess your work for hazards and take appropriate remedial action both before starting work and throughout the job. Dynamic Risk Assessment booklets can be obtained from a member of the H&S Team.

## Part 7 DISCIPLINARY PROCEDURES

It is company policy to encourage conformance with this safety statement through example setting, consultation and participation. However, in the event of failure to conform with this statement, health & safety policies & procedures or other health and safety requirements, disciplinary procedures are in place.

The disciplinary process will be implemented according to Bord na Mona's agreed disciplinary policy & procedure, which are in compliance with the general principles of natural justice and fair procedure, and will depend on the nature of any breach of health and safety requirements. The disciplinary process normally consists of;

- Verbal warning / Counselling
- Formal verbal warning
- Written warning
- Suspension / Disciplinary action / Final written warning
- Dismissal

Discipline, depending on the severity of the breech may consist of:

- Short term suspension of one to three days without remuneration.
- Suspension leading to dismissal.

In applying the disciplinary procedure employees will be accorded the following:

- The right to know that of which they are being accused.
- The right of reply.
- The right of due consideration.

## Part 8 REVIEW

The Safety Statement will be periodically reviewed, at least annually, and revised as necessary as follows:

- Where there is a significant change in the company having an impact on safety, health and welfare.
- To take account of changes in Health and Safety legislation.
- Where there is a change in Company policy or procedures.
- Following changes in work practices.
- On introduction or modification of plant or equipment.
- Following an Accident or Dangerous Occurrence investigation.
- Following request from a Health and Safety Authority Inspector.

The safety statement review will be carried out by Bord na Móna Land & Habitats management and Health and Safety personnel.

The safety statement will be brought to the attention of employees via training and other communication mechanisms in place.

### 8.1 Legal / Statutory Requirements

Bord Na Mona is committed to complying with all relevant legal obligations in relation to H&S. To ensure Bord na Móna are kept up to date on all amendments and new legislation the following memberships and subscriptions are provided for:

**IBEC**
• Bord Na Mona subscribe to IBECs legal database which provides a full register of H&S Legislation and monthly updates on new and revised H&S legislation.
• The Head of EHS is a member of IBEC's Safety Managers Forum which receives consultation emails on upcoming legislation and notifications of Safety Seminars and Webinars.
**IOSH**
• The H&S Team are members of IOSH keeps members up to date on upcoming and new legislation.
**H.S.A**
• Regular reviews of the H.S.A website to view news and events.
**Red Online (Previously Pegasus**)
• Online database of EHS Legislation allowing assessment of compliance by Busines Units.
**Irish Waste Management Association (IWMA)**
• Relevant EH&S and Management team members are members of the IWMA H&S Subgroup.

## Part 9 DOCUMENT CONTROL

The safety statement is a working document which must be maintained up to date so as to accurately reflect the arrangements for managing safety health and welfare within Bord na Móna Land & Habitats at all times.
An electronic safety statement register is retained, including a list of all safety statements; their document numbers; controlled copy locations; dates of issue and revision numbers.
An appropriate number of paper copies of each safety statement will be located in places of work to which they relate.

## Part 10 REFERENCE DOCUMENTS

- Safety, Health and Welfare at Work Act, 2005
- Safety, Health and Welfare at Work (General Application) Regulations, 2007, as amended
- Safety, Health and Welfare at Work (Construction) Regulations, 2013
- Bord na Mona Visitors Policy **BnM HS P 0010**
- Bord na Mona Agreed Disciplinary Procedure
- Bord na Mona Anti-Harassment & Bullying in the Workplace policy
- Lone Working Policy **REF-BnM-H&S-007**
- Occupational Health Service Policy **REF-BnM-HS-006**
- Driving for Work Policy **REF-BnM-HS-012**
- Use of Personal Protective Equipment **REF-BnM-H&S-003**
- Bord na Mona Accident & Dangerous Occurrence Reporting and Investigation Procedure **REF-BnM-H&S-001**
- BnM L&H Emergency Procedures **POHS B 0043**

## Part 11 FORMS

- Risk Assessment Template **POHS C 0010**
- Risk Rating sheet **POHS C 0011**
- Bord na Mona Accident Report Form **SOP-BnM-HS-001-F1**
- Bord na Mona Dangerous Occurrence / Incident Report Form **SOP-BnM-HS-001-F2**
- Bord na Mona Incident Investigation Form **SOP-BnM-HS-001-F1(b)**
- Bord Na Mona Incident Remedial Form **SOP-BnM-HS-001-F1(c)**

## SAFETY STATEMENT ACKNOWLEDGEMENT SIGN OFF SHEET

The undersigned have read and acknowledged the Safety Statement of **Bord Na Móna Land & Habits** and agree to comply with its requirements in order to minimise and control risks and maintain an acceptable standard of Health, Safety and Welfare. I am also aware that this document is uncontrolled once printed and an up to date digital version is available upon request from the Health and Safety Department.

| NAME (BLOCK CAPITALS) | SIGNATURE | DATE |
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# APPENDIX 6-Ǵ

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# Appendix II

## An Overview of the Bord na Móna Habitat Classification

| General Pioneer Community | Pioneer Community | BnM Habitat Code | Nearest Phytosociological Syntaxa | Fossitt 2000 Classification | |
|---|---|---|---|---|---|
| | Bare peat (0-50% cover) | BP | | Spoil and bare ground | ED2 |
| **Embryonic bog** | Pioneer *Eriophorum angustifolium* community (acidic) * | PBa | Oxycocco-Sphagnetea | Bog | PB |
| | *Sphagnum cuspidatum-Eriophorum angustifolium* community* | PBb | Oxycocco-Sphagnetea | Bog | PB |
| | Embryonic bog community (somewhat more diverse and developed) * | PBc | Calluno-Sphagnion | Bog | PB |
| **Poor fen** | Pioneer *Campylopus* dominated community | pCamp | Caricion curto-nigrae | Poor fen | PF2 |
| | Pioneer *Juncus effusus* community | pJeff | Caricion curto-nigrae | Poor fen | PF2 |
| | Pioneer *Eriophorum angustifolium* community (poor fen) | pEang | Caricion curto-nigrae | Poor fen | PF2 |
| | Pioneer *Juncus bulbosus* community | pJbulb | Caricion curto-nigrae | Poor fen | PF2 |
| | Pioneer *Triglochin palustris* community | pTrig | Caricion curto-nigrae | Poor fen | PF2 |
| | Pioneer *Juncus* with *Sphagnum** | pJunc | Sphagneto-Juncetum | Poor fen | PF2 |
| **Rich fen** | Pioneer rich fen community with *Schoenus nigricans* (rudimentary rich fen) | Pschon | Caricetalia davallianae | Rich fen | PF1 |
| | Pioneer *Carex viridula*/brown moss community (rich fen) | pVir | Caricetalia davallianae | Rich fen | PF1 |
| | Pioneer *Cladium* community | pCladium | Caricion davallianae | Rich fen | PF1 |
| **Emergent wetland communities** | *Carex rostrata* community (poor fen) | pRos | Cariculion rostratae | Poor fen | PF1 |
| | *Carex paniculata* community | pPan | Caricetum paniculatae | Reed and large sedge swamps | FS1 |
| | *Phragmites australis* community* | pPhrag | Scirpo-Phragmitetum | Reed and large sedge swamps | FS1 |
| | *Typha* community* | pTyp | Typhetum latifoliae | Reed and large sedge swamps | FS1 |
| | *Schoenoplectus* community | pSch | Scirpo-Phragmitetum | Reed and large sedge swamps | FS1 |
| **Open water/aquatic** | Permanent pools and lakes | OW | Isoeto-Litorelletea | Dystrophic lakes | FL1 |
| | Permanent pools and lakes | OW | Isoeto-Litorelletea | Acid-oligotrophic lakes | FL2 |
| | Charaphytes | pChar | Charetea | Limestone/Marl lakes | FL3 |
| | Temporary open water | tOW | | | |
| **Woodland and scrub** | Emergent *Betula*-dominated community (A) | eBir | Salici-Betuletum pubescentis | Scrub | WS1 |
| | Open *Betula*-dominated community (B) | oBir | Salici-Betuletum pubescentis | Scrub | WS1 |
| | Closed *Betula* scrub community (C) | cBir | Salici-Betuletum pubescentis | Scrub | WS1 |
| | *Ulex*-dominated community | eGor | | Scrub | WS1 |
| | *Betula-Salix* woodland | BirWD | Salici-Betuletum pubescentis | Bog woodland | WN7 |

| General Pioneer Community | Pioneer Community | BnM Habitat Code | Nearest Phytosociological Syntaxa | Fossitt 2000 Classification | |
|---|---|---|---|---|---|
| **Heathland** | Dry *Calluna* community | dHeath | Calluno-Ulicetalia | Dry heath | HH1 |
| | Wet Heath community | wHeath | Narthecio-Ericetum | Wet Heath | HH3 |
| | Dense *Pteridum* | dPter | Rhamno-Prunetea | Dense Bracken | HD1 |
| **Grassland** | Dry calcareous grassland | gCal | Centaureo-Cynosuretum | Dry calcareous and neutral grassland | GS1 |
| | *Antoxanhthum-Holcus-Equisetum* community | gAn-H-Eq | No close affinities to Irish syntaxa | Dry calcareous and neutral grassland | GS |
| | *Dactylis-Arrhenatherum* community | gDact-Arr | Arrhenatheritum elatioris | Dry meadows and grassy verges | GS2 |
| | *Molinia caerula*-dominated community | gMol | Junco conglomerati-Molinion | Wet grassland | GS4 |
| | Marsh - *Filipendula* and other tall herbs | Mar | Filipendulion ulmariae | Marsh | GM1 |
| **Disturbed** | *Tussiligo*-dominated community (vegetation > 50%) | DisCF | Tussilaginetum | Recolonising bare ground | ED3 |
| | *Epilobium*-dominated community (vegetation > 50%) | DisWil | Tussilaginetum | Recolonising bare ground | ED3 |
| **General** | Riparian areas (streams or drains with associated edge habitats) | Rip | | | FW2/4 |
| | Access (tracks or railways with associated edge habitats) | Acc | | | BL3 |

*indicates potentially peat forming habitat

# Appendix III

## Supporting documents


Bord na Móna. 2010. *Bord na Móna Biodiversity Action Plan 2010-2015.* Brosna Press, Ferbane.

Bord na Móna. 2011. *Strategic Framework for the Future Use of Peatlands.* Bord na Móna.

Clark, D. and Rieley, J. 2010. *Strategy for responsible peatland management.* International Peat Society, Finland.

NPWS. 2011. *Actions for biodiversity 2011-2016. Ireland's national biodiversity plan.* Department of Arts, Heritage and the Gaeltacht.

NPWS. 2015. *National Peatland Strategy.* www.npws.ie


## Recent studies and reports 2012-2015


Biosphere Environmental Services. 2014. *Bord na Móna Breeding Bird Survey 2013. Ballivor Bog Group.* Unpublished report to Bord na Móna.

Biosphere Environmental Services. 2014. *Bord na Móna Wintering Bird Survey 2013/14. Ballivor Bog Group.* Unpublished report to Bord na Móna.

Biosphere Environmental Services. 2014. *Bord na Móna Winter Bird Survey 2013-14. Ballydermot and Derrrygreenagh Bog Group.* Unpublished report Bord na Móna.

Biosphere Environmental Services. 2014. *Bord na Móna Summer Breeding Bird Survey 2013. Ballydermot and Derrrygreenagh Bog Group.* Unpublished report Bord na Móna.

Bord na Móna. 2014. Blocking Drains in Irish raised bogs. The Bord na Móna Raised Bog Restoration Project. In: *Global Peatland Restoration demonstrating SUCCESS.* (Cris, R., Buckmaster, S., Bain, C. and Reed, M. eds.) IUCN UK National Committee Peatland Programme, Edinburgh. www.iucn-uk peatlandprogramme.org

Copland, A. 2011. *Birds on Cutaway Peatlands: Baseline Breeding Bird Population Survey.* Project report 2011. Unpublished report for Bord na Móna. BirdWatch Ireland, Co. Wicklow.

Copland, A. 2012. *Birds on Cutaway Peatlands: 2012 Breeding Bird Survey. Project report 2012.* Unpublished report for Bord na Móna. BirdWatch Ireland, Co. Wicklow.

# APPENDIX 6-2

## BAT SUMMARY REPORT

Planning and Environmental Consultants

# Appendix 6-2 Bat Report

## Extraction in the Ballivor Bog Group, Co. Meath & Westmeath



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# 1. INTRODUCTION

MKO was commissioned to complete bat surveys at the Application Site, located in Co. Meath and Co. Westmeath. This report provides details of the bat surveys undertaken, including survey design, methods and results.

Bat surveys were undertaken throughout 2020 and 2022 and are consistent with the methodologies described in NatureScot 2021[1] and Collins 2016[2]. Bat surveys employed a combination of methods, including desktop study, habitat and landscape assessments, roost inspections, manual activity surveys and static detector surveys at ground level and at height. Detector locations achieved a representative spatial spread and sampled the range of available habitats within the Application Site.

## 1.1 Irish Bats: Legislation, Policy, and Status

Ireland has nine resident bat species, comprising more than half of Ireland's native terrestrial mammals (Montgomery *et al.,* 2014).

All Irish bats are protected under European legislation, namely the Habitats Directive (92/43/EEC). All Irish species are listed under Annex IV of the Directive, requiring strict protection for individuals, their breeding sites and resting places. The lesser horseshoe bat (*Rhinolophus hipposideros*) is further listed under Annex II of the Directive, requiring the designation of conservation areas for the species. Under this Directive, Ireland is obliged to maintain the favourable conservation status of Annex-listed species. This Directive has been transposed into Irish law through the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477/2011, as amended).

In addition, Irish species are further protected by national legislation (Wildlife Acts 1976, as amended). Under this legislation, it is an offence to intentionally disturb, injure or kill a bat, or disturb its roost. Any work at a roost study area must be carried out with the agreement of the National Parks and Wildlife Service (NPWS).

The NPWS monitors the conservation status of European protected habitats and species and reports their findings to the European Commission every 6 years in the form of an Article 17 Report. The most recent report for the Republic of Ireland was submitted in 2019. Table 1-1 summarises the current conservation status of Irish bat species and identified threats to Irish bat populations.

[1] *NatureScot published Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation. Version: August 2021 (NatureScot, 2021).*
[2] *Collins J. (ed.) published Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn) (Collins, 2016).*

*Table 1-1 Irish Bat Species Conservation Status and Threats (NPWS, 2019)*

| Bat Species | Conservation Status | Principal Threats |
|---|---|---|
| Common pipistrelle *Pipistrellus pipistrellus* | Favourable | **A05** Removal of small landscape features for agricultural land parcel consolidation (M)<br>**A14** Livestock farming (without grazing) [impact of anti-helminthic dosing on dung fauna] (M)<br>**B09** Clear--cutting, removal of all trees (M)<br>**F01** Conversion from other land uses to housing, settlement or recreational areas (M)<br>**F02** Construction or modification (e.g. of housing and settlements) in existing urban or recreational areas (M)<br>**F24** Residential or recreational activities and structures generating noise, light, heat or other forms of pollution (M)<br>**H08** Other human intrusions and disturbance not mentioned above (Dumping, accidental and deliberate disturbance of bat roosts (e.g. caving) (M)<br>**L06** Interspecific relations (competition, predation, parasitism, pathogens) (M)<br>**M08** Flooding (natural processes)<br>**D01** Wind, wave and tidal power, including infrastructure (M) |
| Soprano pipistrelle *Pipistrellus pygmaeus* | Favourable | |
| Nathusius' pipistrelle *Pipistrellus nathusii* | Unknown | |
| Leisler's bat *Nyctalus leisleri* | Favourable | |
| Daubenton's bat *Myotis daubentoni* | Favourable | |
| Natterer's bat *Myotis nattereri* | Favourable | |
| Whiskered bat *Myotis mystacinus* | Favourable | |
| Brown long-eared bat *Plecotus auritus* | Favourable | |
| Lesser horseshoe bat *Rhinolophus hipposideros* | Inadequate | |

## 1.2 Statement of Authority

Scope development and project management was overseen by Aoife Joyce (BSc., MSc.) and John Hynes (BSc., MSc., MCIEEM).

Bat surveys carried out in 2020 were conducted by MKO ecologists Aoife Joyce, Luke Dodebier (BSc.) Claire Stephens (BSc.), Neil Campbell (BSc., MSc.), and Cathal Bergin (BSc.). Bat surveys carried out in 2022 were conducted by MKO ecologists Shane Connolly (BSc.), Laura McEntegart (BSc.) and Neil Campbell. All staff have relevant academic qualifications to complete the surveys and assessments that they were required to do.

Data analysis for 2020 was undertaken and results compiled by Aoife Joyce. Data analysis for 2022 was undertaken by Laura Gránicz (BSc., MSc.), and results were compiled by Shane Connolly (BSc.). This report was prepared by Shane Connolly (BSc.) and was reviewed by Aoife Joyce (BSc., MSc.) and Pat Roberts (BSc.) who have over 5 years' and 18 years' experience in ecological assessment, respectively.

*Table 1-2 Project team qualifications and training*

| Staff | Role | Training |
|---|---|---|
| **Pat Roberts (B.Sc., MCIEEM)** | Principal Ecologist | B.Sc. Environmental Science, University of Galway, Ireland.<br><br>18+ years post graduate experience working as a professional ecologist. Over 10 years previous experience working as a nature conservation warden, tree surgeon/surveyor. Bat Detector Workshop (Bat Conservation Ireland). Bats & Arboriculture Training Course, (BCT & Arboricultural Association). |
| **John Hynes (B.Sc., M.Sc., MCIEEM)** | Ecology Director | B.Sc. in Environmental Science, University of Galway, Ireland (2010). M. Sc. Applied Ecology, University College Cork (2011).<br><br>Full member of the Chartered Institute of Ecology and Environmental Management. Extensive experience regarding Habitats Directive |

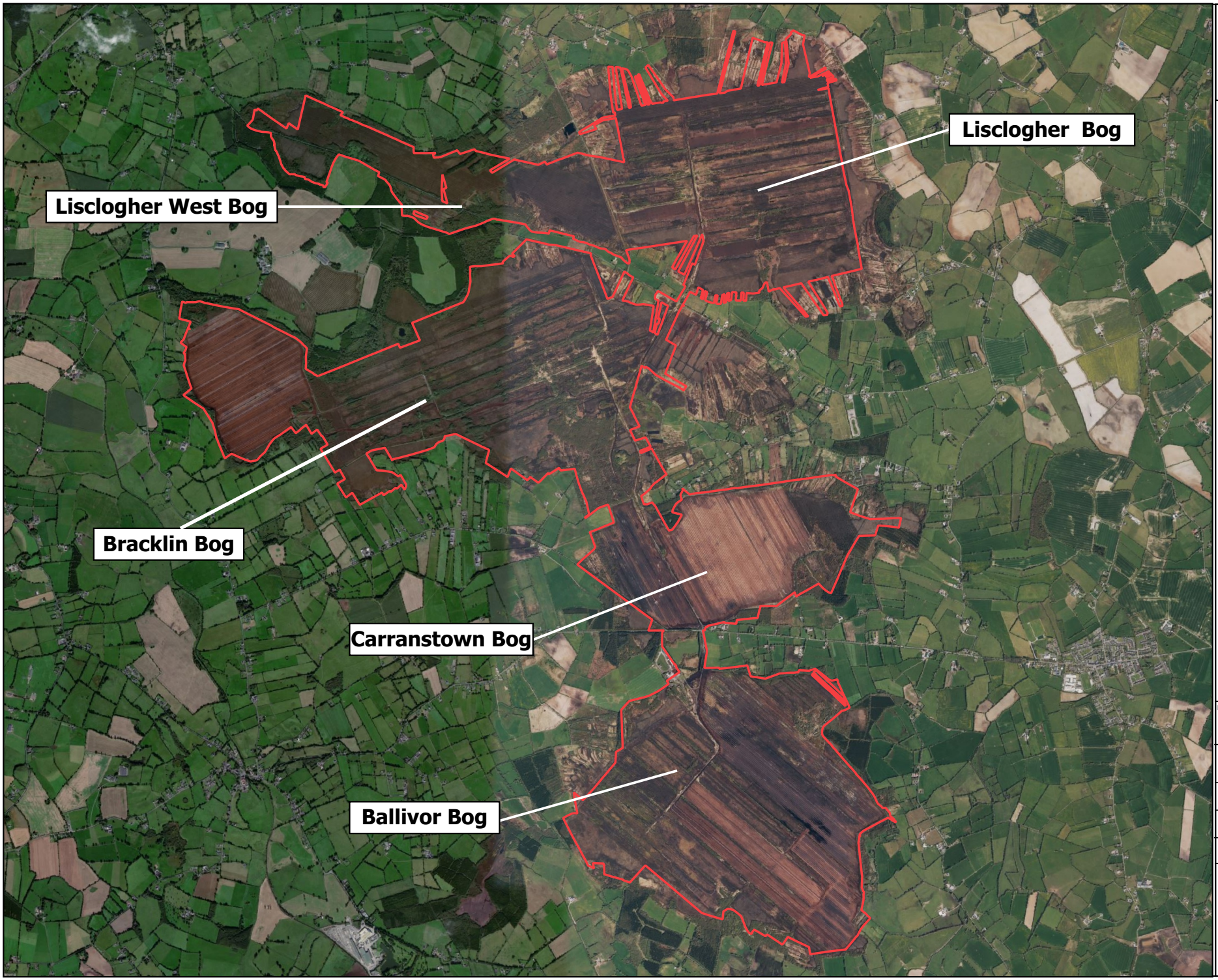
| | | |
|---|---|---|
| | | Assessment and EIS preparation of a number of Windfarm developments, of construction supervision and monitoring of development sites, and dealing with statutory ecological consultees in Ireland over past 12 years. |
| Aoife Joyce (B.Sc., M.Sc.) | Project Director | B.Sc. (Hons) Environmental Science, University of Galway, Ireland.<br>M.Sc. (Hons) Agribioscience, University of Galway, Ireland.<br><br>Advanced Bat Survey Techniques – Trapping, biometrics, handling (BCI), Bat Impacts and Mitigation (CIEEM), Bat Tree Roost Identification and Endoscope Training (BCI), Bats in Heritage Structures (BCI), Bats and Lighting (BCI), Kaleidoscope Pro Analysis (Wildlife Acoustics). |
| Claire Stephens (BSc.) | Ecologist | B.Sc. (Hons) Environmental Science, University of Galway, Ireland.<br><br>Emergence and Re-Entry Surveys (Internal), Static deployment and collection, Structure & Tree Inspection (Internal), Manual Transect Survey (Internal), Bat Habitat Appraisal (Internal). |
| Cathal Bergin (BSc.) | Ecologist | B.Sc. Wildlife Biology from MTU.<br><br>Emergence and Re-Entry Surveys (Internal), Static deployment and collection, Structure & Tree Inspection (Internal), Manual Transect Survey (Internal), Bat Habitat Appraisal (Internal). |
| Luke Dodebier (BSc.) | Ecologist | B.Sc. Wildlife Biology from MTU.<br><br>Bat Impacts and Mitigation (CIEEM), Kaleidoscope Pro Analysis (Wildlife Acoustics), Static deployment and collection, Endoscope Training (Internal), Emergence and Re-Entry Surveys (Internal) Structure & Tree Inspection (Internal), Manual Transect Survey (Internal), Bat Habitat Appraisal (Internal). |
| Neil Campbell (B.Sc., M.Sc.) | Ecologist | B.Sc. Botany and Plant Science, National University of Ireland, Galway.<br>M.Sc. Botany and Plant Science, National University of Ireland, Galway.<br><br>Kaleidoscope Pro Analysis (Wildlife Acoustics), Endoscope Training (Internal), Structure & Tree Inspection (Internal), Manual Transect Survey (Internal), Bat Habitat Appraisal (Internal), Emergence and Re-Entry Surveys (Internal). |
| Laura McEntegart (B.Sc.) | Ecologist | B.Sc. (Hons) Botany and Plant Science, National university of Ireland, Galway<br><br>Bat Handling Training Course (BCI), Bats: Assessing the Impact of Development on Bats, Mitigation & Enhancement - (CIEEM), Kaleidoscope Pro Analysis (Wildlife Acoustics), Endoscope Training (Internal), Emergence and Re-Entry Surveys (Internal), Structure & Tree Inspection (Internal), Manual Transect Survey (Internal), Bat Habitat Appraisal (Internal). |
| Laura Gránicz (B.Sc., M.Sc.) | Project Ecologist | B.Sc. Biology, University of Szeged, Hungary.<br>M.Sc. Biology, University of Pécs, Hungary.<br><br>Structure & Tree Inspection (Internal), Manual Transect Survey (Internal), Bat Habitat Appraisal (Internal), Emergence and Re-Entry Surveys (Internal), Advanced Bat Survey Techniques (BCI), Kaleidoscope Pro Analysis (Wildlife Acoustics). |
| Shane Connolly (B.Sc.) | Ecologist | B.Sc. (Hons) in Botany and Plant Science, National University of Ireland, Galway.<br><br>Endoscope Training (Internal), Emergence and Re-Entry Surveys (Internal), Structure & Tree Inspection (Internal), Manual Transect Survey (Internal), Bat Habitat Appraisal (Internal) |

# 2. SITE DESCRIPTION

The Application Site comprises five bogs located at the Westmeath-Meath County border. The bogs include Ballivor Bog at the southern extent of the site, Carranstown and Bracklin Bogs towards the centre of the site and Lisclogher and Lisclogher West Bogs to the north. The Application Site will hereafter be referred to as the "Study Area" and comprises an overall site area of 2,421 hectares (ha).

The site is located approximately 3.7km west of the village of Raharney, 4.5km south of Delvin town, Co. Westmeath and 2.5km east of Ballivor village, Co. Meath. The Application Site is bisected by the R156 which joins the villages of Ballivor in the east to Raharney in the west.

The land-use/activities within the Study Area predominantly consists of bare cut-away peat, re-vegetation of bare peat and scrub and rehabilitation of commercial peatland. Land-use in the surrounding landscape comprises a mix of agricultural land, pockets of in-tact bog, cutaway peatlands, forestry, village settlements and one-off rural housing.




## Map Legend

Application Site Boundary

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Drawing Title

Study Area Location

Project Title

Ballivor Substitute Consent Application

| Drawn By | Checked By |
|---|---|
| PD | SM |
| Project No. | Drawing No. |
| 191137-f | Figure 2-1 |
| Scale | Date |
| 1:50,000 | 02/07/2024 |

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# 3. METHODS

## 3.1 Desk Study

A desk study of published material was undertaken prior to conducting field surveys. The aim was to provide context to the Study Area to assist bat survey planning and assessment. This included the identification of designated sites, species of interest or any other potential risk factors within the Study Area and the surrounding region. The results of the desk study including sources of information utilised are provided below.

### 3.1.1 Bat Database Records

The National Bat Database of Ireland holds records of bat observations received and maintained by BCI. These records include results of national monitoring schemes, roost records as well as ad-hoc observations. The most recent search examined bat presence and roost records within 10km of a central point within the Study Area (Grid Ref: N 64592 54895). Available bat records were provided by Bat Conservation Ireland on 3rd March 2022. Results from the National Biodiversity Data Centre were also reviewed for bat species present within the relevant 10km grid squares of the Study Area.

### 3.1.2 Bat Species' Range

EU member states are obliged to monitor the conservation status of natural habitats and species listed in the Annexes of the Habitats Directive. Under Article 17, they are required to report to the European Commission every six years. In April 2019, Ireland submitted the third assessment of conservation status for Annex-listed habitats and species, including all species of bats (NPWS, 2019).

The 2019 Article 17 Reports were reviewed for information on bat species' range and distribution in relation to the location of the Study Area. The aim was to identify any high-risk species at the edge of their range.

### 3.1.3 Designated Sites

The National Parks and Wildlife Service (NPWS) map viewer and website provides information on rare and protected species, sites designated for nature conservation and their conservation objectives. A search was undertaken of sites designated for the conservation of bats within a 10km radius of the Study Area. This included European designated sites, i.e., SACs, and nationally designated sites, i.e., NHAs and pNHAs.

### 3.1.4 Landscape Features

#### 3.1.4.1 Ordnance Survey Mapping

Ordnance survey maps (OSI 1:5,000 and 1:50,000) and aerial photographs were reviewed to identify any habitats and features likely to be used by bats. Maps and images of the Study Area and general landscape were examined for suitable foraging or commuting habitats including woodlands and forestry, hedgerows, treelines, and watercourses. In addition, any potential roost sites, such as buildings and bridges, were noted for further investigation.

#### 3.1.4.2 Geological Survey Ireland

The Geological Survey Ireland (GSI) online mapping tool and University of Bristol Speleological Society (UBSS) Cave Database for the Republic of Ireland were consulted for any indication of natural subterranean bat sites, such as caves, within 10km of the Study Area (BCI, 2012) (last searched on the 9th of July 2024). Furthermore, the archaeological database of national monuments was reviewed for any evidence of manmade underground structures, e.g., souterrains, that may be used by bats (last searched on the 9th of July 2024).

#### 3.1.4.3 National Biodiversity Data Centre Bat Landscape Mapping

The National Biodiversity Data Centre (NBDC) map viewer presents "Bat Landscape" maps for individual species and for all species combined. Lundy *et al.* (2011) used Maximum Entropy Models to examine the relative importance of bat landscape and habitat associations in Ireland. The resulting map provides a 5-point scale, ranging from highest habitat suitability index (presented in red) to lowest suitability index (presented in green). However, squares highlighted as less favourable may still have local areas of abundance.

The location of the Study Area was reviewed in relation to bat habitat suitability indices. The aim of this was to assess habitat suitability for all bat species within the Application Site. It is worth noting that these results are based on a modelling exercise and not confirmed bat species records. Regardless, they may provide a useful indication of potential favourable bat associations within the Application Site.

## 3.2 Field Surveys

### 3.2.1 Roost Surveys

A search for roosts was undertaken within the site in 2020 and 2022. The aim was to determine the presence of roosting bats. A walkover was carried out and structures and trees were assessed for their potential to support roosting bats.

Any potential tree roosts were examined for the presence of rot holes, hazard beams, cracks and splits, partially detached bark, knot holes, gaps between overlapping branches and any other potential roost features (i.e., PRFs) identified by Andrews (2018).

### 3.2.2 Manual Transects

Manual activity surveys comprised walked transects at dusk and/or dawn throughout 2020 and 2022. A series of representative transect routes were selected throughout the site. The aim of these surveys was to identify bat species using the site and gather any information on bat behaviour and important features used by bats. Transect routes were prepared with reference to linear features on site, desktop, and walkover survey results as well as any health and safety considerations and access limitations. As such, transect routes generally followed existing roads and tracks. Transect routes are presented in Figures 3-1 to 3-6.

Transects were walked by two surveyors, recording bats in real time. Dusk surveys commenced 30 minutes before sunset and were completed for up to 3 hours after sunset. Dawn surveys commenced 2 hours before sunrise and were completed at sunrise. Surveyors were equipped with active full spectrum bat detectors, the Batlogger M bat detector (Elekon AG, Lucerne, Switzerland), and all bat activity was recorded for subsequent analysis to confirm species identifications. Transect surveys were undertaken in Spring, Summer and Autumn of 2020 and 2022. Table 3-1 summarises survey effort in relation to walked transects.

*Table 3-1 2020 and 2022 Survey Effort - Manual Transects*

| Date | Surveyors | Sunrise/ Sunset | Type | Weather | Walked (km) |
|---|---|---|---|---|---|
| 23rd April 2020 | Aoife Joyce and Luke Dodebier | 20:45 | Dusk | 15˚C, dry, calm/light air | 8.8km |
| 24th April 2020 | Aoife Joyce and Luke Dodebier | 06:06 | Dawn | 6˚C, dry, 70 % cloud cover, calm/ light air. | 3.8km |
| 4th June 2020 | Luke Dodebier and Claire Stephens | 21:50 | Dusk | 12˚C, dry, 40% cloud cover, calm/light air | 8.9km |
| 5th June 2020 | Luke Dodebier and Claire Stephens | 05:03 | Dawn | 10˚C, dry, 100% cloud cover, calm/ light air | 6.3km |
| 3rd September 2020 | Neil Campbell Cathal Bergin | 20:13 | Dusk | 15˚C dry, 20-30% cloud cover, calm/ light air | 6km |
| 4th September 2020 | Neil Campbell Cathal Bergin | 06:42 | Dawn | 10˚C, dry, 50% cloud cover, calm/ light air | 4.2km |
| **Total Survey Effort for 2020** | | | | | **38km** |
| **Date** | **Surveyors** | **Sunrise/ Sunset** | **Type** | **Weather** | **Walked (km)** |
| 26th April 2022 | Shane Connolly and Laura McEntegart | 20:49 | Dusk | 10˚C, dry, 25% cloud, calm air | 7.9km |
| 19th August 2022 | Shane Connolly and Laura McEntegart | 21:43 | Dusk | 18˚C, dry, 90% cloud cover, calm air | 11km |
| 20th October 2022 | Shane Connolly and Neil Campbell | 18:20 | Dusk | 9˚C dry, 50% cloud cover, calm/ light air | 3.2km |
| **Total Survey Effort for 2022** | | | | | **22.1km** |



## Map Legend

- Site Boundary
- Spring Manual Transect Route

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|---|---|
| Drawing Title | 2020 Spring Manual Transect Route |
| Project Title | Ballivor Substitute Consent Application |
| Drawn by: RC | Checked by: AJ/SF |
| Project No.: 191137 | Drawing No.: Figure 3-1 |
| Scale: 1:23,000 | Date: 24/07/2024 |

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Drawing Title
2020 Summer Manual Transect Route

Project Title
Ballivor Substitute Consent Application

| Drawn by | Checked by |
|---|---|
| RC | AJ/SF |
| Project No. 191137 | Drawing No. Figure 3-2 |
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## Map Legend

- Site Boundary
- Autumn Transect Routes

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| Drawing Title | 2020 Autumn Manual Transect Route |
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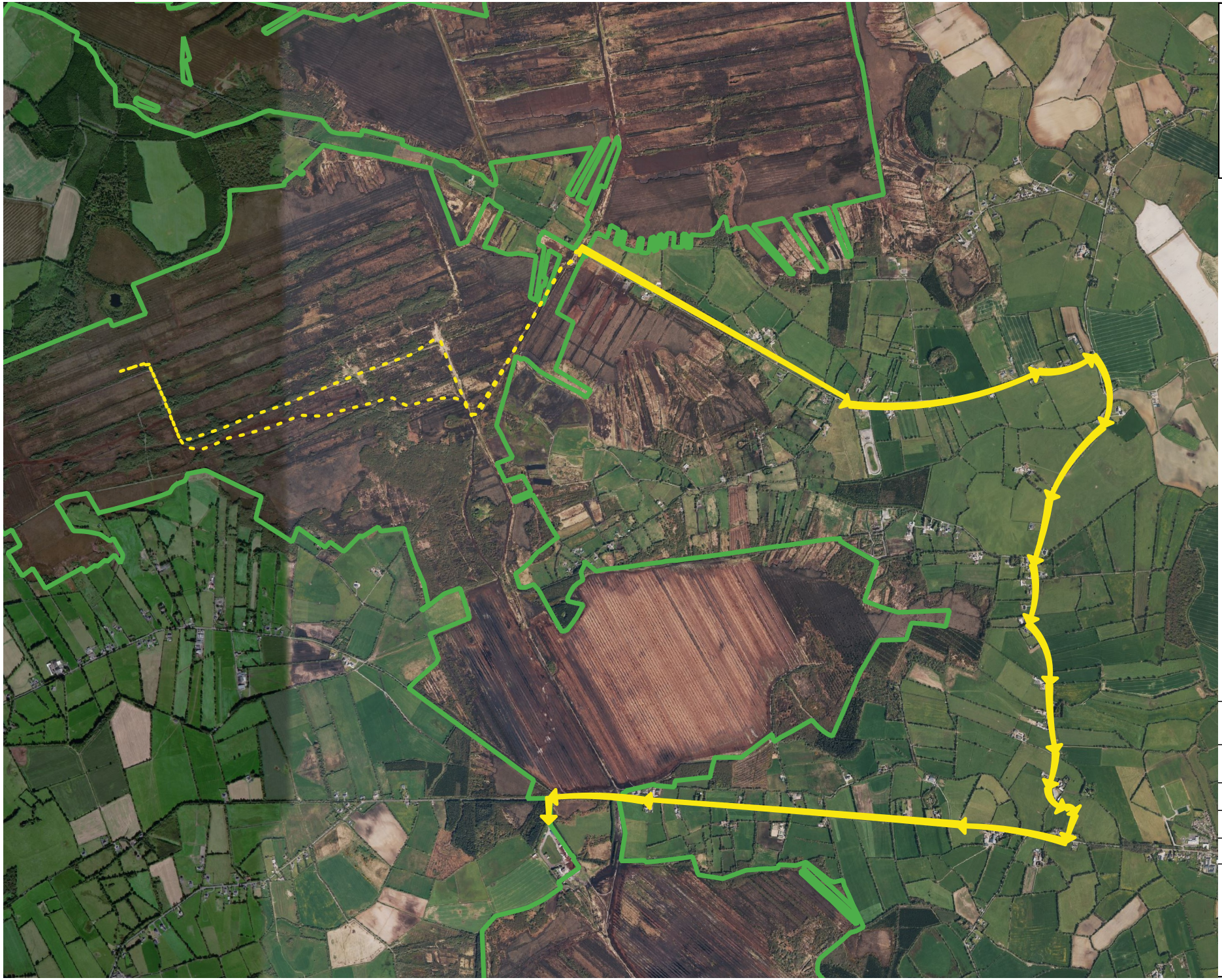


Drawing Title
2022 Spring Manual Transect Route

Project Title
Ballivor Substitute Consent Application

| Drawn by | Checked by |
|---|---|
| RC | AJ/SF |
| Project No. 191137 | Drawing No. Figure 3-4 |
| Scale 1:30,000 | Date 24/07/2024 |

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## Map Legend

- Site Boundary
- Summer Transect Route

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| | |
|---|---|
| Drawing Title | 2022 Summer Manual Transect Route |
| Project Title | Ballivor Substitute Consent Application |
| Drawn by: RC | Checked by: AJ/SF |
| Project No.: 191137 | Drawing No.: Figure 3-5 |
| Scale: 1:25,000 | Date: 24/07/2024 |

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## Map Legend

- Site Boundary
- Autumn Transect Route

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| Drawing Title | 2022 Summer Manual Transect Route |
| Project Title | Ballivor Substitute Consent Application |
| Drawn by: RC | Checked by: AJ/SF |
| Project No.: 191137 | Drawing No.: Figure 3-6 |
| Scale: 1:25,000 | Date: 24/07/2024 |

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### 3.2.3 Ground-level Static Surveys

Automated full spectrum bat detectors, Song Meter SM4BAT (Wildlife Acoustics, Maynard, MA, USA), were employed using settings recommended for bats, with minor adjustments in gain settings and band pass filters to reduce background noise when recording. Eighteen detectors were deployed in 2020 and fifteen detectors were deployed in 2022. Locations of static detectors were selected to represent the range of habitats present within the site, including favourable bat habitats. Overall, a good spatial spread of the site was achieved. Detectors were set to record from 30 minutes before sunset until 30 minutes after sunrise. The Song Meter automatically adjusts sunset and sunrise times using the Solar Calculation Method when provided with GPS coordinates.

Onsite weather monitoring was undertaken concurrently with static detector deployments. One Vantage Pro 2 (Davis Instruments, CA, UCS) was deployed each season and night-time hourly data was tracked remotely to ensure a sufficient number of nights (i.e., minimum 10 no.) with appropriate weather conditions were captured (i.e., dusk temperatures above 8˚C, wind speeds less than 5m/s and no or only very light rainfall). Tables 3-2 to 3-5 summarise survey efforts achieved in 2020 and 2022 for each of the 18 and 15 no. detector locations respectively. Figures 3-7 and 3-8 show static detector locations for 2020 and 2022.

#### 2020 Static Detectors

Automated bat detectors were deployed at 18 no. locations for at least 10 nights in each of spring (April-May), summer (June-mid August) and autumn (mid-August-October) 2020. Detector locations achieved a representative spatial spread of the study area and sampled the range of available habitats.

*Table 3-2 2020 Ground-level Static Detector Locations*

| ID | Location (ITM) | Habitat | Linear Feature within 50m |
|---|---|---|---|
| D01 | 665696 753427 | Cutover bog, birch forest edge | Birch Forest |
| D02 | 664368 752788 | Cutover bog, birch forest edge | Birch Forest |
| D03 | 665454 752534 | Within cutover bog, edge of heather beside rail tracks | Treelines |
| D04 | 664723 753136 | Beside birch trees and heather, cutover bog | Treelines |
| D05 | 665167 751925 | Beside willow between heather and mature birch scrub | Treelines |
| D06 | 665697 755287 | Cutover bog edge with heather and birch scrub | Scrub |
| D07 | 664349 755108 | Edge of birch/willow in bog bramble | Treelines |
| D08 | 660672 756989 | Heather along train track | Scrub |
| D09 | 663384 758116 | Beside track, open cutover bog and birch scrub | Scrub |
| D10 | 662221 756738 | Cutover bog/heath beside willow drain to north | Scrub/ Eroding upland river |
| D11 | 663810 757238 | Beside rail track birch wood edge | Treelines |
| D12 | 662808 756980 | Molinia beside gorse bush and heather | Scrub |
| D13 | 665120 759482 | Along rail track/birch forest linear | Treelines |

| | | | |
|---|---|---|---|
| D14 | 662439 758957 | Along cutover bog edge-gorse and heather along drain | Scrub/ Eroding upland river |
| D15 | 665539 758542 | Cutover bog, gorse and heather alder scrub | Scrub |
| D16 | 664281 759084 | Cutover bog edge beside riparian vegetation on drain | Eroding upland river/ Riparian woodland |
| D17 | 665207 758989 | Beside birch tree between heather scrub | Treelines/ Scrub |
| D18 | 665696 753427 | Beside trees adjacent to river, beside gravel road | Riparian woodland/ Treelines |

*Table 3-3 2020 Survey Effort - Ground-level Static Surveys*

| Season | Survey Period | Total Survey Nights per Detector Location | Nights with Appropriate Weather |
|---|---|---|---|
| Spring | 23rd April – 6th May 2020 | 14 | 14 |
| Summer | 4th June – 16th June 2020 | 12 | 12 |
| Autumn | 3rd September – 14th September 2020 | 11 | 11 |
| **Total Survey Effort** | | **37** | **37** |

## 2022 Static Detectors

Automated bat detectors were deployed at 15 no. locations for at least 10 nights in each of spring (April-May), 20 nights of summer (June-mid August) and autumn (mid-August-October) 2022. Detector locations achieved a representative spatial spread of the study area and sampled the range of available habitats. One detector (D10) was redeployed on 26th April 2022 following technical difficulties with the original SD cards, to ensure a full dataset. The redeployed detector was collected on 10th May 2022. One detector (D07) did not record data in autumn 2022.

*Table 3-4 2022 Ground-level Static Detector Locations*

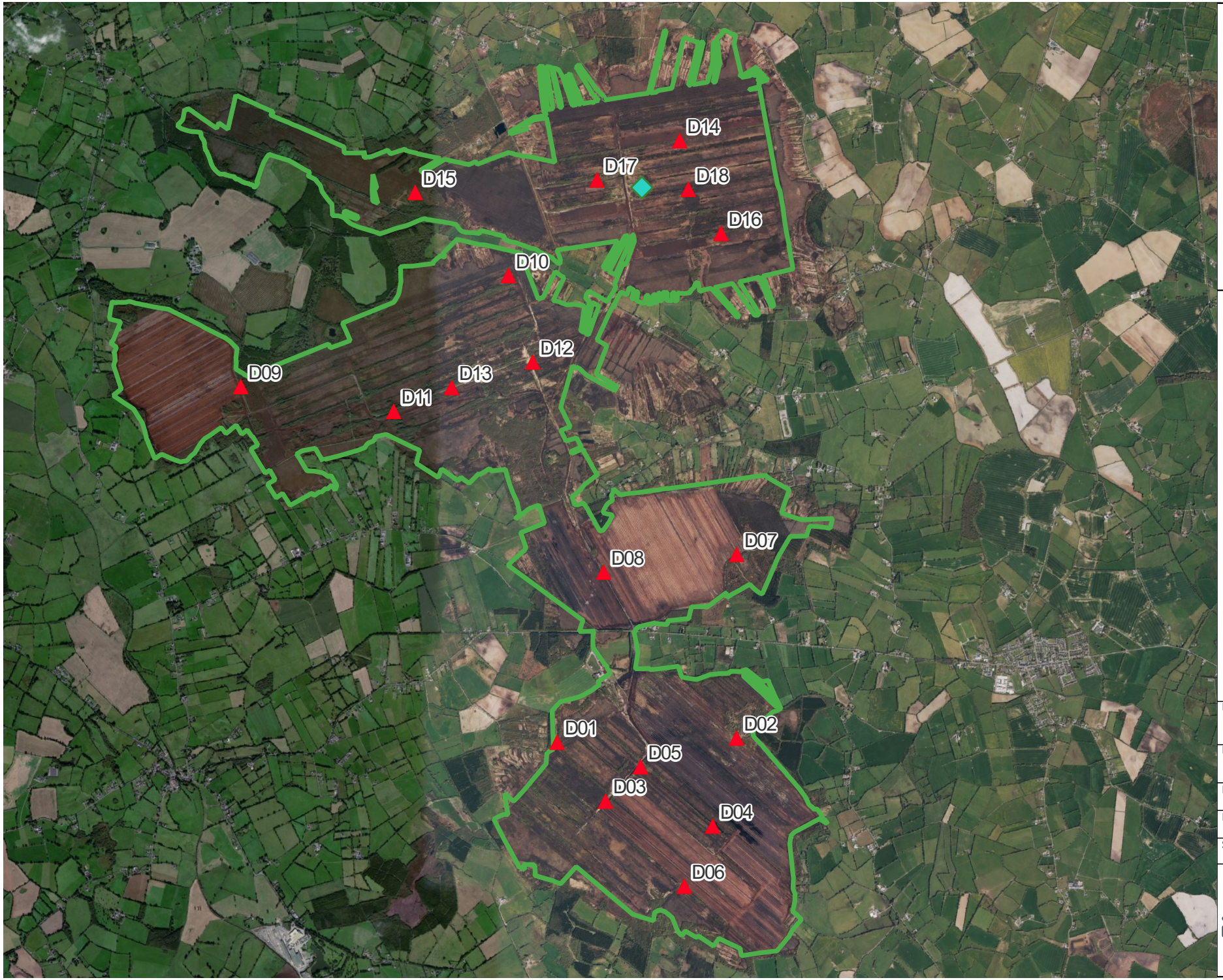
| ID | Location (ITM) | Habitat | Linear Feature within 50m |
|---|---|---|---|
| D01 | 665161 753511 | Scrub | Scrub |
| D02 | 665988 752966 | Scrub | Scrub |
| D03 | 665928 751691 | Cutover Bog | Scrub |
| D04 | 663783 752452 | Scrub | Scrub |
| D05 | 665231 752586 | Cutover Bog | Scrub |
| D06 | 664616 752002 | Scrub | Scrub |
| D07* | 664329 753720 | Cutover Bog | Scrub |
| D08 | 663741 757005 | Scrub | Scrub |
| D09 | 662766 757322 | Dry Silicious Heath | Scrub |
| D10 | 661509 757054 | Dry Silicious Heath | Scrub |
| D11 | 664025 759551 | Dry Silicious Heath | Scrub |
| D12 | 665118 758518 | Cutover Bog | Scrub |
| D13 | 665850 758649 | Dry Silicious Heath | Scrub |
| D14 | 665471 759851 | Dry Silicious Heath | Scrub |
| D15 | 665033 759184 | Cutover Bog | Scrub |

*Due to a technical fault, no data was recorded at D07 in autumn 2022.

*Table 3-5 2022 Survey Effort - Ground-level Static Surveys*

| Season | Survey Period | Total Survey Nights per Detector Location | Nights with Appropriate Weather |
|---|---|---|---|
| Spring | 8th April – 26th April 2022 | 18 | 10 |
| Summer | 20th June – 19th July 2022 | 29 | 21 |
| Autumn | 5th October – 25th October | 21 | 14 |

| | | |
|---|---|---|
| **Total Survey Effort** | **58** | **45** |




## Map Legend

- Site Boundary
- 2020 Static Detector Locations
- Met Mast Location

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| | |
|---|---|
| Drawing Title | 2020 Static Detector Locations |
| Project Title | Ballivor Substitute Consent Application |
| Drawn by: RC | Checked by: AJ/SF |
| Project No.: 191137 | Drawing No.: Figure 3-7 |
| Scale: 1:50,000 | Date: 24/07/2024 |

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## Map Legend

- Site Boundary
- 2022 Static Detector Locations

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|---|---|
| Drawing Title | 2022 Static Detector Locations |
| Project Title | Ballivor Substitute Consent Application |
| Drawn by: RC | Checked by: AJ/SF |
| Project No.: 191137 | Drawing No.: Figure 3-8 |
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### 3.2.4 Static Surveys at Height

Monitoring at height can provide useful information on bat activity. Simultaneous surveying at ground level and at height was undertaken throughout 2020. One Song Meter SM3BAT (Wildlife Acoustics, Maynard, MA, USA) was installed on a meteorological mast within the site (Grid Ref: E264783 N258983). The detector was equipped with two microphones; one at ground level and one at height (approx. 98 m above ground level) to allow for simultaneous surveying. Table 3-6 describes survey effort in relation to surveys at height and the location of the met mast is illustrated in Figure 3-7.

*Table 3-6 2020 Survey Effort - Static Surveys at Height*

| ID | Survey Period | Total Survey Nights |
|---|---|---|
| Deployment - 1 | 20th July – 5th August 2020 | 17 |
| Deployment - 2 | 7th August – 21st August 2020 | 15 |
| Deployment - 3 | 3rd September – 13th September 2020 | 10 |
| **Total Survey Effort** | | **42** |

## 3.3 Bat Call Analysis

All recordings from 2020 and 2022 were later analysed using bat call analysis software Kaleidoscope Pro v.5.1.9 and v.5.4.8 (Wildlife Acoustics, MA, USA), respectively. The aim of this was to identify, to a species or genus level, what bats were present at the Study area site. Bat species were identified using established call parameters, to create site-specific custom classifiers and were manually verified.

Echolocation signal characteristics (including signal shape, peak frequency of maximum energy, signal slope, pulse duration, start frequency, end frequency, pulse bandwidth, inter-pulse interval and power spectra) were compared to published signal characteristics for local bat species (Russ, 1999). Myotis species (potentially Daubenton's bat (*M. daubentonii*), Whiskered bat (*M. mystacinus*), Natterer's bat (*M. nattereri*) were considered as a single group, due to the difficulty in distinguishing them based on echolocation parameters alone (Russ, 1999). The echolocation of Soprano pipistrelle (*P. pygmaeus*) and Common pipistrelle (*P. pipistrellus*) are distinguished by having distinct frequencies (peak frequency of maximum energy in search flight) of ~55 kHz and ~46 kHz respectively (Jones & van Parijs, 1993).

Plate 3-1 below shows a typical sonogram of echolocation pulses for common pipistrelle recorded with a SM4BAT bioacoustics static bat recording device. The recorded file is illustrated using Wildlife Acoustics Kaleidoscope software.

Individual bats of the same species cannot be distinguished by their echolocation alone. Thus, 'bat passes' was used as a measure of activity (Collins, 2016). A bat pass was defined as a recording of an individual species/species group's echolocation containing at least two echolocation pulses and of maximum 15s duration. All bat passes recorded in the course of this study follow these criteria, allowing comparison.

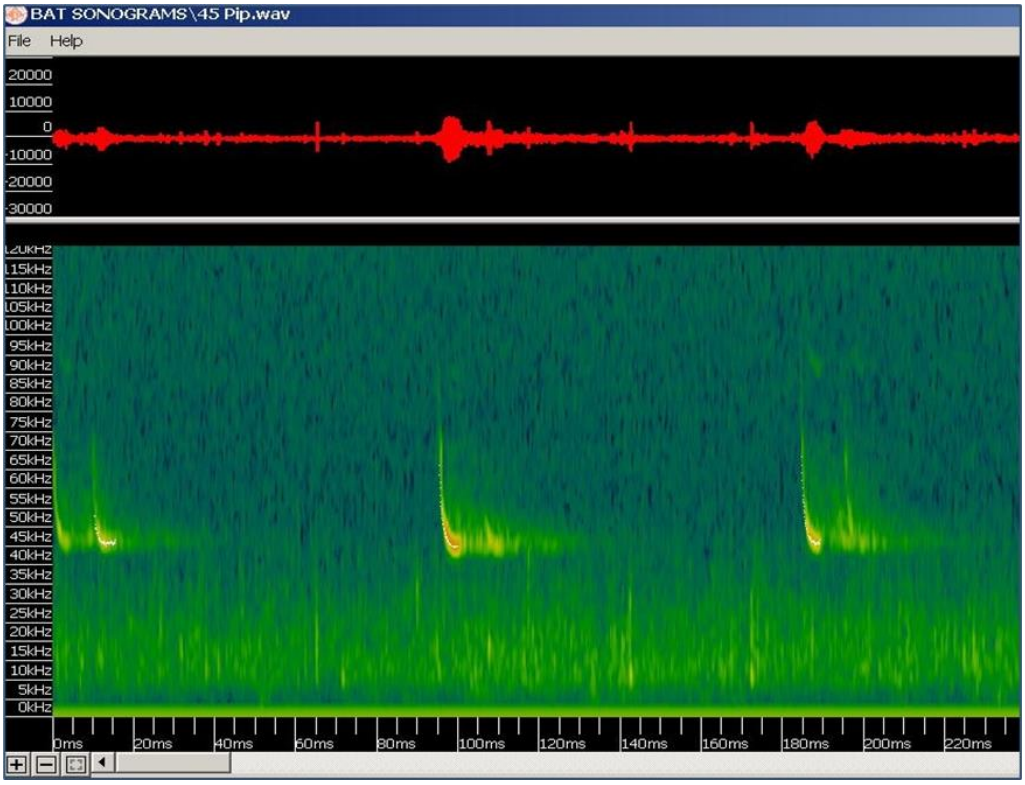


*Plate 3-1 Sonogram of Echolocation Pulses of Common pipistrelle (Peak Frequency 45kHz)*

## 3.4 Limitations

A comprehensive suite of bat surveys has been undertaken at the Study Area in 2020 and 2022. The surveys provide the information necessary to determine what species of bats are present and how they are utilising the site.

The information provided in this report accurately and comprehensively describes the baseline environment and bat populations at the site. The specialist studies, analysis and reporting have been undertaken in accordance with the appropriate guidelines.

Surveys were carried out during suitable survey periods for bat activity surveys, (Collins, 2016) and weather conditions were suitable for carrying out all surveys.

No limitations in the scope, scale or context of the assessment have been identified. Overall, a comprehensive assessment has been achieved.

# 4. RESULTS

## 4.1 Desk Study

### 4.1.1 Bat Database Records

#### National Biodiversity Data Centre

The National Bat Database of Ireland was searched for records of bat activity and roosts within 10km of the Study Area (last search 09/07/2024). Hectads N65, N66 and N55 lie within 10km of the Study Area. Five of Ireland's nine resident bat species were recorded within 10km of the Study Area. The results of the database search are provided in Table 4-1.

*Table 4-1 NBDC Bat Records within 10km of Study Area*

| Hectad | Species | Database | Designation |
|---|---|---|---|
| N55, N65 | Common pipistrelle *Pipistrellus pipistrellus* | National Bat Database of Ireland | HD Annex IV, WA |
| N55, N65, N66 | Leisler's bat *Nyctalus leisleri* | National Bat Database of Ireland | HD Annex IV, WA |
| N55, N65, N66 | Brown long-eared bat *Plecotus auritus* | National Bat Database of Ireland | HD Annex IV, WA |
| N55, N66 | Soprano pipistrelle *Pipistrellus pygmaeus* | National Bat Database of Ireland | HD Annex IV, WA |
| N55, N66 | Daubenton's Bat *Myotis daubentonii* | National Bat Database of Ireland | HD Annex IV, WA |

#### Bat Conservation Ireland

Based on the size of the site, two searches were made with Bat Conservation Ireland. Records were received on 3rd March 2022 (Table 4-2). Searches were carried out within a 1km and 10km radius of the northern section of the study area (IG Ref: E 263983 N 259683) and southern section of the Study Area (IG Ref: E 265634 N 251541). The search yielded no results of roosts within a 1km radius of the site.

| Northern Section of the Study Area (IG Ref: E 263983 N 259683) | | | | |
|---|---|---|---|---|
| **Record** | **Species** | **Grid Reference** | **Date** | **Location** |
| Roost | *Plecotus auritus* | N6854 | N/A | Ballivor, Co. Meath |
| | *Pipistrellus pygmaeus* | N6568 | N/A | Clonmellon, Castlepollard, County Westmeath |
| | *Plecotus auritus* | N7258 | N/A | Kildalkey, County Meath |
| | *Plecotus auritus* | N5651 | N/A | Killucan, Mullingar, County Westmeath |
| | *Plecotus auritus* | N5458 | N/A | Castlepollard, County Westmeath |
| Transect | *Myotis daubentonii*, Unidentified bat, *Pipistrellus pygmaeus, Pipistrellus pipistrellus* (45kHz) | N7202163568 | N/A | Athboy Bridge Transect |
| | *Unidentified bat, Myotis daubentonii* | N7145364744 | N/A | Athboy Bridge Transect spot 1 |
| | *Myotis daubentonii, Unidentified bat* | N7197763830 | N/A | Athboy Bridge Transect spot 10 |
| | *Myotis daubentonii, Unidentified bat* | N7194263934 | N/A | Athboy Bridge Transect spot 2 |
| | *Myotis daubentonii, Unidentified bat* | N7191864026 | N/A | Athboy Bridge Transect spot 3 |
| | *Myotis daubentonii, Unidentified bat* | N7182964149 | N/A | Athboy Bridge Transect spot 4 |
| | *Myotis daubentonii, Unidentified bat* | N7169164250 | N/A | Athboy Bridge Transect spot 5 |
| | *Myotis daubentonii* | N7159764384 | N/A | Athboy Bridge Transect spot 6 |
| | *Myotis daubentonii, Unidentified bat* | N7152464653 | N/A | Athboy Bridge Transect spot 7 |
| | *Myotis daubentonii, Unidentified bat* | N7148964653 | N/A | Athboy Bridge Transect spot 8 |
| | *Unidentified bat, Myotis daubentonii, Nyctalus leisleri* | N6430061900 | N/A | Athboy Bridge Transect spot 9 |
| | *Myotis daubentonii, Unidentified bat* | N592498 | N/A | Coxtown Transect |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus spp. (45kHz/55kHz), Nyctalus leisleri* | N7339569390 | N/A | DArcys Bridge Transect |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus spp. (45kHz/55kHz), Nyctalus leisleri* | N7357764382 | N/A | N74 (3) 2006- |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus spp. (45kHz/55kHz), Pipistrellus pygmaeus, Nyctalus leisleri, Unidentified bat* | N7327557662 | N/A | N74 (4) 2006- |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Nyctalus leisleri, Pipistrellus spp. (45kHz/55kHz)* | N7332753266 | N/A | N74 (5) 2006- |
| | *Pipistrellus pygmaeus, Nyctalus leisleri, Pipistrellus pipistrellus (45kHz), Pipistrellus nathusii, Pipistrellus spp. (45kHz/55kHz), Unidentified bat* | N734526 | N/A | N74 (6) 2006- |
| | *Myotis daubentonii, Unidentified bat* | N7145364744 | N/A | Scarrif Bridge (Meath) Transect |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Nyctalus leisleri* | N6864654122 | 23/08/2018 | Consultancy Surveys |

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|---|---|---|---|---|
| Ad-Hoc | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Nyctalus leisleri, Myotis spp.* | N6772154194 | 23/08/2018 | Consultancy Surveys |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus* | N6841754164 | 23/08/2018 | Consultancy Surveys |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Nyctalus leisleri* | N6844254095 | 23/08/2018 | Consultancy Surveys |
| | *Myotis daubentonii* | N710564 | 11/10/2009 | BATLAS 2010 |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus* | N716642 | 20/09/2009 | BATLAS 2010 |
| | *Pipistrellus pygmaeus, Myotis daubentonii* | N708667 | 20/09/2009 | BATLAS 2010 |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus* | N736676 | 20/09/2009 | BATLAS 2010 |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Myotis daubentonii* | N6552161153 | 13/07/2017 | BATLAS 2010 |
| | *Myotis daubentonii* | N5851549989 | 25/09/2015 | BATLAS 2020 |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Nyctalus leisleri, Pipistrellus spp. (45kHz/55kHz)* | N5796050836 | 25/09/2015 | BATLAS 2020 |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Nyctalus leisleri, Myotis spp.* | N5438552353 | 18/08/2015 | BATLAS 2020 |
| | *Pipistrellus pygmaeus, Myotis daubentonii* | N6003253032 | 15/08/2016 | BATLAS 2020 |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus* | N6331053309 | 15/08/2016 | BATLAS 2020 |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Pipistrellus spp. (45kHz/55kHz)* | N5652353332 | 18/09/2015 | BATLAS 2020 |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Plecotus auritus, Myotis spp.* | N6785054205 | 21/09/2018 | BATLAS 2020 |
| | *Nyctalus leisleri* | N6171854227 | 16/08/2016 | BATLAS 2020 |
| | *Pipistrellus pygmaeus* | N6591454415 | 21/09/2018 | BATLAS 2020 |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus* | N5453355765 | 30/09/2015 | BATLAS 2020 |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus* | N6084555945 | 27/09/2018 | BATLAS 2020 |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus nathusii* | N6934556105 | 21/09/2018 | BATLAS 2020 |
| | *Pipistrellus pipistrellus (45kHz)* | N5546856382 | 26/09/2015 | BATLAS 2020 |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Nyctalus leisleri, Plecotus auritus, Myotis spp.* | N6520457382 | 22/09/2018 | BATLAS 2020 |
| | *Pipistrellus pygmaeus, Nyctalus leisleri* | N5845357619 | 26/09/2015 | BATLAS 2020 |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Nyctalus leisleri* | N6255858610 | 22/09/2018 | BATLAS 2020 |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus* | N7073959394 | 20/08/2018 | BATLAS 2020 |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Myotis daubentonii, Myotis spp.* | N5781059945 | 09/10/2015 | BATLAS 2020 |
| | *Pipistrellus pipistrellus (45kHz)* | N6473660827 | 13/07/2017 | BATLAS 2020 |
| | *Pipistrellus pygmaeus, Myotis daubentonii* | N5637162568 | 27/06/2017 | BATLAS 2020 |

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|---|---|---|---|---|
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Myotis daubentonii* | N6204462577 | 13/07/2017 | BATLAS 2020 |
| | *Pipistrellus pipistrellus (45kHz)* | N5676363989 | 27/06/2017 | BATLAS 2020 |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Nyctalus leisleri, Myotis daubentonii, Plecotus auritus* | N7168664269 | 19/08/2018 | BATLAS 2020 |
| | *Pipistrellus pygmaeus* | N6571264430 | 13/07/2017 | BATLAS 2020 |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus* | N5580865499 | 27/06/2017 | BATLAS 2020 |
| | *Pipistrellus pygmaeus, Pipistrellus spp. (45kHz/55kHz)* | N6139866125 | 14/07/2017 | BATLAS 2020 |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Nyctalus leisleri* | N7075266653 | 19/08/2018 | BATLAS 2020 |
| | *Pipistrellus pygmaeus, Pipistrellus spp. (45kHz/55kHz)* | N6228467284 | 14/07/2017 | BATLAS 2020 |
| | *Pipistrellus pygmaeus, Myotis daubentonii* | N6748069165 | 13/07/2017 | BATLAS 2020 |
| | *Pipistrellus pipistrellus (45kHz)* | N6632869554 | 14/07/2017 | BATLAS 2020 |
| | *Plecotus auritus* | N684653 | 17/07/2005 | Consultancy Surveys |
| | *Nyctalus leisleri, Pipistrellus pipistrellus (45kHz)* | N6800054000 | 27/06/2007 | Brown long-eared Roost Monitoring Scheme |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Plecotus auritus* | N5485065500 | 20/05/2003 | Consultancy Surveys |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Plecotus auritus, Nyctalus leisleri* | N5680051850 | 06/09/2007 | Consultancy Surveys |
| | *Myotis natterreri, Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Nyctalus leisleri* | N7109358118 | 26/03/2012 | Consultancy Surveys |
| **Southern Section of the Study area (IG Ref: E 265634 N 251541)** | | | | |
| **Record** | **Species** | **Grid Reference** | **Date** | **Location** |
| Roost | *Nyctalus leisleri, Pipistrellus spp. (45kHz/55kHz)* | N7313742708 | N/A | Enfield, County Meath |
| | *Plecotus auritus* | N6854 | N/A | Ballivor, Co. Meath |
| | *Pipistrellus pygmaeus* | N7551 | N/A | Doolystown, Trim, County Meath |
| | *Pipistrellus spp. (45kHz/55kHz)* | N6844 | N/A | Ballynakill, Longwood, County Meath |
| | *Pipistrellus pygmaeus* | N6849 | N/A | Killyon, County Meath |
| | *Plecotus auritus* | N5743 | N/A | Kinnegad, County Meath |
| | *Plecotus auritus* | N7258 | N/A | Kildalkey,County Meath |
| | *Plecotus auritus* | N5651 | N/A | Killucan, Mullingar, County Westmeath |
| Transect | *Unidentified bat* | N6087346115 | N/A | Ballivor Road Bridge Transect spot 1 |
| | *Unidentified bat* | N6077245970 | N/A | Ballivor Road Bridge Transect spot 3 |
| | *Unidentified bat,Myotis daubentonii* | N6071345902 | N/A | Ballivor Road Bridge Transect spot 4 |

| | | | | |
|---|---|---|---|---|
| | *Myotis daubentonii,Unidentified bat* | N6064245796 | N/A | Ballivor Road Bridge Transect spot 5 |
| | *Myotis daubentonii* | N6010045717 | N/A | Ballivor Road Bridge Transect spot 6 |
| | *Myotis daubentonii,Unidentified bat* | N592498 | N/A | DArcys Bridge Transect |
| | *Unidentified bat,Myotis daubentonii* | N7220042600 | N/A | Moyvalley Bridge Transect |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Nyctalus leisleri, Pipistrellus spp. (45kHz/55kHz)* | N7327557662 | N/A | N74 (5) 2006- |
| | *Pipistrellus pygmaeus, Nyctalus leisleri, Pipistrellus pipistrellus (45kHz), Pipistrellus nathusii, Pipistrellus spp. (45kHz/55kHz), Unidentified bat* | N7332753266 | N/A | N74 (6) 2006- |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus spp. (45kHz/55kHz), Pipistrellus pygmaeus, Nyctalus leisleri, Plecotus auritus, Unidentified bat* | N7559147955 | N/A | N74 (8) 2006- |
| | *Pipistrellus spp. (45kHz/55kHz), Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Nyctalus leisleri* | N7273944501 | N/A | N74 (9) 2006- |
| | *Myotis daubentonii, Unidentified bat* | N734526 | N/A | Scarrif Bridge (Meath) Transect |
| Ad-Hoc | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Nyctalus leisleri* | N6864654122 | 23/08/2018 | Consultancy Surveys |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Nyctalus leisleri, Myotis spp.* | N6772154194 | 23/08/2018 | Consultancy Surveys |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus* | N6841754164 | 23/08/2018 | Consultancy Surveys |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Nyctalus leisleri* | N6844254095 | 23/08/2018 | Consultancy Surveys |
| | *Myotis daubentonii* | N710564 | 11/10/2009 | BATLAS 2010 |
| | *Pipistrellus pygmaeus, Pipistrellus pipistrellus (45kHz)* | N7562957770 | 11/10/2009 | BATLAS 2010 |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Myotis daubentonii* | N6552161153 | 13/07/2017 | BATLAS 2010 |
| | *Pipistrellus pygmaeus, Nyctalus leisleri* | N7371442396 | 23/08/2018 | BATLAS 2020 |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus* | N5785742916 | 11/09/2018 | BATLAS 2020 |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Nyctalus leisleri* | N7183143465 | 26/09/2018 | BATLAS 2020 |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Myotis spp.* | N6262544714 | 12/09/2018 | BATLAS 2020 |
| | *Pipistrellus pygmaeus, Pipistrellus spp. (45kHz/55kHz)* | N7231645158 | 23/08/2018 | BATLAS 2020 |
| | *Pipistrellus spp. (45kHz/55kHz)* | N7557245429 | 23/08/2018 | BATLAS 2020 |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus* | N6476647081 | 29/09/2018 | BATLAS 2020 |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus* | N6113149273 | 29/09/2018 | BATLAS 2020 |
| | *Pipistrellus pygmaeus, Plecotus auritus* | N5972949371 | 29/09/2018 | BATLAS 2020 |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Myotis daubentonii* | N6637349447 | 29/09/2018 | BATLAS 2020 |
| | *Myotis daubentonii* | N5851549989 | 25/09/2015 | BATLAS 2020 |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Nyctalus leisleri, Pipistrellus spp. (45kHz/55kHz)* | N5796050836 | 25/09/2015 | BATLAS 2020 |
| | *Pipistrellus pygmaeus, Myotis daubentonii* | N6003253032 | 15/08/2016 | BATLAS 2020 |

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|---|---|---|---|---|
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus* | N6331053309 | 15/08/2016 | BATLAS 2020 |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Pipistrellus spp. (45kHz/55kHz)* | N5652353332 | 18/09/2015 | BATLAS 2020 |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Plecotus auritus, Myotis spp.* | N6785054205 | 21/09/2018 | BATLAS 2020 |
| | *Nyctalus leisleri* | N6171854227 | 16/08/2016 | BATLAS 2020 |
| | *Pipistrellus pygmaeus* | N6591454415 | 21/09/2018 | BATLAS 2020 |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus* | N6084555945 | 27/09/2018 | BATLAS 2020 |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus nathusii* | N6934556105 | 21/09/2018 | BATLAS 2020 |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Nyctalus leisleri, Plecotus auritus, Myotis spp.* | N6520457382 | 22/09/2018 | BATLAS 2020 |
| | *Pipistrellus pygmaeus, Nyctalus leisleri* | N5845357619 | 26/09/2015 | BATLAS 2020 |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Nyctalus leisleri, Myotis daubentonii, Plecotus auritus* | N7550957732 | 20/08/2018 | BATLAS 2020 |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Nyctalus leisleri* | N6255858610 | 22/09/2018 | BATLAS 2020 |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus* | N7073959394 | 20/08/2018 | BATLAS 2020 |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Myotis daubentonii, Myotis spp.* | N5781059945 | 09/10/2015 | BATLAS 2020 |
| | *Pipistrellus pipistrellus (45kHz)* | N6473660827 | 13/07/2017 | BATLAS 2020 |
| | *Nyctalus leisleri, Pipistrellus pipistrellus (45kHz)* | N6800054000 | 27/06/2007 | Brown long-eared Roost Monitoring Scheme |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Plecotus auritus, Nyctalus leisleri* | N5680051850 | 06/09/2007 | Consultancy Surveys |
| | *Myotis natterreri, Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Nyctalus leisleri* | N7109358118 | 26/03/2012 | Consultancy Surveys |
| | *Pipistrellus pipistrellus (45kHz)* | N5800048000 | 23/06/2002 | Consultancy Surveys |
| | *Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Myotis daubentonii* | N5800049000 | 23/06/2002 | Consultancy Surveys |
| | *Nyctalus leisleri, Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus* | N572432 | 13/06/2000 | Consultancy Surveys |

*Table 4-2 BCI Database Records*

### 4.1.2 Bat Species Range

The potential for negative impacts is likely to increase where there are high risk species at the edge of their range (NatureScot, 2021). Therefore, range maps presented in the 2019 Article 17 Reports (NWPS, 2019) were reviewed in relation to the location of the site.

The Study Area is located outside the current known range for lesser horseshoe bat, Nathusius' pipistrelle, Natterer's bat and Whiskered bat. The Study Area is within the range of all other species.

### 4.1.3 Designated Sites

Within Ireland, the lesser horseshoe bat is the only bat species requiring the designation of Special Areas of Conservation (SACs) and the Study Area is situated outside the known range of this species.

Natural Heritage Areas (NHAs) and proposed Natural Heritage Areas (pNHAs) may be designated for any bat species. A search of NHAs and pNHAs within a 10km radius of the Study Area found no sites designated for the conservation of bats.

### 4.1.4 Landscape Features

A review of mapping and photographs provided insight into the habitats and landscape features present within the Study area. In summary, the primary land use within the Study Area was commercial peat harvesting which ceased operation in 2020.

A review of the GSI online mapper did not indicate the possible presence of any natural subterranean sites within the Study area and a search of the National Monuments Database did not reveal the presence of any manmade subterranean sites within the Study Area.

A search of the UBSS Cave Database for the Republic of Ireland found no caves within the Study Area study area or within 10km of the Study Area.

A review of the NBDC bat landscape map provided a habitat suitability index of 16.67 (green) to 21.89 (yellow). This indicates that the Study Area has low habitat suitability for bat species.

## 4.2 Field Surveys

### 4.2.1 Roost Surveys

The Study Area was checked for potential tree roosts but no trees with significant roosting features were identified within the site. Trees may have an increased or decreased probability of hosting roosting bats in certain circumstances. For example, a large broadleaf tree with cavities or damage such as rot or loose bark increases the probability of hosting roosting bats. Whereas coniferous plantations and young trees with little to no damage have a decreased probability of hosting roosting bats (Marnell *et al.*, 2022). The surrounding habitats, i.e. cutover bog and scrub, were assessed as largely unsuitable for roosting bats.

Following a search for roosts in 2020 and 2022, no evidence of bat roosts were identified within the Study Area.

## 4.2.2 Manual Transects

### 2020 Manual Results

Manual transects were undertaken in Spring, Summer and Autumn 2020. Bat activity was recorded on all surveys. A total of 535 bat passes were recorded. In general, Common pipistrelle (*Pipistrellus pipistrellus)* (n=230) was recorded most frequently, followed by Soprano pipistrelle *(Pipistrellus pygmaeus)* (n=169), and Leisler's Bat *(Nyctalus leisleri)* (n=132). Instances of Brown long-eared bat *(Plecotus auritus)* (n=3) and *Myotis* spp. (n=1) were rare.

Species composition and activity levels varied significantly between surveys. Transect survey results were calculated as bat passes per km surveyed (to account for differences in survey effort) (Plate 4-1).

Figures 4-1 to 4-3 present the spatial distribution of bat activity across the 2020 surveys. Bat activity was concentrated along woodland edge, scrub and linear (road/track) habitats.

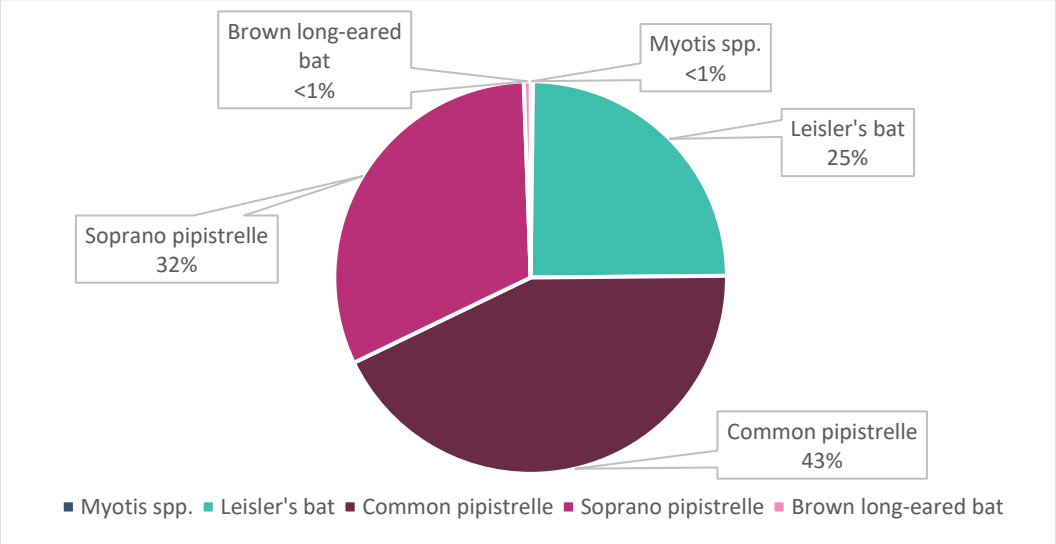


*Plate 4-1 2022 Manual Activity Surveys (Total Species Composition)*

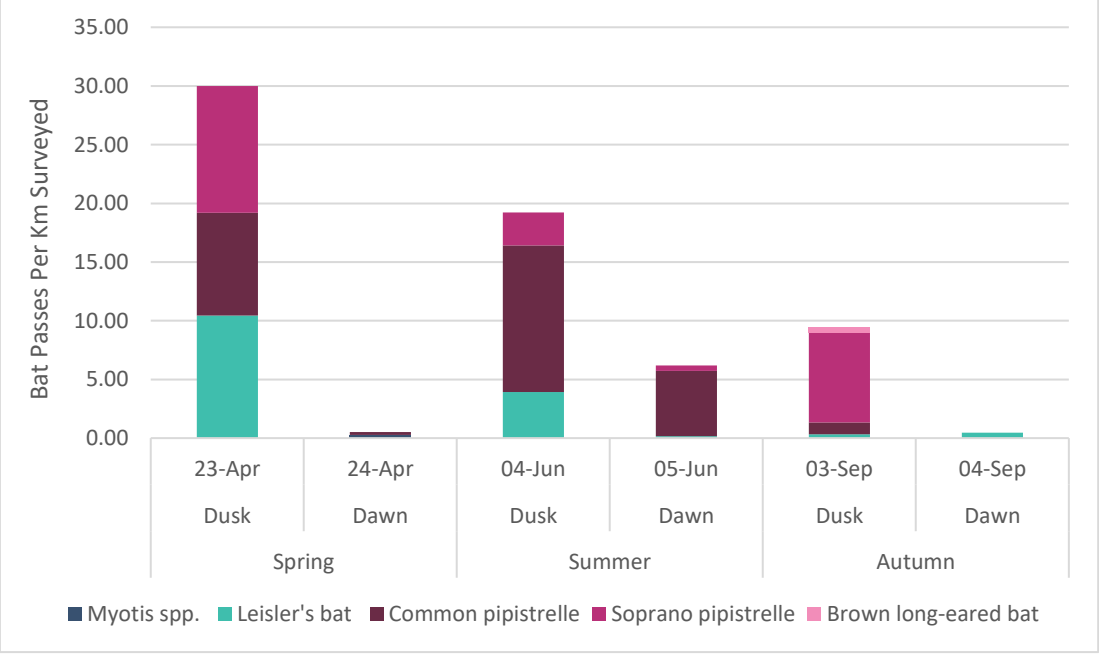


*Plate 4-2 2020 Transect Results – Species Composition Per Survey Period*




Drawing Title
2020 Spring Manual Transect Results

Project Title
Ballivor Substitute Consent Application

| Drawn by | Checked by |
|---|---|
| RC | AJ/SF |
| Project No. 191137 | Drawing No. Figure 4-1 |
| Scale 1:25,000 | Date 25/07/2024 |

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Drawing Title
2020 Summer Manual Transect Results

Project Title
Ballivor Substitute Consent Application

| Drawn by | Checked by |
|---|---|
| RC | AJ/SF |
| Project No. 191137 | Drawing No. Figure 4-2 |
| Scale 1:25,000 | Date 25/07/2024 |

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Drawing Title
2020 Autumn Manual Transect Results

Project Title
Ballivor Substitute Consent Application

| Drawn by | Checked by |
|---|---|
| RC | AJ/SF |
| Project No. 191137 | Drawing No. Figure 4-3 |
| Scale 1:25,000 | Date 25/07/2024 |

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Website: ww.mkoireland.ie

## 2022 Manual Results

Manual transects were undertaken in Spring, Summer, and Autumn 2022. Bat activity was recorded on all surveys. A total of 108 bat passes were recorded. In general, Common pipistrelle (*Pipistrellus pipistrellus)* (n=96) was recorded most frequently, followed the Leisler's bat *(Nyctalus leisleri)* (n=8), and Soprano pipistrelle *(Pipistrellus pygmaeus)* (n=4).

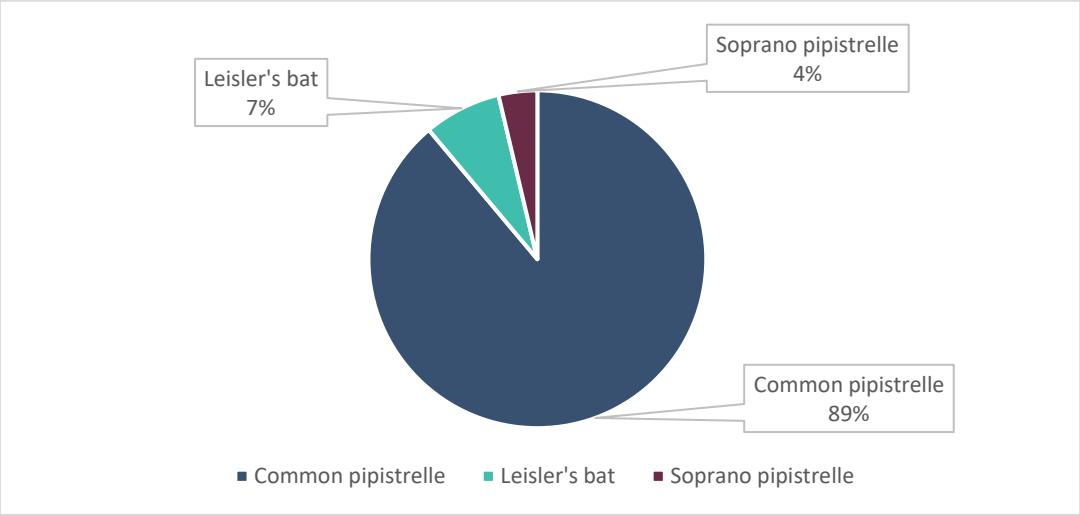



*Plate 4-3 2022 Manual Activity Surveys (Total Species Composition)*

Species composition and activity levels varied slightly between surveys, but for all surveys, species activity was relatively low. Plate 4-3 presents the results for individual species per survey period. Transect survey results were calculated as bat passes per km surveyed (to account for differences in survey effort) (Plate 4-4). Figure 4-4 to Figure 4-6 present the seasonal distribution of bat activity across the 2022 surveys. Bat activity was concentrated along linear habitats such as forestry edge, scrub and roads/tracks.

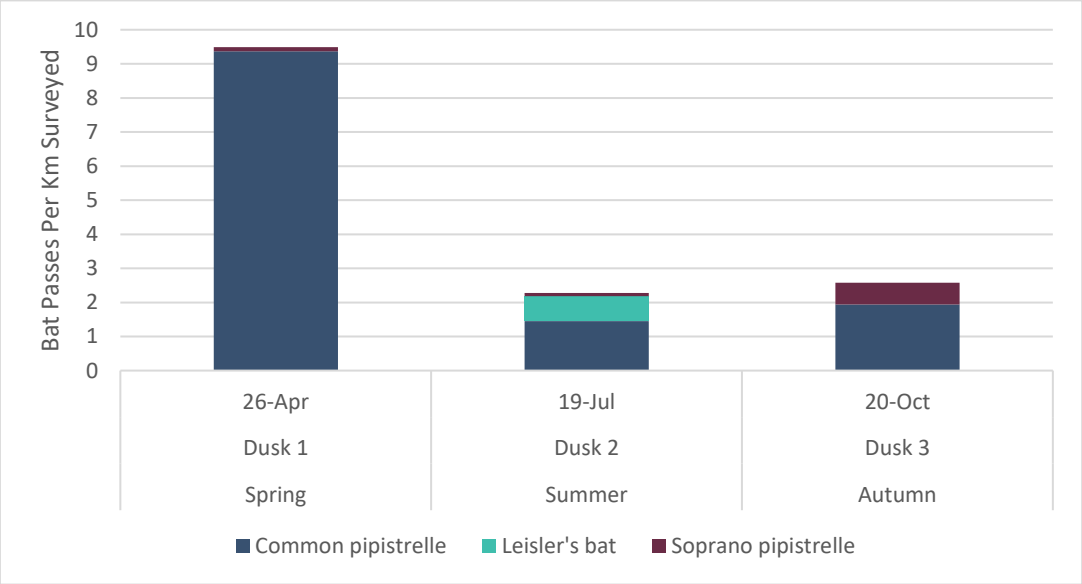
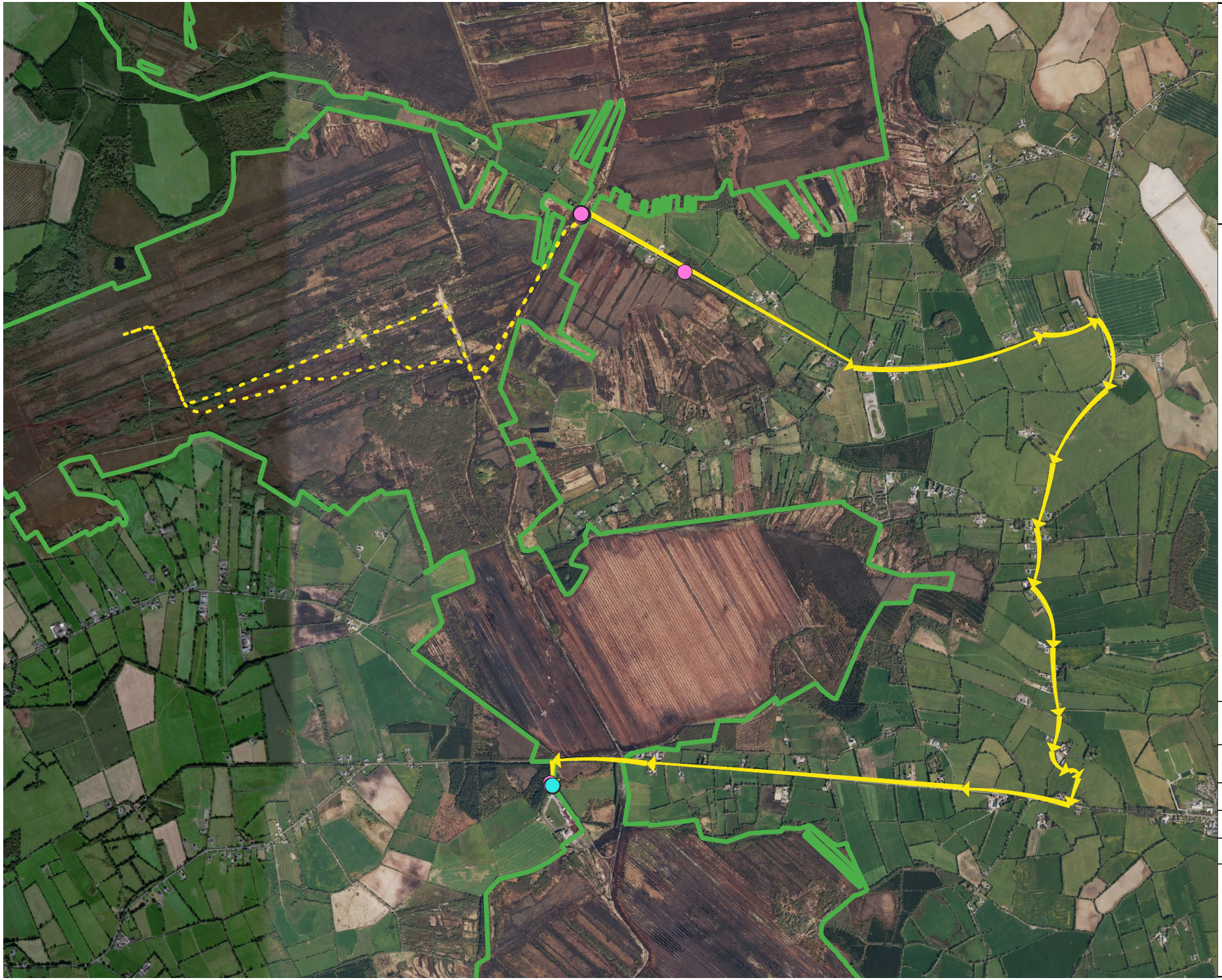



*Plate 4-4 2022 Transect Results – Species Composition Per Survey Period*




Drawing Title
2022 Spring Manual Transect Results

Project Title
Ballivor Substitute Consent Application

| Drawn by | Checked by |
|---|---|
| RC | AJ/SF |
| Project No. 191137 | Drawing No. Figure 4-4 |
| Scale 1:30,000 | Date 24/07/2024 |

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Drawing Title
2022 Summer Manual Transect Results

Project Title
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| Project No. 191137 | Drawing No. Figure 4-5 |
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Project Title
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## 4.2.3 Ground-level Static Surveys

### 2020 Static Results

In total, 96,711 bat passes were recorded across all deployments. In general, Common pipistrelle (*Pipistrellus pipistrellus)* (n=61,883) occurred most frequently, followed by Soprano pipistrelle *(Pipistrellus pygmaeus)* (n=18,637), and Leisler's bat *(Nyctalus leisleri)* (n=12,712). Instances of Nathusius' pipistrelle *(Pipistrellus nathusii)* (n=2,360), *Myotis* spp. (n=696) and Brown long-eared bat *(Plecotus auritus)* (n=423) were significantly less. Plate 4-5 presents species composition across all ground-level static detectors.

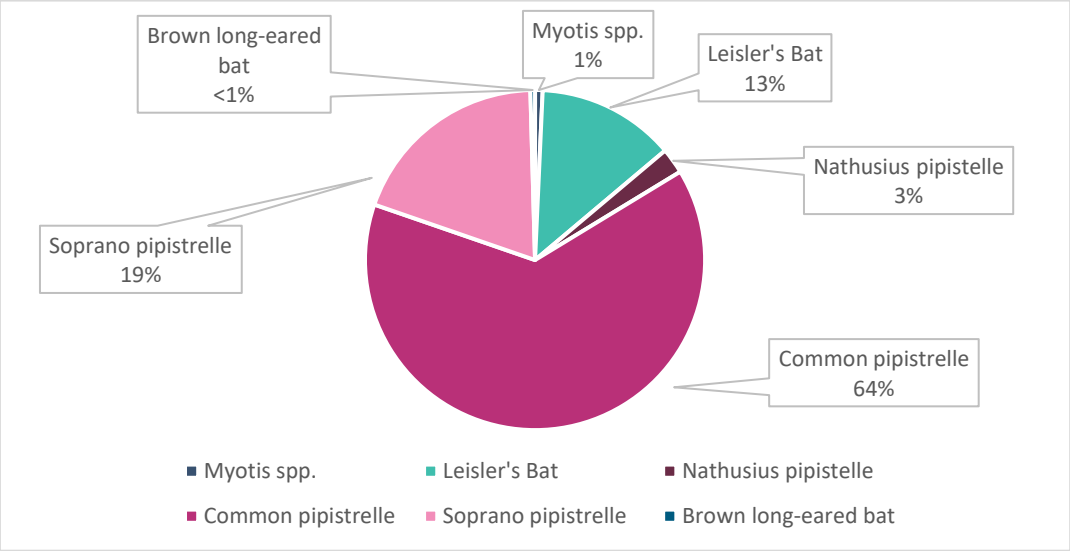


*Plate 4-5 2020 Static Detector Surveys: Species Composition Across All Deployments (Total Bat Passes)*

Bat activity was calculated as total bat passes per hour (bpph) per season to account for any bias in survey effort, resulting from varying night lengths between seasons. Plate 4-6 and Table 4-3 presents these results for each species. Bat activity was dominated by Common pipistrelle in spring and summer Soprano pipistrelle was more common in autumn. Instances of Leisler's bat were less frequent. Nathusius' pipistrelle, *Myotis* spp. and Brown long-eared bat and were relatively rare.

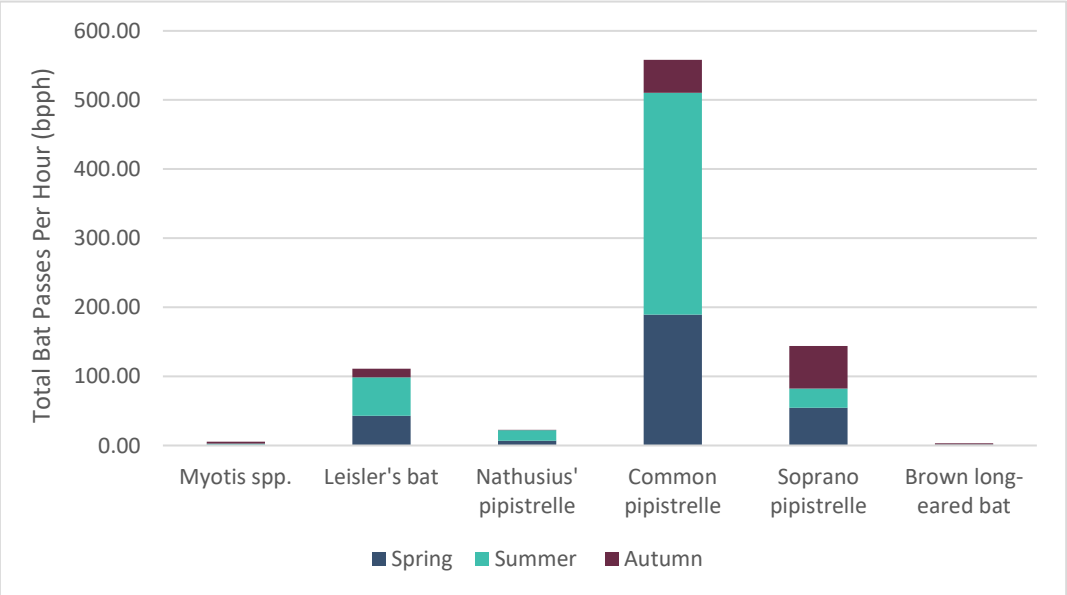


*Plate 4-6 2020 Static Detector Surveys: Species Composition Across All Deployments (Total Bat Passes Per Hour, All Nights)*

*Table 4-3 Static Detector Surveys: Species Composition Across All Deployments in 2020 (Total Bat Passes Per Hour, All Nights)*

| | Spring | Summer | Autumn |
|---|---|---|---|
| ***Total Survey Hours*** | **143.7** | **92** | **140.9** |
| *Myotis spp.* | 1.16 | 1.43 | 2.82 |
| Leisler's bat | 40.65 | 55.41 | 12.58 |
| Nathusius' pipistrelle | 6.70 | 15.10 | 0.06 |
| Common pipistrelle | 178.10 | 321.01 | 47.96 |
| Soprano pipistrelle | 51.23 | 27.91 | 61.80 |
| Brown long-eared bat | 0.93 | 0.41 | 1.79 |

Plate 4-7 illustrates the total bat passes per species per deployment. Common pipistrelle bats were predominant at the majority of detectors during the Spring and Summer survey periods. Autumn activity varied at each detector with Soprano pipistrelle, Common pipistrelle and Leisler's bat as the dominant species.

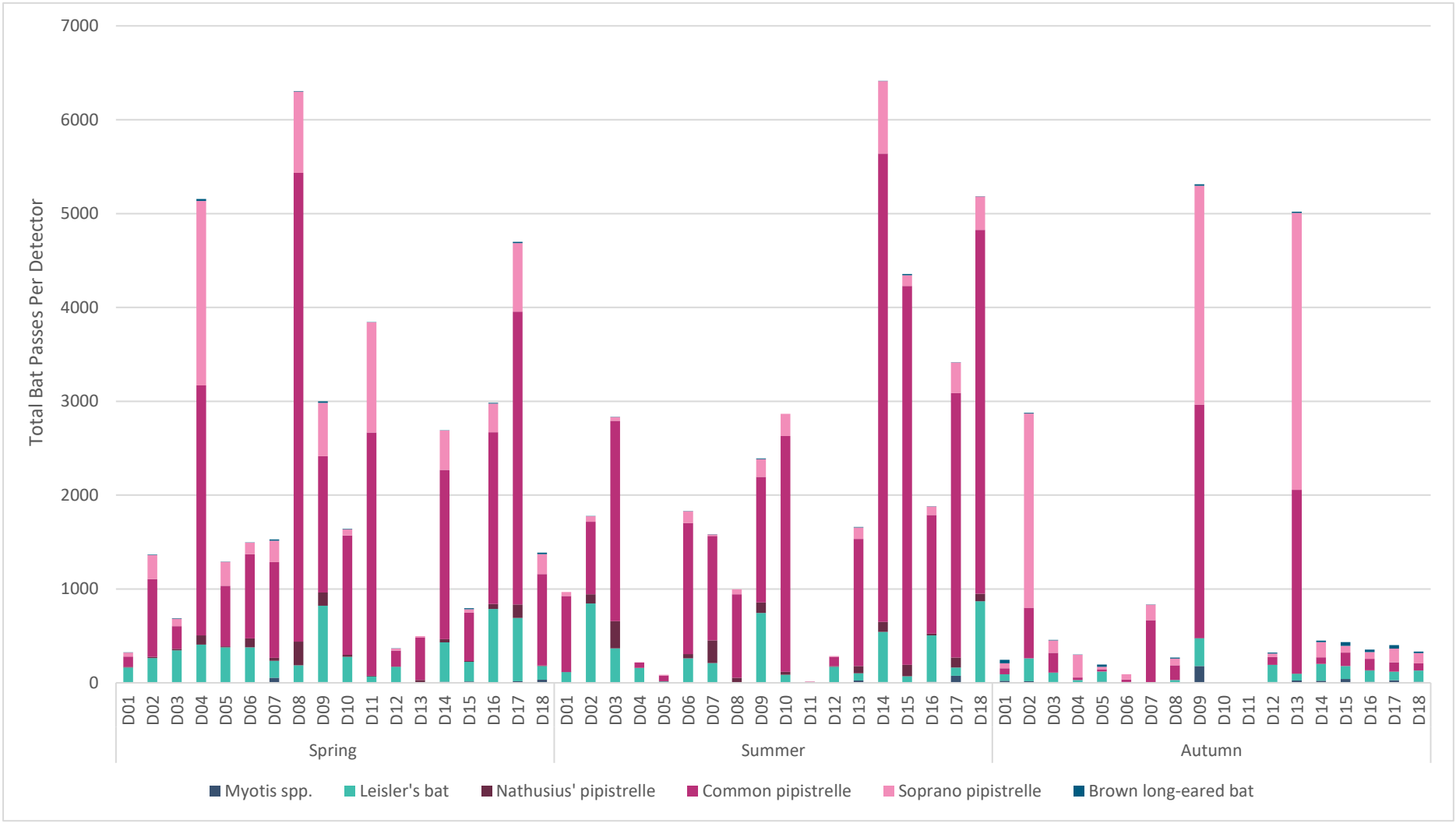


*Plate 4-7 Total Bat Passes Per Detector - 2020*

## 2022 Static Results

In total, 44,221 bat passes were recorded across all deployments in 2022. In general, Common pipistrelle (*Pipistrellus pipistrellus)* (n=24,758) occurred most frequently, followed by Soprano pipistrelle *(Pipistrellus pygmaeus)* (n=11,882), and Leisler's bat *(Nyctalus leisleri)* (n=6,730). Instances of *Myotis* spp. (n=645), Brown long-eared bat *(Plecotus auritus)* (n=192) and Nathusius' pipistrelle *(Pipistrellus nathusii)* (n=14) were significantly less. Plate 4-8 presents species composition across all ground-level static detectors.

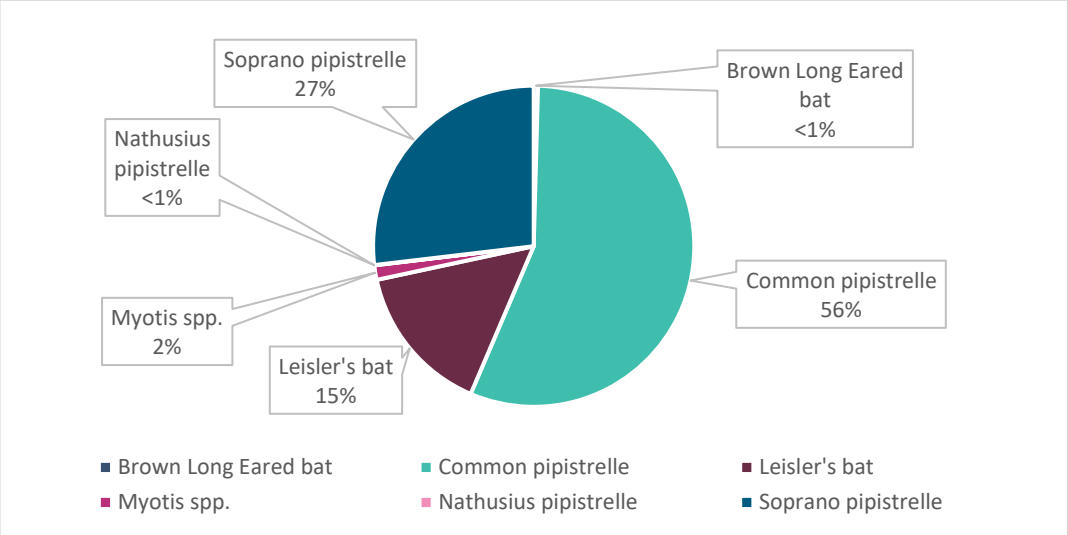


*Plate 4-8 2022 Static Detector Surveys: Species Composition Across All Deployments (Total Bat Passes)*

Bat activity was calculated as total bat passes per hour (bpph) per season to account for any bias in survey effort, resulting from varying night lengths between seasons. Plate 4-9 and Table 4-4 presents these results for each species. Bat activity was dominated by Common pipistrelle in summer. Soprano pipistrelle was more common in spring and autumn. Instances of Leisler's bat were less frequent. *Myotis* spp., Brown long-eared bat and Nathusius' pipistrelle, and were relatively rare.

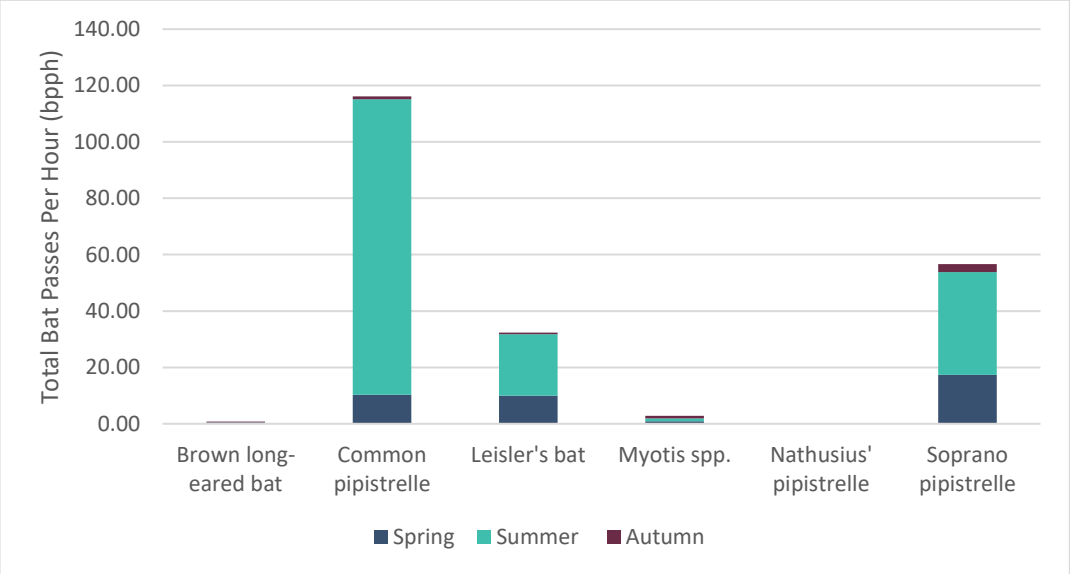


*Plate 4-9 2022 Static Detector Surveys: Species Composition Across All Deployments (Total Bat Passes Per Hour, All Nights)*

*Table 4-4 Static Detector Surveys: Species Composition Across All Deployments in 2022 (Total Bat Passes Per Hour, All Nights)*

| | Spring | Summer | Autumn |
|---|---|---|---|
| ***Total Survey Hours*** | **187.5** | **214.9** | **280.7** |
| *Myotis spp.* | 0.89 | 0.98 | 0.96 |
| Leisler's bat | 9.99 | 21.79 | 0.62 |
| Nathusius' pipistrelle | 0.02 | 0.05 | 0.00 |
| Common pipistrelle | 10.29 | 104.81 | 1.08 |
| Soprano pipistrelle | 17.40 | 36.40 | 2.84 |
| Brown long-eared bat | 0.07 | 0.41 | 0.32 |

Plate 4-10 illustrates the total bat passes per species per deployment. Activity is variable between survey nights. Common pipistrelle bats were predominant at the majority of detectors during the summer survey period. Spring and autumn activity varied at each detector with Soprano pipistrelle, Common pipistrelle and Leisler's bat as the dominant species.

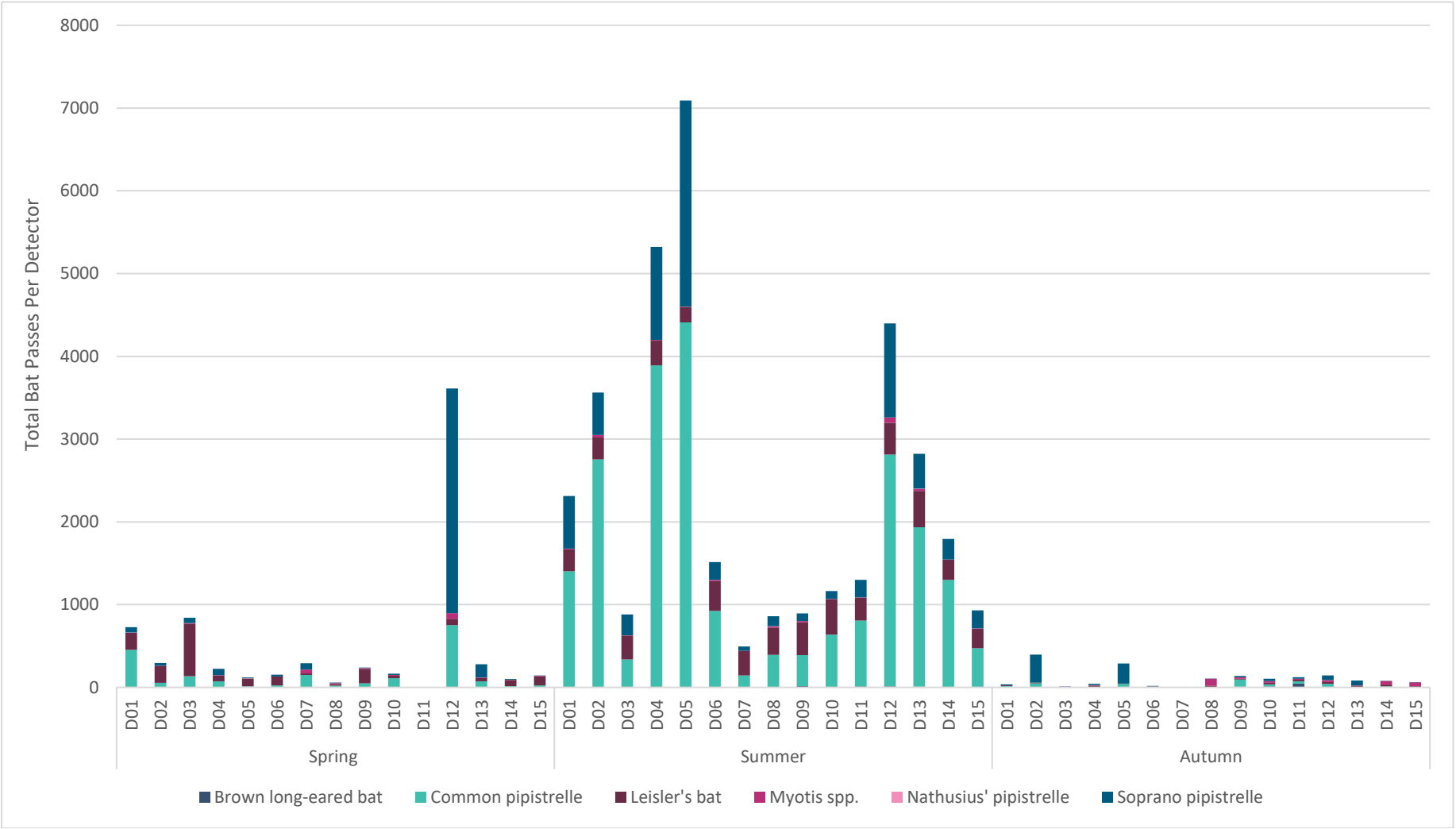


*Plate 4-10 Total Bat Passes Per Detector - 2022*

### 4.2.4 Static Surveys at Height - 2020

Simultaneous surveying at ground level and at height was undertaken using a SM3 static bat detector. One U1 microphone was attached at height (approx. 98m) on the meteorological mast (Grid Ref: N 64762 58978) while another U1 microphone was placed 2m from ground level.

In 2020, 42 nights of simultaneous bat monitoring at ground level and at height was achieved. In total, 1,339 bat passes were recorded with bat activity higher at ground level (69%) compared to activity at height (31%) (Plate 4-11). Leisler's bats (n=409) were predominantly recorded at height with small numbers of common pipistrelle (n=9) also present. *Myotis* spp. (n=1) and soprano pipistrelle (n=1) were also recorded at height.

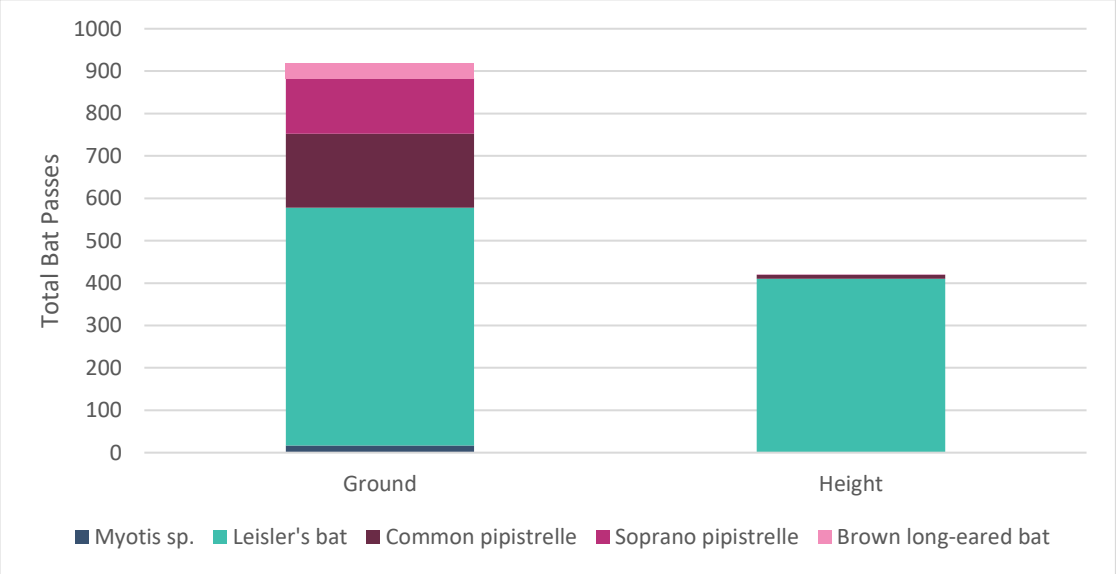


*Plate 4-11 Surveys at Height 2020: Overall Species Composition Per Microphone*

Table 4-5 presents met mast monitoring as total bat passes. Plate 4-12 presents total bat passes per night. Activity was dominated by Leisler's bat.

*Table 4-5 Static Detector Surveys at Height: 2020 Total Bat Passes*

| Species | Ground Level | At Height | Total |
|---|---|---|---|
| *Myotis* spp. | 17 | 1 | **18** |
| Leisler's bat | 561 | 409 | **970** |
| Common pipistrelle | 174 | 9 | **183** |
| Soprano pipistrelle | 132 | 1 | **133** |
| Brown long-eared bat | 35 | - | **35** |
| **Total** | **919** | **420** | **1339** |

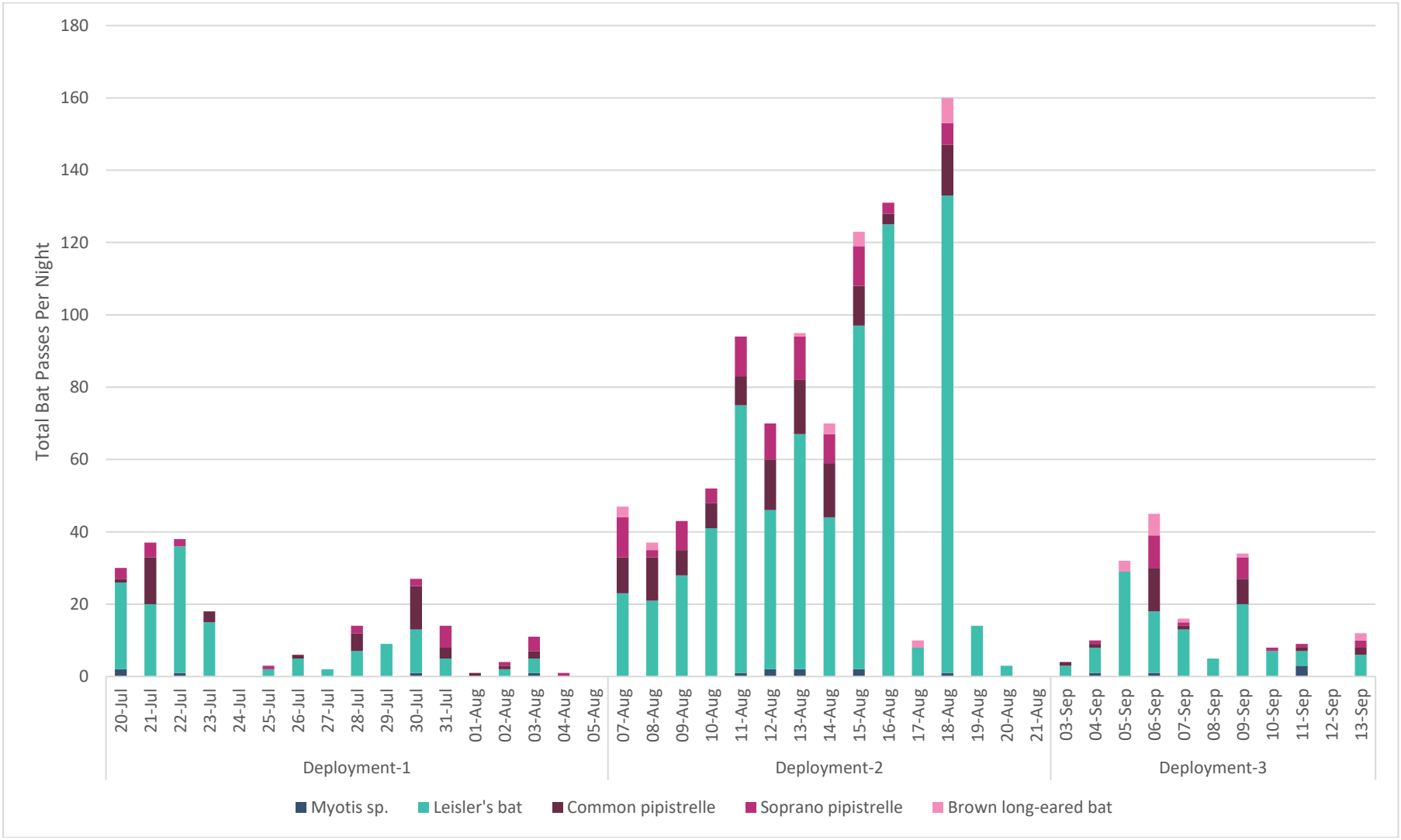


*Plate 4-12 Surveys at Height: Overall Species Composition Per Microphone*

## 4.3 Importance of Bat Population Recorded at the Site

Ecological evaluation within this section follows a methodology that is set out in Chapter three of the '*Guidelines for Assessment of Ecological Impacts of National Roads Schemes'* (NRA, 2009).

All bat species in Ireland are protected under the Bonn Convention (1992), Bern Convention (1982) and the EU Habitats Directive (92/43/EEC). Additionally, in Ireland bat species are afforded further protection under the Birds and Natural Habitats Regulations (2011) and the Wildlife Acts 1976, as amended. No bat roosts were identified within the footprint of the Study Area. Bats as an Ecological Receptor have been assigned ***Local Importance (Higher value)*** on the basis that the habitats within the Study Area are utilized by a regularly occurring bat population of Local Importance.

No roosting study area of National Importance (i.e., Study Area greater than 100 individuals) was recorded within the site. The Study Area does not support a roosting site of ecological significance.

# 5. OVERALL FINDINGS

Six bat species were recorded across the site in both 2020 and 2022. The habitats within the site provide suitable commuting and foraging habitat for a regularly occurring population of bat species of local importance higher value.

No bat roosts were identified within the site in 2020 or 2022, and the site overall provides suboptimal roosting opportunities. Trees on site comprised a mix of immature, semi-mature and mature broadleaf and conifer species. As such, the majority of trees within the site lacked suitable PRFs for roosting bats.

Although bats were recorded within the site, the site in its unmodified state, as an active raised bog prior to peat extraction activities and all ancillary works, is unlikely to have supported significant woodland and scrub habitat suitable for bat habitat. The linear landscape features currently present within the site, as secondary habitats of cutover bog, including woodland and scrub habitat, have come about as a result of natural revegetation of the cutover bog following cessation of peat extraction. These areas of woodland and scrub provide foraging and commuting habitat for bats species would have been largely absent in remnant uncut raised bog and large areas of bare peat that would have existed in 1988.

This report provides a full and comprehensive assessment of baseline bat activity within the site in 2020 and 2022. The surveys and results provided in this report are in accordance with the relevant industry guidance.

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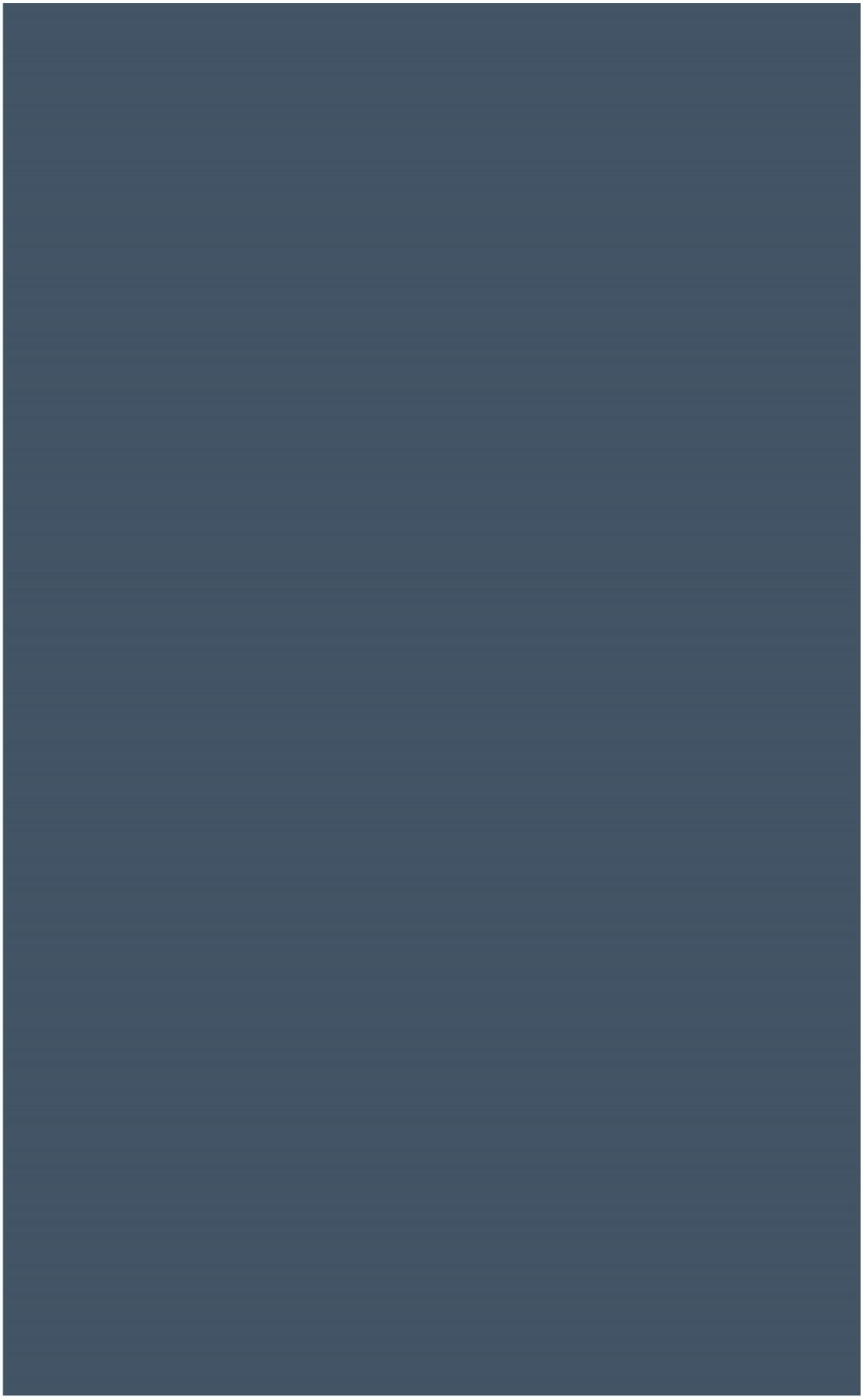

# APPENDIX 6-3

***AQUATIC ASSESSMENT***

# Aquatic baseline report for Ballivor wind farm, Co. Meath/Westmeath




Prepared by Triturus Environmental Ltd. for McCarthy Keville O'Sullivan Ltd.

**October 2021**

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Please cite as:

Triturus (2021). Aquatic baseline report for Ballivor wind farm, Co. Meath. Report prepared by Triturus Environmental Ltd. for McCarthy Keville O'Sullivan Ltd. October. October 2021.

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# 1. Introduction

## 1.1 Background

The following report provides a baseline assessment of the aquatic ecology including fisheries and biological water quality as well as protected aquatic species and habitats in the vicinity of the proposed Ballivor wind farm, located near Ballivor, Co. Meath.

Undertaken on a catchment-wide scale, the baseline surveys focused on aquatic habitats in relation to fisheries potential for species of high conservation value (i.e., salmonids, eel and lamprey), white-clawed crayfish (*Austropotamobious pallipes*) and other aquatic invertebrates. It also considered macrophytes and aquatic bryophytes, aquatic invasive species, and otter (*Lutra lutra*) which may use the watercourses in the vicinity of the proposed project. Aquatic surveys were undertaken in May and July 2021.

The *n*=20 aquatic survey sites were located within the Deel (Raharney) and Stoneyford River sub-basins, in the wider River Boyne catchment (Boyne_SC_040 and Boyne_SC_050). Whilst not located within a European site, the proposed wind farm site (via several watercourses) shared downstream hydrological connectivity with the River Boyne and River Blackwater SAC (002299).

## 1.2 Project description

The proposed Bord na Móna Ballivor wind farm is located on the Ballivor, Bracklin, Carranstown, Lisclogher and Lisclogher West bogs located in Counties Meath and Westmeath. The closest large settlements to the site are Ballivor which is located approximately 2km to the east, Delvin which is located approximately 2.5km to the northwest and Raharney which is located 3km to the west.

A full description of the proposed project is provided in Chapter 2 of the EIAR.

# 2. Methodology

## 2.1 Selection of watercourses for assessment

All freshwater watercourses which could be affected directly or indirectly by the proposed wind farm project were considered as part of the current assessment. A total of *n*=20 sites were selected for detailed aquatic assessment (see **Table 2.1, Figure 2.1** below). The nomenclature for the watercourses surveyed is as per the Environmental Protection Agency's (EPA) online map viewer.

Aquatic survey sites were present on the Cartenstown Stream (EPA code: 07C60), Stonestown River (07S11), Ballinn Stream (07B47), Bolandstown River (07B45), Woodtown West Stream (07W06), Stonyford River (07S02), Carranstown Little River (07C87), Killaconnigan Stream (07K34), Kilballivor Stream (07B35), Ballivor River (07B52) and two unnamed tributaries, Graffanstown Stream (07G10), Ballynaskeagh Stream (07B24), Mucklin Stream (07M13), River Deel (07D01), Craddanstown Stream (07C550), Clondalee More Stream (07C77) and River Boyne (07B04) (**Table 2.1**). The survey sites on the Stonyford River, River Deel and River Boyne were located within the River Boyne and River Blackwater SAC (002299).

Surveys at each of these sites included a fisheries assessment (electro-fishing, habitat appraisal), and (where suitable) biological water quality sampling (Q-sampling) (**Figure 2.1**). White-clawed crayfish (sweep netting & hand searching) surveys were also undertaken at each site, in addition to macrophyte & aquatic bryophyte and otter surveys. This holistic approach informed the overall aquatic ecological evaluation of each site in context of the proposed wind farm project.

Please note this aquatic report should be read in conjunction with the final Environmental Impact Assessment Report (EIAR) prepared for the proposed project. More specific aquatic methodology is outlined below and in the appendices of this report.

## 2.2 Aquatic site surveys

Surveys of the watercourses within the vicinity of the proposed wind farm project were conducted in July 2021. Survey effort focused on both instream and riparian habitats in the vicinity of each sampling point (see **Figure 2.1** above). The watercourses at each survey site were described in terms of the important aquatic habitats and species. This helped to evaluate species and habitats of ecological value in the vicinity of each site. The aquatic baseline prepared would inform mitigation for the wind farm project.

A broad aquatic habitat assessment was conducted utilising elements of the methodology given in the Environment Agency's 'River Habitat Survey in Britain and Ireland Field Survey Guidance Manual 2003' (EA, 2003) and the Irish Heritage Council's 'A Guide to Habitats in Ireland' (Fossitt, 2000). All sites were assessed in terms of:

- Physical watercourse/waterbody characteristics (i.e., width, depth etc.)
- Substrate type, listing substrate fractions in order of dominance (i.e., bedrock, boulder, cobble, gravel, sand, silt etc.)

- River profile in the sampling area
- An appraisal of the macrophyte and aquatic bryophyte community at each site
- Riparian vegetation composition

**Table 2.1** Location of *n*=20 aquatic survey sites in the vicinity of Ballivor wind farm near Ballivor, Co. Meath.

| Site no. | Watercourse | EPA code | Location | X (ITM) | Y (ITM) |
|---|---|---|---|---|---|
| A1 | Cartenstown Stream | 07C60 | Ballyhealy | 661703 | 759056 |
| A2 | Stonestown River | 07S11 | Cartenstown Stream confluence | 663011 | 759233 |
| A3 | Ballinn Stream | 07B47 | Local road crossing, Lisclogher Great | 664937 | 760833 |
| A4 | Bolandstown River | 07B45 | Local road crossing, Bracklin | 662455 | 758674 |
| A5 | Cartenstown Stream | 07C60 | Local road crossing, Coolronan | 666077 | 756898 |
| A6 | Woodtown West Stream | 07W06 | Lisclogher Great | 666459 | 758978 |
| A7 | Stonyford River | 07S02 | Cloghbrack Bridge | 667624 | 758158 |
| A8 | Carranstown Little River | 07C87 | Coolronan | 664558 | 756649 |
| B1 | Killaconnigan Stream | 07K34 | Grange More | 664652 | 754555 |
| B2 | Kilballivor Stream | 07K35 | Killconnigan | 667115 | 755088 |
| B3 | Unnamed stream | n/a | Clonycavan | 667308 | 753476 |
| B4 | Unnamed stream | n/a | Local road crossing, Clonycavan | 666871 | 752716 |
| B5 | Ballivor River | 07B52 | Local road crossing, Clonycavan | 667266 | 751725 |
| C1 | Graffanstown Stream | 07G10 | Local road crossing, Bracklin | 659139 | 757974 |
| C2 | Ballynaskeagh Stream | 07B24 | Local road crossing, Ballynaskeagh | 659022 | 756531 |
| C3 | Mucklin Stream | 07M13 | Local road crossing, Craddanstown | 659139 | 755895 |
| C4 | River Deel | 07D01 | Raharney Bridge, R156 road crossing | 660041 | 753049 |
| C5 | Craddanstown Stream | 07C55 | Local road crossing, Riverdale | 663341 | 751542 |
| C6 | Clondalee More Stream | 07C77 | Local road crossing, Clondalee More | 664753 | 750982 |
| D1 | River Boyne | 07B04 | Scarriff Bridge, R156 road crossing | 673349 | 752700 |

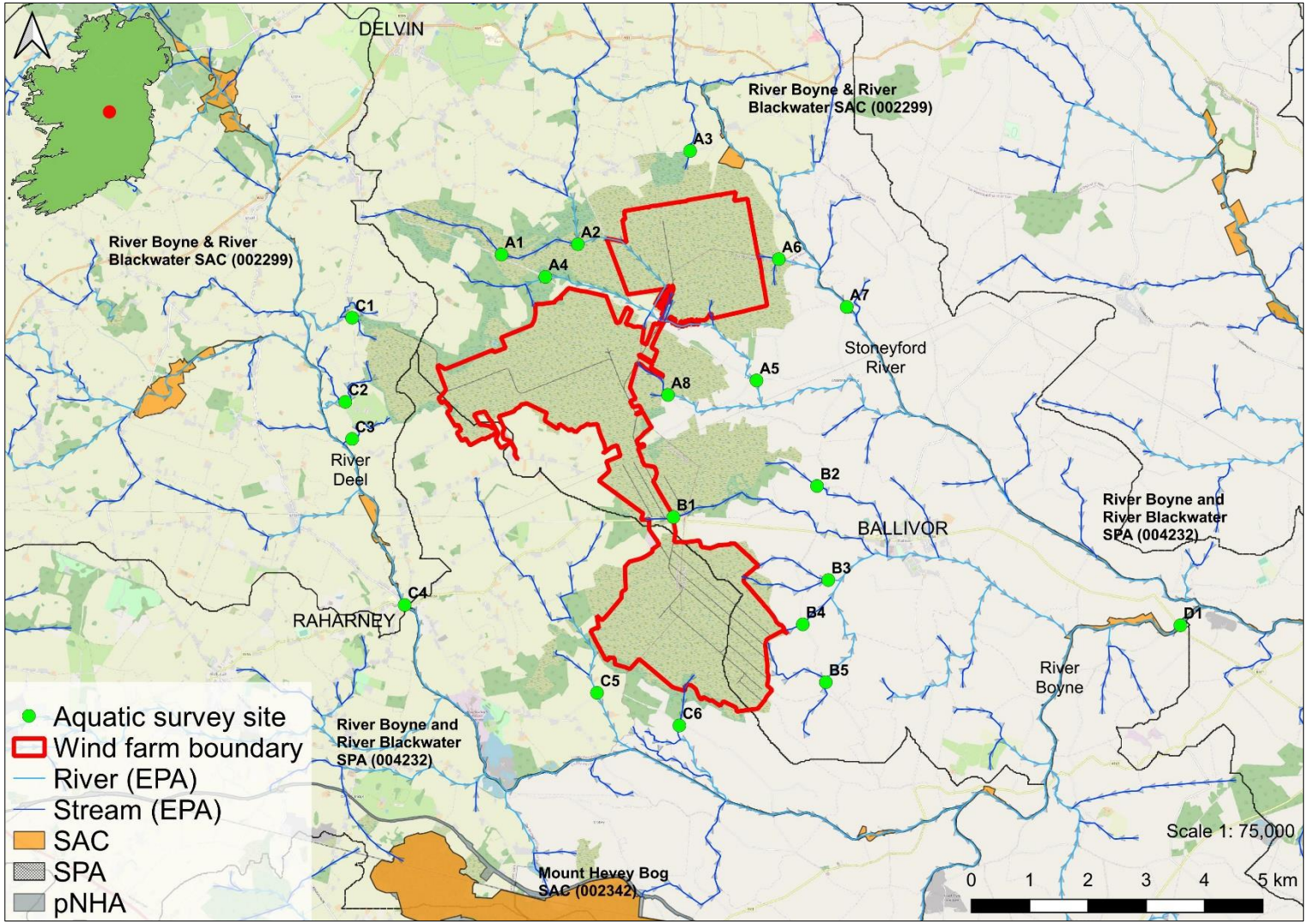


**Figure 2.1** Overview of the *n*=20 aquatic survey site locations for the proposed Ballivor wind farm project, Co. Meath

## 2.3 Catchment-wide electro-fishing

A catchment-wide electro-fishing (CWEF) survey of the watercourses within the vicinity of the proposed wind farm (*n*=20 sites, **Figure 2.1**) was conducted on the 14-16th July 2021, under the conditions of a Department of Communications, Climate Action & Environment (DCCAE) license. The survey was undertaken in accordance with best practice and Section 14 licencing requirements.

Furthermore, a fisheries habitat appraisal of the watercourses in the vicinity of the proposed wind farm project (**Figure 2.1**) was undertaken to establish their importance for salmonid, lamprey, European eel and other fish species. The baseline assessment also considered the quality of spawning, nursery and holding habitat for salmonids and lamprey within the vicinity of the survey sites.

For detailed survey methodology, please refer to accompanying fisheries assessment report in **Appendix A.**

## 2.4 White-clawed crayfish survey

White-clawed crayfish (*Austropotamobius pallipes*) surveys were undertaken at the aquatic survey sites in July 2021 under a National Parks and Wildlife (NPWS) open licence (no. C145/2021), as prescribed by Sections 9, 23 and 34 of the Wildlife Act (1976-2021), to capture and release crayfish to their site of capture, under condition no. 6 of the licence. As per Inland Fisheries Ireland recommendations, the crayfish license sampling started at the uppermost site(s) of the wind farm catchment/sub-catchments in the survey area to minimise the risk of transfer invasive propagules (including crayfish plague) in an upstream direction.

Hand-searching of instream refugia and sweep netting was undertaken according to Reynolds et al. (2010). Trapping of crayfish was not feasible given the small nature of most aquatic survey sites sampled. An appraisal of white-clawed crayfish habitat at each site was conducted based on physical channel attributes, water chemistry and incidental records in mustelid spraint. Additionally, a desktop review of crayfish records within the wider Ballivor wind farm survey area was completed.

## 2.5 Biological water quality (Q-sampling)

The aquatic survey sites were assessed for biological water quality through Q-sampling in May 2021. Some sites were unsuitable for Q-sampling during the survey period given low water levels/flows and the non-perennial nature of some watercourses (see section 4). Sites A2 (Stonestown River), B1 (Killaconnigan Stream), B2 (Kilballivor Stream), B4 (Ballivor River) and C3 (Mucklin Stream) were dry or semi-dry during the sampling period (i.e., non-perennial channels) and, thus, it was not possible to take biological water quality (Q) samples at these sites. A total of *n*=15 sites were sampled (i.e., sites A1, A3, A4, A6, A7, A8, A9, B3, B5, C1, C2, C4, C5, C6 & D1; **Figure 2.2**).

Macro-invertebrate samples were converted to Q-ratings as per Toner et al. (2005). All riverine samples were taken with a standard kick sampling hand net (250mm width, 500µm mesh size) from areas of riffle/glide utilising a three-minute sample. Large cobble was also washed at each site where present and samples were elutriated and fixed in 70% ethanol for subsequent laboratory identification. Any rare invertebrate species were identified from the NPWS Red List publications for beetles (Foster et al., 2009), mayflies (Kelly-Quinn & Regan, 2012), stoneflies (Feeley et al., 2020) and other relevant taxa (i.e., Byrne et al., 2009; Nelson et al., 2011).

**Table 2.2** Reference categories for EPA Q-ratings (Q1 to Q5)

| Q Value | WFD Status | Pollution status | Condition |
|---|---|---|---|
| Q5 or Q4-5 | High status | Unpolluted | Satisfactory |
| Q4 | Good status | Unpolluted | Satisfactory |
| Q3-4 | Moderate status | Slightly polluted | Unsatisfactory |
| Q3 or Q2-3 | Poor status | Moderately polluted | Unsatisfactory |
| Q2, Q1-2 or Q1 | Bad status | Seriously polluted | Unsatisfactory |

## 2.6 Otter signs

The presence of otter (*Lutra lutra*) was determined through the recording of otter signs within 150m of the aquatic survey sites. This also helped to determine the presence of white-clawed crayfish, whose remains may be found in otter spraint. The location of signs was recorded via handheld GPS.

## 2.7 Aquatic ecological evaluation

The evaluation of aquatic ecological receptors contained within this report uses the geographic scale and criteria defined in the 'Guidelines for Assessment of Ecological Impacts of National Road Schemes' (NRA, 2009).

## 2.8 Biosecurity

A strict biosecurity protocol including the Check-Clean-Dry approach was adhered to during surveys for all equipment and PPE used. Disinfection of all equipment and PPE before and after use with Virkon™ was conducted to prevent the transfer of pathogens or invasive propagules between survey sites. Surveys were undertaken at sites in a downstream order to minimise the risk of upstream propagule mobilisation. Particular cognisance was given towards preventing the spread or introduction of crayfish plague (*Aphanomyces astaci*) given the known distribution of white-clawed crayfish (*Austropotamobius pallipes*) in the wider survey area. Where feasible, equipment was also thoroughly dried (through UV exposure) between survey areas. Any aquatic invasive species or pathogens recorded within or adjoining the survey areas were geo-referenced.

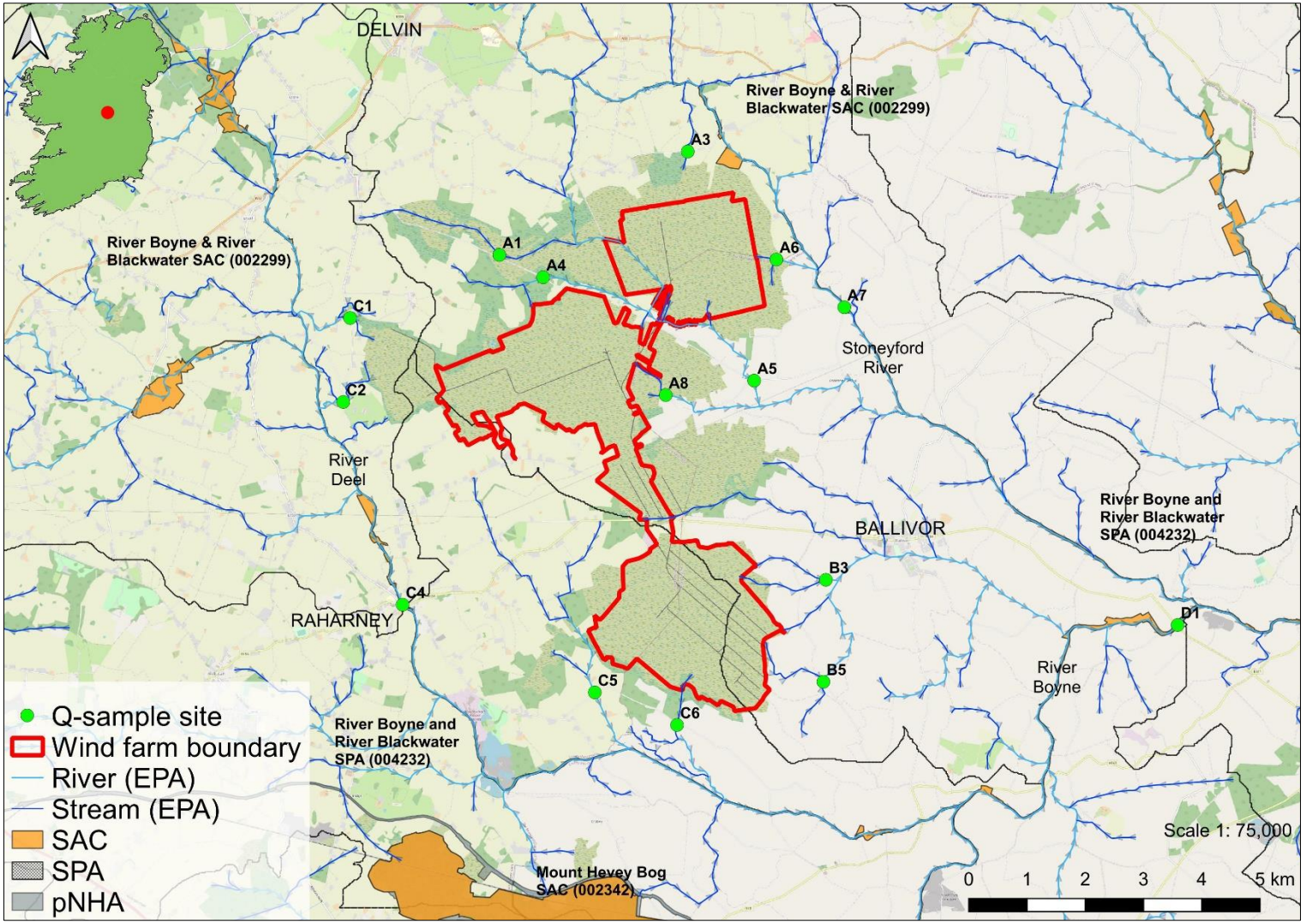


**Figure 2.2** Overview of the biological water quality (Q-sampling) survey locations for the proposed Ballivor wind farm project, Co. Meath

# 3. Receiving environment

## 3.1 Sites designated for aquatic interests

There was a single European site with downstream hydrological connectivity to the proposed Ballivor wind farm project, namely the River Boyne and River Blackwater SAC (site code: 002299) (**Figure 2.1**).

### 3.1.1 River Boyne and River Blackwater SAC (002299)

This site comprises the freshwater element of the River Boyne as far as the Boyne Aqueduct, the Blackwater as far as Lough Ramor and the Boyne tributaries including the Deel, Stoneyford and Tremblestown Rivers. These riverine stretches drain a considerable area of Meath and Westmeath, and smaller areas of Cavan and Louth. The Boyne and its tributaries form one of Ireland's premier game fisheries and the area offers a wide range of angling, from fishing for spring salmon and grilse to seatrout fishing and extensive brown trout fishing. Atlantic Salmon (*Salmo salar*) use the tributaries and headwaters as spawning grounds. The River Blackwater is a medium sized limestone river which is still recovering from the effects of the arterial drainage scheme of the 1970s. Salmon stocks have not recovered to the numbers that existed pre drainage. The Deel, Riverstown, Stoneyford and Tremblestown Rivers are all spring-fed, with a continuous high volume of water. They are difficult to fish because some areas are overgrown, while others have been affected by drainage with resultant high banks due to deepening. This River Boyne & Blackwater SAC (002299) is also important for the populations of two other species listed on Annex II of the E.U. Habitats Directive which it supports, namely river lamprey (*Lampetra fluviatilis*), which is present in the lower reaches of the Boyne River, and otter (*Lutra lutra*), which can be found throughout the site (NPWS, 2014).

Potential downstream hydrological connectivity exists between the proposed wind farm site and River Boyne and River Blackwater SAC via all 19 no. survey watercourses (20 no. survey sites within), namely the Cartenstown Stream, Stonestown River, Ballinn Stream, Bolandstown River, Woodtown West Stream, Stonyford River, Carranstown Little River, Killaconnigan Stream, Kilballivor Stream, Ballivor River and two unnamed tributaries, Graffanstown Stream, Ballynaskeagh Stream, Mucklin Stream, River Deel, Craddanstown Stream, Clondalee More Stream and River Boyne (**Figure 2.1**).

The survey sites on the Stonyford River (A7), River Deel (C4) and River Boyne (D1) were located within the River Boyne and River Blackwater SAC (002299) (**Figure 2.2**). The River Boyne and River Blackwater SAC is designated for the following qualifying interests (NPWS, 2021), namely;

- [1106] *Salmo salar* (Atlantic salmon)
- [1355] *Lutra Rivertown* (otter)
- [1099] *Lampetra fluviatilis* (river lamprey)
- [91E0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)
- [7230] Alkaline fens

## 3.2 Sensitive species data request

A sensitive species data request was submitted (13/07/21) to the National Parks and Wildlife Service for the 10km grid squares containing and adjoining the proposed wind farm project (i.e., N55, N65, N66, N75) and was received on the 23rd July 2021. Records for a number of rare or protected species were available although most did not overlap directly with the survey area (**Figure 3.1**).

Records for white-clawed crayfish (*Austropotamobius pallipes*) widespread within the survey area, on the Deel, Stonyford and Boyne rivers (**Figure 3.1**). However, the bulk of these records were historical only (i.e., 1971-1985). A low number of contemporary records (2006-2009) were available for the upper reaches of the Stonyford River, although a single record was available for Stonyford Bridge near the River Boyne confluence (downstream of survey area) in 2009.

Otter (*lutra lutra*) records were also widespread throughout the relevant grid squares, with records available for the River Deel, Stonyford River and River Boyne. Historical records (1980) were available for the Cartenstown Stream and Bolandstown River within the vicinity of the proposed wind farm planning boundary.

Numerous kingfisher (*Alcedo atthis*) records were available for the survey area, including along the Deel, Stonyford and Boyne Rivers (all from 2010). Historical records were also available for these watercourses from data held by the National Biodiversity Data Centre (NBDC). There were no kingfisher records available for the watercourses within the proposed site boundary.

Common frog (*Rana temporaria*) were widespread throughout 10km grid squares S22, S23, S24, S33 and S34, with a low number of records available for Culronan Bog, located within the proposed site boundary.

## 3.3 Ballivor wind farm catchment and survey area description

The proposed Ballivor wind farm is located on the Ballivor, Bracklin, Carranstown, Lisclogher and Lisclogher West bogs located in Counties Meath and Westmeath. The closest large settlements to the site are Ballivor which is located approximately 2km to the east, Delvin which is located approximately 2.5km to the northwest and Raharney which is located 3km to the west. The proposed wind farm site is within the Eastern River Basin District and within hydrometric area 7 (Boyne). This catchment includes the area drained by the River Boyne and by all streams entering tidal water between The Haven and Mornington Point, Co. Meath, draining a total area of 2,694km². The aquatic survey sites were located within the Deel (Raharney) and Stoneyford River sub-basins, in the wider River Boyne catchment (Boyne_SC_040 and Boyne_SC_050) (**Figure 2.1**).

The following watercourses drained the proposed wind farm site: Cartenstown Stream (07C60), Stonestown River (07S11), Ballinn Stream (07B47), Bolandstown River (07B45), Woodtown West Stream (07W06), Stoneyford River (07S02), Carranstown Little River (07C87), Killaconnigan Stream (07K34), Kilballivor Stream (07K35), Ballivor River (07B52), Graffanstown Stream (07G10), Ballynaskeagh Stream (07B24), Mucklin Stream (07M13), River Deel (07D01), Craddanstown

Stream (07C55), Clondalee More Stream (07C77), River Boyle (07B04) and an unnamed stream near the townland of Clonycavan.

The watercourses and aquatic surveys sites in the vicinity of Ballivor wind farm were typically small, lowland depositing channels (FW2; Fossitt, 2000) and drainage ditches (FW4) (see **section 4** for more details). The three major watercourses with hydrological connectivity to the site were the River Deel, Stoneyford River and River Boyne. Land use practices in the wider survey area were primarily peat bogs (CORINE 412) bordered by agricultural pasture (231) and non-irrigated arable land (211).

Predominantly, the watercourses flowed over areas of Visean or Tournaisian limestone and calcareous shale limestone (Geological Survey of Ireland data).

## 3.4 EPA water quality data (existing data)

The following outlines the available water quality data for the watercourses in context of the proposed wind farm project. Only recent water quality (i.e., since 2015) is summarised below. There were no existing EPA biological monitoring data available for the smaller watercourses surveyed, namely the Cartenstown Stream (07C60), Stonestown River (07S11), Ballinn Stream (07B47), Bolandstown River (07B45), Woodtown West Stream (07W06), Carranstown Little River (07C87), Killaconnigan Stream (07K34), Kilballivor Stream (07K35), Ballivor River (07B52), Graffanstown Stream (07G10), Ballynaskeagh Stream (07B24), Mucklin Stream (07M13), Craddanstown Stream (07C55) or Clondalee More Stream (07C77).

Please note that biological water quality analysis was undertaken as part of this study, with the results presented in the **section 4** and **Appendix B** of this report.

### 3.4.1 Stoneyford River

The Stoneyford River (EPA code: 07S02) flowed parallel to the proposed eastern site boundary. There were a number of EPA biological monitoring stations which have been recently monitored on the river (since 2015). In the vicinity of the wind farm site, the uppermost of these (station code RS07S020075) was located at Stonestown Bridge upstream of the proposed site boundary, and achieved Q3 (poor status) water quality in 2020. Station RS07S020100, located at Rathkenna Bridge, downstream of the site boundary and downstream of aquatic survey site A7, achieved Q4 (good status) water quality in 2015. At Stonyford Bridge (station RS07S020400) near the River Boyne confluence, the river achieved Q3-4 (moderate status) in 2020.

At the time of report drafting, there was no WFD status (2013-2018) or River Waterbodies Risk score available for the Stoneyford River.

### 3.4.2 River Deel

The River Deel (07D01) ran parallel (loosely north to south) to the western site boundary, draining several small watercourses to the west and south of the proposed site. At both Cummer Bridge (station RS07D010200) and Raharney Bridge (RS07D010300, survey site C4) the Deel achieved Q4 (good status) in 2020 and 2018, respectively. At Inan Bridge (RS07D010400), located south of the

wind farm site, the river achieved Q3-4 (moderate status) in 2020. The lowermost monitoring station on the river, at the R161 road bridge (RS07D010600), the river achieved Q4 (good status) in 2020.

Upstream of the wind farm, the Deel (Raharney)_030 sub-catchment was of moderate WFD status. Downstream, the Deel (Raharney)_040 and Deel (Raharney)_060 sub-catchments were of good WFD status (2013-2018). Downstream of Raharney, the Deel (Raharney)_050 sub-catchment was of moderate WFD status. At the time of report drafting, there was no River Waterbodies Risk score available for the River Deel.

### 3.4.3 River Boyne

The River Deel and Stoneyford River both joined the River Boyne (07B04) to the south of the proposed site (i.e., downstream connectivity). At Inchamore Bridge (RS07B040800), downstream of the Deel confluence, the Boyne achieved QQ4-5 (high status) in 2015. However, at Scarriff Bridge (RS07B040900, aquatic survey site D1), the river achieved Q3-4 (moderate status) in 2015. Downstream of the Stoneyford confluence, the Boyne typically achieved Q3-4 (moderate status) for the length of its course (EPA data 2015-2020).

Whilst the WFD status of the Boyne was good upstream of Scarriff Bridge, downstream it fell to moderate status and was generally considered 'at risk' in terms of the Waterbodies Risk score.

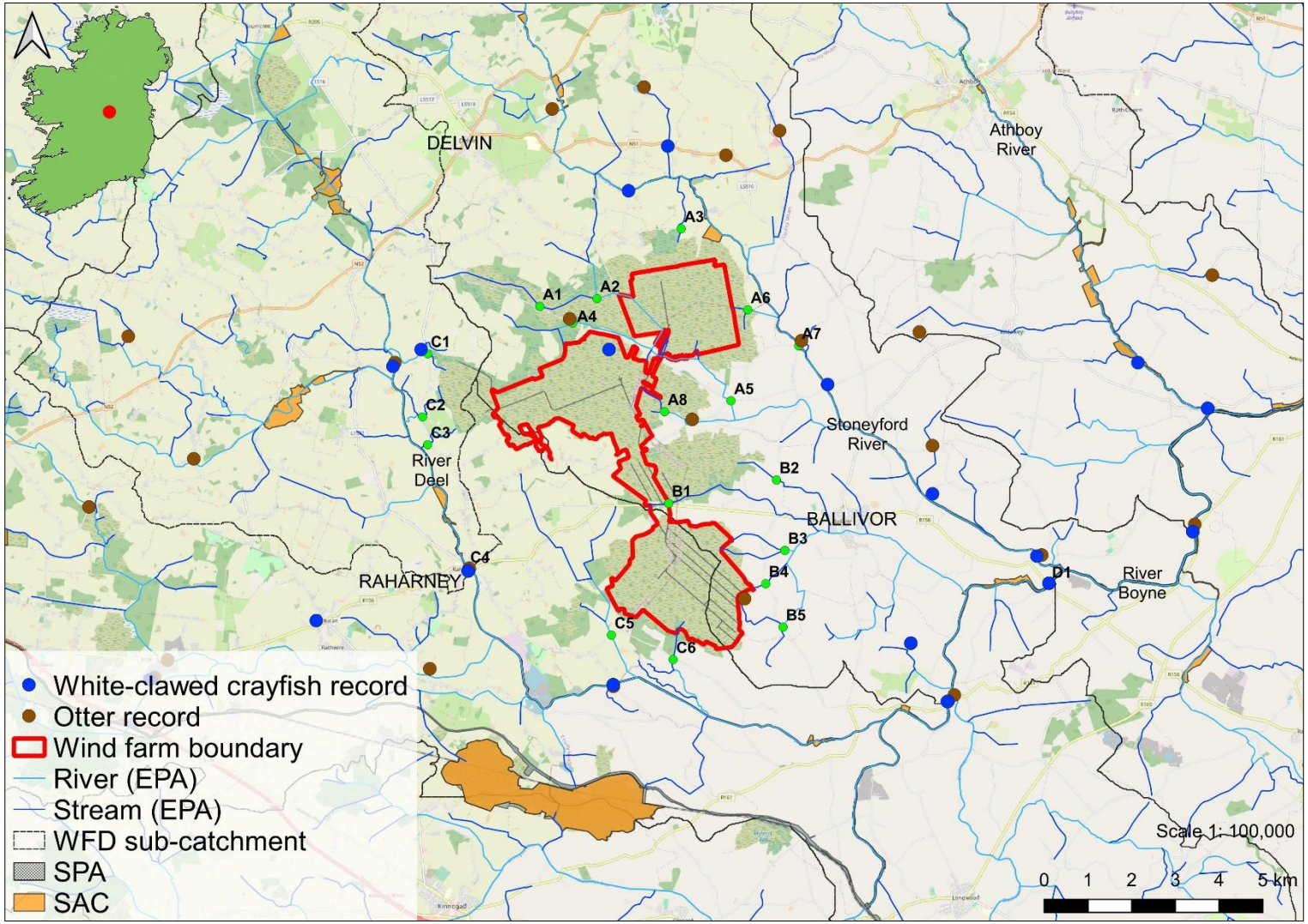


**Figure 3.1** Distribution of white-clawed crayfish and otter records in the vicinity of the proposed Ballivor wind farm (source: NPWS data)

# 4. Results of aquatic surveys

The following section summarises each of the *n*=20 survey sites in terms of aquatic habitats, physical characteristics and overall value for fish, white-clawed crayfish and macrophyte/aquatic bryophyte communities. The aquatic sites were surveyed in July 2021. Please refer to **Appendix A** (fisheries assessment report) for detailed fisheries results. Biological water quality (Q-sample) results are also summarised for each sampling site (*n*=15) in Appendix B. Habitat codes are listed according to Fossitt (2000). Scientific names are provided at first mention only. An evaluation of the aquatic ecological importance of each survey site based on these aquatic surveys is provided and summarised in **Table 4.1**.

## 4.1 Aquatic survey site results

### 4.1.1 Site A1 – Cartenstown Stream, Ballyhealy

Site A1 was located on the upper reaches of the Cartenstown Stream in area of cutover bog (PB4). The stream was a very narrow (<0.5m wide) modified drainage channel that had been straightened and deepened historically with bankfull heights of 1.5-2m. The channel was deeply cut into peat and, resultingly, the channel bed comprised 100% soft peat with no hard substrata. The site featured 100% slow-flowing glide habitat and was considered likely non-perennial (i.e., dries up seasonally), being 0.05-0.1m deep with a slight flow. Instream encroachment by downy birch (*Betula pubescens*), purple moor grass (*Molinia caerulea*), heather (*Calluna vulgaris*), grey willow (*Salix cinerea*) and other terrestrial grasses obstructed the flow considerably. Shading was also high given the steep (often vertical) cut banks. The channel was bordered by cutover bog dominated by heather with cottongrass (*Eriophorum angustifolium*), occasional tormentil (*Potentilla erecta*) and scattered downy birch and Scots pine (*Pinus sylvestris*). Macrophytes and aquatic bryophytes were absent due to the peat-stained water, likely non-perennial nature and shading.

Three-spined stickleback was the only fish species recorded via electro-fishing (**Appendix A**). With the exception of low densities of this species, the heavily silted channel was of very poor fisheries value, i.e., not of value to salmonids or lamprey species given the lack of flow and heavily-silted (peat) nature. The site offered no suitability for white-clawed crayfish or otter with no evidence of either species recorded during the survey.

Biological water quality, based on Q-sampling, was calculated as **Q2-3 (poor status)** (**Appendix B**). However, it should be noted that, given the poor flows and heavily silted nature, this is a tentative Q-rating. No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

The aquatic ecological evaluation of site A1 was of **local importance (lower value)** (**Table 4.1**).



**Plate 4.1** Representative image of site A1 on the Cartenstown Stream, May 2021

### 4.1.2 Site A2 – Stonestown River, Cartenstown Stream confluence

Site A2 was located on the Stonestown River (07S11) at the Cartenstown Stream confluence. The channel had been modified historically (straightened and deepened) and was 100% dry at the time of survey, with no pools of standing water remaining. The non-perennial channel drained cutover peat bog (PB4) and averaged 1.5-2m wide in a shallow U-shaped channel. The river featured a 100% peat base and was evidently dry for much of the year. The channel was heavily scrubbed with willow (*Salix* sp.) and bramble (*Rubus fruticosus* agg.) vegetation.

The river had no aquatic or fisheries value given the lack of water. However, the downstream-connecting Cartenstown Stream featured low flows at the time of survey and had some low fisheries and aquatic value.

Site A2 was not suitable for Q-sampling during the survey period due to its dry nature and lack of flow. Thus, it was not possible to assess biological water quality at this site.

The aquatic ecological evaluation of site A2 was of **local importance (lower value) (Table 4.1).**



**Plate 4.2** Representative image of site A2 on the Stonestown River, May 2021 (channel 100% dry)

### 4.1.3 Site A3 – Ballinn Stream, Lisclogher Great

Site A3 was located on the upper reaches of the Ballinn Stream (07B47) at a local road crossing north of the wind farm site boundary. The stream represented a 1.5-2m-wide peat drainage channel (FW4) that had been straightened and deepened historically, with bankfull heights of 2m-2.5m in a steep U-shaped channel. The channel had been excavated to a uniform depth of 0.6-0.7m and was heavily silted (peat deposition). Some fine to medium gravels were present underfoot but these were heavily bedded in silt. Peat staining was high. The stream adjoined another channel along the adjacent local road which featured greater depths to 0.8m in a 2m wide channel. The site was heavily covered with terrestrial and aquatic vegetation. Macrophytes recorded included occasional watercress (*Nasturtium officinale*) and common duckweed (*Lemna minuta*) with >90% cover of bentgrass (*Agrostis* sp.) instream, creating extensive floating mats. Reed canary grass (*Phalaris arundinacea*) was also present along the banks and instream. There was no open water present. Flow was very slow at the time of survey (even following rainfall). Upstream of the confluence, the Ballinn Stream was heavily shaded by riparian scrub with frequent downy birch and grey willow treelines. To the west, cutover bog (PB4) with high birch cover was present, with GA1 (sheep grazing) to the west and downstream of the road crossing (pipe culvert).

Three-spined stickleback was the only fish species recorded via electro-fishing (**Appendix A**). With the exception of low densities of this species, the heavily silted channel was of very poor fisheries value, i.e., not of value to salmonids or lamprey species given the lack of flow and heavily-silted (peat) nature. Some low potential for European eel was present but none were recorded. The site offered no suitability for white-clawed crayfish or otter.

Biological water quality, based on Q-sampling, was calculated as **Q2-3 (poor status)** (**Appendix B**). However, it should be noted that, given the poor flows and absence of faster flowing riffle and glide habitat heavily, this is a **tentative** Q-rating. No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

The aquatic ecological evaluation of site A3 was of **Local importance (lower value)** (**Table 4.1**).



**Plate 4.3** Representative image of site A3 on the Ballinn Stream, May 2021 (stream is in background, with adjoining drainage channel in foreground)

### 4.1.4 Site A4 – Bolandstown River, Bracklin

Site A4 was located on the upper Bolandstown River (07B45) at a local road crossing. The river was a small lowland depositing watercourse (FW2) which had been historically straightened and deepened. Recent maintenance (bank clearance and excavation) was evident upstream of the bridge. The river averaged 2m wide and 0.1-0.2m deep in a deep V-shaped channel with 2-3m bankfull heights. The site predominantly featured shallow moderate flowing glide habitat with occasional riffle areas and even more occasional pools (max depth 0.4m). The water was heavily peat-stained at the time of survey (following recent rain) and the substrata were moderately to heavily silted with flocculent peat. The bed was dominated by soft sand (low compaction) with frequent silt deposits (some >15cm deep). Exposed gravels were rare but present (tailings of pools etc.) but these were compacted/bedded. Boulder and cobble were absent. Instream macrophytes were limited to emergent species given the high peat-staining with occasional watercress, brooklime (*Veronica beccabunga*) and water speedwell (*Veronica* sp.) along channel margins. Downstream of the bridge, the river was adjoined by improved pasture (GA1) and scrubby woodland dominated by willow, birch and occasional ash (*Fraxinus excelsior*) along the channel with frequent cherry laurel (*Prunus laurocerasus*). An area of clear-fell (WS5) was located adjacent to the channel upstream of the bridge (south bank).

Three-spined stickleback and *Lampetra* sp. were the only species recorded via electro-fishing (**Appendix A**). Site A4 had low nursery, spawning and holding value for salmonids given the poor thalweg and very high levels of siltation and none were recorded during electro-fishing. The channel was not considered of value to European eel given the absence of refugia such as cobble and boulder. The channel was however of some value to lamprey given pockets of fine silt with a high organic content up to 20cm deep adjoining areas with finer gravels (albeit degraded by silt). Low to moderate densities of lamprey were recorded at 2.8 per $m^2$ ($5m^2$ of habitat targeted and 14 ammocoetes captured). The site offered no suitability for white-clawed crayfish, given heavy siltation. Although no otter signs were recorded, there was some low foraging potential for the species.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

The aquatic ecological evaluation of site A3 was of **Local importance (higher value)** (**Table 4.1**).



**Plate 4.4** Representative image of site A4 on the Bolandstown River, May 2021

### 4.1.5 Site A5 – Cartenstown Stream, Coolronan

Site A5 was located on the Cartenstown Stream (07C60) at a local road crossing, approx. 1.6km downstream of the wind farm boundary. The stream was a small, swift-flowing lowland depositing watercourse (FW2) that had been straightened and deepened historically, both upstream and downstream of the bridge. The channel averaged 2.5-3m wide in a deep steep U-shaped channel with bankfull heights often exceeding 2.5m. Channel depths were between 0.1m and 0.5m deep. The site was dominated by glide and pool habitat with occasional riffles upstream and downstream in association with instream large woody debris (LWD). The water was very heavily peat-stained at the time of survey. Instream substrata were dominated by bedded mixed gravels

and cobble with frequent boulder. Sand was frequent and sand/silt accumulations were present in channel margins and slacks. The bridge featured a concrete apron with harder substrata atop. Overall, siltation (peat derived) was moderate. Given high peat staining, there were no visible macrophytes or aquatic bryophytes. The stream flowed through improved pasture (GA1) with associated riparian treelines (WL2) and hedgerows of hawthorn (*Crataegus monoygna*), elder (*Sambucus nigra*), willow, privet (*Ligustrum vulgare*) and scrubby bramble understories.

Brown trout (*Salmo trutta*) and *Lampetra* sp. were the only species recorded via electro-fishing (**Appendix A**). The site had low nursery, spawning and holding value for salmonids given the poor thalweg and very high levels of siltation. These were exacerbated by historical channelization and sedimentation pressures from the adjoining improved grassland. Only small numbers of 0+ brown trout were recorded, exemplifying the poor value of the site for salmonids. The channel was considered of only moderate value to European eel (none recorded). The channel was however of some value to lamprey given pockets of fine silt with a high organic content up to 15cm deep adjoining areas with finer gravels (albeit degraded by silt). Very low densities of lamprey were recorded at 0.4 per $m^2$ ($10m^2$ of habitat targeted and 4 ammocoetes captured) despite targeted electro-fishing of soft sediment areas being undertaken. The site offered no suitability for white-clawed crayfish, given heavy siltation. Although no signs were recorded, there was some low potential for foraging otter.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

The aquatic ecological evaluation of site A5 was of **Local importance (higher value)** (**Table 4.1**).



**Plate 4.5** Representative image of site A5 on the Cartenstown Stream, May 2021 (facing downstream from underneath road bridge)

### 4.1.6 Site A6 – Woodtown West Stream, Lisclogher Great

Site A6 was located on the on the Woodtown West Stream (07W06) was located in cutover bog (PB4) downstream of the wind farm site boundary. The stream was a heavily-modified bog drainage channel (FW4) which averaged 1-1.5m in width and 0.2-0.3m deep. The channel had been historically straightened and deepened adjacent to a working area of cutover bog. The stream had an imperceptible flow with numerous instream blockages (100% standing water/ponding). The channel was considered non-perennial at this location. The drainage channel was grossly silted (several silt dams present). The channel and banks comprised 100% soft peat. No macrophytes were present in the heavily peat-stained water. However, *Sphagnum* sp. moss was abundant within the channel and filamentous algae was also present (10% cover). Encroachment of terrestrial grasses (e.g., *Juncus* sp.) was high and often coverage exceeded 80%. The channel adjoined an area of cutover bog with birch-dominated woodland/scrub present along the south bank, with frequent heather, soft rush (*Juncus effusus*) and occasional willow. Improved pasture (GA1) was present to the south.

No fish species were recorded via electro-fishing (**Appendix A**) and the heavily silted channel was of no fisheries value, given the lack of flow and heavily-silted (peat) nature. The site offered no suitability for white-clawed crayfish or otter and the species were not recorded during the survey. However, both common frog (*Rana temporaria*) and smooth newt (*Lissotriton vulgaris*) were recorded via sweep netting.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix B**). However, it should be noted that, given the poor flows and absence of faster flowing riffle and glide habitat heavily, this is a tentative Q-rating. No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of both smooth newt and common frog, the aquatic ecological evaluation of site A6 was of **local importance (higher value)** (**Table 4.1**).



**Plate 4.6** Representative image of site A6 on the Woodtown West Stream, May 2021

### 4.1.7 Site A7 – Stonyford River, Cloghbrack Bridge

Site A7 was located on the Stoneyford River (07S02) at Cloghbrack Bridge. The river at this location was a high energy lowland depositing watercourse (FW2). The had been historically straightened and over-deepened, with bankfull heights of 3-4m. The channel was 7-8m in width in a steep V-shaped channel that had been excavated down to clay. Thus, the substrata were very compacted/bedded, with calcified deposits present also further reducing availability of the bed to aquatic biota. The site was typified by fast glide averaging 0.4-0.8m in depth. Small pools to 1m+ were present but rare with deep glide predominating upstream and downstream of the bridge structure. Riffles were present locally upstream of the bridge. A small drain adjoined the south bank of the river which carried a significantly higher peat loading (stained water). Peat staining of the main river was low. The heavily compacted bed featured mostly cobble and boulder with interstitial bedded coarse gravels and some sand. Soft sediment deposits were not present. Instream macrophytes were not recorded owing to high flow rates, relatively high riparian shading and compacted substrata although the cover of Kneiff's feather moss (*Leptodictyum riparium*) was relatively high (20%), with submerged *Pellia* sp. liverwort being occasional on boulders. Filamentous algae was also present at low coverage (<2%). The riparian zone supported mature treelines of ash, alder (*Alnus glutinosa*), willow and hazel (*Corylus avellana*) with occasional sycamore (*Acer psuedoplatanus*). The understorey was dominated by bramble scrub (WS1). The site was adjoined by improved pasture (GA1) on all sides.

Brown trout, Atlantic salmon (*Salmo salar*) and *Lampetra* sp. ammocoetes were recorded via electro-fishing (**Appendix A**). The channel featured moderate quality nursery and spawning habitat, given that both were compromised by historical dredging. This had resulted in a channel with limited riffle habitat and localised patches of gravel between paths of argillaceous clay. The holding value for salmonids was good due to the presence of deep glide and pool with

overhanging trees, undercut banks etc. The site was not considered of good quality for European eel given the limited presence of accessible refugia such as cobble and boulder. The site was of only moderate value for lamprey, with both sub-optimal adult (spawning) and ammocoete burial habitat present. Low densities of larval lamprey were recorded at 1.75 per $m^2$ ($4m^2$ of habitat targeted and *n*=7 ammocoetes captured). The site offered poor suitability for white-clawed crayfish given a paucity of suitable refugia and no crayfish were recorded during targeted surveys. Although no signs were recorded, there was some good potential for foraging otter given the presence of salmonids.

Biological water quality, based on Q-sampling, was calculated as **Q4 (good status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the location of the Stoneyford River within the River Boyne and River Blackwater SAC (002299), the aquatic ecological evaluation of site A7 was of **international importance.**



**Plate 4.7** Representative image of site A7 on the Stonyford River, May 2021 (facing downstream towards bridge)

### 4.1.8 Site A8 – Carranstown Little River, Coolronan

Site A8 was located on the upper reaches of the Carranstown Little River (07C87), downstream of the wind farm site boundary. Situated at a drainage channel confluence, site A8 was a 2m-wide historically modified, swift-flowing lowland depositing watercourse with some eroding characteristics. The river averaged 0.2-0.3m deep with occasional pools >0.5m. The river had been straightened and deepened with bank heights exceeding 2.5m in a steep U-shaped channel. The substrata were dominated by bedded/compacted mixed gravels and small cobble with occasional boulder in faster flowing areas near the bridge culvert, with sand heavily intermixed with peat dominating in slower flowing glide. The river drained an area of adjacent cutover bog (PB4) and

peat staining was very high at the time of survey. Silt accumulations were present and, despite having high fractions of sand, were invariably soft (uncompacted). Glide habitat dominated with only occasional pool and even more occasional riffle areas. Instream macrophytes were absent given the peat-staining but the semi-aquatic moss *Brachythecium rivulare* was present on the lip of the bridge apron (2ft fall, barrier to fish at low flows) and on larger boulders. The site adjoined cutover bog and improved grassland (GA1), with scattered treelines of willow, elder and downy birch and scrubby understories adjoining the channel.

No fish were recorded via electro-fishing at site A8 (**Appendix A**). Suitability was limited to three-spined stickleback, although none were recorded present. The channel featured poor quality salmonid nursery and spawning habitat, given high levels of peat-derived siltation. The site was not considered of good quality for European eel given the limited presence of accessible refugia such as cobble and boulder. Despite the presence of soft sediment accumulations, these were humic in nature (i.e., peat-dominated) and not suitable for larval lamprey. The site offered no suitability for white-clawed crayfish given high levels of siltation. Potential for otter was low given the evidently poor fish prey resource.

Biological water quality, based on Q-sampling, was calculated as **Q2-3 (poor status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the absence of fish species and poor status water quality, the aquatic ecological evaluation of site A8 was of **local importance (lower value).**



**Plate 4.8** Representative image of site A8 on the Carranstown Little River, May 2021

### 4.1.9 Site B1 – Killaconnigan Stream, Grange More

Site B1 was located on the uppermost reaches of the Killaconnigan Stream (07K34), adjacent to the R156 near the Ballivor Bord na Móna factory. The stream represented a semi-dry bog drainage channel (FW4), that averaged 2m wide and <0.1m deep. The channel had been straightened and over-deepened historically, with poor recovery evident. The stream was located in a deeply excavated, steep U-shaped channel with bankfull heights of 2-2.5m. There was no flow at the time of survey with stagnant water (ponding) present. The site drained an extensive area of cutover bog (PB4) to the north and was heavily silted, with no harder substrata present (i.e., 100% soft peat). The banks were heavily scrubbed with downy birch, willow and bramble. As such, riparian shading was high and no instream macrophytes were present.

No fish were recorded via electro-fishing of stagnant pools (**Appendix A**). Other than very low suitability for three-spined stickleback in the wider area, site B1 was not of fisheries value given its heavily-silted nature with limited water. There was some suitability for common frog (although none were recorded via sweep netting). The site had no suitability or white-clawed crayfish or otter and the species was not recorded.

Site B1 was not suitable for Q-sampling during the survey period due to its semi-dry nature and lack of flow. Thus, it was not possible to assess biological water quality at this site.

Given the non-perennial nature of the stream at this location, the aquatic ecological evaluation of site B1 was of **local importance (lower value).**



**Plate 4.9** Representative image of site B1 on the Killaconnigan Stream, May 2020 (semi-dry channel)

### 4.1.10 Site B2 – Kilballivor Stream, Killconnigan

Site B2 was located on the upper reaches of the Kilballivor Stream, approx. 1km downstream of an extensive area of cutover bog. The site was 100% dry at the time of survey and, evidently, had not conveyed water for a considerable period. The 2-2.5m wide, U-shaped drainage channel (FW4) had been historically straightened and realigned through improved agricultural grassland. Bankfull heights were 1-1.5m. The channel base was dry mud (i.e., no evidence of recent flows or standing water) and was colonised by ruderal species such as nettle. The non-perennial site was heavily shaded by a mature treeline/hedgerow of ash, elder and hawthorn with bramble scrub. The site was adjoined by improved grassland on both banks.

The stream had no aquatic or fisheries value given the lack of water at the time of survey and would appear to offer no aquatic value for much of the year. No signs of otter were recorded.

Site B4 was not suitable for Q-sampling during the survey period due to its dry nature and lack of flow. Thus, it was not possible to assess biological water quality at this site.

The aquatic ecological evaluation of site B2 was of **local importance (lower value) (Table 4.1).**



**Plate 4.10** Representative image of site B2 on the Kilballivor Stream, May 2020 (100% dry channel)

### 4.1.11 Site B3 – Unnamed stream, Clonycavan

Site B3 was located at the confluence of two unnamed tributaries (no EPA code) of the Ballivor River, approx. 1.4km downstream of the site boundary. Bordered by intensive pasture (GA1), both channels had been extensively straightened and deepened in the recent past with poor recovery evident. Downstream and upstream of the confluence, the channel averaged 2m in width and 0.1-0.2m deep. The steep V-shaped profile featured bankfull heights of 2.5m throughout. Slow-

flowing glide dominated with an absence of pool habitat apart from the confluence. The northern channel featured a greater flow than the southern channel, which was more representative of a drainage ditch habitat (near stagnant and very heavily silted apart from near road crossing, where dredging had not been undertaken). As a result of dredging, the substrata were very heavily silted with very limited harder substrata present. These were restricted to localised medium-coarse gravels and small cobble in areas of faster flow (riffle zones) and partially bedded in peat/silt. Sand was frequent but overwhelmingly the bed was composed of silt (often >15cm in depth). The southern channel was heavily peat-stained whilst the northern channel was much less turbid. Instream macrophytes were limited to occasional watercress, fool's watercress (*Apium nodiflorum*) and brooklime in channel margins, with very occasional water starwort (*Callitriche stagnalis*) present in slacker areas. Aquatic bryophytes were not present given recent channel modifications. The riparian zone (which had been flailed and recently cut) supported treelines and hedgerows of hawthorn, willow, elder, holly (*Ilex aquifolium*) and ash with scrubby understories of mostly bramble. The southern bank had been cleared to the banktop.

Three-spined stickleback was the only fish species recorded via electro-fishing (**Appendix A**). With the exception of low densities of this species, the heavily-silted channel was of very poor fisheries value, i.e., not of value to salmonids given the lack of flow and heavily-silted (peat) nature. Some low potential for European eel and *Lampetra* sp. was present but none were recorded. The site offered no suitability for white-clawed crayfish and none were recorded. No signs of otter were recorded.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

The aquatic ecological evaluation of site B3 was of **local importance (lower value).**



**Plate 4.11** Representative image of site B3, May 2021

### 4.1.12 Site B4 – Unnamed stream, Clonycavan

Site B3 was located in the upper reaches of an unnamed Ballivor River tributary (no EPA code) at a local road crossing, approx. 0.3km downstream of the site boundary. The historically straightened and deepened channel averaged 1-1.5m wide with bankfull heights of up to 2m. The channel was 100% dry at the time of survey, with no ponding or stagnant water present (i.e., non-perennial channel). The base comprised 100% mud (i.e., no hard substrata). The site was bordered by improved agricultural grassland (GA1) and a mature treeline of sycamore, hawthorn and ash.

The river had no aquatic or fisheries value given the lack of water at the time of survey and no otter signs were recorded. The channel was considered likely to convey water intermittently during the year given a damp, muddy base. The downstream-connecting Ballivor River (0.7km downstream) was of some moderate fisheries and aquatic value.

Site B4 was not suitable for Q-sampling during the survey period due to its dry nature and lack of flow. Thus, it was not possible to assess biological water quality at this site.

The aquatic ecological evaluation of site A2 was of **local importance (lower value) (Table 4.1).**



**Plate 4.12** Representative image of site B4 on unnamed Ballivor River tributary, May 2021 (dry channel)

### 4.1.13 Site B5 – Ballivor River, Clonycavan

Site B5 was located on the upper reaches of the Ballivor River (07B52) at a local road crossing, approx. 1.5km downstream of the site boundary. The lowland depositing watercourse (FW2/FW4) had been straightened and deepened historically, with more recent maintenance evident downstream of the bridge. The channelised river was 3m wide and 0.2-0.3m deep on average. The water was peat-stained and had a moderate flow rate, but no broken riffle or glide

habitat was present. The river was very heavily silted with extremely localised superficial patches of fine to medium gravels atop deep silt deposits in vicinity of the bridge. The bed comprised 99% silt, often deeper than 0.5m. The river had been extensively straightened and deepened upstream of the bridge (to the north) and suffered from imperceptible flows and gross siltation. The profile was of shallow glide with an absence of pooling areas and no riffle zones (typical of a dredged channel section). The river was contained in an excavated deep U-shaped channel with 2-2.5m bankfull heights. Instream macrophytes were limited to occasional unbranched bur reed (*Sparganium erectum*) with very occasional water starwort. The site adjoined agricultural pasture (GA1) with a mature scrubby treeline of ash, sycamore, elder, Scots pine and abundant hawthorn and bramble along the north bank. The south bank had been cleared historically (to banktop) with the steeply sloping bank colonised by grasses and nitrophilous species like nettle (*Urtica dioica*) and hogweed (*Heracleum sphondylium*).

Three-spined stickleback was the only fish species recorded via electro-fishing (**Appendix A**). With the exception of low densities of this species, the heavily silted channel was of very poor fisheries value, i.e., not of value to salmonids or lamprey species given the lack of flow and heavily-silted (peat) nature. Some low potential for European eel was present but none were recorded. The site offered no suitability for white-clawed crayfish and the species was not recorded. A regular otter spraint site was recorded on a ledge underneath the bridge (ITM 667172, 751822) (invertebrate remains only, no fish or crayfish).

Biological water quality, based on Q-sampling, was calculated as **Q2-3 (poor status)** (**Appendix B**). However, it should be noted that, given the absence of faster flowing riffle and glide habitat heavily, this is a **tentative** Q-rating. No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of otter, the aquatic ecological evaluation of site B5 was of **Local importance (higher value).**



**Plate 4.13** Representative image of site B5 on the Ballivor River, May 2021 (facing downstream from bridge)

### 4.1.14 Site C1 – Graffanstown Stream, Bracklin

Site C1 was located on the Graffanstown Stream (07G10) at a local road crossing, approx. 1.2km upstream of the River Deel confluence and River Boyne and River Blackwater SAC (002299). The lowland depositing watercourse (FW2) emanated from cutover bog and had been extensively straightened and over-deepened, historically. Upstream of the single pipe culvert at the road crossing, the stream was contained within a 3m-wide, deep U-shaped channel with bankfull heights of >2.5m. The stream averaged 2.5m wide and <0.15m deep. The site comprised 95% shallow, slow-flowing glide with very limited pool. The flow was slow at the time of survey. Gravels were present underfoot but these were underneath 0.2-0.3m of silt deposits. The stream bed was very heavily silted (peat derived) with deep deposits (to 0.25m) present. Whilst some limited sands and fine gravels were present on top of the flocculent sediment in places (e.g., near meander 40m upstream of culvert), these were also heavily silted. Peat staining was low at the time of survey. However, instream macrophytes were limited to only occasional lesser water parsnip (*Berula erecta*) along channel margins. No aquatic bryophytes were recorded (no suitable substrata or flow for such species). The site was bordered by improved pasture (GA1) to the south and an area of mixed broadleaved woodland (WD1) to the north. The banks of the channel were heavily scrubbed with willow and bramble along the north bank, with the adjoining pasture extending to the banktop on the south.

Three-spined stickleback was the only fish species recorded via electro-fishing (**Appendix A**). With the exception of very low densities of this species, the heavily silted channel was of very poor fisheries value, i.e., not of value to salmonids or lamprey species given the lack of flow and heavily-silted (peat) nature. Despite an abundance of soft sediment accumulations, these were not of value for larval lamprey given the flocculent and or high humic content, in addition to poor flows.

The site offered no suitability for white-clawed crayfish and none were recorded. No otter signs were recorded.

Biological water quality, based on Q-sampling, was calculated as **Q2-3 (poor status)** (**Appendix B**). However, it should be noted that, given the absence of faster flowing riffle and glide habitat heavily, this is a **tentative** Q-rating. No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

The aquatic ecological evaluation of site C1 was of **local importance (lower value).**



**Plate 4.14** Representative image of site C1 on the Graffanstown Stream, May 2021 (facing upstream from road culvert)

### 4.1.15 Site C2 – Ballynaskeagh Stream, Ballynaskeagh

Site C2 was located on the Ballynaskeagh Stream (07B24) at a local road crossing, approx. 0.6km upstream of the River Deel confluence and River Boyne and River Blackwater SAC (002299). The stream was a small, shallow, moderate-energy lowland depositing watercourse (FW2), with low flows at the time of survey. The stream was considered likely to be non-perennial at this location. The channel had been straightened and deepened historically, with bankfull heights of >2m. The stream averaged 1-1.5m wide and <0.05m deep at the time of survey (July 2021). Shallow glide and riffle dominated with only very localised shallow pool to 0.1m depth. The bed featured fine, medium and coarse gravels with low sand fractions. However, these were often heavily silted and bound in peat. Cobble and small boulder were occasional. Peat agglomerations were present on top of the substrata in some areas (the stream drained cutover bog upstream). The site was bordered by residential properties (GA2) and scrub, with a mature treeline of sycamore, hawthorn and elder. The channel was very heavily shaded upstream and downstream of the road bridge by riparian scrub, with tunnelling present in most areas. This precluded the presence of instream macrophytes although very limited *Leptodictyum riparium* present.

No fish were recorded via electro-fishing (**Appendix A**). Despite some low physical habitat suitability for salmonids and lamprey, these species were absent. This was considered a result of very low water levels at the time of survey (average depth <0.05m) and the stream's likely non-perennial nature. Nevertheless, even during higher water levels (e.g., winter), the site would only provide (at best) moderate suitability, given high rates of siltation and compacted substrata. There was some low suitability for European eel, albeit none were recorded. The site offered no suitability for white-clawed crayfish or otter and neither species was recorded.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

The aquatic ecological evaluation of site C2 was of **local importance (lower value).**



**Plate 4.15** Representative image of site C2 on the Ballynaskeagh Stream, July 2021

### 4.1.16 Site C3 – Mucklin Stream, Craddanstown

Site C3 was located on the lowermost reaches of the Mucklin Stream (07M13), approx. 0.2km upstream of the River Deel confluence and River Boyne and River Blackwater SAC (002299). The channel was 100% dry at the time of survey, with no ponding or stagnant water present (i.e., non-perennial channel). The historically straightened and deepened channel averaged <1m wide with bankfull heights of 0.5-1m. The base comprised 100% mud (i.e., no hard substrata). The site was bordered by improved agricultural grassland (GA1) and a mature hawthorn hedgerow.

The stream had no aquatic or fisheries value given the lack of water at the time of survey. The channel was considered likely to convey water intermittently during the year (but mostly dry). The fisheries and aquatic value was superior in the nearby downstream-connecting River Deel,

located <200m downstream. The lowermost reaches of the channel were likely of some low fisheries and aquatic value during high water levels (i.e., refuge from flood water on the River Deel).

Site B4 was not suitable for Q-sampling during the survey period due to its dry nature and lack of flow. Thus, it was not possible to assess biological water quality at this site.

The aquatic ecological evaluation of site C3was of **local importance (lower value) (Table 4.1).**



**Plate 4.16** Representative image of site C3 on the Mucklin Stream, July 2021 (100% dry channel)

### 4.1.17 Site C4 – River Deel, Raharney Bridge

Site C4 on the River Deel (07D01) was located at Raharney Bridge on the R156 in Raharney village. The River Deel was a medium-sized high-energy lowland river (FW2) which averaged 6-7m wide and 0.2-0.5m deep. Fast glide dominated with localised pools to 0.8m and very occasional riffle areas. The river had been historically straightened and deepened (embankments still present) but good natural recovery had occurred both in the riparian zone and instream. Small cobble and boulder dominated the substrata with localised areas of medium to very coarse gravels present, intestinally. Given the fast flow, the substrata were clean from siltation with little or no silt accumulations present (apart from those associated with macrophytes). Water turbidity was very low and, coupled with only moderate shading and evidently good water quality, the site featured a relatively high coverage of macrophytes. Water crowfoot (*Ranunculus* sect. *Batrachium*) dominated (25% cover) with frequent submerged form of lesser water parsnip plus fool's watercress and frequent fine-leaved dropwort (*Oenanthe aquatica*) along channel margins. *Callitriche* sp. was rare but present. Pellia sp. liverwort was submerged on cobble. The aquatic smaller lattice moss (*Cinclidotus fontinaloides*) was also frequent on larger cobble and boulder. The presence of more than three indicator species meant the site's aquatic plant community was considered representative of the Annex I habitat 'Water courses of plain to montane levels with

the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260]'. Filamentous algae was present, indicating some enrichment, but coverage was low (<2%). The fast-flowing site was contained in a deep U-shaped channel with mature riparian treelines along the west bank supporting sycamore, ash, elder and willow. Butterbur (*Petasites hybridus*) was frequent along the west bank downstream of the bridge. The eastern bank was an ornamental/biodiversity garden (BC4) with associated flood walls. Herbaceous vegetation recorded downstream of the bridge supported watercress, great willowherb (*Epilobium hirsutum*), water mint (*Mentha aquatica*), fool's watercress, bindweed (*Calystegia* sp.) and meadowsweet (*Filipendula ulmaria*), thus indicating linkages with the Annex I habitat 'Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430]' (see EC, 2013; Devaney et al., 2013).

Brown trout and Atlantic salmon were the only two fish species recorded via electro-fishing (**Appendix A**). Both were present in several cohorts and in relatively high densities. The site provided excellent-quality salmonid nursery habitat with well-oxygenated broken glide and riffle sequences and cover in macrophyte vegetation. The cobble substrata also provided good cover for juvenile salmonids. Good-quality spawning habitat was also present given unbedded, well-sorted mixed gravels between cobble areas. These had light siltation only. Holding habitat was also very good in deep glide and localised pool with overhanging tree cover and good shading. The site was also considered good for European eel, with ample boulder and cobble refugia, albeit none were recorded. No soft sediment lamprey habitat was identified present but the quality of spawning habitat was considered good. Lamprey species likely occur downstream of the survey area in suitable depositing areas. Despite some good suitability, no white-clawed crayfish were recorded and no contemporary records were available for the river (1980s only: see section 3.1). Otter foraging potential was high although no otter signs were recorded during the survey.

Biological water quality, based on Q-sampling, was calculated as **Q4 (good status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the location of the site within the River Boyne and River Blackwater SAC (002299), in addition to the presence of two Annex I aquatic habitats and qualifying interest Atlantic salmon, the aquatic ecological evaluation of site C4 was of **international importance.**



**Plate 4.17** Representative image of site C4 on the River Deel at Raharney Bridge, May 2021

### 4.1.18 Site C5 – Craddanstown Stream, Riverdale

Site C5 was located on the Craddanstown Stream (07C55) at a local road crossing, south of the proposed wind farm site boundary. The stream represented a small lowland depositing watercourse (FW2) that had been straightened and deepened historically. The stream was contained in a deep U-shaped channel with bankfull heights varying between 1.8-3m. The canalised stream averaged 2.5m in width and 0.2-0.4m in depth, with occasional pools to 0.75m. Moderate-flowing glide dominated the site with a lack of riffle areas and only localised pool. The stream bed was composed almost entirely of soft silt (peat-derived) although some compacted sands were present on top of the silt locally. The sediment was a mixture of clay and peat and often exceeded 0.2m in depth. Instream macrophytes were limited to very sparse growth of unbranched bur reed (more present upstream of the bridge). No aquatic bryophytes were recorded. The site adjoined improved pasture (GA1) with narrow riparian treelines supporting mature ash, hawthorn, elder, grey willow and alder.

Low numbers of brown trout, *Lampetra* sp. and three-spined stickleback were recorded via electro-fishing (**Appendix A**). The channel had negligible nursery, spawning and holding value for salmonids given the absence of riffle, glide and pool sequences and extreme levels of siltation. These were exacerbated by historical channelisation and sedimentation pressures from the adjoining improved grassland. Only a single 0+ brown trout was recorded, exemplifying the poor value of the site for salmonids. The channel was not considered of value to European eel given the absence of refugia such as cobble and boulder and the shallow nature. The channel was, however, of some value to *Lampetra* sp. given pockets of fine silt with a high organic content up to 15cm deep. These adjoined degraded areas of fine gravel that provided some local spawning habitat for the species. Low densities of larval lamprey were recorded at 0.8 per $m^2$ ($10m^2$ of habitat targeted and *n*=8 ammocoetes captured). Despite some physical suitability (i.e., soft

loamy banks in which to burrow) the extensive channel modifications and high siltation created conditions inimical to white-clawed crayfish. A regular otter spraint site with associated prints was recorded on a muddy paludal area underneath the bridge (ITM 663341, 751542).

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of brown trout, *Lampetra* sp. and otter, the aquatic ecological evaluation of site C5 was of **local importance (higher value).**



**Plate 4.18** Representative image of site C5 on the Craddanstown Stream, May 2021 (facing downstream from bridge)

### 4.1.19 Site C6 – Clondalee More Stream, Clondalee More

Site C6 was located on the Clondalee More Stream (07C77) at a local road crossing, approx. 0.6km south of the site boundary. The stream represented a small lowland depositing watercourse (FW2) that had been extensively straightened and deepened. Whilst some recovery of the banks had occurred, instream recovery was poor. The stream averaged 1.5-2m wide with bankfull heights of up to 2.5m in a deep U-shaped channel. Shallow glide predominated with only very localised riffle and pool areas. The stream bed comprised 100% soft silt, with peat agglomerations (sods) on top of the bed. The soft (largely peat) sediment was up to 0.3m deep locally. Slumping of the peat banks due to floods and widespread livestock poaching (sheep) was evident. Peat-staining was moderate at the time of survey. No instream macrophytes were recorded growing on the soft (often flocculent) bed. The site adjoined improved pasture (GA1) with a small area of mixed broadleaved woodland (WD1) upstream (supporting mostly beech and sycamore). A disjunct riparian treeline was present downstream of the road culvert (1m pipe) supporting

hawthorn, alder and willow with occasional bramble understorey (all grazed). The south bank was farmed to the edge with no riparian buffer.

Three-spined stickleback was the only fish species recorded via electro-fishing (**Appendix A**). With the exception of low densities of this species, the heavily silted channel was of very poor fisheries value, i.e., not of value to salmonids or lamprey species given the lack of flow and heavily-silted (peat) nature. Despite an abundance of soft sediment accumulations, these were not of value for larval lamprey given the flocculent and or high humic content, in addition to high clay fractions, locally, resulting in compaction. Suitability or European eel was low given the open, shallow nature of the site and paucity of suitable refugia. The site offered no suitability for white-clawed crayfish and none were recorded. No otter signs were recorded.

Biological water quality, based on Q-sampling, was calculated as **Q2-3 (poor status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

The aquatic ecological evaluation of site C6 was of **local importance (lower value).**



**Plate 4.19** Representative image of site C6 on the Clondalee More Stream, May 2021

### 4.1.20 Site D1 – River Boyne, Scarriff Bridge

Site D1 was located on the River Boyne (07B04) at Scarriff Bridge, approx. 7km downstream of the site boundary (shortest hydrological distance). The Boyne at this location was a large lowland depositing watercourses (FW2) that averaged 20m in width and 0.4-0.7m deep. Fast glide dominated with occasional pools to >1m. Localised shallower riffle areas were resent downstream of the bridge. Given high flow rates, the substrata were compacted with cobble and coarse gravels dominating between argillaceous clay banks. Boulder was frequent but scattered. There were no sediment accumulations recorded outside of the margins. The river had been

historically straightened (possibly deepened) with embankments present. The channel showed good recovery, however. Instream macrophytes were limited although the cover of aquatic bryophytes such *Pellia* sp. were frequent on more stable substrata. Unbranched bur reed was present in channel margins and here some soft sediment accumulations suitable for larval lamprey were present (albeit very shallow). The riparian zone supported typical species such as hogweed, bramble, willowherb, nettle and frequent willow. The north bank upstream of the bridge featured a mature riparian treeline of alder/willow and had been cleared to the edge downstream (agricultural grassland).

Atlantic salmon, brown trout, stone loach (*Barbatula barbatula*) and minnow (*Phoxinus phoxinus*) were recorded via electro-fishing (**Appendix A**). Historical alterations had reduced the salmonid nursery value of the site. The spawning value was moderate as spawning gravels were restricted to isolated pockets between banks of argillaceous clay given historical deepening works. Holding habitat was very good. While no large salmonids were captured, larger fish were observed in deep pool adjoining the glide habitat surveyed - these areas were outside of wadable reach electro-fishing. Lamprey burial habitat was rare but present in association with marginal bur reed beds (however, no ammocoetes were recorded). European eel habitat was moderate with refugia largely limited to overhanging trees and scattered boulders. Some crayfish habitat was present but the bedded nature of the substrata and sparse macrophyte growth, in addition to the compacted banks, reduced the value overall in the vicinity of the bridge. The River Boyne also has a history of crayfish plague (*Aphanomyces astaci*) outbreaks which have periodically eradicated the species. Otter potential was high although no signs were recorded (few marking opportunities given the removal of boulder outcrops during historical dredging).

Biological water quality, based on Q-sampling, was calculated as **Q4 (good status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the location of the site within the River Boyne and River Blackwater SAC (002299), in addition to the presence of qualifying interest Atlantic salmon, the aquatic ecological evaluation of site D1 was of **international importance.**



**Plate 4.20** Representative image of site D1 on the River Boyne, May 2021 (facing downstream)

## 4.2 Biological water quality (macro-invertebrates)

Sites A7 (Stonyford River), C4 (River Deel) and D1 (River Boyne) achieved **Q4** (good status) and thus met the good status (**≥Q4**) requirements of the European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 and the Water Framework Directive (2000/60/EC) (**Figure 4.1**, **Appendix B**). These sites supported low numbers of Group A species such as the mayfly *Ecdyonurus dispar*, *Heptagenia sulphurea* and or *Rhithrogena semicolorata,* as well as the stonefly species *Isoperla grammatica* and *Nemurella picteti.* The presence of these species at sites C4 and D1 elevated the water quality status to **Q4** (good status).

Water samples from sites A1, A3, A4, A5, A6, A8, B3, B5, C1, C2, C5 and C6 achieved **Q2-3** or **Q3** (poor status) water quality and, therefore, failed to meet the good status (≥Q4) requirements of the European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 and the Water Framework Directive (2000/60/EC). Whilst some of these sites supported group B species such as cased caddis *Limnephilus* spp., the dominance of group C species such as *Gammarus duebeni,* the mayfly species *Baetis rhodani* and Simuliidae larvae, as well as the presence of group D *Asellus aquaticus,* reduced the Q-rating to that of poor status (i.e., **Q2-3** or **Q3**).

No rare or protected macro-invertebrate species (according to national red lists) were recorded in the biological water quality samples taken from *n*=15 sites (**Figure 4.1, Appendix B**).

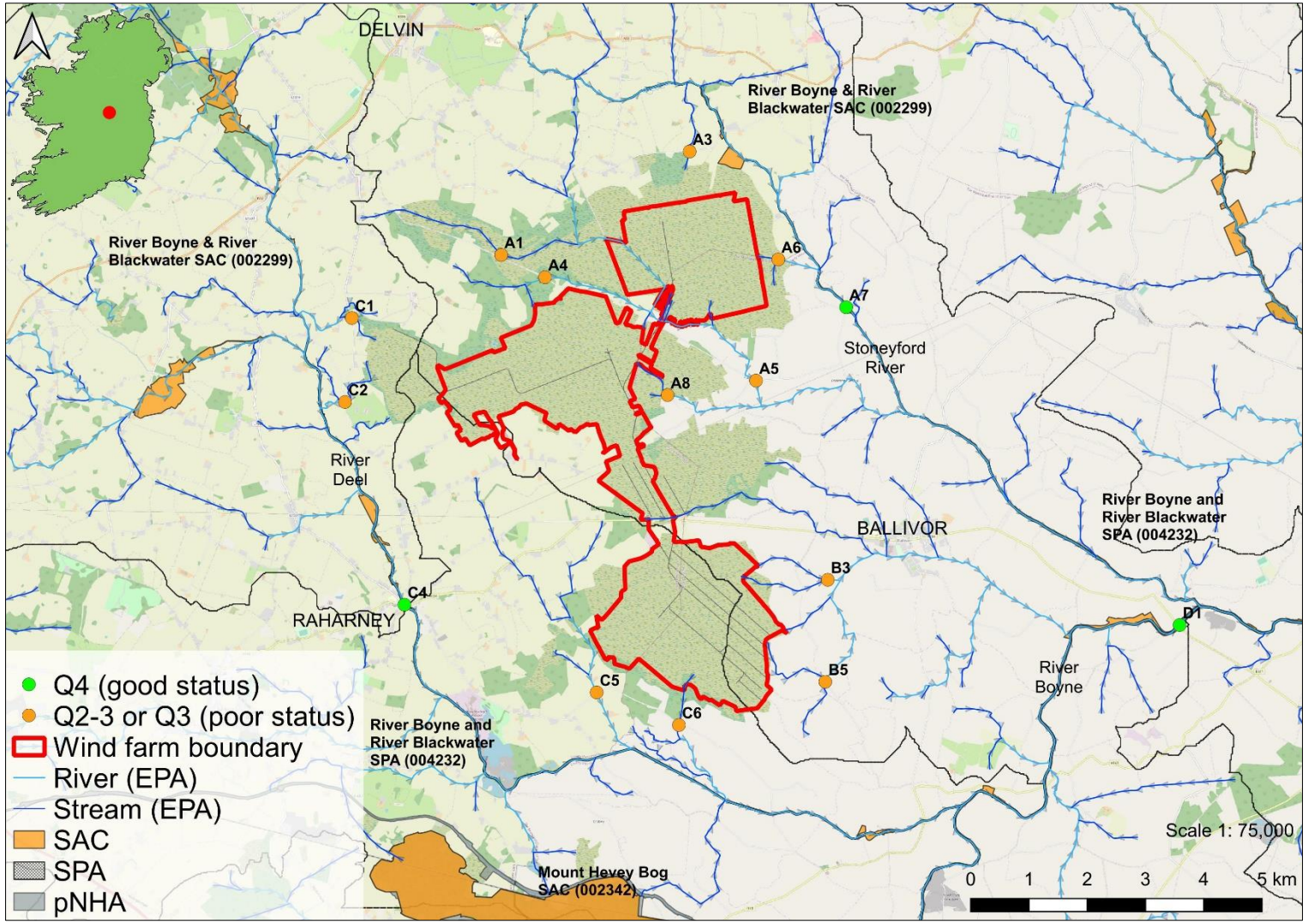


**Figure 4.1** Overview of the biological water quality status in the vicinity of the proposed Ballivor wind farm project, Co. Meath

## 4.3 Aquatic ecological evaluation

An aquatic ecological evaluation of each survey site was based on the results of electro-fishing (i.e., presence of fish of conservation value), the presence of protected or rare invertebrates (i.e., white-clawed crayfish), the presence of rare macrophytes and aquatic bryophytes and or associated representations of Annex I habitats. Furthermore, biological water quality status, the presence of otter and or situation within a protected site also informed the evaluation (**Table 4.1**).

Sites A7 (Stonyford River), C4 (River Deel) and D1 (River Boyne) were evaluated as **international importance** given their location within the River Boyne and River Blackwater SAC (002299).

None of the other aquatic survey sites were evaluated as greater than **local importance (higher value)**. The **local importance (higher value)** sites were present on the Bolandstown River (A4), Cartenstown Stream (A5), Woodtown West Stream (A6), Ballivor River (B5), Craddanstown Stream (C5), given the presence of salmonids, *Lampetra* sp., otter and or other aquatic species of conservation value (e.g., smooth newt recorded at site A6).

The remaining sites (i.e., A1, A2, A3, A8, B1, B2, B3, B4, C1, C2, C3 & C6) were evaluated as **local importance (lower value)**.

**Table 4.1** Aquatic ecological evaluation summary of the survey sites according to NRA (2009) criteria

| Site no. | Watercourse | EPA code | Evaluation of importance | Rationale summary |
|---|---|---|---|---|
| A1 | Cartenstown Stream | 07C60 | Local importance (lower value) | Very low fisheries value overall; three-spined stickleback recorded at low densities via electro-fishing; Q2-3 (poor status) water quality; no aquatic species or habitats of high conservation value recorded present |
| A2 | Stonestown River | 07S11 | Local importance (lower value) | No aquatic value due to non-perennial nature of channel; not possible to assess biological water quality due to lack of water; no aquatic species or habitats of high conservation value recorded present |
| A3 | Ballinn Stream | 07B47 | Local importance (lower value) | Very low fisheries value overall; three-spined stickleback recorded at low densities via electro-fishing; Q2-3 (poor status) water quality; no aquatic species or habitats of high conservation value recorded present |
| A4 | Bolandstown River | 07B45 | **Local importance (higher value)** | Moderate fisheries value overall; *Lampetra* sp. ammocoetes & three-spined stickleback recorded at low densities via electro-fishing; Q3 (poor status) water quality; no other aquatic species or habitats of high conservation value recorded present |
| A5 | Cartenstown Stream | 07C60 | **Local importance (higher value)** | Poor-quality salmonid, lamprey & European eel habitat present but only brown trout and *Lampetra* sp. ammocoetes recorded in low densities via electro-fishing; Q3 (poor status) water quality; no other aquatic species or habitats of high conservation value recorded present |
| A6 | Woodtown West Stream | 07W06 | **Local importance (higher value)** | Very low fisheries value overall; no fish recorded via electro-fishing; Q3 (poor status) water quality; smooth newt[1] and common frog[1] present; no other aquatic species or habitats of high conservation value recorded present |
| A7 | Stonyford River | 07S02 | **International importance** | Located within River Boyne and River Blackwater SAC (002299); moderate-quality salmonid & lamprey habitat; Atlantic salmon, brown trout & *Lampetra* sp. ammocoetes recorded via electro-fishing; Q4 (good status) water quality |
| A8 | Carranstown Little River | 07C87 | Local importance (lower value) | Poor-quality salmonid, lamprey and European eel habitat present; no fish recorded via electro-fishing; Q2-3 (poor status) water quality; no aquatic species or habitats of high conservation value recorded present |
| B1 | Killaconnigan Stream | 07K34 | Local importance (lower value) | Very low fisheries value overall; no fish recorded via electro-fishing; non-perennial channel; not possible to assess biological water quality |

| Site no. | Watercourse | EPA code | Evaluation of importance | Rationale summary |
|---|---|---|---|---|
| | | | | due to lack of water; no aquatic species or habitats of high conservation value recorded present |
| B2 | Kilballivor Stream | 07K35 | Local importance (lower value) | No aquatic value due to dry and non-perennial nature of channel; not possible to assess biological water quality due to lack of water; no aquatic species or habitats of high conservation value recorded present |
| B3 | Unnamed stream | n/a | Local importance (lower value) | Low fisheries value overall; three-spined stickleback recorded at low densities via electro-fishing; Q3 (poor status) water quality; no aquatic species or habitats of high conservation value recorded present |
| B4 | Unnamed stream | n/a | Local importance (lower value) | No aquatic value due to non-perennial nature of channel; not possible to assess biological water quality due to lack of water; no aquatic species or habitats of high conservation value recorded present |
| B5 | Ballivor River | 07B52 | **Local importance (higher value)** | Some poor-quality salmonid, lamprey & European eel habitat present but none recorded; three-spined stickleback recorded via electro-fishing; Q2-3 (poor status) water quality; otter spraint recorded (no crayfish remains); no other aquatic species or habitats of high conservation value recorded present |
| C1 | Graffanstown Stream | 07G10 | Local importance (lower value) | Some poor-quality salmonid, lamprey & European eel habitat present but none recorded; three-spined stickleback recorded via electro-fishing; Q2-3 (poor status) water quality); no aquatic species or habitats of high conservation value recorded present |
| C2 | Ballynaskeagh Stream | 07B24 | Local importance (lower value) | Poor-quality salmonid, lamprey & European eel habitat present; no fish recorded via electro-fishing; Q3 (poor status) water quality; likely non-perennial site; no aquatic species or habitats of high conservation value recorded present |
| C3 | Mucklin Stream | 07M13 | Local importance (lower value) | No aquatic value due to non-perennial nature of channel; not possible to assess biological water quality due to lack of water; no aquatic species or habitats of high conservation value recorded present |
| C4 | River Deel | 07D01 | **International importance** | Located within River Boyne and River Blackwater SAC (002299); excellent-quality salmonid habitat & moderate lamprey & European eel habitat present; Atlantic salmon & brown trout recorded via electro-fishing; Annex I 'floating river vegetation' and 'Hydrophilous tall herb' habitats present[2]; Q4 (good status) water quality); no other aquatic species or habitats of high conservation value recorded present |

| Site no. | Watercourse | EPA code | Evaluation of importance | Rationale summary |
|---|---|---|---|---|
| C5 | Craddanstown Stream | 07C55 | **Local importance (higher value)** | Poor-quality salmonid, lamprey & European eel habitat present; brown trout, *Lampetra* sp. & three-spined stickleback recorded via electro-fishing; Q3 (poor status) water quality; otter present (spraint); no other aquatic species or habitats of high conservation value recorded present |
| C6 | Clondalee More Stream | 07C77 | Local importance (lower value) | Poor-quality salmonid, lamprey & European eel habitat present but these species were not recorded; three-spined stickleback recorded via electro-fishing; Q2-3 (poor status) water quality); no aquatic species or habitats of high conservation value recorded present |
| D1 | River Boyne | 07B04 | **International importance** | Located within River Boyne and River Blackwater SAC (002299); moderate-quality salmonid, lamprey & European eel habitat; Atlantic salmon, brown trout, stone loach & minnow recorded via electro-fishing; Q4 (good status) water quality; no other aquatic species or habitats of high conservation value recorded present |

[1] Both smooth newt (*Lissotriton vulgaris*) and common frog (*Rana temporaria*) are protected under the Wildlife Act (1976-2021). Furthermore, common frogs are protected under Annex V of the Habitats Directive [92/42/EEC].

[2] Both Annex I habitats 'Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation or aquatic mosses [3260]'. And 'Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430]' recorded at site C4

*** Conservation value:** Atlantic salmon (*Salmo salar*), sea lamprey (*Petromyzon marinus*), brook lamprey (L*ampetra planeri*), river lamprey (*Lampetra fluviatilis*), white-clawed crayfish (*Austropotamobius pallipes*) and otter (*Lutra lutra*) are listed under Annex II of the Habitats Directive [92/42/EEC]. Atlantic salmon, river lamprey, white-clawed crayfish and otter are also listed under Annex V of the Habitats Directive [92/42/EEC]. Otters, along with their breeding and resting places, are also protected under provisions of the Irish Wildlife Acts 1976 to 2021. European eel are 'critically endangered' according to most recent ICUN red list (Pike et al., 2020) and listed as 'critically engendered' in Ireland (King et al., 2011). With the exception of the Fisheries Acts 1959 to 2019, brown trout have no legal protection in Ireland.

# 5. Discussion

## 5.1 Most valuable areas for aquatic ecology

Sites A7 (Stonyford River), C4 (River Deel) and D1 (River Boyne) were evaluated as **international importance** given their location within the River Boyne and River Blackwater SAC (002299). These sites also supported qualifying interest Atlantic salmon and Q4 (good status) water quality. None of the other aquatic survey sites were evaluated as greater than **local importance (higher value)**. The higher value sites were present on the Bolandstown River (A4), Cartenstown Stream (A5), Woodtown West Stream (A6), Ballivor River (B5), Craddanstown Stream (C5), given the presence of salmonids, *Lampetra* sp., otter and or other aquatic species of conservation value (e.g., smooth newt). The remaining sites (i.e., A1, A2, A3, A8, B1, B2, B3, B4, C1, C2, C3 & C6) were evaluated as **local importance (lower value)**, primarily due to poor flows and poor quality of aquatic habitats.

Atlantic salmon were recorded (via electro-fishing) from a total of three sites on Stonyford River (A7), River Deel (C4) and River Boyne (D1), with brown trout recorded from a total of five sites on the Cartenstown Stream (A5), Stonyford River (A7), River Deel (C4), Craddanstown Stream (C5) and River Boyne (D1). *Lampetra* sp. ammocoetes were recorded from a total of four sites on the Bolandstown River (A4), Cartenstown Stream (A5), Stonyford River (A7) and Craddanstown Stream (C5). Despite some low to moderate suitability across numerous survey sites, no European eel were recorded during the survey. The fisheries value of these watercourses is addressed in further detail in **Appendix A**.

Otter signs (spraint and or prints) were recorded at sites B5 (Ballivor River) and C5 (Craddanstown Stream). Smaller, narrower, modified channels with limited vegetation (such as those in the vicinity of the proposed wind farm) are known to be negative determinants of otter presence (Bailey & Rochford, 2006; Reid et al., 2013). Therefore, wider, less-modified watercourses with improved fisheries habitat, such as the Craddanstown Stream, Stoneyford River and River Deel, have higher inherent value for otter. This would also reflect the distribution of otter records in the vicinity of the proposed project, presented in **Figure 3.1** (sensitive species data request), i.e., primarily located in the middle to lower reaches of larger watercourses.

A single adult smooth newt (*Lissotriton vulgaris*), protected under the Wildlife Act (1976-2021), was recorded during sweep sampling at site A6 on the Woodtown Stream. Although records for white-clawed crayfish widespread within the wider survey area (Deel, Stonyford and Boyne rivers), the bulk of these records were historical only (i.e., 1971-1985). No white-clawed crayfish were recorded during the aquatic surveys. No rare or protected macro-invertebrate species (according to national red lists) were recorded in the biological water quality samples taken from *n*=15 sites.

Good status (Q4) water quality was only recorded from sites A7 (Stonyford River), C4 (River Deel) and D1 (River Boyne). Primarily due to peat harvesting pressures, all remaining survey sites achieved Q2-3 or Q3 (poor status) water quality and, thus, failed to meet the good status (≥Q4) requirements of the European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 and the Water Framework Directive (2000/60/EC).

Examples of the Annex I habitats 'Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation or aquatic mosses [3260]' and 'Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430]' were present at site C4 on the River Deel (Raharney Bridge). No other survey sites supported examples these Annex I habitats.

In summary, the majority of watercourses in the vicinity of the proposed Ballivor wind farm were of **local importance (higher value)** in terms of their aquatic ecology. However, historical drainage pressures and ongoing peat escapement (siltation) had significantly reduced the quality and or presence of aquatic habitats on the Cartenstown Stream (EPA code: 07C60), Stonestown River (07S11), Ballinn Stream (07B47), Bolandstown River (07B45), Woodtown West Stream (07W06), Carranstown Little River (07C87), Killaconnigan Stream (07K34), Kilballivor Stream (07B35), Ballivor River (07B52) and two unnamed tributaries, Graffanstown Stream (07G10), Ballynaskeagh Stream (07B24), Mucklin Stream (07M13), Craddanstown Stream (07C550) and Clondalee More Stream (07C77). Typically, larger watercourses with higher flow rates are better able to buffer against such impacts and these proved the better-quality aquatic habitat (i.e., Stonyford River, River Deel, River Boyne). With the exception of survey sites on these three watercourses, biological water quality was of ≤Q3 (poor status) across all survey sites sampled and this contributed to the reduction in habitat quality for salmonids, macro-invertebrates (including white-clawed crayfish) and other aquatic species and habitats of conservation value.

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# Appendix A:
# Fisheries assessment of Ballivor wind farm, Co. Meath/Westmeath




Prepared by Triturus Environmental Ltd. for McCarthy Keville O' Sullivan Ltd.

**October 2021**

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# 1. Introduction

## 1.1 Background

Triturus Environmental Ltd. were contracted by McCarthy Keville O' Sullivan to undertake a baseline fisheries assessment of numerous watercourses in the vicinity of the proposed Ballivor wind farm, located near Ballivor, Co. Meath (**Figure 2.1**).

The survey was undertaken to establish baseline fisheries data used in the preparation of the EIAR for the proposed project (**Figure 2.1**). In order to gain an accurate overview of the existing and potential fisheries value of the riverine watercourses within the vicinity of the proposed project, a catchment-wide electro-fishing survey across *n*=20 sites was undertaken (**Table 2.1; Figure 2.1**). Electro-fishing helped to identify the importance of the watercourses as nurseries and habitats for salmonids, lamprey and European eel (*Anguilla anguilla*), as well as other species, and helped to further inform impact assessment and any subsequent mitigation for the project.

Triturus Environmental Ltd. made an application under Section 14 of the Fisheries (Consolidation) Act, 1959 as substituted by Section 4 of the Fisheries (Amendment) Act, 1962, to undertake a catchment-wide electro-fishing survey in the vicinity of the proposed Ballivor wind farm. Permission was granted on Friday 25th June 2021 and the survey was undertaken on Wednesday 14th to Friday 16th July 2021.

## 1.2 Fisheries asset of the survey area

The aquatic survey sites were located within the Deel (Raharney) and Stoneyford River sub-basins, in the wider River Boyne catchment (Boyne_SC_040 and Boyne_SC_050). Whilst not located within a European site, the proposed wind farm site (via several watercourses) shared downstream hydrological connectivity with the River Boyne and River Blackwater SAC (002299).

Fisheries survey sites were present on the Cartenstown Stream (EPA code: 07C60), Stonestown River (07S11), Ballinn Stream (07B47), Bolandstown River (07B45), Woodtown West Stream (07W06), Stonyford River (07S02), Carranstown Little River (07C87), KIllaconnigan Stream (07K34), Kilballivor Stream (07B35), Ballivor River (07B52) and two unnamed tributaries, Graffanstown Stream (07G10), Ballynaskeagh Stream (07B24), Mucklin Stream (07M13), River Deel (07D01), Craddanstown Stream (07C550, Clondalee More Stream (07C77) and River Boyne (07B04) (**Table 2.1**). The survey sites on the Stonyford River, River Deel and River Boyne were located within the River Boyne and River Blackwater SAC (002299).

The Stoneyford River rises south of Oldcastle, at the base of Slieve na Caillaigh, Co. Meath. It then flows south easterly for 25km through counties Meath and Westmeath. It enters the River Boyne half a mile downstream of Scarriff Bridge. Recreational brown trout fishing is popular along this river (O'Reilly, 2009). In terms of genetic stock, the Stonyford is known to be a significant contributor of brown trout to the main Boyne channel (one of the three most important spawning tributaries in the middle-Boyne; Mariani & Massa-Gallucci, 2012). Whilst

The River Deel emanates from Lough Lene, Lough Bane and the Ben Loughs (Westmeath) and then flows for 35km in a south easterly direction through Raharney, Co. Westmeath before joining with the River Boyne 2km upstream of Inchamore Bridge. The River Deel is a limestone river with high water clarity, renowned as a wild brown trout fishery (O'Reilly, 2009). *Lampetra* sp. ammocoetes (likely brook lamprey *Lampetra planeri*) are widespread throughout both the Stonyford and Dee rivers. Densities of lamprey have been recorded as low (O'Connor, 2006) and the species is known to suffer from the impacts of continued arterial drainage that have been undertaken in the catchment (IFI, 2013).

The River Boyne rises in Co. Kildare and flows for over 110km in a north easterly direction through counties Offaly, Meath and Louth before entering the Irish Sea at Drogheda. The Boyne is a designated salmonid watercourse under the European Communities (Quality of Salmonid Waters) Regulations, 1988 (S.I. No. 293/1988) and is a renowned wild brown trout, Atlantic salmon and (in its lower reaches) sea trout fishery (O'Reilly, 2009). As well as salmonids, the river is known to support *Lampetra* sp., European eel (*Anguilla anguilla*), stone loach (*Barbatula barbatula*), minnow (*Phoxinus phoxinus*) and three-spined stickleback (*Gasterosteus aculeatus*) (Kelly et al., 2011a, 2011b). A number of other cyprinid species are also known from the river, including roach (*Rutilus rutilus*) and bream (*Abramis brama*), primarily in the middle to lower reaches (pers. obs.).

Whilst *Lampetra* sp. ammocoetes (likely brook lamprey *Lampetra planeri*) are widespread throughout both the Boyne, Stonyford and Deel rivers, densities have been recorded as low (O'Connor, 2006) and the species is known to suffer from the impacts of continued arterial drainage throughout the catchment (IFI, 2013).

Fisheries data for the other watercourses within the survey area was not available at the time of survey.

# 2. Methodology

## 2.1 Fish stock assessment (electro-fishing)

A single anode Smith-Root LR24 backpack (12V DC input; 300V, 100W DC output) was used to electro-fish sites on watercourses in the vicinity of the proposed Ballivor wind farm on the Wednesday 14th to Friday the 16th July 2021, following notification to Inland Fisheries Ireland and under the conditions of a Department of Communications, Climate Action & Environment (DCCAE) licence. Both river and holding tank water temperature was monitored continually throughout the survey to ensure temperatures of 20°C were not exceeded, thus minimising stress to the captured fish due to low dissolved oxygen levels. A portable battery-powered aerator was also used to further reduce stress to any captured fish contained in the holding tank.

Salmonids, European eel and other captured fish species were transferred to a holding container with oxygenated fresh river water following capture. To reduce fish stress levels, anaesthesia was not applied to captured fish. All fish were measured to the nearest millimetre and released in-situ following a suitable recovery period.

As three primary species groups were targeted during the survey, i.e., salmonids, lamprey, and eel, the electro-fishing settings were tailored for each species. By undertaking electro-fishing using the rapid electro-fishing technique (see methodology below), the broad characterisation of the fish community at each sampling reach could be determined as a longer representative length of channel can be surveyed. Electro-fishing methodology followed accepted European standards (CEN, 2003) and adhered to best practice (e.g., CFB, 2008).

The catchment-wide electro-fishing (CWEF) survey was undertaken across *n*=20 sites (see **Table 2.1, Figure 2.1**).

**Table 2.1** *n*=20 electro-fishing survey site locations in the vicinity of the proposed Ballivor wind farm project, Co. Meath

| Site no. | Watercourse | EPA code | Location | X (ITM) | Y (ITM) |
|---|---|---|---|---|---|
| A1 | Cartenstown Stream | 07C60 | Ballyhealy | 661703 | 759056 |
| A2 | Stonestown River | 07S11 | Cartenstown Stream confluence | 663011 | 759233 |
| A3 | Ballinn Stream | 07B47 | Local road crossing, Lisclogher Great | 664937 | 760833 |
| A4 | Bolandstown River | 07B45 | Local road crossing, Bracklin | 662455 | 758674 |
| A5 | Cartenstown Stream | 07C60 | Local road crossing, Coolronan | 666077 | 756898 |
| A6 | Woodtown West Stream | 07W06 | Lisclogher Great | 666459 | 758978 |
| A7 | Stonyford River | 07S02 | Cloghbrack Bridge | 667624 | 758158 |
| A8 | Carranstown Little River | 07C87 | Coolronan | 664558 | 756649 |
| B1 | Killaconnigan Stream | 07K34 | Grange More | 664652 | 754555 |
| B2 | Kilballivor Stream | 07K35 | Killconnigan | 667115 | 755088 |
| B3 | Unnamed stream | n/a | Clonycavan | 667308 | 753476 |

| Site no. | Watercourse | EPA code | Location | X (ITM) | Y (ITM) |
|---|---|---|---|---|---|
| B4 | Unnamed stream | n/a | Local road crossing, Clonycavan | 666871 | 752716 |
| B5 | Ballivor River | 07B52 | Local road crossing, Clonycavan | 667266 | 751725 |
| C1 | Graffanstown Stream | 07G10 | Local road crossing, Bracklin | 659139 | 757974 |
| C2 | Ballynaskeagh Stream | 07B24 | Local road crossing, Ballynaskeagh | 659022 | 756531 |
| C3 | Mucklin Stream | 07M13 | Local road crossing, Craddanstown | 659139 | 755895 |
| C4 | River Deel | 07D01 | Raharney Bridge, R156 road crossing | 660041 | 753049 |
| C5 | Craddanstown Stream | 07C55 | Local road crossing, Riverdale | 663341 | 751542 |
| C6 | Clondalee More Stream | 07C77 | Local road crossing, Clondalee More | 664753 | 750982 |
| D1 | River Boyne | 07B04 | Scarriff Bridge, R156 road crossing | 673349 | 752700 |

### 2.1.1 Salmonids and European eel

For salmonid species and European eel, as well as all other incidental species, electro-fishing was carried out in an upstream direction for a 10-minute CPUE, an increasingly common standard approach for wadable streams (Matson et al., 2018). A total of approx. 40-100m channel length was surveyed at each site, where feasible, in order to gain a better representation of fish stock assemblages. At certain, more minor watercourse sites or sites with limited access, it was more feasible to undertake electro-fishing for a 5-minute CPUE. Discrepancies in fishing effort (CPUE) between sites are accounted for in the subsequent results section (**Table 3.1**).

Relative conductivity of the water at each site was checked in-situ with a conductivity meter and the electro-fishing backpack was energised with the appropriate voltage and frequency to provide enough draw to attract salmonids and European eel to the anode without harm. For the moderate conductivity waters of the sites (most draining calcareous geologies) a voltage of 200-230v, frequency of 35-45Hz and pulse duration of 3.5-4ms was utilised to draw fish to the anode without causing physical damage.

### 2.1.2 Lamprey

Electro-fishing for lamprey ammocoetes was conducted using targeted box quadrat-based electro-fishing (as per Harvey & Cowx, 2003) in objectively suitable areas of sand/silt, where encountered. As lamprey take longer to emerge from silts and require a more persistent approach, they were targeted at a lower frequency (30Hz) burst DC pulse setting which also allowed detection of European eel in sediment, if present. Settings for lamprey followed those recommended and used by Harvey & Cowx (2003), APEM (2004) and Niven & McAuley (2013). Using this approach, the anode was placed under the water's surface, approx. 10–15 cm above the sediment, to prevent immobilising lamprey ammocoetes within the sediment. The anode was energised with 100V of pulsed DC for 15-20 seconds and then turned off for approximately five seconds to allow ammocoetes to emerge from their burrows. The anode was switched on and off in this way for approximately two minutes. Immobilised ammocoetes were collected by a second operator using a fine-mesh hand net as they emerged.

Lamprey species were identified to species level, where possible, with the assistance of a hand lens, through external pigmentation patterns and trunk myomere counts as described by Potter & Osborne (1975) and Gardiner (2003).

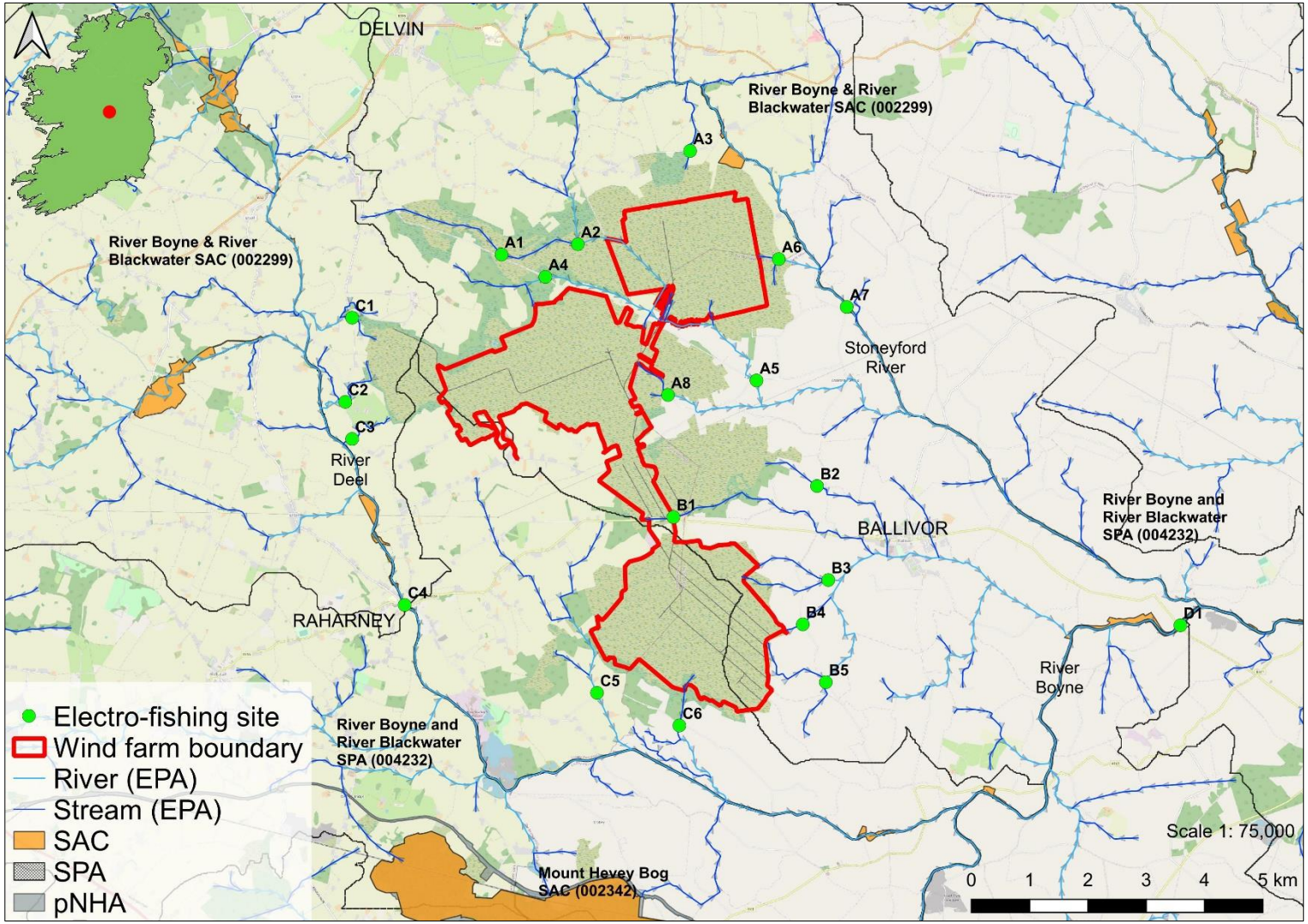


**Figure 2.1** Location overview of the *n*=20 electro-fishing sites in vicinity of the proposed Ballivor wind farm, Co. Meath.

## 2.2 Fisheries habitat

### 2.2.1 General fisheries habitat

A broad appraisal / overview of the upstream and downstream habitat at each site was also undertaken to evaluate the wider contribution to salmonid and lamprey spawning and general fisheries habitat. River habitat surveys and fisheries assessments were also carried out utilising elements of the approaches in the River Habitat Survey Methodology (Environment Agency, 2003) and Fishery Assessment Methodology (O'Grady, 2006) to broadly characterise the riverine sites (i.e., channel profiles, substrata etc.).

## 2.3 Biosecurity

A strict biosecurity protocol following the Check-Clean-Dry approach was employed during the survey. Equipment and PPE used was disinfected with Virkon® between survey sites to prevent the transfer of pathogens and/or invasive species between survey areas. Particular cognisance was given to preventing the introduction or spread of crayfish plague (*Aphanomyces astaci*) given the known presence of white-clawed crayfish in the wider Boyne catchment. As per best practice, surveys were undertaken at sites in a downstream order (i.e., uppermost site surveyed first etc.) to prevent the upstream mobilisation of invasive propagules and pathogens.

# 3. Results

A catchment-wide electro-fishing survey of *n*=20 sites in the vicinity of the proposed Ballivor wind farm was conducted on Wednesday 14th to Friday 16th July 2021 following notification to Inland Fisheries Ireland. The results of the survey are discussed below in terms of fish population structure, population size and the suitability and value of the surveyed areas as nursery and spawning habitat for salmonids, European eel and lamprey species. Scientific names are provided at first mention only.

## 3.1 Fish stock assessment (electro-fishing)

### 3.1.1 Site A1 – Cartenstown Stream, Ballyhealy

Three-spined stickleback was the only fish species recorded via electro-fishing (**Figure 3.1**). With the exception of low densities of this species, the narrow, historically straightened and deepened channel was of very poor fisheries value, i.e., not of value to salmonids or lamprey species given the lack of flow and heavily-silted (peat) nature. The site featured 100% slow-flowing glide habitat and was considered likely non-perennial (i.e., dries up seasonally). Fisheries value improved further downstream where the channel became wider, deeper and more supportive of perennial aquatic habitats.

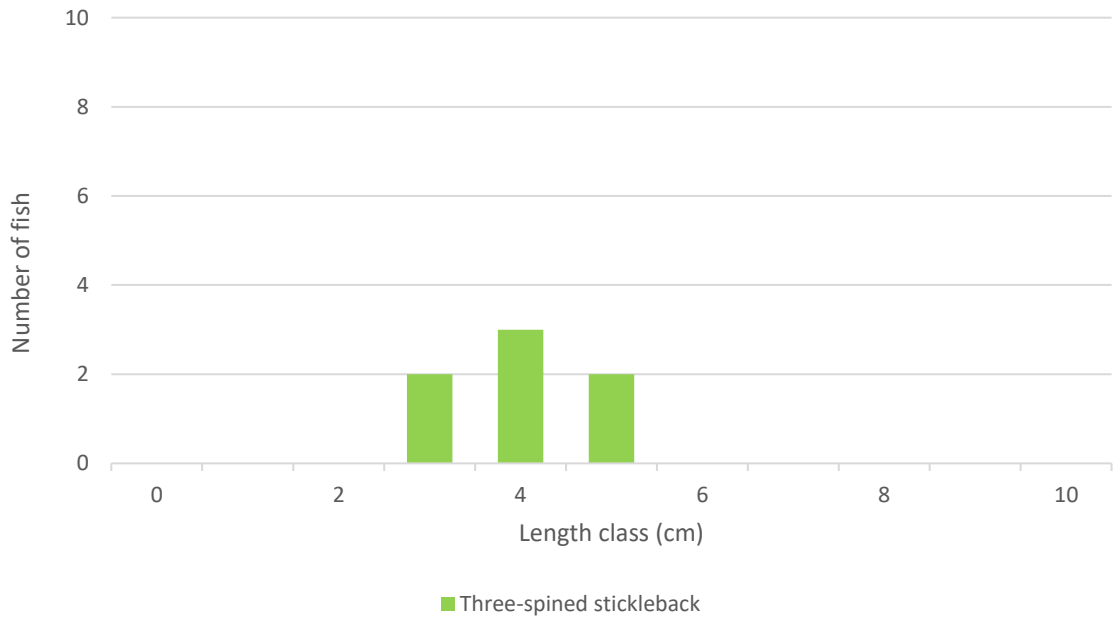


**Figure 3.1** Length frequency distribution recorded via electro-fishing at site A1 on the Cartenstown Stream, July 2021



**Plate 3.1** Representative image of site A1 on the Cartenstown Stream, May 2021

### 3.1.2 Site A2 – Stonestown River, Cartenstown Stream confluence

No fish were recorded from site A2 on the Stonestown River. The channel had been modified historically (straightened and deepened) and was 100% dry at the time of survey, with no pools of standing water remaining. Thus, the site had no fisheries value. The non-perennial channel drained cutover peat bog (PB4) and was evidently dry for much of the year.



**Plate 3.2** Representative image of site A2 on the Stonestown River, May 2021

### 3.1.3 Site A3 – Ballinn Stream, Lisclogher Great

Three-spined stickleback was the only fish species recorded via electro-fishing from site A3 on the Ballinn Stream (**Figure 3.2**). All mature male sticklebacks recorded (*n*=10) were an uncommon melanic form (**Plate 3.3**). Melanic male three-spined stickleback are associated with waterbodies that are red-shifted due to the presence of tannins (e.g., peat-stained), where the ambient light environment is dominated by long wavelengths, and is hypothesised to have either a sexual selection or dietary basis (Smith et al., 2020; Flamarique et al., 2011; Reimchen, 1989). With the exception of low densities of this species, the heavily-silted peat drainage channel was of very poor fisheries value, i.e., not of value to salmonids or lamprey species given the lack of flow and heavily-silted (peat) nature. Some low potential for European eel was present but none were recorded.

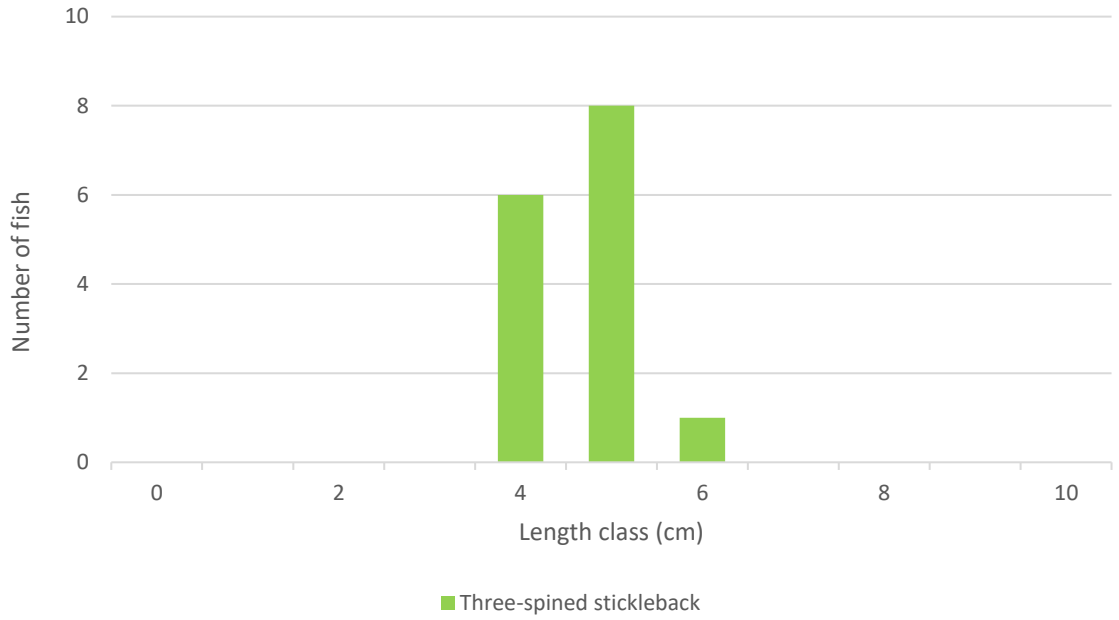


**Figure 3.2** Length frequency distribution recorded via electro-fishing at site A3 on the Ballinn Stream, July 2021



**Plate 3.3** Rare melanic (pigmented) male three-spined stickleback recorded from the Ballinn Stream, July 2021

### 3.1.4 Site A4 – Bolandstown River, Bracklin

A total of two fish species were recorded via electro-fishing from site A4 on the Bolandstown River (**Figure 3.3**). Low densities of three-spined stickleback (*n*=5) and *Lampetra* sp. ammocoetes (*n*=14) were captured. Low to moderate densities of ammocoetes (likely brook lamprey) were recorded at 2.8 per $m^2$ ($5m^2$ of habitat targeted and 14 ammocoetes captured), with two distinct size classes present.

Site A4 had low nursery, spawning and holding value for salmonids given the poor thalweg and very high levels of siltation and none were recorded during electro-fishing. The channel was not considered of value to European eel given the absence of refugia such as cobble and boulder. The channel was however of some value to lamprey given pockets of fine silt with a high organic content up to 20cm deep adjoining areas with finer gravels (albeit degraded by silt).

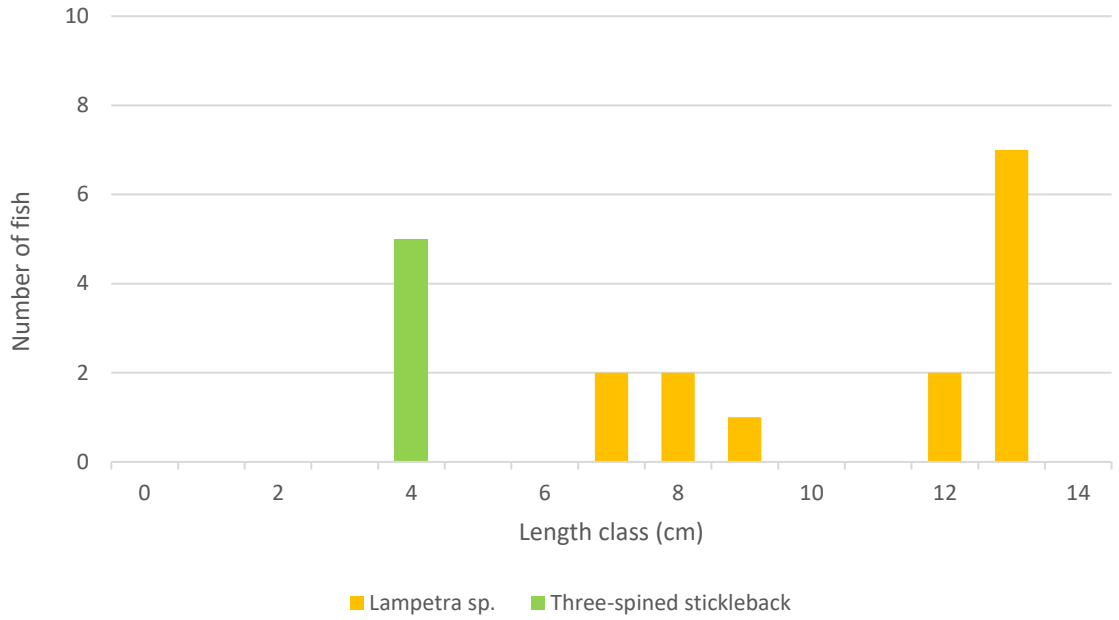


**Figure 3.3** Length frequency distribution recorded via electro-fishing at site A4 on the Bolandstown River, July 2021



**Plate 3.4** Representative image of site A4 on the Bolandstown River, May 2021

### 3.1.5 Site A5 – Cartenstown Stream, Coolronan

Brown trout (*Salmo trutta*) and *Lampetra* sp. were the only species recorded via electro-fishing from site A5 on the Cartenstown Stream (**Figure 3.5**). Both were present in low densities and represented single age cohorts, respectively. Only small numbers of 0+ brown trout were recorded, exemplifying the poor value of the site for salmonids Very low densities of lamprey were recorded at 0.4 per $m^2$ ($10m^2$ of habitat targeted and 4 ammocoetes captured) despite targeted electro-fishing of soft sediment areas being undertaken.

The site had low nursery, spawning and holding value for salmonids given the poor thalweg and very high levels of siltation. These were exacerbated by historical channelization and sedimentation pressures from the adjoining improved grassland. The channel was considered of only moderate value to European eel (none recorded). The channel was however of some value to lamprey given pockets of fine silt with a high organic content up to 15cm deep adjoining areas with finer gravels (albeit degraded by silt).

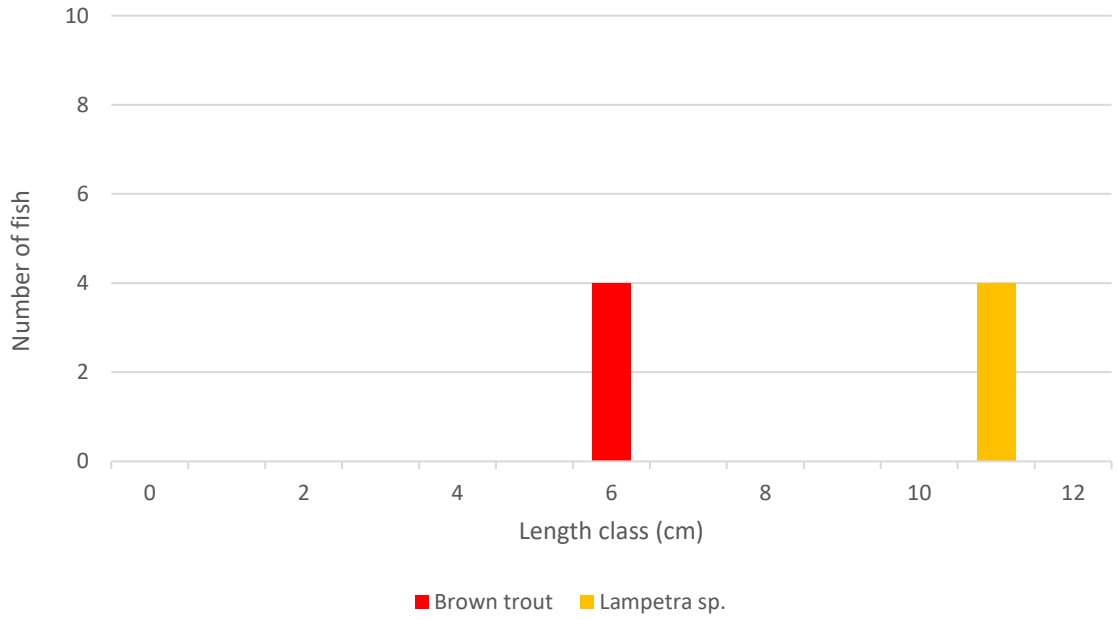


**Figure 3.4** Length frequency distribution recorded via electro-fishing at site A5 on the Cartenstown Stream, July 2021



**Plate 3.5** *Lampetra* sp. ammocoetes recorded from site A5 on the Cartenstown Stream, July 2021

### 3.1.6 Site A6 – Woodtown West Stream, Lisclogher Great

No fish species were recorded via electro-fishing at site A6 on the Woodtown West Stream. The peat drainage channel was of no fisheries value, given the lack of flow and heavily-silted (peat) nature. The stream had an imperceptible flow with numerous instream blockages (100% standing water/ponding). The drainage channel was grossly silted (several silt dams present). Deeper pool areas downstream of the survey site may have supported low densities of three-spined stickleback, although the intermittent/non-perennial nature of the stream likely precluded fish presence in the upper reaches. Both common frog (*Rana temporaria*) and smooth newt (*Lissotriton vulgaris*) were recorded via sweep netting during the site visit.



**Plate 3.6** Representative image of site A6 on the Woodtown West Stream, May 2021

### 3.1.7 Site A7 – Stonyford River, Cloghbrack Bridge

A total of three fish species were recorded via electro-fishing at site A7 on the Stonyford River (**Figure 3.5**). Brown trout dominated the site, with a range of juvenile and adult cohorts present (*n*=19 total). Two Atlantic salmon (*Salmo salar*) parr were also recorded (likely 1+ cohort). A low density of *Lampetra* sp. ammocoetes were recorded from sub-optimal marginal silt accumulations (1.75 per $m^2$, 4$m^2$ of habitat targeted and *n*=7 ammocoetes captured).

The site featured moderate-quality salmonid nursery and spawning habitat, given that both were compromised by historical dredging. This had resulted in a channel with limited riffle habitat and localised patches of gravel between paths of argillaceous clay. The holding value for salmonids was good due to the presence of deep glide and pool with overhanging trees, undercut banks etc. The site was of only moderate value for lamprey, with both sub-optimal adult (spawning) and ammocoete burial habitat present. The site was not considered of good quality for European eel given the limited presence of accessible refugia such as cobble and boulder (compacted substrata) and none were recorded.

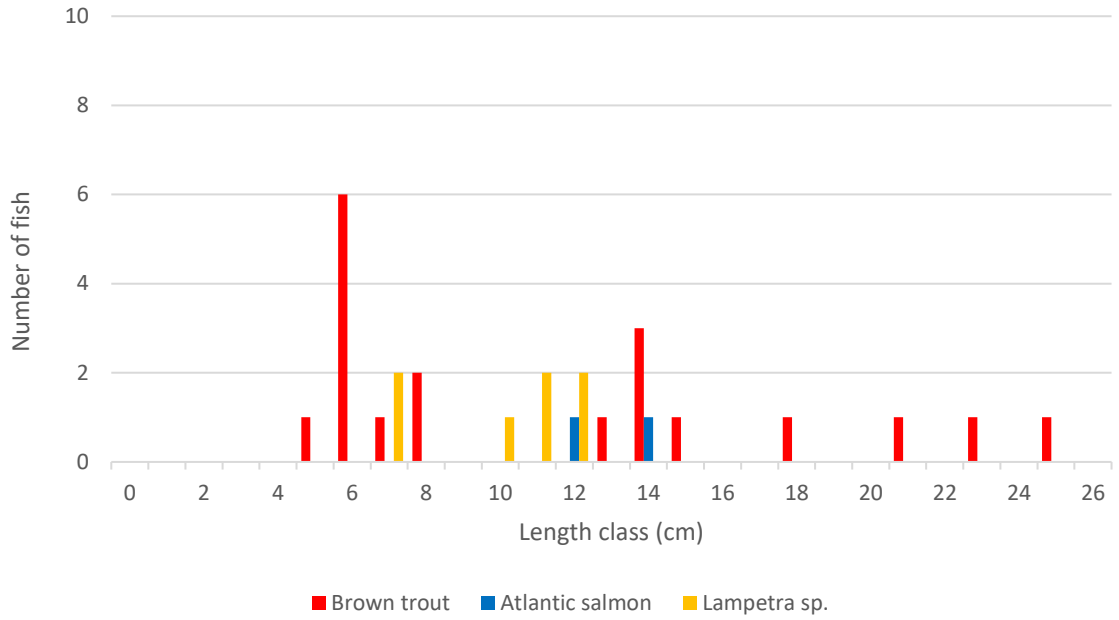


**Figure 3.5** Length frequency distribution recorded via electro-fishing at site A7 on the Stonyford River, July 2021



**Plate 3.7** Atlantic salmon parr recorded from site A7 on the Stonyford River, July 2021

### 3.1.8 Site A8 – Carranstown Little River, Coolronan

No fish were recorded via electro-fishing at site A8 on the Carranstown Little River. Suitability was limited to three-spined stickleback, although none were recorded present. The channel featured poor-quality salmonid nursery and spawning habitat, given high levels of peat-derived siltation (site drained an area of cutover bog). The site was not considered of good quality for European eel given the limited presence of accessible refugia such as cobble and boulder. Despite the presence of soft sediment accumulations, these were humic in nature (i.e., peat dominated) and not suitable for larval lamprey.



**Plate 3.8** Representative image of site A8 on the Carranstown Little River, May 2021

### 3.1.9 Site B1 – Killaconnigan Stream, Grange More

No fish were recorded via electro-fishing at site B1 on the Killaconnigan Stream, located adjacent to the R156 near the Ballivor Bord na Móna factory. The stream represented a semi-dry bog drainage channel (FW4) at the time of survey, with only pools of stagnant (standing) water present, i.e., no flow. The stream was evidently non-perennial at this location. Other than very low suitability for three-spined stickleback in the wider area (i.e., downstream of survey site), site B1 was not of fisheries value given its non-perennial and heavily-silted nature.



**Plate 3.9** Representative image of site B1 on the Killaconnigan Stream, May 2020

### 3.1.10 Site B2 – Kilballivor Stream, Killconnigan

No fish were recorded from site B2 on the Kilballivor Stream. The channel had been modified historically (straightened and deepened) and was 100% dry at the time of survey, with no pools of standing water remaining. Thus, the site had no fisheries value. The non-perennial channel drained cutover peat bog (PB4) and was evidently dry for much of the year.



**Plate 3.10** Representative image of site B2 on the Kilballivor Stream, May 2020 (100% dry)

### 3.1.11 Site B3 – Unnamed stream, Clonycavan

Three-spined stickleback was the only fish species recorded via electro-fishing at site B3 on an unnamed Ballivor River tributary (**Figure 3.6**). With the exception of low densities of this species, the heavily silted channel was of very poor fisheries value, i.e., not of value to salmonids given the lack of flow and heavily-silted (peat) nature. Some low potential for European eel and *Lampetra* sp. was present but none were recorded. The site had been extensively straightened and deepened in the recent past with poor instream recovery evident.

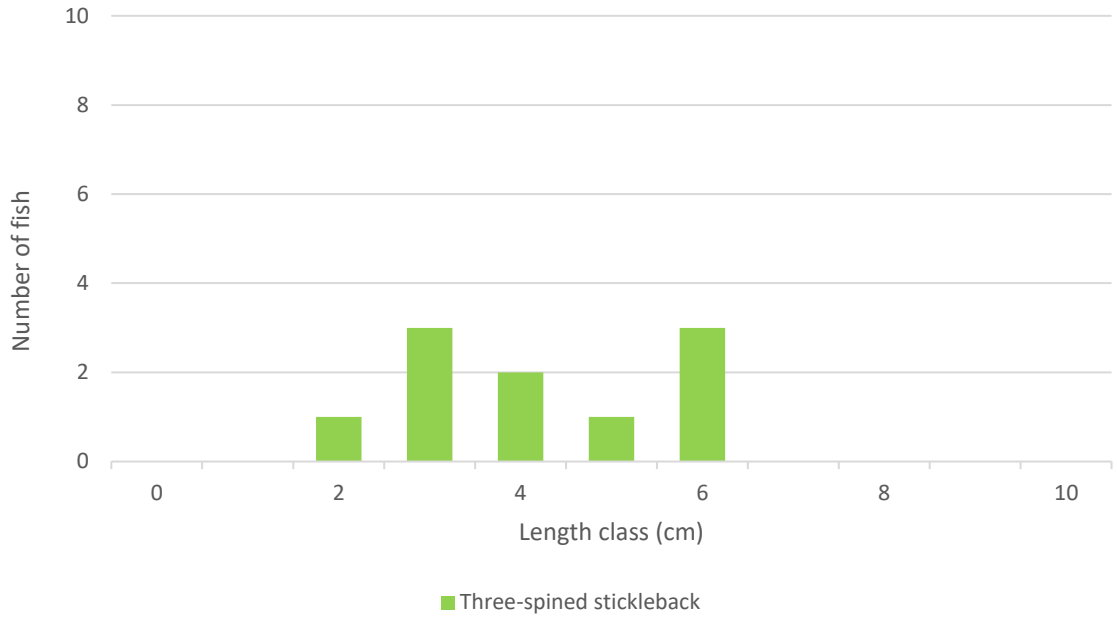


**Figure 3.6** Length frequency distribution recorded via electro-fishing at site B3 on an unnamed Ballivor River tributary, July 2021



**Plate 3.11** Representative image of site B3 at the confluence of two unnamed streams, May 2021

### 3.1.12 Site B4 – Unnamed stream, Clonycavan

No fish were recorded via electro-fishing at site B4 on an unnamed Ballivor River tributary. The channel was 100% dry at the time of survey, with no ponding or stagnant water present (i.e., non-perennial channel). The river had no aquatic or fisheries value given the lack of water at the time of survey. The channel was considered likely to convey water intermittently during the year (i.e., mostly dry) and thus may have some very low value as a stickleback habitat. The downstream-connecting Ballivor River (0.7km downstream) was of some moderate fisheries and aquatic value.



**Plate 3.12** Representative image of site B4 on unnamed Ballivor River tributary, May 2021 (dry channel)

### 3.1.13 Site B5 – Ballivor River, Clonycavan

Three-spined stickleback was the only fish species recorded via electro-fishing at site B5 on the Ballivor River (**Figure 3.7**). The lowland depositing watercourse (FW2/FW4) had been straightened and deepened historically, with more recent maintenance evident downstream of the bridge. With the exception of low densities of stickleback, the heavily silted channel was of very poor fisheries value, i.e., not of value to salmonids or lamprey species given the lack of flow and heavily-silted (peat) nature. Some low potential for European eel was present but none were recorded.

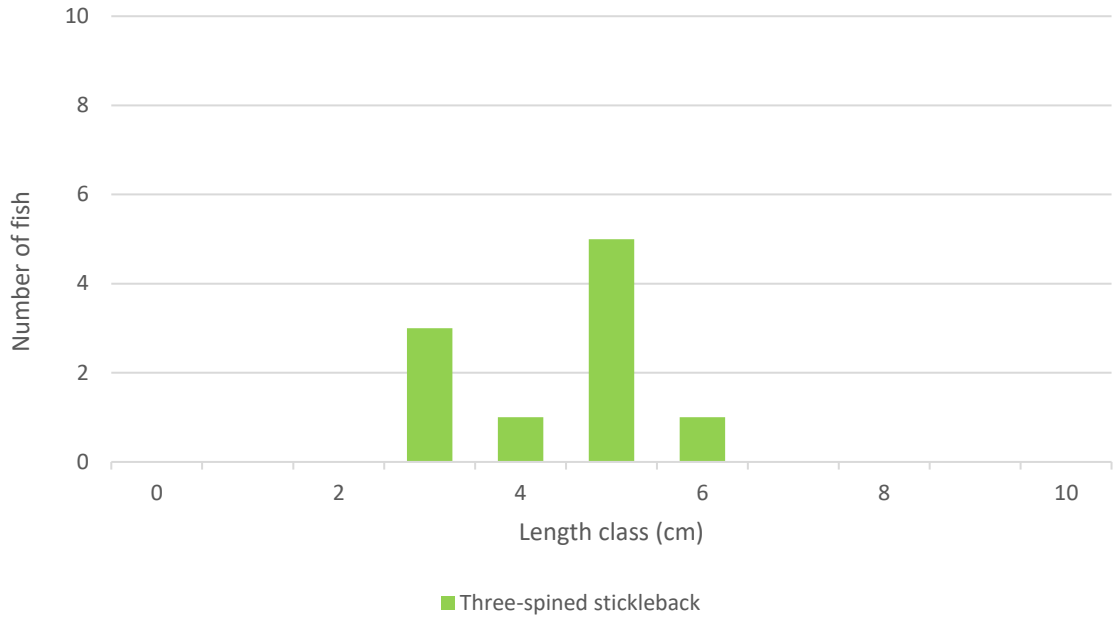


**Figure 3.7** Length frequency distribution recorded via electro-fishing at site B5 on the Ballivor River, July 2021



**Plate 3.13** Representative image of site B5 on the Ballivor River, May 2021 (facing downstream from bridge)

### 3.1.14 Site C1 – Graffanstown Stream, Bracklin

Three-spined stickleback was the only fish species recorded via electro-fishing at site C1 on the Graffanstown Stream (**Figure 3.8**). With the exception of very low densities of this species, the heavily silted and enriched drainage channel was of very poor fisheries value, i.e., not of value to salmonids or lamprey species given the lack of flow and heavily-silted (peat) nature. Whilst some limited sands and fine gravels were present on top of the flocculent sediment in places (e.g., near meander 40m upstream of culvert), these were also heavily silted. Despite an abundance of soft sediment accumulations, these were not of value for larval lamprey given the flocculent and or high humic content, in addition to poor flows.

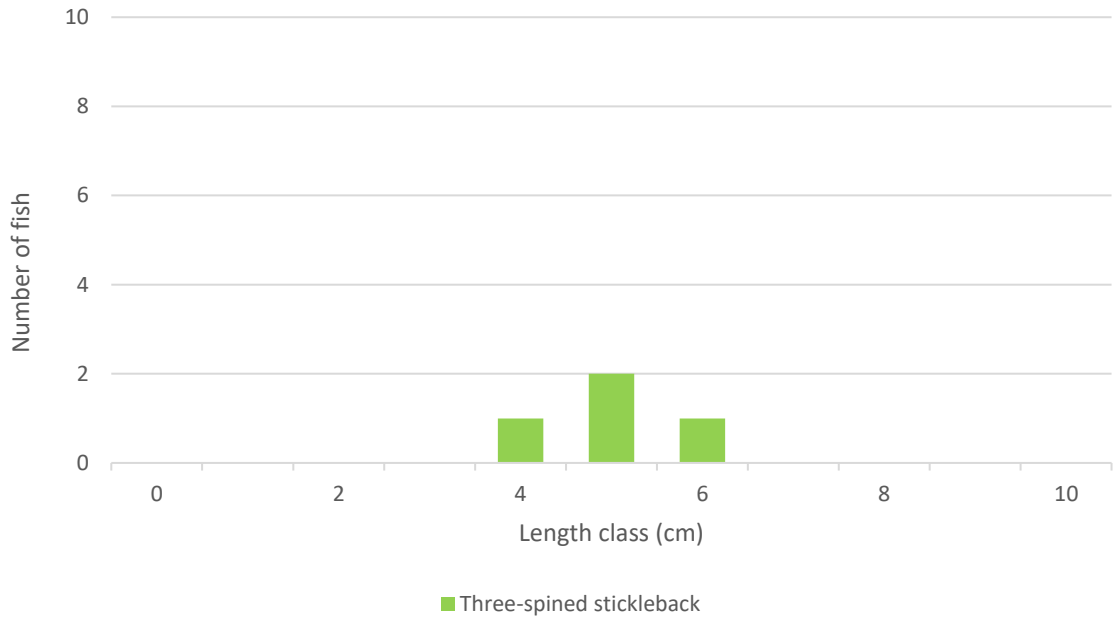


**Figure 3.8** Length frequency distribution recorded via electro-fishing at site C1 on the Graffanstown Stream July 2021



**Plate 3.14** Representative image of site C1 on the Graffanstown Stream, May 2021 (facing upstream from road culvert)

### 3.1.15 Site C2 – Ballynaskeagh Stream, Ballynaskeagh

No fish were recorded via electro-fishing at site C2 on the Ballynaskeagh Stream. Despite some moderate physical habitat suitability for salmonids and lamprey, these species were absent. This was considered a result of very low water levels at the time of survey (average depth <0.05m) and the stream's likely non-perennial nature. Nevertheless, even during higher water levels (e.g., winter), the site would only provide (at best) moderate suitability, given high rates of siltation and compacted substrata. There was some low suitability for European eel, albeit none were recorded. Improved fisheries habitat was present in the lowermost reaches at the River Deel confluence and River Boyne and River Blackwater SAC (002299) site boundary.



**Plate 3.15** Representative image of site C2 on the Ballynaskeagh Stream, July 2021

### 3.1.16 Site C3 – Mucklin Stream, Craddanstown

No fish were recorded via electro-fishing at site C2 on the Mucklin Stream. The channel was 100% dry at the time of survey, with no ponding or stagnant water present (i.e., non-perennial channel). Thus, the stream had no aquatic or fisheries value given the lack of water at the time of survey. The channel was considered likely to convey water intermittently during the year (but mostly dry). Fisheries and aquatic value was high in the downstream-connecting River Deel, located <200m downstream. The lowermost reaches of the channel were likely of some low fisheries and aquatic value during high water levels (i.e., refuge from flood water on the River Deel).



**Plate 3.16** Representative image of site C3 on the Mucklin Stream, July 2021 (100% dry channel)

### 3.1.17 Site C4 – River Deel, Raharney Bridge

A total of two fish species were recorded via electro-fishing at site C4 on the River Deel (**Figure 3.9**). Brown trout dominated the site (*n*=40), with a range of cohorts present. Adults were more numerous than juveniles. Two distinct cohorts of Atlantic salmon parr (likely 0+ and 1+) were also recorded (*n*=21 in total).

The site provided excellent-quality salmonid nursery habitat with well-oxygenated broken glide and riffle sequences and cover in macrophyte vegetation. The cobble substrata also provided good cover for juvenile salmonids. Good-quality spawning habitat was also present given unbedded, well-sorted mixed gravels between cobble areas. These had light siltation only. Holding habitat was also very good in deep glide and localised pool with overhanging tree cover and good shading. The site was also considered good for European eel, with ample boulder and cobble refugia, albeit none were recorded. No soft sediment lamprey habitat was identified present but the quality of spawning habitat was considered good. The species likely occur downstream of the survey area in suitable depositing areas.

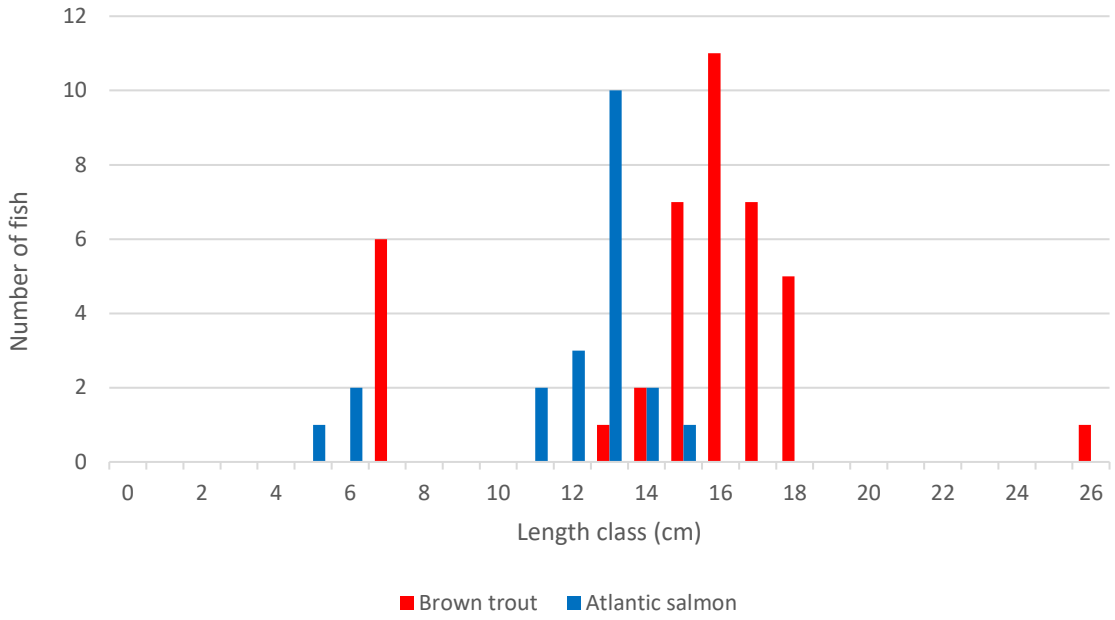


**Figure 3.9** Length frequency distribution recorded via electro-fishing at site C4 on the River Deel, July 2021



**Plate 3.17** Atlantic salmon (top) and brown trout (bottom) recorded from site C4 on the River Deel at Raharney Bridge, July 2021

### 3.1.18 Site C5 – Craddanstown Stream, Riverdale

A total of three fish species were recorded via electro-fishing at site C5 on the Craddanstown Stream (**Figure 3.10**). Low densities of three-spined stickleback (*n*=3) and *Lampetra* sp. (*n*=8) were recorded, in addition to a single juvenile (0+) brown trout. Low densities of larval lamprey were recorded at 0.8 per $m^2$ ($10m^2$ of habitat targeted and *n*=8 ammocoetes captured).

The historically straightened site had negligible nursery, spawning and holding value for salmonids given the absence of riffle, glide and pool sequences and extreme levels of siltation. These were exacerbated by historical channelisation and sedimentation pressures from the adjoining improved grassland. The channel was not considered of value to European eel given the absence of refugia such as cobble and boulder and the shallow nature. The channel was, however, of some value to *Lampetra* sp. given pockets of fine silt with a high organic content up to 15cm deep. These adjoined degraded areas of fine gravel that provided some local spawning habitat for the species.

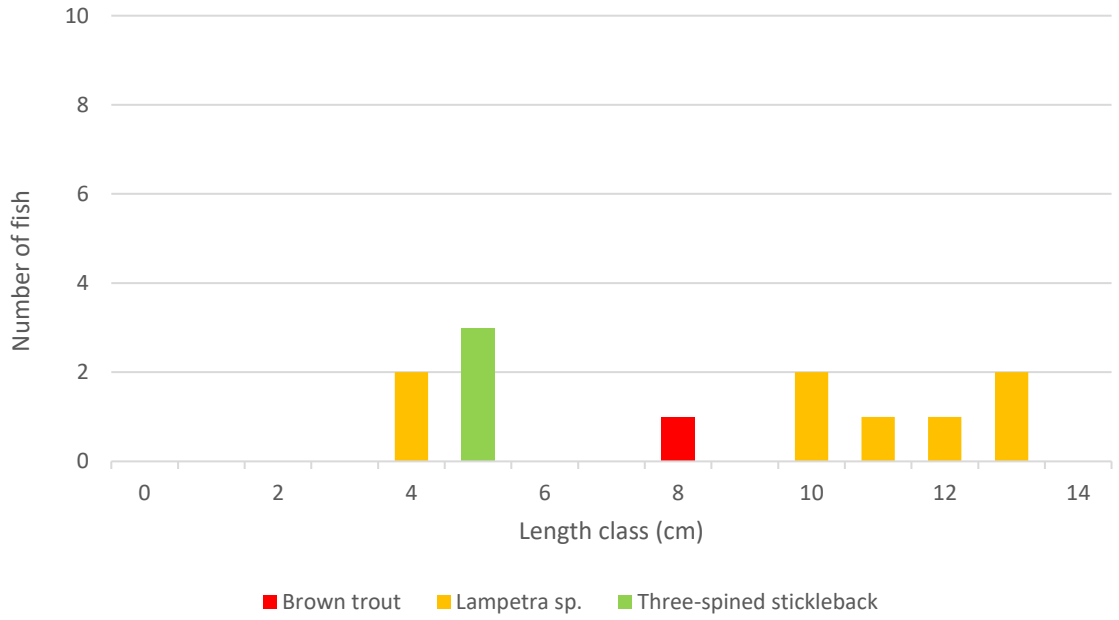


**Figure 3.10** Length frequency distribution recorded via electro-fishing at site C5 on the Craddanstown Stream, July 2021



**Plate 3.18** Representative image of site C5 on the Craddanstown Stream, May 2021 (facing downstream from bridge)

### 3.1.19 Site C6 – Clondalee More Stream, Clondalee More

Three-spined stickleback was the only fish species recorded via electro-fishing at site C6 on the Clondalee More Stream (**Figure 3.11**). With the exception of low densities of this species, the historically straightened channel was of very poor fisheries value, i.e., not of value to salmonids or lamprey species given the lack of flow and heavily-silted (peat) nature. Despite an abundance of soft sediment accumulations, these were not of value for larval lamprey given the flocculent and or high humic content, in addition to high clay fractions, locally, resulting in compaction. Suitability or European eel was low given the open, shallow nature of the site and paucity of suitable refugia.

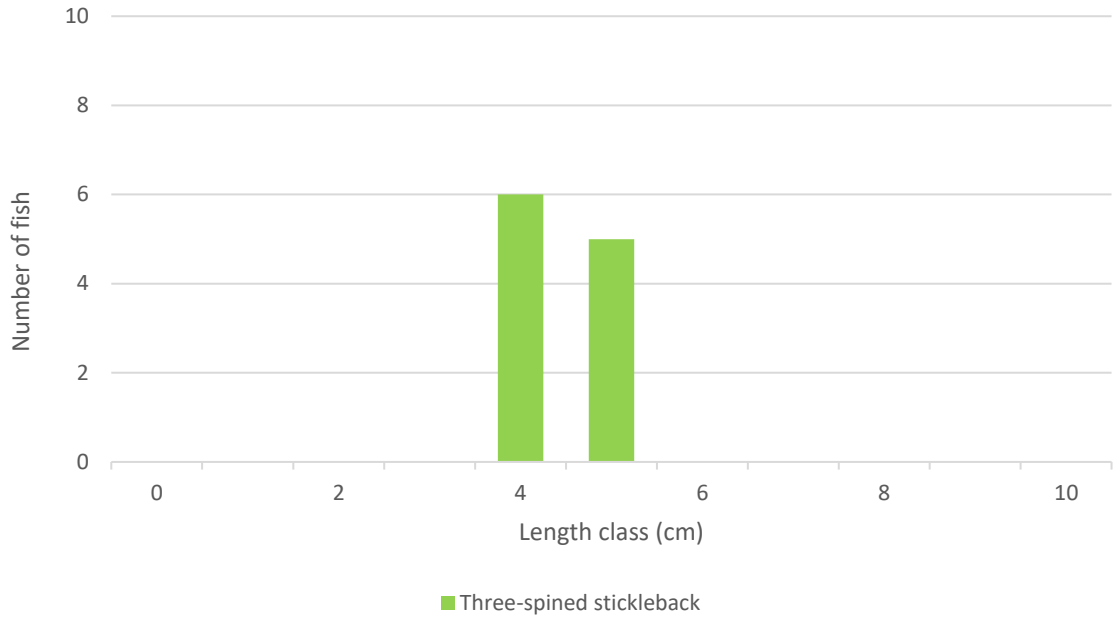


**Figure 3.11** Length frequency distribution recorded via electro-fishing at site C6 on the Clondalee More Stream, July 2021



**Plate 3.19** Representative image of site C6 on the Clondalee More Stream, May 2021

### 3.1.20 Site D1 – River Boyne, Scarriff Bridge

A total of four fish species were recorded via electro-fishing at site D1 on the River Boyne (**Figure 3.12**). Low numbers of both Atlantic salmon parr (*n*=9) and brown trout (*n*=5) were recorded, in addition to low numbers of minnow (*n*=5) and stone loach (*n*=4). With the exception of one adult brown trout, all salmonids captured were of the 0+ cohort.

Historical alterations had reduced the salmonid nursery value of the site. The spawning value was moderate as spawning gravels were restricted to isolated pockets between banks of argillaceous clay given historical deepening works. Holding habitat was very good. While no large salmonids were captured, larger fish were observed in deep pool adjoining the glide habitat surveyed - these areas were outside of wadable reach electro-fishing. Lamprey burial habitat was rare but present in association with marginal bur reed beds (however, no ammocoetes were recorded). European eel habitat was moderate with refugia largely limited to overhanging trees and scattered boulders.

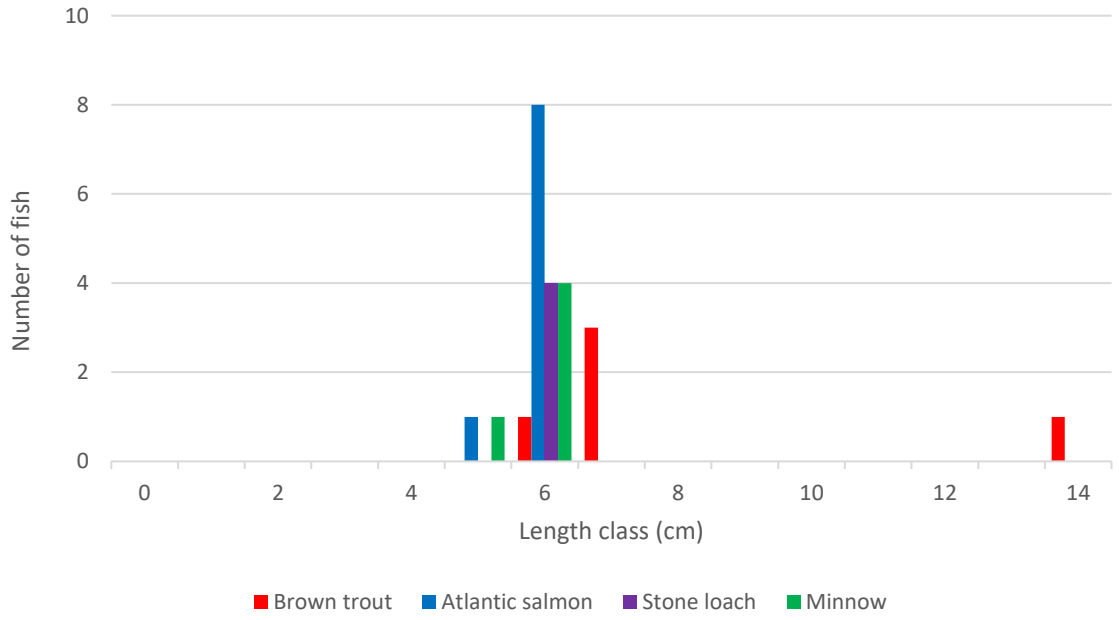


**Figure 3.12** Length frequency distribution recorded via electro-fishing at site D1 on the River Boyne, July 2021




**Plate 3.20** Stone loach recorded from site D1 on the River Boyne, July 2021

**Table 3.1** Fish species densities per $m^2$ recorded at sites in the vicinity of Ballivor wind farm via electro-fishing in July 2021. Values in bold represent the highest densities recorded for each species, respectively. * = no. ammocoetes per $m^2$ of targeted habitat fished

| Site | Watercourse | CPUE (elapsed time) | Approx. area fished ($m^2$) | Fish density (number fish per $m^2$) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Brown trout | Atlantic salmon | *Lampetra* sp. | Three-spined stickleback | Minnow | Stone loach |
| A1 | Cartenstown Stream | 5 | 25 | 0.000 | 0.000 | 0.000 | **0.280** | 0.000 | 0.000 |
| A2 | Stonestown River | n/a | Dry channel | n/a | n/a | n/a | n/a | n/a | n/a |
| A3 | Ballinn Stream | 5 | 50 | 0.000 | 0.000 | 0.000 | 0.240 | 0.000 | 0.000 |
| A4 | Bolandstown River | 10 | 140 | 0.000 | 0.000 | ***2.8** | 0.036 | 0.000 | 0.000 |
| A5 | Cartenstown Stream | 10 | 200 | 0.020 | 0.000 | *0.4 | 0.000 | 0.000 | 0.000 |
| A6 | Woodtown West Stream | 5 | 25 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| A7 | Stonyford River | 10 | 400 | 0.048 | 0.005 | *1.75 | 0.000 | 0.000 | 0.000 |
| A8 | Carranstown Little River | 10 | 150 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| B1 | Killaconnigan Stream | 5 | 20 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| B2 | Kilballivor Stream | n/a | Dry channel | n/a | n/a | n/a | n/a | n/a | n/a |
| B3 | Unnamed stream | 10 | 160 | 0.000 | 0.000 | 0.000 | 0.063 | 0.000 | 0.000 |
| B4 | Unnamed stream | n/a | Dry channel | n/a | n/a | n/a | n/a | n/a | n/a |
| B5 | Ballivor River | 10 | 180 | 0.000 | 0.000 | 0.000 | 0.056 | 0.000 | 0.000 |
| C1 | Graffanstown Stream | 10 | 100 | 0.000 | 0.000 | 0.000 | 0.040 | 0.000 | 0.000 |
| C2 | Ballynaskeagh Stream | 5 | 45 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

| Site | Watercourse | CPUE (elapsed time) | Approx. area fished ($m^2$) | Fish density (number fish per $m^2$) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Brown trout | Atlantic salmon | *Lampetra* sp. | Three-spined stickleback | Minnow | Stone loach |
| C3 | Mucklin Stream | n/a | Dry channel | n/a | n/a | n/a | n/a | n/a | n/a |
| C4 | River Deel | 10 | 320 | **0.125** | **0.066** | 0.000 | 0.000 | 0.000 | 0.000 |
| C5 | Craddanstown Stream | 10 | 190 | 0.005 | 0.000 | *0.8 | 0.016 | 0.000 | 0.000 |
| C6 | Clondalee More Stream | 10 | 160 | 0.000 | 0.000 | 0.000 | 0.069 | 0.000 | 0.000 |
| D1 | River Boyne | 10 | 340 | 0.015 | 0.026 | 0.000 | 0.000 | **0.015** | **0.012** |

# 4. Discussion

## 4.1 Most valuable sites

### 4.1.1 Salmonids

A total of five sites supported brown trout at the time of survey, namely sites A5 (Cartenstown Stream), A7 (Stonyford River), C4 (River Deel), C5 (Craddanstown Stream) and D1 (River Boyne). Sites A7, C4 and D1 also supported Atlantic salmon. The quality of salmonid habitat was typically poor to moderate, with better-quality habitat only present on the Stonyford River, River Deel and River Boyne. The best quality salmonid habitat was present on the River Deel at site C4, where nursery, spawning and holding habitat were all evaluated as excellent quality.

In general, salmonid habitat in the vicinity of the proposed Ballivor wind farm was poor due to historical drainage pressures, low or intermittent/seasonal flows and often excessive siltation (primarily from peat escapement). Diffuse siltation is one of the greatest threats to salmonid populations. Sediment not only blocks interstitial spaces in substrata and limits oxygen supply to salmonid eggs (required for healthy embryonic development and successful hatching) but can also smother substrata, thus reducing available spawning habitat and impact macro-invertebrate communities on which salmonids feed (Soulsby et al., 2001; Walling et al., 2003; Heywood & Walling, 2007; Louhi et al., 2008, 2011; Cocchiglia et al., 2012; Conroy et al., 2016; Davis et al., 2018; Kelly-Quinn et al., 2020). Sedimentation of salmonid habitat is a particular problem in Irish rivers flowing through modified catchments (Evans et al., 2006).

### 4.1.2 Lamprey

*Lampetra* sp. ammocoetes were recorded from a total of four sites, namely sites A4 (Bolandstown River), A5 (Cartenstown Stream), A7 (Stonyford River) and C5 (Craddanstown Stream). The highest density recorded were present at sites A4 and A7 (2.8 and 1.75 ammocoetes per $m^2$ of ammocoete habitat fished, respectively).

However, lamprey habitat was generally poor across the survey area. Owing to their relatively small morphologies, *Lampetra* species such as brook lamprey require clean, fine gravels in which to dig their redds (Lasne et al., 2010; Rooney et al., 2013; Dawson et al., 2015) although areas may also include fractions of sand, larger gravels, and cobble (Nika & Virbickas, 2010). Spawning habitat in the vicinity of the proposed Ballivor wind farm was appreciably sparse and of poor quality due to significant (peat) siltation pressures (as outlined above). Furthermore, lamprey ammocoetes require the deposition of fine, organic-rich sediment ≥5cm in depth in which to burrow and mature (Gardiner, 2003; Goodwin et al., 2008; Aronsuu & Virkkala, 2014). Peat-dominated substrata (i.e., humic deposits), such as those typically found in the vicinity of the proposed Ballivor wind farm, do not provide suitable burial/burrowing habitat complexity or structure for ammocoetes given their invariably fine and flocculent nature (pers. obs.).

### 4.1.3 European eel

On both a global and Irish scale, the European eel is listed as 'critically endangered' (Pike et al., 2020; King et al., 2011). Despite some suitability across the survey area, no European eel were recorded during the current survey. This was considered as a result of significant siltation (peat sedimentation) pressures within the vicinity of the proposed wind farm, in addition to a paucity of suitable diurnal refugia and low/intermittent flows in numerous watercourses. Nevertheless, even smaller channels with poor or little fisheries value overall can offer potential as European eel migratory pathways, provided they maintain downstream connectivity to larger channels. (e.g., adult migration seawards, usually from September/October onwards).

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# 8. Appendix B – Q-sample results (biological water quality)

**Table 8.1** Macro-invertebrate Q-sampling results for aquatic survey sites A1, A3, A4, A6, A7, A8, A9, B3, B5, C1, C2, C4, C5, C6 & D1

| Group | Family | Species | A1 | A3 | A4 | A5 | A6 | A7 | A8 | B3 | B5 | C1 | C2 | C4 | C5 | C6 | D1 | EPA group |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ephemeroptera | Heptageniidae | *Ecdyonurus dispar* | | | | | | 1 | | | | | | 3 | | | 14 | A |
| Ephemeroptera | Heptageniidae | *Heptagenia sulphurea* | | | | | | | | | | | | 10 | | | 7 | A |
| Ephemeroptera | Heptageniidae | *Rhithrogena semicolorata* | | | | | | | | | | | | | | | 1 | A |
| Plecoptera | Perlodidae | *Isoperla grammatica* | | | | | | | | | | | | 1 | | | 2 | A |
| Plecoptera | Nemouridae | *Nemurella pictetii* | | | | | | | | | | | | | | 1 | | A |
| Ephemeroptera | Leptophlebiidae | *Leptophlebia vespertina* | | | | | | | | | | | | | | | | B |
| Ephemeroptera | Baetidae | *Baetis muticus* | | | | | | 8 | | | | | | 2 | | | 7 | B |
| Trichoptera | Glossosomatidae | *Agapetus fuscipes* | | | | | | | | | | | | | 2 | | | B |
| Trichoptera | Hydroptilidae | *Hydroptila* sp. | | | | | | | | | | | | 3 | | | 2 | B |
| Trichoptera | Limnephilidae | Unidentified species | | 1 | | | | | | | | | | 2 | | | | B |
| Trichoptera | Limnephilidae | *Limnephilus* sp. | | 1 | | 3 | | | 1 | 3 | | | | | | | | B |
| Trichoptera | Limnephilidae | *Drusus annulatus* | | | | | | 3 | | | | | | | | | 1 | B |
| Trichoptera | Limnephilidae | *Limnephilus auricula* | | | | | | | | | 4 | 2 | | | | 6 | | B |
| Trichoptera | Limnephilidae | *Potamophylax cingulatus* | | | | | | | | | | | 1 | | | | 3 | B |
| Trichoptera | Sericostomatidae | *Sericostoma personatum* | | | | | | | | | | | | 1 | 7 | | 1 | B |
| Odonata | Coenagrionidae | *Pyrrhosoma nymphula* | 1 | 1 | | | | | | | | | | | | | | B |
| Odonata | Calopterygidae | *Calopteryx splendens* | | | | | | | | | | | | | | | 1 | B |
| Ephemeroptera | Baetidae | *Baetis rhodani* | | | 50 | 2 | | 84 | 4 | 5 | | | | 6 | 32 | | 4 | C |
| Ephemeroptera | Ephemerellidae | *Serratella ignita* | | | | | | 2 | | | | | | 3 | | | 3 | C |
| Trichoptera | Hydropsychidae | *Hydropsyche siltalai* | | | | | | 6 | | | | | | 3 | | | 11 | C |
| Trichoptera | Hydropsychidae | *Hydropsyche instabilis* | | | | | | 4 | | | | | | 6 | | | 2 | C |
| Trichoptera | Polycentropodidae | *Plectrocnemia conspersa* | 6 | | | | | | 1 | | | | | | | | | C |
| Trichoptera | Polycentropodidae | *Polycentropus kingi* | | | | 1 | | | | | | | | | | | 1 | C |
| Trichoptera | Polycentropodidae | *Polycentropus flavomaculatus* | | | | 3 | | | | | | | | | | | | C |

| Group | Family | Species | A1 | A3 | A4 | A5 | A6 | A7 | A8 | B3 | B5 | C1 | C2 | C4 | C5 | C6 | D1 | EPA group |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Trichoptera | Rhyacophilidae | *Rhyacophila dorsalis* | | | 3 | | | | | | | | | | | | | C |
| Coleoptera | Hydraenidae | *Hydraena gracilis* | 1 | | | | | | | | | | | | | | | C |
| Coleoptera | Hydraenidae | *Limnebius* sp. | 1 | | | | | | | | | | | | | | | C |
| Coleoptera | Dytiscidae | Dytiscidae larva | | 1 | | | 1 | | | | | | | | | | | C |
| Coleoptera | Dytiscidae | *Nartus (Rhantus) grapii* | | 1 | | | | | | | | | | | | | | C |
| Coleoptera | Dytiscidae | *Hydroporus* sp. | | 3 | | | | | | | | | | | | | | C |
| Coleoptera | Elmidae | *Elmis aenea* | | | 3 | 1 | | | | | | | 2 | 8 | 2 | | 4 | C |
| Coleoptera | Dytiscidae | *Agabus fuscipes* | | | 3 | | | | | | | | | 3 | | | | C |
| Coleoptera | Gyrinidae | *Gyrinus substriatus* | | | | | 1 | | | | | | | | | | | C |
| Coleoptera | Elmidae | *Limnius volckmari* | | | | | | | | | | | | 4 | | | 2 | C |
| Coleoptera | Dytiscidae | *Nebrioporus depressus* | | | | | | | | | | | | | 1 | | 1 | C |
| Coleoptera | Haliplidae | *Brychius elevatus* | | | | | | | | | | | | | | | 2 | C |
| Crustacea | Gammaridae | *Gammarus duebeni* | | | 4 | 12 | | 5 | 5 | 62 | 5 | 8 | 40 | 4 | 11 | 2 | 4 | C |
| Diptera | Chironomidae | Unidentified larvae | 7 | | 1 | | 3 | 1 | 1 | 4 | 3 | 6 | 3 | 2 | 1 | 10 | 6 | C |
| Diptera | Dixidae | Unidentified species | 1 | 1 | | | 1 | | | | | | | | | | | C |
| Diptera | Simuliidae | Unidentified larvae | 1 | | 6 | | | 23 | | | | | 1 | 12 | | | | C |
| Diptera | Pediciidae | *Dicranota* sp. | 1 | | 2 | | | | | 1 | | 1 | 4 | | 2 | 1 | | C |
| Diptera | Tipuliidae | *Tipula* sp. | | | | 1 | | | | | | | | | | | | C |
| Diptera | Ceratopogonidae | Ceratopogonidae larva | | | | 1 | | | | | | | | | | | | C |
| Diptera | Chaoboridae | Chaoboridae larva | | | | | 3 | | | | | | | | | | | C |
| Diptera | Pediciidae | *Pedicia* sp. | | | | | | | 2 | | | | | | | | | C |
| Diptera | Limoniidae | *Antocha*larva | | | | | | | | | | | | 1 | | | | C |
| Arachnida | Hydrachnidiae | Unidentified species | 1 | | | | | | | 1 | 1 | 3 | | | | | | C |
| Hemiptera | Veliidae | *Velia caprai* | 2 | | | | | | | | 1 | | | | | | | C |
| Hemiptera | Corixidae | *Corixida* nymph | | | | | 3 | | | | | | | | | | | C |
| Hemiptera | Corixidae | *Hesperocorixa sahlbergi* | | | | | 2 | | | | | | | | | | | C |

| Group | Family | Species | A1 | A3 | A4 | A5 | A6 | A7 | A8 | B3 | B5 | C1 | C2 | C4 | C5 | C6 | D1 | EPA group |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hemiptera | Corixidae | *Siagara* sp. | | | | | | | | | | | | | | | | C |
| Gastropoda | Sphaeriidae | Unidentified species | 8 | | | | | | | | 3 | | | | 3 | 3 | | C |
| Gastropoda | Lymnaeidae | *Galba truncatula* | | 3 | | | | | | | | | | | | | | C |
| Gastropoda | Planorbidae | *Planorbis planorbis* | | | | | | | | | 1 | | | | | | | C |
| Gastropoda | Bithnyiidae | *Bithynia tentaculata* | | | | | | | | | | | | 1 | | | 3 | C |
| Gastropoda | Planorbidae | *Ancylus fluviatilis* | | | | | | | | | | | | | | | 6 | C |
| Gastropoda | Lymnaeidae | *Ampullaceana (Radix) balthica* | | | | | | | | | | | | | | | 4 | C |
| Megaloptera | Sialidae | *Sialis* sp. | | 1 | | 1 | | | | | | | | | | | | D |
| Crustacea | Asellidae | *Asellus aquaticus* | 19 | 170 | 8 | 7 | 1 | | 28 | 57 | 25 | 87 | 14 | | 5 | 173 | 2 | D |
| Hirudinidae | Glossiphoniidae | Unidentified species | | | | | | | | 1 | 2 | 3 | | | | 4 | | D |
| Hirudinidae | Erpobdellidae | Unidentified species | | | | | | | | | | | | | | 1 | | D |
| Oligochaeta | Lumbricidae | Unidentified species | | | 1 | 1 | | | 5 | 3 | | | 1 | 1 | | | | n/a |
| **Abundance** | | | **49** | **183** | **81** | **33** | **15** | **137** | **47** | **137** | **45** | **110** | **66** | **76** | **66** | **201** | **94** | |
| **Q-rating** | | | 2-3* | 2-3* | 3 | 3 | 3* | 4 | 2-3 | 3 | 2-3* | 2-3* | 3 | 4 | 3 | 2-3 | 4 | |
| **WFD status** | | | Poor | Poor | Poor | Poor | Poor | Good | Poor | Poor | Poor | Poor | Poor | Good | Poor | Poor | Good | |

*tentative Q-rating due to poor flows and or lack of suitable riffle areas for sampling (Toner et al., 2005)

# APPENDIX 6-4

***Confidential Appendix- Badger Sett Locations***

Confidential - Not for Public Display



## Map Legend

- Site Boundary
- Badger sett locations

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Drawing Title
Figure 6-2 Confidential - Badger sett locations

Project Title
Ballivor Bog Group Substitute Consent

| Drawn By | SM |
|---|---|
| Project No. | Drawing No. |
| 191137f | 6-2 |
| Scale | Date |
| 1:25000 | 08.12.22 |

N

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# APPENDIX 6-5

***BIRD SUMMARY REPORT***

# Appendix 6-5 Bird Survey Report

## Extraction in the Ballivor Bog Group, Co. Meath & Westmeath

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# 1. INTRODUCTION

MKO were appointed to carry out ornithological surveys at the Ballivor Bog Group, Counties Meath and Westmeath (hereafter "the Application Site"). This report describes the survey methods employed and survey results collected at the Application Site for the period October 2021 to March 2023 inclusive. It is structured as follows:

- An introduction describing the site.
- A description of the ornithological surveys carried out, including a statement of authority and limitations.
- The results of ornithological surveys carried out.

# 2. METHODOLOGY

## 2.1 Field Surveys

The bird survey work was undertaken between October 2021 and March 2023. Field survey methodologies were devised to survey for the bird species composition and assemblages that occur within the Application Site. The study area/ area surveyed for each type of survey is discussed in the methodology section below.

### 2.1.1.1 Initial Site Assessment

Based on the results of the desk study, consultation and reconnaissance site visits, the likely importance of the Application Site for bird species was ascertained. Based on the collated information available from the above preliminary assessment and adopting a precautionary approach, a site-specific scope for the ornithological survey was developed. The various survey types undertaken are described below.

#### 2.1.1.1.1 *Vantage Point Surveys*

Vantage point surveys were undertaken at the Application Site from October 2021 to March 2023. Surveys were conducted monthly throughout the survey period from sixteen fixed point vantage points to allow as comprehensive as possible coverage of the Application Site.

##### Data Recording and Digitisation

Data on bird observations and flight activity was collected from a scanning arc of 180° and a 2km radius by an observer at each fixed location for six hours per month. Surveys were scheduled to provide a spread over the full daylight period including dawn and dusk watches to coincide with the highest periods of bird activity.

Each flight observation was assigned a unique identifier when mapped in the field and subsequently digitised using GIS software.

#### 2.1.1.1.2 *Breeding Walkover Surveys (Brown & Shepherd Survey)*

Breeding walkover surveys were undertaken to determine the presence of bird species of high conservation concern and identify areas of possible, probable, or confirmed breeding territories for bird species observed within the Application Site. The survey methodology followed the Brown and Shepherd (1993) and Calladine et al. (2009).

Transect routes were devised to ensure the required coverage of different habitat was achieved within the Application Site. Transects were selected to ensure all areas of suitable breeding/foraging habitat were approached to within 100m. Target species included waders, raptors, waterbirds, gulls and other birds of conservation concern. Along with target species, all additional species observed were recorded to inform the evaluation of supporting habitat.

Walkover surveys were carried out between daylight hours during the core breeding season months of April, May, June and July 2022, with the site being visited four to six days per month on each occasion. The timing of visits followed the recommendations of Brown and Shepherd (1993). Following all survey visits, the field maps were analysed to determine the number and location of breeding territories. All non-breeding individuals and species encountered were also recorded.

#### 2.1.1.1.3 Breeding Woodcock Surveys

Breeding woodcock surveys were undertaken in accordance with Gilbert *et al.* (1998). Surveys were undertaken at the Application Site in May and June 2022, in areas of suitable habitat. The survey area extended 500m beyond the Application Site boundary and was focused in areas of suitable habitat. Surveys commenced one hour before sunset and continued for one hour after sunset or until it was too dark to see. Transects were slowly walked through areas of suitable woodland habitat. All observations of woodcock (as well as the areas covered) are recorded on to a map. The aim of the survey was to record the presence of roding (displaying) male woodcock and thereby establish the distribution and abundance of the species on the site. This survey method also allowed the observer to survey for owls, i.e. barn owls and long-eared owls.

#### 2.1.1.1.4 Winter Walkover Surveys

Winter transect surveys were undertaken to record the presence of bird species of high conservation concern within areas of potentially suitable habitat in the Application Site.

Transect routes were devised to ensure coverage of different habitat complexes throughout the Application Site, during the winter months. The methodology was broadly based on methods described in Bibby *et al.* (2000) and adapted Brown and Shepherd surveys'. Target species were raptors, waterbirds, gulls and ground birds of conservation interest. Along with target species, all additional species observed were recorded to inform the evaluation of supporting habitat.

#### 2.1.1.1.5 Barn Owl Surveys

Breeding barn owl surveys were undertaken at the Belvue Bord na Mona Works within the Ballivor Bog and at Martinstown Castle, approximately 400m north of Lisclogher West Bog. The aim of the survey was to identify breeding barn owl territories near or within the Application Site by locating nest sites. Survey methodology followed TII (2021). The surveyor conducted a watch at potential nest sites from 30 mins before sunset until 1 hour after sunset, searching for barn owls provisioning young, listening for the sound of chicks, and observing for barn owl pellets, feathers or whitewash. All such observations were recorded and mapped and a breeding status was assigned following TII (2021). Each potential nest site was surveyed three times during the core breeding season April to July 2022.

## 2.2 Statement of Authority

This report has been prepared by Kathryn Sheridan (M.Sc.), Project Ornithologist of MKO, and reviewed by Patrick Manley (B.Sc.), Senior Ornithologist. Both are suitably qualified ornithologists with experience in conducting ornithological assessments and competent for the purposes of the preparation of this end of season report. Field surveys were undertaken by Eamonn O'Brien, EH, Enda Flynn, Franck Le Moënner, Declan Manley, Donnacha Woods, John McMahon, Kate Bismilla, Kathryn Sheridan, Matt Worsdale, Neil Campbell, Niall Murray, Ian Hynes, Padraig Cregg, Sean Pierce and Tom Siekaniec. Surveyors are all experienced and competent field ornithologists.

# 3. RESULTS

## 3.1 Field Survey Results

The target species listed below were recorded during the ornithological surveys. The list is ordered in accordance with conservation significance: Annex I species, SCIs of designated sites, Red listed species and raptors.

- Golden Plover (Annex I)
- Hen Harrier (Annex I)
- Kingfisher (Annex I; SCI species of the River Boyne and River Blackwater SPA)
- Little Egret (Annex I)
- Merlin (Annex I)
- Peregrine (Annex I)
- Red Kite (Annex I)
- Short-eared Owl (Annex I)
- Whooper Swan (Annex I)
- Barn Owl (BoCCI Red Listed)
- Kestrel (BoCCI Red Listed)
- Lapwing (BoCCI Red Listed)
- Redshank (BoCCI Red Listed)
- Snipe (BoCCI Red Listed)
- Woodcock (BoCCI Red Listed)
- Buzzard (Raptor)
- Long-eared Owl (Raptor)
- Sparrowhawk (Raptor)
- BoCCI Red listed passerine species (Grey Wagtail, Meadow Pipit, Redwing, Stock Dove, Swift, Yellowhammer)

A summary of observations for each of the species mentioned above is presented in table 3-1 below.

*Table 3-1 Summary of target species recorded during surveys*

| Species Name | No. of Observations | Flock Range | Locations | Notes on Activity |
|---|---|---|---|---|
| Golden Plover | 288 | 1 to 1,000 | Lisclogher West, Lisclogher, Bracklin, Carranstown, Ballivor | Circling and commuting over bogs. Birds were observed utilising bog habitats on 21 occasions for foraging or roosting. |
| Hen Harrier | 10 | 1 | Lisclogher, Bracklin, Ballivor | Hunting observed on five occasions, all remaining observations were of birds commuting through the bogs. |
| Kingfisher | 1 | 1 | Lisclogher | The observation was of an individual commuting along drains in July 2022. |
| Little Egret | 2 | 1 to 2 | Bracklin, Carranstown | Observations were of bird travelling over the bogs. |
| Merlin | 25 | 1 | Lisclogher West, Lisclogher, Bracklin, Carranstown, Ballivor | No breeding evidence was observed. There were 12 observations of individuals hunting, the remaining observations were of individuals travelling. |
| Peregrine | 65 | 1 to 2 | Lisclogher West, Lisclogher, Bracklin, Carranstown, Ballivor | The majority of observations were of birds hunting or commuting. There was one observation of an adult peregrine chasing a juvenile peregrine and another of two peregrine chasing each other |
| Red Kite | 1 | 1 | Ballivor | Observation was of an individual soaring/circling over the bog in March 2023. |
| Short-eared Owl | 1 | 2 | Bracklin | Pair flushed from the bog during a walkover survey on one occasion in March 2022. |
| Whooper Swan | 27 | 1 to 11 | Lisclogher West, Lisclogher, Bracklin, Carranstown, Ballivor | The majority of observations were of birds travelling across the bogs, one record was of a whooper swan heard calling but not seen. |
| Barn owl | 15 | 1 to 2 | Lisclogher West and Belvue Bord na Mona works between Carranstown and Ballivor bogs | There was one nest in a shed at the Belvue Bord na Mona Works between Carranstown and Ballivor bogs. The second nest site was at Martinstown Castle to the NW of Lisclogher West. Begging calls were heard at both locations, confirming successful breeding. |

| Species Name | No. of Observations | Flock Range | Locations | Notes on Activity |
|---|---|---|---|---|
| Kestrel | 386 | 1 to 2 | Lisclogher West, Lisclogher, Bracklin, Carranstown, Ballivor | The majority of observations were of birds hunting, commuting or perched. There were two confirmed breeding territories in 2022. One at Lisclogher West bog and one south of Ballivor bog. Additionally, there were four probable breeding territories identified in 2022, one north of Lisclogher bog, two within Bracklin bog, and one at Ballivor bog. |
| Lapwing | 25 | 1 to 200 | Lisclogher, Bracklin, Carranstown and Ballivor bogs | The majority of observations were of birds commuting or circling over the Ballivor Bog Group. |
| Redshank | 1 | 1 | Lisclogher West | One bird observed travelling low over bog in September 2022. |
| Snipe | 256 | 1 to 22 | Lisclogher West, Lisclogher, Bracklin, Carranstown, Ballivor | The majority of observations were of birds commuting, calling or being flushed by the observer. There were a total of ten probable snipe territories identified during the 2022 breeding season. All of these territories were on, or adjacent to, the Ballivor group of bogs. |
| Woodcock | 113 | 1 to 3 | Lisclogher West, Lisclogher, Bracklin, Carranstown, Ballivor | The majority of woodcock observations were during the dedicated breeding woodcock surveys and were associated with breeding territories. There were eleven breeding woodcock territories identified during 2022 breeding season. Each of the five of bogs within the Ballivor Bog Group contained at least one woodcock breeding territory. |
| Buzzard | 601 | 1 to 6 | Lisclogher West, Lisclogher, Bracklin, Carranstown, Ballivor | The majority of buzzard observations were of birds commuting, hunting or soaring. In 2022 there were three confirmed breeding territories and six probable breeding territories. All confirmed breeding territories were adjacent to the Ballivor Bog Group (north of Liscogher, west of Carranstown and south of Ballivor bogs). Four of the six probable territories were on the Ballivor Bog Group (two at Carranstown and two at Ballivor Bog). The remaining two probable territories were between 1 and 2.5km off-site. |
| Long-eared owl | 3 | 1 | Lisclogher and Ballivor | All observations were of individuals recorded on the bogs. Birds were observed commuting on two occasions. Begging was heard at Lisclogher in September 2022, indicating a breeding territory in this bog. |
| Sparrowhawk | 109 | 1 to 2 | Lisclogher West, Lisclogher, Bracklin, Carranstown, Ballivor | The majority of sparrowhawk observations were of birds commuting, hunting or soaring. In 2022, there were four probable breeding territories on Bracklin (two territories), Lisclogher and Lisclogher West Bogs. |
| Passerines (Red Listed) | - | - | Lisclogher West, Lisclogher, Bracklin, | The BoCCI Red listed species grey wagtail, meadow pipit, redwing, stock dove, swift and yellowhammer were recorded during the surveys undertaken at the Ballivor Bog Group. Grey |

| Species Name | No. of Observations | Flock Range | Locations | Notes on Activity |
|---|---|---|---|---|
| | | | Carranstown, Ballivor | wagtail were observed on two occasions, with up to two birds recorded. Meadow pipit were observed on 535 occasions, with up to 65 birds being recorded. Redwing were observed on 89 occasions, with up to 300 birds being recorded. Stock dove were observed on seven occasions with up to two birds being recorded. Swift were observed on 23 occasions, with up to 13 birds being recorded. Yellowhammer were observed on eight occasions, with up to two birds being recorded. |

# APPENDIX 7-1

***GEOTECHNICAL AND PEAT STABILITY REPORT***

FEHILY TIMONEY

CONSULTANTS IN ENGINEERING, ENVIRONMENTAL SCIENCE & PLANNING

# GEOTECHNICAL & PEAT STABILITY REPORT

## BALLIVOR WIND FARM

Prepared for: **MKO Ltd**

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# GEOTECHNICAL & PEAT STABILITY ASSESSMENT REPORT
# BALLIVOR WIND FARM

**User is responsible for Checking the Revision Status of this Document**

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**Client:** MKO Ltd

**Keywords:** Geotechnical, Peat Stability, Peat Failure, Risk Assessment

**Abstract:** Fehily Timoney and Company (FT) were engaged by McCarthy Keville O'Sullivan to undertake a geotechnical assessment of the proposed Ballivor wind farm site with respect to peat stability. As part of the geotechnical assessment of the proposed development, FT completed a walkover survey at the site as well as a ground investigation comprising boreholes and trial pits. The findings of the geotechnical and peat stability assessment showed that the site has an acceptable margin of safety and is suitable for the proposed wind farm development.

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# 1. NON-TECHNCIAL SUMMARY

Fehily Timoney and Company (FT) was engaged by McCarthy Keville O'Sullivan on behalf of Coillte to undertake a geotechnical and peat stability assessment of the proposed Ballivor wind farm site. In accordance with planning guidelines compiled by the Department of the Housing, Planning and Local Government (Draft Revised Wind Energy Development Guidelines, DoHPLG, 2019), where peat >0.5m in thickness is present on a proposed wind farm development, a peat stability assessment is required.

A walkover including intrusive peat depth probing, desk study, stability analysis and risk assessment was carried out to assess the susceptibility of the site to peat failure following the principles in Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments (PLHRAG, Scottish Government, 2017).

The findings, which involved analysis of approximately 300 locations, show that the site has an acceptable margin of safety and is suitable for the proposed wind farm project. The findings include recommendations and control measures for construction work in peat lands to ensure that all works adhere to an acceptable standard of safety.

The proposed wind farm comprises 26 no. wind turbines and associated infrastructure.

The site which is typically flat consists predominantly of bare locally re-vegetated cut-away peat and intact peat. The site has been extensively harvested and drained by Bord na Móna.

The site is relatively flat-lying with drainage channels running typically northwest to southeast. The site is split into three areas, with two areas to the north of the R156 regional road and one to the south. The land uses and types within the proposed development site are a mixture of bare cutover and cutaway peat, re-vegetation of bare peat and commercial Bord na Móna operated bog land. Several Bord na Mona rail lines also pass through the site.

Bord na Móna has considerable experience in the handling of peat in these circumstances, both during peat production operations and during wind farm construction projects. This experience has shown that the most environmentally sensitive and stable way of handling and moving of peat is its placement across the site and at locations as close as possible to the excavation areas.

A walkover including intrusive peat depth probing, a ground investigation including boreholes and trial pits, desk study, stability analysis and risk assessment was carried out to assess the susceptibility of the site to peat failure following the principles in Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments (PLHRAG, 2nd Edition, 2017).

Peat depth recorded during the site walkover and from the ground investigation ranged from 0.4 to 4.9m with an average peat depth of 1.7m. 40% of the probes recorded peat depths of less than 1.5m, with 67% of peat depth probes recorded peat depths of less than 2.0m and 94% of peat depth probes recorded peat depths of less than 3.0m. A number of localised readings recorded peat depths from 3.0 to 4.9m.

Slope inclinations at the main infrastructure locations range from 2 to 4 degrees. The flat topography/nature of the terrain on site reflects the low risk of peat failure. Ground conditions comprised mainly of peat overlying lacustrine clay overlying fluvioglacial sands and gravel.

The purpose of the stability analysis was to determine the stability i.e. Factor of Safety (FoS), of the peat slopes. The FoS provides a direct measure of the degree of stability of a peat slope. A FoS of less than 1.0 indicates that

a slope is unstable; a FoS of greater than 1.0 indicates a stable slope. An acceptable FoS for slopes is generally taken as a minimum of 1.3. The stability analysis for this project, which analysed the turbine locations, access roads and substation, resulted in FoS above the minimum acceptable value of 1.3 and hence the site has a satisfactory margin of safety.

The risk assessment uses the results of the stability analysis in combination with qualitative factors, which cannot be reasonably included in a stability calculation but nevertheless may affect the occurrence of peat instability, to assess the risk of peat failure at the site. The results of the risk assessment are given in Appendix B. A construction buffer zone plan based on qualitative factors identified during the site walkover is included as Figure 4.2.

The findings of the peat assessment (which combines the FOS and the risk assessment), which involved analysis of 300 no. locations, showed that the proposed development areas have an acceptable margin of safety and that the site is suitable for the proposed wind farm development. Notwithstanding the above, the management of peat stability and appropriate construction practices will be inherent in the construction phase of the wind farm to ensure peat failures do not occur on site.

In summary, the Ballivor wind farm site has an acceptable margin of safety and is considered to be at **low** risk of peat failure.

# 2. INTRODUCTION

## 2.1 Fehily Timoney and Company

Fehily Timoney and Company (FT) is an Irish engineering, environmental science and planning consultancy with offices in Cork, Dublin and Carlow. The practice was established in 1990 and currently has about 70 members of staff, including engineers, scientists, planners and technical support staff. FT deliver projects in Ireland and internationally in our core competency areas of Waste Management, Environment and Energy, Civils Infrastructure, Planning and GIS and Data Management.

FT have been involved in over 100 wind farm developments in both Ireland and the UK at various stages of development i.e. preliminary feasibility, planning, design, construction and operational stage and have established themselves as one of the leading engineering consultancies in peat stability assessment, geohazard mapping in peat land areas, investigation of peat failures and site assessment of peat.

This Report was writen by Ian Higgins (FT Principal Geotechnical Engineer, MSc in Geotechnical Engineering) and Alan Whelan (FT Project Engineer, BEng (Hons) Civil Engineering). Ian is a Principal Geotechnical Engineer with Fehily Timoney and has over 20 years' experience in geotechnical engineering. Alan is a Project Engineer with Fehily Timoney and has two years' experience in geotechnical engineering.

## 2.2 Project Description

FT was engaged in February 2020 by McCarthy Keville O'Sullivan (MKO) to undertake a geotechnical & peat stability assessment of the proposed Ballivor wind farm site.

The proposed Ballivor wind farm is located approximately 4km west of Ballivor, on the border between Co. Meath and Co. Westmeath.

The Ballivor wind farm site comprises milled peat area of approximately 19.6km$^2$. The site is located on the border between Co. Meath and Co. Westmeath. The surrounding landscape is predominately flat with land-use comprising forestry, agricultural land and cutaway peatland.

The development comprises the following:

(1) 26 no. wind turbines and all associated hard-standing areas

(2) 2 no. borrow pits

(3) 1 no. 110kV electrical substation, which will be constructed in the townland of Grange More

(4) Provision of new site access roads and associated drainage

(5) All works associated with the connection of the proposed wind farm to the national electricity grid

(6) 2 no permanent meteorological masts with a height of 115m

(7) New access junctions, improvements and temporary modifications to existing public road infrastructure to facilitate delivery of abnormal loads and construction access

(8) All associated site development works

The peat depth data was recorded by FT during the site walkovers from the 8th to the 10th June 2021 and the 22nd to the 24th June 2021 and has been used in the assessment of peat stability for the proposed wind farm site.

Ground investigation in the form of trial pits and boreholes were carried out by FT and Irish Drilling Ltd. (IDL) during the following dates:

- 17th - 21st August 2020
- 1st - 16th February 2021
- 19th July 2021
- 5th - 11th August 2021

In addition to the above, Bord na Mona undertook trial pitting on the 18th and 19th of March 2021.

## 2.3 Peat Stability Assessment Methodology

FT undertook the assessment following the principles in Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments (2nd edition, PLHRAG, Scottish Government, 2017). The Peat Landslide Hazard and Risk Assessment Guide (PLHRAG) is used in this report as it provides best practice methods to identify, mitigate and manage peat slide hazards and associated risks in respect of consent applications for electricity generation projects.

The best practice guide was produced following peat failures in the Shetland Islands, Scotland in September 2003 but more pertinently following the peat failure in October 2003, during the construction of a wind farm at Derrybrien, County Galway, Ireland.

This peat stability assessment has been undertaken taking into account peat failures that have occurred on peatland sites (such as recent failures at Shass Mountain 2020, Co. Leitrim and Meenbog 2020, Co. Donegal). The lessons learned from both peat slide events have been incorporated into the design of this project and the construction methodologies to be implemented. The Meenbog failure occurred during the construction of a section of floating road on sidelong ground in an area of weak peat. The slope angle on the Proposed Development site are lower than those at Meenbog, and no significant areas of sidelong ground are present. It is important that the existing site drainage is maintained during construction to avoid a similar failure to that on Shass Mountain, which occurred following heavy rainfall, and this is referenced in the Risk Assessments.

A constraints study was initially undertaken by the Environmental, Hydrogeological and Ecological members of the design team to determine the developable area on the site, prior to the site reconnaissance by engineering geologists/geotechnical engineers from FT. The extent and depth of ground investigation and peat stability analysis by FT have been undertaken in accordance with guidance within Eurocode 7 and PLHRAG, 2017 to investigate peat slopes that have the potential to impact on the proposed development, as applicable. Sufficient peat depth data has been recorded during the site walkovers to enable the characterisation of the peat depth across the site, with additional detail at infrastructure locations. The peat stability assessment is undertaken within the proposed development to identify peat slope at risk from the proposed development, and to identify peat slopes that may pose a risk to the proposed development.

The geotechnical and peat stability assessment at the site included the following activities:

(1) Desk study

(2) Site reconnaissance including shear strength and peat depth measurements undertaken following initial constraints study (by design team) to determine the proposed construction envelope within the site

(3) Peat stability assessment of the peat slopes on site using a deterministic and qualitative approach

(4) Peat contour depth plan – compiled based on the peat depth probes carried out across the site by FT (2020)

(5) Factor of safety plan – compiled for the short-term critical condition (undrained) for approximately 300 no. FoS points analysed along the proposed infrastructure envelope on site

(6) Construction buffer zone plan – identifies areas with an elevated or higher construction risk where mitigation/control measures will need to be implemented during construction to minimise the potential risks and ensure they are kept within an acceptable range

(7) A peat stability risk register was compiled to assess the potential design/construction risks at the infrastructure locations and determine adequate mitigation/control measures for each location to minimise the potential risks and ensure they are kept within an acceptable range, where necessary

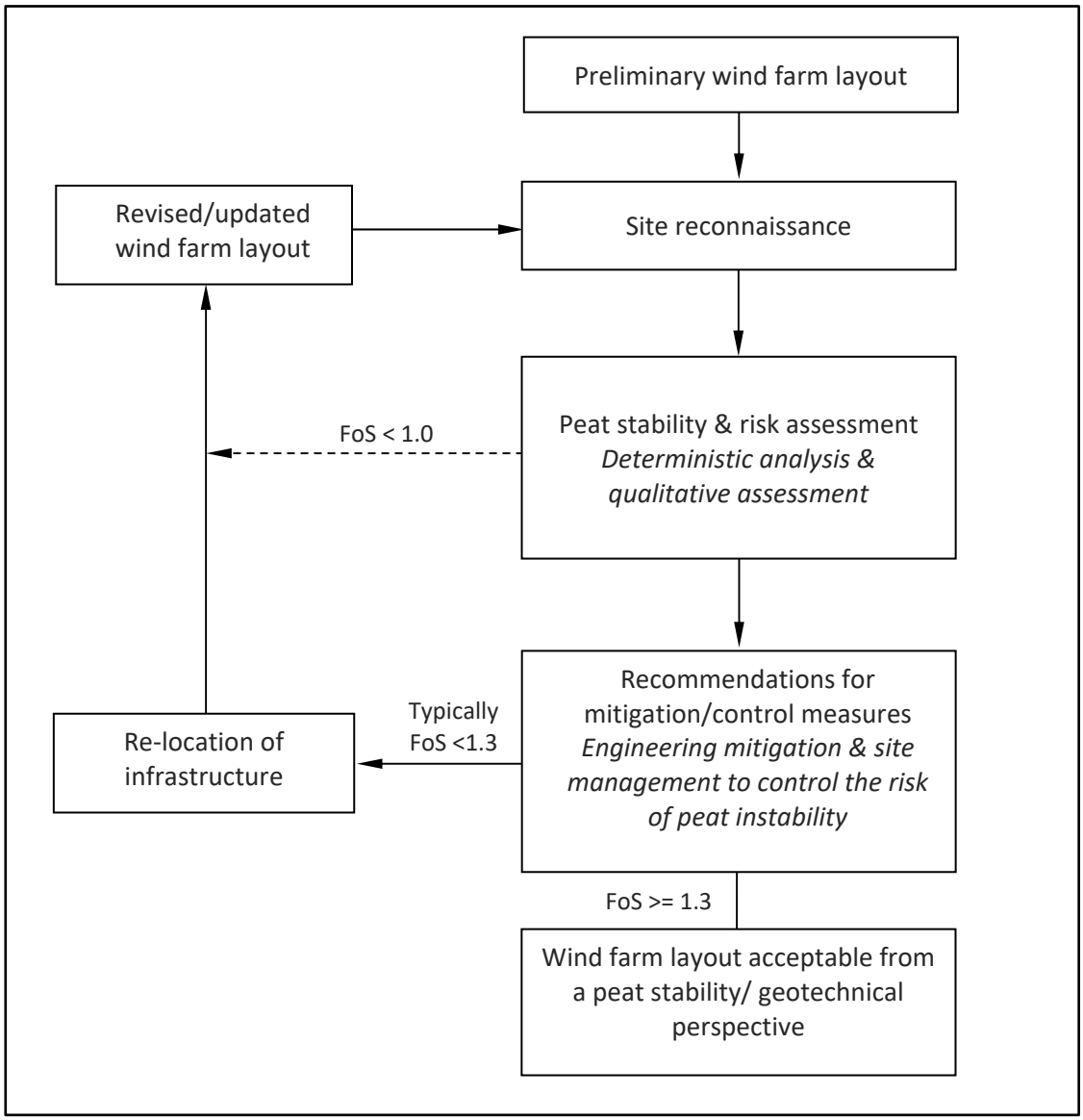
(8) Review of ground investigation carried out at the site

(9) Preliminary assessment of foundation type for turbines

(10) Commentary of founding details for other infrastructure elements such as access roads, crane hardstands, substation & construction compound platforms and met mast foundation

A flow diagram showing the general methodology for peat stability assessment is shown in Figure 2.1. The methodology illustrates the optimisation of the wind farm layout based on the findings from the site reconnaissance and stability analysis and subsequent feedback.

**Figure 2.1: Methodology for Peat Stability Assessment**




*An FoS of between 1.0 and 1.3 does not mean that a failure will occur, but that the area requires attention. Mitigation measures can be provided for areas with an FoS of between 1.0 and 1.3 to reduce the risk of failure.

As for all construction projects, a detailed engineering construction design must be carried out by the appointed construction stage designer prior to any construction work commencing on site. This must take account of the consented project details and any conditions imposed by that consent. This must include a confirmatory peat stability assessment to account for any changes in the environment which may have occurred in the time leading up to the commencement of construction and a peat and spoil management plan to allow for the most appropriate geotechnical and environmental led solutions to be developed for the management of peat and spoil

## 2.4 Peat Failure Definition

Peat failure in this report refers to a significant mass movement of a body of peat that would have an adverse impact on the proposed wind farm development and the surrounding environment. Peat failure excludes localised movement of peat that would occur below an access road, creep movement or erosion type events.

The potential for peat failure at this site is examined with respect to wind farm construction and associated activity.

## 2.5 Main Approaches to Assessing Peat Stability

The main approaches for assessing peat stability for wind farm developments include the following:

(1) Geomorphological

(2) Qualitative (judgement)

(3) Index/Probabilistic (probability)

(4) Deterministic (factor of safety)

Approaches (1) to (3) listed above are considered subjective and do not provide a definitive indication of stability; in addition, a high level of judgement/experience is required which makes it difficult to relate the findings to real conditions. FT apply a more objective approach, the deterministic approach (as discussed in Section 2.6).

As part of FT's deterministic approach, a qualitative risk assessment is also carried out taking into account qualitative factors, which cannot necessarily be quantified, such as the presence of mechanically cut peat, quaking peat, bog pools, sub peat water flow, slope characteristics and numerous other factors. The qualitative factors used in the risk assessment are compiled based on FT's experience of assessments and construction in peat land sites and peat failures throughout Ireland and the UK. FT have been involved with in excess of 100 wind farm developments across Ireland and the UK at various stages of development, from preliminary feasibility stage through planning and from scheme development at tender design and detailed design stage, through to the construction and operational stages. This approach follows the guidelines for geotechnical risk management as given in Clayton (2001), as referenced in the best practice for Peat Landslide Hazard and Risk Assessment Guide (PLHRAG, 2017), and takes into account the approach of MacCulloch (2005).

The risk assessment uses the results of the deterministic approach in combination with qualitative factors, which cannot be reasonably included in a stability calculation but nevertheless may affect the occurrence of peat instability to assess the risk of instability on a peat land site.

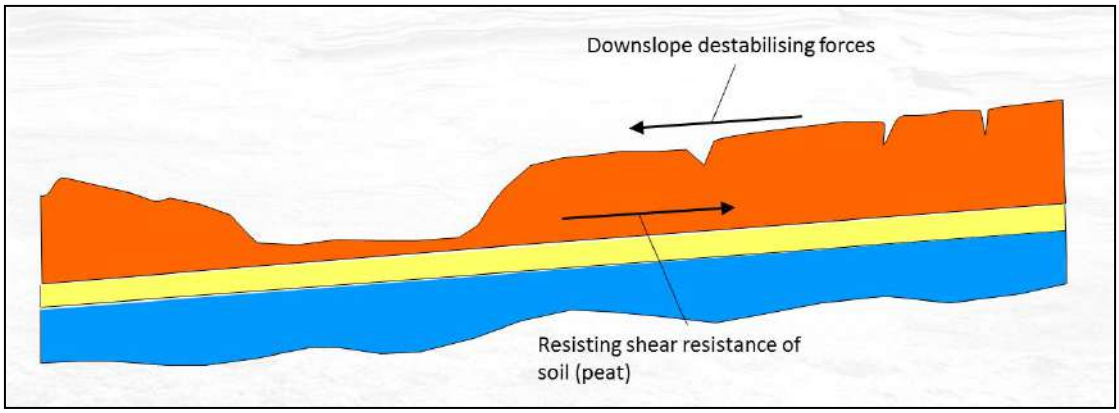
## 2.6 Peat Stability Assessment – Deterministic Approach

The peat stability assessment is carried out across a wide area of peatland to determine the stability of peat slopes and to identify areas of peatland that are suitable for development; this allows the layout of infrastructure on a particular wind farm site to be optimised. The assessment provides a numerical value (factor of safety) of the stability of individual parcels of peatland. The findings of the assessment discriminate between areas of stable and unstable peat, and areas of marginal stability where restrictions may apply. This allows for the identification of the most suitable locations for turbines, access roads and other infrastructure associated with wind energy developments.

A deterministic assessment requires geotechnical information and site characteristics which are obtained from desk study and site walkover, e.g. properties of peat/soil/rock, slope geometry, depth of peat, underlying strata, groundwater, etc. An adverse combination of the factors listed above could potentially result in instability. Using the information above, a factor of safety is calculated for the stability of individual parcels of peatland on a site (as discussed in Section 7).

The factor of safety is a measure of the stability of a particular slope. For any slope, the degree of stability depends on the balance of forces between the weight of the soil/peat working downslope (destabilising force) and the inherent strength of the peat/soil (shear resistance) to resist the downslope weight, see Figure 2.2.

**Figure 2.2: Peat Slope Showing Balance of Forces to Maintain Stability**




The factor of safety provides a direct measure of the degree of stability of a slope and is the ratio of the shear resistance over the downslope destabilising force. Provided the available shear resistance is greater than the downslope destabilising force then the factor of safety will be greater than 1.0 and the slope will remain stable. If the factor of safety is less than 1.0 the slope is unstable and liable to fail. The acceptable range for factor of safety is typically from 1.3 to 1.4 (BS5930:1981). For the purposes of this assessment a result of >1.3 is required.

## 2.7 Applicability of the Factor of Safety (Deterministic) Approach for Peat Slopes

The factor of safety approach is a standard engineering approach in assessing slopes which is applied to many engineering materials, such as peat, soil, rock, etc.

The factor of safety approach is included in the Peat Landslide Hazard and Risk Assessments Best Practice Guide for Proposed Electricity Generation Developments (PLHRAG, 2017); see Section 5.3.1 of the guide. This guide provides best practice methods to identify, mitigate and manage peat slide hazards and associated risks in respect of consent applications for electricity generation projects.

Furthermore, the best practice guide notes that the results from the factor of safety approach 'has provided the most informative results' with respect to analysing peat stability (Section 5.3.1 of the guide).

The factor of safety approach in this report includes undrained (short-term stability) and drained (long-term stability) analyses. The undrained condition is the critical condition for the development. The purpose of the drained analysis is to identify the relative susceptibility of rainfall-induced failures at the site.

Notwithstanding the above, the stability analysis used by FT in this report also includes qualitative factors to determine the potential for peat stability i.e. the analysis used does not solely rely on the factor of safety approach.

The deterministic analysis is considered an acceptable engineering design approach. This concurs with the best practice guide referenced above.

## 2.8 Assessment of Intense Rainfall and Extreme Dry Events on the Peat Slope

The deterministic approach carried out by FT examines intense rainfall and extreme dry events. The deterministic approach includes and undrained (short-term stability) and drained (long-term stability) analysis to assess the factor of safety for the peat slopes against a peat failure.

The drained loading condition applies in the long-term. This condition examines the effect of the change in groundwater level as a result of rainfall on the existing stability of the natural peat slopes. For the drained analysis the level of the water table above the failure surface is required to calculate the factor of safety for the peat slope.

In order to represent varying water levels within the peat slopes, a sensitivity analysis is carried out which assesses varying water level in the peat slopes i.e. water levels ranging from 0 to 100% of the peat depth is conducted, where 0% equates to the peat been completely dry and 100% equates to the peat being fully saturated.

By carrying out such a sensitivity analysis with varying water level in the peat slopes, the effects of intense rainfall and extreme dry events are considered and analysed. The results of which are presented in Section 7 of this report.

# 3. DESK STUDY

## 3.1 Desk Study

The main relevant sources of interest with respect to the site include:

- Geological plans and Geological Survey of Ireland database
- Ordnance survey plans
- Literature review of peat failures

The Geological Survey of Ireland (GSI, 1999) geological plans for the site were used to verify the soil and bedrock conditions.

The Ordnance Survey plans were reviewed to determine if any notable features or areas of particular interest (from a geotechnical point of view) are present on the site.

The desk study also includes a review of both published literature and GSI online dataset viewer (GSI, 2021) on peat failures/landslides in the vicinity of the site.

## 3.2 Soils, Subsoil & Bedrock

A review of the Geological Survey of Ireland online database and published documents from GSI was carried out.

The GSI subsoils maps indicates that the site is underlain by a combination of predominantly cut over raised peat with small pockets of till derived from limestones and gravels derived from limestone.

In relation to bedrock, the site location and surrounding area is underlain by the Walsortian Limestone Formation. This formation comprises a massive, unbedded lime-mudstone. The north-western corner of the site is underlain by the Lucan Formation, a dark limestone and shale and the Tober Colleen Formation, a calcareous route.

There is a quarry recorded approximately 9km southeast of the site boundary.

No karst features were identified on the survey area. The nearest karst feature was recorded 3km to the west of the site and is described as a spring.

No geological heritage sites are noted within 5km of the site development.

## 3.3 Previous Failures

There are no recorded peat failures within the Ballivor wind farm site (GSI, 2020). The nearest recorded failure is located at Girley Bog, approximately 12km north of the study area. This failure described as a block slide failure. It is not known when the failure occurred.

The landslide susceptibility the site was classified by the GSI (2020) as low susceptibility, which is expected given the flat terrain present.

The presence, or otherwise, of relict peat failures or clustering of relict failures within an area is an indicator that particular site conditions exist that pre-dispose a site to failure or not as the case may be. Hence based on the historical data reviewed and the terrain and ground conditions present on site it can be concluded that site conditions in the area of the Ballivor site have a limited potential of peat failure.

# 4. FINDINGS OF SITE RECONNAISSANCE

## 4.1 Site Reconnaissance

As part of the assessment of potential peat failure at the proposed site, FT carried out a site reconnaissance in conjunction with the desk study review described in Section 3. This comprised walkover inspections of the site with recording of salient geomorphological features with respect to the wind farm development which included peat depth and preliminary assessment of peat strength. General photographs of the site are included at the end of the main text. The information gathered from these site visits provide sufficient information for a site-wide assessment of the extent, depth and strength of peat present at the Proposed Development.

The following salient geomorphological features were considered:

- Active, incipient or relict instability (where present) within the peat deposits
- Presence of shallow valley or drainage line
- Wet areas
- Any change in vegetation
- Peat depth
- Slope inclination and break in slope

The method adopted for carrying out the site reconnaissance relied on experienced practitioners carrying out a visual assessment of the site supplemented with measurement of slope inclinations.

## 4.2 Findings of Site Reconnaissance

The site reconnaissance comprised a walkover inspection of the site from the 8th to the 10th and the 22nd to the 24th June 2021. Weather conditions for the site visit were sunny, warm and dry.

The findings from the site walkover have been used to optimise the layout of the infrastructure on site.

The main findings of the site walkover of the wind farm site are as follows:

(1) The site is typically covered in a layer of peat and relatively flat. Peat depths vary across the site depending on mainly topography. Generally deeper peat was encountered in the flatter areas of the site with thinner peat on the few areas of higher ground. Bare cutover and cutaway peat, re-vegetation of bare peat and commercial Bord na Móna operated bog land are present across the site (see Appendix A). Several Bord na Mona rail lines also pass through the site.

(2) A total of approximately 300 no. peat depth probes were carried out on site. Peat depths recorded from peat probing across the site ranged from 0.4 to 4.9m with an average depth of 1.7m (Figure 4-1). Approximately 94 percent of peat depth probes recorded peat depths of less than 3.0m. A number of localised readings were recorded where peat depths were 3.0 to 4.9m.

(3) The peat depths recorded at the turbine locations varied from 0.85 to 4.9m with an average depth of 2.6m.

(4) With respect to the new proposed access roads, peat depths are typically less than 3.0m with localised depths of up to 4.2m recorded.

(5) The access roads for the wind farm upgrade comprise of existing access roads and the construction of new proposed access roads. The construction of new proposed access roads will be carried out using either a floating or an excavate & replace construction technique which involves the removal and replacement of peat or soft ground where encountered.

(6) Slope angles at the turbine locations ranged from 2 to 4 degrees. These slope angle readings were obtained using a combination of readings taken during the site reconnaissance by FT using handheld equipment, such as the Silva Clino Master which has an accuracy of +/- 0.25 degrees and from contour survey plans for the site.

(7) The slope angle quoted typically reflects the slope within the footprint of each infrastructure location. The flat topography/nature of the terrain on site highlights the low risk of peat failure.

(8) Localised areas of ponded water were recorded. This is not unexpected given the ground conditions and the flat terrain present across the site.

(9) No evidence of past failures or any significant signs of peat instability were noted on site.

(10) A summary of the site walkover findings for the wind farm are as follows:

(a) The site is typically covered in a layer of peat with typically flat terrain and open peatland. Peat depths recorded across the site ranged from 0.4 to 4.9m with an average depth of 1.7m.

(b) A construction buffer zone plan has been produced for the site (Figure 4-2). This shows areas on the site where no development is advised and areas with an elevated or higher construction risk. The above identified buffer areas are based on qualitative factors identified during the walkover survey e.g. relatively deep peat, quaking peat, mechanically cut peat, recent peat landslide, etc.

(c) The results of the peat depth probing, shear strength testing of the peat and qualitative factors identified on site have been used in the stability and risk assessments, see Sections 6, 7 and 8 of this report for details.

(d) Based on the findings from the walkover survey, the proposed wind farm development is considered to have a low risk of peat failure.

In summary, based on the findings from the site reconnaissance, the proposed development footprint for the site would be considered to have a low risk of peat instability.

# PLAN

Scale 1:20000

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Peat Depth Legend:

- ≥ 0 < 0.5
- ≥ 0.5 < 1
- ≥ 1 < 1.5
- ≥ 1.5 < 2
- ≥ 2 < 2.5
- ≥ 2.5 < 3
- ≥ 3 < 3.5
- ≥ 3.5 < 4
- ≥ 4 < 4.5
- > 4.5

T22 T23 T24 T25 T26 T21 T20 T19 J08 J07 T15 T14 T16 J03 T18 J04 J02 T13 J05 T17 J06 MM2 J01

Proposed Turbine & Hardstanding

Proposed New Access Road

Proposed Permanent Amenity Car Park

Proposed Temporary Construction Compound

Site Boundary

Proposed Met Mast 2

Proposed Temporary Access Track

Borrow Pit 2

Proposed Site Offices

Access for delivery and Removal of Machinery to Borrow Pit

Proposed Substation

Corduff - Mullingar 110kv OHL

Borrow Pit 1B

0m 100m 200m 300m 400m 500m 600m 700m 800m 900m 1000m

Scale 1:20000

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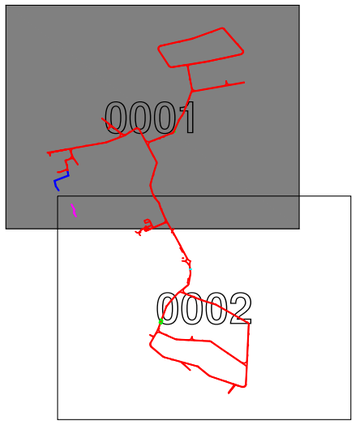


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Date - 24.02.23

## FIGURE 4.1 - PEAT DEPTH CONTOURS SHEET 1 OF 2

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Friday 24 February 2023

# PLAN

Scale 1:20000

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Peat Depth Legend:

- ≥ 0 < 0.5
- ≥ 0.5 < 1
- ≥ 1 < 1.5
- ≥ 1.5 < 2
- ≥ 2 < 2.5
- ≥ 2.5 < 3
- ≥ 3 < 3.5
- ≥ 3.5 < 4
- ≥ 4 < 4.5
- > 4.5

Access for delivery and Removal of Machinery to Borrow Pit
Proposed Substation
Corduff - Mullingar 110kv OHL
Borrow Pit 1B
J01
ENT01
ENT02
Proposed Drain
Borrow Pit 1A
Proposed Site Offices
J09
T12
T01
T02
Site Boundary
Proposed Met Mast 1
T11
J13
J12
MM1
T06
T03
Proposed Turbine & Hardstanding
T05
T04
Proposed New Access Road
T10
J11
T09
T08
J10
T07

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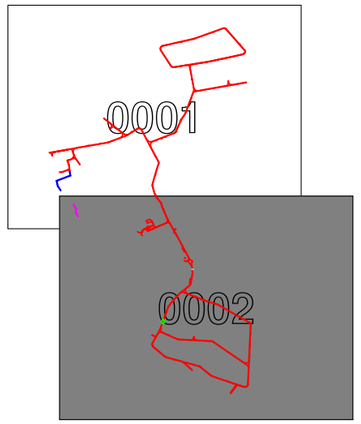
0m 100m 200m 300m 400m 500m 600m 700m 800m 900m 1000m

Scale 1:20000

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Date - 24.02.23

## FIGURE 4.1 - PEAT DEPTH CONTOURS SHEET 2 OF 2

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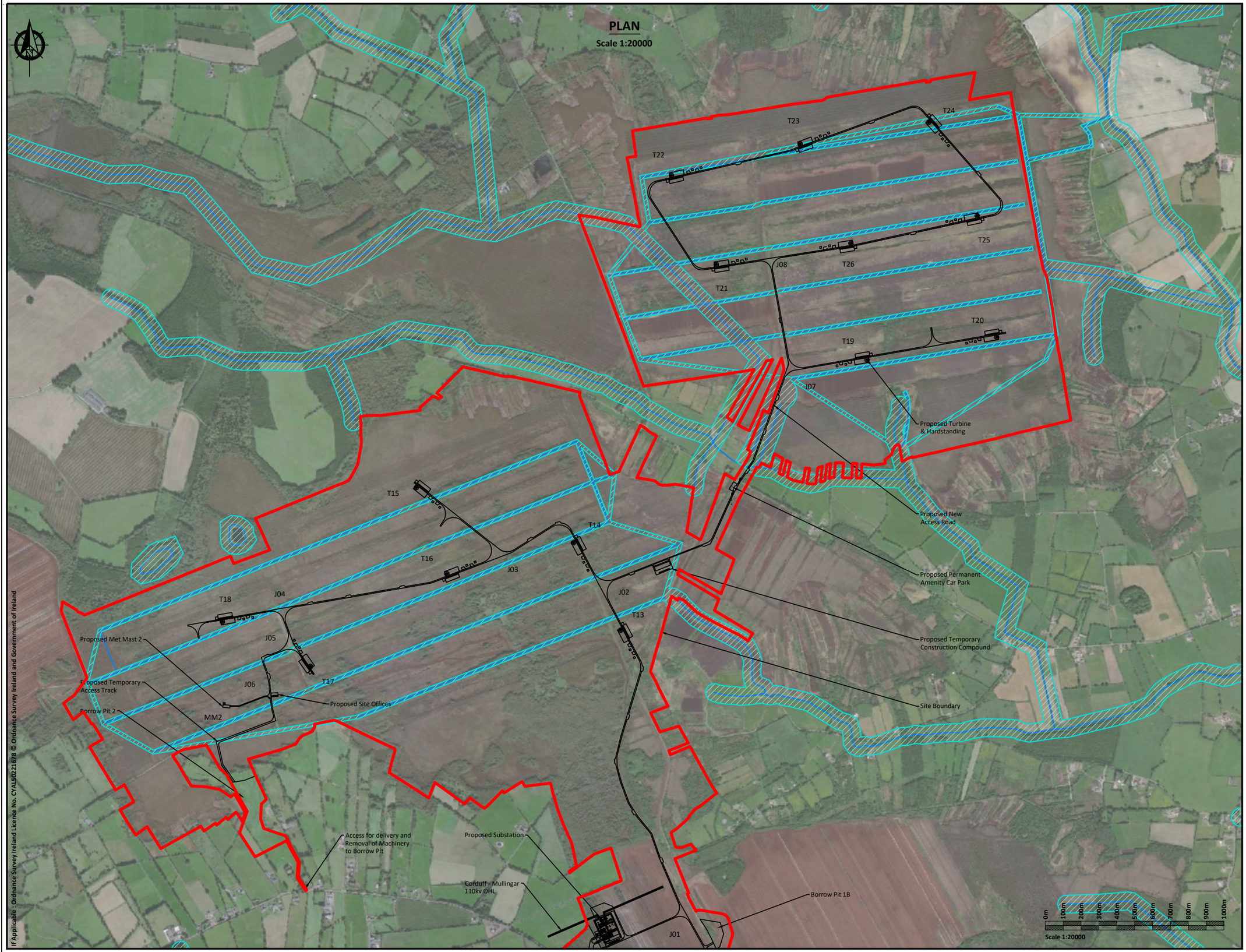


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Construction Buffer Zone Legend:

- Watercourses / Lakes with 50m buffer
- Drains with 10m buffer

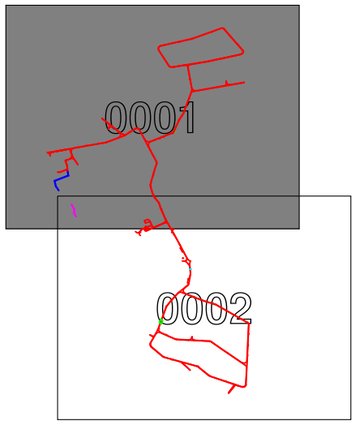


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**FIGURE 4.2 - CONSTRUCTION BUFFER ZONE PLAN SHEET 1 OF 2**

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# PLAN
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Access for delivery and Removal of Machinery to Borrow Pit
Proposed Substation
Corduff - Mullingar 110kv OHL
Borrow Pit 1B
J01
ENT01
ENT02
Proposed Drain
Borrow Pit 1A
Proposed Site Offices
J09
T12
T01
T02
Site Boundary
Proposed Met Mast 1
T11
J13
J12
MM1
T06
T05
T03
Proposed Turbine & Hardstanding
T04
Proposed New Access Road
T10
J11
J10
T09
T08
T07

0m 100m 200m 300m 400m 500m 600m 700m 800m 900m 1000m
Scale 1:20000

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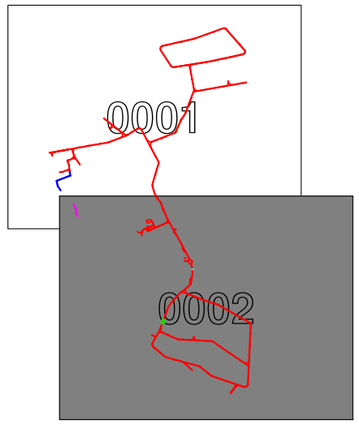
Construction Buffer Zone Legend:

- Watercourses / Lakes with 50m buffer
- Drains with 10m buffer

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Date - 24.02.23

## FIGURE 4.2 - CONSTRUCTION BUFFER ZONE PLAN SHEET 2 OF 2

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Friday 24 February 2023

# 5. GROUND INVESTIGATION

Ground investigations in the form of trial pits and boreholes were carried out at the Ballivor site by FT and Irish Drilling Limited (IDL) in August 2020 and February, July and August 2021.

The ground investigations by FT and IDL comprised a total of 78 no. trial pits, 16 no. boreholes and 5 no. rotary coreholes with associated laboratory testing. An additional 24 trial pits were excavated by Bord na Mona. The ground investigations were carried out using a phased approach. The initial phase of ground investigation was to investigate the potential to develop borrow pits across the site. With the second phase of investigations were carried out at the main infrastructure locations on site e.g. turbine and substation locations. The third phase of investigations involved investigation at an additional two borrow pit locations.

The laboratory testing included the following:

- Classification testing for overburden material
- Minimum and maximum density values for overburden material
- Determination of dry density/moisture content relationship

The trial pits logs, photographs and associated laboratory testing are included within Appendix E and F of this report.

The purpose of the ground investigation was to assess the ground conditions at the main infrastructure locations and potential borrow pit locations across the site. A ground investigation location plan is included as Figure 5-1 in this report.

## 5.1 Summary of Ground Conditions

The ground conditions at the site can be typically categorised into the following deposits:

**Peat** – Typically described as orangish brown to dark brown amorphous to fibrous peat. Peat thicknesses from ranged from 1.1 to >4.5m from trial pits and 0.4 to 3.8m from the boreholes.

**Lacustrine Clay –** Light grey to brown, soft to stiff slightly gravelly organic Silt/Clay with some cobbles. The thickness of the layer is variable across the site.

**Fluvioglacial Sand and Gravel –** Typically described as grey silty sandy Gravel/silty fine Sand with cobbles and some boulders. The thickness of the layer is variable across the site.

**Glacial Till –** Typically described as soft to stiff greenish grey to blueish grey slightly sandy slightly gravelly Silt/Clay. The thickness of the layer is variable across the site.

Groundwater was recorded in thirty-two of the trial pits and boreholes on site and varied between 0.0 and 7.4m bgl.

## 5.2 Summary of Laboratory Tests

Following completion of intrusive site investigations by FT and IDL laboratory testing was scheduled by FT and undertaken by Irish Drilling Ltd (IDL). Soil testing was carried out in accordance with BS1377 (1990) - *Methods of Test for Soils for Civil Engineering Purposes* in IDL's Materials Laboratory, accredited in accordance with the Irish National Accreditation Board (INAB).

The samples of the overburden material were analysed for a range of parameters which included Particle Size Distribution (PSD), Moisture Content and Atterberg Limits.

The results are summarised in Table 5.1. Further detail is included in the FT Ground Investigation Report.

**Table 5.1: Laboratory Testing**

| Type | N | Min | Max | Remarks |
|---|---|---|---|---|
| Natural Moisture Content (%) | 49 | 5.2 | 55 | Typical % lower from gravel dominated soil and higher for silt dominated soil. Outlier at BPA-BH01 with 43% for Gravel. |
| Atterberg Limits | 26 | 0 | 27 | Low plasticity Clay and intermediate-to-high plasticity silt. |
| Particle Size Distribution | 47 | - | - | % passing 63 µm ranged from 4 to 72% |
| Hydrometer | 8 | - | - | % passing 1.6 µm ranged from 4 to 14% |
| Compaction | 3 | | | OMC of 11-12% recorded |
| Moisture Condition Value (MCV) | 3 | 8.8 | 10.5 | |
| Soil Organic Content (%) | 12 | 0.421- | 17.4 | |
| Sulphate Total (mg/kg) | 13 | <48 | 473 | |
| Water Soluble Sulphate as $SO_4$ (g/L) | 13 | <0.004 | 0.0435 | |
| Total Sulphur (%) | 6 | <0.02 | 0.36 | |
| pH | 13 | 6.4 | 8.69 | |

## 5.3 Summary of Geotechnical Parameters

Table 5-2 contains characteristic geotechnical parameters for the main material types likely to be encountered on the Ballivor wind farm site. Where direct measurement of parameters has not been carried out, established correlations with measured properties have been used to derive values. Characteristic values are defined as a cautious estimate of the value affecting the occurrence of limit state based on clause 2.4.5.2 from Eurocode 7.

## Table 5-2: Summary of Geotechnical Parameters

| Material Type/Strata | Unit Weight | Geotechnical Parameters | | |
|---|---|---|---|---|
| | | Undrained Parameters | Drained Parameters | |
| | $\gamma$ (kN/m$^3$) | $c_u$ (kPa) | $\varphi'$ (°) | c' (kPa) |
| Peat | 11 | 8 (3) | 25 | 4 |
| Lacustrine Soil | 18 | 20 | 26 | 0 |
| Fluvioglacial – Sand & Gravel | 20 | - | 32 | 0 |
| Glacial Till | 19 | 75 | 30 | 0 |

**Notes**

Note (1) The above parameters are indicative only and have been derived based on experience and from a review of the ground investigation carried out at the site.

Note (2) Where direct measurement of parameters has not been carried out, established correlations with measured properties have been used to derive values.

Note (3) A lower bound undrained shear strength, $c_u$ for the peat of 8kPa was selected. The lowest recorded value on the Ballivor wind farm site was 18kPa hence a value of 8kPa is a conservative value

Note (4) $\varphi'$ (°) – internal angle of shearing resistance

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Legend:

- BPA-TP01 Location of Trial Pit
- BPA-BH01 Location of Borehole
- CMP-W05 Location of Rotary Corehole

0m 125m 250m 375m 500m 625m 750m 875m 1000m 1125m 1250m

Scale 1:25000

**PLAN**

Scale 1:25000

**PLAN**

Scale 1:25000

**PLAN**

Scale 1:5000

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# FIGURE 5.1 - GROUND INVESTIGATION LOCATION PLAN

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# 6. PEAT DEPTHS, STRENGTH & SLOPE AT PROPOSED INFRASTRUCTURE LOCATIONS

As part of the site walkover, peat depth, in-situ peat strength and slope angles were recorded at various locations across the site.

## 6.1 Peat Depth

Peat depth probes were carried out at/near to proposed turbine locations and access roads and other main infrastructure elements. At turbine locations up to 5 probes were carried out around the turbine location, and an average peat depth was calculated.

## 6.2 Peat Strength

The strength testing was carried out in-situ using a Geonor H-60 Hand-Field Vane Tester. From FT's experience hand vanes give indicative results for in-situ strength of peat and would be considered best practice for the field assessment of peat strength. Strength testing was carried out at selected locations across the site to provide representative coverage of indicative peat strengths. The results of the vane testing with depth are presented in Figure 6.1.

## 6.3 Slope Angle

The slope angles at each of the main infrastructure locations were obtained using a combination of readings taken during the site reconnaissance by FT using handheld equipment, such as the Silva Clino Master and from contour survey plans for site.

The slope angle quoted typically reflects the slope within the footprint of each infrastructure location. It should be noted that slope angles derived from contour survey plans would be considered approximate, as such surveys are dependent on the density of survey data and do not always reflect local variations in ground topography. Slope angles recorded during the site reconnaissance by FT using handheld equipment would generally be deemed more accurate and representative of local topography.

## 6.4 Summary of Findings

Based on the peat depths recorded across the site by FT, the peat varied in depth from 0.4 to 4.9m with an average depth of 1.7m. All peat depth probes carried out on site have been utilised to produce a peat depth contour plan for the site (Figure 4.1).

A summary of the peat depths at the proposed infrastructure locations is given in Table 6.1. The data presented in Table 6.1 is used in the peat stability assessment of the site.

**Table 6.1: Peat Depth & Slope Angle at Proposed Infrastructure Locations**

| Turbine | Easting | Northing | Peat Depth Range (m) (1) | Average Peat Depth (m) | Slope Angle (°) (2) |
|---|---|---|---|---|---|
| T01 | 665162 | 753511 | 1.1 – 2.35 | 1.5 | 2 |
| T02 | 665604 | 753275 | 1.0 – 1.75 | 1.1 | 3 |
| T03 | 665983 | 752965 | 0.4 – 0.85 | 0.5 | 2 |
| T04 | 665796 | 752196 | 2.5 – 2.9 | 2.8 | 3 |
| T05 | 665231 | 752587 | 2.1 – >4.9 | 2.2 | 2 |
| T06 | 664502 | 752692 | 1.0 – 2.1 | 1.1 | 3 |
| T07 | 665928 | 751694 | 3.6 – 4.4 | 3.9 | 4 |
| T08 | 665164 | 751792 | 0.7 – 3.8 | 1.5 | 2 |
| T09 | 664623 | 752007 | 1.5 – 2.9 | 1.6 | 2 |
| T10 | 663783 | 752452 | 0.7 – 2.05 | 0.8 | 2 |
| T11 | 663976 | 753121 | 1.0 – 1.2 | 1.1 | 3 |
| T12 | 664329 | 753719 | 2.1 – >3.5 | 2.2 | 2 |
| T13 | 663739 | 757007 | 1.7 – 2.8 | 1.8 | 2 |
| T14 | 663474 | 757496 | 0.4 – 1.2 | 0.5 | 3 |
| T15 | 662595 | 757805 | 2.1 – 2.8 | 2.6 | 3 |
| T16 | 662765 | 757323 | 2.5 – >4.1 | 3.0 | 2 |
| T17 | 662002 | 756804 | 0.6 – 1.0 | 0.8 | 4 |
| T18 | 661508 | 757054 | 2.2 – 4.4 | 2.4 | 4 |
| T19 | 665118 | 758520 | 2.0 – 2.8 | 2.2 | 4 |
| T20 | 665844 | 758647 | 1.6 – 2.0 | 1.8 | 2 |
| T21 | 664274 | 759054 | 0.8 – 1.0 | 0.9 | 3 |
| T22 | 664023 | 759553 | 1.2 – 1.6 | 1.4 | 2 |
| T23 | 664744 | 759727 | 2.1 – 3.1 | 2.2 | 2 |
| T24 | 665464 | 759850 | 1.4 – 3.35 | 1.8 | 3 |
| T25 | 665735 | 759326 | 2.0 – 3.85 | 2.1 | 2 |
| T26 | 665028 | 759172 | 1.7 – 2.3 | 1.9 | 2 |
| Met Mast 1 | 661518 | 756595 | 2.5 – 3.0 | 2.75 | 2 |
| Met Mast 2 | 663677 | 752816 | 1.5 – 2.0 | 1.65 | 2 |
| Borrow Pit 1/1a (Carranstown) | 664226 | 755100 | 0.0 - -2.1 | 1.2 | 0-2 |
| Borrow Pit 2 | 661667 | 755996 | 0.7 | - | 4 |

| | | | | | |
|---|---|---|---|---|---|
| Car Park 1 | 664349 | 757812 | 1.0 – 2.0 | 1.4 | 3 |
| Substation | 663587 | 755382 | 1.0 – 1.9 | 1.5 | 2 |
| Construction Compound 1 | 663854 | 757488 | 1.8 – 2.0 | 1.9 | 3 |
| Construction Compound 2 | 663517 | 755194 | 0.5 – 1.9 | 1.1 | 2 |
| Construction Compound 3 | 664542 | 754056 | 1.2 – 1.8 | 1.45 | 2 |
| Construction Compound 4 | 661791 | 756641 | 0.9 – 2.0 | 1.35 | 3 |
| Construction Compound 5 | 665323 | 751430 | 0.8 – 1.8 | 1.25 | 2 |

Note (1) Based on probe results from the site walkovers. The range of peat depths for the infrastructure locations are typically based on a 10m grid carried out around the infrastructure element, where accessible.

Note (2) The slope angles at each of the main infrastructure locations were obtained using a combination of readings taken during the site reconnaissance by FT using handheld equipment, such as the Silva Clino Master (which has an accuracy of +/- 0.25 degrees) and from contour survey plans for site. The slope angle quoted typically reflects the slope within the footprint of each infrastructure location.

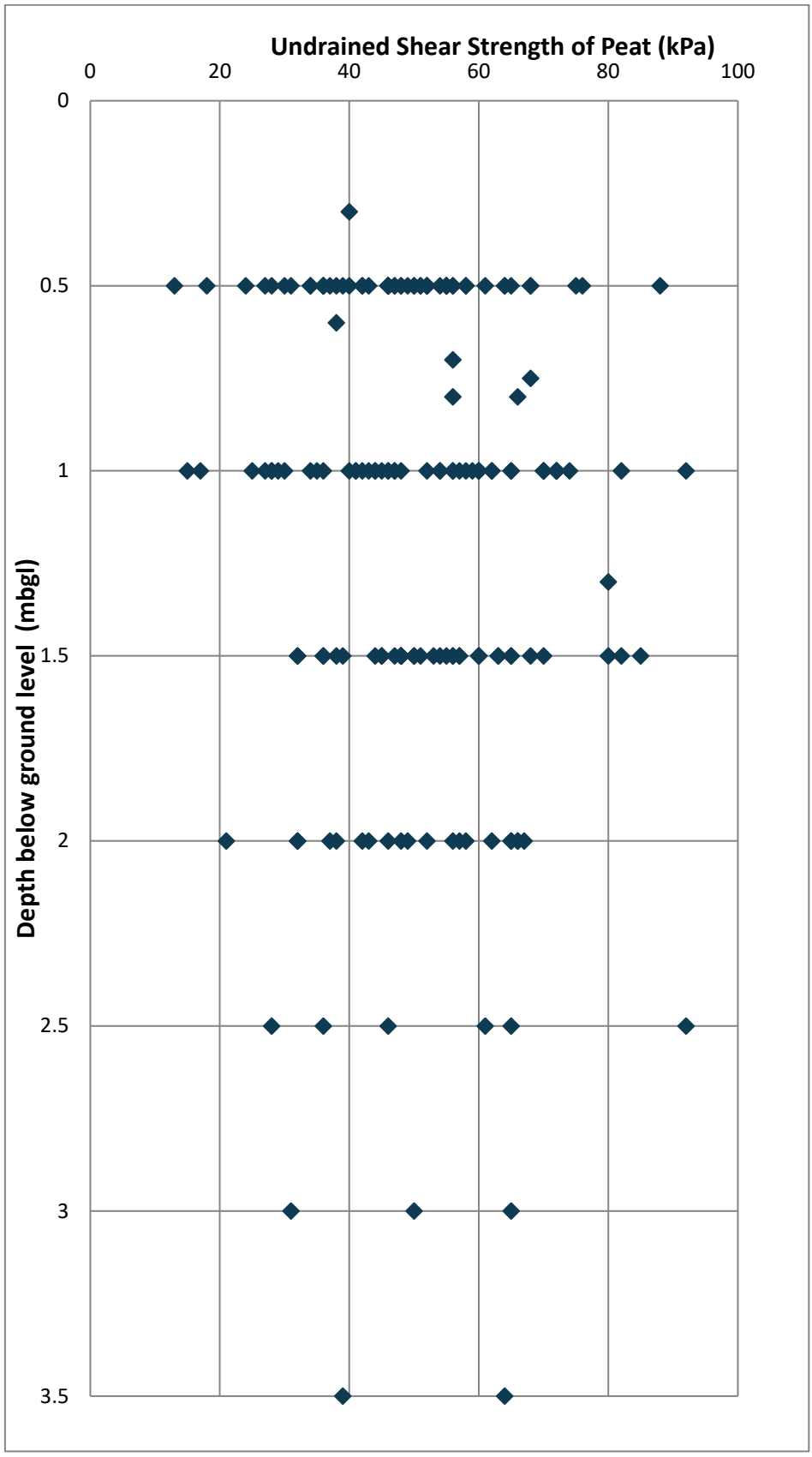
Note (3) The data presented in the Table above is used in the peat stability assessment of the site.

In addition to probing, in-situ shear vane testing was carried out as part of the ground investigation. Strength testing was carried out at selected locations across the site to provide representative coverage of indicative peat strengths. The results of the vane testing with depth are presented in Figure 6.1.

The hand vane results indicate undrained shear strengths in the range 13 to 130kPa, with an average value of about 50kPa. The strengths recorded would be typical of well drained peat as is present on the Ballivor site.

Peat strength at sites of known peat failures (assuming undrained loading failure) are generally very low, for example the undrained shear strength at the Derrybrien failure (AGEC, 2004) as derived from back-analysis, was estimated at 2.5kPa. The recorded undrained strength at Ballivor is significantly greater than the lower bound values for Derrybrien indicating that there is no close correlation to the peat conditions at the Derrybrien site and that there is significantly less likelihood of failure on the Ballivor site.

**Figure 6.1: Undrained Shear Strength ($c_u$) Profile for Peat with Depth**



# 7. PEAT STABILITY ASSESSMENTS

The peat stability assessment includes an assessment of the stability of the natural peat slopes for individual parcels across the site including at the turbine locations and along the proposed access roads. The assessment also analyses the stability of the natural peat slopes with a surcharge loading of 10kPa, equivalent to placing 1m of stockpiled peat on the surface of the peat slope.

## 7.1 Methodology for Peat Stability Assessment

Stability of a peat slope is dependent on several factors working in combination. The main factors that influence peat stability are slope angle, shear strength of peat, depth of peat, pore water pressure and loading conditions.

An adverse combination of factors could potentially result in peat sliding. An adverse condition of one of the above-mentioned factors alone is unlikely to result in peat failure. The infinite slope model (Skempton and DeLory, 1957) is used to combine these factors to determine a factor of safety for peat sliding. This model is based on a translational slide, which is a reasonable representation of the dominant mode of movement for peat failures.

To assess the factor of safety for a peat slide, an undrained (short-term stability) and drained (long-term stability) analysis has been undertaken to determine the stability of the peat slopes on site.

1. The undrained loading condition applies in the short-term during construction and until construction induced pore water pressures dissipate.

2. The drained loading condition applies in the long-term. The condition examines the effect of the change in groundwater level as a result of rainfall on the existing stability of the natural peat slopes.

Undrained shear strength values ($c_u$) for peat are used for the total stress analysis. Based on the findings of the 2003 Derrybrien failure and other failures in peat, undrained loading during construction was found to be the critical failure mechanism.

A drained analysis requires effective cohesion (c') and effective friction angle (ø') values for the calculations. These values can be difficult to obtain because of disturbance experienced when sampling peat and the difficulties in interpreting test results due to the excessive strain induced within the peat. To determine suitable drained strength values a review of published information on peat was carried out. Table 7.1 shows a summary of the published information on peat together with drained strength values.

From Table 7.1 the values for c' ranged from 1.1 to 8.74kPa and ø' ranged from 21.6 to 43°. The average c' and ø' values are 4.5kPa and 30° respectively. Based on the above, it was considered to adopt a conservative approach and to use design values below the averages. For design the following general drained strength values have been used for the site:

$c'$ = 4kPa
$ø'$ = 25°

## Table 7.1: List of Effective Cohesion and Friction Angle Values for Peat

| Reference | Cohesion, c' (kPa) | Friction Angle, ø' (degs) | Testing Apparatus/ Comments |
|---|---|---|---|
| Hanrahan et al (1967) | 5 to 7 | 36 to 43 | From triaxial apparatus |
| Rowe and Mylleville (1996) | 2.5 | 28 | From simple shear apparatus |
| Landva (1980) | 2 to 4 | 27.1 to 32.5 | Mainly ring shear apparatus for normal stress greater than 13kPa |
| | 5 to 6 | - | At zero normal stress |
| Carling (1986) | 6.5 | 0 | - |
| Farrell and Hebib (1998) | 0 | 38 | From ring shear and shear box apparatus. Results are not considered representative. |
| | 0.61 | 31 | From direct simple shear (DSS) apparatus. Result considered too low therefore DSS not considered appropriate |
| Rowe, Maclean and Soderman (1984) | 1.1 | 26 | From simple shear apparatus |
| | 3 | 27 | From DSS apparatus |
| McGreever and Farrell (1988) | 6 | 38 | From triaxial apparatus using soil with 20% organic content |
| | 6 | 31 | From shear box apparatus using soil with 20% organic content |
| Hungr and Evans (1985) | 3.3 | - | Back-analysed from failure |
| Dykes and Kirk (2006) | 3.2 | 30.4 | Test within acrotelm |
| Dykes and Kirk (2006) | 4 | 28.8 | Test within catotelm |
| Warburton et al (2003) | 5 | 23.9 | Test in basal peat |
| Warburton et al (2003) | 8.74 | 21.6 | Test using fibrous peat |
| Hendry et al (2012) | 0 | 31 | Remoulded test specimen |
| Komatsu et al (2011) | 8 | 34 | Remoulded test specimen |
| Zwanenburg et al (2012) | 2.3 | 32.3 | From DSS apparatus |
| Den Haan & Grognet (2014) | - | 37.4 | From large DSS apparatus |
| O'Kelly & Zhang (2013) | 0 | 28.9 to 30.3 | Tests carried out on reconstituted, undisturbed and blended peat samples |

## 7.2 Analysis to Determine Factor of Safety (Deterministic Approach)

The purpose of the analysis was to determine the Factor of Safety (FoS) of the peat slopes using infinite slope analysis. The analysis was carried out at the turbine locations, along the proposed access roads and at various locations across the site.

The FoS provides a direct measure of the degree of stability of the slope. A FoS of less than unity indicates that a slope is unstable, a FoS of greater than unity indicates a stable slope.

The acceptable safe range for FoS typically ranges from 1.3 to 1.4. The previous code of practice for earthworks BS 6031:1981 (BSI, 1981), provided advice on design of earthworks slopes. It stated that for a first-time failure with a good standard of site investigation the design FoS should be greater than 1.3.

As a general guide the FoS limits for peat slopes in this report are summarised in Table 7.2.

**Table 7.2: Factor of Safety Limits for Slopes**

| Factor of Safety (FoS) | Degree of Stability |
|---|---|
| Less than 1.0 | Unstable (red) |
| Between 1.0 and 1.3 | Marginally stable (yellow) |
| 1.3 or greater | Acceptable (green) |

Eurocode 7 (EC7) (IS EN 1997-1:2005) now serves as the reference document and the basis for design geotechnical engineering works. The design philosophy used in EC7 applies partial factors to soil parameters, actions and resistances. Unlike the traditional approach, EC7 does not provide a direct measure of stability, since global Factors of Safety are not used.

As such, and in order to provide a direct measure of the level of safety on a site, EC7 partial factors have not been used in this stability assessment. The results are given in terms of FoS.

A lower bound undrained shear strength, $c_u$ for the peat of 8kPa was selected for the assessment based on the $c_u$ values recorded at the site. It should be noted that a $c_u$ of 8kPa for the peat is considered a conservative value for the analysis and is not representative of all peat present across the site. In reality the peat generally has a higher undrained strength.

The formula used to determine the factor of safety for the undrained condition in the peat (Bromhead, 1986) is as follows:

$$F = \frac{c_u}{\gamma z \sin\alpha \cos\alpha}$$

Where:

$F$ = Factor of Safety
$c_u$ = Undrained strength
$\gamma$ = Bulk unit weight of material

$z$ = Depth to failure plane assumed as depth of peat

$\alpha$ = Slope angle

The formula used to determine the factor of safety for the drained condition in the peat (Bromhead, 1986) is as follows:

$$F = \frac{c' + (\gamma z - \gamma_w h_w)\cos^2 \alpha \tan \phi'}{\gamma z \sin \alpha \cos \alpha}$$

Where:

$F$ = Factor of Safety

$c'$ = Effective cohesion

$\gamma$ = Bulk unit weight of material

$z$ = Depth to failure plane assumed as depth of peat

$\gamma_w$ = Unit weight of water

$h_w$ = Height of water table above failure plane

$\alpha$ = Slope angle

$\phi'$ = Effective friction angle

For the drained analysis the level of the water table above the failure surface is required to calculate the factor of safety for the slope. Since the water level in blanket peat can be variable and can be recharged by rainfall, it is not feasible to establish its precise location throughout the site. Therefore, a sensitivity analysis using water level ranging between 0% and 100% of the peat depth was conducted, where 0% equates to the peat being completely dry and 100% equates to the peat been fully saturated.

The following general assumptions were used in the analysis of peat slopes at each location:

(1) Peat depths are based on the maximum peat depth recorded at each location from the walkover surveys.

(2) The slope angles used in the peat stability assessment were obtained using a combination of readings taken during the site reconnaissance by FT using handheld equipment and from contour survey plans for site. It should be noted that slope angles derived from contour survey plans would be considered approximate, as such surveys are dependent on the density of survey data and do not always reflect local variations in ground topography.

(3) Slope angle at base of sliding assumed to be parallel to ground surface.

(4) A lower bound undrained shear strength, $c_u$ for the peat of 8kPa was selected for the assessment. The lowest recorded value on the Ballivor wind farm site during the site walkover was 13kPa. It should be noted that a $c_u$ of 8kPa for the peat is considered a conservative value for the analysis and is not representative of all peat present across the site. In reality, the peat has a significantly higher undrained strength as a result of the extensive drainage & extraction works which have been carried out on site.

For the stability analysis two load conditions were examined, namely

Condition (1): no surcharge loading
Condition (2): surcharge of 10 kPa, equivalent to 1m of stockpiled peat assumed as a worst case.

## 7.3 Results of Analysis

### 7.3.1 Undrained Analysis for the Peat

The results of the undrained analysis for the natural peat slopes are presented in Appendix C and the results of the undrained analysis for the most critical load case (load condition 2) are shown on Figure 7.1. The undrained analysis for load condition 2 is considered the most critical load case as most peat failures occur in the short term upon loading of the peat surface. The results from the main infrastructure locations are summarised in Table 7.3.

The calculated FoS for load condition 1 is in excess of 1.30 for each of the locations (approx. 300 no. locations) analysed with a range of FoS of 2.61 to 57.34, indicating a low risk of peat instability.

The calculated FoS for load condition 2 is in excess of 1.30 for each of the locations (approx. 300 no. locations) analysed with a range of FoS of 2.13 to 16.38, indicating a low risk of peat instability.

**Table 7.3: Factor of Safety Results (Undrained Condition)**

| Turbine No./Waypoint | Easting | Northing | Factor of Safety for Load Condition | |
|---|---|---|---|---|
| | | | Condition (1) | Condition (2) |
| T1 | 665162 | 753511 | **9.76** | **6.85** |
| T2 | 665604 | 753275 | **8.75** | **5.57** |
| T3 | 665983 | 752965 | **26.98** | **12.40** |
| T4 | 665796 | 752196 | **5.47** | **4.03** |
| T5 | 665231 | 752587 | **4.68** | **3.89** |
| T6 | 664502 | 752692 | **7.29** | **4.94** |
| T7 | 665928 | 751694 | **2.61** | **2.13** |
| T8 | 665164 | 751792 | **6.04** | **4.78** |
| T9 | 664623 | 752007 | **7.91** | **5.88** |
| T10 | 663783 | 752452 | **11.19** | **7.52** |
| T11 | 663976 | 753121 | **13.92** | **7.29** |
| T12 | 664329 | 753719 | **6.55** | **5.10** |
| T13 | 663739 | 757007 | **8.19** | **6.04** |
| T14 | 663474 | 757496 | **12.76** | **6.96** |
| T15 | 662595 | 757805 | **5.89** | **4.25** |
| T16 | 662765 | 757323 | **5.59** | **4.50** |
| T17 | 662002 | 756804 | **12.77** | **6.05** |
| T18 | 661508 | 757054 | **2.61** | **2.13** |
| T19 | 665118 | 758520 | **4.11** | **3.03** |

| Turbine No./Waypoint | Easting | Northing | Factor of Safety for Load Condition | |
|---|---|---|---|---|
| | | | Condition (1) | Condition (2) |
| T20 | 665844 | 758647 | **11.47** | **7.65** |
| T21 | 664274 | 759054 | **17.01** | **8.06** |
| T22 | 664023 | 759553 | **16.38** | **9.56** |
| T23 | 664744 | 759727 | **7.40** | **5.59** |
| T24 | 665464 | 759850 | **457** | **3.52** |
| T25 | 665735 | 759326 | **5.96** | **4.73** |
| T26 | 665028 | 759172 | **9.97** | **6.95** |
| Met Mast 1 | 661518 | 756595 | **7.65** | **5.10** |
| Met Mast 2 | 663677 | 752816 | **11.47** | **7.65** |
| Borrow Pit 1/1a (Carranstown) | 664226 | 755100 | **7.66** | **4.60** |
| Borrow Pit 2 | 661667 | 755996 | **16.42** | **6.76** |
| Car Park 1 | 664349 | 757812 | **7.65** | **5.10** |
| Substation | 663587 | 755382 | **12.07** | **7.91** |
| Construction Compound 1 | 663854 | 757488 | **8.50** | **5.47** |
| Construction Compound 2 | 663517 | 755194 | **12.07** | **7.91** |
| Construction Compound 3 | 664542 | 754056 | **12.74** | **8.19** |
| Construction Compound 4 | 661791 | 756641 | **11.47** | **7.65** |
| Construction Compound 5 | 665323 | 751430 | **12.74** | **8.19** |

# PLAN

Scale 1:20000

FEHILY TIMONEY Cork | Dublin | Carlow www.fehilytimoney.ie

## Factor of Safety Legend:

- 0 < 1.0
- ≥ 1.0 < 1.3
- ≥ 1.3

Increasing Stability

No Peat Recorded At This Location

T24
T23
T22
T25
T26
J08
T21
T20
T19
J07
T15
T14
T16
J03
J02
T18
J04
T13
J05
T17
J06
MM2
Proposed Met Mast 2
Proposed Temporary Access Track
Borrow Pit 2
Proposed Site Offices
Access for delivery and Removal of Machinery to Borrow Pit
Proposed Substation
Corduff - Mullingar 110kv OHL
Borrow Pit 1B
J01
Proposed Turbine & Hardstanding
Proposed New Access Road
Proposed Permanent Amenity Car Park
Proposed Temporary Construction Compound
Site Boundary

0m 100m 200m 300m 400m 500m 600m 700m 800m 900m 1000m

Scale 1:20000

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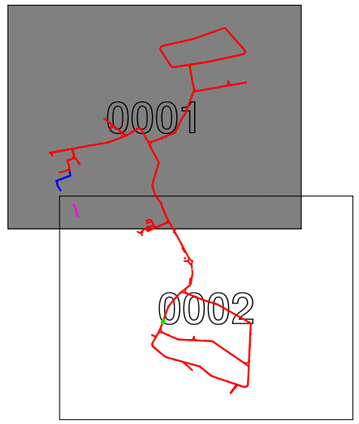


## KEYPLAN

Scale (@ A3 ) 1:20000

Date - 24.02.23

# FIGURE 7.1 - FACTOR OF SAFETY PLAN SHEET 1 OF 2

Drawn - POR

Checked - IH

Rev - C

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Friday 24 February 2023

# PLAN

Scale 1:20000

Access for delivery and Removal of Machinery to Borrow Pit

Proposed Substation

Corduff - Mullingar 110kv OHL

Borrow Pit 1B

J01

ENT01

ENT02

Proposed Drain

Borrow Pit 1A

Proposed Site Offices

J09

T12

T01

T02

Site Boundary

Proposed Met Mast 1

T11

J13

J12

MM1

T06

T05

T04

Proposed Turbine & Hardstanding

T03

Proposed New Access Road

T10

J11

T09

T08

J10

T07

0m 100m 200m 300m 400m 500m 600m 700m 800m 900m 1000m

Scale 1:20000

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FEHILY TIMONEY Cork | Dublin | Carlow www.fehilytimoney.ie

## Factor of Safety Legend:

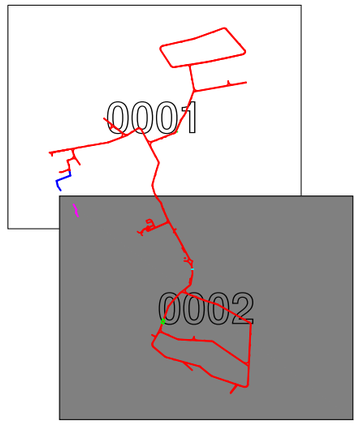
0 < 1.0

≥ 1.0 < 1.3

≥ 1.3

Increasing Stability

No Peat Recorded At This Location




## KEYPLAN

Scale (@ A3 ) 1:20000

Date - 24.02.23

## FIGURE 7.1 - FACTOR OF SAFETY PLAN SHEET 2 OF 2

Drawn - POR

Checked - IH

Rev - C

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Friday 24 February 2023

### 7.3.2 Drained Analysis for the Peat

The results of the drained analysis for the peat are presented in Appendix C. The results from the main infrastructure locations are summarised in Table 7.4. As stated previously, the drained loading condition examines the effect of rainfall and water on the existing stability of the natural peat slopes.

The calculated FoS for load condition 1 is in excess of 1.30 for each of the locations (approx. 300 no. locations) analysed with a range of FoS of 1.31 to 28.67, indicating a low risk of peat instability.

The calculated FoS for load condition 2 is in excess of 1.30 for each of the locations (approx. 300 no. locations) analysed with a range of FoS of 2.30 to 17.73, indicating a low risk of peat instability.

The results of Condition (2) are slightly higher than for Condition (1) in the drained case because the water level is assumed to be at original ground level, rather than at the top of the additional 1m of peat. This results in a slightly higher FoS because the effective height of the water in the peat is no longer 100% of the height of the peat.

**Table 7.4: Factor of Safety Results (Drained Conditions)**

| Turbine No./Waypoint | Easting | Northing | Factor of Safety for Load Condition | |
|---|---|---|---|---|
| | | | Condition (1) | Condition (2) |
| T1 | 665162 | 753511 | **4.88** | **7.41** |
| T2 | 665604 | 753275 | **4.37** | **6.02** |
| T3 | 665983 | 752965 | **13.49** | **13.42** |
| T4 | 665796 | 752196 | **2.73** | **4.36** |
| T5 | 665231 | 752587 | **2.34** | **4.21** |
| T6 | 664502 | 752692 | **3.64** | **5.34** |
| T7 | 665928 | 751694 | **1.31** | **2.30** |
| T8 | 665164 | 751792 | **3.02** | **5.17** |
| T9 | 664623 | 752007 | **3.95** | **6.36** |
| T10 | 663783 | 752452 | **5.59** | **8.14** |
| T11 | 663976 | 753121 | **6.96** | **7.88** |
| T12 | 664329 | 753719 | **3.28** | **5.52** |
| T13 | 663739 | 757007 | **4.10** | **6.53** |
| T14 | 663474 | 757496 | **6.38** | **7.52** |
| T15 | 662595 | 757805 | **2.94** | **4.60** |
| T16 | 662765 | 757323 | **2.80** | **4.87** |
| T17 | 662002 | 756804 | **6.39** | **6.54** |
| T18 | 661508 | 757054 | **1.31** | **2.30** |
| T19 | 665118 | 758520 | **2.05** | **3.27** |
| T20 | 665844 | 758647 | **5.73** | **8.27** |

| Turbine No./Waypoint | Easting | Northing | Factor of Safety for Load Condition | |
|---|---|---|---|---|
| | | | Condition (1) | Condition (2) |
| T21 | 664274 | 759054 | **8.50** | **8.71** |
| T22 | 664023 | 759553 | **8.19** | **10.34** |
| T23 | 664744 | 759727 | **3.70** | **6.05** |
| T24 | 665464 | 759850 | **2.28** | **3.80** |
| T25 | 665735 | 759326 | **2.98** | **5.12** |
| T26 | 665028 | 759172 | **4.99** | **7.52** |
| Met Mast 1 | 661518 | 756595 | **3.82** | **6.21** |
| Met Mast 2 | 663677 | 752816 | **5.73** | **8.27** |
| Borrow Pit 1/1a (Carranstown) | 664226 | 755100 | **3.83** | **4.97** |
| Borrow Pit 2 | 661667 | 755996 | **8.21** | **7.30** |
| Car Park 1 | 664349 | 757812 | **3.83** | **5.52** |
| Substation 1 | 663587 | 755382 | **6.04** | **8.56** |
| Construction Compound 1 | 663854 | 757488 | **4.25** | **5.91** |
| Construction Compound 2 | 663517 | 755194 | **6.04** | **8.56** |
| Construction Compound 3 | 664542 | 754056 | **6.37** | **8.86** |
| Construction Compound 4 | 661791 | 756641 | **5.73** | **8.27** |
| Construction Compound 5 | 665323 | 751430 | **6.37** | **8.86** |

# 8. PEAT STABILITY RISK ASSESSMENT

A peat stability risk assessment was carried out for the main infrastructure elements at the wind farm. This approach takes into account guidelines for geotechnical/peat stability risk assessments as given in PLHRAG (2017) and MacCulloch (2005).

The risk assessment uses the results of the stability analysis (deterministic approach) in combination with qualitative factors, which cannot be reasonably included in a stability calculation but nevertheless may affect the occurrence of peat instability, to assess the risk for each infrastructure element.

For each of the main infrastructure elements, a risk rating (product of probability and impact) is calculated and rated as shown in Table 8.1. Where a subsection is rated 'Medium' or 'High', control measures are required to reduce the risk to at least a 'Low' risk rating. Where a subsection is rated 'Low' or 'Negligible', only routine control measures are required.

**Table 8.1: Risk Rating Legend**

| | |
|---|---|
| 17 to 25 | High: avoid works in area or significant control measures required |
| 11 to 16 | Medium: notable control measures required |
| 5 to 10 | Low: only routine control measures required |
| 1 to 4 | Negligible: none or only routine control measures required |

A full methodology for the peat stability risk assessment is given in Appendix D.

## 8.1 Summary of Risk Assessment Results

The results of the peat stability risk assessment for potential peat failure at the main infrastructure elements is presented as a Geotechnical Risk Register in Appendix B and summarised in Table 8.2.

The risk rating for each infrastructure element at the Ballivor wind farm is designated Negligible or Low following some mitigation/control measures being implemented. Sections of access roads to the nearest infrastructure element will be subject to the same mitigation/control measures that apply to the nearest infrastructure element.

Details of the required mitigation/control measures can be found in the Geotechnical Risk Register for each infrastructure element (Appendix B).

**Table 8.2: Summary of Peat Stability Risk Register**

| Infrastructure | Pre-Control Measure Implementation Risk Rating | Pre-Control Measure Implementation Risk Rating Category | Notable Control Measures Required | Post-Control Measure Implementation Risk Rating | Post-Control Measure Implementation Risk Rating Category |
|---|---|---|---|---|---|
| T1 | Negligible | 1 to 4 | No | Negligible | 1 to 4 |
| T2 | Negligible | 1 to 4 | No | Negligible | 1 to 4 |
| T3 | Negligible | 1 to 4 | No | Negligible | 1 to 4 |
| T4 | Negligible | 1 to 4 | No | Negligible | 1 to 4 |
| T5 | Negligible | 1 to 4 | No | Negligible | 1 to 4 |
| T6 | Negligible | 1 to 4 | No | Negligible | 1 to 4 |
| T7 | Negligible | 1 to 4 | No | Negligible | 1 to 4 |
| T8 | Negligible | 1 to 4 | No | Negligible | 1 to 4 |
| T9 | Negligible | 1 to 4 | No | Negligible | 1 to 4 |
| T10 | Negligible | 1 to 4 | No | Negligible | 1 to 4 |
| T11 | Negligible | 1 to 4 | No | Negligible | 1 to 4 |
| T12 | Negligible | 1 to 4 | No | Negligible | 1 to 4 |
| T13 | Low | 5 to 10 | No | Low | 5 to 10 |
| T14 | Low | 5 to 10 | No | Low | 5 to 10 |
| T15 | Negligible | 1 to 4 | No | Negligible | 1 to 4 |
| T16 | Negligible | 1 to 4 | No | Negligible | 1 to 4 |
| T17 | Negligible | 1 to 4 | No | Negligible | 1 to 4 |
| T18 | Negligible | 1 to 4 | No | Negligible | 1 to 4 |
| T19 | Low | 5 to 10 | No | Low | 5 to 10 |
| T20 | Negligible | 1 to 4 | No | Negligible | 1 to 4 |
| T21 | Low | 5 to 10 | No | Low | 5 to 10 |
| T22 | Negligible | 1 to 4 | No | Negligible | 1 to 4 |
| T23 | Negligible | 1 to 4 | No | Negligible | 1 to 4 |
| T24 | Negligible | 1 to 4 | No | Negligible | 1 to 4 |
| T25 | Negligible | 1 to 4 | No | Negligible | 1 to 4 |
| T26 | Negligible | 1 to 4 | No | Negligible | 1 to 4 |
| Met Mast 1 | Negligible | 1 to 4 | No | Negligible | 1 to 4 |
| Met Mast 2 | Negligible | 1 to 4 | No | Negligible | 1 to 4 |

| | | | | | |
|---|---|---|---|---|---|
| Borrow Pit 1a/1b (Carranstown) | Negligible | 1 to 4 | No | Negligible | 1 to 4 |
| Borrow Pit 2 | Negligible | 1 to 4 | No | Negligible | 1 to 4 |
| Car Park 1 | Low | 5 to 10 | No | Low | 5 to 10 |
| Substation | Negligible | 1 to 4 | No | Negligible | 1 to 4 |
| Construction Compound 1 | Low | 5 to 10 | No | Low | 5 to 10 |
| Construction Compound 2 | Negligible | 1 to 4 | No | Negligible | 1 to 4 |
| Construction Compound 3 | Negligible | 1 to 4 | No | Negligible | 1 to 4 |
| Construction Compound 4 | Negligible | 1 to 4 | No | Negligible | 1 to 4 |
| Construction Compound 5 | Negligible | 1 to 4 | No | Negligible | 1 to 4 |

# 9. INDICTATIVE FOUNDATION TYPE AND FOUNDATION DEPTH FOR TURBINES

## 9.1 Summary

Based on a review of the ground investigation information for site, a preliminary assessment of the likely foundation type and founding depths for each turbine location was carried out, where possible. A summary of this assessment is provided in Table 9-1.

**Table 9-1: Summary of Indicative Turbine Foundation Type and Founding Depths**

| Turbine No. | Turbine Foundation Type | Relevant GI | Indicative founding depth (m bgl) | Comment |
|---|---|---|---|---|
| T1 | Piled foundation | TP B | - | The site investigation works carried out indicate that a piled foundation will be required. |
| T2 | Piled foundation | TP Z | - | The site investigation works carried out indicate that a piled foundation will be required. |
| T3 | Piled foundation | TP N | - | The site investigation works carried out indicate that a piled foundation will be required. |
| T4 | Piled foundation | TP A | - | The site investigation works carried out indicate that a piled foundation will be required. |
| T5 | Piled foundation | TP Y | - | The site investigation works carried out indicate that a piled foundation will be required. |
| T6 | Piled foundation | TP F | - | The site investigation works carried out indicate that a piled foundation will be required. |
| T7 | Piled foundation | TP P | - | The site investigation works carried out indicate that a piled foundation will be required. |
| T8 | Piled foundation | TP X | - | The site investigation works carried out indicate that a piled foundation will be required. |
| T9 | Piled foundation | TP O | - | The site investigation works carried out indicate that a piled foundation will be required. |

| Turbine No. | Turbine Foundation Type | Relevant GI | Indicative founding depth (m bgl) | Comment |
|---|---|---|---|---|
| T10 | Piled foundation | TP E | - | The site investigation works carried out indicate that a piled foundation will be required. |
| T11 | Piled foundation | TP C | - | The site investigation works carried out indicate that a piled foundation will be required. |
| T12 | Piled foundation | TP D | - | The site investigation works carried out indicate that a piled foundation will be required. |
| T13 | Piled foundation | TP V | - | The site investigation works carried out indicate that a piled foundation will be required. |
| T14 | Piled foundation | TP T | - | The site investigation works carried out indicate that a piled foundation will be required. |
| T15 | Piled foundation | TP Q | - | The site investigation works carried out indicate that a piled foundation will be required. |
| T16 | Piled foundation | TP U | - | The site investigation works carried out indicate that a piled foundation will be required. |
| T17 | Piled foundation | TP S | - | The site investigation works carried out indicate that a piled foundation will be required. |
| T18 | Piled foundation | TP R | - | The site investigation works carried out indicate that a piled foundation will be required. |
| T19 | Piled foundation | TP M | - | The site investigation works carried out indicate that a piled foundation will be required. |
| T20 | Piled foundation | TP K | - | The site investigation works carried out indicate that a piled foundation will be required. |
| T21 | Piled foundation | TP L | - | The site investigation works carried out indicate that a piled foundation will be required. |
| T22 | Piled foundation | TP H | - | The site investigation works carried out indicate that a piled foundation will be required. |

| Turbine No. | Turbine Foundation Type | Relevant GI | Indicative founding depth (m bgl) | Comment |
|---|---|---|---|---|
| T23 | Piled foundation | TP I | - | The site investigation works carried out indicate that a piled foundation will be required. |
| T24 | Piled foundation | TP G | - | The site investigation works carried out indicate that a piled foundation will be required. |
| T25 | Piled foundation | TP W | - | The site investigation works carried out indicate that a piled foundation will be required. |
| T26 | Piled foundation | TP J | - | The site investigation works carried out indicate that a piled foundation will be required. |
| Substation | Raft foundation on imported structural fill | BH-02 to BH14, TP01-29 | - | The site investigation works carried out indicate that a gravity foundation will be required. |

It should be noted that further ground investigation will be carried out prior to construction at each turbine location in the form of a borehole with in-situ SPT testing at 1m intervals in the overburden and follow-on rotary core through bedrock to confirm the foundation types and founding stratums assumed in Table 9-1. It is likely that following the completion of further ground investigation prior to construction that a number of the turbine bases will be deemed suitable for gravity type foundations.

For gravity type turbine foundations, where the depth of excavation exceeds the required founding depth for the proposed turbine base, up-fill material consisting of granular fill (6N) shall be used to backfill the excavation to the required founding depth.

For the piled turbine foundations, a typical piling type and configuration could be up to 16 no. 1200-1600mm diameter rotary bored piles.

# 10. FOUNDING DETAILS FOR OTHER INFRASTRUCTURE ELEMENTS

## 10.1 Access Roads

Floating access roads are the predominant road construction type proposed for the site which given the ground conditions and type of terrain present is deemed an appropriate construction approach.

The total length of new proposed access road to be constructed on site is approximately 28km (see Figure 1.1 of the Peat & Spoil Management Plan).

The typical make-up of the founded access roads is a minimum stone thickness of 800mm. The requirement for a layer of geotextile and geogrid and the necessary stone thickness will be confirmed at detailed design stage.

Refer to the Peat & Spoil Management Plan for Ballivor wind farm for further details on the proposed access roads on site.

## 10.2 Crane Hardstands

The crane hardstands will be constructed using the founded technique (i.e. not floated technique).

Crane hardstands are constructed using compacted Class 1/6F material on a suitable sub-formation to achieve the required bearing resistance. The hardstands will be designed for the most critical loading combinations from the crane.

The hardstands will require to be founded on competent material underlying the peat deposits. The founding levels for the hardstands will be variable across the site and will be determined during detailed ground investigation/design stage.

The typical make-up of the hardstands will include a minimum of 1.0m of granular stone fill with possibly a layer of geotextile and/or geogrid.

## 10.3 Substation Foundations & Platforms

The substation platform will be constructed using the founded technique (i.e. not floated technique). The substation foundations may comprise strip/raft foundations under the main footprint of the building with possibly a basement/pit for cable connections.

Substation platforms are constructed using compacted Class 1/6F material in accordance with Eirgrid/ESB network requirements on a suitable sub-formation to achieve the required bearing resistance.

The substation platform will require to be founded on competent material underlying the peat deposits.

Given the ground conditions present at the proposed substations, it is envisaged that the foundations will require to be founded on glacial till. The peat and lacustrine soils will not be a suitable founding stratum for the substation foundations.

Typical founding depth for substation platforms is likely to be 1.5-3.5m bgl.

The typical make-up of the substation platform will require approximately 4.0-5.0m of granular stone fill due to the thickness of peat, with possibly a layer of geotextile and/or geogrid. At the underside of the substation foundations, a layer of structural up-fill (class 6N/6P) in accordance with Eirgrid requirements will likely be required.

## 10.4 Construction Compound Platforms

The construction compound platforms will be constructed using the founded or floated technique as appropriate.

The construction compound platforms are generally constructed using compacted Class 1/6F material on a suitable sub-formation to achieve the required bearing resistance.

The construction compound platforms will require to be founded on material underlying the peat deposits.

Typical founding depth for construction compound platforms will require excavations from 1.0m to 4.5m bgl, where founded.

The typical make-up of the construction compound platform will include a minimum of 1000mm of granular stone fill with possibly a layer of geotextile and/or geogrid.

## 10.5 Met Mast Foundations

The met mast foundation will likely comprise gravity type foundation.

Given the ground conditions present at the proposed met mast, it is envisaged that the foundation will require to be founded on a competent stratum below the peat.

Typical founding depth for the met mast foundation is envisaged to be 2.5 to 3.0m bgl. At the underside of the met mast foundation, a layer of structural up-fill (class 6N) will be required.

# 11. SUMMARY AND RECOMMENDATIONS

## 11.1 Summary

The following summary is given.

FT was engaged by MKO to undertake a geotechnical and peat stability assessment of the proposed Ballivor wind farm site.

The findings of the peat assessment showed that the site has an acceptable margin of safety and is suitable for the proposed wind farm development. The findings include recommendations and control measures for construction work in peat lands to ensure that all works adhere to an acceptable standard of safety.

The site which is typically flat consists predominantly of bare locally re-vegetated cut-away peat and intact shallow peat. The site has been extensively harvested and drained by Bord na Móna.

Peat depth recorded during the site walkover and from the ground investigation ranged from 0.4 to 4.9m with an average peat depth of 1.7m. 40% of the probes recorded peat depths of less than 1.5m, with 67% of peat depth probes recorded peat depths of less than 2.0m and 94% of peat depth probes recorded peat depths of less than 3.0m. A number of localised readings recorded peat depths from 3.0 to 4.9m.

Slope inclinations at the main infrastructure locations range from 2 to 4 degrees.

An analysis of peat sliding was carried out at the main infrastructure locations across site for both the undrained and drained conditions. The purpose of the analysis was to determine the Factor of Safety (FoS) of the peat slopes.

For the undrained condition, the calculated FoS for load conditions (1) and (2) for the locations analysed, showed that all locations have an acceptable FoS of greater than 1.3, indicating a low risk of peat failure. The undrained analysis would be considered the most critical condition for the peat slopes.

A drained analysis was also carried out, which examined the effect of in particular, rainfall on the existing stability of the natural peat slopes on site. For the drained condition, the calculated FoS for load conditions (1) & (2) for the locations analysed, showed that all locations have an acceptable FoS of greater than 1.3.

The peat stability risk assessment at each infrastructure location identified a number of mitigation/control measures to reduce the potential risk of peat failure. Sections of access roads to the nearest infrastructure element should be subject to the same mitigation/control measures that apply to the nearest infrastructure element. See Appendix B for details of the required mitigation/control measures for each infrastructure element.

In summary, the findings of the peat assessment showed that the proposed Ballivor wind farm site has an acceptable margin of safety, is suitable for the proposed wind farm development and is considered to be at **low** risk of peat failure. The findings include recommendations and control measures for construction work in peat lands to ensure that all works adhere to an acceptable standard of safety.

## 11.2 Recommendations

The following recommendations are given.

Notwithstanding that the site has an acceptable margin of safety a number of mitigation/control measures are given to ensure that all works adhere to an acceptable standard of safety for work in peatlands. Mitigation/control measures identified for each of the infrastructure elements in the risk assessment will be taken into account and implemented throughout design and construction works (Appendix B).

Figure 4-2 shows areas which have an elevated or higher construction risk due to the terrain and features encountered during the site reconnaissance i.e. presence of relatively deep peat. Figure 7-1 shows the results of the factor of safety (FoS) analysis for the peat slopes on site for the most critical load condition.

Recommendations and guidelines given in FT's report 'Peat & Spoil Management Plan - Ballivor Wind Farm (FT 2021), included as Appendix 4.2 of the EIAR, should be implemented during the design and construction stage of the wind farm development.

To minimise the risk of construction activity causing potential peat instability the Construction Method Statements (CMSs) for the project will take into account, but not be limited, to the recommendations above. This will ensure that best practice guidance regarding the management of peat stability will be inherent in the construction phase.

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# APPENDIX A

Photos from Site Walkover



Photo 1: Partially revegetated worked peatland



Photo 2:Open worked peatland



Photo 3: Open peatland with ponded water



Photo 4: Revegetated worked peatland

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# APPENDIX B

## Peat Stability Risk Registers

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Turbine T1 |
|---|---|

| | | |
|---|---|---|
| Grid Reference (Eastings, Northings): | 665162 | 753511 |
| Distance to Watercourse (m) | > 150 | |
| Min & Max Measured Peat Depth (m): | 1.1 - 2.35 | |
| Control Required: | No | |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 6.85 (u), 4.88 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 3 | 1 | 3 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Other | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **Turbine T1** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties. |
| v | Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed. |
| vi | Based on available ground investigaiton, a piled turbine foundation may be required. |

**Note**

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Turbine T2 |
|---|---|

| | | |
|---|---|---|
| Grid Reference (Eastings, Northings): | 665604 | 753276 |
| Distance to Watercourse (m) | > 150 | |
| Min & Max Measured Peat Depth (m): | 1.0 - 1.75 | |
| Control Required: | No | |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 5.57 (u), 4.37 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 3 | 1 | 3 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Other | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **Turbine T2** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties. |
| v | Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed. |
| vi | Based on available ground investigaiton, a piled turbine foundation may be required. |

**Note**

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Turbine T3 |
|---|---|

| | | |
|---|---|---|
| Grid Reference (Eastings, Northings): | 665983 | 752965 |
| Distance to Watercourse (m) | > 150 | |
| Min & Max Measured Peat Depth (m): | 0.4 - 0.85 | |
| Control Required: | No | |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 12.40 (u), 13.42 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 3 | 1 | 3 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Other | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **Turbine T3** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties. |
| v | Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed. |
| vi | Based on available ground investigaiton, a piled turbine foundation may be required. |

**Note**

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Turbine T4 |
|---|---|

| | | |
|---|---|---|
| Grid Reference (Eastings, Northings): | 665796 | 752196 |
| Distance to Watercourse (m) | > 150 | |
| Min & Max Measured Peat Depth (m): | 2.7 - 2.9 | |
| Control Required: | No | |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 4.03 (u), 2.73 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Relatively deep peat | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |

| | Control Measures to be Implemented Prior to/and During Construction for **Turbine T4** |
|---|---|
| i | Due to relatively deep peat at this turbine location, additional construction measures such as the following may be required:<br>- excavation side walls to be supported (e.g. boulders, sheet piles) or excavation facew battered to a shallow angle<br>- temporary works designer may be required to provide excavation support design<br>-daily detailed inspection of excavation faces<br>-potential for greater water inflow into excavation requiring removal of water using pumping<br>-increased exclusion zone around excavation to avoid accidental loading of crest of slope |
| ii | Maintain hydrology of area as far as possible; |
| iii | Use of experienced geotechnical staff for site investigation; |
| iv | Use of experienced contractors and trained operators to carry out the work; |
| v | Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties. |
| vi | Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed. |
| vii | Based on available ground investigaiton, a piled turbine foundation may be required. |

**Note**
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Turbine T5 |
|---|---|

| | | |
|---|---|---|
| Grid Reference (Eastings, Northings): | 665231 | 752587 |
| Distance to Watercourse (m) | > 150 | |
| Min & Max Measured Peat Depth (m): | 2.1 - 4.9 | |
| Control Required: | No | |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 3.89 (u), 2.34 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Relatively deep peat | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |

| | Control Measures to be Implemented Prior to/and During Construction for **Turbine T5** |
|---|---|
| i | Due to relatively deep peat at this turbine location, additional construction measures such as the following may be required:<br>- excavation side walls to be supported (e.g. boulders, sheet piles) or excavation facew battered to a shallow angle<br>- temporary works designer may be required to provide excavation support design<br>-daily detailed inspection of excavation faces<br>-potential for greater water inflow into excavation requiring removal of water using pumping<br>-increased exclusion zone around excavation to avoid accidental loading of crest of slope |
| ii | Maintain hydrology of area as far as possible; |
| iii | Use of experienced geotechnical staff for site investigation; |
| iv | Use of experienced contractors and trained operators to carry out the work; |
| v | Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties. |
| vi | Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed. |
| vii | Based on available ground investigaiton, a piled turbine foundation may be required. |

**Note**
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Turbine T6 |
|---|---|

| | | |
|---|---|---|
| Grid Reference (Eastings, Northings): | 664502 | 752692 |
| Distance to Watercourse (m) | > 150 | |
| Min & Max Measured Peat Depth (m): | 1.0 - 2.10 | |
| Control Required: | No | |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 4.94 (u), 3.64 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 3 | 1 | 3 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 1 | 1 | 1 | Negligible | No | | 0 | 1 | 0 | Not Applicable |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Other | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **Turbine T6** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties. |
| v | Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed. |
| vi | Based on available ground investigaiton, a piled turbine foundation may be required. |

**Note**
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Turbine T7 |
|---|---|

| Grid Reference (Eastings, Northings): | 665928 | 751694 |
|---|---|---|
| Distance to Watercourse (m) | > 150 | |
| Min & Max Measured Peat Depth (m): | 3.6 - 4.4 | |
| Control Required: | No | |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 2.13 (u), 1.31 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Relatively deep peat | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |

| | Control Measures to be Implemented Prior to/and During Construction for **Turbine T7** |
|---|---|
| i | Due to relatively deep peat at this turbine location, additional construction measures such as the following may be required:<br>- excavation side walls to be supported (e.g. boulders, sheet piles) or excavation facew battered to a shallow angle<br>- temporary works designer may be required to provide excavation support design<br>-daily detailed inspection of excavation faces<br>-potential for greater water inflow into excavation requiring removal of water using pumping<br>-increased exclusion zone around excavation to avoid accidental loading of crest of slope |
| ii | Maintain hydrology of area as far as possible; |
| iii | Use of experienced geotechnical staff for site investigation; |
| iv | Use of experienced contractors and trained operators to carry out the work; |
| v | Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties. |
| vi | Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed. |
| vii | Based on available ground investigaiton, a piled turbine foundation may be required. |

**Note**
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Turbine T8 |
|---|---|

| | | |
|---|---|---|
| Grid Reference (Eastings, Northings): | 665164 | 751792 |
| Distance to Watercourse (m) | > 150 | |
| Min & Max Measured Peat Depth (m): | 0.7 - 3.80 | |
| Control Required: | No | |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 4.78 (u), 3.02 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Relatively deep peat | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |

| | Control Measures to be Implemented Prior to/and During Construction for **Turbine T8** |
|---|---|
| i | Due to relatively deep peat at this turbine location, additional construction measures such as the following may be required:<br>- excavation side walls to be supported (e.g. boulders, sheet piles) or excavation facew battered to a shallow angle<br>- temporary works designer may be required to provide excavation support design<br>-daily detailed inspection of excavation faces<br>-potential for greater water inflow into excavation requiring removal of water using pumping<br>-increased exclusion zone around excavation to avoid accidental loading of crest of slope |
| ii | Maintain hydrology of area as far as possible; |
| iii | Use of experienced geotechnical staff for site investigation; |
| iv | Use of experienced contractors and trained operators to carry out the work; |
| v | Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties. |
| vi | Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed. |
| vii | Based on available ground investigaiton, a piled turbine foundation may be required. |

**Note**
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Turbine T9 |
|---|---|

| Grid Reference (Eastings, Northings): | 664623 | 752007 |
|---|---|---|
| Distance to Watercourse (m) | > 150 | |
| Min & Max Measured Peat Depth (m): | 1.5 - 2.9 | |
| Control Required: | No | |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 5.88 (u), 3.95 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Relatively deep peat | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |

| | Control Measures to be Implemented Prior to/and During Construction for **Turbine T9** |
|---|---|
| i | Due to relatively deep peat at this turbine location, additional construction measures such as the following may be required:<br>- excavation side walls to be supported (e.g. boulders, sheet piles) or excavation facew battered to a shallow angle<br>- temporary works designer may be required to provide excavation support design<br>-daily detailed inspection of excavation faces<br>-potential for greater water inflow into excavation requiring removal of water using pumping<br>-increased exclusion zone around excavation to avoid accidental loading of crest of slope |
| ii | Maintain hydrology of area as far as possible; |
| iii | Use of experienced geotechnical staff for site investigation; |
| iv | Use of experienced contractors and trained operators to carry out the work; |
| v | Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties. |
| vi | Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed. |
| vii | Based on available ground investigaiton, a piled turbine foundation may be required. |

**Note**
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Turbine T10 |
|---|---|

| Grid Reference (Eastings, Northings): | 663783 | 752452 |
|---|---|---|
| Distance to Watercourse (m) | > 150 | |
| Min & Max Measured Peat Depth (m): | 0.7 - 2.05 | |
| Control Required: | No | |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 7.52 (u), 5.59 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 3 | 1 | 3 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Other | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **Turbine T10** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties. |
| v | Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed. |
| vi | Based on available ground investigaiton, a piled turbine foundation may be required. |

**Note**
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Turbine T11 |
|---|---|

| | | |
|---|---|---|
| Grid Reference (Eastings, Northings): | 663976 | 753121 |
| Distance to Watercourse (m) | > 150 | |
| Min & Max Measured Peat Depth (m): | 1.0 - 1.2 | |
| Control Required: | No | |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 7.29 (u), 6.96 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 3 | 1 | 3 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 0 | 1 | 0 | Not Applicable | No | | 2 | 1 | 2 | Negligible |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Other | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **Turbine T11** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties. |
| v | Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed. |
| vi | Based on available ground investigaiton, a piled turbine foundation may be required. |

**Note**
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Turbine T12 |
|---|---|

| Grid Reference (Eastings, Northings): | 664329 | 753719 |
|---|---|---|
| Distance to Watercourse (m) | > 150 | |
| Min & Max Measured Peat Depth (m): | 2.1 - 3.5 | |
| Control Required: | No | |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 5.10 (u), 3.28 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Relatively deep peat | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |

| | Control Measures to be Implemented Prior to/and During Construction for **Turbine T12** |
|---|---|
| i | Due to relatively deep peat at this turbine location, additional construction measures such as the following may be required:<br>- excavation side walls to be supported (e.g. boulders, sheet piles) or excavation facew battered to a shallow angle<br>- temporary works designer may be required to provide excavation support design<br>-daily detailed inspection of excavation faces<br>-potential for greater water inflow into excavation requiring removal of water using pumping<br>-increased exclusion zone around excavation to avoid accidental loading of crest of slope |
| ii | Maintain hydrology of area as far as possible; |
| iii | Use of experienced geotechnical staff for site investigation; |
| iv | Use of experienced contractors and trained operators to carry out the work; |
| v | Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties. |
| vi | Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed. |
| vii | Based on available ground investigaiton, a piled turbine foundation may be required. |

**Note**
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Turbine T13 |
|---|---|

| Grid Reference (Eastings, Northings): | 663739 | 757007 |
|---|---|---|
| Distance to Watercourse (m) | 50 - 100 | |
| Min & Max Measured Peat Depth (m): | 1.7 - 2.8 | |
| Control Required: | No | |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 6.04 (u), 4.10 (d) | 1 | 3 | 3 | Negligible | No | See Below | 1 | 3 | 3 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 3 | 3 | Negligible | No | | 1 | 3 | 3 | Negligible |
| 3 | Evidence of surface water flow | 3 | 3 | 9 | Low | No | | 2 | 3 | 6 | Low |
| 4 | Evidence of previous failures/slips | 0 | 3 | 0 | Not Applicable | No | | 0 | 3 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 3 | 6 | Low | No | | 2 | 3 | 6 | Low |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 3 | 6 | Low | No | | 2 | 3 | 6 | Low |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 3 | 0 | Not Applicable | No | | 0 | 3 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 3 | 0 | Not Applicable | No | | 0 | 3 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 0 | 3 | 0 | Not Applicable | No | | 0 | 3 | 0 | Not Applicable |
| 10 | Evidence of bog pools | 0 | 3 | 0 | Not Applicable | No | | 0 | 3 | 0 | Not Applicable |
| 11 | Relatively deep peat | 3 | 3 | 9 | Low | No | | 2 | 3 | 6 | Low |

| | Control Measures to be Implemented Prior to/and During Construction for **Turbine T13** |
|---|---|
| i | Due to relatively deep peat at this turbine location, additional construction measures such as the following may be required:<br>- excavation side walls to be supported (e.g. boulders, sheet piles) or excavation facew battered to a shallow angle<br>- temporary works designer may be required to provide excavation support design<br>-daily detailed inspection of excavation faces<br>-potential for greater water inflow into excavation requiring removal of water using pumping<br>-increased exclusion zone around excavation to avoid accidental loading of crest of slope |
| ii | Maintain hydrology of area as far as possible; |
| iii | Use of experienced geotechnical staff for site investigation; |
| iv | Use of experienced contractors and trained operators to carry out the work; |
| v | Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties. |
| vi | Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed. |
| vii | Based on available ground investigaiton, a piled turbine foundation may be required. |

**Note**
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Turbine T14 |
|---|---|

| Grid Reference (Eastings, Northings): | 663474 | 757496 |
|---|---|---|
| Distance to Watercourse (m) | 50 - 100 | |
| Min & Max Measured Peat Depth (m): | 0.4 - 1.2 | |
| Control Required: | No | |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 6.96 (u), 6.38 (d) | 1 | 3 | 3 | Negligible | No | See Below | 1 | 3 | 3 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 3 | 3 | Negligible | No | | 1 | 3 | 3 | Negligible |
| 3 | Evidence of surface water flow | 3 | 3 | 9 | Low | No | | 2 | 3 | 6 | Low |
| 4 | Evidence of previous failures/slips | 0 | 3 | 0 | Not Applicable | No | | 0 | 3 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 3 | 6 | Low | No | | 2 | 3 | 6 | Low |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 3 | 6 | Low | No | | 2 | 3 | 6 | Low |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 3 | 0 | Not Applicable | No | | 0 | 3 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 3 | 0 | Not Applicable | No | | 0 | 3 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 0 | 3 | 0 | Not Applicable | No | | 0 | 3 | 0 | Not Applicable |
| 10 | Evidence of bog pools | 0 | 3 | 0 | Not Applicable | No | | 0 | 3 | 0 | Not Applicable |
| 11 | Other | 0 | 3 | 0 | Not Applicable | No | | 0 | 3 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **Turbine T14** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties. |
| v | Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed. |
| vi | Based on available ground investigaiton, a piled turbine foundation may be required. |

**Note**
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Turbine T15 |
|---|---|

| Grid Reference (Eastings, Northings): | 662595 | 757805 |
|---|---|---|
| Distance to Watercourse (m) | > 150 | |
| Min & Max Measured Peat Depth (m): | 2.4 - 2.8 | |
| Control Required: | No | |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 4.25 (u), 2.94 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Relatively deep peat | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |

| | Control Measures to be Implemented Prior to/and During Construction for **Turbine T15** |
|---|---|
| i | Due to relatively deep peat at this turbine location, additional construction measures such as the following may be required:<br>- excavation side walls to be supported (e.g. boulders, sheet piles) or excavation facew battered to a shallow angle<br>- temporary works designer may be required to provide excavation support design<br>-daily detailed inspection of excavation faces<br>-potential for greater water inflow into excavation requiring removal of water using pumping<br>-increased exclusion zone around excavation to avoid accidental loading of crest of slope |
| ii | Maintain hydrology of area as far as possible; |
| iii | Use of experienced geotechnical staff for site investigation; |
| iv | Use of experienced contractors and trained operators to carry out the work; |
| v | Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties. |
| vi | Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed. |
| vii | Based on available ground investigaiton, a piled turbine foundation may be required. |

**Note**
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Turbine T16 |
|---|---|

| Grid Reference (Eastings, Northings): | 662765 | 757323 |
|---|---|---|
| Distance to Watercourse (m) | > 150 | |
| Min & Max Measured Peat Depth (m): | 2.5 - 4.1 | |
| Control Required: | No | |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 4.50 (u), 2.80 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Relatively deep peat | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |

| | Control Measures to be Implemented Prior to/and During Construction for **Turbine T16** |
|---|---|
| i | Due to relatively deep peat at this turbine location, additional construction measures such as the following may be required:<br>- excavation side walls to be supported (e.g. boulders, sheet piles) or excavation facew battered to a shallow angle<br>- temporary works designer may be required to provide excavation support design<br>-daily detailed inspection of excavation faces<br>-potential for greater water inflow into excavation requiring removal of water using pumping<br>-increased exclusion zone around excavation to avoid accidental loading of crest of slope |
| ii | Maintain hydrology of area as far as possible; |
| iii | Use of experienced geotechnical staff for site investigation; |
| iv | Use of experienced contractors and trained operators to carry out the work; |
| v | Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties. |
| vi | Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed. |
| vii | Based on available ground investigaiton, a piled turbine foundation may be required. |

**Note**
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Turbine T17 |
|---|---|

| | | |
|---|---|---|
| Grid Reference (Eastings, Northings): | 662002 | 756804 |
| Distance to Watercourse (m) | > 150 | |
| Min & Max Measured Peat Depth (m): | 0.6 - 1.0 | |
| Control Required: | No | |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 6.05 (u), 6.39 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 3 | 1 | 3 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Other | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **Turbine T17** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties. |
| v | Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed. |
| vi | Based on available ground investigaiton, a piled turbine foundation may be required. |

**Note**
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Turbine T18 |
|---|---|

| Grid Reference (Eastings, Northings): | 661508 | 757054 |
|---|---|---|
| Distance to Watercourse (m) | > 150 | |
| Min & Max Measured Peat Depth (m): | 2.2 - 4.4 | |
| Control Required: | No | |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 2.13 (u), 1.31 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Relatively deep peat | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |

| | Control Measures to be Implemented Prior to/and During Construction for **Turbine T18** |
|---|---|
| i | Due to relatively deep peat at this turbine location, additional construction measures such as the following may be required:<br>- excavation side walls to be supported (e.g. boulders, sheet piles) or excavation facew battered to a shallow angle<br>- temporary works designer may be required to provide excavation support design<br>-daily detailed inspection of excavation faces<br>-potential for greater water inflow into excavation requiring removal of water using pumping<br>-increased exclusion zone around excavation to avoid accidental loading of crest of slope |
| ii | Maintain hydrology of area as far as possible; |
| iii | Use of experienced geotechnical staff for site investigation; |
| iv | Use of experienced contractors and trained operators to carry out the work; |
| v | Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties. |
| vi | Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed. |
| vii | Based on available ground investigaiton, a piled turbine foundation may be required. |

**Note**
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Turbine T19 |
|---|---|

| | | |
|---|---|---|
| Grid Reference (Eastings, Northings): | 665118 | 758520 |
| Distance to Watercourse (m) | 100 - 150 | |
| Min & Max Measured Peat Depth (m): | 2.0 - 2.8 | |
| Control Required: | No | |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 3.03 (u), 2.05 (d) | 1 | 2 | 2 | Negligible | No | | 1 | 2 | 2 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 2 | 2 | Negligible | No | | 1 | 2 | 2 | Negligible |
| 3 | Evidence of surface water flow | 3 | 2 | 6 | Low | No | | 2 | 2 | 4 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 2 | 0 | Not Applicable | No | | 0 | 2 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 2 | 4 | Negligible | No | | 2 | 2 | 4 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 2 | 4 | Negligible | No | See Below | 2 | 2 | 4 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 2 | 0 | Not Applicable | No | | 0 | 2 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 2 | 0 | Not Applicable | No | | 0 | 2 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 0 | 2 | 0 | Not Applicable | No | | 0 | 2 | 0 | Not Applicable |
| 10 | Evidence of bog pools | 0 | 2 | 0 | Not Applicable | No | | 0 | 2 | 0 | Not Applicable |
| 11 | Relatively deep peat | 3 | 2 | 6 | Low | No | | 2 | 2 | 4 | Negligible |

| | Control Measures to be Implemented Prior to/and During Construction for **Turbine T19** |
|---|---|
| i | Due to relatively deep peat at this turbine location, additional construction measures such as the following may be required:<br>- excavation side walls to be supported (e.g. boulders, sheet piles) or excavation facew battered to a shallow angle<br>- temporary works designer may be required to provide excavation support design<br>-daily detailed inspection of excavation faces<br>-potential for greater water inflow into excavation requiring removal of water using pumping<br>-increased exclusion zone around excavation to avoid accidental loading of crest of slope |
| ii | Maintain hydrology of area as far as possible; |
| iii | Use of experienced geotechnical staff for site investigation; |
| iv | Use of experienced contractors and trained operators to carry out the work; |
| v | Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties. |
| vi | Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed. |
| vii | Based on available ground investigaiton, a piled turbine foundation may be required. |

**Note**
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Turbine T20 |
|---|---|

| Grid Reference (Eastings, Northings): | 665844 | 758647 |
|---|---|---|
| Distance to Watercourse (m) | > 150 | |
| Min & Max Measured Peat Depth (m): | 1.6 - 2.0 | |
| Control Required: | No | |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 7.65 (u), 5.73 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 3 | 1 | 3 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Other | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **Turbine T20** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties. |
| v | Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed. |
| vi | Based on available ground investigaiton, a piled turbine foundation may be required. |

**Note**
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Turbine T21 |
|---|---|

| Grid Reference (Eastings, Northings): | 664274 | 759054 |
|---|---|---|
| Distance to Watercourse (m) | 100 - 150 | |
| Min & Max Measured Peat Depth (m): | 0.8 - 1.0 | |
| Control Required: | No | |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 8.06 (u), 8.50 (d) | 1 | 2 | 2 | Negligible | No | See Below | 1 | 2 | 2 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 2 | 2 | Negligible | No | | 1 | 2 | 2 | Negligible |
| 3 | Evidence of surface water flow | 3 | 2 | 6 | Low | No | | 2 | 2 | 4 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 2 | 0 | Not Applicable | No | | 0 | 2 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 2 | 4 | Negligible | No | | 2 | 2 | 4 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 2 | 4 | Negligible | No | | 2 | 2 | 4 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 2 | 0 | Not Applicable | No | | 0 | 2 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 2 | 0 | Not Applicable | No | | 0 | 2 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 0 | 2 | 0 | Not Applicable | No | | 2 | 2 | 4 | Negligible |
| 10 | Evidence of bog pools | 0 | 2 | 0 | Not Applicable | No | | 0 | 2 | 0 | Not Applicable |
| 11 | Other | 0 | 2 | 0 | Not Applicable | No | | 0 | 2 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **Turbine T21** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties. |
| v | Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed. |
| vi | Based on available ground investigaiton, a piled turbine foundation may be required. |

**Note**
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Turbine T22 |
|---|---|

| | | |
|---|---|---|
| Grid Reference (Eastings, Northings): | 664023 | 759553 |
| Distance to Watercourse (m) | > 150 | |
| Min & Max Measured Peat Depth (m): | 1.2 - 1.6 | |
| Control Required: | No | |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 9.56 (u), 8.19 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 3 | 1 | 3 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Other | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **Turbine T22** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties. |
| v | Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed. |
| vi | Based on available ground investigaiton, a piled turbine foundation may be required. |

**Note**

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Turbine T23 |
|---|---|

| Grid Reference (Eastings, Northings): | 664744 | 759727 |
|---|---|---|
| Distance to Watercourse (m) | > 150 | |
| Min & Max Measured Peat Depth (m): | 2.1 - 3.1 | |
| Control Required: | No | |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 5.59 (u), 3.70 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 1 | 1 | 1 | Negligible | No | | 0 | 1 | 0 | Not Applicable |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Relatively deep peat | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |

| | Control Measures to be Implemented Prior to/and During Construction for **Turbine T23** |
|---|---|
| i | Due to relatively deep peat at this turbine location, additional construction measures such as the following may be required:<br>- excavation side walls to be supported (e.g. boulders, sheet piles) or excavation facew battered to a shallow angle<br>- temporary works designer may be required to provide excavation support design<br>-daily detailed inspection of excavation faces<br>-potential for greater water inflow into excavation requiring removal of water using pumping<br>-increased exclusion zone around excavation to avoid accidental loading of crest of slope |
| ii | Maintain hydrology of area as far as possible; |
| iii | Use of experienced geotechnical staff for site investigation; |
| iv | Use of experienced contractors and trained operators to carry out the work; |
| v | Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties. |
| vi | Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed. |
| vii | Based on available ground investigaiton, a piled turbine foundation may be required. |

**Note**
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Turbine T24 |
|---|---|

| Grid Reference (Eastings, Northings): | 665464 | 759850 |
|---|---|---|
| Distance to Watercourse (m) | > 150 | |
| Min & Max Measured Peat Depth (m): | 1.6 - 3.35 | |
| Control Required: | No | |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 3.52 (u), 2.28 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 1 | 1 | 1 | Negligible | No | | 0 | 1 | 0 | Not Applicable |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Relatively deep peat | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |

| | Control Measures to be Implemented Prior to/and During Construction for **Turbine T24** |
|---|---|
| i | Due to relatively deep peat at this turbine location, additional construction measures such as the following may be required:<br>- excavation side walls to be supported (e.g. boulders, sheet piles) or excavation facew battered to a shallow angle<br>- temporary works designer may be required to provide excavation support design<br>-daily detailed inspection of excavation faces<br>-potential for greater water inflow into excavation requiring removal of water using pumping<br>-increased exclusion zone around excavation to avoid accidental loading of crest of slope |
| ii | Maintain hydrology of area as far as possible; |
| iii | Use of experienced geotechnical staff for site investigation; |
| iv | Use of experienced contractors and trained operators to carry out the work; |
| v | Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties. |
| vi | Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed. |
| vii | Based on available ground investigaiton, a piled turbine foundation may be required. |

**Note**
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Turbine T25 |
|---|---|

| Grid Reference (Eastings, Northings): | 665735 | 759326 |
|---|---|---|
| Distance to Watercourse (m) | > 150 | |
| Min & Max Measured Peat Depth (m): | 2.0 - 3.85 | |
| Control Required: | No | |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 4.73 (u), 2.98 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 1 | 1 | 1 | Negligible | No | | 0 | 1 | 0 | Not Applicable |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Relatively deep peat | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |

| | Control Measures to be Implemented Prior to/and During Construction for **Turbine T25** |
|---|---|
| i | Due to relatively deep peat at this turbine location, additional construction measures such as the following may be required:<br>- excavation side walls to be supported (e.g. boulders, sheet piles) or excavation facew battered to a shallow angle<br>- temporary works designer may be required to provide excavation support design<br>-daily detailed inspection of excavation faces<br>-potential for greater water inflow into excavation requiring removal of water using pumping<br>-increased exclusion zone around excavation to avoid accidental loading of crest of slope |
| ii | Maintain hydrology of area as far as possible; |
| iii | Use of experienced geotechnical staff for site investigation; |
| iv | Use of experienced contractors and trained operators to carry out the work; |
| v | Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties. |
| vi | Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed. |
| vii | Based on available ground investigaiton, a piled turbine foundation may be required. |

**Note**
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Turbine T26 |
|---|---|

| Grid Reference (Eastings, Northings): | 665028 | 759172 |
|---|---|---|
| Distance to Watercourse (m) | > 150 | |
| Min & Max Measured Peat Depth (m): | 1.7 - 2.3 | |
| Control Required: | No | |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 6.95 (u), 4.99 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 1 | 1 | 1 | Negligible | No | | 0 | 1 | 0 | Not Applicable |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Other | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **Turbine T26** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties. |
| v | Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed. |
| vi | Based on available ground investigaiton, a piled turbine foundation may be required. |

**Note**
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

# Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Met. Mast (1) |
|---|---|

| Grid Reference (Eastings, Northings): | 661518 | 756595 |
|---|---|---|
| Distance to Watercourse (m) | > 150 | |
| Min & Max Measured Peat Depth (m): | 2.5 - 3.0 | |
| Control Required: | No | |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 5.73 (u), 3.82 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 3 | 1 | 3 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 3 | 1 | 3 | Negligible | No | | 3 | 1 | 3 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Relatively deep peat | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |

| | Control Measures to be Implemented Prior to/and During Construction for **Met. Mast** 1 |
|---|---|
| i | Due to relatively deep peat at this turbine location, additional construction measures such as the following may be required:<br>- excavation side walls to be supported (e.g. boulders, sheet piles) or excavation facew battered to a shallow angle<br>- temporary works designer may be required to provide excavation support design<br>-daily detailed inspection of excavation faces<br>-potential for greater water inflow into excavation requiring removal of water using pumping<br>-increased exclusion zone around excavation to avoid accidental loading of crest of slope |
| ii | Maintain hydrology of area as far as possible; |
| iii | Use of experienced geotechnical staff for site investigation; |
| iv | Use of experienced contractors and trained operators to carry out the work; |
| v | Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties. |
| vi | Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed. |
| vii | Based on available ground investigaiton, a piled turbine foundation may be required. |

**Note**
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Met. Mast (2) |
|---|---|

| | | |
|---|---|---|
| **Grid Reference (Eastings, Northings):** | **663677** | **752816** |
| **Distance to Watercourse (m)** | **> 150** | |
| **Min & Max Measured Peat Depth (m):** | **1.5 - 2.0** | |
| **Control Required:** | **No** | |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 7.65 (u), 5.73 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 3 | 1 | 3 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 3 | 1 | 3 | Negligible | No | | 3 | 1 | 3 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Other | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **Met. Mast 2** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties. |

**Note**
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Car Park (1) |
|---|---|

| | | |
|---|---|---|
| Grid Reference (Eastings, Northings): | 664349 | 757812 |
| Distance to Watercourse (m) | 50 - 100 | |
| Min & Max Measured Peat Depth (m): | 1.0 - 2.0 | |
| Control Required: | No | |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 5.10 (u), 3.83 (d) | 1 | 3 | 3 | Negligible | No | See Below | 1 | 3 | 3 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 3 | 3 | Negligible | No | | 1 | 3 | 3 | Negligible |
| 3 | Evidence of surface water flow | 3 | 3 | 9 | Low | No | | 3 | 3 | 9 | Low |
| 4 | Evidence of previous failures/slips | 0 | 3 | 0 | Not Applicable | No | | 0 | 3 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 3 | 6 | Low | No | | 2 | 3 | 6 | Low |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 3 | 3 | 9 | Low | No | | 3 | 3 | 9 | Low |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 3 | 0 | Not Applicable | No | | 0 | 3 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 3 | 0 | Not Applicable | No | | 0 | 3 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 0 | 3 | 0 | Not Applicable | No | | 0 | 3 | 0 | Not Applicable |
| 10 | Evidence of bog pools | 0 | 3 | 0 | Not Applicable | No | | 0 | 3 | 0 | Not Applicable |
| 11 | Other | 0 | 3 | 0 | Not Applicable | No | | 0 | 3 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **Car Park 1** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Detailed ground investigation to determine bedrock condition and properties. |

**Note**
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Substation |
|---|---|

| | | |
|---|---|---|
| Grid Reference (Eastings, Northings): | 663666 | 755339 |
| Distance to Watercourse (m) | > 150 | |
| Min & Max Measured Peat Depth (m): | 1.0 - 1.9 | |
| Control Required: | No | |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 8.19 (u), 6.04 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 3 | 1 | 3 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 3 | 1 | 3 | Negligible | No | | 3 | 1 | 3 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Other | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **Substation 1** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Detailed ground investigation to determine bedrock condition and properties. |

**Note**
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Const. Comp. (1) |
|---|---|

| | | |
|---|---|---|
| Grid Reference (Eastings, Northings): | 663980 | 757341 |
| Distance to Watercourse (m) | 100 - 150 | |
| Min & Max Measured Peat Depth (m): | 2.1 - 3.1 | |
| Control Required: | No | |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 5.59 (u), 3.70 (d) | 1 | 2 | 2 | Negligible | No | See Below | 1 | 2 | 2 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 2 | 2 | Negligible | No | | 1 | 2 | 2 | Negligible |
| 3 | Evidence of surface water flow | 3 | 2 | 6 | Low | No | | 3 | 2 | 6 | Low |
| 4 | Evidence of previous failures/slips | 0 | 2 | 0 | Not Applicable | No | | 0 | 2 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 2 | 4 | Negligible | No | | 2 | 2 | 4 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 3 | 2 | 6 | Low | No | | 3 | 2 | 6 | Low |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 2 | 0 | Not Applicable | No | | 0 | 2 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 2 | 0 | Not Applicable | No | | 0 | 2 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 0 | 2 | 0 | Not Applicable | No | | 0 | 2 | 0 | Not Applicable |
| 10 | Evidence of bog pools | 0 | 2 | 0 | Not Applicable | No | | 0 | 2 | 0 | Not Applicable |
| 11 | Relatively deep peat | 3 | 2 | 6 | Low | No | | 2 | 2 | 4 | Negligible |

| | Control Measures to be Implemented Prior to/and During Construction for **Construction Compound 1** |
|---|---|
| i | Due to relatively deep peat at this turbine location, additional construction measures such as the following may be required:<br>- excavation side walls to be supported (e.g. boulders, sheet piles) or excavation facew battered to a shallow angle<br>- temporary works designer may be required to provide excavation support design<br>-daily detailed inspection of excavation faces<br>-potential for greater water inflow into excavation requiring removal of water using pumping<br>-increased exclusion zone around excavation to avoid accidental loading of crest of slope |
| ii | Maintain hydrology of area as far as possible; |
| iii | Use of experienced geotechnical staff for site investigation; |
| iv | Use of experienced contractors and trained operators to carry out the work; |
| v | Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties. |
| vi | Inspection & approval of turbine base sub-formation by a competent person where a gravity type foundation base is constructed. |
| vii | Based on available ground investigaiton, a piled turbine foundation may be required. |

**Note**
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

# Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Const. Comp. (2) |
|---|---|

| | | |
|---|---|---|
| **Grid Reference (Eastings, Northings):** | **663517** | **755194** |
| **Distance to Watercourse (m)** | **> 150** | |
| **Min & Max Measured Peat Depth (m):** | **0.5 - 1.9** | |
| **Control Required:** | **No** | |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 7.91 (u), 6.04 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 3 | 1 | 3 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 3 | 1 | 3 | Negligible | No | | 3 | 1 | 3 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Other | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **Construction Compound 2** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties. |

**Note**
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Main Const. Comp. |
|---|---|

| Grid Reference (Eastings, Northings): | 664542 | 754056 |
|---|---|---|
| Distance to Watercourse (m) | > 150 | |
| Min & Max Measured Peat Depth (m): | 1.2 - 1.8 | |
| Control Required: | No | |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 8.82 (u), 6.37 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 3 | 1 | 3 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 3 | 1 | 3 | Negligible | No | | 3 | 1 | 3 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Other | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **Construction Compound 3** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties. |

**Note**
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Const. Comp. (4) |
|---|---|

| Grid Reference (Eastings, Northings): | 661791 | 756641 |
|---|---|---|
| Distance to Watercourse (m) | > 150 | |
| Min & Max Measured Peat Depth (m): | 0.9 - 2.0 | |
| Control Required: | No | |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 7.65 (u), 5.73 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 3 | 1 | 3 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 3 | 1 | 3 | Negligible | No | | 3 | 1 | 3 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Other | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **Construction Compound 4** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties. |

**Note**
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Const. Comp. (5) |
|---|---|

| | | |
|---|---|---|
| **Grid Reference (Eastings, Northings):** | **665323** | **751430** |
| **Distance to Watercourse (m)** | **> 150** | |
| **Min & Max Measured Peat Depth (m):** | **0.8 - 1.8** | |
| **Control Required:** | **No** | |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 8.19 (u), 6.37 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 3 | 1 | 3 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 3 | 1 | 3 | Negligible | No | | 3 | 1 | 3 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Other | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **Construction Compound 5** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties. |

**Note**
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Borrow Pit 1a/1b |
|---|---|

| | |
|---|---|
| Grid Reference (Eastings, Northings): | 664226 755100 |
| Distance to Watercourse (m) | > 150 |
| Min & Max Measured Peat Depth (m): | 0 - 2.1 |
| Control Required: | No |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 4.60 (u), 3.83 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 3 | 1 | 3 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 3 | 1 | 3 | Negligible | No | | 3 | 1 | 3 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Other | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **Borrow Pit 1/1a** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties. |

**Note**
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Borrow Pit 2 |
|---|---|

| | | |
|---|---|---|
| Grid Reference (Eastings, Northings): | 665330 | 751430 |
| Distance to Watercourse (m) | > 150 | |
| Min & Max Measured Peat Depth (m): | 0 - 2.1 | |
| Control Required: | No | |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 4.60 (u), 3.83 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 3 | 1 | 3 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 3 | 1 | 3 | Negligible | No | | 3 | 1 | 3 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Other | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **Borrow Pit 2** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Detailed ground investigation to determine peat, mineral soil and bedrock condition and properties. |

**Note**
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix E.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Road from Site Entrance to T12 |
|---|---|

| | |
|---|---|
| **Grid Reference (Eastings, Northings):** | **Varies** |
| **Distance to Watercourse (m)** | **> 150** |
| **Min & Max Measured Peat Depth (m):** | **1.5-2.0** |
| **Control Required:** | **No** |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 6.12 (u), 5.10 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Other | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **Main Entrance Road to T12** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties. |

**Note**
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Road from T12 to T1 |
|---|---|

| | |
|---|---|
| **Grid Reference (Eastings, Northings):** | **Varies** |
| **Distance to Watercourse (m)** | **> 150** |
| **Min & Max Measured Peat Depth (m):** | **1.1-1.9** |
| **Control Required:** | **No** |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 4.61 (u), 4.03 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Other | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **T12 to T1** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties. |

**Note**
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Road from T1 to T2 |
|---|---|

| | |
|---|---|
| **Grid Reference (Eastings, Northings):** | **Varies** |
| **Distance to Watercourse (m)** | **> 150** |
| **Min & Max Measured Peat Depth (m):** | **1.8-3.1** |
| **Control Required:** | **No** |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 5.59 (u), 3.70 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Other | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **T1 to T2** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties. |

**Note**
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Road from T2 to T3 |
|---|---|

| | |
|---|---|
| **Grid Reference (Eastings, Northings):** | **Varies** |
| **Distance to Watercourse (m)** | **> 150** |
| **Min & Max Measured Peat Depth (m):** | **1.2-2.0** |
| **Control Required:** | **No** |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 7.65 (u), 5.73 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Other | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **T2to T3** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties. |

**Note**
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Road from T3 to T4 |
|---|---|

| | |
|---|---|
| **Grid Reference (Eastings, Northings):** | **Varies** |
| **Distance to Watercourse (m)** | **> 150** |
| **Min & Max Measured Peat Depth (m):** | **1.5-2.4** |
| **Control Required:** | **No** |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 4.50 (u), 3.19 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Other | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **T3 to T4** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties. |

**Note**
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Road from T4 to T7 |
|---|---|

| | |
|---|---|
| **Grid Reference (Eastings, Northings):** | **Varies** |
| **Distance to Watercourse (m)** | **> 150** |
| **Min & Max Measured Peat Depth (m):** | **1.3-1.9** |
| **Control Required:** | **No** |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 4.50 (u), 3.19 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Other | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **T4 to T7** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties. |

**Note**
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Road from T7 to T8 |
|---|---|

| | |
|---|---|
| **Grid Reference (Eastings, Northings):** | **Varies** |
| **Distance to Watercourse (m)** | **> 150** |
| **Min & Max Measured Peat Depth (m):** | **1.0-1.8** |
| **Control Required:** | **No** |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 6.12 (u), 5.10(d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Other | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **T7 to T8** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties. |

**Note**
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Road from T8 to T9 |
|---|---|

| | |
|---|---|
| **Grid Reference (Eastings, Northings):** | **Varies** |
| **Distance to Watercourse (m)** | **< 50** |
| **Min & Max Measured Peat Depth (m):** | **0.9-3.3** |
| **Control Required:** | **No** |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 3.56 (u), 2.32 (d) | 1 | 4 | 4 | Negligible | No | | 1 | 4 | 4 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 4 | 4 | Negligible | No | | 1 | 4 | 4 | Negligible |
| 3 | Evidence of surface water flow | 3 | 4 | 12 | Medium | No | | 2 | 4 | 8 | Low |
| 4 | Evidence of previous failures/slips | 0 | 4 | 0 | Not Applicable | No | | 0 | 4 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 4 | 8 | Low | No | | 1 | 4 | 4 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 4 | 8 | Low | No | See Below | 2 | 4 | 8 | Low |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 4 | 0 | Not Applicable | No | | 0 | 4 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 4 | 0 | Not Applicable | No | | 0 | 4 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 1 | 4 | 4 | Negligible | No | | 1 | 4 | 4 | Negligible |
| 10 | Evidence of bog pools | 0 | 4 | 0 | Not Applicable | No | | 0 | 4 | 0 | Not Applicable |
| 11 | Other | 0 | 4 | 0 | Not Applicable | No | | 0 | 4 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **T8 to T9** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties. |

**Note**
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| **Location:** | **Road from T9 to T10** |
|---|---|

| | |
|---|---|
| **Grid Reference (Eastings, Northings):** | **Varies** |
| **Distance to Watercourse (m)** | **> 150** |
| **Min & Max Measured Peat Depth (m):** | **0.8-2.3** |
| **Control Required:** | **No** |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 5.00 (u), 4.42 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Other | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **T9 to T10** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties. |

**Note**
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Road from T10 - Met. Mast |
|---|---|

| | |
|---|---|
| **Grid Reference (Eastings, Northings):** | **Varies** |
| **Distance to Watercourse (m)** | **> 150** |
| **Min & Max Measured Peat Depth (m):** | **1.0-1.7** |
| **Control Required:** | **No** |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 4.26 (u), 3.38 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Other | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **T10 to Met Mast** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Installation of appropriate drainge measures to alleviate ingress of surface water into excavations |
| iii | Use of experienced geotechnical staff for site investigation; |
| iv | Use of experienced contractors and trained operators to carry out the work; |
| v | Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties. |

**Note**
(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Road from Met. Mast to T6 |
|---|---|

| | |
|---|---|
| **Grid Reference (Eastings, Northings):** | **Varies** |
| **Distance to Watercourse (m)** | **> 150** |
| **Min & Max Measured Peat Depth (m):** | **0.6-1.4** |
| **Control Required:** | **No** |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 7.65 (u), 5.73 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Other | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **Met Mast to T6** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties. |

**Note**

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Road from T6 to T5 |
|---|---|

| | |
|---|---|
| **Grid Reference (Eastings, Northings):** | **Varies** |
| **Distance to Watercourse (m)** | **> 150** |
| **Min & Max Measured Peat Depth (m):** | **1.1-2.7** |
| **Control Required:** | **No** |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 6.20 (u), 4.25 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Other | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **T6 to T5** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties. |

**Note**

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Road from T5 to T4 |
|---|---|

| | |
|---|---|
| **Grid Reference (Eastings, Northings):** | **Varies** |
| **Distance to Watercourse (m)** | **> 150** |
| **Min & Max Measured Peat Depth (m):** | **1.0-2.1** |
| **Control Required:** | **No** |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 7.40 (u), 5.46 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Other | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **T5 to T4** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties. |

**Note**

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Road from Met. Mast to T12 |
|---|---|

| | |
|---|---|
| **Grid Reference (Eastings, Northings):** | **Varies** |
| **Distance to Watercourse (m)** | **> 150** |
| **Min & Max Measured Peat Depth (m):** | **0.6-2.8** |
| **Control Required:** | **No** |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 3.03 (u), 2.05 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Other | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **Met Mast to T12** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties. |

**Note**

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Site Entance to Borrow Pit 1a/b. |
|---|---|

| | |
|---|---|
| **Grid Reference (Eastings, Northings):** | **Varies** |
| **Distance to Watercourse (m)** | **> 150** |
| **Min & Max Measured Peat Depth (m):** | **1.5-3.0** |
| **Control Required:** | **No** |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 3.28 (u), 2.30 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Other | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **Site Entrance to Borrow Pit 1a/b** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties. |

**Note**

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Road from Borrow Pit 1a/b to T13 |
|---|---|

| | |
|---|---|
| **Grid Reference (Eastings, Northings):** | **Varies** |
| **Distance to Watercourse (m)** | **> 150** |
| **Min & Max Measured Peat Depth (m):** | **0.5-1.8** |
| **Control Required:** | **No** |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 4.11 (u), 3.19 (d) | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | See Below | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Other | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **Borrow Pit 1a/b to T13** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties. |

**Note**

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Road from T13 to CCP1 |
|---|---|

| | |
|---|---|
| **Grid Reference (Eastings, Northings):** | **Varies** |
| **Distance to Watercourse (m)** | **> 150** |
| **Min & Max Measured Peat Depth (m):** | **1.0-2.0** |
| **Control Required:** | **No** |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 8.50 (u), 6.75 (d) | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | See Below | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Other | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **T13 to CCP1** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties. |

**Note**

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Road from CCP1 to T19 |
|---|---|

| | |
|---|---|
| **Grid Reference (Eastings, Northings):** | **Varies** |
| **Distance to Watercourse (m)** | **< 50** |
| **Min & Max Measured Peat Depth (m):** | **0.6-2.0** |
| **Control Required:** | **No** |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 4.33 (u), 2.67 (d) | 1 | 4 | 4 | Negligible | No | See Below | 1 | 4 | 4 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 4 | 4 | Negligible | No | | 1 | 4 | 4 | Negligible |
| 3 | Evidence of surface water flow | 3 | 4 | 12 | Medium | No | | 2 | 4 | 8 | Low |
| 4 | Evidence of previous failures/slips | 0 | 4 | 0 | Not Applicable | No | | 0 | 4 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 4 | 8 | Low | No | | 1 | 4 | 4 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 4 | 8 | Low | No | | 2 | 4 | 8 | Low |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 4 | 0 | Not Applicable | No | | 0 | 4 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 4 | 0 | Not Applicable | No | | 0 | 4 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 1 | 4 | 4 | Negligible | No | | 1 | 4 | 4 | Negligible |
| 10 | Evidence of bog pools | 0 | 4 | 0 | Not Applicable | No | | 0 | 4 | 0 | Not Applicable |
| 11 | Other | 0 | 4 | 0 | Not Applicable | No | | 0 | 4 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **CCP1 to T19** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties. |

**Note**

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Road from T19 to T20 |
|---|---|

| | |
|---|---|
| **Grid Reference (Eastings, Northings):** | **Varies** |
| **Distance to Watercourse (m)** | **> 150** |
| **Min & Max Measured Peat Depth (m):** | **1.1-1.5** |
| **Control Required:** | **No** |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 9.17 (u), 7.65 (d) | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | See Below | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Other | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **Spur to T3** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties. |

**Note**

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Road from T19 to T21 |
|---|---|

| | |
|---|---|
| **Grid Reference (Eastings, Northings):** | **Varies** |
| **Distance to Watercourse (m)** | **> 150** |
| **Min & Max Measured Peat Depth (m):** | **0.6-1.5** |
| **Control Required:** | **No** |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 4.60 (u), 3.83 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Other | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **T19 to T21** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties. |

**Note**

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Road from T21 to T22 |
|---|---|

| | |
|---|---|
| **Grid Reference (Eastings, Northings):** | **Varies** |
| **Distance to Watercourse (m)** | **100 - 150** |
| **Min & Max Measured Peat Depth (m):** | **1.0-2.0** |
| **Control Required:** | **No** |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 5.10 (u), 3.83 (d) | 1 | 2 | 2 | Negligible | No | See Below | 1 | 2 | 2 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 2 | 2 | Negligible | No | | 1 | 2 | 2 | Negligible |
| 3 | Evidence of surface water flow | 3 | 2 | 6 | Low | No | | 2 | 2 | 4 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 2 | 0 | Not Applicable | No | | 0 | 2 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 2 | 4 | Negligible | No | | 1 | 2 | 2 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 2 | 4 | Negligible | No | | 2 | 2 | 4 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 2 | 0 | Not Applicable | No | | 0 | 2 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 2 | 0 | Not Applicable | No | | 0 | 2 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 1 | 2 | 2 | Negligible | No | | 1 | 2 | 2 | Negligible |
| 10 | Evidence of bog pools | 0 | 2 | 0 | Not Applicable | No | | 0 | 2 | 0 | Not Applicable |
| 11 | Other | 0 | 2 | 0 | Not Applicable | No | | 0 | 2 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **T21 to T22** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties. |

**Note**

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Road from T22 to T23 |
|---|---|

| | |
|---|---|
| **Grid Reference (Eastings, Northings):** | **Varies** |
| **Distance to Watercourse (m)** | **> 150** |
| **Min & Max Measured Peat Depth (m):** | **1.3-2.0** |
| **Control Required:** | **No** |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 7.65 (u), 5.73 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Other | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **T22 to T23** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties. |

**Note**

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Road from T23 to T24 |
|---|---|

| | |
|---|---|
| **Grid Reference (Eastings, Northings):** | **Varies** |
| **Distance to Watercourse (m)** | **> 150** |
| **Min & Max Measured Peat Depth (m):** | **2.1-4.2** |
| **Control Required:** | **No** |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 4.50 (u), 3.19 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Other | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **T23 to T24** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties. |

**Note**

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Road from T24 to T25 |
|---|---|

| | |
|---|---|
| **Grid Reference (Eastings, Northings):** | **Varies** |
| **Distance to Watercourse (m)** | **> 150** |
| **Min & Max Measured Peat Depth (m):** | **0.6-1.5** |
| **Control Required:** | **No** |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 5.10 (u), 3.83 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Other | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **T24 to T25** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties. |

**Note**

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Road from T25 to T26 |
|---|---|

| | |
|---|---|
| **Grid Reference (Eastings, Northings):** | **Varies** |
| **Distance to Watercourse (m)** | **> 150** |
| **Min & Max Measured Peat Depth (m):** | **0.6-1.7** |
| **Control Required:** | **No** |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 8.50 (u), 6.75 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Other | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **T25 to T26** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties. |

**Note**

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| **Location:** | **Road from T26 to T21** |
|---|---|

| | |
|---|---|
| **Grid Reference (Eastings, Northings):** | **Varies** |
| **Distance to Watercourse (m)** | **> 150** |
| **Min & Max Measured Peat Depth (m):** | **0.9-1.5** |
| **Control Required:** | **No** |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 6.66 (u), 5.89 (d) | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | See Below | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Other | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **T26 to T21** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties. |

**Note**

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Road from T13 - T14 |
|---|---|

| | |
|---|---|
| **Grid Reference (Eastings, Northings):** | **Varies** |
| **Distance to Watercourse (m)** | **> 150** |
| **Min & Max Measured Peat Depth (m):** | **1.2-2.0** |
| **Control Required:** | **No** |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 7.65 (u), 5.73 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Other | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **T13 to T14** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties. |

**Note**

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Road from T14 to T15 |
|---|---|

| | |
|---|---|
| **Grid Reference (Eastings, Northings):** | **Varies** |
| **Distance to Watercourse (m)** | **> 150** |
| **Min & Max Measured Peat Depth (m):** | **1.1-2.6** |
| **Control Required:** | **No** |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 5.10 (u), 3.83 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Other | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **T14 to T15** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties. |

**Note**

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| **Location:** | **Road from T15 to T16** |
|---|---|

| | |
|---|---|
| **Grid Reference (Eastings, Northings):** | **Varies** |
| **Distance to Watercourse (m)** | **> 150** |
| **Min & Max Measured Peat Depth (m):** | **1.1-2.0** |
| **Control Required:** | **No** |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 5.10 (u), 3.83 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Other | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **T15 to T16** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties. |

**Note**

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Road from T16 to T17 |
|---|---|

| | |
|---|---|
| **Grid Reference (Eastings, Northings):** | **Varies** |
| **Distance to Watercourse (m)** | **> 150** |
| **Min & Max Measured Peat Depth (m):** | **0.7-2.8** |
| **Control Required:** | **No** |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 6.04 (u), 4.10 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Other | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **T16 to T17** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties. |

**Note**

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Road from T17 to T18 |
|---|---|

| | |
|---|---|
| **Grid Reference (Eastings, Northings):** | **Varies** |
| **Distance to Watercourse (m)** | **> 150** |
| **Min & Max Measured Peat Depth (m):** | **0.8-2.5** |
| **Control Required:** | **No** |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 3.28 (u), 2.30 (d) | 1 | 1 | 1 | Negligible | No | See Below | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Other | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **T17 to T18** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties. |

**Note**

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

## Ballivor Wind Farm - Peat Stability Risk Register (Rev 0)

| Location: | Road from T17 to Borrow Pit 2 |
|---|---|

| | |
|---|---|
| **Grid Reference (Eastings, Northings):** | **Varies** |
| **Distance to Watercourse (m)** | **> 150** |
| **Min & Max Measured Peat Depth (m):** | **1.0-3.2** |
| **Control Required:** | **No** |

| | | Pre-Control Measure Implementation | | | | | | Post-Control Measure Implementation | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ref. | Contributory/Qualitative Factors to Potential Peat Failure | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating | Control Required | Control measures to be implemented during construction | Prob (Note 2) | Impact (Note 3) | Risk | Risk Rating |
| 1 | FOS = 3.64 (u), 2.39 (d) | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 2 | Evidence of sub peat water flow | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 3 | Evidence of surface water flow | 3 | 1 | 3 | Negligible | No | | 2 | 1 | 2 | Negligible |
| 4 | Evidence of previous failures/slips | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 5 | Type of vegetation | 2 | 1 | 2 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 6 | General slope characteristics upslope/downslope from infrastructure location | 2 | 1 | 2 | Negligible | No | See Below | 2 | 1 | 2 | Negligible |
| 7 | Evidence of very soft/soft clay at base of peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 8 | Evidence of mechanically cut peat | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 9 | Evidence of quaking or buoyant peat | 1 | 1 | 1 | Negligible | No | | 1 | 1 | 1 | Negligible |
| 10 | Evidence of bog pools | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |
| 11 | Other | 0 | 1 | 0 | Not Applicable | No | | 0 | 1 | 0 | Not Applicable |

| | Control Measures to be Implemented Prior to/and During Construction for **T17 to Borrow Pit 2** |
|---|---|
| i | Maintain hydrology of area as far as possible; |
| ii | Use of experienced geotechnical staff for site investigation; |
| iii | Use of experienced contractors and trained operators to carry out the work; |
| iv | Confirmatory ground investigation to determine peat, mineral soil and bedrock condition and properties. |

**Note**

(1) FOS abbreviations are: u: FOS for undrained analysis, d: FOS for drained analysis.
(2) Probability assessed as per Table A and B of Appendix D in PSA.
(3) Impact based on distance of infrastructure element to nearest watercourse.

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# APPENDIX C

Calculated FOS for Peat Slopes on Site

# Calculated FoS of Natural Peat Slopes for Ballivor Wind Farm - Undrained Analysis

| Turbine No./Waypoint | Easting | Northing | Slope | Undrained shear strength | Bulk unit weight of Peat | Peat Depth | Surcharge Equivalent Placed Fill Depth (m) | Factor of Safety for Load Condition | |
|---|---|---|---|---|---|---|---|---|---|
| | | | β (deg) | $c_u$ (kPa) | γ (kN/m$^3$) | (m) | Condition (2) | Condition (1) | Condition (2) |
| T01 | 665162 | 753511 | 2 | 8 | 10 | 2.35 | 3.4 | **9.76** | **6.85** |
| T02 | 665604 | 753275 | 3 | 8 | 10 | 1.75 | 2.8 | **8.75** | **5.57** |
| T03 | 665983 | 752965 | 2 | 8 | 10 | 0.85 | 1.9 | **26.98** | **12.40** |
| T04 | 665796 | 752196 | 3 | 8 | 10 | 2.80 | 3.8 | **5.47** | **4.03** |
| T05 | 665231 | 752587 | 2 | 8 | 10 | 4.90 | 5.9 | **4.68** | **3.89** |
| T06 | 664502 | 752692 | 3 | 8 | 10 | 2.10 | 3.1 | **7.29** | **4.94** |
| T07 | 665928 | 751694 | 4 | 8 | 10 | 4.40 | 5.4 | **2.61** | **2.13** |
| T08 | 665164 | 751792 | 2 | 8 | 10 | 3.80 | 4.8 | **6.04** | **4.78** |
| T09 | 664623 | 752007 | 2 | 8 | 10 | 2.90 | 3.9 | **7.91** | **5.88** |
| T10 | 663783 | 752452 | 2 | 8 | 10 | 2.05 | 3.1 | **11.19** | **7.52** |
| T11 | 663976 | 753121 | 3 | 8 | 10 | 1.1 | 2.1 | **13.92** | **7.29** |
| T12 | 664329 | 753719 | 2 | 8 | 10 | 3.5 | 4.5 | **6.55** | **5.10** |
| T13 | 663739 | 757007 | 2 | 8 | 10 | 2.8 | 3.8 | **8.19** | **6.04** |
| T14 | 663474 | 757496 | 3 | 8 | 10 | 1.2 | 2.2 | **12.76** | **6.96** |
| T15 | 662595 | 757805 | 3 | 8 | 10 | 2.6 | 3.6 | **5.89** | **4.25** |
| T16 | 662765 | 757323 | 2 | 8 | 10 | 4.1 | 5.1 | **5.59** | **4.50** |
| T17 | 662002 | 756804 | 4 | 8 | 10 | 0.9 | 1.9 | **12.77** | **6.05** |
| T18 | 661508 | 757054 | 4 | 8 | 10 | 4.4 | 5.4 | **2.61** | **2.13** |
| T19 | 665118 | 758520 | 4 | 8 | 10 | 2.8 | 3.8 | **4.11** | **3.03** |
| T20 | 665844 | 758647 | 2 | 8 | 10 | 2 | 3.0 | **11.47** | **7.65** |
| T21 | 664274 | 759054 | 3 | 8 | 10 | 0.9 | 1.9 | **17.01** | **8.06** |
| T22 | 664023 | 759553 | 2 | 8 | 10 | 1.4 | 2.4 | **16.38** | **9.56** |
| T23 | 664744 | 759727 | 2 | 8 | 10 | 3.1 | 4.1 | **7.40** | **5.59** |
| T24 | 665464 | 759850 | 3 | 8 | 10 | 3.35 | 4.4 | **4.57** | **3.52** |
| T25 | 665735 | 759326 | 2 | 8 | 10 | 3.85 | 4.9 | **5.96** | **4.73** |
| T26 | 665028 | 759172 | 2 | 8 | 10 | 2.3 | 3.3 | **9.97** | **6.95** |
| | | | | | | | | | |
| R7 | 659651 | 757657 | 2 | 8 | 10 | 1.5 | 2.5 | **15.29** | **9.17** |
| R9 | 659841 | 757721 | 3 | 8 | 10 | 1.1 | 2.1 | **13.92** | **7.29** |
| R11 | 660029 | 757697 | 2 | 8 | 10 | 1.8 | 2.8 | **12.74** | **8.19** |
| R13 | 660211 | 757616 | 2 | 8 | 10 | 2.1 | 3.1 | **10.92** | **7.40** |
| R15 | 660389 | 757526 | 2 | 8 | 10 | 2.8 | 3.8 | **8.19** | **6.04** |
| R17 | 660455 | 757345 | 3 | 8 | 10 | 2.5 | 3.5 | **6.12** | **4.37** |
| R19 | 660517 | 757155 | 2 | 8 | 10 | 2.1 | 3.1 | **10.92** | **7.40** |
| R21 | 660638 | 756999 | 3 | 8 | 10 | 2.1 | 3.1 | **7.29** | **4.94** |
| R23 | 660819 | 756918 | 3 | 8 | 10 | 2.5 | 3.5 | **6.12** | **4.37** |
| R25 | 661012 | 756908 | 3 | 8 | 10 | 2.7 | 3.7 | **5.67** | **4.14** |
| R27 | 661200 | 756977 | 3 | 8 | 10 | 2.2 | 3.2 | **6.96** | **4.78** |
| R29 | 661388 | 757046 | 4 | 8 | 10 | 2.6 | 3.6 | **4.42** | **3.19** |
| R31 | 661584 | 757082 | 4 | 8 | 10 | 2.5 | 3.5 | **4.60** | **3.28** |
| R33 | 661781 | 757116 | 4 | 8 | 10 | 0.8 | 1.8 | **14.37** | **6.39** |
| R35 | 661978 | 757151 | 3 | 8 | 10 | 1.5 | 2.5 | **10.20** | **6.12** |
| R37 | 662175 | 757185 | 2 | 8 | 10 | 2.8 | 3.8 | **8.19** | **6.04** |
| R39 | 662372 | 757220 | 2 | 8 | 10 | 0.7 | 1.7 | **32.77** | **13.49** |
| R41 | 662569 | 757254 | 2 | 8 | 10 | 1.5 | 2.5 | **15.29** | **9.17** |
| R43 | 662762 | 757305 | 2 | 8 | 10 | 2 | 3.0 | **11.47** | **7.65** |
| R45 | 662949 | 757376 | 2 | 8 | 10 | 1.8 | 2.8 | **12.74** | **8.19** |
| R47 | 663135 | 757450 | 2 | 8 | 10 | 2 | 3.0 | **11.47** | **7.65** |
| R49 | 663304 | 757557 | 2 | 8 | 10 | 2 | 3.0 | **11.47** | **7.65** |
| R50 | 663391 | 757604 | 2 | 8 | 10 | 2.6 | 3.6 | **8.82** | **6.37** |
| R52 | 663514 | 757463 | 2 | 8 | 10 | 1.2 | 2.2 | **19.11** | **10.43** |
| R54 | 663608 | 757286 | 2 | 8 | 10 | 2 | 3.0 | **11.47** | **7.65** |
| R56 | 663702 | 757110 | 2 | 8 | 10 | 1.5 | 2.5 | **15.29** | **9.17** |
| R58 | 663795 | 756933 | 3 | 8 | 10 | 1.3 | 2.3 | **11.77** | **6.66** |
| R60 | 663844 | 756749 | 3 | 8 | 10 | 0.5 | 1.5 | **30.61** | **10.20** |
| R62 | 663786 | 756558 | 3 | 8 | 10 | 1 | 2.0 | **15.31** | **7.65** |
| R64 | 663731 | 756366 | 3 | 8 | 10 | 1.2 | 2.2 | **12.76** | **6.96** |
| R66 | 663736 | 756170 | 4 | 8 | 10 | 1.5 | 2.5 | **7.66** | **4.60** |
| R68 | 663816 | 755988 | 4 | 8 | 10 | 1.8 | 2.8 | **6.39** | **4.11** |
| R70 | 663926 | 755823 | 2 | 8 | 10 | 0.5 | 1.5 | **45.87** | **15.29** |
| R71 | 663959 | 755729 | 2 | 8 | 10 | 1.7 | 2.7 | **13.49** | **8.50** |
| R72 | 663999 | 755637 | 2 | 8 | 10 | 1.8 | 2.8 | **12.74** | **8.19** |
| R73 | 664038 | 755545 | 3 | 8 | 10 | 1.8 | 2.8 | **8.50** | **5.47** |
| R74 | 664081 | 755455 | 3 | 8 | 10 | 2.2 | 3.2 | **6.96** | **4.78** |
| R75 | 664131 | 755368 | 2 | 8 | 10 | 0.4 | 1.4 | **57.34** | **16.38** |
| R76 | 664181 | 755281 | 2 | 8 | 10 | 1 | 2.0 | **22.94** | **11.47** |
| R77 | 664230 | 755194 | 4 | 8 | 10 | 1.5 | 2.5 | **7.66** | **4.60** |
| R78 | 664280 | 755108 | 4 | 8 | 10 | 1.8 | 2.8 | **6.39** | **4.11** |
| R79 | 664328 | 755020 | 2 | 8 | 10 | 2.4 | 3.4 | **9.56** | **6.75** |
| R80 | 664376 | 754932 | 3 | 8 | 10 | 3.4 | 4.4 | **4.50** | **3.48** |
| R81 | 664423 | 754844 | 3 | 8 | 10 | 3 | 4.0 | **5.10** | **3.83** |
| R82 | 664470 | 754756 | 3 | 8 | 10 | 2.5 | 3.5 | **6.12** | **4.37** |
| R83 | 664517 | 754668 | 4 | 8 | 10 | 2.5 | 3.5 | **4.60** | **3.28** |
| R84 | 664563 | 754579 | 4 | 8 | 10 | 3 | 4.0 | **3.83** | **2.87** |
| R85 | 664589 | 754516 | 4 | 8 | 10 | 2.2 | 3.2 | **5.23** | **3.59** |
| R86 | 664612 | 754508 | 4 | 8 | 10 | 2 | 3.0 | **5.75** | **3.83** |
| R90 | 664627 | 754112 | 3 | 8 | 10 | 1.5 | 2.5 | **10.20** | **6.12** |
| R91 | 664610 | 754014 | 2 | 8 | 10 | 1.8 | 2.8 | **12.74** | **8.19** |
| R92 | 664564 | 753930 | 2 | 8 | 10 | 2.1 | 3.1 | **10.92** | **7.40** |
| R93 | 664485 | 753869 | 2 | 8 | 10 | 1.8 | 2.8 | **12.74** | **8.19** |
| R94 | 664405 | 753808 | 2 | 8 | 10 | 2 | 3.0 | **11.47** | **7.65** |
| R95 | 664332 | 753740 | 2 | 8 | 10 | 1.5 | 2.5 | **15.29** | **9.17** |
| R96 | 664264 | 753667 | 3 | 8 | 10 | 2.8 | 3.8 | **5.47** | **4.03** |
| R97 | 664196 | 753594 | 2 | 8 | 10 | 2.4 | 3.4 | **9.56** | **6.75** |
| R98 | 664133 | 753516 | 3 | 8 | 10 | 2.6 | 3.6 | **5.89** | **4.25** |
| R99 | 664077 | 753434 | 4 | 8 | 10 | 2.8 | 3.8 | **4.11** | **3.03** |
| R100 | 664043 | 753340 | 4 | 8 | 10 | 2.4 | 3.4 | **4.79** | **3.38** |
| R101 | 664009 | 753246 | 3 | 8 | 10 | 0.9 | 1.9 | **17.01** | **8.06** |

# Calculated FoS of Natural Peat Slopes for Ballivor Wind Farm - Undrained Analysis

| Turbine No./Waypoint | Easting | Northing | Slope | Undrained shear strength | Bulk unit weight of Peat | Peat Depth | Surcharge Equivalent Placed Fill Depth (m) | Factor of Safety for Load Condition | |
|---|---|---|---|---|---|---|---|---|---|
| | | | β (deg) | $c_u$ (kPa) | γ (kN/m$^3$) | (m) | Condition (2) | Condition (1) | Condition (2) |
| R102 | 663974 | 753152 | 3 | 8 | 10 | 1.2 | 2.2 | **12.76** | **6.96** |
| R103 | 663940 | 753058 | 3 | 8 | 10 | 0.4 | 1.4 | **38.27** | **10.93** |
| R104 | 663906 | 752964 | 2 | 8 | 10 | 0.9 | 1.9 | **25.49** | **12.07** |
| R105 | 663866 | 752873 | 2 | 8 | 10 | 0.6 | 1.6 | **38.23** | **14.34** |
| R106 | 663817 | 752785 | 2 | 8 | 10 | 0.6 | 1.6 | **38.23** | **14.34** |
| R107 | 663768 | 752698 | 3 | 8 | 10 | 1 | 2.0 | **15.31** | **7.65** |
| R108 | 663719 | 752611 | 3 | 8 | 10 | 1.7 | 2.7 | **9.00** | **5.67** |
| R109 | 663725 | 752520 | 4 | 8 | 10 | 1.7 | 2.7 | **6.76** | **4.26** |
| R110 | 663801 | 752455 | 4 | 8 | 10 | 1.2 | 2.2 | **9.58** | **5.23** |
| R111 | 663877 | 752390 | 4 | 8 | 10 | 1.8 | 2.8 | **6.39** | **4.11** |
| R112 | 663954 | 752326 | 2 | 8 | 10 | 1.4 | 2.4 | **16.38** | **9.56** |
| R113 | 664035 | 752270 | 2 | 8 | 10 | 1.3 | 2.3 | **17.64** | **9.97** |
| R114 | 664132 | 752244 | 2 | 8 | 10 | 2.3 | 3.3 | **9.97** | **6.95** |
| R115 | 664228 | 752219 | 4 | 8 | 10 | 0.8 | 1.8 | **14.37** | **6.39** |
| R116 | 664325 | 752193 | 4 | 8 | 10 | 1.3 | 2.3 | **8.84** | **5.00** |
| R117 | 664422 | 752167 | 4 | 8 | 10 | 1.2 | 2.2 | **9.58** | **5.23** |
| R118 | 664518 | 752140 | 3 | 8 | 10 | 1.5 | 2.5 | **10.20** | **6.12** |
| R119 | 664614 | 752113 | 3 | 8 | 10 | 1.5 | 2.5 | **10.20** | **6.12** |
| R120 | 664710 | 752085 | 3 | 8 | 10 | 1 | 2.0 | **15.31** | **7.65** |
| R121 | 664807 | 752058 | 3 | 8 | 10 | 3.3 | 4.3 | **4.64** | **3.56** |
| R122 | 664887 | 751999 | 4 | 8 | 10 | 0.9 | 1.9 | **12.77** | **6.05** |
| R123 | 664964 | 751936 | 4 | 8 | 10 | 2 | 3.0 | **5.75** | **3.83** |
| R124 | 665042 | 751873 | 4 | 8 | 10 | 2.2 | 3.2 | **5.23** | **3.59** |
| R125 | 665126 | 751821 | 3 | 8 | 10 | 1.5 | 2.5 | **10.20** | **6.12** |
| R126 | 665221 | 751789 | 3 | 8 | 10 | 1.8 | 2.8 | **8.50** | **5.47** |
| R127 | 665316 | 751757 | 3 | 8 | 10 | 1 | 2.0 | **15.31** | **7.65** |
| R128 | 665410 | 751725 | 3 | 8 | 10 | 1.1 | 2.1 | **13.92** | **7.29** |
| R129 | 665505 | 751693 | 2 | 8 | 10 | 1.2 | 2.2 | **19.11** | **10.43** |
| R130 | 665600 | 751661 | 2 | 8 | 10 | 1.3 | 2.3 | **17.64** | **9.97** |
| R131 | 665695 | 751629 | 3 | 8 | 10 | 1.5 | 2.5 | **10.20** | **6.12** |
| R132 | 665789 | 751597 | 3 | 8 | 10 | 1.5 | 2.5 | **10.20** | **6.12** |
| R133 | 665886 | 751575 | 3 | 8 | 10 | 1.7 | 2.7 | **9.00** | **5.67** |
| R134 | 665939 | 751650 | 3 | 8 | 10 | 1.8 | 2.8 | **8.50** | **5.47** |
| R135 | 665943 | 751750 | 2 | 8 | 10 | 2 | 3.0 | **11.47** | **7.65** |
| R136 | 665948 | 751850 | 2 | 8 | 10 | 1.9 | 2.9 | **12.07** | **7.91** |
| R137 | 665952 | 751950 | 2 | 8 | 10 | 1.3 | 2.3 | **17.64** | **9.97** |
| R138 | 665957 | 752050 | 2 | 8 | 10 | 1.3 | 2.3 | **17.64** | **9.97** |
| R139 | 665962 | 752149 | 2 | 8 | 10 | 1.5 | 2.5 | **15.29** | **9.17** |
| R140 | 665966 | 752249 | 2 | 8 | 10 | 1.7 | 2.7 | **13.49** | **8.50** |
| R141 | 665971 | 752349 | 2 | 8 | 10 | 1.7 | 2.7 | **13.49** | **8.50** |
| R143 | 665988 | 752543 | 3 | 8 | 10 | 2.4 | 3.4 | **6.38** | **4.50** |
| R145 | 665989 | 752739 | 2 | 8 | 10 | 2.1 | 3.1 | **10.92** | **7.40** |
| R147 | 665998 | 752938 | 2 | 8 | 10 | 0.8 | 1.8 | **28.67** | **12.74** |
| R149 | 665929 | 753104 | 2 | 8 | 10 | 2 | 3.0 | **11.47** | **7.65** |
| R151 | 665755 | 753203 | 2 | 8 | 10 | 1.8 | 2.8 | **12.74** | **8.19** |
| R152 | 665669 | 753252 | 2 | 8 | 10 | 1.2 | 2.2 | **19.11** | **10.43** |
| R153 | 665582 | 753301 | 2 | 8 | 10 | 1.5 | 2.5 | **15.29** | **9.17** |
| R154 | 665495 | 753351 | 2 | 8 | 10 | 1.8 | 2.8 | **12.74** | **8.19** |
| R156 | 665321 | 753450 | 2 | 8 | 10 | 3.1 | 4.1 | **7.40** | **5.59** |
| R158 | 665139 | 753530 | 3 | 8 | 10 | 1.6 | 2.6 | **9.57** | **5.89** |
| R159 | 665044 | 753560 | 3 | 8 | 10 | 1.5 | 2.5 | **10.20** | **6.12** |
| R161 | 664854 | 753623 | 3 | 8 | 10 | 1.9 | 2.9 | **8.06** | **5.28** |
| R163 | 664667 | 753695 | 5 | 8 | 10 | 1 | 2.0 | **9.21** | **4.61** |
| R165 | 664481 | 753767 | 2 | 8 | 10 | 1.1 | 2.1 | **20.85** | **10.92** |
| R166 | 664396 | 753800 | 2 | 8 | 10 | 2 | 3.0 | **11.47** | **7.65** |
| R168 | 663896 | 759442 | 3 | 8 | 10 | 2 | 3.0 | **7.65** | **5.10** |
| R170 | 664003 | 759273 | 3 | 8 | 10 | 2 | 3.0 | **7.65** | **5.10** |
| R171 | 664057 | 759189 | 3 | 8 | 10 | 1 | 2.0 | **15.31** | **7.65** |
| R172 | 664112 | 759105 | 3 | 8 | 10 | 1.2 | 2.2 | **12.76** | **6.96** |
| R174 | 664274 | 759038 | 4 | 8 | 10 | 1.2 | 2.2 | **9.58** | **5.23** |
| R175 | 664373 | 759053 | 4 | 8 | 10 | 0.6 | 1.6 | **19.16** | **7.19** |
| R176 | 664472 | 759069 | 4 | 8 | 10 | 1.5 | 2.5 | **7.66** | **4.60** |
| R178 | 664669 | 759100 | 2 | 8 | 10 | 1.1 | 2.1 | **20.85** | **10.92** |
| R180 | 664867 | 759131 | 3 | 8 | 10 | 1.3 | 2.3 | **11.77** | **6.66** |
| R182 | 665064 | 759164 | 2 | 8 | 10 | 1.5 | 2.5 | **15.29** | **9.17** |
| R183 | 665162 | 759185 | 2 | 8 | 10 | 1.5 | 2.5 | **15.29** | **9.17** |
| R185 | 665357 | 759228 | 2 | 8 | 10 | 0.6 | 1.6 | **38.23** | **14.34** |
| R187 | 665553 | 759271 | 2 | 8 | 10 | 1.7 | 2.7 | **13.49** | **8.50** |
| R189 | 665748 | 759313 | 2 | 8 | 10 | 1.3 | 2.3 | **17.64** | **9.97** |
| R191 | 665856 | 759427 | 2 | 8 | 10 | 0.6 | 1.6 | **38.23** | **14.34** |
| R193 | 665724 | 759578 | 3 | 8 | 10 | 2 | 3.0 | **7.65** | **5.10** |
| R195 | 665592 | 759728 | 2 | 8 | 10 | 1.5 | 2.5 | **15.29** | **9.17** |
| R198 | 665383 | 759936 | 3 | 8 | 10 | 4.2 | 5.2 | **3.64** | **2.94** |
| R200 | 665194 | 759873 | 3 | 8 | 10 | 2.1 | 3.1 | **7.29** | **4.94** |
| R202 | 665006 | 759805 | 3 | 8 | 10 | 2.4 | 3.4 | **6.38** | **4.50** |
| R205 | 664724 | 759703 | 2 | 8 | 10 | 1.1 | 2.1 | **20.85** | **10.92** |
| R207 | 664530 | 759654 | 2 | 8 | 10 | 2 | 3.0 | **11.47** | **7.65** |
| R209 | 664335 | 759609 | 2 | 8 | 10 | 1.3 | 2.3 | **17.64** | **9.97** |
| R211 | 664140 | 759564 | 2 | 8 | 10 | 1.5 | 2.5 | **15.29** | **9.17** |
| R213 | 663945 | 759519 | 2 | 8 | 10 | 1.4 | 2.4 | **16.38** | **9.56** |
| R215 | 664576 | 759085 | 2 | 8 | 10 | 1 | 2.0 | **22.94** | **11.47** |
| R216 | 664592 | 758987 | 2 | 8 | 10 | 0.9 | 1.9 | **25.49** | **12.07** |
| R218 | 664629 | 758790 | 2 | 8 | 10 | 1.5 | 2.5 | **15.29** | **9.17** |
| R220 | 664665 | 758593 | 2 | 8 | 10 | 0.9 | 1.9 | **25.49** | **12.07** |
| R222 | 664647 | 758401 | 2 | 8 | 10 | 2 | 3.0 | **11.47** | **7.65** |
| R224 | 664577 | 758213 | 3 | 8 | 10 | 1.3 | 2.3 | **11.77** | **6.66** |
| R226 | 664508 | 758026 | 3 | 8 | 10 | 1.2 | 2.2 | **12.76** | **6.96** |
| R228 | 664412 | 757851 | 3 | 8 | 10 | 0.7 | 1.7 | **21.87** | **9.00** |
| R230 | 664268 | 757720 | 3 | 8 | 10 | 1 | 2.0 | **15.31** | **7.65** |
| R232 | 664091 | 757627 | 3 | 8 | 10 | 1.5 | 2.5 | **10.20** | **6.12** |

# Calculated FoS of Natural Peat Slopes for Ballivor Wind Farm - Undrained Analysis

| Turbine No./Waypoint | Easting | Northing | Slope | Undrained shear strength | Bulk unit weight of Peat | Peat Depth | Surcharge Equivalent Placed Fill Depth (m) | Factor of Safety for Load Condition | |
|---|---|---|---|---|---|---|---|---|---|
| | | | β (deg) | $c_u$ (kPa) | γ (kN/m$^3$) | (m) | Condition (2) | Condition (1) | Condition (2) |
| R234 | 663914 | 757534 | 3 | 8 | 10 | 1.2 | 2.2 | **12.76** | **6.96** |
| R236 | 663737 | 757441 | 3 | 8 | 10 | 1 | 2.0 | **15.31** | **7.65** |
| R238 | 663569 | 757352 | 2 | 8 | 10 | 1.6 | 2.6 | **14.34** | **8.82** |
| R240 | 664767 | 758474 | 2 | 8 | 10 | 1.1 | 2.1 | **20.85** | **10.92** |
| R242 | 664964 | 758508 | 2 | 8 | 10 | 0.6 | 1.6 | **38.23** | **14.34** |
| R244 | 665161 | 758543 | 2 | 8 | 10 | 1 | 2.0 | **22.94** | **11.47** |
| R246 | 665358 | 758577 | 2 | 8 | 10 | 1.1 | 2.1 | **20.85** | **10.92** |
| R248 | 665555 | 758612 | 2 | 8 | 10 | 1.4 | 2.4 | **16.38** | **9.56** |
| R250 | 665752 | 758646 | 2 | 8 | 10 | 1.5 | 2.5 | **15.29** | **9.17** |
| R253 | 663092 | 757431 | 2 | 8 | 10 | 2 | 3.0 | **11.47** | **7.65** |
| R255 | 662935 | 757555 | 3 | 8 | 10 | 1.1 | 2.1 | **13.92** | **7.29** |
| R257 | 662778 | 757679 | 3 | 8 | 10 | 2 | 3.0 | **7.65** | **5.10** |
| R259 | 662622 | 757804 | 4 | 8 | 10 | 2.5 | 3.5 | **4.60** | **3.28** |
| R261 | 661812 | 757122 | 4 | 8 | 10 | 2 | 3.0 | **5.75** | **3.83** |
| R263 | 661895 | 756941 | 4 | 8 | 10 | 1.5 | 2.5 | **7.66** | **4.60** |
| R265 | 662009 | 756777 | 3 | 8 | 10 | 2.1 | 3.1 | **7.29** | **4.94** |
| R267 | 661910 | 756919 | 3 | 8 | 10 | 1.4 | 2.4 | **10.93** | **6.38** |
| R269 | 661735 | 756838 | 3 | 8 | 10 | 1.9 | 2.9 | **8.06** | **5.28** |
| R270 | 661766 | 756743 | 2 | 8 | 10 | 1 | 2.0 | **22.94** | **11.47** |
| R272 | 661793 | 756545 | 2 | 8 | 10 | 1.5 | 2.5 | **15.29** | **9.17** |
| R274 | 661776 | 756648 | 2 | 8 | 10 | 2 | 3.0 | **11.47** | **7.65** |
| R275 | 661683 | 756613 | 2 | 8 | 10 | 2.1 | 3.1 | **10.92** | **7.40** |
| R277 | 661552 | 756582 | 2 | 8 | 10 | 2 | 3.0 | **11.47** | **7.65** |
| R284 | 661884 | 756460 | 3 | 8 | 10 | 2.1 | 3.1 | **7.29** | **4.94** |
| R286 | 661688 | 756420 | 3 | 8 | 10 | 1.5 | 2.5 | **10.20** | **6.12** |
| R288 | 661492 | 756382 | 3 | 8 | 10 | 3.2 | 4.2 | **4.78** | **3.64** |
| R290 | 661296 | 756343 | 3 | 8 | 10 | 3 | 4.0 | **5.10** | **3.83** |
| R294 | 661547 | 756197 | 2 | 8 | 10 | 2.1 | 3.1 | **10.92** | **7.40** |
| R296 | 661690 | 756214 | 2 | 8 | 10 | 1.8 | 2.8 | **12.74** | **8.19** |
| R298 | 661525 | 756287 | 2 | 8 | 10 | 1.2 | 2.2 | **19.11** | **10.43** |
| R300 | 663937 | 755791 | 2 | 8 | 10 | 0.5 | 1.5 | **45.87** | **15.29** |
| R301 | 663948 | 755890 | 2 | 8 | 10 | 1 | 2.0 | **22.94** | **11.47** |
| R303 | 663970 | 756089 | 2 | 8 | 10 | 1.2 | 2.2 | **19.11** | **10.43** |
| R305 | 663992 | 756288 | 2 | 8 | 10 | 1.5 | 2.5 | **15.29** | **9.17** |
| R307 | 663916 | 756471 | 2 | 8 | 10 | 1 | 2.0 | **22.94** | **11.47** |
| R309 | 663831 | 756652 | 2 | 8 | 10 | 1.2 | 2.2 | **19.11** | **10.43** |
| R311 | 664098 | 755425 | 2 | 8 | 10 | 2.1 | 3.1 | **10.92** | **7.40** |
| R314 | 663823 | 755305 | 2 | 8 | 10 | 1.7 | 2.7 | **13.49** | **8.50** |
| R315 | 663731 | 755265 | 2 | 8 | 10 | 1.8 | 2.8 | **12.74** | **8.19** |
| R316 | 663640 | 755225 | 2 | 8 | 10 | 2 | 3.0 | **11.47** | **7.65** |
| R317 | 663570 | 755256 | 2 | 8 | 10 | 1.5 | 2.5 | **15.29** | **9.17** |
| R318 | 663487 | 755224 | 2 | 8 | 10 | 1.7 | 2.7 | **13.49** | **8.50** |
| R319 | 663429 | 755148 | 2 | 8 | 10 | 2 | 3.0 | **11.47** | **7.65** |
| R320 | 663771 | 755283 | 3 | 8 | 10 | 1 | 2.0 | **15.31** | **7.65** |
| R321 | 663730 | 755374 | 3 | 8 | 10 | 0.6 | 1.6 | **25.51** | **9.57** |
| R322 | 663689 | 755465 | 2 | 8 | 10 | 1 | 2.0 | **22.94** | **11.47** |
| R323 | 663598 | 755432 | 2 | 8 | 10 | 1 | 2.0 | **22.94** | **11.47** |
| R324 | 663581 | 755425 | 2 | 8 | 10 | 0.8 | 1.8 | **28.67** | **12.74** |
| R325 | 664589 | 754516 | 2 | 8 | 10 | 0.5 | 1.5 | **45.87** | **15.29** |
| R326 | 664494 | 754548 | 3 | 8 | 10 | 2.3 | 3.3 | **6.66** | **4.64** |
| R327 | 664411 | 754602 | 3 | 8 | 10 | 2.1 | 3.1 | **7.29** | **4.94** |
| R330 | 663871 | 752882 | 2 | 8 | 10 | 0.8 | 1.8 | **28.67** | **12.74** |
| R331 | 663963 | 752842 | 2 | 8 | 10 | 1.3 | 2.3 | **17.64** | **9.97** |
| R333 | 664146 | 752761 | 2 | 8 | 10 | 1 | 2.0 | **22.94** | **11.47** |
| R335 | 664331 | 752689 | 2 | 8 | 10 | 1.4 | 2.4 | **16.38** | **9.56** |
| R337 | 664531 | 752678 | 3 | 8 | 10 | 1.5 | 2.5 | **10.20** | **6.12** |
| R339 | 664731 | 752667 | 3 | 8 | 10 | 1.1 | 2.1 | **13.92** | **7.29** |
| R341 | 664930 | 752656 | 2 | 8 | 10 | 2.7 | 3.7 | **8.50** | **6.20** |
| R343 | 665127 | 752635 | 2 | 8 | 10 | 2 | 3.0 | **11.47** | **7.65** |
| R344 | 665210 | 752578 | 2 | 8 | 10 | 2 | 3.0 | **11.47** | **7.65** |
| R345 | 665293 | 752522 | 2 | 8 | 10 | 2.1 | 3.1 | **10.92** | **7.40** |
| R347 | 665457 | 752408 | 2 | 8 | 10 | 1 | 2.0 | **22.94** | **11.47** |
| R349 | 665622 | 752295 | 2 | 8 | 10 | 1.2 | 2.2 | **19.11** | **10.43** |
| R350 | 665705 | 752239 | 2 | 8 | 10 | 1.6 | 2.6 | **14.34** | **8.82** |
| R351 | 665788 | 752183 | 3 | 8 | 10 | 2.9 | 3.9 | **5.28** | **3.92** |
| R352 | 665870 | 752127 | 3 | 8 | 10 | 2.4 | 3.4 | **6.38** | **4.50** |
| R353 | 665953 | 752071 | 3 | 8 | 10 | 1.3 | 2.3 | **11.77** | **6.66** |
| R354 | 665958 | 752067 | 2 | 8 | 10 | 1.5 | 2.5 | **15.29** | **9.17** |
| R355 | 665685 | 751633 | 2 | 8 | 10 | 1.2 | 2.2 | **19.11** | **10.43** |
| R356 | 665624 | 751554 | 2 | 8 | 10 | 1 | 2.0 | **22.94** | **11.47** |
| R357 | 665562 | 751475 | 2 | 8 | 10 | 1.8 | 2.8 | **12.74** | **8.19** |
| R358 | 665533 | 751437 | 2 | 8 | 10 | 1.2 | 2.2 | **19.11** | **10.43** |
| R359 | 665278 | 751409 | 2 | 8 | 10 | 0.8 | 1.8 | **28.67** | **12.74** |
| R366 | 664417 | 752168 | 3 | 8 | 10 | 1.5 | 2.5 | **10.20** | **6.12** |
| R367 | 664492 | 752102 | 2 | 8 | 10 | 1.5 | 2.5 | **15.29** | **9.17** |
| R368 | 664567 | 752035 | 2 | 8 | 10 | 0.6 | 1.6 | **38.23** | **14.34** |
| R369 | 664638 | 751972 | 2 | 8 | 10 | 1.2 | 2.2 | **19.11** | **10.43** |
| R371 | 661662 | 756489 | 2 | 8 | 10 | 2.5 | 3.5 | **9.17** | **6.55** |
| R373 | 661474 | 756421 | 3 | 8 | 10 | 3.4 | 4.4 | **4.50** | **3.48** |
| R375 | 661368 | 756384 | 3 | 8 | 10 | 1.2 | 2.2 | **12.76** | **6.96** |
| R377 | 661976 | 756619 | 3 | 8 | 10 | 0.9 | 1.9 | **17.01** | **8.06** |
| R379 | 661917 | 756810 | 3 | 8 | 10 | 1.5 | 2.5 | **10.20** | **6.12** |
| | | | | | | | | | |
| MET1_1 | 663828 | 759073 | 4 | 8 | 10 | 0.9 | 1.9 | **12.77** | **6.05** |
| MET1_3 | 663867 | 759067 | 4 | 8 | 10 | 1.4 | 2.4 | **8.21** | **4.79** |
| CP1_1 | 664353 | 757837 | 3 | 8 | 10 | 2 | 3.0 | **7.65** | **5.10** |
| CP1_3 | 664342 | 757787 | 2 | 8 | 10 | 1.3 | 2.3 | **17.64** | **9.97** |
| CP1_5 | 664349 | 757812 | 2 | 8 | 10 | 1 | 2.0 | **22.94** | **11.47** |
| CCP1_1 | 663854 | 757488 | 2 | 8 | 10 | 2 | 3.0 | **11.47** | **7.65** |

# Calculated FoS of Natural Peat Slopes for Ballivor Wind Farm - Undrained Analysis

| Turbine No./Waypoint | Easting | Northing | Slope | Undrained shear strength | Bulk unit weight of Peat | Peat Depth | Surcharge Equivalent Placed Fill Depth (m) | Factor of Safety for Load Condition | |
|---|---|---|---|---|---|---|---|---|---|
| | | | β (deg) | $c_u$ (kPa) | γ (kN/m$^3$) | (m) | Condition (2) | Condition (1) | Condition (2) |
| CCP1_3 | 663966 | 757490 | 3 | 8 | 10 | 1.8 | 2.8 | **8.50** | **5.47** |
| MET2_1 | 661518 | 756595 | 2 | 8 | 10 | 2.5 | 3.5 | **9.17** | **6.55** |
| MET2_3 | 661551 | 756572 | 2 | 8 | 10 | 3 | 4.0 | **7.65** | **5.73** |
| CCP2_1 | 663467 | 755177 | 2 | 8 | 10 | 0.5 | 1.5 | **45.87** | **15.29** |
| CCP2_2 | 663533 | 755252 | 2 | 8 | 10 | 0.9 | 1.9 | **25.49** | **12.07** |
| CCP2_3 | 663571 | 755219 | 2 | 8 | 10 | 1.5 | 2.5 | **15.29** | **9.17** |
| CCP2_4 | 663505 | 755144 | 2 | 8 | 10 | 1.9 | 2.9 | **12.07** | **7.91** |
| CCP2_5 | 663517 | 755194 | 2 | 8 | 10 | 0.8 | 1.8 | **28.67** | **12.74** |
| SUB1_1 | 663587 | 755382 | 2 | 8 | 10 | 1 | 2.0 | **22.94** | **11.47** |
| SUB1_2 | 663685 | 755425 | 2 | 8 | 10 | 1.2 | 2.2 | **19.11** | **10.43** |
| SUB1_4 | 663736 | 755293 | 2 | 8 | 10 | 1.5 | 2.5 | **15.29** | **9.17** |
| SUB1_6 | 663625 | 755295 | 2 | 8 | 10 | 1.8 | 2.8 | **12.74** | **8.19** |
| SUB1_9 | 663451 | 755343 | 2 | 8 | 10 | 1.7 | 2.7 | **13.49** | **8.50** |
| SUB1_10 | 663815 | 755501 | 2 | 8 | 10 | 1.5 | 2.5 | **15.29** | **9.17** |
| SUB1_11 | 663975 | 755571 | 2 | 8 | 10 | 1.9 | 2.9 | **12.07** | **7.91** |
| BP1_2 | 661667 | 755996 | 4 | 8 | 10 | 0.7 | 1.7 | **16.42** | **6.76** |
| BP2_3 | 664138 | 755330 | 4 | 8 | 10 | 2.7 | 3.7 | **4.26** | **3.11** |
| BP3_1 | 664131 | 755390 | 4 | 8 | 10 | 1.2 | 2.2 | **9.58** | **5.23** |
| BP3_2 | 664296 | 755371 | 4 | 8 | 10 | 1.4 | 2.4 | **8.21** | **4.79** |
| BP3_3 | 664315 | 755307 | 3 | 8 | 10 | 1 | 2.0 | **15.31** | **7.65** |
| BP3_4 | 664293 | 755235 | 3 | 8 | 10 | 1.2 | 2.2 | **12.76** | **6.96** |
| BP3_5 | 664252 | 755205 | 3 | 8 | 10 | 1 | 2.0 | **15.31** | **7.65** |
| BP3_5 | 664195 | 755316 | 4 | 8 | 10 | 2.1 | 3.1 | **5.47** | **3.71** |
| BP3_6 | 664199 | 755355 | 2 | 8 | 10 | 0.9 | 1.9 | **25.49** | **12.07** |
| BP3_7 | 664251 | 755323 | 3 | 8 | 10 | 1 | 2.0 | **15.31** | **7.65** |
| BP3_8 | 664263 | 755267 | 3 | 8 | 10 | 1.9 | 2.9 | **8.06** | **5.28** |
| BP4_1 | 664188 | 755215 | 6 | 8 | 10 | 2.1 | 3.1 | **3.66** | **2.48** |
| BP4_2 | 664233 | 755134 | 4 | 8 | 10 | 1.5 | 2.5 | **7.66** | **4.60** |
| BP4_3 | 664298 | 754980 | 4 | 8 | 10 | 1 | 2.0 | **11.50** | **5.75** |
| BP4_4 | 664267 | 754886 | 4 | 8 | 10 | 1.7 | 2.7 | **6.76** | **4.26** |
| BP4_5 | 664119 | 754716 | 3 | 8 | 10 | 1 | 2.0 | **15.31** | **7.65** |
| BP4_6 | 664158 | 754845 | 3 | 8 | 10 | 0.6 | 1.6 | **25.51** | **9.57** |
| BP4_7 | 664198 | 754953 | 6 | 8 | 10 | 0.9 | 1.9 | **8.55** | **4.05** |
| BP4_8 | 664141 | 755041 | 6 | 8 | 10 | 1.9 | 2.9 | **4.05** | **2.65** |
| BP4_9 | 664175 | 755114 | 4 | 8 | 10 | 2.1 | 3.1 | **5.47** | **3.71** |
| BP4_10 | 664207 | 755043 | 2 | 8 | 10 | 1 | 2.0 | **22.94** | **11.47** |
| BP4_11 | 664236 | 754939 | 2 | 8 | 10 | 1.2 | 2.2 | **19.11** | **10.43** |
| BP4_12 | 664181 | 754808 | 3 | 8 | 10 | 2 | 3.0 | **7.65** | **5.10** |
| BP5_2 | 665330 | 751430 | 3 | 8 | 10 | 2.1 | 3.1 | **7.29** | **4.94** |
| CCP3_1 | 664599 | 754013 | 2 | 8 | 10 | 1.6 | 2.6 | **14.34** | **8.82** |
| CCP3_2 | 664472 | 754040 | 2 | 8 | 10 | 1.2 | 2.2 | **19.11** | **10.43** |
| CCP3_3 | 664486 | 754108 | 2 | 8 | 10 | 1.8 | 2.8 | **12.74** | **8.19** |
| CCP3_4 | 664613 | 754082 | 2 | 8 | 10 | 1.5 | 2.5 | **15.29** | **9.17** |
| CCP3_5 | 664542 | 754056 | 2 | 8 | 10 | 1.2 | 2.2 | **19.11** | **10.43** |
| MET3_1 | 663677 | 752816 | 2 | 8 | 10 | 1.7 | 2.7 | **13.49** | **8.50** |
| MET3_2 | 663661 | 752801 | 2 | 8 | 10 | 1.5 | 2.5 | **15.29** | **9.17** |
| MET3_3 | 663695 | 752781 | 2 | 8 | 10 | 2 | 3.0 | **11.47** | **7.65** |
| MET3_4 | 663703 | 752794 | 2 | 8 | 10 | 1.5 | 2.5 | **15.29** | **9.17** |
| WP001 | 663694 | 757286 | 2 | 8 | 10 | 1.7 | 2.7 | **13.49** | **8.50** |
| WP002 | 663790 | 757320 | 1 | 8 | 10 | 2 | 3.0 | **22.92** | **15.28** |
| WP003 | 663920 | 757372 | 2 | 8 | 10 | 2.3 | 3.3 | **9.97** | **6.95** |
| WP004 | 663980 | 757341 | 2 | 8 | 10 | 3.1 | 4.1 | **7.40** | **5.59** |
| WP005 | 664008 | 757401 | 2 | 8 | 10 | 2.1 | 3.1 | **10.92** | **7.40** |
| WP006 | 664230 | 757492 | 2 | 8 | 10 | 4.3 | 5.3 | **5.33** | **4.33** |
| WP007 | 664303 | 757637 | 2 | 8 | 10 | 4.5 | 5.5 | **5.10** | **4.17** |
| | | | | | | | **Minimum =** | **2.61** | **2.13** |
| | | | | | | | **Maximum =** | **57.34** | **16.38** |
| | | | | | | | **Average =** | **13.74** | **7.55** |
| | | | | | | | count | 320.0 | 320.0 |
| | | | | | | | count if >1.3 | 320.0 | 320.0 |

**Notes:**

(1) Assuming a bulk unit weight for peat of 10kN/m$^3$

(2) Assuming a surcharge equivalent to fill depth of 1m of peat i.e. 10kPa.

(3) Slope inclination (β) based on site readings and site contour plans.

(4) A lower bound undrained shear strength, cu for the peat of 8kPa was selected for the assessment. It should be noted that a cu of 8kPa for the peat is considered a conservative value for the analysis and is not representative of all peat present across the site. In reality the peat has a significantly higher undrained strength.

(5) Peat depths based on probes carried out by FT.

(6) For load conditions see report text.

# Calculated FoS of Natural Peat Slopes for Ballivor Wind Farm - Drained Analysis

| Turbine No./Waypoint | Slope | Design c' | Bulk unit weight of Peat | Unit weight of Water | Depth of In situ Peat | Friction Angle | Surcharge Equivalent Placed Fill | Equivalent Total Depth of Peat (m) | Factor of Safety for Load Condition | |
|---|---|---|---|---|---|---|---|---|---|---|
| | α (deg) | c' (kPa) | γ (kN/m$^3$) | $\gamma_w$ (kN/m$^3$) | (m) | ø' (deg) | Condition (2) | Condition (2) | Condition (1) | Condition (2) |
| | | | | | | | | | 100% Water | 100% Water |
| T01 | 2 | 4 | 10.0 | 10.0 | 2.35 | 25 | 1.0 | 3.4 | **4.88** | **7.41** |
| T02 | 3 | 4 | 10.0 | 10.0 | 1.75 | 25 | 1.0 | 2.8 | **4.37** | **6.02** |
| T03 | 2 | 4 | 10.0 | 10.0 | 0.85 | 25 | 1.0 | 1.9 | **13.49** | **13.42** |
| T04 | 3 | 4 | 10.0 | 10.0 | 2.80 | 25 | 1.0 | 3.8 | **2.73** | **4.36** |
| T05 | 2 | 4 | 10.0 | 10.0 | 4.90 | 25 | 1.0 | 5.9 | **2.34** | **4.21** |
| T06 | 3 | 4 | 10.0 | 10.0 | 2.10 | 25 | 1.0 | 3.1 | **3.64** | **5.34** |
| T07 | 4 | 4 | 10.0 | 10.0 | 4.40 | 25 | 1.0 | 5.4 | **1.31** | **2.30** |
| T08 | 2 | 4 | 10.0 | 10.0 | 3.80 | 25 | 1.0 | 4.8 | **3.02** | **5.17** |
| T09 | 2 | 4 | 10.0 | 10.0 | 2.90 | 25 | 1.0 | 3.9 | **3.95** | **6.36** |
| T10 | 2 | 4 | 10.0 | 10.0 | 2.05 | 25 | 1.0 | 3.1 | **5.59** | **8.14** |
| T11 | 3 | 4 | 10.0 | 10.0 | 1.1 | 25 | 1.0 | 2.1 | **6.96** | **7.88** |
| T12 | 2 | 4 | 10.0 | 10.0 | 3.5 | 25 | 1.0 | 4.5 | **3.28** | **5.52** |
| T13 | 2 | 4 | 10.0 | 10.0 | 2.8 | 25 | 1.0 | 3.8 | **4.10** | **6.53** |
| T14 | 3 | 4 | 10.0 | 10.0 | 1.2 | 25 | 1.0 | 2.2 | **6.38** | **7.52** |
| T15 | 3 | 4 | 10.0 | 10.0 | 2.6 | 25 | 1.0 | 3.6 | **2.94** | **4.60** |
| T16 | 2 | 4 | 10.0 | 10.0 | 4.1 | 25 | 1.0 | 5.1 | **2.80** | **4.87** |
| T17 | 4 | 4 | 10.0 | 10.0 | 0.9 | 25 | 1.0 | 1.9 | **6.39** | **6.54** |
| T18 | 4 | 4 | 10.0 | 10.0 | 4.4 | 25 | 1.0 | 5.4 | **1.31** | **2.30** |
| T19 | 4 | 4 | 10.0 | 10.0 | 2.8 | 25 | 1.0 | 3.8 | **2.05** | **3.27** |
| T20 | 2 | 4 | 10.0 | 10.0 | 2 | 25 | 1.0 | 3.0 | **5.73** | **8.27** |
| T21 | 3 | 4 | 10.0 | 10.0 | 0.9 | 25 | 1.0 | 1.9 | **8.50** | **8.71** |
| T22 | 2 | 4 | 10.0 | 10.0 | 1.4 | 25 | 1.0 | 2.4 | **8.19** | **10.34** |
| T23 | 2 | 4 | 10.0 | 10.0 | 3.1 | 25 | 1.0 | 4.1 | **3.70** | **6.05** |
| T24 | 3 | 4 | 10.0 | 10.0 | 3.35 | 25 | 1.0 | 4.4 | **2.28** | **3.80** |
| T25 | 2 | 4 | 10.0 | 10.0 | 3.85 | 25 | 1.0 | 4.9 | **2.98** | **5.12** |
| T26 | 2 | 4 | 10.0 | 10.0 | 2.3 | 25 | 1.0 | 3.3 | **4.99** | **7.52** |
| | | | | | | | | | | |
| R7 | 2 | 4 | 10.0 | 10.0 | 1.5 | 25 | 1.0 | 2.5 | **7.65** | **9.93** |
| R9 | 3 | 4 | 10.0 | 10.0 | 1.1 | 25 | 1.0 | 2.1 | **6.96** | **7.88** |
| R11 | 2 | 4 | 10.0 | 10.0 | 1.8 | 25 | 1.0 | 2.8 | **6.37** | **8.86** |
| R13 | 2 | 4 | 10.0 | 10.0 | 2.1 | 25 | 1.0 | 3.1 | **5.46** | **8.01** |
| R15 | 2 | 4 | 10.0 | 10.0 | 2.8 | 25 | 1.0 | 3.8 | **4.10** | **6.53** |
| R17 | 3 | 4 | 10.0 | 10.0 | 2.5 | 25 | 1.0 | 3.5 | **3.06** | **4.73** |
| R19 | 2 | 4 | 10.0 | 10.0 | 2.1 | 25 | 1.0 | 3.1 | **5.46** | **8.01** |
| R21 | 3 | 4 | 10.0 | 10.0 | 2.1 | 25 | 1.0 | 3.1 | **3.64** | **5.34** |
| R23 | 3 | 4 | 10.0 | 10.0 | 2.5 | 25 | 1.0 | 3.5 | **3.06** | **4.73** |
| R25 | 3 | 4 | 10.0 | 10.0 | 2.7 | 25 | 1.0 | 3.7 | **2.83** | **4.47** |
| R27 | 3 | 4 | 10.0 | 10.0 | 2.2 | 25 | 1.0 | 3.2 | **3.48** | **5.17** |
| R29 | 4 | 4 | 10.0 | 10.0 | 2.6 | 25 | 1.0 | 3.6 | **2.21** | **3.45** |
| R31 | 4 | 4 | 10.0 | 10.0 | 2.5 | 25 | 1.0 | 3.5 | **2.30** | **3.55** |
| R33 | 4 | 4 | 10.0 | 10.0 | 0.8 | 25 | 1.0 | 1.8 | **7.19** | **6.90** |
| R35 | 3 | 4 | 10.0 | 10.0 | 1.5 | 25 | 1.0 | 2.5 | **5.10** | **6.62** |
| R37 | 2 | 4 | 10.0 | 10.0 | 2.8 | 25 | 1.0 | 3.8 | **4.10** | **6.53** |
| R39 | 2 | 4 | 10.0 | 10.0 | 0.7 | 25 | 1.0 | 1.7 | **16.38** | **14.60** |
| R41 | 2 | 4 | 10.0 | 10.0 | 1.5 | 25 | 1.0 | 2.5 | **7.65** | **9.93** |
| R43 | 2 | 4 | 10.0 | 10.0 | 2 | 25 | 1.0 | 3.0 | **5.73** | **8.27** |
| R45 | 2 | 4 | 10.0 | 10.0 | 1.8 | 25 | 1.0 | 2.8 | **6.37** | **8.86** |
| R47 | 2 | 4 | 10.0 | 10.0 | 2 | 25 | 1.0 | 3.0 | **5.73** | **8.27** |
| R49 | 2 | 4 | 10.0 | 10.0 | 2 | 25 | 1.0 | 3.0 | **5.73** | **8.27** |
| R50 | 2 | 4 | 10.0 | 10.0 | 2.6 | 25 | 1.0 | 3.6 | **4.41** | **6.89** |
| R52 | 2 | 4 | 10.0 | 10.0 | 1.2 | 25 | 1.0 | 2.2 | **9.56** | **11.28** |
| R54 | 2 | 4 | 10.0 | 10.0 | 2 | 25 | 1.0 | 3.0 | **5.73** | **8.27** |
| R56 | 2 | 4 | 10.0 | 10.0 | 1.5 | 25 | 1.0 | 2.5 | **7.65** | **9.93** |
| R58 | 3 | 4 | 10.0 | 10.0 | 1.3 | 25 | 1.0 | 2.3 | **5.89** | **7.20** |
| R60 | 3 | 4 | 10.0 | 10.0 | 0.5 | 25 | 1.0 | 1.5 | **15.31** | **11.03** |
| R62 | 3 | 4 | 10.0 | 10.0 | 1 | 25 | 1.0 | 2.0 | **7.65** | **8.28** |
| R64 | 3 | 4 | 10.0 | 10.0 | 1.2 | 25 | 1.0 | 2.2 | **6.38** | **7.52** |
| R66 | 4 | 4 | 10.0 | 10.0 | 1.5 | 25 | 1.0 | 2.5 | **3.83** | **4.97** |
| R68 | 4 | 4 | 10.0 | 10.0 | 1.8 | 25 | 1.0 | 2.8 | **3.19** | **4.43** |
| R70 | 2 | 4 | 10.0 | 10.0 | 0.5 | 25 | 1.0 | 1.5 | **22.94** | **16.55** |
| R71 | 2 | 4 | 10.0 | 10.0 | 1.7 | 25 | 1.0 | 2.7 | **6.75** | **9.19** |
| R72 | 2 | 4 | 10.0 | 10.0 | 1.8 | 25 | 1.0 | 2.8 | **6.37** | **8.86** |
| R73 | 3 | 4 | 10.0 | 10.0 | 1.8 | 25 | 1.0 | 2.8 | **4.25** | **5.91** |
| R74 | 3 | 4 | 10.0 | 10.0 | 2.2 | 25 | 1.0 | 3.2 | **3.48** | **5.17** |
| R75 | 2 | 4 | 10.0 | 10.0 | 0.4 | 25 | 1.0 | 1.4 | **28.67** | **17.73** |
| R76 | 2 | 4 | 10.0 | 10.0 | 1 | 25 | 1.0 | 2.0 | **11.47** | **12.41** |
| R77 | 4 | 4 | 10.0 | 10.0 | 1.5 | 25 | 1.0 | 2.5 | **3.83** | **4.97** |
| R78 | 4 | 4 | 10.0 | 10.0 | 1.8 | 25 | 1.0 | 2.8 | **3.19** | **4.43** |
| R79 | 2 | 4 | 10.0 | 10.0 | 2.4 | 25 | 1.0 | 3.4 | **4.78** | **7.30** |
| R80 | 3 | 4 | 10.0 | 10.0 | 3.4 | 25 | 1.0 | 4.4 | **2.25** | **3.76** |
| R81 | 3 | 4 | 10.0 | 10.0 | 3 | 25 | 1.0 | 4.0 | **2.55** | **4.14** |
| R82 | 3 | 4 | 10.0 | 10.0 | 2.5 | 25 | 1.0 | 3.5 | **3.06** | **4.73** |
| R83 | 4 | 4 | 10.0 | 10.0 | 2.5 | 25 | 1.0 | 3.5 | **2.30** | **3.55** |
| R84 | 4 | 4 | 10.0 | 10.0 | 3 | 25 | 1.0 | 4.0 | **1.92** | **3.10** |
| R85 | 4 | 4 | 10.0 | 10.0 | 2.2 | 25 | 1.0 | 3.2 | **2.61** | **3.88** |
| R86 | 4 | 4 | 10.0 | 10.0 | 2 | 25 | 1.0 | 3.0 | **2.87** | **4.14** |
| R90 | 3 | 4 | 10.0 | 10.0 | 1.5 | 25 | 1.0 | 2.5 | **5.10** | **6.62** |
| R91 | 2 | 4 | 10.0 | 10.0 | 1.8 | 25 | 1.0 | 2.8 | **6.37** | **8.86** |
| R92 | 2 | 4 | 10.0 | 10.0 | 2.1 | 25 | 1.0 | 3.1 | **5.46** | **8.01** |
| R93 | 2 | 4 | 10.0 | 10.0 | 1.8 | 25 | 1.0 | 2.8 | **6.37** | **8.86** |
| R94 | 2 | 4 | 10.0 | 10.0 | 2 | 25 | 1.0 | 3.0 | **5.73** | **8.27** |
| R95 | 2 | 4 | 10.0 | 10.0 | 1.5 | 25 | 1.0 | 2.5 | **7.65** | **9.93** |
| R96 | 3 | 4 | 10.0 | 10.0 | 2.8 | 25 | 1.0 | 3.8 | **2.73** | **4.36** |
| R97 | 2 | 4 | 10.0 | 10.0 | 2.4 | 25 | 1.0 | 3.4 | **4.78** | **7.30** |
| R98 | 3 | 4 | 10.0 | 10.0 | 2.6 | 25 | 1.0 | 3.6 | **2.94** | **4.60** |
| R99 | 4 | 4 | 10.0 | 10.0 | 2.8 | 25 | 1.0 | 3.8 | **2.05** | **3.27** |
| R100 | 4 | 4 | 10.0 | 10.0 | 2.4 | 25 | 1.0 | 3.4 | **2.40** | **3.65** |
| R101 | 3 | 4 | 10.0 | 10.0 | 0.9 | 25 | 1.0 | 1.9 | **8.50** | **8.71** |
| R102 | 3 | 4 | 10.0 | 10.0 | 1.2 | 25 | 1.0 | 2.2 | **6.38** | **7.52** |
| R103 | 3 | 4 | 10.0 | 10.0 | 0.4 | 25 | 1.0 | 1.4 | **19.13** | **11.82** |
| R104 | 2 | 4 | 10.0 | 10.0 | 0.9 | 25 | 1.0 | 1.9 | **12.74** | **13.06** |
| R105 | 2 | 4 | 10.0 | 10.0 | 0.6 | 25 | 1.0 | 1.6 | **19.11** | **15.51** |

# Calculated FoS of Natural Peat Slopes for Ballivor Wind Farm - Drained Analysis

| Turbine No./Waypoint | Slope | Design c' | Bulk unit weight of Peat | Unit weight of Water | Depth of In situ Peat | Friction Angle | Surcharge Equivalent Placed Fill | Equivalent Total Depth of Peat (m) | Factor of Safety for Load Condition | |
|---|---|---|---|---|---|---|---|---|---|---|
| | α (deg) | c' (kPa) | γ (kN/m$^3$) | $\gamma_w$ (kN/m$^3$) | (m) | ø' (deg) | Condition (2) | Condition (2) | Condition (1) | Condition (2) |
| | | | | | | | | | 100% Water | 100% Water |
| R106 | 2 | 4 | 10.0 | 10.0 | 0.6 | 25 | 1.0 | 1.6 | **19.11** | **15.51** |
| R107 | 3 | 4 | 10.0 | 10.0 | 1 | 25 | 1.0 | 2.0 | **7.65** | **8.28** |
| R108 | 3 | 4 | 10.0 | 10.0 | 1.7 | 25 | 1.0 | 2.7 | **4.50** | **6.13** |
| R109 | 4 | 4 | 10.0 | 10.0 | 1.7 | 25 | 1.0 | 2.7 | **3.38** | **4.60** |
| R110 | 4 | 4 | 10.0 | 10.0 | 1.2 | 25 | 1.0 | 2.2 | **4.79** | **5.64** |
| R111 | 4 | 4 | 10.0 | 10.0 | 1.8 | 25 | 1.0 | 2.8 | **3.19** | **4.43** |
| R112 | 2 | 4 | 10.0 | 10.0 | 1.4 | 25 | 1.0 | 2.4 | **8.19** | **10.34** |
| R113 | 2 | 4 | 10.0 | 10.0 | 1.3 | 25 | 1.0 | 2.3 | **8.82** | **10.79** |
| R114 | 2 | 4 | 10.0 | 10.0 | 2.3 | 25 | 1.0 | 3.3 | **4.99** | **7.52** |
| R115 | 4 | 4 | 10.0 | 10.0 | 0.8 | 25 | 1.0 | 1.8 | **7.19** | **6.90** |
| R116 | 4 | 4 | 10.0 | 10.0 | 1.3 | 25 | 1.0 | 2.3 | **4.42** | **5.40** |
| R117 | 4 | 4 | 10.0 | 10.0 | 1.2 | 25 | 1.0 | 2.2 | **4.79** | **5.64** |
| R118 | 3 | 4 | 10.0 | 10.0 | 1.5 | 25 | 1.0 | 2.5 | **5.10** | **6.62** |
| R119 | 3 | 4 | 10.0 | 10.0 | 1.5 | 25 | 1.0 | 2.5 | **5.10** | **6.62** |
| R120 | 3 | 4 | 10.0 | 10.0 | 1 | 25 | 1.0 | 2.0 | **7.65** | **8.28** |
| R121 | 3 | 4 | 10.0 | 10.0 | 3.3 | 25 | 1.0 | 4.3 | **2.32** | **3.85** |
| R122 | 4 | 4 | 10.0 | 10.0 | 0.9 | 25 | 1.0 | 1.9 | **6.39** | **6.54** |
| R123 | 4 | 4 | 10.0 | 10.0 | 2 | 25 | 1.0 | 3.0 | **2.87** | **4.14** |
| R124 | 4 | 4 | 10.0 | 10.0 | 2.2 | 25 | 1.0 | 3.2 | **2.61** | **3.88** |
| R125 | 3 | 4 | 10.0 | 10.0 | 1.5 | 25 | 1.0 | 2.5 | **5.10** | **6.62** |
| R126 | 3 | 4 | 10.0 | 10.0 | 1.8 | 25 | 1.0 | 2.8 | **4.25** | **5.91** |
| R127 | 3 | 4 | 10.0 | 10.0 | 1 | 25 | 1.0 | 2.0 | **7.65** | **8.28** |
| R128 | 3 | 4 | 10.0 | 10.0 | 1.1 | 25 | 1.0 | 2.1 | **6.96** | **7.88** |
| R129 | 2 | 4 | 10.0 | 10.0 | 1.2 | 25 | 1.0 | 2.2 | **9.56** | **11.28** |
| R130 | 2 | 4 | 10.0 | 10.0 | 1.3 | 25 | 1.0 | 2.3 | **8.82** | **10.79** |
| R131 | 3 | 4 | 10.0 | 10.0 | 1.5 | 25 | 1.0 | 2.5 | **5.10** | **6.62** |
| R132 | 3 | 4 | 10.0 | 10.0 | 1.5 | 25 | 1.0 | 2.5 | **5.10** | **6.62** |
| R133 | 3 | 4 | 10.0 | 10.0 | 1.7 | 25 | 1.0 | 2.7 | **4.50** | **6.13** |
| R134 | 3 | 4 | 10.0 | 10.0 | 1.8 | 25 | 1.0 | 2.8 | **4.25** | **5.91** |
| R135 | 2 | 4 | 10.0 | 10.0 | 2 | 25 | 1.0 | 3.0 | **5.73** | **8.27** |
| R136 | 2 | 4 | 10.0 | 10.0 | 1.9 | 25 | 1.0 | 2.9 | **6.04** | **8.56** |
| R137 | 2 | 4 | 10.0 | 10.0 | 1.3 | 25 | 1.0 | 2.3 | **8.82** | **10.79** |
| R138 | 2 | 4 | 10.0 | 10.0 | 1.3 | 25 | 1.0 | 2.3 | **8.82** | **10.79** |
| R139 | 2 | 4 | 10.0 | 10.0 | 1.5 | 25 | 1.0 | 2.5 | **7.65** | **9.93** |
| R140 | 2 | 4 | 10.0 | 10.0 | 1.7 | 25 | 1.0 | 2.7 | **6.75** | **9.19** |
| R141 | 2 | 4 | 10.0 | 10.0 | 1.7 | 25 | 1.0 | 2.7 | **6.75** | **9.19** |
| R143 | 3 | 4 | 10.0 | 10.0 | 2.4 | 25 | 1.0 | 3.4 | **3.19** | **4.87** |
| R145 | 2 | 4 | 10.0 | 10.0 | 2.1 | 25 | 1.0 | 3.1 | **5.46** | **8.01** |
| R147 | 2 | 4 | 10.0 | 10.0 | 0.8 | 25 | 1.0 | 1.8 | **14.34** | **13.79** |
| R149 | 2 | 4 | 10.0 | 10.0 | 2 | 25 | 1.0 | 3.0 | **5.73** | **8.27** |
| R151 | 2 | 4 | 10.0 | 10.0 | 1.8 | 25 | 1.0 | 2.8 | **6.37** | **8.86** |
| R152 | 2 | 4 | 10.0 | 10.0 | 1.2 | 25 | 1.0 | 2.2 | **9.56** | **11.28** |
| R153 | 2 | 4 | 10.0 | 10.0 | 1.5 | 25 | 1.0 | 2.5 | **7.65** | **9.93** |
| R154 | 2 | 4 | 10.0 | 10.0 | 1.8 | 25 | 1.0 | 2.8 | **6.37** | **8.86** |
| R156 | 2 | 4 | 10.0 | 10.0 | 3.1 | 25 | 1.0 | 4.1 | **3.70** | **6.05** |
| R158 | 3 | 4 | 10.0 | 10.0 | 1.6 | 25 | 1.0 | 2.6 | **4.78** | **6.37** |
| R159 | 3 | 4 | 10.0 | 10.0 | 1.5 | 25 | 1.0 | 2.5 | **5.10** | **6.62** |
| R161 | 3 | 4 | 10.0 | 10.0 | 1.9 | 25 | 1.0 | 2.9 | **4.03** | **5.71** |
| R163 | 5 | 4 | 10.0 | 10.0 | 1 | 25 | 1.0 | 2.0 | **4.61** | **4.97** |
| R165 | 2 | 4 | 10.0 | 10.0 | 1.1 | 25 | 1.0 | 2.1 | **10.43** | **11.82** |
| R166 | 2 | 4 | 10.0 | 10.0 | 2 | 25 | 1.0 | 3.0 | **5.73** | **8.27** |
| R168 | 3 | 4 | 10.0 | 10.0 | 2 | 25 | 1.0 | 3.0 | **3.83** | **5.52** |
| R170 | 3 | 4 | 10.0 | 10.0 | 2 | 25 | 1.0 | 3.0 | **3.83** | **5.52** |
| R171 | 3 | 4 | 10.0 | 10.0 | 1 | 25 | 1.0 | 2.0 | **7.65** | **8.28** |
| R172 | 3 | 4 | 10.0 | 10.0 | 1.2 | 25 | 1.0 | 2.2 | **6.38** | **7.52** |
| R174 | 4 | 4 | 10.0 | 10.0 | 1.2 | 25 | 1.0 | 2.2 | **4.79** | **5.64** |
| R175 | 4 | 4 | 10.0 | 10.0 | 0.6 | 25 | 1.0 | 1.6 | **9.58** | **7.76** |
| R176 | 4 | 4 | 10.0 | 10.0 | 1.5 | 25 | 1.0 | 2.5 | **3.83** | **4.97** |
| R178 | 2 | 4 | 10.0 | 10.0 | 1.1 | 25 | 1.0 | 2.1 | **10.43** | **11.82** |
| R180 | 3 | 4 | 10.0 | 10.0 | 1.3 | 25 | 1.0 | 2.3 | **5.89** | **7.20** |
| R182 | 2 | 4 | 10.0 | 10.0 | 1.5 | 25 | 1.0 | 2.5 | **7.65** | **9.93** |
| R183 | 2 | 4 | 10.0 | 10.0 | 1.5 | 25 | 1.0 | 2.5 | **7.65** | **9.93** |
| R185 | 2 | 4 | 10.0 | 10.0 | 0.6 | 25 | 1.0 | 1.6 | **19.11** | **15.51** |
| R187 | 2 | 4 | 10.0 | 10.0 | 1.7 | 25 | 1.0 | 2.7 | **6.75** | **9.19** |
| R189 | 2 | 4 | 10.0 | 10.0 | 1.3 | 25 | 1.0 | 2.3 | **8.82** | **10.79** |
| R191 | 2 | 4 | 10.0 | 10.0 | 0.6 | 25 | 1.0 | 1.6 | **19.11** | **15.51** |
| R193 | 3 | 4 | 10.0 | 10.0 | 2 | 25 | 1.0 | 3.0 | **3.83** | **5.52** |
| R195 | 2 | 4 | 10.0 | 10.0 | 1.5 | 25 | 1.0 | 2.5 | **7.65** | **9.93** |
| R198 | 3 | 4 | 10.0 | 10.0 | 4.2 | 25 | 1.0 | 5.2 | **1.82** | **3.18** |
| R200 | 3 | 4 | 10.0 | 10.0 | 2.1 | 25 | 1.0 | 3.1 | **3.64** | **5.34** |
| R202 | 3 | 4 | 10.0 | 10.0 | 2.4 | 25 | 1.0 | 3.4 | **3.19** | **4.87** |
| R205 | 2 | 4 | 10.0 | 10.0 | 1.1 | 25 | 1.0 | 2.1 | **10.43** | **11.82** |
| R207 | 2 | 4 | 10.0 | 10.0 | 2 | 25 | 1.0 | 3.0 | **5.73** | **8.27** |
| R209 | 2 | 4 | 10.0 | 10.0 | 1.3 | 25 | 1.0 | 2.3 | **8.82** | **10.79** |
| R211 | 2 | 4 | 10.0 | 10.0 | 1.5 | 25 | 1.0 | 2.5 | **7.65** | **9.93** |
| R213 | 2 | 4 | 10.0 | 10.0 | 1.4 | 25 | 1.0 | 2.4 | **8.19** | **10.34** |
| R215 | 2 | 4 | 10.0 | 10.0 | 1 | 25 | 1.0 | 2.0 | **11.47** | **12.41** |
| R216 | 2 | 4 | 10.0 | 10.0 | 0.9 | 25 | 1.0 | 1.9 | **12.74** | **13.06** |
| R218 | 2 | 4 | 10.0 | 10.0 | 1.5 | 25 | 1.0 | 2.5 | **7.65** | **9.93** |
| R220 | 2 | 4 | 10.0 | 10.0 | 0.9 | 25 | 1.0 | 1.9 | **12.74** | **13.06** |
| R222 | 2 | 4 | 10.0 | 10.0 | 2 | 25 | 1.0 | 3.0 | **5.73** | **8.27** |
| R224 | 3 | 4 | 10.0 | 10.0 | 1.3 | 25 | 1.0 | 2.3 | **5.89** | **7.20** |
| R226 | 3 | 4 | 10.0 | 10.0 | 1.2 | 25 | 1.0 | 2.2 | **6.38** | **7.52** |
| R228 | 3 | 4 | 10.0 | 10.0 | 0.7 | 25 | 1.0 | 1.7 | **10.93** | **9.74** |
| R230 | 3 | 4 | 10.0 | 10.0 | 1 | 25 | 1.0 | 2.0 | **7.65** | **8.28** |
| R232 | 3 | 4 | 10.0 | 10.0 | 1.5 | 25 | 1.0 | 2.5 | **5.10** | **6.62** |
| R234 | 3 | 4 | 10.0 | 10.0 | 1.2 | 25 | 1.0 | 2.2 | **6.38** | **7.52** |
| R236 | 3 | 4 | 10.0 | 10.0 | 1 | 25 | 1.0 | 2.0 | **7.65** | **8.28** |
| R238 | 2 | 4 | 10.0 | 10.0 | 1.6 | 25 | 1.0 | 2.6 | **7.17** | **9.55** |
| R240 | 2 | 4 | 10.0 | 10.0 | 1.1 | 25 | 1.0 | 2.1 | **10.43** | **11.82** |
| R242 | 2 | 4 | 10.0 | 10.0 | 0.6 | 25 | 1.0 | 1.6 | **19.11** | **15.51** |
| R244 | 2 | 4 | 10.0 | 10.0 | 1 | 25 | 1.0 | 2.0 | **11.47** | **12.41** |
| R246 | 2 | 4 | 10.0 | 10.0 | 1.1 | 25 | 1.0 | 2.1 | **10.43** | **11.82** |

# Calculated FoS of Natural Peat Slopes for Ballivor Wind Farm - Drained Analysis

| Turbine No./Waypoint | Slope | Design c' | Bulk unit weight of Peat | Unit weight of Water | Depth of In situ Peat | Friction Angle | Surcharge Equivalent Placed Fill | Equivalent Total Depth of Peat (m) | Factor of Safety for Load Condition | |
|---|---|---|---|---|---|---|---|---|---|---|
| | α (deg) | c' (kPa) | γ (kN/m$^3$) | $\gamma_w$ (kN/m$^3$) | (m) | ø' (deg) | Condition (2) | Condition (2) | Condition (1) | Condition (2) |
| | | | | | | | | | 100% Water | 100% Water |
| R248 | 2 | 4 | 10.0 | 10.0 | 1.4 | 25 | 1.0 | 2.4 | **8.19** | **10.34** |
| R250 | 2 | 4 | 10.0 | 10.0 | 1.5 | 25 | 1.0 | 2.5 | **7.65** | **9.93** |
| R253 | 2 | 4 | 10.0 | 10.0 | 2 | 25 | 1.0 | 3.0 | **5.73** | **8.27** |
| R255 | 3 | 4 | 10.0 | 10.0 | 1.1 | 25 | 1.0 | 2.1 | **6.96** | **7.88** |
| R257 | 3 | 4 | 10.0 | 10.0 | 2 | 25 | 1.0 | 3.0 | **3.83** | **5.52** |
| R259 | 4 | 4 | 10.0 | 10.0 | 2.5 | 25 | 1.0 | 3.5 | **2.30** | **3.55** |
| R261 | 4 | 4 | 10.0 | 10.0 | 2 | 25 | 1.0 | 3.0 | **2.87** | **4.14** |
| R263 | 4 | 4 | 10.0 | 10.0 | 1.5 | 25 | 1.0 | 2.5 | **3.83** | **4.97** |
| R265 | 3 | 4 | 10.0 | 10.0 | 2.1 | 25 | 1.0 | 3.1 | **3.64** | **5.34** |
| R267 | 3 | 4 | 10.0 | 10.0 | 1.4 | 25 | 1.0 | 2.4 | **5.47** | **6.90** |
| R269 | 3 | 4 | 10.0 | 10.0 | 1.9 | 25 | 1.0 | 2.9 | **4.03** | **5.71** |
| R270 | 2 | 4 | 10.0 | 10.0 | 1 | 25 | 1.0 | 2.0 | **11.47** | **12.41** |
| R272 | 2 | 4 | 10.0 | 10.0 | 1.5 | 25 | 1.0 | 2.5 | **7.65** | **9.93** |
| R274 | 2 | 4 | 10.0 | 10.0 | 2 | 25 | 1.0 | 3.0 | **5.73** | **8.27** |
| R275 | 2 | 4 | 10.0 | 10.0 | 2.1 | 25 | 1.0 | 3.1 | **5.46** | **8.01** |
| R277 | 2 | 4 | 10.0 | 10.0 | 2 | 25 | 1.0 | 3.0 | **5.73** | **8.27** |
| R284 | 3 | 4 | 10.0 | 10.0 | 2.1 | 25 | 1.0 | 3.1 | **3.64** | **5.34** |
| R286 | 3 | 4 | 10.0 | 10.0 | 1.5 | 25 | 1.0 | 2.5 | **5.10** | **6.62** |
| R288 | 3 | 4 | 10.0 | 10.0 | 3.2 | 25 | 1.0 | 4.2 | **2.39** | **3.94** |
| R290 | 3 | 4 | 10.0 | 10.0 | 3 | 25 | 1.0 | 4.0 | **2.55** | **4.14** |
| R294 | 2 | 4 | 10.0 | 10.0 | 2.1 | 25 | 1.0 | 3.1 | **5.46** | **8.01** |
| R296 | 2 | 4 | 10.0 | 10.0 | 1.8 | 25 | 1.0 | 2.8 | **6.37** | **8.86** |
| R298 | 2 | 4 | 10.0 | 10.0 | 1.2 | 25 | 1.0 | 2.2 | **9.56** | **11.28** |
| R300 | 2 | 4 | 10.0 | 10.0 | 0.5 | 25 | 1.0 | 1.5 | **22.94** | **16.55** |
| R301 | 2 | 4 | 10.0 | 10.0 | 1 | 25 | 1.0 | 2.0 | **11.47** | **12.41** |
| R303 | 2 | 4 | 10.0 | 10.0 | 1.2 | 25 | 1.0 | 2.2 | **9.56** | **11.28** |
| R305 | 2 | 4 | 10.0 | 10.0 | 1.5 | 25 | 1.0 | 2.5 | **7.65** | **9.93** |
| R307 | 2 | 4 | 10.0 | 10.0 | 1 | 25 | 1.0 | 2.0 | **11.47** | **12.41** |
| R309 | 2 | 4 | 10.0 | 10.0 | 1.2 | 25 | 1.0 | 2.2 | **9.56** | **11.28** |
| R311 | 2 | 4 | 10.0 | 10.0 | 2.1 | 25 | 1.0 | 3.1 | **5.46** | **8.01** |
| R314 | 2 | 4 | 10.0 | 10.0 | 1.7 | 25 | 1.0 | 2.7 | **6.75** | **9.19** |
| R315 | 2 | 4 | 10.0 | 10.0 | 1.8 | 25 | 1.0 | 2.8 | **6.37** | **8.86** |
| R316 | 2 | 4 | 10.0 | 10.0 | 2 | 25 | 1.0 | 3.0 | **5.73** | **8.27** |
| R317 | 2 | 4 | 10.0 | 10.0 | 1.5 | 25 | 1.0 | 2.5 | **7.65** | **9.93** |
| R318 | 2 | 4 | 10.0 | 10.0 | 1.7 | 25 | 1.0 | 2.7 | **6.75** | **9.19** |
| R319 | 2 | 4 | 10.0 | 10.0 | 2 | 25 | 1.0 | 3.0 | **5.73** | **8.27** |
| R320 | 3 | 4 | 10.0 | 10.0 | 1 | 25 | 1.0 | 2.0 | **7.65** | **8.28** |
| R321 | 3 | 4 | 10.0 | 10.0 | 0.6 | 25 | 1.0 | 1.6 | **12.76** | **10.34** |
| R322 | 2 | 4 | 10.0 | 10.0 | 1 | 25 | 1.0 | 2.0 | **11.47** | **12.41** |
| R323 | 2 | 4 | 10.0 | 10.0 | 1 | 25 | 1.0 | 2.0 | **11.47** | **12.41** |
| R324 | 2 | 4 | 10.0 | 10.0 | 0.8 | 25 | 1.0 | 1.8 | **14.34** | **13.79** |
| R325 | 2 | 4 | 10.0 | 10.0 | 0.5 | 25 | 1.0 | 1.5 | **22.94** | **16.55** |
| R326 | 3 | 4 | 10.0 | 10.0 | 2.3 | 25 | 1.0 | 3.3 | **3.33** | **5.02** |
| R327 | 3 | 4 | 10.0 | 10.0 | 2.1 | 25 | 1.0 | 3.1 | **3.64** | **5.34** |
| R330 | 2 | 4 | 10.0 | 10.0 | 0.8 | 25 | 1.0 | 1.8 | **14.34** | **13.79** |
| R331 | 2 | 4 | 10.0 | 10.0 | 1.3 | 25 | 1.0 | 2.3 | **8.82** | **10.79** |
| R333 | 2 | 4 | 10.0 | 10.0 | 1 | 25 | 1.0 | 2.0 | **11.47** | **12.41** |
| R335 | 2 | 4 | 10.0 | 10.0 | 1.4 | 25 | 1.0 | 2.4 | **8.19** | **10.34** |
| R337 | 3 | 4 | 10.0 | 10.0 | 1.5 | 25 | 1.0 | 2.5 | **5.10** | **6.62** |
| R339 | 3 | 4 | 10.0 | 10.0 | 1.1 | 25 | 1.0 | 2.1 | **6.96** | **7.88** |
| R341 | 2 | 4 | 10.0 | 10.0 | 2.7 | 25 | 1.0 | 3.7 | **4.25** | **6.71** |
| R343 | 2 | 4 | 10.0 | 10.0 | 2 | 25 | 1.0 | 3.0 | **5.73** | **8.27** |
| R344 | 2 | 4 | 10.0 | 10.0 | 2 | 25 | 1.0 | 3.0 | **5.73** | **8.27** |
| R345 | 2 | 4 | 10.0 | 10.0 | 2.1 | 25 | 1.0 | 3.1 | **5.46** | **8.01** |
| R347 | 2 | 4 | 10.0 | 10.0 | 1 | 25 | 1.0 | 2.0 | **11.47** | **12.41** |
| R349 | 2 | 4 | 10.0 | 10.0 | 1.2 | 25 | 1.0 | 2.2 | **9.56** | **11.28** |
| R350 | 2 | 4 | 10.0 | 10.0 | 1.6 | 25 | 1.0 | 2.6 | **7.17** | **9.55** |
| R351 | 3 | 4 | 10.0 | 10.0 | 2.9 | 25 | 1.0 | 3.9 | **2.64** | **4.24** |
| R352 | 3 | 4 | 10.0 | 10.0 | 2.4 | 25 | 1.0 | 3.4 | **3.19** | **4.87** |
| R353 | 3 | 4 | 10.0 | 10.0 | 1.3 | 25 | 1.0 | 2.3 | **5.89** | **7.20** |
| R354 | 2 | 4 | 10.0 | 10.0 | 1.5 | 25 | 1.0 | 2.5 | **7.65** | **9.93** |
| R355 | 2 | 4 | 10.0 | 10.0 | 1.2 | 25 | 1.0 | 2.2 | **9.56** | **11.28** |
| R356 | 2 | 4 | 10.0 | 10.0 | 1 | 25 | 1.0 | 2.0 | **11.47** | **12.41** |
| R357 | 2 | 4 | 10.0 | 10.0 | 1.8 | 25 | 1.0 | 2.8 | **6.37** | **8.86** |
| R358 | 2 | 4 | 10.0 | 10.0 | 1.2 | 25 | 1.0 | 2.2 | **9.56** | **11.28** |
| R359 | 2 | 4 | 10.0 | 10.0 | 0.8 | 25 | 1.0 | 1.8 | **14.34** | **13.79** |
| R366 | 3 | 4 | 10.0 | 10.0 | 1.5 | 25 | 1.0 | 2.5 | **5.10** | **6.62** |
| R367 | 2 | 4 | 10.0 | 10.0 | 1.5 | 25 | 1.0 | 2.5 | **7.65** | **9.93** |
| R368 | 2 | 4 | 10.0 | 10.0 | 0.6 | 25 | 1.0 | 1.6 | **19.11** | **15.51** |
| R369 | 2 | 4 | 10.0 | 10.0 | 1.2 | 25 | 1.0 | 2.2 | **9.56** | **11.28** |
| R371 | 2 | 4 | 10.0 | 10.0 | 2.5 | 25 | 1.0 | 3.5 | **4.59** | **7.09** |
| R373 | 3 | 4 | 10.0 | 10.0 | 3.4 | 25 | 1.0 | 4.4 | **2.25** | **3.76** |
| R375 | 3 | 4 | 10.0 | 10.0 | 1.2 | 25 | 1.0 | 2.2 | **6.38** | **7.52** |
| R377 | 3 | 4 | 10.0 | 10.0 | 0.9 | 25 | 1.0 | 1.9 | **8.50** | **8.71** |
| R379 | 3 | 4 | 10.0 | 10.0 | 1.5 | 25 | 1.0 | 2.5 | **5.10** | **6.62** |
| | | | | | | | | | | |
| MET1_1 | 4 | 4 | 10.0 | 10.0 | 0.9 | 25 | 1.0 | 1.9 | **6.39** | **6.54** |
| MET1_3 | 4 | 4 | 10.0 | 10.0 | 1.4 | 25 | 1.0 | 2.4 | **4.11** | **5.17** |
| CP1_1 | 3 | 4 | 10.0 | 10.0 | 2 | 25 | 1.0 | 3.0 | **3.83** | **5.52** |
| CP1_3 | 2 | 4 | 10.0 | 10.0 | 1.3 | 25 | 1.0 | 2.3 | **8.82** | **10.79** |
| CP1_5 | 2 | 4 | 10.0 | 10.0 | 1 | 25 | 1.0 | 2.0 | **11.47** | **12.41** |
| CCP1_1 | 2 | 4 | 10.0 | 10.0 | 2 | 25 | 1.0 | 3.0 | **5.73** | **8.27** |
| CCP1_3 | 3 | 4 | 10.0 | 10.0 | 1.8 | 25 | 1.0 | 2.8 | **4.25** | **5.91** |
| MET2_1 | 2 | 4 | 10.0 | 10.0 | 2.5 | 25 | 1.0 | 3.5 | **4.59** | **7.09** |
| MET2_3 | 2 | 4 | 10.0 | 10.0 | 3 | 25 | 1.0 | 4.0 | **3.82** | **6.21** |
| CCP2_1 | 2 | 4 | 10.0 | 10.0 | 0.5 | 25 | 1.0 | 1.5 | **22.94** | **16.55** |
| CCP2_2 | 2 | 4 | 10.0 | 10.0 | 0.9 | 25 | 1.0 | 1.9 | **12.74** | **13.06** |
| CCP2_3 | 2 | 4 | 10.0 | 10.0 | 1.5 | 25 | 1.0 | 2.5 | **7.65** | **9.93** |
| CCP2_4 | 2 | 4 | 10.0 | 10.0 | 1.9 | 25 | 1.0 | 2.9 | **6.04** | **8.56** |
| CCP2_5 | 2 | 4 | 10.0 | 10.0 | 0.8 | 25 | 1.0 | 1.8 | **14.34** | **13.79** |
| SUB1_1 | 2 | 4 | 10.0 | 10.0 | 1 | 25 | 1.0 | 2.0 | **11.47** | **12.41** |
| SUB1_2 | 2 | 4 | 10.0 | 10.0 | 1.2 | 25 | 1.0 | 2.2 | **9.56** | **11.28** |
| SUB1_4 | 2 | 4 | 10.0 | 10.0 | 1.5 | 25 | 1.0 | 2.5 | **7.65** | **9.93** |

# Calculated FoS of Natural Peat Slopes for Ballivor Wind Farm - Drained Analysis

| Turbine No./Waypoint | Slope | Design c' | Bulk unit weight of Peat | Unit weight of Water | Depth of In situ Peat | Friction Angle | Surcharge Equivalent Placed Fill | Equivalent Total Depth of Peat (m) | Factor of Safety for Load Condition | |
|---|---|---|---|---|---|---|---|---|---|---|
| | α (deg) | c' (kPa) | γ (kN/m$^3$) | $\gamma_w$ (kN/m$^3$) | (m) | ø' (deg) | Condition (2) | Condition (2) | Condition (1) | Condition (2) |
| | | | | | | | | | 100% Water | 100% Water |
| SUB1_6 | 2 | 4 | 10.0 | 10.0 | 1.8 | 25 | 1.0 | 2.8 | **6.37** | **8.86** |
| SUB1_9 | 2 | 4 | 10.0 | 10.0 | 1.7 | 25 | 1.0 | 2.7 | **6.75** | **9.19** |
| SUB1_10 | 2 | 4 | 10.0 | 10.0 | 1.5 | 25 | 1.0 | 2.5 | **7.65** | **9.93** |
| SUB1_11 | 2 | 4 | 10.0 | 10.0 | 1.9 | 25 | 1.0 | 2.9 | **6.04** | **8.56** |
| BP1_2 | 4 | 4 | 10.0 | 10.0 | 0.7 | 25 | 1.0 | 1.7 | **8.21** | **7.30** |
| BP2_3 | 4 | 4 | 10.0 | 10.0 | 2.7 | 25 | 1.0 | 3.7 | **2.13** | **3.36** |
| BP3_1 | 4 | 4 | 10.0 | 10.0 | 1.2 | 25 | 1.0 | 2.2 | **4.79** | **5.64** |
| BP3_2 | 4 | 4 | 10.0 | 10.0 | 1.4 | 25 | 1.0 | 2.4 | **4.11** | **5.17** |
| BP3_3 | 3 | 4 | 10.0 | 10.0 | 1 | 25 | 1.0 | 2.0 | **7.65** | **8.28** |
| BP3_4 | 3 | 4 | 10.0 | 10.0 | 1.2 | 25 | 1.0 | 2.2 | **6.38** | **7.52** |
| BP3_5 | 3 | 4 | 10.0 | 10.0 | 1 | 25 | 1.0 | 2.0 | **7.65** | **8.28** |
| BP3_5 | 4 | 4 | 10.0 | 10.0 | 2.1 | 25 | 1.0 | 3.1 | **2.74** | **4.01** |
| BP3_6 | 2 | 4 | 10.0 | 10.0 | 0.9 | 25 | 1.0 | 1.9 | **12.74** | **13.06** |
| BP3_7 | 3 | 4 | 10.0 | 10.0 | 1 | 25 | 1.0 | 2.0 | **7.65** | **8.28** |
| BP3_8 | 3 | 4 | 10.0 | 10.0 | 1.9 | 25 | 1.0 | 2.9 | **4.03** | **5.71** |
| BP4_1 | 6 | 4 | 10.0 | 10.0 | 2.1 | 25 | 1.0 | 3.1 | **1.83** | **2.67** |
| BP4_2 | 4 | 4 | 10.0 | 10.0 | 1.5 | 25 | 1.0 | 2.5 | **3.83** | **4.97** |
| BP4_3 | 4 | 4 | 10.0 | 10.0 | 1 | 25 | 1.0 | 2.0 | **5.75** | **6.21** |
| BP4_4 | 4 | 4 | 10.0 | 10.0 | 1.7 | 25 | 1.0 | 2.7 | **3.38** | **4.60** |
| BP4_5 | 3 | 4 | 10.0 | 10.0 | 1 | 25 | 1.0 | 2.0 | **7.65** | **8.28** |
| BP4_6 | 3 | 4 | 10.0 | 10.0 | 0.6 | 25 | 1.0 | 1.6 | **12.76** | **10.34** |
| BP4_7 | 6 | 4 | 10.0 | 10.0 | 0.9 | 25 | 1.0 | 1.9 | **4.28** | **4.36** |
| BP4_8 | 6 | 4 | 10.0 | 10.0 | 1.9 | 25 | 1.0 | 2.9 | **2.03** | **2.86** |
| BP4_9 | 4 | 4 | 10.0 | 10.0 | 2.1 | 25 | 1.0 | 3.1 | **2.74** | **4.01** |
| BP4_10 | 2 | 4 | 10.0 | 10.0 | 1 | 25 | 1.0 | 2.0 | **11.47** | **12.41** |
| BP4_11 | 2 | 4 | 10.0 | 10.0 | 1.2 | 25 | 1.0 | 2.2 | **9.56** | **11.28** |
| BP4_12 | 3 | 4 | 10.0 | 10.0 | 1 | 25 | 1.0 | 2.0 | **7.65** | **8.28** |
| BP5_2 | 3 | 4 | 10.0 | 10.0 | 2.1 | 25 | 1.0 | 3.1 | **3.64** | **5.34** |
| CCP3_1 | 2 | 4 | 10.0 | 10.0 | 1.6 | 25 | 1.0 | 2.6 | **7.17** | **9.55** |
| CCP3_2 | 2 | 4 | 10.0 | 10.0 | 1.2 | 25 | 1.0 | 2.2 | **9.56** | **11.28** |
| CCP3_3 | 2 | 4 | 10.0 | 10.0 | 1.8 | 25 | 1.0 | 2.8 | **6.37** | **8.86** |
| CCP3_4 | 2 | 4 | 10.0 | 10.0 | 1.5 | 25 | 1.0 | 2.5 | **7.65** | **9.93** |
| CCP3_5 | 2 | 4 | 10.0 | 10.0 | 1.2 | 25 | 1.0 | 2.2 | **9.56** | **11.28** |
| MET3_1 | 2 | 4 | 10.0 | 10.0 | 1.7 | 25 | 1.0 | 2.7 | **6.75** | **9.19** |
| MET3_2 | 2 | 4 | 10.0 | 10.0 | 1.5 | 25 | 1.0 | 2.5 | **7.65** | **9.93** |
| MET3_3 | 2 | 4 | 10.0 | 10.0 | 2 | 25 | 1.0 | 3.0 | **5.73** | **8.27** |
| MET3_4 | 2 | 4 | 10.0 | 10.0 | 1.5 | 25 | 1.0 | 2.5 | **7.65** | **9.93** |
| WP001 | 2 | 4 | 10.0 | 10.0 | 1.7 | 25 | 1.0 | 2.7 | **6.75** | **9.19** |
| WP002 | 1 | 4 | 10.0 | 10.0 | 2 | 25 | 1.0 | 3.0 | **11.46** | **16.55** |
| WP003 | 2 | 4 | 10.0 | 10.0 | 2.3 | 25 | 1.0 | 3.3 | **4.99** | **7.52** |
| WP004 | 2 | 4 | 10.0 | 10.0 | 3.1 | 25 | 1.0 | 4.1 | **3.70** | **6.05** |
| WP005 | 2 | 4 | 10.0 | 10.0 | 2.1 | 25 | 1.0 | 3.1 | **5.46** | **8.01** |
| WP006 | 2 | 4 | 10.0 | 10.0 | 4.3 | 25 | 1.0 | 5.3 | **2.67** | **4.68** |
| WP007 | 2 | 4 | 10.0 | 10.0 | 4.5 | 25 | 1.0 | 5.5 | **2.55** | **4.51** |
| | | | | | | | | | | |
| | | | | | | | | **Minimum =** | **1.31** | **2.30** |
| | | | | | | | | **Maximum =** | **28.67** | **17.73** |
| | | | | | | | | **Average =** | **6.88** | **8.18** |
| | | | | | | | | count | **320.00** | **320.00** |
| | | | | | | | | count if >1.3 | 320.0 | 320.0 |

**Notes:**

(1) Assuming a bulk unit weight of peat of 10 (kN/m$^3$)
(2) Assuming a surcharge equivalent to fill depth of 1.0m.
(3) Slope inclination (β) based on site readings and contour survey plans of site.
(4) FoS is based on slope inclination and shear test results obtained from published data.
(5) Peat depths based on probes carried out by FT.
(6) For load conditions see Report text.
(7) Minimum acceptable factor of safety required of 1.3 for first-time failures based on BS: 6031:1981 Code of practice for Earthworks.

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# APPENDIX D

## Methodology for Peat Stability Risk Assessment

## Methodology for Peat Stability Risk Assessment

A peat stability risk assessment was carried out for each of the main infrastructure elements at the proposed wind farm development. This approach takes into account guidelines for geotechnical/peat stability risk assessments as given in PLHRAG (2nd Edition, 2017) and MacCulloch (2005). The degree of risk is determined as a Risk Rating (R), which is the product of probability (P) and impact (I). How these factors are determined and applied in the analysis is described below.

The main approaches for assessing peat stability include the following:

(a) Geomorphological

(b) Qualitative (judgement)

(c) Index/Probabilistic (probability)

(d) Deterministic (factor of safety)

Approaches (a) to (c) listed above would be considered subjective and do not provide a definitive indication of stability; in addition, a high level of judgement/experience is required which makes it difficult to relate the findings to real conditions. FT apply a more objective approach, the deterministic approach. As part of FT's deterministic approach, a qualitative risk assessment is also carried out taking into account qualitative factors, which cannot necessarily be quantified.

## Probability

The likelihood of a peat failure occurring was assessed based on the results of both the quantitative results of stability calculations (deterministic approach using factors of safety) and the assessment of the severity of several qualitative factors which cannot be reasonably included in a stability calculation but nevertheless may affect the occurrence of peat instability.

The qualitative factors used in the risk assessment are outlined in Table A and have been compiled based on FT's experience of assessments and construction in peat land sites and peat failures throughout Ireland and the UK.

**Table A: Qualitative Factors used to Assess Potential for Peat Failure**

| Qualitative Factor | Type of Feature/Indicator for each Qualitative Factor (1) | Explanation/Description of Qualitative Factor |
|---|---|---|
| Evidence of sub peat water flow | No | Based on site walkover observations. Sub peat water flow generally occurs in the form of natural piping at the base of peat. Where there is a constriction or blockage in natural pipes a build-up of water can occur at the base of the peat causing a reduction in effective stress at the base of the peat resulting in failure; this is particularly critical during periods of intense rainfall. |
| | Possibly | |
| | Probably | |
| | Yes | |

| Qualitative Factor | Type of Feature/Indicator for each Qualitative Factor [1] | Explanation/Description of Qualitative Factor |
|---|---|---|
| Evidence of surface water flow | Dry | Based on site walkover observations. The presence of surface water flow indicates if peat in an area is well drained or saturated and if any additional loading from the ponding of surface water onto the peat is likely. |
| | Localised/Flowing in drains | |
| | Ponded in drains | |
| | Springs/surface water | |
| Evidence of previous failures/slips | No | Based on site walkover observations. The presence of clustering of relict failures may indicate that particular pre-existing site conditions predispose a site to failure. |
| | In general area | |
| | On site | |
| | Within 500m of location | |
| Type of vegetation | Grass/Crops | Based on site walkover observations. The type of vegetation present indicates if peat in an area is well drained, saturated, etc. Vegetation that indicates wetter ground may also indicate softer underlying peat deposits. |
| | Improved Grass/Dry Heather | |
| | Wet Grassland/Juncus (Rushes) | |
| | Wetlands Sphagnum (Peat moss) | |
| General slope characteristics upslope/downslope from infrastructure location | Concave | Based on site walkover observations. Slope morphology in the area of the infrastructure location is an important factor. A number of recorded peat failures have occurred in close proximity to a convex break in slope. |
| | Planar to concave | |
| | Planar to convex | |
| | Convex | |
| Evidence of very soft/soft clay at base of peat | No | Based on inspection of exposures in general area from site walkover. Several reported peat failures identify the presence of a weak layer at the base of the peat along which shear failure has occurred. |
| | Yes | |
| Evidence of mechanically cut peat | No | Based on site walkover observations. Mechanically cut peat typically cut using a ‘sausage’ machine to extract |

| Qualitative Factor | Type of Feature/Indicator for each Qualitative Factor [1] | Explanation/Description of Qualitative Factor |
|---|---|---|
| | Yes | peat for harvesting. Areas which have been cut in this manner have been linked to peat instability. The mechanical cuts can notably reduce the intrinsic strength of the peat and also allow ingress of rainfall/surface water. |
| Evidence of quaking or buoyant peat | No | Based on site walkover observations. Quaking/buoyant peat is indicative of highly saturated peat, which would generally be considered to have a low strength. Quaking peat is a feature on sites that have been previously linked with peat instability. |
| | Yes | |
| Evidence of bog pools | No | Based on site walkover observations. Bog pools are generally an indicator of areas of weak, saturated peat. Commonly where there are open areas of water within peat these can be interconnected, with the result that there may be sub-surface bodies of water. The presence of bog pools have been previously linked with peat instability. |
| | Yes | |
| Other | Varies | In addition to the above features/ indicators and based on site recordings the following are some of the features which may be identified: Excessively deep peat, weak peat, overly steep slope angles, etc. |

Note (1) The list of features/indicators for each qualitative factor are given in increasing order of probability of leading to peat instability/failure.

It should be noted that the presence of one of the qualitative factors alone from Table A is unlikely to lead to peat instability/failure. Peat instability/failure at a site is generally the combination of a number of these factors occurring at the same time at a particular location. The probability rating assigned to the quantitative and qualitative factors is judged on a 5-point scale from 1 (indicating negligible or no probability of failure) to 5 (indicating a very likely failure), as outlined in Table B.

**Table B: Probability Scale**

| Scale | Factor of Safety | Probability |
|---|---|---|
| 1 | 1.30 or greater | Negligible/None |
| 2 | 1.29 to 1.20 | Unlikely |
| 3 | 1.19 to 1.11 | Likely |
| 4 | 1.01 to 1.10 | Probable |
| 5 | ≤1.0 | Very Likely |

| Scale | Likelihood of Qualitative Factor leading to Peat Failure | Probability of Failure |
|---|---|---|
| 1 | Negligible/None | Least |
| 2 | Unlikely | |
| 3 | Probable | |
| 4 | Likely | |
| 5 | Very Likely | Greatest |

## Impact

The severity of the risk is also assessed qualitatively in terms of impact. The impact of a peat failure on the environment within and beyond the immediate wind farm site is assessed based on the potential travel distance of a peat failure. Where a peat failure enters a watercourse, it can travel a considerable distance downstream. Therefore, the proximity of a potential peat failure to a drainage course is a significant indicator of the likely potential impact.

The risk is determined based on the combination of hazard and impact. A qualitative scale has been derived for the impact of the hazard based on distance of infrastructure element to a watercourse (Table C).

The location of watercourses is based on topographic maps and supplemented by site observations from walkover survey. Note that not all watercourses are shown on maps.

**Table C: Impact Scale**

| Scale | Criteria | Impact |
|---|---|---|
| 1 | Proposed infrastructure element greater than 150m of watercourse | Negligible/None |
| 2 | Proposed infrastructure element within 150 to 101m of watercourse | Low |
| 3 | Proposed infrastructure element within 100 to 51m of watercourse | Medium |

| | | |
|---|---|---|
| 4 | Proposed infrastructure element within 50 m of watercourse | High |
| 5 | Proposed infrastructure element within 50 m of watercourse, in an environmentally sensitive area | Extremely High |

### Risk Rating

The degree of risk is determined as the product of probability (P) and impact (I), which gives the Risk Rating (R) as follows:

The Risk Rating is calculated from: R = P x I

Due to the 5-point scales used to assess Probability and Impact, the Risk Rating can range from 1 to 25 as shown in Table D.

**Table D: Qualitative Risk Rating**

| | | Probability | | | | |
|---|---|---|---|---|---|---|
| | | **1** | **2** | **3** | **4** | **5** |
| **Impact** | **5** | 5 | 10 | 15 | 20 | 25 |
| | **4** | 4 | 8 | 12 | 16 | 20 |
| | **3** | 3 | 6 | 9 | 12 | 15 |
| | **2** | 2 | 4 | 6 | 8 | 10 |
| | **1** | 1 | 2 | 3 | 4 | 5 |

| Risk Rating & Control Measures | |
|---|---|
| 17 to 25 | High: avoid working in area or significant control measures required |
| 11 to 16 | Medium: notable control measures required |
| 5 to 10 | Low: only routine control measures required |
| 1 to 4 | Negligible: none or only routine control measures required |

The risk rating is calculated individually for each contributory factor. Control measures are required to reduce the risk to at least a 'Low' risk rating. The control measures in response to the qualitative risk ratings are included in the peat stability risk registers for each main infrastructure element in Appendix B.

The risk rating is calculated individually for each contributory factor. Control measures are required to reduce the risk to at least a 'Low' risk rating

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# APPENDIX E

Borrow Pit Ground Investigation, FT, 2020

# Trial Pit Log

Trialpit No
**P1 TP-A**
Sheet 1 of 2

| | | | |
|---|---|---|---|
| Project Name: Ballivor Wind Farm | Project No. P2318 | Co-ords: 663962.00 - 758684.00<br>Level: | Date 17/08/2020 |
| Location: Co. Meath | | Dimensions (m):<br>Depth 5.50 | Scale 1:25 |
| Client: Bord na Mona | | | Logged |

| Water Strike | Samples and In Situ Testing: Depth | Type | Results | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|
| | | | | | | | Fibrous soft PEAT with branches and roots. |
| | | | | 2.80 | | | Soft light grey slightly sandy, slightly gravelly CLAY. Sand is fine-grained and gravels are sub-rounded. |
| ▼ | | | | 4.00 | | | Firm grey slightly gravelly, sandy CLAY with cobbles. Cobbles and gravels are sub-rounded. |
| | | | | | | | Continued on next sheet |

1 2 3 4 5

Remarks: Trial pit moved to area with suspected shallow bedrock (according to machine operator)

Stability: Pit began to collapse at 5.5m

# Trial Pit Log

Trialpit No
**P1 TP-A**
Sheet 2 of 2

| | | | |
|---|---|---|---|
| Project Name: Ballivor Wind Farm | Project No. P2318 | Co-ords: 663962.00 - 758684.00<br>Level: | Date 17/08/2020 |
| Location: Co. Meath | | Dimensions (m):<br>Depth 5.50 | Scale 1:25 |
| Client: Bord na Mona | | | Logged |

| Water Strike | Samples and In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|
| | Depth | Type | Results | | | | |
| | | | | 5.50 | | | End of pit at 5.50 m |

6
7
8
9
10

Remarks: Trial pit moved to area with suspected shallow bedrock (according to machine operator)

Stability: Pit began to collapse at 5.5m

# Trial Pit Log

Trialpit No
**P1 TP-B**
Sheet 1 of 1

| | | | |
|---|---|---|---|
| Project Name: Ballivor Wind Farm | Project No. P2318 | Co-ords: 665121.00 - 758495.00<br>Level: | Date 17/08/2020 |
| Location: Co. Meath | | Dimensions (m):<br>Depth 5.00 | Scale 1:25 |
| Client: Bord na Mona | | | Logged |

| Water Strike | Samples and In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|
| | Depth | Type | Results | | | | |
| | | | | 0.20 | | | Firm dark brown fibrous PEAT. |
| | | | | | | | Soft light brown, amorphous PEAT with branches and roots (moss peat). |
| ▼ | | | | 2.80 | | | Soft light grey sandy gravelly CLAY. Sand is coarse grained and gravel is sub-rounded. |
| | 3.50 | B | | | | | |
| | | | | 5.00 | | | End of pit at 5.00 m |

1 2 3 4 5

Remarks:

Stability: Walls began to collapse at 5m.

# Trial Pit Log

Trialpit No
**P1 TP-C**
Sheet 1 of 1

| | | | |
|---|---|---|---|
| Project Name: Ballivor Wind Farm | Project No. P2318 | Co-ords: 665735.00 - 759326.00<br>Level: | Date 17/08/2020 |
| Location: Co. Meath | | Dimensions (m):<br>Depth 4.70 | Scale 1:25 |
| Client: Bord na Mona | | | Logged |

| Water Strike | Samples and In Situ Testing: Depth | Type | Results | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|
| | | | | | | | Soft light brown, amorphous PEAT (moss peat) |
| | | | | 3.40 | | | Firm grey sandy, gravelly SILT with cobbles. Medium grained sand with sub-rounded gravels and cobbles. |
| ▼ | | | | 3.60 | | | Grey sandy silty GRAVEL with cobbles. Coarse grained sand with sub-rounded gravel and cobbles. |
| | | | | 4.70 | | | End of pit at 4.70 m |

1
2
3
4
5

Remarks:

Stability: Instability of walls at 4.7m

# Trial Pit Log

Trialpit No
**P1 TP-D**
Sheet 1 of 1

| | | | |
|---|---|---|---|
| Project Name: Ballivor Wind Farm | Project No. P2318 | Co-ords: 665950.00 - 752542.00<br>Level: | Date 20/08/2020 |
| Location: Co. Meath | | Dimensions (m):<br>Depth 4.00 | Scale 1:25 |
| Client: Bord na Mona | | | Logged |

| Water Strike | Samples and In Situ Testing: Depth | Type | Results | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|
| | | | | 0.30 | | | Soft dark brown fibrous PEAT |
| | | | | | | | Soft light brown amorphous PEAT (moss peat) |
| | | | | 3.00 | | | Firm grey slightly gravelly SILT. |
| ▼ | | | | 3.30 | | | Grey coarse grained SAND. |
| | | | | 4.00 | | | End of pit at 4.00 m |

1 2 3 4 5

Remarks:

Stability: Instability of trial pit walls at 4m

# Trial Pit Log

Trialpit No
**P1 TP-E**
Sheet 1 of 1

| | | | |
|---|---|---|---|
| Project Name: Ballivor Wind Farm | Project No. P2318 | Co-ords: 665431.00 - 751473.00<br>Level: | Date 21/08/2020 |
| Location: Co. Meath | | Dimensions (m):<br>Depth 4.50 | Scale 1:25 |
| Client: Bord na Mona | | | Logged |

| Water Strike | Samples and In Situ Testing: Depth | Type | Results | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|
| | | | | | | | Soft dark brown fibrous PEAT. |
| | | | | 0.40 | | | Soft light brown PEAT (moss peat) |
| | | | | 4.00 | | | Soft grey slightly sandy SILT. |
| | | | | 4.50 | | | End of pit at 4.50 m |

1
2
3
4
5

Remarks: Pit dry

Stability: Pit stable

# Trial Pit Log

Trialpit No
**P1 TP-F**
Sheet 1 of 2

| | | | |
|---|---|---|---|
| Project Name: Ballivor Wind Farm | Project No. P2318 | Co-ords: 661548.00 - 757078.00<br>Level: | Date 19/08/2020 |
| Location: Co. Meath | | Dimensions (m):<br>Depth 5.20 | Scale 1:25 |
| Client: Bord na Mona | | | Logged |

| Water Strike | Samples and In Situ Testing: Depth | Type | Results | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|
| | | | | | | | Firm, dark brown fibrous PEAT. |
| | | | | 0.30 | | | Soft, light brown amorphous PEAT (moss peat) |
| | | | | 4.40 | | | Slightly gravelly, silty SAND. Gravel is sub-rounded and sand is medium grained. |
| ▼ | | | | | | | Continued on next sheet |

1 2 3 4 5

Remarks:

Stability: Instability of walls at 5.2m

# Trial Pit Log

Trialpit No
**P1 TP-F**
Sheet 2 of 2

| | | | |
|---|---|---|---|
| Project Name: Ballivor Wind Farm | Project No. P2318 | Co-ords: 661548.00 - 757078.00<br>Level: | Date 19/08/2020 |
| Location: Co. Meath | | Dimensions (m):<br>Depth 5.20 | Scale 1:25 |
| Client: Bord na Mona | | | Logged |

| Water Strike | Samples and In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|
| | Depth | Type | Results | | | | |
| | | | | 5.20 | | | End of pit at 5.20 m |

6
7
8
9
10

Remarks:

Stability: Instability of walls at 5.2m

# Trial Pit Log

Trialpit No
**P1 TP-G**
Sheet 1 of 1

| | | | |
|---|---|---|---|
| Project Name: Ballivor Wind Farm | Project No. P2318 | Co-ords: 659961.00 - 756843.00<br>Level: | Date 19/08/2020 |
| Location: Co. Meath | | Dimensions (m):<br>Depth 4.40 | Scale 1:25 |
| Client: Bord na Mona | | | Logged |

| Water Strike | Samples and In Situ Testing: Depth | Type | Results | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|
| | | | | | | | Soft light brown amorphous PEAT (moss peat) |
| | | | | 2.60 | | | Soft grey slightly gravelly CLAY. Gravel is sub-rounded. |
| | | | | 3.40 | | | Soft grey slightly gravelly, slightly cobbly CLAY. Gravel and cobbles are sub-rounded. |
| | | | | 4.40 | | | End of pit at 4.40 m |

1 2 3 4 5

Remarks: Pit dry

Stability: Instability of trial pit walls at 4.4m

# Trial Pit Log

Trialpit No
**P1 TP-H**
Sheet 1 of 1

| | | | |
|---|---|---|---|
| Project Name: Ballivor Wind Farm | Project No. P2318 | Co-ords: 663431.00 - 757512.00<br>Level: | Date 19/08/2020 |
| Location: Co. Meath | | Dimensions (m):<br>Depth 4.00 | Scale 1:25 |
| Client: Bord na Mona | | | Logged |

| Water Strike | Samples and In Situ Testing: Depth | Type | Results | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|
| | | | | 0.30 | | | Firm dark brown fibrous PEAT. |
| | | | | 1.90 | | | Soft light brown amorphous PEAT (moss peat). |
| | | | | 4.00 | | | Firm grey slightly gravelly SILT with cobbles. Gravel is sub-rounded and cobbles are angular. |
| | | | | | | | End of pit at 4.00 m |

1
2
3
4
5

Remarks: Pit dry

Stability: Instability of trial pit walls at 4m

# Trial Pit Log

Trialpit No
**P1 TP-I**
Sheet 1 of 1

| | | | |
|---|---|---|---|
| Project Name: Ballivor Wind Farm | Project No. P2318 | Co-ords: 664636.00 - 752049.00<br>Level: | Date 21/08/2020 |
| Location: Co. Meath | | Dimensions (m):<br>Depth 4.20 | Scale 1:25 |
| Client: Bord na Mona | | | Logged |

| Water Strike | Samples and In Situ Testing: Depth | Type | Results | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|
| | | | | | | | Soft light brown amorphous PEAT (moss peat) |
| | | | | 3.00 | | | Soft grey slightly gravelly SILT. |
| | | | | 4.20 | | | End of pit at 4.20 m |

1
2
3
4
5

Remarks:

Stability: Instability of trial pit walls at 4.2m

# Trial Pit Log

Trialpit No
**P1 TP-J**
Sheet 1 of 1

| | | | |
|---|---|---|---|
| Project Name: Ballivor Wind Farm | Project No. P2318 | Co-ords: 663138.00 - 756984.00<br>Level: | Date 19/08/2020 |
| Location: Co. Meath | | Dimensions (m):<br>Depth 4.60 | Scale 1:25 |
| Client: Bord na Mona | | | Logged |

| Water Strike | Samples and In Situ Testing: Depth | Type | Results | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|
| | | | | | | | Firm dark brown slightly fibrous PEAT. |
| | | | | 0.30 | | | Soft light brown amorphous PEAT (moss peat). Branches placed within this layer. |
| | | | | 2.00 | | | Soft grey sandy, slightly gravelly SILT. Sand is medium grained and gravel is sub-rounded. |
| | | | | 2.50 | | | Grey slightly gravelly SAND with cobbles. Sand is coarse grained with sub-rounded gravel and cobbles. |
| ▼ | | | | 4.60 | | | End of pit at 4.60 m |

1 2 3 4 5

Remarks:

Stability: Instability of trial pit walls at 4.6m

# Trial Pit Log

Trialpit No
**P1 TP-K**
Sheet 1 of 1

| | | | |
|---|---|---|---|
| Project Name: Ballivor Wind Farm | Project No. P2318 | Co-ords: 664120.00 - 755361.00<br>Level: | Date 19/08/2020 |
| Location: Co. Meath | | Dimensions (m):<br>Depth 4.00 | Scale 1:25 |
| Client: Bord na Mona | | | Logged |

| Water Strike | Samples and In Situ Testing: Depth | Type | Results | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|
| | | | | 0.30 | | | Firm dark brown fibrous PEAT. |
| | | | | 0.50 | | | Soft light brown amorphous PEAT (moss peat) |
| | | | | 4.00 | | | Firm grey/ brown gravelly SILT with cobbles. Gravel is sub-rounded and cobbles are sub-angular<br>End of pit at 4.00 m |

1
2
3
4
5

Remarks: Pit dry

Stability: Pit stable

# Trial Pit Log

Trialpit No
**P1 TP-L**
Sheet 1 of 1

| | | | |
|---|---|---|---|
| Project Name: Ballivor Wind Farm | Project No. P2318 | Co-ords: 664194.00 - 755179.00<br>Level: | Date 20/08/2020 |
| Location: Co. Meath | | Dimensions (m):<br>Depth 5.00 | Scale 1:25 |
| Client: Bord na Mona | | | Logged |

| Water Strike | Samples and In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|
| | Depth | Type | Results | | | | |
| | | | | 0.10 | | | Soft dark brown fibrous PEAT. |
| | | | | | | | Firm grey/ brown sandy, slightly gravelly, slightly cobbly SILT. Coarse grained sand with sub-rounded gravel and cobbles. |
| | | | | 2.00 | | | Grey sandy silty GRAVEL with cobbles. Sand is coarse grained and gravel and cobbles are sub-rounded. |
| | 3.00 | B | | | | | |
| | | | | 5.00 | | | End of pit at 5.00 m |

Remarks: Pit dry

Stability: Pit stable

# Trial Pit Log

Trialpit No
**P1 TP-M**
Sheet 1 of 2

| | | | |
|---|---|---|---|
| Project Name: Ballivor Wind Farm | Project No. P2318 | Co-ords: 664207.00 - 755015.00<br>Level: | Date 20/08/2020 |
| Location: Co. Meath | | Dimensions (m):<br>Depth 6.00 | Scale 1:25 |
| Client: Bord na Mona | | | Logged |

| Water Strike | Samples and In Situ Testing: Depth | Type | Results | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|
| | | | | 0.10 | | | Soft dark brown PEAT. |
| | | | | | | | Grey sandy silty GRAVEL with cobbles and boulders. Sand is medium grained and gravel and cobbles are sub-rounded. Boulders are sub-angular. |
| | | | | 2.00 | | | Grey slightly cobbly SAND. Cobbles are sub-rounded and sand is coarse grained. |
| | | | | | | | Continued on next sheet |

1
2
3
4
5

Remarks: Pit dry

Stability: Pit stable

# Trial Pit Log

Trialpit No
**P1 TP-M**
Sheet 2 of 2

| | | | |
|---|---|---|---|
| Project Name: Ballivor Wind Farm | Project No. P2318 | Co-ords: 664207.00 - 755015.00<br>Level: | Date 20/08/2020 |
| Location: Co. Meath | | Dimensions (m):<br>Depth 6.00 | Scale 1:25 |
| Client: Bord na Mona | | | Logged |

| Water Strike | Samples and In Situ Testing: Depth | Type | Results | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|
| | | | | 6.00 | | | End of pit at 6.00 m |

6
7
8
9
10

Remarks: Pit dry

Stability: Pit stable

# Trial Pit Log

Trialpit No
**P1 TP-N**
Sheet 1 of 2

| | | | |
|---|---|---|---|
| Project Name: Ballivor Wind Farm | Project No. P2318 | Co-ords: 664173.00 - 754794.00<br>Level: | Date 20/08/2020 |
| Location: Co. Meath | | Dimensions (m):<br>Depth 5.30 | Scale 1:25 |
| Client: Bord na Mona | | | Logged |

| Water Strike | Samples and In Situ Testing: Depth | Type | Results | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|
| | | | | 0.40 | | | Firm dark brown fibrous PEAT. |
| | | | | 0.80 | | | Soft brown/ grey gravelly SILT. Gravel is sub-rounded. |
| | | | | | | | Firm grey silty, sandy GRAVEL with boulders. Sand is medium grained, gravel is sub-rounded and boulders are sub-angular. |
| | | | | | | | Continued on next sheet |

1 2 3 4 5

Remarks:

Stability: Instability of trial pit walls at 5.3m

# Trial Pit Log

Trialpit No
**P1 TP-N**
Sheet 2 of 2

| | | | |
|---|---|---|---|
| Project Name: Ballivor Wind Farm | Project No. P2318 | Co-ords: 664173.00 - 754794.00<br>Level: | Date 20/08/2020 |
| Location: Co. Meath | | Dimensions (m):<br>Depth 5.30 | Scale 1:25 |
| Client: Bord na Mona | | | Logged |

| Water Strike | Samples and In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|
| | Depth | Type | Results | | | | |
| ▼ | | | | 5.30 | | | End of pit at 5.30 m |

6
7
8
9
10

Remarks:

Stability: Instability of trial pit walls at 5.3m

# Trial Pit Log

Trialpit No **P1 TP-SUB1**
Sheet 1 of 1

| | | | |
|---|---|---|---|
| Project Name: Ballivor Wind Farm | Project No. P2318 | Co-ords: 664003.00 - 755502.00<br>Level: | Date 20/08/2020 |
| Location: Co. Meath | | Dimensions (m): Depth 3.40 | Scale 1:25 |
| Client: Bord na Mona | | | Logged |

| Water Strike | Samples and In Situ Testing: Depth | Type | Results | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|
| | | | | | | | Soft light brown amorphous PEAT (moss peat) |
| | | | | 2.90 | | | Soft grey slightly gravelly SILT. Gravel is sub-rounded |
| ▼ | | | | 3.40 | | | End of pit at 3.40 m |

1 2 3 4 5

Remarks:

Stability: Instability of trial pit walls at 3.4m

# Trial Pit Log

Trialpit No **P1 TP-SUB2** Sheet 1 of 1

| | | | |
|---|---|---|---|
| Project Name: Ballivor Wind Farm | Project No. P2318 | Co-ords: 663822.00 - 755369.00<br>Level: | Date 20/08/2020 |
| Location: Co. Meath | | Dimensions (m): Depth 3.40 | Scale 1:25 |
| Client: Bord na Mona | | | Logged |

| Water Strike | Samples and In Situ Testing: Depth | Type | Results | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|
| | | | | | | | Soft light brown amorphous PEAT (moss peat) |
| | | | | 2.90 | | | Soft grey gravelly SILT with cobbles. Gravel and cobbles are sub-rounded. |
| ▼ | | | | 3.40 | | | End of pit at 3.40 m |

Remarks:

Stability: Instability of trial pit walls at 3.4m

# Trial Pit Log

Trialpit No
**P1 TPX1**
Sheet 1 of 1

| | | | |
|---|---|---|---|
| Project Name: Ballivor Wind Farm | Project No. P2318 | Co-ords: 661626.00 - 756186.00<br>Level: | Date 18/08/2020 |
| Location: Co. Meath | | Dimensions (m):<br>Depth 5.00 | Scale 1:25 |
| Client: Bord na Mona | | | Logged |

| Water Strike | Samples and In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|
| | Depth | Type | Results | | | | |
| | | | | 0.20 | | | Peaty topsoil |
| | | | | 0.80 | | | Soft brown gravelly SILT. |
| | | | | 1.50 | | | Soft brownish grey gravelly, cobbly SILT with a small boulder (0.4m in length). Gravel and cobbles are sub-rounded. |
| | 3.00 | B | | 5.00 | | | Grey sandy cobbly GRAVEL with boulders. Coarse grained sand with sub-rounded gravel and cobbles. |
| | | | | | | | End of pit at 5.00 m |

1 2 3 4 5

Remarks: Pit dry

Stability: Instability of trial pit walls at 5m

# Trial Pit Log

Trialpit No
**P1 TPX2**
Sheet 1 of 1

| | | | |
|---|---|---|---|
| Project Name: Ballivor Wind Farm | Project No. P2318 | Co-ords: 661755.00 - 755767.00<br>Level: | Date 18/08/2020 |
| Location: Co. Meath | | Dimensions (m):<br>Depth 4.70 | Scale 1:25 |
| Client: Bord na Mona | | | Logged |

| Water Strike | Samples and In Situ Testing: Depth | Type | Results | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|
| | | | | 0.30 | | | Peaty topsoil |
| | | | | 0.90 | | | Firm brown slightly gravelly SILT. |
| | | | | 3.60 | | | Greyish brown sandy, silty GRAVEL with cobbles. Medium grained sand with well-rounded gravels and cobbles. |
| ▼ | | | | 3.70 | | | Firm orange/ brown slightly gravelly CLAY. |
| | | | | 4.70 | | | Grey sandy silty GRAVEL. Coarse grained sand with well rounded gravel. |
| | | | | | | | End of pit at 4.70 m |

1 2 3 4 5

Remarks:

Stability: Instability of trial pit walls at 4.7

# Trial Pit Log

Trialpit No
**P1 TPX3**
Sheet 1 of 2

| | | | |
|---|---|---|---|
| Project Name: Ballivor Wind Farm | Project No. P2318 | Co-ords: 661859.00 - 755820.00<br>Level: | Date 18/08/2020 |
| Location: Co. Meath | | Dimensions (m):<br>Depth 5.70 | Scale 1:25 |
| Client: Bord na Mona | | | Logged |

| Water Strike | Samples and In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|
| | Depth | Type | Results | | | | |
| | | | | 0.20 | | | Peaty Topsoil |
| | | | | 0.40 | | | Firm brown slightly gravelly SILT. Gravel is sub-rounded. |
| | | | | | | | Brown/ grey silty sandy GRAVEL with cobbles. Medium grained sand with well-rounded gravel and cobbles. |
| | 3.50 | B | | | | | |
| | | | | | | | Continued on next sheet |

1 2 3 4 5

Remarks: Trial pit moved to area allowing distance of 100m between pit and dwelling as requested by landowner. Pit dry.

Stability: Pit stable

# Trial Pit Log

Trialpit No
**P1 TPX3**
Sheet 2 of 2

| | | | |
|---|---|---|---|
| Project Name: Ballivor Wind Farm | Project No. P2318 | Co-ords: 661859.00 - 755820.00<br>Level: | Date 18/08/2020 |
| Location: Co. Meath | | Dimensions (m):<br>Depth 5.70 | Scale 1:25 |
| Client: Bord na Mona | | | Logged |

| Water Strike | Samples and In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|
| | Depth | Type | Results | | | | |
| | | | | 5.50 | | | Firm brown CLAY. |
| | | | | 5.70 | | | End of pit at 5.70 m |

6
7
8
9
10

Remarks: Trial pit moved to area allowing distance of 100m between pit and dwelling as requested by landowner. Pit dry.

Stability: Pit stable

# Trial Pit Log

Trialpit No
**P1 TPX4**
Sheet 1 of 1

| | | | |
|---|---|---|---|
| Project Name: Ballivor Wind Farm | Project No. P2318 | Co-ords: 661667.00 - 755996.00<br>Level: | Date 18/08/2020 |
| Location: Co. Meath | | Dimensions (m):<br>Depth 3.50 | Scale 1:25 |
| Client: Bord na Mona | | | Logged |

| Water Strike | Samples and In Situ Testing: Depth | Type | Results | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|
| | | | | 0.70 | | | Soft dark brown, fibrous PEAT. |
| ▼ | | | | | | | Soft to firm, grey, sandy, gravelly SILT with cobbles. Gravel is sub-rounded and cobbles are angular. Boulder at approx 1.2m bgl measuring 0.8m in length |
| | | | | 3.50 | | | End of pit at 3.50 m |

1 2 3 4 5

Remarks:

Stability: Instability of trial pit walls at 3.5m

# Trial Pit Log

Trialpit No
**P1 TPX5**
Sheet 1 of 1

| | | | |
|---|---|---|---|
| Project Name: Ballivor Wind Farm | Project No. P2318 | Co-ords: 661605.00 - 755872.00<br>Level: | Date 18/08/2020 |
| Location: Co. Meath | | Dimensions (m):<br>Depth 2.50 | Scale 1:25 |
| Client: Bord na Mona | | | Logged |

| Water Strike | Samples and In Situ Testing: Depth | Type | Results | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|
| | | | | 0.90 | | | Firm dark brown, fibrous PEAT. |
| ▼ | | | | | | | Firm grey slightly gravelly SILT. Gravel is sub-rounded. |
| | | | | 2.50 | | | End of pit at 2.50 m |

1
2
3
4
5

Remarks:

Stability: Instability of trial pit walls at 2.5m

# Trial Pit Log

Trialpit No
**P1 TPX6**
Sheet 1 of 2

| | | | |
|---|---|---|---|
| Project Name: Ballivor Wind Farm | Project No. P2318 | Co-ords: 661663.00 - 755839.00<br>Level: | Date 18/08/2020 |
| Location: Co. Meath | | Dimensions (m):<br>Depth 5.40 | Scale 1:25 |
| Client: Bord na Mona | | | Logged |

| Water Strike | Samples and In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|
| | Depth | Type | Results | | | | |
| | | | | | | | Soft to firm brown, gravelly SILT. Gravel is sub-rounded. |
| | | | | 1.00 | | | Grey sandy silty GRAVEL with cobbles. Sand is medium grained and gravel and cobbles are sub-rounded. |
| | 2.00 | B | | | | | |
| | | | | 3.00 | | | Soft brown slightly gravelly CLAY. |
| | | | | 3.40 | | | Grey gravelly SAND with cobbles. Coarse grained sand with sub-rounded gravel and cobbles. |
| | | | | | | | Continued on next sheet |

Remarks: Pit dry

Stability: Pit stable

# Trial Pit Log

Trialpit No
**P1 TPX6**
Sheet 2 of 2

| | | | |
|---|---|---|---|
| Project Name: Ballivor Wind Farm | Project No. P2318 | Co-ords: 661663.00 - 755839.00<br>Level: | Date 18/08/2020 |
| Location: Co. Meath | | Dimensions (m):<br>Depth 5.40 | Scale 1:25 |
| Client: Bord na Mona | | | Logged |

| Water Strike | Samples and In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description |
|---|---|---|---|---|---|---|---|
| | Depth | Type | Results | | | | |
| | | | | 5.40 | | | End of pit at 5.40 m |

Remarks: Pit dry

Stability: Pit stable

# Summary of Classification Test Results

| Project No. | Project Name |
|---|---|
| 2020Lab104 | Ballivor Wind Farm |

| Hole No. | Sample Ref | Top | Base | Type | | Soil Description | Density bulk Mg/m3 | Density dry Mg/m3 | w % | Passing 425µm % | LL % | PL % | PI % | Particle density Mg/m3 | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TP-B | 1 | 3.50 | | B | | Dark grey sandy very silty medium and coarse GRAVEL. | | | 13.0 | 40 | 26 | 17 | 9 | | CL |
| TP-C | 1 | 0.00 | | B | | Dark grey very silty very sandy medium GRAVEL. | | | 12.0 | 30 | | | | | |
| TPX1 | 1 | 3.00 | | B | | Dark grey silty sandy coarse GRAVEL. | | | 9.5 | 16 | | | | | |
| TPX3 | 1 | 3.50 | | B | | Grey silty very sandy coarse GRAVEL. | | | 5.2 | 9 | | | | | |
| TPX6 | 1 | 2.00 | | B | | Grey silty coarse SAND and fine GRAVEL. | | | 8.0 | 18 | | | | | |

All tests performed in accordance with BS1377:1990 unless specified otherwise

Key w = water content, LL = Liquid Limit, PL = Plastic Limit, PI = Plasticity Index

Density test: wd - water displacement; wi - immersion in water

Linear measurement unless : 4pt cone unless : 1pt - single point test; NP - Non Plastic

Liquid Limit

Particle density: sp - small pyknometer; gj - gas jar

Date Printed: 29/09/2020

QC From No: R1

Approved By

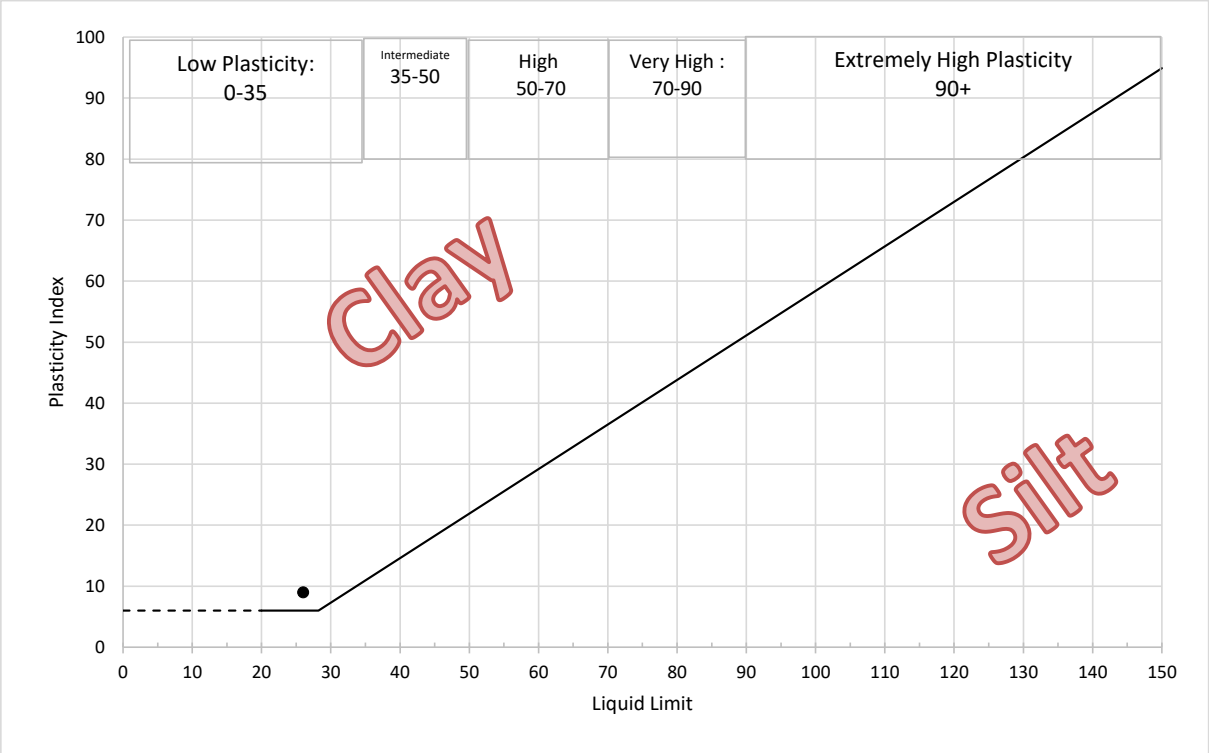
Table 1

sheet 1

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | Plasticity (A-Line) Chart | Project Number |
|---|---|---|
| Project Name: | **Ballivor Wind Farm** | |
| Location: | | 2020Lab104 |




Abreviations in the remarks column of the Classification Summary Sheet: C = Clay, M = Silt

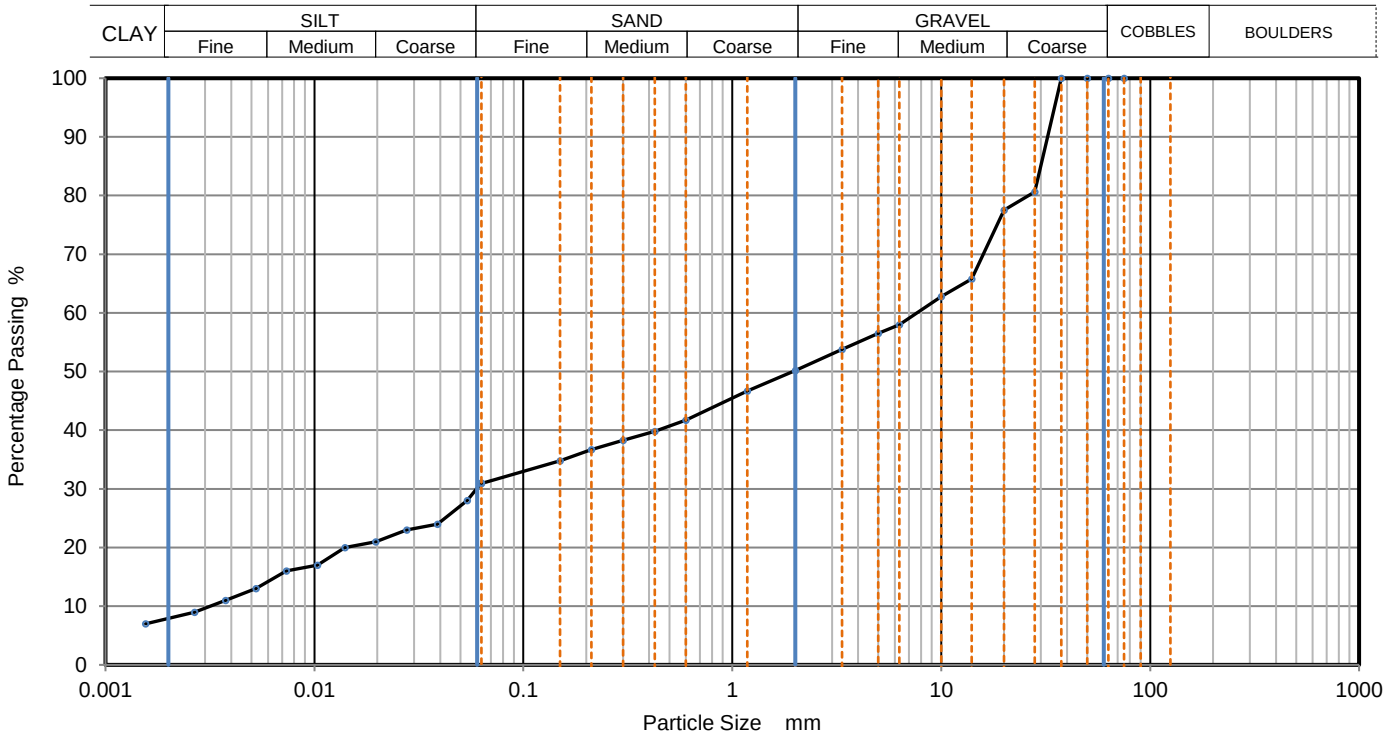
Plasticity abeviations: L = Low, I = Intermediate = H = High, V = Very High, E = Extremely High.

The letter O is added to the symbol of any material containing a significant proportion of organic material.

Chart taken from BS5930: 2010

QC Form: R1

| | | | |
|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | Job Ref | **2020Lab104** |
| | | Borehole/Pit No. | TP-B |
| Site Name | Ballivor Wind Farm | Sample No. | 1 |
| Soil Description | Dark grey sandy very silty medium and coarse GRAVEL. | Depth, m | 3.50 |
| Specimen Reference | Specimen Depth: m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clauses 9.2 and 9.5 | KeyLAB ID | IDL1202009090 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | 0.0630 | 31 |
| | | 0.0539 | 28 |
| 75 | 100 | 0.0388 | 24 |
| 63 | 100 | 0.0276 | 23 |
| 50 | 100 | 0.0196 | 21 |
| 37.5 | 100 | 0.0140 | 20 |
| 28 | 81 | 0.0103 | 17 |
| 20 | 78 | 0.0073 | 16 |
| 14 | 66 | 0.0053 | 13 |
| 10 | 63 | 0.0038 | 11 |
| 6.3 | 58 | 0.0027 | 9 |
| 5 | 57 | 0.0016 | 7 |
| 3.35 | 54 | | |
| 2 | 50 | | |
| 1.18 | 47 | | |
| 0.6 | 42 | Particle density (assumed) | |
| 0.425 | 40 | 2.65 Mg/m3 | |
| 0.3 | 38 | | |
| 0.212 | 37 | | |
| 0.15 | 35 | | |
| 0.063 | 31 | | |

| | |
|---|---|
| Dry Mass of sample, g | 640 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 50 |
| Sand | 19 |
| Silt | 23 |
| Clay | 8 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 7.63 |
| D30 | mm | 0.0597 |
| D10 | mm | 0.0031 |
| Uniformity Coefficient | | 2500 |
| Curvature Coefficient | | 0.15 |

Remarks

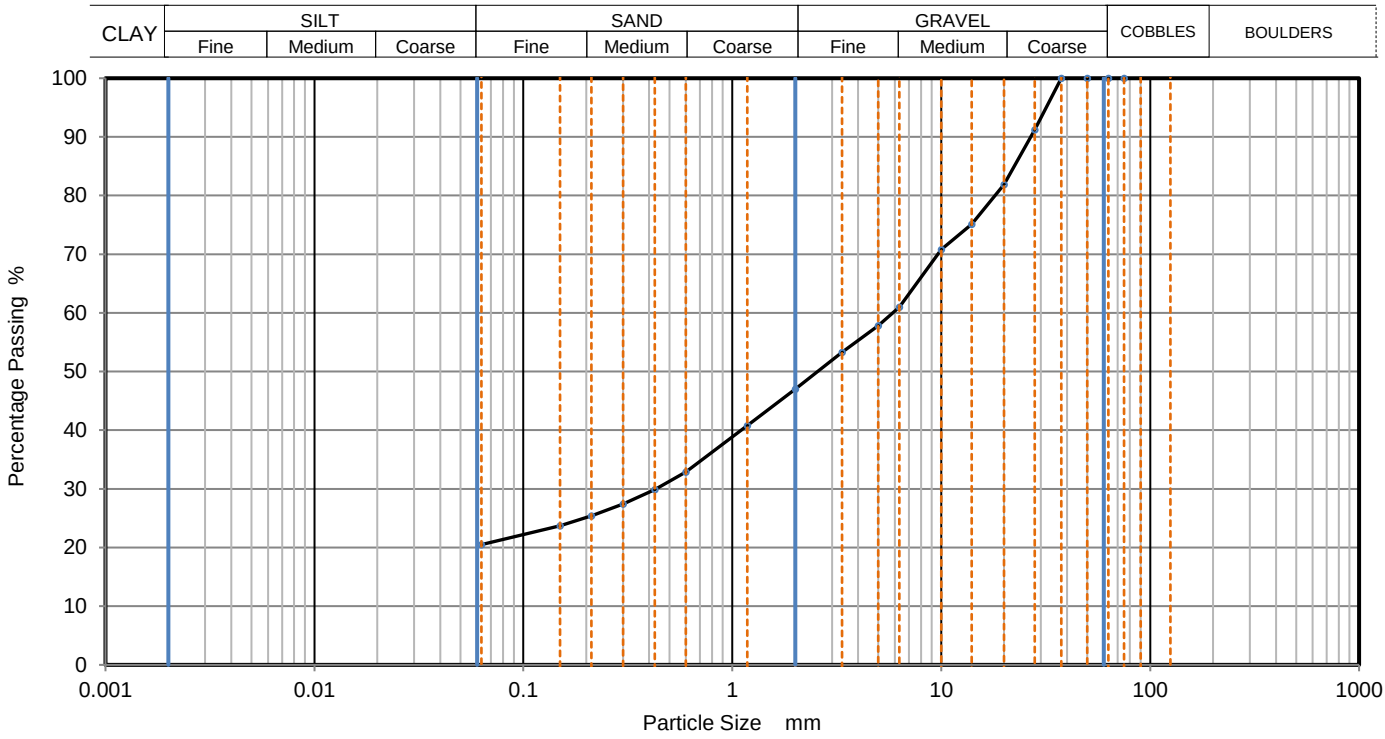
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 29/09/2020 09:14 | 1 |
| | | | | QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020Lab104** |
| | | | | Borehole/Pit No. | TP-C |
| Site Name | Ballivor Wind Farm | | | Sample No. | 1 |
| Soil Description | Dark grey very silty very sandy medium GRAVEL. | | | Depth, m | 0.00 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL1202009091 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 91 | | |
| 20 | 82 | | |
| 14 | 75 | | |
| 10 | 71 | | |
| 6.3 | 61 | | |
| 5 | 58 | | |
| 3.35 | 53 | | |
| 2 | 47 | | |
| 1.18 | 41 | | |
| 0.6 | 33 | | |
| 0.425 | 30 | | |
| 0.3 | 27 | | |
| 0.212 | 25 | | |
| 0.15 | 24 | | |
| 0.063 | 21 | | |

| | |
|---|---|
| Dry Mass of sample, g | 760 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 53 |
| Sand | 27 |
| | |
| Fines <0.063mm | 21 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 5.87 |
| D30 | mm | 0.43 |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

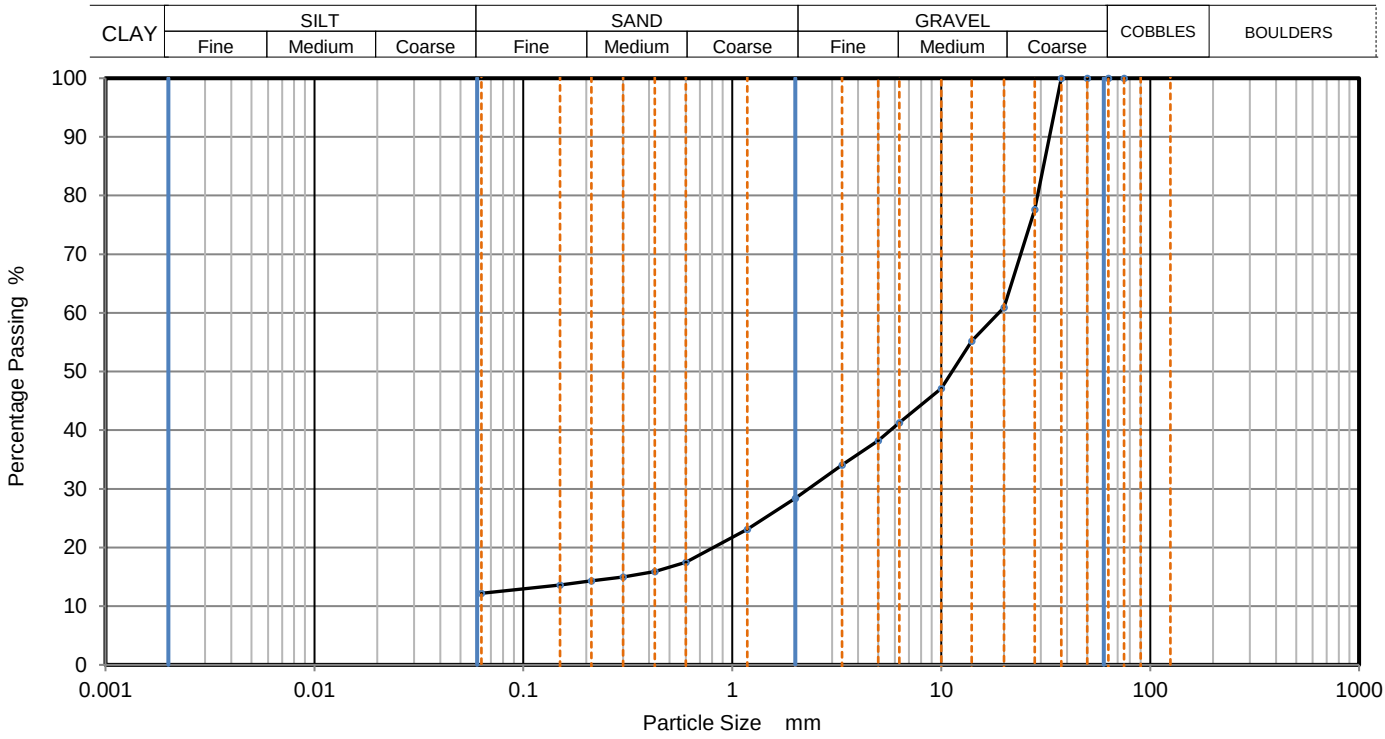
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 29/09/2020 09:14 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020Lab104** |
| | | | | Borehole/Pit No. | TPX1 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 1 |
| Soil Description | Dark grey silty sandy coarse GRAVEL. | | | Depth, m | 3.00 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL1202009093 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 78 | | |
| 20 | 61 | | |
| 14 | 55 | | |
| 10 | 47 | | |
| 6.3 | 41 | | |
| 5 | 38 | | |
| 3.35 | 34 | | |
| 2 | 28 | | |
| 1.18 | 23 | | |
| 0.6 | 18 | | |
| 0.425 | 16 | | |
| 0.3 | 15 | | |
| 0.212 | 14 | | |
| 0.15 | 14 | | |
| 0.063 | 12 | | |

| | |
|---|---|
| Dry Mass of sample, g | 639 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 72 |
| Sand | 16 |
| | |
| Fines <0.063mm | 12 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 18.9 |
| D30 | mm | 2.31 |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

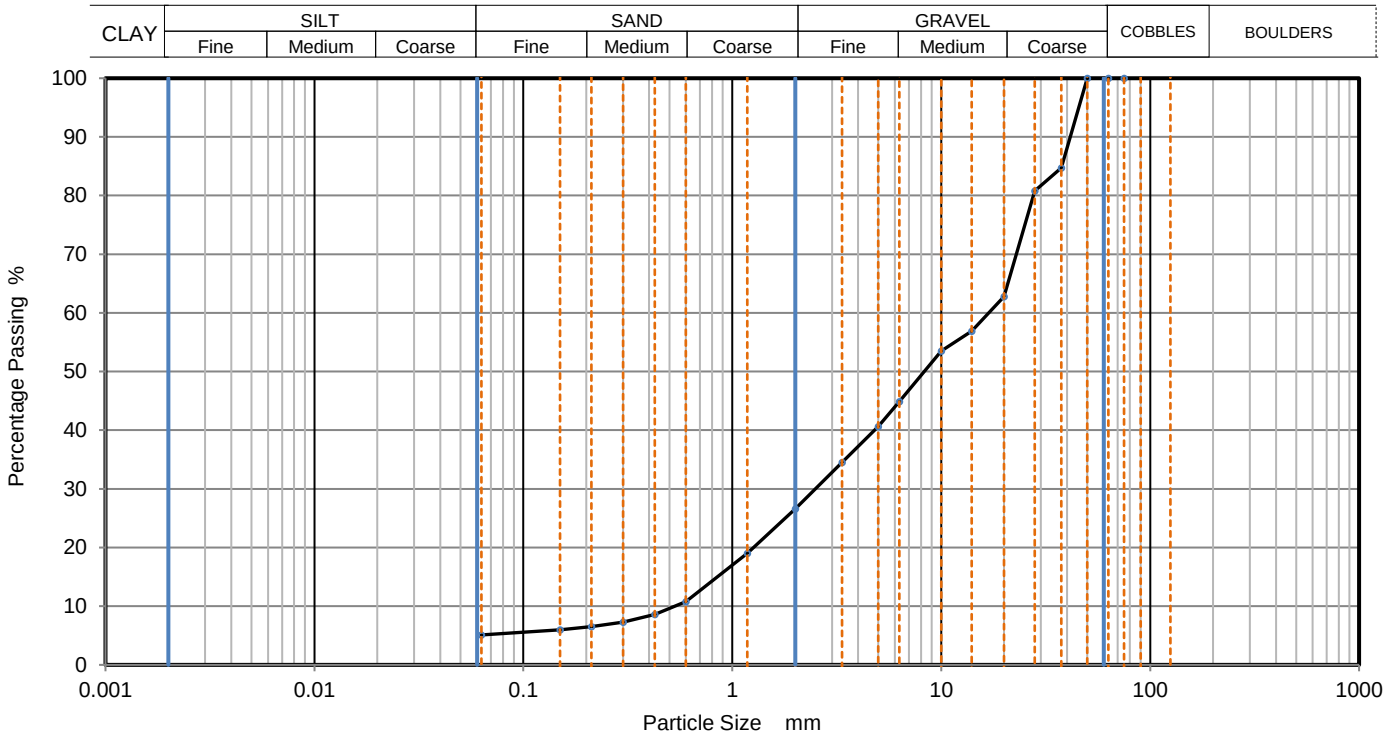
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 29/09/2020 09:14 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020Lab104** |
| | | | | Borehole/Pit No. | TPX3 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 1 |
| Soil Description | Grey silty very sandy coarse GRAVEL. | | | Depth, m | 3.50 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL1202009094 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 85 | | |
| 28 | 81 | | |
| 20 | 63 | | |
| 14 | 57 | | |
| 10 | 54 | | |
| 6.3 | 45 | | |
| 5 | 41 | | |
| 3.35 | 35 | | |
| 2 | 27 | | |
| 1.18 | 19 | | |
| 0.6 | 11 | | |
| 0.425 | 9 | | |
| 0.3 | 7 | | |
| 0.212 | 7 | | |
| 0.15 | 6 | | |
| 0.063 | 5 | | |

| | |
|---|---|
| Dry Mass of sample, g | 893 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 73 |
| Sand | 22 |
| | |
| Fines <0.063mm | 5 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 16.9 |
| D30 | mm | 2.5 |
| D10 | mm | 0.527 |
| Uniformity Coefficient | | 32 |
| Curvature Coefficient | | 0.7 |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

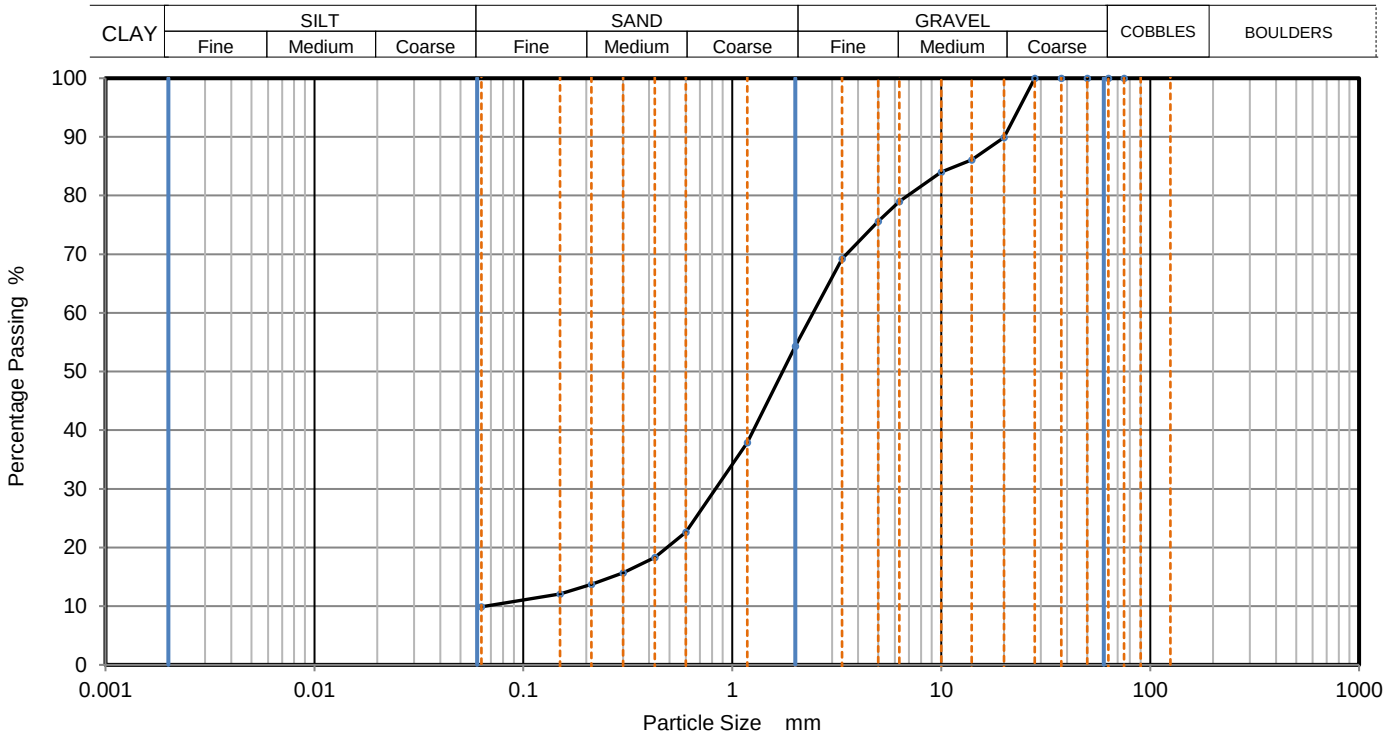
| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 29/09/2020 09:14 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

# PARTICLE SIZE DISTRIBUTION

| | | | | | |
|---|---|---|---|---|---|
| | | | | Job Ref | **2020Lab104** |
| | | | | Borehole/Pit No. | TPX6 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 1 |
| Soil Description | Grey silty coarse SAND and fine GRAVEL. | | | Depth, m | 2.00 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL1202009095 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 90 | | |
| 14 | 86 | | |
| 10 | 84 | | |
| 6.3 | 79 | | |
| 5 | 76 | | |
| 3.35 | 69 | | |
| 2 | 54 | | |
| 1.18 | 38 | | |
| 0.6 | 23 | | |
| 0.425 | 18 | | |
| 0.3 | 16 | | |
| 0.212 | 14 | | |
| 0.15 | 12 | | |
| 0.063 | 10 | | |

| | |
|---|---|
| Dry Mass of sample, g | 722 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 46 |
| Sand | 44 |
| | |
| Fines <0.063mm | 10 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 2.44 |
| D30 | mm | 0.832 |
| D10 | mm | 0.065 |
| Uniformity Coefficient | | 38 |
| Curvature Coefficient | | 4.4 |

Remarks

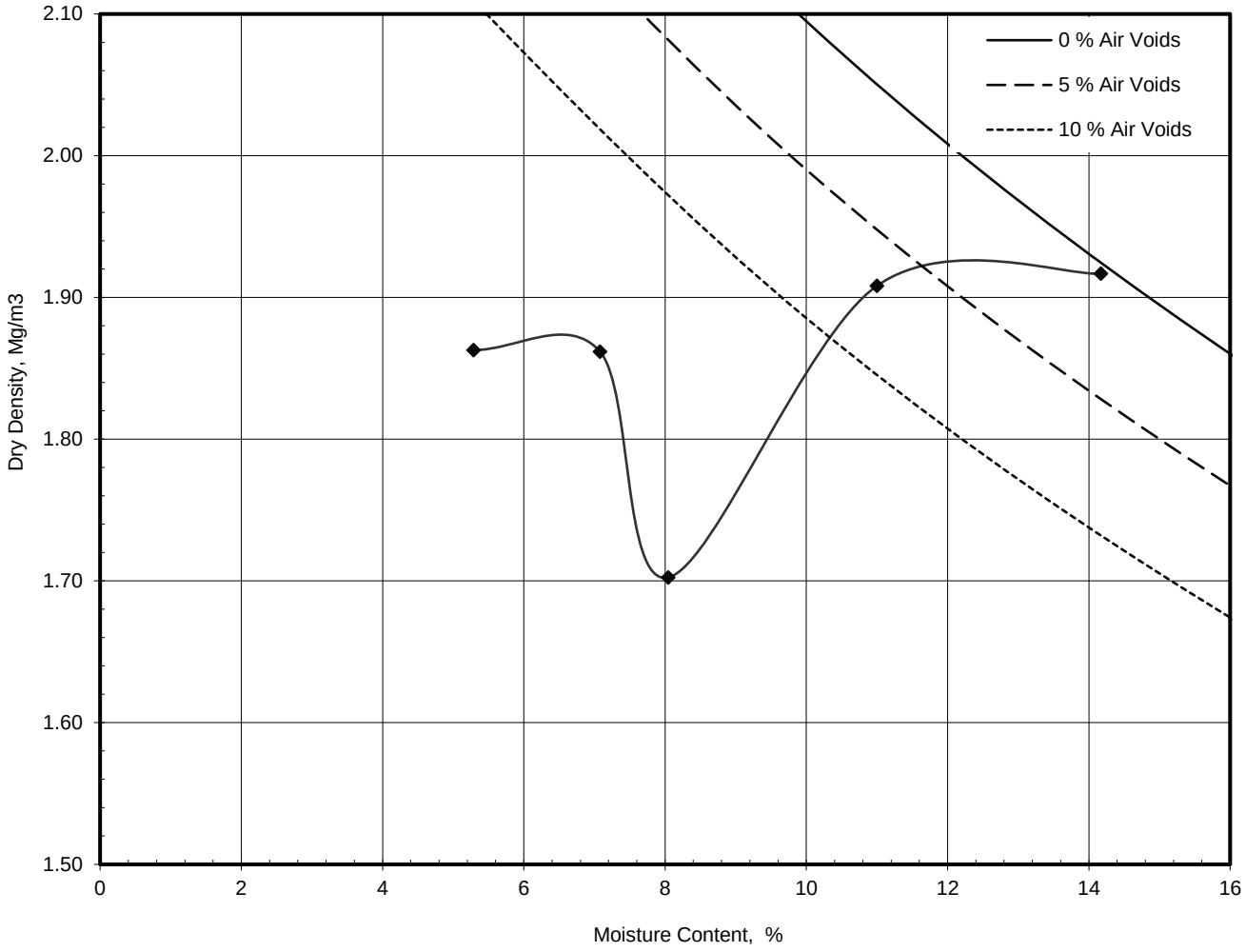
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 29/09/2020 09:14 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| IDL | Dry Density / Moisture Content Relationship<br>Vibrating Hammer Compaction | | | Job Ref | 2020Lab104 |
|---|---|---|---|---|---|
| | | | | Borehole / Pit No | TPX1 |
| Site Name | **Ballivor Wind Farm** | | | Sample No | 1 |
| Soil Description | Dark grey silty sandy coarse GRAVEL. | | | Depth | 3.00 m |
| Specimen Ref. | 1 | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 4:1990, clause 3.7 Vibrating Hammer Method | | | Keylab ID | IDL1202009093 |
| | | | | Compaction Test Reference/No. | |



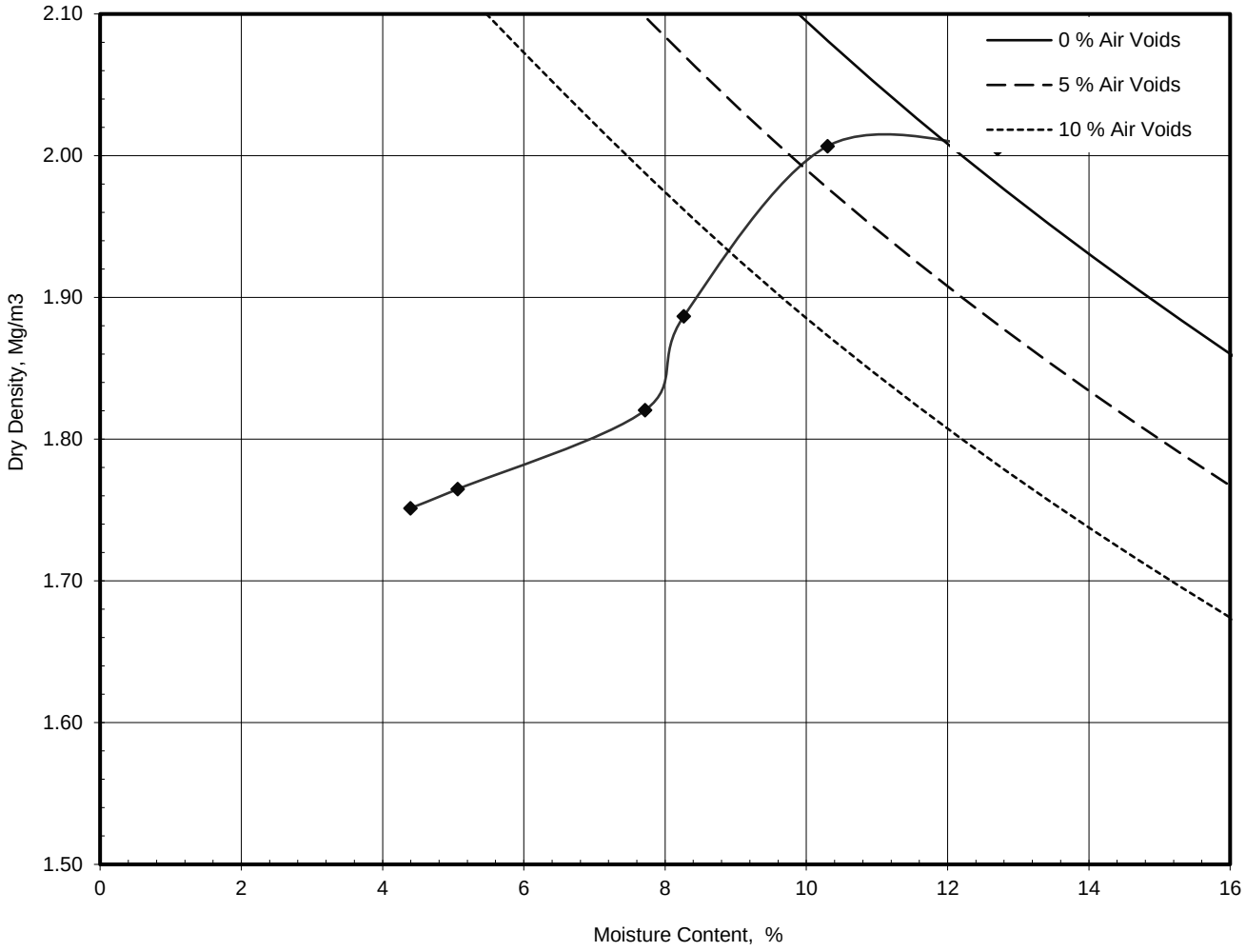

| Preparation | | -2146826273 |
|---|---|---|
| Mould Type | | CBR |
| Samples Used | | |
| Material Retained on 37.5 mm Sieve | % | |
| Material Retained on 20.0 mm Sieve | % | |
| Particle Density - Assumed | Mg/m³ | 2.65 |

| **Maximum Dry Density** | Mg/m³ | **1.93** |
|---|---|---|

| **Optimum Moisture Content** | % | **12** |
|---|---|---|

| Operator | Checked | Approved | Remarks | **Fig** |
|---|---|---|---|---|
| | Administrator | | | Sheet 1 of 1 |

| IDL | Dry Density / Moisture Content Relationship<br>Vibrating Hammer Compaction | | | Job Ref | 2020Lab104 |
|---|---|---|---|---|---|
| | | | | Borehole / Pit No | TPX6 |
| Site Name | **Ballivor Wind Farm** | | | Sample No | 1 |
| Soil Description | Grey silty coarse SAND and fine GRAVEL. | | | Depth | 2.00 m |
| Specimen Ref. | 1 | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 4:1990, clause 3.7 Vibrating Hammer Method | | | Keylab ID | IDL1202009095 |
| | | | | Compaction Test Reference/No. | |




| Preparation | | Material used was natural and air dried |
|---|---|---|
| Mould Type | | CBR |
| Samples Used | | Composite specimens tested |
| Material Retained on 37.5 mm Sieve | % | |
| Material Retained on 20.0 mm Sieve | % | |
| Particle Density - Assumed | Mg/m³ | 2.65 |

| **Maximum Dry Density** | Mg/m³ | **2.02** |
|---|---|---|

| **Optimum Moisture Content** | % | **11** |
|---|---|---|

| Operator | Checked | Approved | Remarks | **Fig** |
|---|---|---|---|---|
| | Administrator | | | Sheet 1 of 1 |

FEHILY TIMONEY

CONSULTANTS IN ENGINEERING,
ENVIRONMENTAL SCIENCE
& PLANNING

# APPENDIX F

Infrastructure Ground Investigation, IDL, 2021

# IRISH DRILLING LIMITED

LOUGHREA, CO. GALWAY, IRELAND

**CONTRACT DRILLING**
**SITE INVESTIGATION**

Phone: (091) 841 274
Fax: (091) 847 687

email: info@irishdrilling.ie


# BALLIVOR WIND FARM

# SITE INVESTIGATION CONTRACT FACTUAL REPORT

Bord na Mona,
Newbridge,
Co. Kildare.

Fehily Timoney & Company,
Consulting Engineers,
Singleton's Lane,
Bagenalstown,
Carlow.

| | Prepared by | Approved by | Rev. Issue Date: | Revision No. |
|---|---|---|---|---|
| | Ronan Killeen | Declan Joyce | 28th April 2021 | 20 _MH_103/01 |
| Signature | RK | DJ | | |

FOREWORD

The borehole and trial pit records have been compiled from an examination of the samples by a Geotechnical Engineer and from the Drillers' descriptions.

The report presents an opinion on the configuration of the strata within the site based on the borehole and trial pit results. The assumptions, though reasonable, are given for guidance only and no liability can be accepted for changes in conditions not revealed by the boreholes and trial pits.

The fieldwork was carried out in accordance with IS EN 1997-2 and BS5930, 2015 Code of Practice for Site Investigations with precedence given to IS EN 1997-2 where applicable.

# Contents:


| | |
|---|---|
| 1.0 | Introduction |
| 2.0 | The Site & Geology |
| 3.0 | Fieldwork |
| 4.0 | Laboratory Testing |

Book 1 of 1

| | |
|---|---|
| Appendix 1 | Borehole Records (Cable Percussive) |
| Appendix 2 | Trial Pit Records |
| Appendix 3 | Groundwater Readings |
| Appendix 4 | Laboratory Test Results |
| Appendix 5 | Photographs (Trial Pits) |
| Appendix 6 | Site Plans |
| Appendix 7 | Digital Data (AGS Files) |

## 1.0 Introduction.

Irish Drilling Ltd. (IDL) was instructed by Fehily Timoney & Company, Consulting Engineers, on behalf of Bord na Mona, to carry out a site investigation at the site of the proposed Ballivor Wind Farm.

This site investigation was carried out to provide detailed factual geotechnical information of the underlying ground conditions at the proposed wastewater treatment works site.

The fieldwork commenced on February 1st 2021 and was completed on February 15th 2021.

## 2.0 Site & Geology

The site is located near Ballivor, County Meath.

The fieldwork was carried out predominantly on peat lands owned by Bord na Mona.

Site Plans, prepared by the client's representatives and amended by IDL to show approximate 'as-built' locations, are included with this report.

Geological Survey Maps of the area indicate that the site is underlain by the Lower Carboniferous Limestone Rock Formation.

## 3.0 Fieldwork.

The following plant was mobilised to site to carry out fieldwork operations:

Dando 2000 Cable Percussive Boring Rig.
Zaxis 120 Wide-Tracked Excavator.

Fieldwork carried out to date has included the following:

Sixteen cable percussion (Shell & Auger) boreholes were completed using a Dando 2000 Cable Percussive Boring Rig. The boreholes were bored to 'refusal' or to depths as instructed by the client's representatives. A 're-bore' was carried out at location BPA BH03 where a relatively shallow 'refusal' was encountered.

The borehole depths ranged from 1.70m to 7.70m below ground level.

In–Situ testing consisting of Standard Penetration Tests were carried out at regular intervals (predominantly 1.0m intervals) or as instructed by the client's representatives.

Disturbed bulk and jar soil samples were taken at each change in strata and at a maximum of 1.50m intervals. The samples were returned to the laboratory and logged by a Geotechnical Engineer and presented for testing.

A 50mm diameter standpipe was installed in the following cable percussive borehole locations to allow for monitoring of groundwater levels over a prolonged period of time: BH 02, BH 05, BH 08, BH 12, BPA BH01 and BPA BH 02.

A summary of water levels recorded during the fieldwork period is included with this report as Appendix 3.

Fifty-two trial pits were excavated on site using a tracked excavator.

The pits were logged and photographed by an Engineer with observations made on ground conditions, pit stability, water ingress and services encountered.

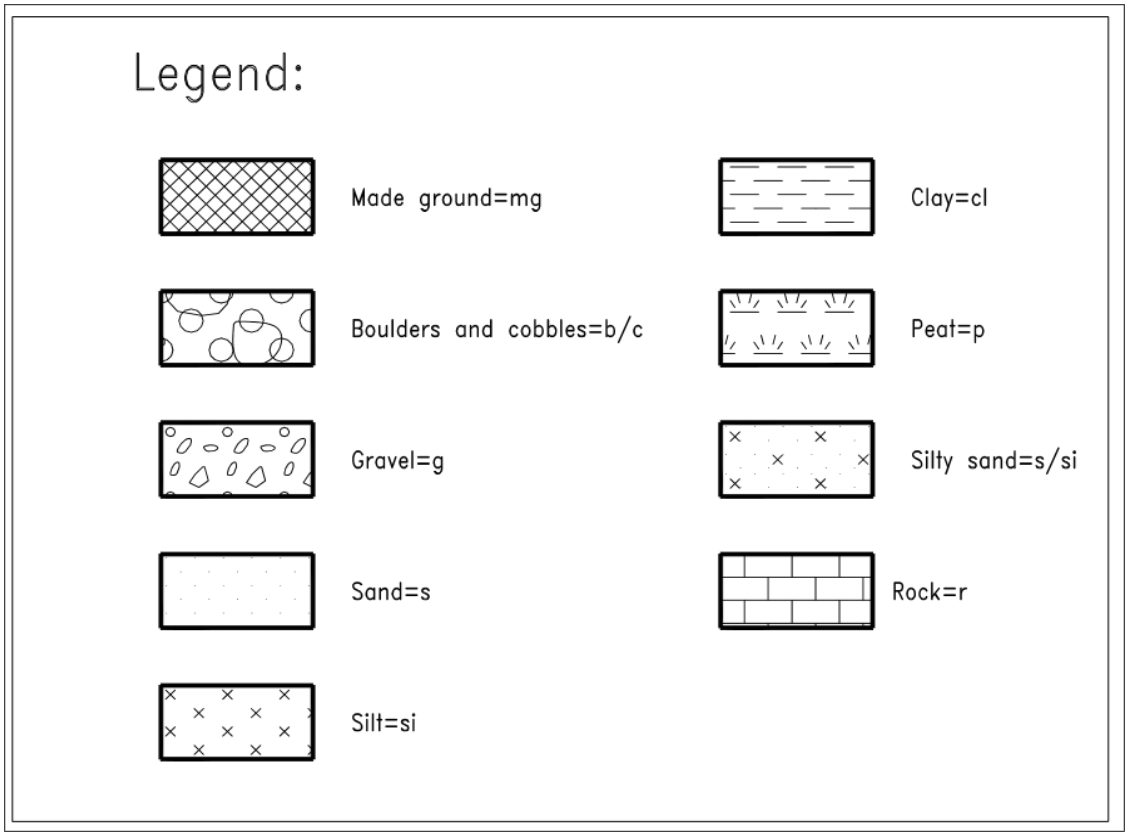
Small and bulk disturbed soil samples were recovered at each change in strata and returned to the laboratory and presented for testing. In-situ testing consisting of hand-held shear vanes were also frequently carried out in cohesive soils.

The borehole and trial pit locations were set out on site using a Trimble CU Bluetooth GPS Surveying Unit and the co-ordinates are included on the logs presented in the appendices.

All fieldwork co-ordinates are reported to Irish Transverse Mercator (ITM) with Reduced Levels recorded relative to Malin Head Datum and with an accuracy level of + or – 0.10m.

The fieldwork was carried out in accordance with IS EN 1997-2 and BS5930, 2015 Code of Practice for Site Investigations with precedence given to IS EN 1997-2 where applicable.

The following Key Legend Table details the symbology used on the engineering logs to describe ground conditions encountered:




Ground conditions encountered during the completion of the fieldwork were typical and as expected for this region and predominantly consisted of Peat overlying Glacial Tills overlying possible bedrock.

The Glacial Tills in general consisted of slightly sandy gravelly silt/clay and/or silty sands and gravels with occasional, some or many cobbles and boulders.

Peat was encountered at all boreholes and trial pits at a depth ranging from 0.50m to 4.90m below ground level.

For detailed descriptions of the ground conditions encountered please refer to the engineering logs included in the appendices of this report.

## 4.0 Laboratory Testing

Representative samples recovered from the boreholes and trial pits were scheduled for testing in the laboratory.

The test schedules were prepared by the Client's Engineer and included some or all of the following tests on disturbed soil samples:

* Natural Moisture Content.
* Atterberg Limits.
* Particle Size Distribution.
* Sedimentation.
* Organic Content.
* Chemical (pH, Sulphate Total, Sulphate Water Gravimetric).
* Compaction (Compaction Light, MCV).

The soil and rock descriptions as noted on the borehole and trial pit logs are in general visual descriptions as observed and logged by our Engineers and are described in accordance with IS EN 1997-2 and BS5930, 2015 Code of Practice for Site Investigations.

Soils descriptions (cohesive or otherwise) are also initially assessed based on the texture and 'feel' of the soil materials as witnessed by our Geotechnical Engineers and in accordance with IS EN 1997-2 and BS5930.

Where laboratory classification tests have been carried out on soil or rock samples then these visual descriptions have been amended accordingly to take into account the results of these classification tests.

The records of all fieldwork, laboratory test results and photographs are included in the appendices of this Factual Report.

Ronan Killeen

Ronan Killeen
Chartered Engineer
Irish Drilling Limited
April 28th 2021

# Appendix 01
# Borehole Records
# (Cable Percussive)

Irish drilling LTD

# BOREHOLE LOG

| Project | Location | BOREHOLE No |
|---|---|---|
| Ballivor Wind Farm | Ballivor, Co. Meath | **BH-02** |

| Job No | Date | Ground Level (m OD) | Co-Ordinates () |
|---|---|---|---|
| 2020MH103 | 04-02-21<br>04-02-21 | 75.08 | E 663,597.0 N 755,423.9 |

| Engineer | GROUNDWATER STRIKES | Water strikes: | Rose to (@ 20 min.): | Sealed at: | Sheet / Rev. |
|---|---|---|---|---|---|
| FTCO/MKO | | 1st: 4.70m | 4.00m | 5.50m | Sheet 1 of 1<br>Rev. DRAFT |
| | | 2nd: 6.50m | 4.30m | | |
| | | 3rd: | | | |

| SAMPLES & TESTS | | | Water | STRATA | | | | Geology | Instrument/ Backfill |
|---|---|---|---|---|---|---|---|---|---|
| Depth | Type No | Test Result | | Reduced Level | Legend | Depth (Thick-ness) | DESCRIPTION | | |
| 0.00-1.00 | B1 | | | | | | Very soft brown fibrous PEAT. | | |
| 1.00 | SPT | N = 0<br>(0, 0, 0, 0, 0, 0) | | | | (2.70) | | | |
| 1.00 | D2 | | | | | | | | |
| 1.00-1.50 | B4 | | | | | | | | |
| 1.50 | D5 | | | | | | | | |
| 2.00 | SPT | N = 14<br>(3, 2, 4, 4, 3, 3) | | | | | 2.00m; firm. | | |
| 2.00-2.50 | B7 | | | | | | | | |
| 2.50 | D8 | | | 72.38 | | 2.70 | | | |
| | | | | | | | Stiff greyish green silty sandy CLAY with cobbles. | | |
| 3.00 | CPT | N = 23<br>(4, 5, 5, 7, 6, 5) | | | | (1.30) | | | |
| 3.00-3.50 | B10 | | | | | | | | |
| 3.50 | D11 | | 1 | 71.08 | | 4.00 | | | |
| 4.00 | SPT | N = 24<br>(3, 5, 4, 7, 6, 7) | 2 | | | | Medium dense gravelly coarse SAND. | | |
| 4.00-4.50 | B13 | | | | | (0.70) | | | |
| 4.50 | D14 | | 1 | 70.38 | | 4.70 | | | |
| | | | | | | | Medium dense grey sandy silty coarse GRAVEL with cobbles. Cobbles are angular. | | |
| 5.00 | CPT | N = 24<br>(3, 4, 4, 4, 7, 9) | | | | (1.50) | | | |
| 5.00-5.50 | B16 | | | | | | | | |
| 5.50 | D17 | | | 68.88 | | 6.20 | | | |
| | | | 2 | | | | Dense grey brown angular cobbles. Possible broken rock. | | |
| 6.50 | CPT | N = 43<br>(5, 7, 8, 7, 10, 18) | | | | (1.10) | | | |
| 6.50-7.00 | B19 | | | | | | | | |
| 7.00 | D20 | | | 67.78 | | 7.30 | | | |
| 7.10 | CPT | 50 for 70 mm<br>(25, -, 50) | | | | | BH terminated at 7.30m bgl. Obstruction as broken rock. | | |
| 7.10-7.30 | B22 | | | | | | | | |
| 7.30 | D23 | | | | | | | | |

## Boring Progress and Water Observations

| Date | Time | Depth | Casing Depth | Casing Dia. mm | Water (bgl) Depth, m |
|---|---|---|---|---|---|
| 04-02-21 | 17.00 | 7.30 | 7.00 | 203 | 3.60 |

## Chiselling

| From | To | Hours |
|---|---|---|
| 7.1 | 7.3 | 1 |

## Water Added

| From | To |
|---|---|
| | |

## GENERAL REMARKS

50mm standpipe installed. Response zone 4.30m to 7.30m bgl.

| All dimensions in metres Scale 1:62.5 | Client: Bord na Mona | Method/ Plant Used: Dando 2000 | Bit Design | Driller: BT | Logged By: BT |
|---|---|---|---|---|---|

IDL AGS3 UK BH BALLIVOR S&A FILE 1 MAR 2 2021.GPJ IDL TP TEMPLATE.GDT 29/4/21

Irish drilling LTD

# BOREHOLE LOG

| Project | Location | BOREHOLE No |
|---|---|---|
| Ballivor Wind Farm | Ballivor, Co. Meath | **BH-04** |

| Job No | Date | Ground Level (m OD) | Co-Ordinates () |
|---|---|---|---|
| 2020MH103 | 01-02-21<br>01-02-21 | 75.62 | E 663,640.6 N 755,442.9 |

| Engineer | GROUNDWATER STRIKES | Sheet |
|---|---|---|
| FTCO/MKO | Water strikes: 1st: 7.40m 2nd: 3rd: Rose to (@ 20 min.): 6.50m Sealed at: | Sheet 1 of 1<br>Rev. DRAFT |

| SAMPLES & TESTS | | | Water | STRATA | | | | Geology | Instrument/ Backfill |
|---|---|---|---|---|---|---|---|---|---|
| Depth | Type No | Test Result | | Reduced Level | Legend | Depth (Thick-ness) | DESCRIPTION | | |
| 0.00-1.00 | B1 | | | | | | Very soft brown fibrous PEAT with rootlets. | | |
| 1.00 | SPT | N = 1 (1, 0, 0, 1, 0, 0) | | | | | | | |
| 1.00 | D2 | | | | | | | | |
| 1.00-1.50 | B4 | | | | | | | | |
| 1.50 | D5 | | | | | (3.80) | | | |
| 2.00-2.45 | U1006 | 2 blows | | | | | | | |
| 2.50 | D7 | | | | | | | | |
| 3.00 | SPT | N = 15 (2, 3, 3, 3, 4, 5) | | | | | 3.00m: firm. | | |
| 3.00-3.50 | B9 | | | | | | | | |
| 3.50 | D10 | | | 71.82 | | 3.80 | | | |
| 4.00 | CPT | N = 29 (4, 5, 7, 6, 8, 8) | | | | (1.00) | Medium dense grey silty sandy GRAVEL with cobbles. Cobbles are angular. | | |
| 4.00-4.50 | B12 | | | | | | | | |
| 4.50 | D13 | | | 70.82 | | 4.80 | | | |
| 5.00 | CPT | N = 19 (3, 3, 4, 5, 4, 6) | | | | | Firm dark grey slightly sandy gravelly SILT with cobbles. Cobbles are angular. 5.00m: stiff. | | |
| 5.00-5.50 | B15 | | | | | | | | |
| 5.50 | D16 | | | | | (2.60) | | | |
| 6.50 | CPT | N = 33 (5, 7, 9, 8, 8, 8) | 1 | | | | | | |
| 6.50-7.00 | B18 | | | | | | | | |
| 7.00 | D19 | | | 68.22 | | 7.40 | | | |
| 7.40 | CPT | 50 for 75 mm (25, -, 50) | | 67.92 | | 7.70 | Obstruction as possible rock. | | |
| | | | | | | | BH terminated at 7.70m bgl. Obstruction as possible rock. | | |

| Boring Progress and Water Observations | | | | | | Chiselling | | | Water Added | | GENERAL REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Depth | Casing Depth | Casing Dia. mm | Water (bgl) Depth, m | From | To | Hours | From | To | |
| 01-02-21 | 16.00 | 7.70 | 7.50 | 203 | | 7.4 | 7.7 | 1 | | | BH backfilled. |

| All dimensions in metres Scale 1:62.5 | Client: Bord na Mona | Method/ Plant Used: Dando 2000 | Bit Design | Driller: BT | Logged By: BT |
|---|---|---|---|---|---|

IDL AGS3 UK BH BALLIVOR S&A FILE 1 MAR 2 2021.GPJ IDL TP TEMPLATE.GDT 29/4/21

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# BOREHOLE LOG

| Project | Location | BOREHOLE No |
|---|---|---|
| Ballivor Wind Farm | Ballivor, Co. Meath | **BH-05** |

| Job No | Date | Ground Level (m OD) | Co-Ordinates () |
|---|---|---|---|
| 2020MH103 | 02-02-21<br>02-02-21 | 77.06 | E 663,691.7 N 755,333.8 |

| Engineer | GROUNDWATER STRIKES | Sheet |
|---|---|---|
| FTCO/MKO | Water strikes: Rose to (@ 20 min.): Sealed at:<br>1st: dry<br>2nd:<br>3rd: | 1 of 1<br>Rev. DRAFT |

| SAMPLES & TESTS | | | Water | STRATA | | | | Geology | Instrument/ Backfill |
|---|---|---|---|---|---|---|---|---|---|
| Depth | Type No | Test Result | | Reduced Level | Legend | Depth (Thick-ness) | DESCRIPTION | | |
| 0.00-1.00 | B1 | | | | | | Very soft brown fibrous PEAT. | | |
| 1.00 | D2 | | | | | | | | |
| 1.00-1.45 | U1003 | 1 blows | | | | | | | |
| 1.00-1.50 | B4 | | | | | (3.00) | | | |
| 1.50 | SPT | N = 1<br>(1, 0, 0, 0, 0, 1) | | | | | | | |
| 1.50 | D5 | | | | | | | | |
| 1.50-2.00 | B7 | | | | | | | | |
| 2.00 | D8 | | | | | | | | |
| 2.50-2.95 | U1009 | 2 blows | | | | | | | |
| | | | | 74.06 | | 3.00 | | | |
| 3.00 | D10 | | | | | | Firm greyish green slightly sandy gravelly SILT with cobbles. Cobbles are angular. | | |
| 3.50 | CPT | N = 11<br>(2, 1, 2, 2, 3, 4) | | | | | | | |
| 3.50-4.00 | B12 | | | | | | | | |
| 4.00 | D13 | | | | | (2.60) | | | |
| 4.50 | CPT | N = 18<br>(3, 3, 4, 3, 5, 6) | | | | | 4.50m: becoming stiff. | | |
| 4.50-5.00 | B15 | | | | | | | | |
| 5.00 | D16 | | | | | | | | |
| | | | | 71.46 | | 5.60 | | | |
| 5.50 | CPT | N = 22<br>(2, 5, 7, 6, 5, 4) | | | | | Stiff grey slightly sandy slightly gravelly CLAY with cobbles. Cobbles are angular. | | |
| 5.50-6.00 | B18 | | | | | | | | |
| 6.00 | D19 | | | | | (1.40) | | | |
| 6.50 | CPT | N = 67<br>(3, 5, 3, 8, 9, 47) | | | | | 6.50m: hard. | | |
| 6.50-7.00 | B21 | | | 70.06 | | 7.00 | | | |
| 7.00 | D22 | | | 69.86 | | 7.20 | Obstruction as possible rock. | | |
| | | | | | | | BH terminated at 7.20m bgl. Obstruction as possible rock. | | |

| Boring Progress and Water Observations | | | | | | Chiselling | | | Water Added | | GENERAL REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Depth | Casing Depth | Casing Dia. mm | Water (bgl) Depth, m | From | To | Hours | From | To | |
| 02-02-21 | 16.00 | 7.20 | 7.00 | 203 | basal seepage | 7 | 7.2 | 1 | | | 50mm standpipe installed. Response zone 4.20m to 7.20m bgl. |

| All dimensions in metres Scale 1:62.5 | Client: Bord na Mona | Method/ Plant Used: Dando 2000 | Bit Design | Driller: BT | Logged By: BT |
|---|---|---|---|---|---|

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# BOREHOLE LOG

| Project | Location | BOREHOLE No |
|---|---|---|
| Ballivor Wind Farm | Ballivor, Co. Meath | **BH-06** |

| Job No | Date | Ground Level (m OD) | Co-Ordinates () |
|---|---|---|---|
| 2020MH103 | 03-02-21<br>03-02-21 | 76.45 | E 663,707.4 N 755,300.3 |

| Engineer | GROUNDWATER STRIKES | Sheet / Rev. |
|---|---|---|
| FTCO/MKO | Water strikes: Rose to (@ 20 min.): Sealed at:<br>1st: dry<br>2nd:<br>3rd: | Sheet 1 of 1<br>Rev. DRAFT |

| SAMPLES & TESTS | | | Water | STRATA | | | | Geology | Instrument/ Backfill |
|---|---|---|---|---|---|---|---|---|---|
| Depth | Type No | Test Result | | Reduced Level | Legend | Depth (Thick-ness) | DESCRIPTION | | |
| 0.00-1.00 | B1 | | | | | | Very soft brown fibrous PEAT. | | |
| 1.00 | SPT | N = 0<br>(0, 0, 0, 0, 0, 0) | | | | | | | |
| 1.00 | D2 | | | | | (3.00) | | | |
| 1.00-1.50 | B4 | | | | | | | | |
| 1.50 | D5 | | | | | | | | |
| 2.00 | SPT | N = 0<br>(1, 0, 0, 0, 0, 0) | | | | | | | |
| 2.00-2.50 | B7 | | | | | | | | |
| 2.50 | D8 | | | | | | | | |
| | | | | 73.45 | | 3.00 | | | |
| 3.00 | SPT | N = 11<br>(2, 1, 2, 3, 4, 2) | | | | | Firm greyish green silty sandy CLAY with cobbles. | | |
| 3.00-3.50 | B10 | | | | | | | | |
| 3.50 | D11 | | | | | | | | |
| 4.00 | CPT | N = 15<br>(2, 3, 4, 4, 4, 3) | | | | | | | |
| 4.00-4.50 | B13 | | | | | | | | |
| 4.50 | D14 | | | | | (3.50) | | | |
| 5.00 | CPT | N = 19<br>(5, 7, 6, 3, 4, 6) | | | | | 5.00m: stiff. | | |
| 5.00-5.50 | B16 | | | | | | | | |
| 5.50 | D17 | | | | | | | | |
| | | | | 69.95 | | 6.50 | | | |
| 6.50 | CPT | N = 21<br>(3, 3, 4, 5, 4, 8) | | | | (0.50) | Stiff dark grey slightlt sandy gravelly CLAY with cobbles. Cobbles are angular. | | |
| 6.50-7.00 | B19 | | | 69.45 | | 7.00 | | | |
| 7.00 | CPT | 50 for 20 mm<br>(25, -, 50) | | 69.35 | | 7.10 | Obstruction as possible rock. | | |
| 7.00 | D20 | | | | | | BH terminated at 7.10m bgl. Obstruction as possible rock. | | |

| Boring Progress and Water Observations | | | | | | Chiselling | | | Water Added | | GENERAL REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Depth | Casing Depth | Casing Dia. mm | Water (bgl) Depth, m | From | To | Hours | From | To | |
| 03-02-21 | 13.00 | 7.10 | 7.00 | 203 | basal seepage | 7 | 7.1 | 1 | | | BH backfilled. |

| All dimensions in metres Scale 1:62.5 | Client: Bord na Mona | Method/ Plant Used: Dando 2000 | Bit Design | Driller: BT | Logged By: BT |
|---|---|---|---|---|---|

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# BOREHOLE LOG

| Project | Location | BOREHOLE No |
|---|---|---|
| Ballivor Wind Farm | Ballivor, Co. Meath | **BH-07** |

| Job No | Date | Ground Level (m OD) | Co-Ordinates () |
|---|---|---|---|
| 2020MH103 | 03-02-21<br>03-02-21 | 75.16 | E 663,682.2 N 755,286.8 |

| Engineer | GROUNDWATER STRIKES | Sheet / Rev. |
|---|---|---|
| FTCO/MKO | Water strikes: 1st: 6.30m Rose to (@ 20 min.): 5.50m Sealed at: 2nd: 3rd: | Sheet 1 of 1<br>Rev. DRAFT |

| SAMPLES & TESTS | | | Water | STRATA | | | | Geology | Instrument/ Backfill |
|---|---|---|---|---|---|---|---|---|---|
| Depth | Type No | Test Result | | Reduced Level | Legend | Depth (Thick-ness) | DESCRIPTION | | |
| 0.00-1.00 | B1 | | | | | | Very soft brown fibrous PEAT. | | |
| 1.00 | SPT | N = 0 (1, 0, 0, 0, 0, 0) | | | | (2.40) | | | |
| 1.00 | D2 | | | | | | | | |
| 1.00-1.50 | B4 | | | | | | | | |
| 1.50 | D5 | | | | | | | | |
| 2.00-2.45 | U1006 | 6 blows NR | | 72.76 | | 2.40 | | | |
| 2.00-2.50 | B7 | | | | | | Soft grey slightly sandy gravelly silty CLAY with cobbles. Cobbles are angular. | | |
| 2.50 | D8 | | | | | | | | |
| 3.00 | CPT | N = 25 (4, 5, 9, 6, 5, 5) | | | | | 3.00m: stiff. | | |
| 3.00-3.50 | B10 | | | | | | | | |
| 3.50 | D11 | | | | | (2.40) | | | |
| 4.00 | CPT | N = 23 (3, 3, 5, 2, 7, 9) | | | | | | | |
| 4.00-4.50 | B13 | | | | | | | | |
| 4.50 | D14 | | | 70.36 | | 4.80 | | | |
| 5.00 | CPT | N = 20 (4, 4, 5, 4, 5, 6) | | | | | Firm dark grey slightly sandy slightly gravelly SILT with cobbles. Cobbles are angular. 5.00m: stiff. | | |
| 5.00-5.50 | B16 | | 1 | | | (1.30) | | | |
| 5.50 | D17 | | | | | | | | |
| | | | | 69.06 | | 6.10 | | | |
| 6.10 | CPT | 50 for 150 mm (25, -, 39, 11) | 1 | 68.86 | | 6.30 | Obstruction as possible rock. | | |
| | | | | | | | BH terminated at 6.30m bgl. Obstruction as possible rock. | | |

| Boring Progress and Water Observations | | | | | | Chiselling | | | Water Added | | GENERAL REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Depth | Casing Depth | Casing Dia. mm | Water (bgl) Depth, m | From | To | Hours | From | To | |
| 03-02-21 | 17.00 | 6.30 | 6.00 | 203 | 3.70 | 6.1 | 6.3 | 1 | | | BH backfilled. |

| All dimensions in metres Scale 1:62.5 | Client: Bord na Mona | Method/ Plant Used: Dando 2000 | Bit Design | Driller: BT | Logged By: BT |
|---|---|---|---|---|---|

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# BOREHOLE LOG

| Project | Location | BOREHOLE No |
|---|---|---|
| Ballivor Wind Farm | Ballivor, Co. Meath | **BH-08** |

| Job No | Date | Ground Level (m OD) | Co-Ordinates () |
|---|---|---|---|
| 2020MH103 | 10-02-21<br>10-02-21 | 74.70 | E 663,616.2 N 755,218.7 |

| Engineer | GROUNDWATER STRIKES | Sheet |
|---|---|---|
| FTCO/MKO | Water strikes: 1st: dry 2nd: 3rd: Rose to (@ 20 min.): Sealed at: | Sheet 1 of 1<br>Rev. DRAFT |

| SAMPLES & TESTS | | | Water | STRATA | | | | Geology | Instrument/ Backfill |
|---|---|---|---|---|---|---|---|---|---|
| Depth | Type No | Test Result | | Reduced Level | Legend | Depth (Thick-ness) | DESCRIPTION | | |
| 0.00-1.00 | B1 | | | | | | Very soft blackish brown fibrous PEAT. | | |
| 1.00 | D2 | | | | | | | | |
| 1.00-1.45 | U1003 | 2 blows | | | | | | | |
| 1.50 | D4 | | | | | (3.40) | | | |
| 2.00 | SPT | N = 0 (0, 0, 0, 0, 0, 0) | | | | | | | |
| 2.00-2.50 | B6 | | | | | | | | |
| 2.50 | D7 | | | | | | | | |
| 3.00 | SPT | N = 3 (1, 0, 0, 0, 1, 2) | | 71.30 | | 3.40 | | | |
| 3.00-3.50 | B9 | | | | | | Soft grey slightly gravelly slightly sandy clayey SILT with cobbles. Cobbles are angular. | | |
| 3.50 | D10 | | | | | | | | |
| 4.00 | CPT | N = 17 (2, 3, 7, 4, 3, 3) | | | | (1.60) | 4.00m: firm. | | |
| 4.00-4.50 | B12 | | | | | | | | |
| 4.50 | D13 | | | 69.70 | | 5.00 | | | |
| 5.00 | CPT | N = 28 (3, 5, 4, 7, 9, 8) | | | | | Stiff grey slightly sandy slightly gravelly CLAY with cobbles and boulders. Boulders are rounded. | | |
| 5.00-5.50 | B15 | | | | | | | | |
| 5.50 | D16 | | | | | (1.20) | | | |
| 6.00 | CPT | 75 Seating Blows for 137 mm (25, 50) | | 68.50 | | 6.20 | | | |
| | | | | 68.30 | | 6.40 | Obstruction as possible rock. | | |
| | | | | | | | BH terminated at 6.40m bgl. Obstruction as possible rock. | | |

## Boring Progress and Water Observations

| Date | Time | Depth | Casing Depth | Casing Dia. mm | Water (bgl) Depth, m |
|---|---|---|---|---|---|
| 10-02-21 | 13.00 | 6.40 | 6.00 | 203 | |

## Chiselling

| From | To | Hours |
|---|---|---|
| 6.2 | 6.4 | 1 |

## Water Added

| From | To |
|---|---|
| | |

## GENERAL REMARKS

50mm standpipe installed. Response zone 3.40m to 6.40m bgl.

| All dimensions in metres Scale 1:62.5 | Client: Bord na Mona | Method/ Plant Used: Dando 2000 | Bit Design | Driller: BT | Logged By: BT |
|---|---|---|---|---|---|

IDL AGS3 UK BH BALLIVOR S&A FILE 1 MAR 2 2021.GPJ IDL TP TEMPLATE.GDT 29/4/21

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# BOREHOLE LOG

| Project | Location | BOREHOLE No |
|---|---|---|
| Ballivor Wind Farm | Ballivor, Co. Meath | **BH-09** |

| Job No | Date | Ground Level (m OD) | Co-Ordinates () |
|---|---|---|---|
| 2020MH103 | 04-02-21<br>04-02-21 | 74.99 | E 663,669.4 N 755,246.7 |

| Engineer | GROUNDWATER STRIKES | Sheet / Rev. |
|---|---|---|
| FTCO/MKO | Water strikes: Rose to (@ 20 min.): Sealed at:<br>1st: dry<br>2nd:<br>3rd: | Sheet 1 of 1<br>Rev. DRAFT |

| SAMPLES & TESTS | | | Water | STRATA | | | | Geology | Instrument/ Backfill |
|---|---|---|---|---|---|---|---|---|---|
| Depth | Type No | Test Result | | Reduced Level | Legend | Depth (Thick-ness) | DESCRIPTION | | |
| 0.00-1.00 | B1 | | | | | | Very soft brown fibrous PEAT. | | |
| 1.00 | SPT | N = 0<br>(1, 0, 0, 0, 0, 0) | | | | (2.40) | | | |
| 1.00 | D2 | | | | | | | | |
| 1.00-1.50 | B4 | | | | | | | | |
| 1.50 | D5 | | | | | | | | |
| 2.00 | SPT | N = 2<br>(1, 0, 1, 0, 0, 1) | | 72.59 | | 2.40 | | | |
| 2.00-2.50 | B7 | | | | | | Soft to firm greyish green silty sandy CLAY with cobbles. | | |
| 2.50 | D8 | | | | | | | | |
| 3.00 | CPT | N = 17<br>(2, 2, 3, 7, 3, 4) | | | | (1.60) | 3.00m: stiff. | | |
| 3.00-3.50 | B10 | | | | | | | | |
| 3.50 | D11 | | | 70.99 | | 4.00 | | | |
| 4.00 | CPT | N = 14<br>(4, 5, 3, 4, 3, 4) | | | | | Firm dark grey slightly sandy slightly gravelly silty CLAY with cobbles. Cobbles are angular. | | |
| 4.00-4.50 | B13 | | | | | (1.00) | | | |
| 4.50 | D14 | | | 69.99 | | 5.00 | | | |
| 5.00 | CPT | 50 for 85 mm<br>(25, -, 41, 9) | | 69.79 | | 5.20 | Obstruction as possible rock. | | |
| | | | | | | | BH terminated at 5.20m bgl. Obstruction as possible rock. | | |

| Boring Progress and Water Observations | | | | | | Chiselling | | | Water Added | | GENERAL REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Depth | Casing Depth | Casing Dia. mm | Water (bgl) Depth, m | From | To | Hours | From | To | |
| 04-02-21 | 12.00 | 5.20 | 5.00 | 203 | basal seepage | 5 | 5.2 | 1 | | | BH backfilled. |

| All dimensions in metres Scale 1:62.5 | Client: Bord na Mona | Method/ Plant Used: Dando 2000 | Bit Design | Driller: BT | Logged By: BT |
|---|---|---|---|---|---|

IDL AGS3 UK BH BALLIVOR S&A FILE 1 MAR 2 2021.GPJ IDL TP TEMPLATE.GDT 29/4/21

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# BOREHOLE LOG

| Project | Location | BOREHOLE No |
|---|---|---|
| Ballivor Wind Farm | Ballivor, Co. Meath | **BH-10** |

| Job No | Date | Ground Level (m OD) | Co-Ordinates () |
|---|---|---|---|
| 2020MH103 | 05-02-21<br>05-02-21 | 74.87 | E 663,716.8 N 755,152.3 |

| Engineer | GROUNDWATER STRIKES | Sheet / Rev. |
|---|---|---|
| FTCO/MKO | Water strikes: 1st: 5.10m 2nd: 3rd: Rose to (@ 20 min.): 4.50m Sealed at: | Sheet 1 of 1<br>Rev. DRAFT |

| SAMPLES & TESTS | | | Water | STRATA | | | | Geology | Instrument/ Backfill |
|---|---|---|---|---|---|---|---|---|---|
| Depth | Type No | Test Result | | Reduced Level | Legend | Depth (Thick-ness) | DESCRIPTION | | |
| 0.00-1.00 | B1 | | | | | | Very soft brown fibrous PEAT. | | |
| 1.00 | D2 | | | | | | | | |
| 1.00-1.45 | U1003 | 1 blows | | | | | | | |
| 1.50 | D4 | | | | | (3.40) | | | |
| 2.00 | SPT | N = 0 (0, 0, 0, 0, 0, 0) | | | | | | | |
| 2.00-2.50 | B7 | | | | | | | | |
| 2.50 | D8 | | | | | | | | |
| 3.00 | CPT | N = 11 (1, 2, 1, 2, 3, 5) | | | | | 3.00m; firm. | | |
| | | | | 71.47 | | 3.40 | | | |
| 3.00-3.50 | B10 | | | | | | Soft grey slightly sandy silty gravelly CLAY. | | |
| 3.50 | D11 | | | | | | | | |
| 4.00 | CPT | N = 8 (1, 1, 1, 2, 3, 2) | | | | (1.10) | | | |
| 4.00-4.50 | B13 | | 1 | 70.37 | | 4.50 | | | |
| 4.50 | D14 | | | | | (0.60) | Loose grey very sandy very silty medium GRAVEL with cobbles. Cobbles are angular. | | |
| 5.00 | CPT | 50 for 125 mm (25, -, 30, 20) | | 69.77 | | 5.10 | | | |
| | | | | 69.47 | | 5.40 | Obstruction as possible rock. | | |
| | | | | | | | BH terminated at 5.40m bgl. Obstruction as possible rock. | | |

| Boring Progress and Water Observations | | | | | | Chiselling | | | Water Added | | GENERAL REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Depth | Casing Depth | Casing Dia. mm | Water (bgl) Depth, m | From | To | Hours | From | To | |
| 05-02-21 | 12.00 | 5.40 | 5.00 | 203 | 4.00 | 5.1 | 5.4 | 1 | | | BH backfilled. |

| All dimensions in metres Scale 1:62.5 | Client: Bord na Mona | Method/ Plant Used: Dando 2000 | Bit Design | Driller: BT | Logged By: BT |
|---|---|---|---|---|---|

IDL AGS3 UK BH BALLIVOR S&A FILE 1 MAR 2 2021.GPJ IDL TP TEMPLATE.GDT 29/4/21

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# BOREHOLE LOG

| Project | Location | BOREHOLE No |
|---|---|---|
| Ballivor Wind Farm | Ballivor, Co. Meath | **BH-11** |

| Job No | Date | Ground Level (m OD) | Co-Ordinates () |
|---|---|---|---|
| 2020MH103 | 08-02-21<br>08-02-21 | 75.66 | E 663,735.6 N 755,120.5 |

| Engineer | GROUNDWATER STRIKES | Sheet |
|---|---|---|
| FTCO/MKO | Water strikes: 1st: 5.50m Rose to (@ 20 min.): 4.00m Sealed at: 2nd: 3rd: | Sheet 1 of 1<br>Rev. DRAFT |

| SAMPLES & TESTS | | | Water | STRATA | | | | Geology | Instrument/ Backfill |
|---|---|---|---|---|---|---|---|---|---|
| Depth | Type No | Test Result | | Reduced Level | Legend | Depth (Thick-ness) | DESCRIPTION | | |
| 0.00-1.00 | B1 | | | | | | Firm brown fibrous PEAT. | | |
| 1.00 | SPT | N = 0<br>(1, 0, 0, 0, 0, 0) | | | | (2.20) | | | |
| 1.00 | D2 | | | | | | | | |
| 1.00-1.50 | B4 | | | | | | | | |
| 1.50 | D5 | | | | | | | | |
| 2.00 | SPT | N = 0<br>(0, 0, 0, 0, 0, 0) | | 73.46 | | 2.20 | | | |
| 2.00-2.50 | B7 | | | | | | Soft greyish green slightly gravelly sandy silty CLAY. | | |
| 2.50 | D8 | | | | | | | | |
| 3.00 | CPT | N = 13<br>(2, 2, 3, 4, 3, 3) | | | | (2.20) | 3.00m: firm. | | |
| 3.00-3.50 | B10 | | | | | | | | |
| 3.50 | D11 | | | | | | | | |
| 4.00 | CPT | N = 16<br>(2, 1, 2, 3, 5, 6) | 1 | | | | 4.00m: stiff. | | |
| 4.00-4.50 | B13 | | | 71.26 | | 4.40 | | | |
| 4.50 | D14 | | | | | | Firm grey slightly gravelly sandy CLAY with cobbles. Cobbles are angular. | | |
| 5.00 | CPT | N = 66<br>(4, 5, 8, 7, 8, 43) | | | | (1.10) | 5.00m: hard. | | |
| 5.00-5.50 | B16 | | 1 | 70.16 | | 5.50 | | | |
| 5.50 | D17 | | | 70.06 | | 5.60 | Obstruction as possible rock. | | |
| | | | | | | | BH terminated at 5.60m bgl. Obstruction as possible rock. | | |

| Boring Progress and Water Observations | | | | | | Chiselling | | | Water Added | | GENERAL REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Depth | Casing Depth | Casing Dia. mm | Water (bgl) Depth, m | From | To | Hours | From | To | |
| 08-02-21 | 17.00 | 5.60 | 5.50 | 203 | 3.20 | 5.5 | 5.6 | 1 | | | BH backfilled. |

| All dimensions in metres Scale 1:62.5 | Client: Bord na Mona | Method/ Plant Used: Dando 2000 | Bit Design | Driller: BT | Logged By: BT |
|---|---|---|---|---|---|

IDL AGS3 UK BH BALLIVOR S&A FILE 1 MAR 2 2021.GPJ IDL TP TEMPLATE.GDT 29/4/21

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# BOREHOLE LOG

| Project | Location | BOREHOLE No |
|---|---|---|
| Ballivor Wind Farm | Ballivor, Co. Meath | **BH-12** |

| Job No | Date | Ground Level (m OD) | Co-Ordinates () |
|---|---|---|---|
| 2020MH103 | 09-02-21<br>09-02-21 | 74.86 | E 663,667.2 N 755,127.8 |

| Engineer | GROUNDWATER STRIKES | Sheet / Rev. |
|---|---|---|
| FTCO/MKO | Water strikes: 1st: 4.50m; Rose to (@ 20 min.): 4.00m; Sealed at: 2nd: 3rd: | Sheet 1 of 1<br>Rev. DRAFT |

| SAMPLES & TESTS | | | Water | STRATA | | | | Geology | Instrument/ Backfill |
|---|---|---|---|---|---|---|---|---|---|
| Depth | Type No | Test Result | | Reduced Level | Legend | Depth (Thick-ness) | DESCRIPTION | | |
| 0.00-1.00 | B1 | | | | | | Very soft brown fibrous PEAT. | | |
| 1.00 | SPT | N = 0 (1, 0, 0, 0, 0, 0) | | | | (2.40) | | | |
| 1.00 | D2 | | | | | | | | |
| 1.00-1.50 | B4 | | | | | | | | |
| 1.50 | D5 | | | | | | | | |
| 2.00 | SPT | N = 12 (1, 1, 2, 2, 4, 4) | | 72.46 | | 2.40 | 2.00m; firm. | | |
| 2.00-2.50 | B7 | | | | | | Soft to firm grey slightly sandy slightly gravelly SILT with cobbles. | | |
| 2.50 | D8 | | | | | | | | |
| 3.00 | CPT | N = 27 (2, 4, 7, 6, 5, 9) | | | | (1.90) | 3.00m; stiff. | | |
| 3.00-3.50 | B10 | | | | | | | | |
| 3.50 | D11 | | 1 | | | | | | |
| 4.00 | CPT | N = 68 (4, 3, 5, 9, 16, 38) | | 70.56 | | 4.30 | | | |
| 4.00-4.50 | B13 | | | 70.36 | | 4.50 | Very dense grey angular COBBLES. | | |
| 4.50 | D14 | | | 70.26 | | 4.60 | Obstruction as possible rock. | | |
| | | | | | | | BH terminated at 4.60m bgl. Obstruction as possible rock. | | |

## Boring Progress and Water Observations

| Date | Time | Depth | Casing Depth | Casing Dia. mm | Water (bgl) Depth, m |
|---|---|---|---|---|---|
| 09-02-21 | 12.00 | 4.60 | 4.50 | 203 | 3.90 |

## Chiselling

| From | To | Hours |
|---|---|---|
| 4.5 | 4.6 | 1 |

## Water Added

| From | To |
|---|---|
| | |

## GENERAL REMARKS

50mm standpipe installed. Response zone 3.00m to 4.60m bgl.

| All dimensions in metres Scale 1:62.5 | Client: Bord na Mona | Method/ Plant Used: Dando 2000 | Bit Design | Driller: BT | Logged By: BT |
|---|---|---|---|---|---|

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# BOREHOLE LOG

| Project | Location | BOREHOLE No |
|---|---|---|
| Ballivor Wind Farm | Ballivor, Co. Meath | **BH-13** |

| Job No | Date | Ground Level (m OD) | Co-Ordinates () |
|---|---|---|---|
| 2020MH103 | 09-02-21<br>09-02-21 | 74.82 | E 663,609.4 N 755,164.8 |

| Engineer | GROUNDWATER STRIKES | Sheet |
|---|---|---|
| FTCO/MKO | Water strikes: Rose to (@ 20 min.): Sealed at:<br>1st: dry<br>2nd:<br>3rd: | 1 of 1<br>Rev. DRAFT |

| SAMPLES & TESTS | | | Water | STRATA | | | | Geology | Instrument/ Backfill |
|---|---|---|---|---|---|---|---|---|---|
| Depth | Type No | Test Result | | Reduced Level | Legend | Depth (Thick-ness) | DESCRIPTION | | |
| 0.00-1.00 | B1 | | | | | | Firm brown fibrous PEAT with rootlets. | | |
| 1.00 | SPT | N = 0<br>(0, 0, 0, 0, 0, 0) | | | | (2.20) | | | |
| 1.00 | D2 | | | | | | | | |
| 1.00-1.50 | B4 | | | | | | | | |
| 1.50 | D5 | | | | | | | | |
| 2.00 | | N = 26<br>(4, 6, 4, 7, 7, 8) | | 72.62 | | 2.20 | | | |
| 2.00-2.45 | U1006 | 5 blows | | | | | Firm grey slightly sandy gravelly silty CLAY with cobbles and boulders. Cobbles are angular. | | |
| 2.50 | D7 | | | | | | | | |
| 3.00 | CPT | N = 67<br>(3, 5, 7, 7, 6, 47) | | | | (1.70) | 3.00m: stiff. | | |
| 3.00-3.50 | B9 | | | | | | | | |
| 3.50 | D10 | | | 70.92 | | 3.90 | | | |
| 4.00-4.50 | B12 | | | | | | Dense grey gravelly coarse SAND. | | |
| | | | | 70.42 | | (0.50)<br>4.40 | | | |
| | | | | 70.22 | | 4.60 | Obstruction as possible rock. | | |
| 4.50 | D13 | | | | | | BH terminated at 4.60m bgl. Obstruction as possible rock. | | |

| Boring Progress and Water Observations | | | | | | Chiselling | | | Water Added | | GENERAL REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Depth | Casing Depth | Casing Dia. mm | Water (bgl) Depth, m | From | To | Hours | From | To | |
| 09-02-21 | 16.00 | 4.60 | 4.50 | 203 | 4.00 | 4.4 | 4.6 | 1 | | | BH backfilled. |

| All dimensions in metres Scale 1:62.5 | Client: Bord na Mona | Method/ Plant Used: Dando 2000 | Bit Design | Driller: BT | Logged By: BT |
|---|---|---|---|---|---|

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# BOREHOLE LOG

| Project | Location | BOREHOLE No |
|---|---|---|
| Ballivor Wind Farm | Ballivor, Co. Meath | **BH-14** |

| Job No | Date | Ground Level (m OD) | Co-Ordinates () |
|---|---|---|---|
| 2020MH103 | 08-02-21<br>08-02-21 | 75.11 | E 663,562.8 N 755,153.0 |

| Engineer | GROUNDWATER STRIKES | Sheet / Rev. |
|---|---|---|
| FTCO/MKO | Water strikes: 1st: 3.50m Rose to (@ 20 min.): 2.90m Sealed at: 2nd: 3rd: | Sheet 1 of 1<br>Rev. DRAFT |

| SAMPLES & TESTS | | | Water | STRATA | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Depth | Type No | Test Result | | Reduced Level | Legend | Depth (Thick-ness) | DESCRIPTION | Geology | Instrument/ Backfill |
| 0.00-1.00 | B1 | | | | | | Very soft brown fibrous PEAT with rootlets. | | |
| 1.00 | SPT | N = 0<br>(0, 0, 0, 0, 0, 0) | | | | | | | |
| 1.00 | D2 | | | | | (2.90) | | | |
| 1.00-1.50 | B4 | | | | | | | | |
| 1.50 | D5 | | | | | | | | |
| 2.00 | SPT | N = 1<br>(1, 0, 0, 0, 0, 1) | | | | | | | |
| 2.00-2.50 | B7 | | | | | | | | |
| 2.50 | D8 | | 1 | 72.21 | | 2.90 | | | |
| 3.00 | CPT | N = 15<br>(3, 4, 2, 5, 4, 4) | | | | (0.60) | Firm dark grey grey slightly sandy slightly gravelly SILT. | | |
| 3.00-3.50 | B10 | | 1 | 71.61 | | 3.50 | | | |
| 3.50 | D11 | | | | | | Medium dense dark grey slightly silty very sandy medium and fine GRAVEL with clay bands. | | |
| 4.00 | CPT | N = 23<br>(4, 5, 5, 6, 4, 8) | | | | (1.70) | | | |
| 4.00-4.50 | B13 | | | | | | | | |
| 4.50 | D14 | | | | | | | | |
| 5.00 | CPT | 50 for 10 mm<br>(18, 7, 50) | | 69.91 | | 5.20 | | | |
| | | | | 69.81 | | 5.30 | Obstruction as possible rock. | | |
| | | | | | | | BH terminated at 5.30m bgl. Obstruction as possible rock. | | |

| Boring Progress and Water Observations | | | | | | Chiselling | | | Water Added | | GENERAL REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Depth | Casing Depth | Casing Dia. mm | Water (bgl) Depth, m | From | To | Hours | From | To | |
| 08-02-21 | 12.00 | 5.30 | 5.20 | 203 | 3.00 | 5.2 | 5.3 | 1 | | | BH backfilled. |

| All dimensions in metres Scale 1:62.5 | Client: Bord na Mona | Method/ Plant Used: Dando 2000 | Bit Design | Driller: BT | Logged By: BT |
|---|---|---|---|---|---|

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# BOREHOLE LOG

| Project | Location | BOREHOLE No |
|---|---|---|
| Ballivor Wind Farm | Ballivor, Co. Meath | **BPA-BH01** |

| Job No | Date | Ground Level (m OD) | Co-Ordinates () |
|---|---|---|---|
| 2020MH103 | 16-02-21<br>16-02-21 | 78.02 | E 664,271.0 N 755,319.0 |

| Engineer | GROUNDWATER STRIKES | Sheet |
|---|---|---|
| FTCO/MKO | Water strikes: Rose to (@ 20 min.): Sealed at:<br>1st: dry<br>2nd:<br>3rd: | 1 of 1<br>Rev. DRAFT |

| SAMPLES & TESTS | | | Water | STRATA | | | | Geology | Instrument/ Backfill |
|---|---|---|---|---|---|---|---|---|---|
| Depth | Type No | Test Result | | Reduced Level | Legend | Depth (Thick-ness) | DESCRIPTION | | |
| 0.00-1.00 | B1 | | | | | | Very soft blackish brown PEAT. | | |
| 1.00 | SPT | N = 0<br>(1, 0, 0, 0, 0, 0) | | | | (2.60) | | | |
| 1.00 | D2 | | | | | | | | |
| 1.00-1.50 | B4 | | | | | | | | |
| 1.50 | D5 | | | | | | | | |
| 2.00 | SPT | N = 10<br>(1, 2, 2, 3, 3, 2) | | | | | 2.00m: firm. | | |
| 2.00-2.50 | B7 | | | 75.42 | | 2.60 | | | |
| 2.50 | D8 | | | | | | Medium dense greyish brown sandy very silty medium GRAVEL with cobbles. | | |
| 3.00 | CPT | N = 21<br>(4, 5, 6, 5, 5, 5) | | | | (1.40) | | | |
| 3.00-3.50 | B10 | | | | | | | | |
| 3.50 | D11 | | | 74.02 | | 4.00 | | | |
| 4.00 | CPT | N = 34<br>(3, 5, 8, 10, 9, 7) | | | | | Dense greenish grey very silty very medium GRAVEL and COBBLES. | | |
| 4.00-4.50 | B13 | | | | | (1.00) | | | |
| 4.50 | D14 | | | 73.02 | | 5.00 | | | |
| 5.00 | CPT | 50 for 35 mm<br>(25, -, 50) | | 72.92 | | 5.10 | Obstruction as possible rock.<br>BH terminated at 5.10m bgl. Obstruction as possible rock. | | |

| Boring Progress and Water Observations | | | | | | Chiselling | | | Water Added | | GENERAL REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Depth | Casing Depth | Casing Dia. mm | Water (bgl) Depth, m | From | To | Hours | From | To | |
| 16-02-21 | 13.00 | 5.10 | 5.00 | 203 | | 5 | 5.1 | 1 | | | 50mm standpipe installed. Response zone 3.10m to 5.10m bgl. |

| All dimensions in metres Scale 1:62.5 | Client: Bord na Mona | Method/ Plant Used: Dando 2000 | Bit Design | Driller: BT | Logged By: BT |
|---|---|---|---|---|---|

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# BOREHOLE LOG

| Project | Location | BOREHOLE No |
|---|---|---|
| Ballivor Wind Farm | Ballivor, Co. Meath | **BPA-BH02** |

| Job No | Date | Ground Level (m OD) | Co-Ordinates () |
|---|---|---|---|
| 2020MH103 | 15-02-21<br>15-02-21 | 78.72 | E 664,211.8 N 755,018.0 |

| Engineer | GROUNDWATER STRIKES | Sheet / Rev. |
|---|---|---|
| FTCO/MKO | Water strikes: Rose to (@ 20 min.): Sealed at:<br>1st: dry<br>2nd:<br>3rd: | Sheet 1 of 1<br>Rev. DRAFT |

| SAMPLES & TESTS | | | Water | STRATA | | | | Geology | Instrument/ Backfill |
|---|---|---|---|---|---|---|---|---|---|
| Depth | Type No | Test Result | | Reduced Level | Legend | Depth (Thick-ness) | DESCRIPTION | | |
| 0.00-1.00 | B1 | | | 78.32 | | 0.40 | PEAT. | | |
| 1.00 | CPT | N = 39 (2, 3, 5, 8, 10, 16) | | | | | Firm dark grey slightly sandy gravelly SILT with cobbles. | | |
| 1.00 | D2 | | | | | | 1.00m: very stiff. | | |
| 1.00-1.50 | B4 | | | | | | | | |
| 1.50 | D5 | | | | | (3.10) | | | |
| 2.00 | CPT | N = 28 (3, 5, 5, 6, 8, 9) | | | | | 2.00m: stiff. | | |
| 2.00-2.50 | B7 | | | | | | | | |
| 2.50 | D8 | | | | | | | | |
| 3.00 | CPT | N = 22 (5, 7, 6, 5, 5, 6) | | | | | | | |
| 3.00-3.50 | B10 | | | 75.22 | | 3.50 | | | |
| 3.50 | D11 | | | | | | Medium dense silty very gravelly coarse SAND. | | |
| 4.00 | CPT | N = 15 (2, 8, 3, 3, 4, 5) | | | | | | | |
| 4.00-4.50 | B13 | | | | | | | | |
| 4.50 | D14 | | | | | (2.50) | | | |
| 5.00 | CPT | N = 29 (4, 4, 5, 6, 9, 9) | | | | | | | |
| 5.00-5.50 | B16 | | | | | | | | |
| 5.50 | D17 | | | | | | | | |
| 6.00 | CPT | 50 for 0 mm (25, -, 50) | | 72.72 | | 6.00 | BH terminated at 6.00m bgl. Obstruction as possible rock. | | |

| Boring Progress and Water Observations | | | | | | Chiselling | | | Water Added | | GENERAL REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Depth | Casing Depth | Casing Dia. mm | Water (bgl) Depth, m | From | To | Hours | From | To | |
| 15-02-21 | 13.00 | 6.00 | 6.00 | 203 | basal seepage | 6 | 6.0 | 1 | | | BH backfilled. |

| All dimensions in metres Scale 1:62.5 | Client: Bord na Mona | Method/ Plant Used: Dando 2000 | Bit Design | Driller: BT | Logged By: BT |
|---|---|---|---|---|---|

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# BOREHOLE LOG

| Project | Location | BOREHOLE No |
|---|---|---|
| Ballivor Wind Farm | Ballivor, Co. Meath | **BPA-BH03** |

| Job No | Date | Ground Level (m OD) | Co-Ordinates () |
|---|---|---|---|
| 2020MH103 | 15-02-21<br>15-02-21 | 76.34 | E 664,184.5 N 754,811.6 |

| Engineer | GROUNDWATER STRIKES | Sheet |
|---|---|---|
| FTCO/MKO | Water strikes: Rose to (@ 20 min.): Sealed at:<br>1st: dry<br>2nd:<br>3rd: | 1 of 1<br>Rev. DRAFT |

| SAMPLES & TESTS | | | Water | STRATA | | | | Geology | Instrument/ Backfill |
|---|---|---|---|---|---|---|---|---|---|
| Depth | Type No | Test Result | | Reduced Level | Legend | Depth (Thick-ness) | DESCRIPTION | | |
| 0.00-1.00 | B1 | | | 75.84 | | (0.50)<br>0.50 | Very soft brown PEAT. | | |
| 1.00 | CPT | N = 57<br>(8, 10, 9, 8, 17, 23) | | | | (1.10) | Medium dense grey slightly slightly sandy very silty GRAVEL with cobbles and boulders.<br>1.00m: very dense. | | |
| 1.00 | D2 | | | 74.74 | | 1.60 | | | |
| 1.00-1.50 | B4 | | | 74.64 | | 1.70 | Obstruction. | | |
| 1.50 | D5 | | | | | | BH terminated at 1.70m bgl. Obstruction. | | |

| Boring Progress and Water Observations | | | | | | Chiselling | | | Water Added | | GENERAL REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Depth | Casing Depth | Casing Dia. mm | Water (bgl) Depth, m | From | To | Hours | From | To | |
| 15-02-21 | 14.30 | 1.70 | 1.50 | 203 | | 1.6 | 1.7 | 1 | | | BH backfilled. Moved and set up at BHA-BH03A. |

| All dimensions in metres Scale 1:62.5 | Client: Bord na Mona | Method/ Plant Used: Dando 2000 | Bit Design | Driller: BT | Logged By: BT |
|---|---|---|---|---|---|

IDL AGS3 UK BH BALLIVOR S&A FILE 1 MAR 2 2021.GPJ IDL TP TEMPLATE.GDT 29/4/21

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# BOREHOLE LOG

| Project | Location | BOREHOLE No |
|---|---|---|
| Ballivor Wind Farm | Ballivor, Co. Meath | **BPA-BH03A** |

| Job No | Date | Ground Level (m OD) | Co-Ordinates () |
|---|---|---|---|
| 2020MH103 | 15-02-21<br>15-02-21 | 76.36 | E 664,187.3 N 754,812.3 |

| Engineer | GROUNDWATER STRIKES | Sheet |
|---|---|---|
| FTCO/MKO | Water strikes: Rose to (@ 20 min.): Sealed at:<br>1st: 3.50m<br>2nd:<br>3rd: | 1 of 1<br>Rev. DRAFT |

| SAMPLES & TESTS | | | Water | STRATA | | | | Geology | Instrument/ Backfill |
|---|---|---|---|---|---|---|---|---|---|
| Depth | Type No | Test Result | | Reduced Level | Legend | Depth (Thick-ness) | DESCRIPTION | | |
| 0.00-1.00 | B1 | | | | | (0.60) | Very soft brown PEAT. | | |
| | | | | 75.76 | | 0.60 | | | |
| | | | | | | | Firm greyish brown slightly sandy slightly gravelly SILT with cobbles and boulders. | | |
| 1.00 | CPT | N = 44 (4, 5, 9, 10, 8, 17) | | | | | 1.00m: very stiff. | | |
| 1.00 | D2 | | | | | (1.90) | | | |
| 1.00-1.50 | B4 | | | | | | | | |
| 1.50 | D5 | | | | | | | | |
| 2.00 | CPT | N = 25 (3, 2, 8, 6, 5, 6) | | | | | 2.00m: stiff. | | |
| 2.00-2.50 | B7 | | | 73.86 | | 2.50 | | | |
| 2.50 | D8 | | | | | | Medium dense dark grey very sandy very silty medium GRAVEL. | | |
| 3.00 | CPT | N = 24 (4, 5, 6, 5, 5, 8) | | | | | | | |
| 3.00-3.50 | B10 | | ▼ | | | (1.90) | | | |
| 3.50 | D11 | | | | | | 3.50m: wet sandy. | | |
| 4.00 | CPT | 57 for 265 mm (8, 10, 10, 15, 20, 12) | | | | | 4.00m: very dense. | | |
| | | | | 71.96 | | 4.40 | | | |
| 4.00-4.50 | B13 | | | 71.86 | | 4.50 | Obstruction as possible rock - recovered as grey silty sandy fine to coarse GRAVEL. | | |
| 4.50 | D14 | | | | | | BH terminated at 4.50m bgl. Obstruction as possible rock. | | |

| Boring Progress and Water Observations | | | | | | Chiselling | | | Water Added | | GENERAL REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Depth | Casing Depth | Casing Dia. mm | Water (bgl) Depth, m | From | To | Hours | From | To | |
| 15-02-21 | 17.00 | 4.50 | 4.50 | 203 | | 4.45 | 4.5 | 1 | | | 50mm standpipe installed. Response zone 3.00m to 4.50m bgl. |

| All dimensions in metres Scale 1:62.5 | Client: Bord na Mona | Method/ Plant Used: Dando 2000 | Bit Design | Driller: BT | Logged By: BT |
|---|---|---|---|---|---|

IDL AGS3 UK BH BALLIVOR S&A FILE 1 MAR 2 2021.GPJ IDL TP TEMPLATE.GDT 29/4/21

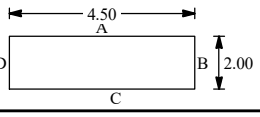
# Appendix 02
# Trial Pit Records

| | | |
|---|---|---|
| **PROJECT: Ballivor Wind Farm** | | **TRIALPIT: BPA-TP01** |
| **LOCATION: Ballivor, Co. Meath** | | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates:** | **Rig: Zaxis 120** |
| **ENGINEER: FTCO/MKO** | **E 664,221.7 N 755,132.4** | **Rev: DRAFT** |
| **Ground level: 74.10m O.D.** | | **DATE: 12.2.21** |

**GROUNDWATER**

**Water strikes:** **Rose to after:**
**1st:** 2.40m
**2nd:** 3.30m
**3rd:**

**PIT DIRECTION: 000-180**
**PIT DIMENSION: 2.00 * 4.50m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit stable.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | |
| | | | | | | | 73.20 | 0.90 | Firm orangish brown fibrous PEAT.<br>H2 B2 F3 R2 W2 TV0 TH0. |
| 1 | | | | | | | | | Spongy brown fibrous PEAT.<br>H4 B2 F2 R3 W3 TV0 TH0. |
| | | 1 | | | | | 71.70 | 2.40 | |
| 2 | | | | | | | 71.55 | 2.55 | Stiff whitish grey slightly gravelly sandy SILT with rootlets. Gravel is angular fine to coarse. |
| | | | | | | | | | Grey silty sandy angular to subangular fine to coarse GRAVEL with high cobble content.<br>Cobbles are angular to subangular. |
| 3 | | 2 | B 1 | 3.20-3.40 | | | 70.80 | 3.30 | |
| | | | | | | | | | Grey silty fine SAND. |
| 4 | | | B 2 | 4.00-4.20 | | | 69.90 | 4.20 | |
| | | | | | | | 69.60 | 4.50 | Grey sandy SILT. |
| | | | | | | END | | | TP terminated at 4.50m bgl on REs instruction. |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** Seepage of water at 2.40m bgl. Rapid ingress of water at 3.30m bgl. TP backfilled with arisings.

**Scale:** 1:50

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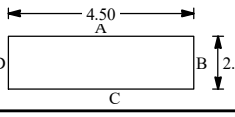
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

| | |
|---|---|
| **PROJECT: Ballivor Wind Farm** | **TRIALPIT: BPA-TP02** |
| **LOCATION: Ballivor, Co. Meath** | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates:** E 664,221.8 N 754,907.8 — **Rig: Zaxis 120** |
| **ENGINEER: FTCO/MKO** | **Rev: DRAFT** |
| **Ground level: 74.95m O.D.** | **DATE: 12.2.21** |

**GROUNDWATER**

Water strikes: Rose to after:
1st: 2.40m
2nd:
3rd:

**PIT DIRECTION: 000-180**
**PIT DIMENSION: 2.00 * 4.50m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse from 2.40m bgl.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | 74.85 | 0.10 | Firm black fibrous PEAT. |
| | | | | | | | | | Firm orangish brown fibrous PEAT. H3 B2 F3 R2 W2 TV0 TH0. |
| 1 | | | VANE | 1.00 | 33mm vane used 16 kN/m² | | 73.55 | 1.40 | |
| | | | B 1 | 1.50-1.70 | | | | | Stiff light grey slightly gravelly sandy SILT with rootlets. Gravel is angular to subrounded fine to coarse. |
| | | | D 2 | 1.50-1.70 | | | 73.15 | 1.80 | |
| 2 | | | | | | | | | Firm bluish grey sandy gravelly SILT with decaying organic material. Gravel is angular to rounded fine to coarse. |
| | | ▼ | | | | | 72.55 | 2.40 | |
| | | | B 3 | 2.50-2.70 | | | | | Wet light grey silty gravelly medium and coarse SAND with medium cobble content. Cobbles are angular. |
| 3 | | | | | | | 71.95 | 3.00 | |
| | | | | | | | 71.65 | 3.30 | Bluish grey sandy gravelly SILT with high cobble content and high boulder content. Boulders are subangular to subrounded. Boulders are up to 600mm in length. |
| | | | | | | | | | Grey gravelly coarse SAND with high cobble content. Gravel is angular to subrounded fine to coarse. Cobbles are subrounded. |
| 4 | | | | | | | 70.75 | 4.20 | |
| | | | | | | END | | | TP terminated at 4.20m bgl. Unable to progress TP - sidewall collapse and ingress of water. |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** Rapid ingress of water at 2.40m bgl. TP backfilled with arisings.

**Scale: 1:50**

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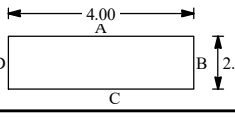
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

| | |
|---|---|
| **PROJECT: Ballivor Wind Farm** | **TRIALPIT: TP-01** |
| **LOCATION: Ballivor, Co. Meath** | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates:** |
| **ENGINEER: FTCO/MKO** | **E 663,586.8 N 755,376.4** |
| **Rig: Zaxis 120** | |
| **Rev: DRAFT** | |
| **Ground level: 75.17m O.D.** | **DATE: 3.2.21** |

**GROUNDWATER**

**Water strikes:** **Rose to after:**
**1st:** 0.00m
**2nd:** 3.10m
**3rd:**

**PIT DIRECTION: 000-180**
**PIT DIMENSION: 2.00 * 4.00m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse from 3.10m bgl.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | |
| | | | | | | | 74.47 | 0.70 | Heather over plastic dark brown amorphous PEAT. |
| | | | VANE | 0.70 | 33mm vane used 15 kN/m² | | | | Firm orangish brown fibrous PEAT.<br>H2 F3 R2 W2 TV0 TH0.<br>Pungent odour. |
| 1 | | | | | | | 73.27 | 1.90 | |
| | | | | | | | 73.17 | 2.00 | Firm brown organic SILT with decaying organic material. |
| 2 | | | B 1<br>D 2 | 2.10-2.30<br>2.10-2.30 | | | | | Firm bluish grey sandy gravelly SILT with low cobble content. Gravel is subangular to subrounded fine to coarse. Cobbles are subangular. |
| 3 | | | | | | | 72.07 | 3.10 | |
| | | | B 3 | 3.30-3.50 | | | | | Dark grey fine SAND. |
| 4 | | | | | | | 70.87 | 4.30 | |
| | | | | | | END | | | TP terminated at 4.30m bgl. Unable to progress TP - sidewall collapse and ingress of water. |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** Seepage of water from g/l to 1.90m bgl. Rapid ingress of water at 3.10m bgl. TP backfilled with arisings.

**Scale:** 1:50

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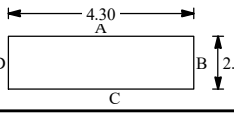
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

| | |
|---|---|
| **PROJECT: Ballivor Wind Farm** | **TRIALPIT: TP-02** |
| **LOCATION: Ballivor, Co. Meath** | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates:** **Rig: Zaxis 120** |
| **ENGINEER: FTCO/MKO** | **E 663,629.8 N 755,383.6** **Rev: DRAFT** |
| **Ground level: 75.03m O.D.** | **DATE: 2.2.21** |

**GROUNDWATER**

**Water strikes:** **Rose to after:**
**1st:** 0.00m
**2nd:** 3.30m
**3rd:**

**PIT DIRECTION: 000-180**
**PIT DIMENSION: 2.00 * 4.30m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse after 20 minutes.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | |
| | | | | | | | 74.33 | 0.70 | Heather over spongy orangish and black brown pseudo fibrous PEAT. |
| 1 | | | | | | | 73.58 | 1.45 | Firm light brown fibrous PEAT.<br>H3 B2 F2 R2 W1 TV0 TH0. |
| | | | B 1<br>D 2 | 1.60-1.80<br>1.60-1.80 | | | 73.43 | 1.60 | Stiff white slightly gravelly SILT with low cobble content. Gravel is angular to subangular fine to coarse.<br>Stiff locally firm bluish grey sandy gravelly SILT with medium cobble content. Gravel is angular to subangular fine to coarse. Cobbles are subrounded. |
| 2 | | | | | | | | | |
| 3 | | | B 3<br>D 4 | 2.80-3.00<br>2.80-3.00 | | | | | |
| | | | | | | | 70.53 | 4.50 | |
| 4 | | | | | | | | | **END** TP terminated at 4.50m bgl on REs instruction. |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** Seepage of water from g/l to 1.45m bgl. Rapid ingress of water at 3.30m bgl. TP backfilled with arisings.

**Scale:** 1:50

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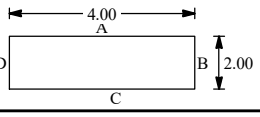
| | |
|---|---|
| **PROJECT: Ballivor Wind Farm** | **TRIALPIT: TP-03** |
| **LOCATION: Ballivor, Co. Meath** | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates: E 663,653.0 N 755,386.8** |
| **ENGINEER: FTCO/MKO** | **Rig: Zaxis 120** |
| **Ground level: 75.26m O.D.** | **Rev: DRAFT** |
| | **DATE: 1.2.21** |

**GROUNDWATER**

Water strikes: Rose to after:
1st: 1.90m
2nd:
3rd:

**PIT DIRECTION: 000-180**
**PIT DIMENSION: 2.00 * 4.00m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit stable.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | B 1 | 0.50-0.70 | | | 74.36 | 0.90 | Heather over spongy brownish black pseudo fibrous PEAT. |
| 1 | | | | | | | 73.36 | 1.90 | Firm yellowish brown fibrous PEAT.<br>H2 B2 F3 R2 W1 TV0 TH0.<br>Pungent odour. |
| 2 | | | D 2<br>B 3 | 2.00-2.20<br>2.00-2.20 | | | 73.26 | 2.00 | Soft light brown SILT. |
| | | | | | | | 72.26 | 3.00 | Soft bluish grey slightly gravelly SILT with medium cobble content. Gravel is angular to subangular fine to coarse. Cobbles are angular to subangular.<br><br>2.50m: firm. |
| 3 | | | D 4 | 3.20-3.40 | | | 70.76 | 4.50 | Firm bluish grey slightly gravelly SILT with medium cobble content and medium boulder content. Gravel is angular to subangular fine to coarse. Cobbles are angular to subangular. Boulders are up to 1500mm in length.<br><br>4.00m: stiff. |
| 4 | | | | | | END | | | TP terminated at 4.50m bgl on REs instruction. |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** Seepage of water at 1.90m bgl. TP backfilled with arisings.

**Scale: 1:50**

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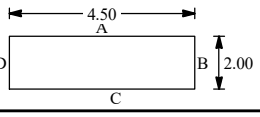
| | |
|---|---|
| **PROJECT: Ballivor Wind Farm** | **TRIALPIT: TP-04** |
| **LOCATION: Ballivor, Co. Meath** | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates: E 663,683.0 N 755,423.9** |
| **ENGINEER: FTCO/MKO** | **Rig: Zaxis 120** |
| **Ground level: 74.65m O.D.** | **Rev: DRAFT** |
| | **DATE: 4.2.21** |

**GROUNDWATER**

Water strikes: 1st: 1.90m Rose to after: 20min 1.80m
2nd:
3rd:

**PIT DIRECTION: 000-180**
**PIT DIMENSION: 2.00 * 4.50m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit stable.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | |
| | | | | | | | | | Firm orangish brown fibrous PEAT.<br>H3 B2 F3 R2 W0 TV0 TH0. |
| 1 | | | VANE | 1.00 | 33mm vane used 15 kN/m² | | | | |
| | | | B 1 | 1.00-1.20 | | | 73.15 | 1.50 | |
| | | 1 | B 2 | 1.70-1.90 | | | | | Soft light brown slightly sandy gravelly SILT with low cobble content. Gravel is angular to subangular fine to coarse. Cobbles are angular. |
| | | | D 3 | 1.70-1.90 | | | 72.75 | 1.90 | |
| 2 | | | B 4 | 2.20-2.40 | | | | | Grey sandy subrounded to rounded fine to coarse GRAVEL with high cobble content. |
| | | | | | | | 71.95 | 2.70 | |
| 3 | | | | | | | | | Stiff dark grey sandy gravelly SILT with high cobble content. Gravel is angular to rounded fine to coarse. Cobbles are angular. |
| | | | | | | | 71.15 | 3.50 | |
| 4 | | | | | | | | | Grey slightly silty gravelly COBBLES and BOULDERS. Boulders are up to 800mm in length. |
| | | | | | | | 70.15 | 4.50 | |
| | | | | | | | **END** | | TP terminated at 4.50m bgl on REs instruction. |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** Ingress of water at 1.90m bgl. TP backfilled with arisings.

**Scale: 1:50**

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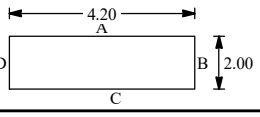
| | |
|---|---|
| **PROJECT: Ballivor Wind Farm** | **TRIALPIT: TP-05** |
| **LOCATION: Ballivor, Co. Meath** | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates:** **Rig: Zaxis 120** |
| **ENGINEER: FTCO/MKO** | **E 663,752.3 N 755,451.5** **Rev: DRAFT** |
| **Ground level: 75.89m O.D.** | **DATE: 4.2.21** |

**GROUNDWATER**

**Water strikes:** **Rose to after:**
**1st:** dry
**2nd:**
**3rd:**

**PIT DIRECTION: 090-270**
**PIT DIMENSION: 2.00 * 4.20m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit stable.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | 75.74 | 0.15 | Heather over plastic black amorphous PEAT. H8. |
| | | | | | | | | | Firm orangish brown fibrous PEAT. H2 B2 F3 R1 W1 TV0 TH0. |
| 1 | | | VANE | 0.90 | 33mm vane used 12 kN/m² | | | | |
| | | | B 1 | 1.80-2.00 | | | | | |
| 2 | | | | | | | | | 2.40m 3.90m: brown. |
| 3 | | | | | | | | | |
| | | | | | | | 71.99 | 3.90 | |
| 4 | | | | | | | 71.89 | 4.00 | Soft brown organic SILT with low cobble content. Cobbles are angular. |
| | | | | | | | | | Firm grey slightly gravelly sandy SILT with high cobble content. Gravel is angular to subangular fine to coarse. Cobbles are angular. |
| | | | | | | | 71.39 | 4.50 | |
| | | | | | | END | | | TP terminated at 4.50m bgl on REs instruction. |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** TP dry on excavation. TP backfilled with arisings.

**Scale:** 1:50

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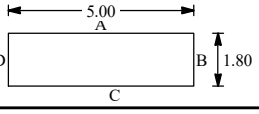
| | |
|---|---|
| **PROJECT: Ballivor Wind Farm** | **TRIALPIT: TP-07** |
| **LOCATION: Ballivor, Co. Meath** | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates:** **Rig: Zaxis 120** |
| **ENGINEER: FTCO/MKO** | **E 663,698.9 N 755,375.6** **Rev: DRAFT** |
| **Ground level: 76.58m O.D.** | **DATE: 1.2.21** |

**GROUNDWATER**

**Water strikes:** **Rose to after:**
**1st:** dry
**2nd:**
**3rd:**

**PIT DIRECTION: 000-180**
**PIT DIMENSION: 1.80 * 5.00m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit stable.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | 76.23 | 0.35 | Plastic black amorphous PEAT. |
| | | | VANE | 0.70 | 33mm vane used 21 kN/m² | | | | Firm yellowish brown fibrous PEAT. H3 B3 F3 R2 W2 TV0 TH0. |
| 1 | | | B 1 | 1.00-1.20 | | | | | |
| 2 | | | | | | | | | |
| 3 | | | | | | | 73.18 | 3.40 | |
| | | | | | | | 72.98 | 3.60 | Soft brownish grey SILT. |
| | | | B 2<br>D 3 | 3.60-3.80<br>3.60-3.80 | | | | | Firm damp grey slightly gravelly SILT with high cobble content. Gravel is angular to rounded fine to coarse. Cobbles are subrounded. |
| 4 | | | | | | | 72.08 | 4.50 | |
| | | | | | | END | | | TP terminated at 4.50m bgl on REs instruction. |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** TP dry on excavation. TP backfilled with arisings.

**Scale:** 1:50

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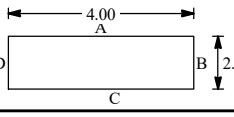
| | |
|---|---|
| **PROJECT: Ballivor Wind Farm** | **TRIALPIT: TP-08** |
| **LOCATION: Ballivor, Co. Meath** | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates:** **Rig: Zaxis 120** |
| **ENGINEER: FTCO/MKO** | **E 663,659.1 N 755,345.5** **Rev: DRAFT** |
| **Ground level: 75.44m O.D.** | **DATE: 2.2.21** |

**GROUNDWATER**

**Water strikes:** **Rose to after:**
**1st:** 1.20m
**2nd:**
**3rd:**

**PIT DIRECTION: 000-180**
**PIT DIMENSION: 2.00 * 4.00m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse from 2.30m bgl.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | 74.74 | 0.70 | Heather over brownish black amorphous PEAT. |
| | | | | | | | 74.34 | 1.10 | Firm orangish brown fibrous PEAT.<br>H2 B2 F2 R2 W1 TV0 TH0. |
| 1 | | ▼ | B 1 | 1.20-1.40 | | | 74.24 | 1.20 | Firm white slightly gravelly organic SILT. Gravel is angular to subangular fine to coarse. |
| | | | | | | | | | Firm grey slightly slightly gravelly sandy SILT with medium cobble content. Gravel is angular to subangular fine to coarse. Cobbles are angular to subrounded. |
| 2 | | | B 2<br>D 3 | 2.20-2.40<br>2.20-2.40 | | | | | 2.00m: soft wet. |
| 3 | | | | | | | | | 3.00m: firm. |
| | | | B 4<br>D 5 | 3.60-3.80<br>3.60-3.80 | | | | | 3.40m: with boulders. |
| 4 | | | | | | | 71.14 | 4.30 | |
| | | | | | | | 70.94 | 4.50 | Stiff dark bluish grey gravelly SILT with high cobble content. Gravel is angular to subangular fine to coarse. |
| | | | | | | | | | **END**<br>TP terminated at 4.50m bgl on REs instruction. |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** Seepage of water at 1.20m bgl. TP backfilled with arisings.

**Scale:** 1:50

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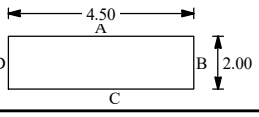
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

| | |
|---|---|
| **PROJECT: Ballivor Wind Farm** | **TRIALPIT: TP-10** |
| **LOCATION: Ballivor, Co. Meath** | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates:** |
| **ENGINEER: FTCO/MKO** | **E 663,797.5 N 755,350.1** |
| **Rig: Zaxis 120** | |
| **Rev: DRAFT** | |
| **Ground level: 74.04m O.D.** | **DATE: 4.2.21** |

**GROUNDWATER**

**Water strikes:** **Rose to after:**
**1st:** 0.40m
**2nd:**
**3rd:**

**PIT DIRECTION: 000-180**
**PIT DIMENSION: 2.00 * 4.50m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit stable.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | 73.94 | 0.10 | Plastic black amorphous PEAT. |
| | | 1 | | | | | | | Firm orangish brown fibrous PEAT.<br>H3 F2 R2 W2 TV0 TH0. |
| 1 | | | | | | | | | 1.00m: brown. |
| 2 | | | | | | | 71.74 | 2.30 | |
| | | | | | | | 71.59 | 2.45 | Soft light grey organic SILT. |
| | | | B 1 | 2.50-2.70 | | | | | Grey slightly silty SAND and angular to subrounded fine to coarse GRAVEL with medium cobble content. Cobbles are angular. |
| 3 | | | | | | | 70.84 | 3.20 | |
| | | | | | | | 70.64 | 3.40 | Grey coarse SAND. |
| | | | B 2<br>D 3 | 3.50-3.70<br>3.50-3.70 | | | | | Firm grey sandy SILT with rootlets. |
| 4 | | | | | | | 69.84 | 4.20 | |
| | | | | | | | 69.54 | 4.50 | Grey slightly silty gravelly medium to coarse SAND with cobbles. Gravel is angular to subrounded fine to coarse. |
| | | | | | | END | | | TP terminated at 4.50m bgl on REs instruction. |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** Ingress of water at 3.20m bgl. TP backfilled with arisings.

**Scale:** 1:50

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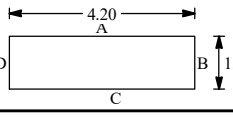
| | |
|---|---|
| **PROJECT: Ballivor Wind Farm** | **TRIALPIT: TP-11** |
| **LOCATION: Ballivor, Co. Meath** | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates:** **Rig: Zaxis 120** |
| **ENGINEER: FTCO/MKO** | **E 663,730.4 N 755,293.9** **Rev: DRAFT** |
| **Ground level: 76.59m O.D.** | **DATE: 1.2.21** |

**GROUNDWATER**

**Water strikes:** **Rose to after:**
**1st:** 1.50m
**2nd:**
**3rd:**

**PIT DIRECTION: 000-180**
**PIT DIMENSION: 1.80 * 4.20m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | |
| | | | | | | | 75.44 | 1.15 | Plastic black amorphous PEAT. |
| 1 | | | VANE | 1.00 | 33mm vane used 24 kN/m² | | | | |
| | | | | | | | 75.09 | 1.50 | Firm yellowish brown fibrous PEAT. H3 B2 F2 W1 TV0 TH0. |
| | | | B 1 | 1.50-1.70 | | | 74.89 | 1.70 | Soft light grey organic SILT. |
| | | | D 2 | 1.50-1.70 | | | | | Soft wet light bluish grey slightly gravelly sandy SILT with high cobble content. Gravel is angular to subangular fine to coarse. Cobbles are subangular to rounded. |
| 2 | | | | | | | | | |
| | | | | | | | | | 2.80m: firm |
| 3 | | | B 3 | 3.00-3.20 | | | | | |
| | | | D 4 | 3.00-3.20 | | | 73.09 | 3.50 | |
| | | | | | | | | | Firm wet light bluish grey slightly gravelly sandy SILT with high cobble content and medium boulder content. Gravel is angular to subangular fine to coarse. Cobbles are subangular to rounded. Boulders are subrounded. |
| 4 | | | | | | | 72.49 | 4.10 | |
| | | | | | | END | | | TP terminated at 4.10m bgl. Unable to progress TP - sidewall collapse. |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** Ingress of water at 1.50m bgl. TP backfilled with arisings.

**Scale:** 1:50

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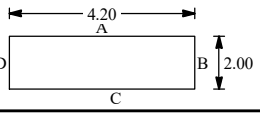
| | | |
|---|---|---|
| **PROJECT: Ballivor Wind Farm** | | **TRIALPIT: TP-12** |
| **LOCATION: Ballivor, Co. Meath** | | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates:** | **Rig: Zaxis 120** |
| **ENGINEER: FTCO/MKO** | **E 663,641.2 N 755,255.6** | **Rev: DRAFT** |
| **Ground level: 74.83m O.D.** | | **DATE: 3.2.21** |

**GROUNDWATER**

**Water strikes:** **Rose to after:**
**1st:** 0.00m
**2nd:** 1.60m
**3rd:**

**PIT DIRECTION: 000-180**
**PIT DIMENSION: 2.00 * 4.20m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit stable.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | Heather over firm orangish brown fibrous PEAT. H2. |
| | | | VANE | 0.80 | 33mm vane used 15 kN/m² | | | | 0.70m: yellowish brown. |
| | | | | | | | 73.18 | 1.65 | |
| 2 | | | B 1<br>D 2 | 1.80-2.00<br>1.80-2.00 | | | | | Stiff bluish grey slightly gravelly sandy SILT with decaying organic material. Gravel is angular to subangular fine to medium.<br>2.00m to 3.90m: with low boulder content. Boulders are subrounded of limestone. Boulders are up to 600mm in length. |
| 3 | | | B 3<br>D 4 | 3.00-3.20<br>3.00-3.20 | | | | | 3.00m: firm. |
| | | | | | | | 70.93 | 3.90 | |
| 4 | | | B 5 | 4.00-4.20 | | | | | Firm light slightly gravelly SILT. Gravel is subangular to rounded fine to coarse. |
| | | | | | | | 70.33 | 4.50 | |
| | | | | | | **END** | | | TP terminated at 4.50m bgl on REs instruction. |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** Seepage of water from g/l to 1.65m bgl. Seepage of water at 1.60m bgl. TP backfilled with arisings.

**Scale:** 1:50

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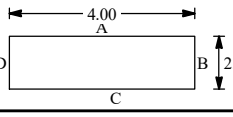
| | |
|---|---|
| **PROJECT: Ballivor Wind Farm** | **TRIALPIT: TP-13** |
| **LOCATION: Ballivor, Co. Meath** | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates: E 663,775.2 N 755,272.6** |
| **ENGINEER: FTCO/MKO** | **Rig: Zaxis 120** |
| **Ground level: 74.62m O.D.** | **Rev: DRAFT** |
| | **DATE: 4.2.21** |

**GROUNDWATER**

Water strikes: Rose to after:
1st: dry
2nd:
3rd:

**PIT DIRECTION: 000-180**
**PIT DIMENSION: 2.00 * 4.00m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | 74.52 | 0.10 | Plastic black amorphous PEAT. |
| | | | | | | | | | Firm orangish brown fibrous PEAT. H2 B2 F3 R1 W0 TV0 TH0. |
| | | | VANE | 0.70 | 33mm vane used 13 kN/m² | | | | |
| 1 | | | | | | | 72.82 | 1.80 | |
| | | | | | | | 72.67 | 1.95 | Soft light brown slightly sandy SILT. |
| 2 | | | B 1<br>D 2 | 2.00-2.20<br>2.00-2.20 | | | | | Firm grey sandy gravelly SILT with high cobble content. Gravel is angular to subangular fine to coarse. Cobbles are subangular to subrounded. |
| | | | | | | | 72.22 | 2.40 | |
| | | | | | | | | | Soft light grey slightly sandy gravelly SILT with medium cobble content. Gravel is angular to subangular fine to coarse. Cobbles are angular. |
| 3 | | | B 3<br>D 4 | 3.00-3.20<br>3.00-3.20 | | | | | |
| | | | | | | | 70.92 | 3.70 | |
| | | | | | | | | | Firm bluish grey slightly gravelly sandy SILT. |
| 4 | | | B 5 | 4.00-4.20 | | | | | |
| | | | | | | | 70.12 | 4.50 | |
| | | | | | | END | | | TP terminated at 4.50m bgl on REs instruction. |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** TP dry on excavation. TP backfilled with arisings.

**Scale:** 1:50

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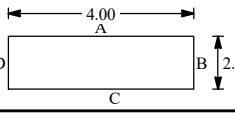
| | |
|---|---|
| **PROJECT: Ballivor Wind Farm** | **TRIALPIT: TP-14** |
| **LOCATION: Ballivor, Co. Meath** | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates:** **Rig: Zaxis 120** |
| **ENGINEER: FTCO/MKO** | **E 663,706.0 N 755,242.9** **Rev: DRAFT** |
| **Ground level: 74.92m O.D.** | **DATE: 2.2.21** |

**GROUNDWATER**

**Water strikes:** **Rose to after:**
**1st:** 0.00m
**2nd:** 3.40m
**3rd:**

**PIT DIRECTION: 000-180**
**PIT DIMENSION: 2.00 * 4.00m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | 74.42 | 0.50 | Spongy brown pseudo fibrous PEAT. H7. |
| 1 | | | VANE | 1.00 | 33mm vane used 17 kN/m² | | 73.02 | 1.90 | Firm orangish brown fibrous PEAT. H2 B2 F2 R1 W1 TV0 TH0. |
| 2 | | | B 1<br>D 2 | 2.20-2.40<br>2.20-2.40 | | | 72.92 | 2.00 | Firm light grey organic SILT. |
| 3 | | | B 3 | 3.40-3.60 | | | 70.92 | 4.00 | Stiff dark grey slightly sandy gravelly SILT with high cobble content. Gravel is angular to subangular fine to coarse. Cobbles are angular.<br>3.20m: firm. |
| 4 | | | | | | END | | | TP terminated at 4.00m bgl. Unable to progress TP - sidewall collapse and ingress of water. |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** Seepage of water from g/l to 1.90m bgl. Rapid ingress of water at 3.40m bgl. TP backfilled with arisings.

**Scale:** 1:50

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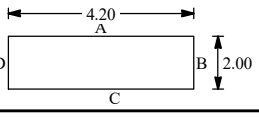
| | |
|---|---|
| **PROJECT: Ballivor Wind Farm** | **TRIALPIT: TP-15** |
| **LOCATION: Ballivor, Co. Meath** | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates:** |
| **ENGINEER: FTCO/MKO** | **E 663,673.0 N 755,210.9** |
| **Rig: Zaxis 120** | |
| **Rev: DRAFT** | |
| **Ground level: 74.89m O.D.** | **DATE: 3.2.21** |

**GROUNDWATER**

**Water strikes:** **Rose to after:**
**1st:** 2.40m
**2nd:**
**3rd:**

**PIT DIRECTION: 000-180**
**PIT DIMENSION: 2.00 * 4.20m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit stable.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | 74.39 | 0.50 | Spongy brown pseudo fibrous PEAT. |
| 1 | | | VANE<br>B 1 | 1.00<br>1.00-1.20 | 33mm vane used 13 kN/m² | | 72.49 | 2.40 | Firm yellowish brown fibrous PEAT.<br>H2 F3 R2 W1 TV0 TH0. |
| 2 | | ▼ | | | | | | | |
| 3 | | | B 2<br>D 3 | 2.50-2.70<br>2.50-2.70 | | | 71.49 | 3.40 | Stiff dark grey SILT with decaying organic material. |
| 4 | | | B 4<br>D 5 | 3.80-4.00<br>3.80-4.00 | | | 70.39 | 4.50 | Stiff grey sandy gravelly SILT with high cobble content. Gravel is angular to subangular fine to coarse. Cobbles are angular. |
| 5 | | | | | | END | | | TP terminated at 4.50m bgl on REs instruction. |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** Seepage of water at 2.40m bgl. TP backfilled with arisings.

**Scale:** 1:50

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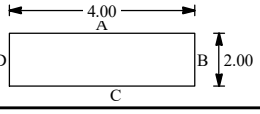
| | |
|---|---|
| **PROJECT: Ballivor Wind Farm** | **TRIALPIT: TP-17** |
| **LOCATION: Ballivor, Co. Meath** | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates:** |
| **ENGINEER: FTCO/MKO** | **E 663,612.1 N 755,194.7** |
| **Rig: Zaxis 120** | |
| **Rev: DRAFT** | |
| **Ground level: 74.39m O.D.** | **DATE: 3.2.21** |

**GROUNDWATER**

**Water strikes:** **Rose to after:**
**1st:** **0.00m**
**2nd:**
**3rd:**

**PIT DIRECTION: 000-180**
**PIT DIMENSION: 2.00 * 4.00m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit stable.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | ▼ | | | | | | | |
| | | | | | | | | | Firm brown fibrous PEAT.<br>H2 B2 F3 R2 W1 TV0 TH0. |
| 1 | | | | | | | | | |
| | | | | | | | 72.89 | 1.50 | |
| | | | | | | END | | | TP terminated at 1.50m bgl. Unable to progress TP due to ingress of surface water. |
| 2 | | | | | | | | | |
| 3 | | | | | | | | | |
| 4 | | | | | | | | | |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** Rapid ingress of surface water. TP backfilled with arisings.

**Scale:** 1:50

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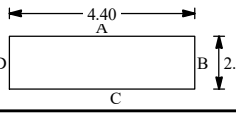
| | |
|---|---|
| **PROJECT: Ballivor Wind Farm** | **TRIALPIT: TP-18** |
| **LOCATION: Ballivor, Co. Meath** | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates:** E 663,626.6 N 755,135.9 — **Rig: Zaxis 120** |
| **ENGINEER: FTCO/MKO** | **Rev: DRAFT** |
| **Ground level: 74.90m O.D.** | **DATE: 3.2.21** |

**GROUNDWATER**

Water strikes: Rose to after:
1st: 0.00m
2nd: 2.00m
3rd:

**PIT DIRECTION: 000-180**
**PIT DIMENSION: 2.00 * 4.40m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | 74.40 | 0.50 | Grass over plastic black amorphous PEAT. |
| | | | | | | | 72.90 | 2.00 | Firm yellowish and orangish brown fibrous PEAT with 'bog oak'.<br>H3 B2 F3 R2 W2 TV0 TH0. |
| 2 | | | B 1<br>D 2 | 2.20-2.40<br>2.20-2.40 | | | 72.50 | 2.40 | Stiff grey sandy SILT with rootlets. |
| 3 | | | B 3 | 3.20-3.40 | | | 70.90 | 4.00 | Dark grey very silty very sandy angular to subangular fine to medium and coarse GRAVEL with high cobble content. |
| 4 | | | | | | | 70.70 | 4.20 | Firm wet grey sandy gravelly SILT with high cobble content. Cobbles are angular. |
| | | | | | | END | | | TP terminated at 4.20m bgl. Unable to progress TP - sidewall collapse. |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** Seepage of water from g/l to 2.00m bgl. Rapid ingress of water at 2.00m bgl. TP backfilled with arisings.

**Scale:** 1:50

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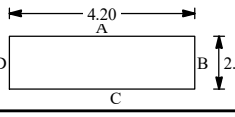
| | |
|---|---|
| **PROJECT: Ballivor Wind Farm** | **TRIALPIT: TP-20** |
| **LOCATION: Ballivor, Co. Meath** | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates:** E 663,726.2 N 755,198.3 |
| **ENGINEER: FTCO/MKO** | **Rig: Zaxis 120** |
| **Ground level: 74.99m O.D.** | **Rev: DRAFT** |
| | **DATE: 2.2.21** |

**GROUNDWATER**

**Water strikes:** **Rose to after:**
**1st:** 0.00m
**2nd:** 2.20m
**3rd:**

**PIT DIRECTION: 000-180**
**PIT DIMENSION: 2.00 * 4.20m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | |
| | | | | | | | 74.44 | 0.55 | Heather over plastic brownish black amorphous PEAT. |
| | | | | | | | | | Firm orangish brown fibrous PEAT.<br>H3 B2 F3 R2 W2 TV0 TH0. |
| 1 | | | VANE | 1.00 | 33mm vane used 16 kN/m² | | | | |
| | | | B 1 | 1.30-1.50 | | | | | |
| 2 | | | | | | | 72.79 | 2.20 | |
| | | | B 2 | 2.40-2.60 | | | | | Stiff dark grey slightly sandy gravelly SILT with high cobble content. Gravel is angular to subangular fine to coarse. Cobbles are angular. |
| | | | D 3 | 2.40-2.60 | | | | | |
| 3 | | | | | | | 71.49 | 3.50 | |
| | | | | | | END | | | TP terminated at 3.50m bgl. Unable to progress TP - sidewall collapse. |
| 4 | | | | | | | | | |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** Seepage of water from g/l to 2.20m bgl. Ingress of water at 2.20m bgl. TP backfilled with arisings.

**Scale:** 1:50

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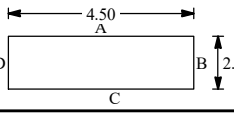
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

| | |
|---|---|
| **PROJECT: Ballivor Wind Farm** | **TRIALPIT: TP-22** |
| **LOCATION: Ballivor, Co. Meath** | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates:** **Rig: Zaxis 120** |
| **ENGINEER: FTCO/MKO** | **E 663,817.4 N 755,166.5** **Rev: DRAFT** |
| **Ground level: 77.19m O.D.** | **DATE: 1.2.21** |

**GROUNDWATER**

**Water strikes:** **Rose to after:**
**1st:** 2.30m
**2nd:** 4.10m
**3rd:**

**PIT DIRECTION: 000-180**
**PIT DIMENSION: 2.00 * 4.50m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | 76.69 | 0.50 | Plastic black amorphous PEAT. |
| | | | | | | | | | Firm orangish brown fibrous PEAT.<br>H3 B2 F3 R2 W2 TV0 TH0. |
| 1 | | | | | | | | | |
| 2 | | 1 | | | | | 74.89 | 2.30 | |
| | | | | | | | 74.69 | 2.50 | Firm whitish grey gravelly SILT. Gravel is subangular fine to coarse. |
| | | | B 1<br>D 2 | 2.50-2.70<br>2.50-2.70 | | | | | Firm bluish grey gravelly SILT with medium cobble content. Gravel is angular to subangular fine to coarse. Cobbles are angular. |
| 3 | | | | | | | | | 3.50m: with boulders. |
| 4 | | 2 | B 3 | 4.20-4.40 | | | 72.69 | 4.50 | |
| | | | | | | **END** | | | TP terminated at 4.50m bgl on REs instruction. |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** Seepage of water at 2.30m bgl. Ingress of water at 4.10m bgl. TP backfilled with arisings.

**Scale:** 1:50

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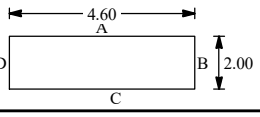
| | |
|---|---|
| **PROJECT: Ballivor Wind Farm** | **TRIALPIT: TP-23** |
| **LOCATION: Ballivor, Co. Meath** | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates:** |
| **ENGINEER: FTCO/MKO** | **E 663,757.2 N 7,551,112.1** |
| **Rig: Zaxis 120** | |
| **Rev: DRAFT** | |
| **Ground level: 76.44m O.D.** | **DATE: 2.2.21** |

**GROUNDWATER**

Water strikes: Rose to after:
1st: 2.00m
2nd:
3rd:

**PIT DIRECTION: 000-180**
**PIT DIMENSION: 2.00 * 4.60m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit stable.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | |
| | | | | | | | 75.79 | 0.65 | Heather over plastic brown amorphous PEAT. |
| 1 | | | B 1 | 1.00-1.20 | | | | | Firm orangish brown fibrous PEAT.<br>H2 B2 F3 R2 W2 TV0 TH0. |
| 2 | | ▼ | | | | | 74.44 | 2.00 | |
| | | | | | | | 73.94 | 2.50 | Soft brownish grey peaty SILT. |
| | | | B 2<br>D 3 | 2.50-2.70<br>2.50-2.70 | | | | | Soft damp bluish grey slightly sandy gravelly SILT with medium cobble content. Gravel is angular to subangular fine to coarse.<br>2.80: firm.<br>3.30m: with medium boulder content. Boulders are up to 400mm in length. |
| 4 | | | | | | | 72.24 | 4.20 | |
| | | | | | | END | | | TP terminated at 4.20m bgl. Obstruction as boulders. |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** Ingress of water at 2.00m bgl. TP backfilled with arisings.

**Scale:** 1:50

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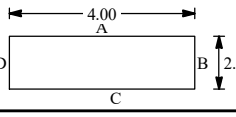
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

| | |
|---|---|
| **PROJECT: Ballivor Wind Farm** | **TRIALPIT: TP-24** |
| **LOCATION: Ballivor, Co. Meath** | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates: E 663,659.4 N 755,080.0** |
| **ENGINEER: FTCO/MKO** | **Rig: Zaxis 120** |
| **Ground level: 74.93m O.D.** | **Rev: DRAFT** |
| | **DATE: 3.2.21** |

**GROUNDWATER**

Water strikes: Rose to after:
1st: 0.00m
2nd:
3rd:

**PIT DIRECTION: 000-180**
**PIT DIMENSION: 2.00 * 4.00m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | 74.48 | 0.45 | Grass over plastic black amorphous PEAT. |
| 1 | | | VANE | 1.00 | 33mm vane used 14 kN/m² | | 72.93 | 2.00 | Firm orangish brown fibrous PEAT.<br>H2 B2 F3 R2 W1 TV0 TH0. |
| 2 | | | B 1<br>D 2 | 2.10-2.30<br>2.10-2.30 | | | 72.23 | 2.70 | Stiff dark grey sandy gravelly SILT with decaying organic material. Gravel is angular to subrounded fine to coarse. |
| 3 | | | B 3<br>D 4 | 3.30-3.50<br>3.30-3.50 | | | 70.93 | 4.00 | Soft bluish grey sandy gravelly SILT with high cobble content. Gravel is angular to rounded fine to coarse. cobbles are subangular.<br>3.30-3.50m: dark grey very sandy very silty GRAVEL. |
| 4 | | | | | | END | | | TP terminated at 4.00m bgl. Unable to progress TP - sidewall collapse. |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** Seepage of water from g/l to 2.00m bgl. TP backfilled with arisings.

**Scale: 1:50**

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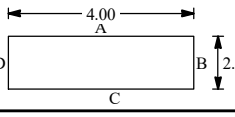
| | |
|---|---|
| **PROJECT: Ballivor Wind Farm** | **TRIALPIT: TP-25** |
| **LOCATION: Ballivor, Co. Meath** | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates:** |
| **ENGINEER: FTCO/MKO** | **E 663,582.7 N 755,281.6** |
| **Rig: Zaxis 120** | |
| **Rev: DRAFT** | |
| **Ground level: 74.68m O.D.** | **DATE: 3.2.21** |

**GROUNDWATER**

**Water strikes:** **Rose to after:**
**1st:** 1.50m
**2nd:**
**3rd:**

**PIT DIRECTION: 000-180**
**PIT DIMENSION: 2.00 * 4.00m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | |
| | | | VANE | 1.00 | 33mm vane used 12 kN/m² | | 73.18 | 1.50 | Heather over firm orangish and yellowish brown fibrous PEAT. H2 B2 F3 R2 W1 TV0 TH0. |
| 1 | | ▼1 | | | | | | | |
| | | | B 1<br>D 2 | 1.70-1.90<br>1.70-1.90 | | | 72.28 | 2.40 | Stiff dark bluish grey slightly gravelly sandy SILT with medium cobble content. Gravel is angular to subrounded fine to coarse. Cobbles are angular. |
| 2 | | | | | | | | | |
| | | | B 3 | 2.80-3.00 | | | 71.68 | 3.00 | Dark grey silty very gravelly medium to coarse SAND. Gravel is angular to subrounded fine to coarse. |
| 3 | | | | | | | 71.18 | 3.50 | Stiff dark grey slightly gravelly SILT with high cobble content and boulders. Gravel is subangular to subrounded fine to coarse. Cobbles are angular. Boulders are subangular to rounded. |
| | | | | | | END | | | TP terminated at 3.50m bgl. Unable to progress TP - sidewall collapse. |
| 4 | | | | | | | | | |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** Ingress of surface water. Rapid ingress of water at 1.50m bgl. TP backfilled with arisings.

**Scale:** 1:50

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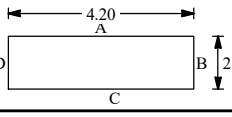
| | |
|---|---|
| **PROJECT: Ballivor Wind Farm** | **TRIALPIT: TP-26** |
| **LOCATION: Ballivor, Co. Meath** | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates: E 663,605.5 N 755,231.3** |
| **ENGINEER: FTCO/MKO** | **Rig: Zaxis 120** |
| **Ground level: 74.62m O.D.** | **Rev: DRAFT** |
| | **DATE: 3.2.21** |

**GROUNDWATER**

**Water strikes:** **Rose to after:**
**1st:** 3.80m
**2nd:**
**3rd:**

**PIT DIRECTION: 000-180**
**PIT DIMENSION: 2.00 * 4.20m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | |
| | | | | | | | 74.07 | 0.55 | Grass and heather over plastic black amorphous PEAT. |
| | | | | | | | 73.42 | 1.20 | Firm orangish brown fibrous PEAT.<br>H2 B2 F3 R1 W1 TV0 TH0. |
| 1 | | | | | | | 72.52 | 2.10 | Spongy brown fibrous PEAT.<br>H4 B2 F2 R2 W2 TV0 TH0. |
| 2 | | | B 1<br>D 2 | 2.20-2.40<br>2.20-2.40 | | | 70.82 | 3.80 | Stiff dark grey slightly gravelly sandy SILT. Gravel is angular to subangular fine to coarse. |
| 3 | | 1 | B 3<br>D 4 | 3.40-3.60<br>3.40-3.60 | | | 70.62 | 4.00 | Dark grey sandy subrounded to rounded fine to coarse GRAVEL. |
| 4 | | | | | | **END** | | | TP terminated at 4.00m bgl. Unable to progress TP - sidewall collapse. |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** Ingress of water at 3.80m bgl. TP backfilled with arisings.

**Scale:** 1:50

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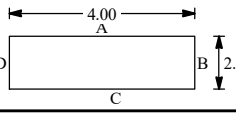
| | | |
|---|---|---|
| **PROJECT: Ballivor Wind Farm** | | **TRIALPIT: TP-27** |
| **LOCATION: Ballivor, Co. Meath** | | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates:** | **Rig: Zaxis 120** |
| **ENGINEER: FTCO/MKO** | **E 663,528.5 N 755,204.7** | **Rev: DRAFT** |
| **Ground level: 74.97m O.D.** | | **DATE: 3.2.21** |

**GROUNDWATER**

**Water strikes:** **Rose to after:**
**1st:** 0.00m
**2nd:** 2.10m
**3rd:**

**PIT DIRECTION: 000-180**
**PIT DIMENSION: 2.00 * 4.00m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | |
| | | | | | | | 74.32 | 0.65 | Heather over plastic brownish black amorphous PEAT. |
| 1 | | | | | | | | | Firm orangish brown fibrous PEAT.<br>H2 B2 F3 R2 W2 TV0 TH0. |
| | | | B 1 | 1.40-1.60 | | | | | |
| 2 | | | | | | | 72.87 | 2.10 | |
| | | | B 2 | 2.40-2.60 | | | | | Dark grey sandy subangular fine to coarse GRAVEL. Sand is coarse. |
| 3 | | | | | | | 71.97 | 3.00 | |
| | | | | | | | | | Wet dark grey gravelly coarse SAND. |
| 4 | | | | | | | 70.97 | 4.00 | |
| | | | | | | END | | | TP terminated at 4.00m bgl. Unable to progress TP - sidewall collapse. |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** Seepage of water from g/l to 2.10m bgl. Ingress of water at 2.10m bgl. TP backfilled with arisings.

**Scale:** 1:50

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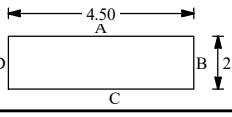
| | | |
|---|---|---|
| **PROJECT: Ballivor Wind Farm** | | **TRIALPIT: TP-28** |
| **LOCATION: Ballivor, Co. Meath** | | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates:** | **Rig: Zaxis 120** |
| **ENGINEER: FTCO/MKO** | **E 663,501.8 N 755,164.4** | **Rev: DRAFT** |
| **Ground level: 74.64m O.D.** | | **DATE: 3.2.21** |

**GROUNDWATER**

**Water strikes:** **Rose to after:**
**1st:** 0.50m
**2nd:** 1.90m
**3rd:**

**PIT DIRECTION: 000-180**
**PIT DIMENSION: 2.00 * 4.50m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | |
| | | 1 | | | | | 74.04 | 0.60 | Plastic black amorphous PEAT. |
| | | | B 1 | 0.60-0.80 | | | | | |
| 1 | | | VANE | 0.90 | 33mm vane used 13 kN/m² | | 73.14 | 1.50 | Firm yellowish brown fibrous PEAT.<br>H2 B2 F3 R2 W1 TV0 TH0. |
| | | | B 2 | 1.60-1.80 | | | | | |
| | | 2 | D 3 | 1.60-1.80 | | | 72.74 | 1.90 | Stiff grey sandy gravelly SILT with high cobble content. Gravel is subangular to rounded fine to coarse. Cobbles are subrounded. |
| 2 | | | | | | | | | Grey sandy subrounded to rounded fine to coarse GRAVEL with high cobble content. |
| | | | B 4 | 2.60-2.80 | | | | | |
| 3 | | | | | | | 70.84 | 3.80 | |
| | | | B 5 | 3.80-4.00 | | | 70.64 | 4.00 | Grey SAND. |
| 4 | | | | | | END | | | TP terminated at 4.00m bgl. Unable to progress TP - sidewall collapse. |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** Rapid ingress of water at 0.50m bgl. Rapid ingress of water at 1.90m bgl. TP backfilled with arisings.

**Scale:** 1:50

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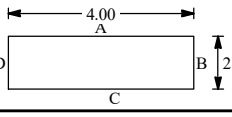
| | |
|---|---|
| **PROJECT: Ballivor Wind Farm** | **TRIALPIT: TP-29** |
| **LOCATION: Ballivor, Co. Meath** | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates: E 663,582.4 N 755,102.2** |
| **ENGINEER: FTCO/MKO** | **Rig: Zaxis 120** |
| **Ground level: 74.97m O.D.** | **Rev: DRAFT** |
| | **DATE: 3.2.21** |

**GROUNDWATER**

**Water strikes:** **Rose to after:**
**1st:** dry
**2nd:**
**3rd:**

**PIT DIRECTION: 270-090**
**PIT DIMENSION: 2.00 * 4.00m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse after 20 minutes.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | 74.37 | 0.60 | Plastic black amorphous PEAT. |
| 1 | | | | | | | | | Firm orangish black fibrous PEAT.<br>H3 B2 F2 R0 W2 TV0 TH0. |
| 2 | | | | | | | 72.67 | 2.30 | |
| | | | | | | | 72.52 | 2.45 | Stiff light grey sandy SILT. Sand is fine. |
| | | | B 1<br>B 2 | 2.60-2.80<br>2.60-2.80 | | | | | Stiff light bluish grey slightly gravelly sandy silty CLAY with medium cobble content. Gravel is angular to rounded fine to coarse. Cobbles are subangular. |
| 3 | | | | | | | | | 3.10m: firm. |
| | | | D 3<br>B 4 | 3.40-3.60<br>3.40-3.60 | | | | | 3.60m: locally soft. |
| 4 | | | | | | | 70.47 | 4.50 | |
| | | | | | | | **END** | | TP terminated at 4.50m bgl on REs instruction. |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** TP dry on excavation. TP backfilled with arisings.

**Scale:** 1:50

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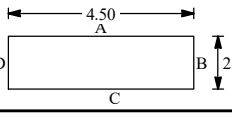
| | |
|---|---|
| **PROJECT: Ballivor Wind Farm** | **TRIALPIT: TP-A** |
| **LOCATION: Ballivor, Co. Meath** | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates:** |
| **ENGINEER: FTCO/MKO** | **E 665,798.9 N 752,202.6** |
| **Rig: Zaxis 120** | |
| **Rev: DRAFT** | |
| **Ground level: 71.93m O.D.** | **DATE: 5.2.21** |

**GROUNDWATER**

**Water strikes:** **Rose to after:**
**1st:** 3.00m
**2nd:** 4.20m
**3rd:**

**PIT DIRECTION: 000-180**
**PIT DIMENSION: 2.00 * 4.50m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse from 3.00m bgl.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | 71.83 | 0.10 | Spongy black pseudo fibrous PEAT. |
| | | | | | | | | | Firm orangish brown fibrous PEAT. H2. |
| 1 | | | VANE | 0.90 | 33mm vane used 15 kN/m² | | 70.33 | 1.60 | |
| | | | | | | | | | Spongy brown pseudo fibrous PEAT. H4 B2 F2 R2 W3 TV0 TH0. |
| 2 | | | B 1 | 2.00-2.20 | | | 69.43 | 2.50 | |
| | | | B 2 | 2.70-2.90 | | | 69.23 | 2.70 | Firm greenish brown slightly sandy slightly gravelly SILT. |
| | | 1 | D 3 | 2.70-2.90 | | | 68.93 | 3.00 | Firm light grey slightly gravelly sandy SILT. Gravel is subrounded fine to coarse. |
| 3 | | | B 4 | 3.00-3.20 | | | 68.33 | 3.60 | Grey medium SAND. |
| | | | | | | | | | Grey medium SAND with medium cobble content. Cobbles are angular to rounded. |
| 4 | | 2 | | | | | 67.43 | 4.50 | |
| | | | | | | | | | END |
| | | | | | | | | | TP terminated at 4.50m bgl on REs instruction. |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** Seepage of water at 3.00m bgl. Ingress of water at 4.20m bgl. TP backfilled with arisings.

**Scale:** 1:50

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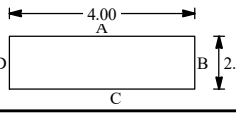
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

| | |
|---|---|
| **PROJECT: Ballivor Wind Farm** | **TRIALPIT: TP-B** |
| **LOCATION: Ballivor, Co. Meath** | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates:** E 665,165.1 N 753,511.5 — **Rig: Zaxis 120** |
| **ENGINEER: FTCO/MKO** | **Rev: DRAFT** |
| **Ground level: 74.92m O.D.** | **DATE: 8.2.21** |

**GROUNDWATER**
Water strikes: Rose to after:
1st: 3.00m
2nd:
3rd:

**PIT DIRECTION: 000-180**
**PIT DIMENSION: 2.00 * 4.00m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | 74.42 | 0.50 | Firm brownish black pseudo fibrous PEAT. |
| 1 | | | VANE | 1.00 | 33mm vane used 13 kN/m² | | | | Firm orangish brown fibrous PEAT.<br>H2 B2 F3 R3 W2 TV0 TH0. |
| 2 | | | B 1<br>D 2 | 2.40-2.60<br>2.40-2.60 | | | 72.57 | 2.35 | Stiff greenish grey slightly sandy gravelly SILT with decaying organic material. Gravel is angular to subrounded fine to coarse. |
| 3 | | ▼1 | B 3<br>D 4 | 3.70-3.90<br>3.70-3.90 | | | 72.12 | 2.80 | Stiff wet light grey slightly sandy gravelly SILT with low cobble content. Gravel is angular to rounded fine to coarse. Cobbles are subangular.<br>3.60m: firm. |
| 4 | | | | | | END | 70.92 | 4.00 | TP terminated at 4.00m bgl. Unable to progress TP - sidewall collapse. |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** Seepage of water at 3.00m bgl. TP backfilled with arisings.

**Scale:** 1:50

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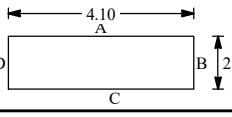
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

| | |
|---|---|
| **PROJECT: Ballivor Wind Farm** | **TRIALPIT: TP-C** |
| **LOCATION: Ballivor, Co. Meath** | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates:** **Rig: Zaxis 120** |
| **ENGINEER: FTCO/MKO** | **E 663,975.5 N 753,121.6** **Rev: DRAFT** |
| **Ground level: 74.11m O.D.** | **DATE: 4.2.21** |

**GROUNDWATER**

**Water strikes:** **Rose to after:**
**1st:** 3.00m
**2nd:**
**3rd:**

**PIT DIRECTION: 000-180**
**PIT DIMENSION: 2.00 * 4.10m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse from 3.00m bgl.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | |
| | | | | | | | 73.41 | 0.70 | Plastic black amorphous PEAT. |
| | | | VANE | 0.80 | 33mm vane used 40 kN/m² | | 73.01 | 1.10 | Firm orangish black fibrous PEAT. H3 B1 F2 R2 W1 TV0 TH0. |
| 1 | | | B 1<br>D 2 | 1.20-1.40<br>1.20-1.40 | | | 72.71 | 1.40 | Firm light brown gravelly SILT with rootlets. Gravel is angular to subrounded fine to coarse. |
| | | | | | | | 72.16 | 1.95 | Grey medium to coarse SAND. |
| 2 | | | B 3<br>D 4 | 2.50-2.70<br>2.50-2.70 | | | 71.11 | 3.00 | Soft bluish brown sandy gravelly SILT with medium cobble content. Gravel is angular to subrounded fine to coarse. Cobbles are subrounded.<br>2.50-2.70m: Grey very gravelly very silty SAND. |
| 3 | | ▼1 | | | | | 70.51 | 3.60 | Wet light brownish grey silty gravelly fine to medium SAND with medium cobble content. Cobbles are subrounded. |
| | | | | | | END | | | TP terminated at 3.60m bgl. Unable to progress TP - sidewall collapse. |
| 4 | | | | | | | | | |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** Ingress of water at 3.00m bgl. TP backfilled with arisings.

**Scale:** 1:50

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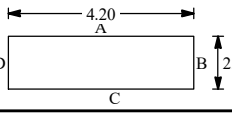
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

| | | | |
|---|---|---|---|
| **PROJECT: Ballivor Wind Farm** | | | **TRIALPIT: TP-D** |
| **LOCATION: Ballivor, Co. Meath** | | | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates:** | | **Rig: Zaxis 120** |
| **ENGINEER: FTCO/MKO** | **E 664,329.3 N 753,718.9** | | **Rev: DRAFT** |
| **Ground level: 77.20m O.D.** | | | **DATE: 4.2.21** |

**GROUNDWATER**

**Water strikes:** **Rose to after:**
**1st:** dry
**2nd:**
**3rd:**

**PIT DIRECTION: 090-270**
**PIT DIMENSION: 2.00 * 4.20m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | |
| | | | | | | | | | Heather over firm brown fibrous PEAT.<br>H2 B3 F3 R2 W3 TV0 TH0 A2. |
| 1 | | | VANE | 1.00 | 33mm vane used 14 kN/m² | | | | |
| | | | B 1 | 1.60-1.80 | | | | | |
| 2 | | | | | | | | | |
| 3 | | | | | | | 73.70 | 3.50 | |
| | | | | | | **END** | | | TP terminated at 3.50m bgl. Unable to progress TP - sidewall collapse. |
| 4 | | | | | | | | | |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** TP dry on excavation. TP backfilled with arisings.

**Scale:** 1:50

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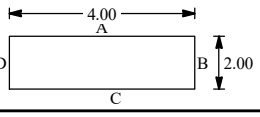
**PROJECT:** Ballivor Wind Farm
**LOCATION:** Ballivor, Co. Meath
**TRIALPIT:** TP-E
**Sheet** 1 of 1

**CLIENT:** Bord na Mona
**ENGINEER:** FTCO/MKO
**Co-ordinates:** E 663,784.3 N 752,452.3
**Rig:** Zaxis 120
**Rev:** DRAFT

**Ground level:** 72.86m O.D.
**DATE:** 5.2.21

**GROUNDWATER**
Water strikes: Rose to after:
1st: 2.00m
2nd:
3rd:

**PIT DIRECTION:** 000-180
**PIT DIMENSION:** 2.00 * 4.00m
**LOGGED BY:** DF




Shoring/Support: N/A
Stability: Pit stable.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | |
| | | | | | | | 72.21 | 0.65 | Grass over spongy brown pseudo fibrous PEAT.<br>H6. |
| | | | VANE | 0.80 | 33mm vane used 16 kN/m² | | 71.76 | 1.10 | Firm orangish brown fibrous PEAT.<br>H2 B2 F3 R1 W0 TV0 TH0. |
| 1 | | | | | | | | | |
| | | | | | | | 70.81 | 2.05 | Spongy brown pseudo fibrous PEAT.<br>H4 B2 F1 R2 W3 TV0 TH0. |
| 2 | | | B 1<br>D 2 | 2.05-2.25<br>2.05-2.25 | | | 70.61 | 2.25 | Stiff brown slightly gravelly slightly sandy organic SILT with decaying organic material.<br>Gravel is angular to subangular fine to coarse. |
| | | | | | | | | | Stiff grey sandy gravelly SILT with medium cobble content. Gravel is angular to subangular fine to coarse. Cobbles are subangular to subrounded. |
| 3 | | | B 3<br>D 4 | 3.10-3.30<br>3.10-3.30 | | | | | 3.20m to 3.60m: firm wet with increase in cobble content. |
| | | | | | | | | | 3.60m to 4.50m: soft. |
| 4 | | | | | | | 68.36 | 4.50 | |
| | | | | | | END | | | TP terminated at 4.50m bgl on REs instruction. |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** Ingress of water at 2.00m bgl. TP backfilled with arisings.

**Scale:** 1:50

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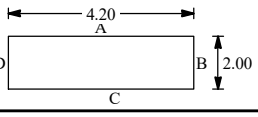
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

| | | |
|---|---|---|
| **PROJECT: Ballivor Wind Farm** | | **TRIALPIT: TP-F** |
| **LOCATION: Ballivor, Co. Meath** | | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates:** | **Rig: Zaxis 120** |
| **ENGINEER: FTCO/MKO** | **E 664,502.3 N 752,692.1** | **Rev: DRAFT** |
| **Ground level: 71.40m O.D.** | | **DATE: 8.2.21** |

**GROUNDWATER**

**Water strikes:** **Rose to after:**
**1st:** dry
**2nd:**
**3rd:**

**PIT DIRECTION: 000-180**
**PIT DIMENSION: 2.00 * 4.20m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit stable.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | |
| | | | | | | | 70.90 | 0.50 | Plastic blackish brown amorphous PEAT.<br>H8. |
| | | | | | | | 70.40 | 1.00 | Firm orangish brown fibrous PEAT.<br>H2 B3 F3 R2 W2 TV0 TH0. |
| 1 | | | VANE | 1.00 | 33mm vane 15 kN/m² | | | | Spongy brown pseudo fibrous PEAT.<br>H4 B2 F3 R3 W2 TV0 TH0. |
| | | | | | | | 69.30 | 2.10 | |
| 2 | | | B 1<br>D 2 | 2.30-2.50<br>2.30-2.50 | | | | | Stiff grey slightly gravelly slightly sandy SILT with medium cobble content and decaying organic material. Gravel is angular to subangular fine to coarse. Cobbles are subrounded. |
| | | | | | | | 68.30 | 3.10 | |
| 3 | | | | | | | 68.15 | 3.25 | Grey coarse SAND. |
| | | | B 3<br>D 4 | 3.30-3.50<br>3.30-3.50 | | | | | Firm damp light grey sandy gravelly SILT with high cobble content. Gravel is subangular to rounded fine to coarse. Cobbles are subrounded.<br>3.60m to 4.50m: stiff. |
| 4 | | | | | | | 66.90 | 4.50 | |
| | | | | | | END | | | TP terminated at 4.50m bgl on REs instruction. |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** TP dry on excavation. TP backfilled with arisings.

**Scale:** 1:50

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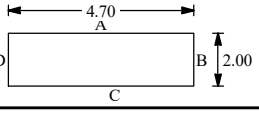
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

| | | |
|---|---|---|
| **PROJECT: Ballivor Wind Farm** | | **TRIALPIT: TP-G** |
| **LOCATION: Ballivor, Co. Meath** | | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates:** | **Rig: Zaxis 120** |
| **ENGINEER: FTCO/MKO** | **E 665,463.9 N 759,852.1** | **Rev: DRAFT** |
| **Ground level: 74.64m O.D.** | | **DATE: 11.2.21** |

**GROUNDWATER**

**Water strikes:** **Rose to after:**
**1st:** 3.80m
**2nd:**
**3rd:**

**PIT DIRECTION: 000-180**
**PIT DIMENSION: 2.00 * 4.70m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit stable.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | |
| | | | | | | | | | Heather over firm yellowish brown fibrous PEAT.<br>H2 B2 F3 R2 W1 TV0 TH0. |
| 1 | | | VANE | 0.90 | 33mm vane 14 kN/m² | | | | |
| | | | B 1 | 1.50-1.70 | | | | | |
| 2 | | | | | | | 72.14 | 2.50 | |
| | | | | | | | | | Spongy brown pseudo fibrous PEAT.<br>H5 B1 F1 R3 W3 TV0 TH0. |
| 3 | | | | | | | 71.29 | 3.35 | |
| | | | | | | | 71.14 | 3.50 | Yellowish brown silty angular to subangular fine to coarse GRAVEL. |
| | | 1 | | | | | | | Light grey silty sandy angular to rounded fine to coarse GRAVEL with high cobble content. |
| 4 | | | B 2 | 3.80-4.00 | | | 70.04 | 4.60 | |
| | | | | | | END | | | TP terminated at 4.60m bgl on REs instruction. |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** Rapid ingress of water at 3.80m bgl. TP backfilled with arisings.

**Scale:** 1:50

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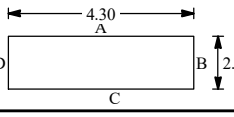
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

| | |
|---|---|
| **PROJECT: Ballivor Wind Farm** | **TRIALPIT: TP-H** |
| **LOCATION: Ballivor, Co. Meath** | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates:** **Rig: Zaxis 120** |
| **ENGINEER: FTCO/MKO** | **E 664,023.0 N 759,552.9** **Rev: DRAFT** |
| **Ground level: 74.54m O.D.** | **DATE: 11.2.21** |

**GROUNDWATER**

**Water strikes:** **Rose to after:**
**1st:** 4.00m
**2nd:**
**3rd:**

**PIT DIRECTION: 090-270**
**PIT DIMENSION: 2.00 * 4.30m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | |
| | | | | | | | | | Heather over firm brown fibrous PEAT.<br>H3 B2 F2 R3 W2 TV0 TH0. |
| 1 | | | VANE | 1.00 | 33mm vane 16 kN/m² | | | | |
| | | | | | | | 73.14 | 1.40 | |
| | | | B 1<br>D 2 | 1.50-1.70<br>1.50-1.70 | | | 72.84 | 1.70 | Firm grey gravelly SILT with high cobble content. Gravel is angular fine to coarse. Cobbles are angular. |
| 2 | | | | | | | 72.44 | 2.10 | Grey silty sandy angular to subangular fine to coarse GRAVEL. Sand is coarse. |
| | | | B 3<br>B 4 | 2.30-2.50<br>2.30-2.50 | | | | | Grey silty gravelly medium to coarse SAND. |
| 3 | | | | | | | | | |
| | | ▼1 | | | | | 70.54 | 4.00 | |
| 4 | | | | | | | **END** | | TP terminated at 4.00m bgl. Unable to progress TP - sidewall collapse. |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** Rapid ingress of water at 2.10m bgl. TP backfilled with arisings.

**Scale:** 1:50

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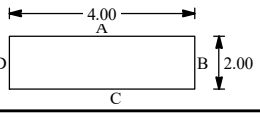
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

| | | |
|---|---|---|
| **PROJECT: Ballivor Wind Farm** | | **TRIALPIT: TP-I** |
| **LOCATION: Ballivor, Co. Meath** | | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates:** | **Rig: Zaxis 120** |
| **ENGINEER: FTCO/MKO** | **E 664,745.0 N 759,718.2** | **Rev: DRAFT** |
| **Ground level: 73.87m O.D.** | | **DATE: 10.2.21** |

**GROUNDWATER**
Water strikes: Rose to after:
1st: 3.10m
2nd:
3rd:

**PIT DIRECTION: 000-180**
**PIT DIMENSION: 2.00 * 4.00m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit stable.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | |
| | | | | | | | | | Heather over soft brownish black pseudo fibrous PEAT. H6 B2 F2 R3 W3 TV0 TH0. |
| 1 | | | VANE | 1.00 | 33mm vane used 15 kN/m² | | | | |
| 2 | | | B 1 | 2.00-2.20 | | | | | |
| 3 | | ▼ | | | | | 70.77 | 3.10 | |
| | | | | | | | 70.57 | 3.30 | Greenish grey silty angular coarse GRAVEL. |
| | | | B 2 | 3.50-3.70 | | | | | Wet grey slightly silty very sandy medium and coarse GRAVEL. |
| 4 | | | | | | | 69.37 | 4.50 | |
| | | | | | | END | | | TP terminated at 4.50m bgl on REs instruction. |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** Rapid ingress of water at 3.10m bgl. TP backfilled with arisings.

**Scale:** 1:50

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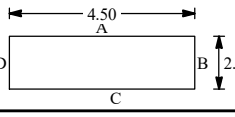
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

| | |
|---|---|
| **PROJECT: Ballivor Wind Farm** | **TRIALPIT: TP-J** |
| **LOCATION: Ballivor, Co. Meath** | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates:** |
| **ENGINEER: FTCO/MKO** | **E 665,027.7 N 759,172.2** |
| **Rig: Zaxis 120** | |
| **Rev: DRAFT** | |
| **Ground level: 72.38m O.D.** | **DATE: 10.2.21** |

**GROUNDWATER**

**Water strikes:** **Rose to after:**
**1st:** 2.30m
**2nd:**
**3rd:**

**PIT DIRECTION: 090-270**
**PIT DIMENSION: 2.00 * 4.50m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse from 2.30m bgl.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | 71.83 | 0.55 | Plastic black amorphous PEAT.<br>H9. |
| 1 | | | VANE | 1.00 | 33mm vane used 16 kN/m² | | | | Spongy brown pseudo fibrous PEAT.<br>H5 B2 F3 R3 W1 TV0 TH0. |
| | | | B 1 | 1.70-1.90 | | | | | |
| 2 | | ▼ | | | | | 70.08 | 2.30 | |
| | | | | | | | 69.98 | 2.40 | Greenish grey silty sandy subangular to subrounded fine to coarse GRAVEL. |
| | | | B 2 | 2.70-2.90 | | | | | Grey slightly silty very sandy angular to rounded fine to coarse GRAVEL with high cobble content. |
| 3 | | | | | | | | | |
| 4 | | | | | | | 68.18 | 4.20 | |
| | | | | | | END | | | TP terminated at 4.20m bgl. Unable to progress TP - sidewall collapse. |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** Rapid ingress of water at 2.30m bgl. TP backfilled with arisings.

**Scale:** 1:50

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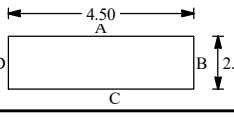
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

| | | |
|---|---|---|
| **PROJECT: Ballivor Wind Farm** | | **TRIALPIT: TP-K** |
| **LOCATION: Ballivor, Co. Meath** | | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates:** | **Rig: Zaxis 120** |
| **ENGINEER: FTCO/MKO** | **E 665,884.0 N 758,544.6** | **Rev: DRAFT** |
| **Ground level: 71.37m O.D.** | | **DATE: 10.2.21** |

**GROUNDWATER**

**Water strikes:** **Rose to after:**
**1st:** 2.20m
**2nd:**
**3rd:**

**PIT DIRECTION: 000-180**
**PIT DIMENSION: 2.00 * 4.50m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse from 2.20m bgl.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | 71.27 | 0.10 | Plastic black amorphous PEAT. |
| | | | | | | | | | Firm orangish brown fibrous PEAT. H3 B2 F3 R2 W2 TV0 TH0. |
| 1 | | | VANE | 0.90 | 33mm vane used 15 kN/m² | | 70.17 | 1.20 | |
| | | | | | | | | | Spongy brown pseudo fibrous PEAT. H4 B2 F2 R3 W2 TV0 TH0. |
| 2 | | | | | | | 69.37 | 2.00 | |
| | | | B 1 | 2.00-2.20 | | | 69.27 | 2.10 | Stiff brownish grey gravelly SILT with rootlets. Gravel is subrounded fine to coarse. |
| | | | | | | | | | Dark grey slightly silty very sandy angular to rounded fine to coarse GRAVEL with low cobble content. |
| 3 | | | B 2 | 2.80-3.00 | | | | | |
| | | | B 3 | 3.80-4.00 | | | | | |
| 4 | | | | | | | 67.17 | 4.20 | |
| | | | | | | END | | | TP terminated at 4.20m bgl. Unable to progress TP - sidewall collapse. |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** Rapid ingress of water at 2.20m bgl. TP backfilled with arisings.

**Scale:** 1:50

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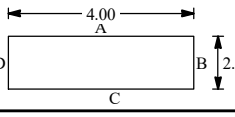
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

| | |
|---|---|
| **PROJECT: Ballivor Wind Farm** | **TRIALPIT: TP-L** |
| **LOCATION: Ballivor, Co. Meath** | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates:** |
| **ENGINEER: FTCO/MKO** | **E 664,274.1 N 759,053.6** |
| **Rig: Zaxis 120** | |
| **Rev: DRAFT** | |
| **Ground level: 72.70m O.D.** | **DATE: 10.2.21** |

**GROUNDWATER**

**Water strikes:** **Rose to after:**
**1st:** 1.40m
**2nd:**
**3rd:**

**PIT DIRECTION: 000-180**
**PIT DIMENSION: 2.00 * 4.00m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse from 1.40m bgl.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | 72.55 | 0.15 | Plastic black amorphous PEAT. |
| | | | | | | | | | Spongy brown pseudo fibrous PEAT.<br>H4 B1 F3 R3 W2 TV0 TH0. |
| | | | | | | | 71.85 | 0.85 | |
| 1 | | | B 1<br>D 2 | 0.90-1.10<br>0.90-1.10 | | | 71.55 | 1.15 | Stiff whitish grey gravelly SILT with rootlets. Gravel is angular to subangular fine to coarse. |
| | | 1 | | | | | 71.30 | 1.40 | Light bluish grey silty sandy GRAVEL. |
| | | | | | | | | | Wet grey coarse SAND and subangular to subrounded fine to coarse GRAVEL. |
| 2 | | | B 3 | 2.00-2.20 | | | 70.70 | 2.00 | |
| | | | | | | | | | Wet grey slightly gravelly silty fine to coarse SAND. |
| 3 | | | | | | | | | |
| | | | | | | | 69.00 | 3.70 | |
| | | | | | | | **END** | | TP terminated at 3.70m bgl. Unable to progress TP - sidewall collapse. |
| 4 | | | | | | | | | |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** Rapid ingress of water at 1.40m bgl. TP backfilled with arisings.

**Scale:** 1:50

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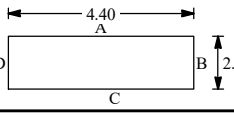
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

| | |
|---|---|
| **PROJECT: Ballivor Wind Farm** | **TRIALPIT: TP-M** |
| **LOCATION: Ballivor, Co. Meath** | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates:** |
| **ENGINEER: FTCO/MKO** | **E 665,121.5 N 758,495.4** |
| **Rig: Zaxis 120** | |
| **Rev: DRAFT** | |
| **Ground level: 70.69m O.D.** | **DATE: 10.2.21** |

**GROUNDWATER**

**Water strikes:** **Rose to after:**
**1st:** **2.80m**
**2nd:**
**3rd:**

**PIT DIRECTION: 090-270**
**PIT DIMENSION: 2.00 * 4.40m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse from 3.00m bgl.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | |
| | | | | | | | 70.19 | 0.50 | Spongy black pseudo fibrous PEAT.<br>H7. |
| | | | | | | | | | Firm orangish brown fibrous PEAT.<br>H2 B2 F3 R2 W2 TV0 TH0. |
| 1 | | | VANE | 1.20 | 33mm vane used 17 kN/m² | | | | |
| | | | B 1 | 1.60-1.80 | | | 68.89 | 1.80 | |
| | | | | | | | | | Spongy dark brown pseudo fibrous PEAT.<br>H4 B2 F2 R3 W2 TV0 TH0. |
| 2 | | | | | | | | | |
| | | 1 | | | | | 67.89 | 2.80 | |
| | | | | | | × × | 67.74 | 2.95 | Soft green organic SILT. |
| 3 | | | B 2 | 3.10-3.30 | | | | | Dark grey silty very sandy angular to rounded fine to coarse GRAVEL with high cobble content. |
| 4 | | | | | | | 66.19 | 4.50 | |
| | | | | | | **END** | | | TP terminated at 4.50m bgl on REs instruction. |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** Rapid ingress of water at 2.80m bgl. TP backfilled with arisings.

**Scale:** 1:50

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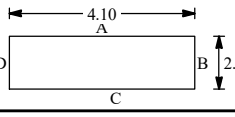
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

| | |
|---|---|
| **PROJECT: Ballivor Wind Farm** | **TRIALPIT: TP-N** |
| **LOCATION: Ballivor, Co. Meath** | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates:** E 665,985.7 N 752,968.1 |
| **ENGINEER: FTCO/MKO** | **Rig: Zaxis 120** |
| **Ground level: 73.56m O.D.** | **Rev: DRAFT** |
| | **DATE: 8.2.21** |

**GROUNDWATER**

Water strikes: Rose to after:
1st: dry
2nd:
3rd:

**PIT DIRECTION: 000-180**
**PIT DIMENSION: 2.00 * 4.10m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | 73.41 | 0.15 | Rushes over spongy black pseudo fibrous PEAT. H7. |
| | | | | | | | | | Firm orangish brown fibrous PEAT. H2 B3 F3 R2 W2 TV0 TH0. |
| | | | | | | | 72.71 | 0.85 | |
| 1 | | | VANE | 1.00 | 33mm vane used 49 kN/m² | | | | Soft greenish grey slightly sandy slightly gravelly SILT with medium cobble content. Gravel is subangular to subrounded fine to coarse. Cobbles are subrounded. |
| | | | B 1 | 1.10-1.30 | | | | | |
| | | | D 2 | 1.10-1.30 | | | 72.06 | 1.50 | |
| 2 | | | | | | | | | Firm light grey slightly sandy slightly gravelly silty CLAY with medium cobble content and medium boulder content. Gravel is subangular to rounded fine to coarse. Cobbles are rounded. Boulders are subangular to rounded. Boulders are up to 600mm in length. |
| | | | B 3 | 2.50-2.70 | | | | | |
| 3 | | | D 4 | 2.50-2.70 | | | | | |
| | | | B 5 | 3.60-3.80 | | | | | |
| 4 | | | | | | | 69.36 | 4.20 | |
| | | | | | | END | | | TP terminated at 4.20m bgl. Unable to progress TP - sidewall collapse. |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** TP dry on excavation. TP backfilled with arisings.

**Scale:** 1:50

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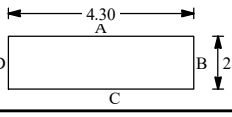
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

| | |
|---|---|
| **PROJECT: Ballivor Wind Farm** | **TRIALPIT: TP-O** |
| **LOCATION: Ballivor, Co. Meath** | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates:** |
| **ENGINEER: FTCO/MKO** | **E 664,622.2 N 752,005.8** |
| **Rig: Zaxis 120** | |
| **Rev: DRAFT** | |
| **Ground level: 72.75m O.D.** | **DATE: 5.2.21** |

**GROUNDWATER**

**Water strikes:** **Rose to after:**
**1st:** dry
**2nd:**
**3rd:**

**PIT DIRECTION: 000-180**
**PIT DIMENSION: 2.00 * 4.30m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse after 20 minutes.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | 72.30 | 0.45 | Spongy brown pseudo fibrous PEAT.<br>H6. |
| 1 | | | VANE<br>B 1 | 0.90<br>1.00-1.20 | 33mm vane used 15 kN/m² | | 71.45 | 1.30 | Firm orangish brown fibrous PEAT.<br>H2 B3 F3 R1 W1 TV0 TH0. |
| 2 | | | | | | | 69.85 | 2.90 | Firm brown fibrous PEAT.<br>H3 B2 F3 R1 W1 TV0 TH0. |
| 3 | | | B 2<br>D 3 | 3.00-3.20<br>3.00-3.20 | | | 69.25 | 3.50 | Stiff greenish grey slightly sandy gravelly SILT with rootlets. Gravel is angular to subangular fine to coarse. |
| 4 | | | B 4<br>D 5 | 4.00-4.20<br>4.00-4.20 | | | 68.15 | 4.60 | Firm grey sandy gravelly SILT with medium cobble content. Gravel is angular to subangular fine to coarse. Cobbles are subrounded.<br>3.80m to 4.60m: soft and wet. |
| 5 | | | | | | END | | | TP terminated at 4.60m bgl on REs instruction. |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** TP dry on excavation. TP backfilled with arisings.

**Scale:** 1:50

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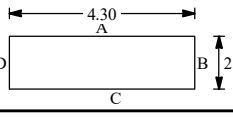
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

| | |
|---|---|
| **PROJECT: Ballivor Wind Farm** | **TRIALPIT: TP-P** |
| **LOCATION: Ballivor, Co. Meath** | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates:** **Rig: Zaxis 120** |
| **ENGINEER: FTCO/MKO** | **E 665,927.4 N 751,694.3** **Rev: DRAFT** |
| **Ground level: 69.97m O.D.** | **DATE: 5.2.21** |

**GROUNDWATER**

**Water strikes:** **Rose to after:**
**1st:** dry
**2nd:**
**3rd:**

**PIT DIRECTION: 000-180**
**PIT DIMENSION: 2.00 * 4.30m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse after 20 minutes.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | 69.82 | 0.15 | Firm black PEAT. |
| | | | | | | | | | Firm orangish brown fibrous PEAT. H2 B2 F2 R2 W2 TV0 TH0. |
| 1 | | | VANE | 0.80 | 33mm vane used 10 kN/m² | | | | |
| | | | B 1 | 1.50-1.70 | | | | | |
| 2 | | | | | | | | | |
| 3 | | | | | | | | | |
| 4 | | | | | | | | | |
| | | | B 2 | 4.40-4.50 | | | 65.57 | 4.40 | |
| | | | | | | × × | 65.47 | 4.50 | Brown peaty SILT. |
| | | | | | | END | | | TP terminated at 4.50m bgl. Unable to progress TP - sidewall collapse. |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** TP dry on excavation. TP backfilled with arisings.

**Scale:** 1:50

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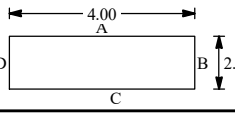
| | |
|---|---|
| **PROJECT: Ballivor Wind Farm** | **TRIALPIT: TP-Q** |
| **LOCATION: Ballivor, Co. Meath** | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates: E 662,594.9 N 757,805.4** |
| **ENGINEER: FTCO/MKO** | **Rig: Zaxis 120** |
| **Ground level: 76.84m O.D.** | **Rev: DRAFT** |
| | **DATE: 9.2.21** |

**GROUNDWATER**

Water strikes: Rose to after:
1st: 1.10m 20min 1.00m
2nd:
3rd:

**PIT DIRECTION: 090-270**
**PIT DIMENSION: 2.00 * 4.00m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse from g/l to 2.10m bgl.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | 76.64 | 0.20 | Heather over plastic black amorphous PEAT. |
| | | | | | | | | | Firm orangish brown fibrous PEAT.<br>H2 B2 F3 R2 W3 TV0 TH0. |
| 1 | | 1 | VANE<br>B 1 | 1.00<br>1.00-1.20 | 33mm vane used<br>13 kN/m² | | 75.84 | 1.00 | |
| | | | | | | | | | Firm brown fibrous PEAT.<br>H3 B2 F3 R3 W2 TV0 TH0. |
| 2 | | | | | | | 74.74 | 2.10 | |
| | | | B 2<br>D 3 | 2.20-2.40<br>2.20-2.40 | | | | | Stiff bluish grey slightly sandy slightly gravelly silty CLAY with medium cobble content and rootlets. Gravel is angular to subrounded fine to coarse.<br><br>2.50m to 2.80m: soft and wet. |
| | | | | | | | 74.04 | 2.80 | |
| 3 | | | | | | END | | | TP terminated at 2.80m bgl. Unable to progress TP - sidewall collapse. |
| 4 | | | | | | | | | |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** Ingress of water at 2.10m bgl. TP backfilled with arisings.

**Scale: 1:50**

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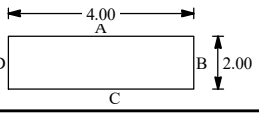
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

| | |
|---|---|
| **PROJECT: Ballivor Wind Farm** | **TRIALPIT: TP-R** |
| **LOCATION: Ballivor, Co. Meath** | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates: E 661,507.8 N 757,054.4** |
| **ENGINEER: FTCO/MKO** | **Rig: Zaxis 120** |
| **Ground level: 75.82m O.D.** | **Rev: DRAFT** |
| | **DATE: 9.2.21** |

**GROUNDWATER**

**Water strikes:** **Rose to after:**
**1st:** 4.40m **10min** 4.25m
**2nd:**
**3rd:**

**PIT DIRECTION: 090-270**
**PIT DIMENSION: 2.00 * 4.00m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit stable.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | 75.52 | 0.30 | Heather over plastic black amorphous PEAT. |
| | | | | | | | 75.02 | 0.80 | Firm orangish brown fibrous PEAT.<br>H2 B2 F3 R2 W3 TV0 TH0. |
| 1 | | | VANE | 0.90 | 33mm vane used 14 kN/m² | | | | Spongy brown pseudo fibrous PEAT.<br>H4 B2 F2 R3 W2 TV0 TH0.<br>Pungent odour. |
| 2 | | | | | | | | | |
| 3 | | | | | | | | | |
| 4 | | 1 | | | | | 71.42 | 4.40 | |
| | | | B 1<br>D 2 | 4.40-4.60<br>4.40-4.60 | | | 71.12 | 4.70 | Stiff dark grey silty CLAY. |
| | | | | | | **END** | | | TP terminated at 4.70m bgl on REs instruction. |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** Ingress of water at 4.40m bgl. TP backfilled with arisings.

**Scale:** 1:50

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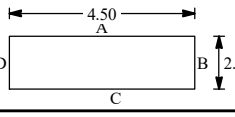
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

| | |
|---|---|
| **PROJECT: Ballivor Wind Farm** | **TRIALPIT: TP-S** |
| **LOCATION: Ballivor, Co. Meath** | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates:** E 662,005.8 N 756,798.2 — **Rig: Zaxis 120** |
| **ENGINEER: FTCO/MKO** | **Rev: DRAFT** |
| **Ground level: 77.78m O.D.** | **DATE: 9.2.21** |

**GROUNDWATER**

| Water strikes: | | Rose to after: | |
|---|---|---|---|
| 1st: | 1.50m | | |
| 2nd: | 2.00m | 10min | 1.20m |
| 3rd: | | | |

**PIT DIRECTION: 000-180**
**PIT DIMENSION: 2.00 * 4.50m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | |
| | | | | | | | 76.88 | 0.90 | Grass and heather over spongy black pseudo fibrous PEAT. H6. |
| 1 | | 1 | B 1 | 1.00-1.20 | 33mm vane used 40 kN/m² | | | | |
| | | | D 2 | 1.00-1.20 | | | 76.58 | 1.20 | Firm greenish grey slightly gravelly slightly sandy SILT with rootlets. Gravel is angular to subangular fine to coarse. |
| | | 1 | VANE | 1.10 | | | | | Firm bluish grey gravelly SILT. Gravel is angular to rounded fine to coarse. |
| | | | | | | | 76.18 | 1.60 | |
| | | | B 3 | 1.60-1.80 | | | | | Dark grey sandy angular to subangular fine to coarse GRAVEL with high cobble content and high boulder content. Sand is coarse. Cobbles are subrounded. Boulders are subrounded. Boulders are up to 800mm in length. |
| 2 | | 2 | | | | | 75.38 | 2.40 | |
| | | | | | | | | | Large limestone BOULDERS with cobble infill. Boulders are up to 1000mm in length. Hard digging. |
| 3 | | | | | | | 74.38 | 3.40 | |
| | | | B 4 | 3.60-3.80 | | | | | Dark grey silty very sandy subrounded fine to coarse GRAVEL with high cobble content and medium boulder content. Cobbles are subangular to subrounded. Boulders are subangular to subrounded. Boulders are up to 600mm in length. |
| 4 | | | | | | | 73.58 | 4.20 | |
| | | | | | | END | | | TP terminated at 4.20m bgl. Obstruction as boulders. |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** Seepage of water at 1.50m bgl. Ingress of water at 2.00m bgl. TP dry on excavation. TP backfilled with arisings.

**Scale:** 1:50

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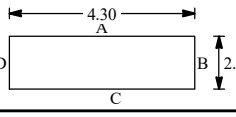
| | |
|---|---|
| **PROJECT: Ballivor Wind Farm** | **TRIALPIT: TP-T** |
| **LOCATION: Ballivor, Co. Meath** | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates: E 663,486.6 N 757,468.3** |
| **ENGINEER: FTCO/MKO** | **Rig: Zaxis 120** |
| **Ground level: 74.01m O.D.** | **Rev: DRAFT** |
| **GROUNDWATER** Water strikes: 1st: 1.20m Rose to after: 2nd: 3rd: | **DATE: 9.2.21** |

**PIT DIRECTION: 000-180**
**PIT DIMENSION: 2.00 * 4.30m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse from 1.20m bgl.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | |
| | | | | | | | 73.21 | 0.80 | Rushes over spongy black pseudo fibrous PEAT. H7. |
| 1 | | | VANE | 1.00 | 33mm vane used 15 kN/m² | | 72.81 | 1.20 | Spongy brownish black pseudo fibrous PEAT. H5 B2 F1 R2 W2 TV0 TH0 A2. |
| | | | B 1 | 1.30-1.50 | | | 72.71 | 1.30 | Soft green sandy SILT with rootlets. |
| | | | D 2 | 1.30-1.50 | | | | | Firm bluish grey sandy gravelly SILT with high cobble content. Gravel is angular to subangular fine to coarse. Cobbles are subangular to subrounded. |
| 2 | | | | | | | | | 2.00m: stiff light grey. |
| | | | | | | | | | 2.20m: with low boulder content. Boulders are subrounded. |
| | | | B 3 | 2.80-3.00 | | | | | |
| 3 | | | D 4 | 2.80-3.00 | | | 70.41 | 3.60 | |
| | | | B 5 | 3.80-4.00 | | | | | Stiff dark grey slightly sandy SILT with high cobble content and high boulder content. Cobbles are subrounded. Boulders are subrounded. Boulders are up to 650mm in length. |
| 4 | | | D 6 | 3.80-4.00 | | | 69.61 | 4.40 | |
| | | | | | | END | | | TP terminated at 4.40m bgl on REs instruction. |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** Ingress of water at 1.20m bgl. TP backfilled with arisings.

**Scale: 1:50**

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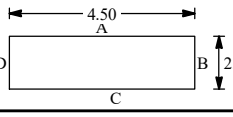
| | |
|---|---|
| **PROJECT: Ballivor Wind Farm** | **TRIALPIT: TP-U** |
| **LOCATION: Ballivor, Co. Meath** | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates:** |
| **ENGINEER: FTCO/MKO** | **E 662,765.2 N 757,323.0** |
| **Rig: Zaxis 120** | |
| **Rev: DRAFT** | |
| **Ground level: 74.15m O.D.** | **DATE: 9.2.21** |

**GROUNDWATER**

**Water strikes:** **Rose to after:**
**1st:** dry
**2nd:**
**3rd:**

**PIT DIRECTION: 090-270**
**PIT DIMENSION: 2.00 * 4.50m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | 73.90 | 0.25 | Heather over plastic black amorphous PEAT. |
| | | | | | | | | | Firm orangish brown fibrous PEAT.<br>H2 B2 F3 R2 W2 TV0 TH0. |
| 1 | | | VANE | 1.00 | 33mm vane used 15 kN/m² | | 72.55 | 1.60 | |
| | | | | | | | | | Firm brown fibrous PEAT.<br>H3 B2 F2 R3 W2 TV0 TH0. |
| 2 | | | B 1 | 2.00-2.20 | | | | | |
| 3 | | | | | | | | | |
| 4 | | | | | | | 70.05 | 4.10 | |
| | | | | | | END | | | TP terminated at 4.10m bgl. Unable to progress TP - sidewall collapse. |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** TP dry on excavation. TP backfilled with arisings.

**Scale:** 1:50

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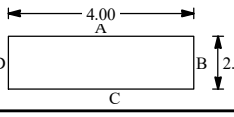
| | |
|---|---|
| **PROJECT: Ballivor Wind Farm** | **TRIALPIT: TP-V** |
| **LOCATION: Ballivor, Co. Meath** | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates:** |
| **ENGINEER: FTCO/MKO** | **E 663,738.6 N 757,006.8** |
| **Rig: Zaxis 120** | |
| **Rev: DRAFT** | |
| **Ground level: 71.80m O.D.** | **DATE: 9.2.21** |

**GROUNDWATER**

**Water strikes:** **Rose to after:**
**1st:** 2.80m
**2nd:**
**3rd:**

**PIT DIRECTION: 090-270**
**PIT DIMENSION: 2.00 * 4.00m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse from g/l.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | 71.40 | 0.40 | Heather over soft blackish brown pseudo fibrous PEAT. |
| | | | | | | | | | Firm orangish brown fibrous PEAT.<br>H2 B2 F3 R2 W1 TV0 TH0. |
| 1 | | | VANE | 1.00 | 33mm vane used 13 kN/m² | | 70.70 | 1.10 | |
| | | | | | | | | | Spongy dark brown pseudo fibrous PEAT.<br>H4 B1 F2 R3 W2 TV0 TH0. |
| 2 | | | | | | | 69.00 | 2.80 | |
| | | | | | | | 68.90 | 2.90 | Soft dark grey organic SILT. |
| 3 | | | B 1 | 3.00-3.20 | | | 68.80 | 3.00 | Soft yellowish brown SILT. |
| | | | | | | | | | Grey silty very sandy subangular to subrounded medium to coarse GRAVEL with medium cobble content and medium boulder content. Cobbles are angular to rounded. Boulders are angular to rounded. |
| 4 | | | | | | | 67.60 | 4.20 | |
| | | | | | | END | | | TP terminated at 4.20m bgl. Unable to progress TP - sidewall collapse. |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** Ingress of water at 2.80m bgl. TP backfilled with arisings.

**Scale:** 1:50

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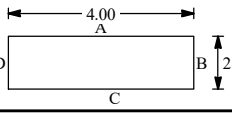
| | |
|---|---|
| **PROJECT: Ballivor Wind Farm** | **TRIALPIT: TP-W** |
| **LOCATION: Ballivor, Co. Meath** | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates: E 665,734.6 N 759,326.7** |
| **ENGINEER: FTCO/MKO** | **Rig: Zaxis 120** |
| **Ground level: 72.74m O.D.** | **Rev: DRAFT** |
| | **DATE: 10.2.21** |

**GROUNDWATER**

**Water strikes:** **Rose to after:**
**1st:** 3.60m
**2nd:**
**3rd:**

**PIT DIRECTION: 090-270**
**PIT DIMENSION: 2.00 * 4.00m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse from 3.60m bgl.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | 72.49 | 0.25 | Plastic black amorphous PEAT. |
| | | | | | | | | | Spongy brown pseudo fibrous PEAT.<br>H4 B2 F3 R3 TV0 TH0. |
| 1 | | | VANE | 1.00 | 33mm vane used 16 kN/m² | | | | |
| 2 | | | | | | | | | |
| 3 | | | | | | | 69.39 | 3.35 | |
| | | | B 1 | 3.40-3.60 | | | 69.34 | 3.40 | Soft green organic SILT. |
| | | | | | | | 69.14 | 3.60 | Greenish grey silty gravelly SAND. Gravel is subangular to subrounded fine to coarse. |
| 4 | | | B 2 | 4.00-4.20 | | | 68.24 | 4.50 | Wet grey slightly silty sandy angular to rounded fine to coarse GRAVEL with high cobble content. |
| | | | | | | | | | **END** TP terminated at 4.50m bgl on REs instruction. |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** Rapid ingress of water at 3.60m bgl. TP backfilled with arisings.

**Scale:** 1:50

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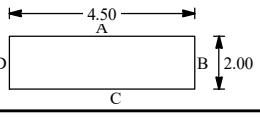
| | |
|---|---|
| **PROJECT: Ballivor Wind Farm** | **TRIALPIT: TP-X** |
| **LOCATION: Ballivor, Co. Meath** | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates:** |
| **ENGINEER: FTCO/MKO** | **E 665,163.1 N 751,792.3** |
| **Rig: Zaxis 120** | |
| **Rev: DRAFT** | |
| **Ground level: 72.23m O.D.** | **DATE: 5.2.21** |

**GROUNDWATER**

Water strikes: Rose to after:
1st: dry
2nd:
3rd:

**PIT DIRECTION: 000-180**
**PIT DIMENSION: 2.00 * 4.50m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit stable.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | 71.83 | 0.40 | Plastic black amorphous PEAT. |
| 1 | | | VANE | 1.00 | 33mm vane used 14 kN/m² | | 70.73 | 1.50 | Firm orangish brown fibrous PEAT.<br>H2 B2 F3 R1 W1 TV0 TH0. |
| 2 | | | | | | | 68.43 | 3.80 | Spongy brown pseudo fibrous PEAT.<br>H4 B2 F2 R2 W3 TV0 TH0. |
| 3 | | | | | | | | | |
| 4 | | | B 1<br>D 2 | 4.10-4.30<br>4.10-4.30 | | | 67.73 | 4.50 | Firm green slightly gravelly sandy SILT.<br>Sand is fine. |
| 5 | | | | | | END | | | TP terminated at 4.50m bgl on REs instruction. |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** TP dry on excavation. TP backfilled with arisings.

**Scale: 1:50**

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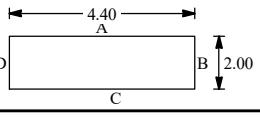
| | | |
|---|---|---|
| **PROJECT: Ballivor Wind Farm** | | **TRIALPIT: TP-Y** |
| **LOCATION: Ballivor, Co. Meath** | | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates:** | **Rig: Zaxis 120** |
| **ENGINEER: FTCO/MKO** | **E 665,230.6 N 752,587.6** | **Rev: DRAFT** |
| **Ground level: 72.25m O.D.** | | **DATE: 8.2.21** |

**GROUNDWATER**
**Water strikes:** **Rose to after:**
**1st:** **1.00m**
**2nd:**
**3rd:**

**PIT DIRECTION: 000-180**
**PIT DIMENSION: 2.00 * 4.40m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit stable.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | 71.80 | 0.45 | Heather over spongy dark brown pseudo fibrous PEAT.<br>H6. |
| 1 | | | VANE | 1.00 | 33mm vane used 13 kN/m² | | | | Firm orangish brown fibrous PEAT.<br>H2 B2 F2 R3 W2 TV0 TH0. |
| 2 | | | | | | | | | |
| 3 | | | | | | | 69.25 | 3.00 | |
| 4 | | | B 1 | 3.80-4.00 | | | | | Spongy brown pseudo fibrous PEAT.<br>H5 B2 F2 R3 W2 TV0 TH0. |
| 5 | | | | | | | 67.35 | 4.90 | |
| | | | | | | **END** | | | TP terminated at 4.90m bgl on REs instruction. |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** Ingress of water at 1.00m bgl. TP backfilled with arisings.

**Scale:** 1:50

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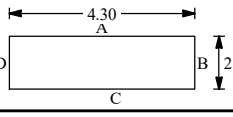
TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

| | |
|---|---|
| **PROJECT: Ballivor Wind Farm** | **TRIALPIT: TP-Z** |
| **LOCATION: Ballivor, Co. Meath** | **Sheet 1 of 1** |
| **CLIENT: Bord na Mona** | **Co-ordinates:** |
| **ENGINEER: FTCO/MKO** | **E 665,604.0 N 753,275.9** |
| **Rig: Zaxis 120** | |
| **Rev: DRAFT** | |
| **Ground level: 73.13m O.D.** | **DATE: 8.2.21** |

**GROUNDWATER**

Water strikes: Rose to after:
1st: dry
2nd:
3rd:

**PIT DIRECTION: 000-180**
**PIT DIMENSION: 2.00 * 4.30m**
**LOGGED BY: DF**




Shoring/Support: N/A
Stability: Pit unstable. Sidewall collapse from 2.20m to 3.80m bgl.

| Depth (m) | Date | Water | Samples | Depth (m) | In-situ Vane Tests | LEGEND | Elevation m O.D. | Depth (m) | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | 72.88 | 0.25 | Spongy black pseudo fibrous PEAT. H7. |
| | | | | | | | | | Firm orangish brown fibrous PEAT. H2 B2 F3 R2 W2 TV0 TH0. |
| 1 | | | VANE<br>B 1 | 1.00<br>1.00-1.20 | 33mm vane used 15 kN/m² | | 71.38 | 1.75 | |
| 2 | | | B 2<br>D 3 | 1.90-2.10<br>1.90-2.10 | | | 70.93 | 2.20 | Stiff greyish green slightly gravelly SILT with decaying organic material. Gravel is subangular to subrounded fine to coarse. |
| 3 | | | B 4 | 2.90-3.10 | | | 69.13 | 4.00 | Firm wet light grey slightly gravelly sandy silty CLAY with high cobble content and low boulder content. Gravel is subangular to rounded fine to coarse. Cobbles are subrounded of limestone. Boulders are subrounded of limestone. Boulders are up to 550mm in length. |
| 4 | | | | | | END | | | TP terminated at 4.00m bgl. Unable to progress TP - sidewall collapse. |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Remarks:** TP dry on excavation. TP backfilled with arisings.

**Scale:** 1:50

**Irish drilling LTD**

Ph.
Fax

TRIAL PIT VANE & WL RISES BALLIVOR TPS ALL FILE FEB 19 2021.GPJ IRISHDRL.GDT 29/4/21

# Appendix 03
# Groundwater Readings

**IRISH DRILLING LTD.**
Loughrea Co. Galway

Tel: (091) 841274 Fax: (091) 880861

Contract:
**Ballivor Wind Farm**

| | | | |
|---|---|---|---|
| Date: | 28.04.2021 | Sheet No. | 1 |
| Tested by: | DF | Checked: | RK |

# Water Levels in Standpipes

| Boreholes | Date 17.02.2021 | Type | Remarks |
|---|---|---|---|
| BH 02 | 2.02m | 50mm standpipe | |
| BH 05 | 2.00m | 50mm standpipe | |
| BH 08 | 0.30m | 50mm standpipe | |
| BH 12 | 0.38m | 50mm standpipe | |
| BPA BH01 | DRY | 50mm standpipe | |
| BPA BH 03A | 2.45m | 50mm standpipe | |

**Remarks:**
**All readings record depth from ground level to top of water level.**

# Appendix 04
# Laboratory Test Results

| | | | | | |
|---|---|---|---|---|---|
| Project ID | 2020MH103 | | Client | Bord na Mona | Remarks |
| Project Name | **Ballivor Wind Farm** | | Report Date | 23/04/2021 09:51 | |
| Schedule ID | 2020MH103_1+2 | | Scheduled Date | 17/2 and 22/2/21 | |

| Sample Details | | | | | | | Classification | | | | | | Chemical / Concrete | | | | | | | | | Compaction | | | | | Compressibility | | | | Strength (Total) | | | | | | | Shear Stregth (Effective Stress) | | | Rock | | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Depth (m) | Base Depth | Sample Type | Sample Ref | Date Sampled | Storage | Moisture Content | Atterberg 4 Point | Particle Density by Gas Jar | Particle Density by Small Pyknometer | Particle Size Distribution | Hydrometer | Organic Content | Loss On Ignition | Sulphate Total | Sulphate Water Gravimetric | *Total Sulphur | ph | Chloride Content | Chloride Content Acid | Compaction Light | Compaction Heavy | Compaction Vibrating Hammer | Moisture Condition Value | Moisture Condition Relationship | CBR | Consolidation | Press ures | Swelling Pressure Test | Laboratory Vane test | Small Direct Shearbox | Ring shear Test | Triaxial Quick Undrained | (Specify Cell Pressure) | Triaxial UU Multi Stage | Triaxial UU Multi Specimen | Consolidated Drained Triaxial Test | Consolidated Undrained Triaxial Test | Consolidated Undrained Triaxial Multis | Rock Uniaxial compression | Point Load | notes |
| BH-02 | 0.00 | 1.00 | B | 1 | 04/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-02 | 1.00 | | D | 2 | 04/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-02 | 1.00 | 1.50 | B | 4 | 04/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-02 | 1.50 | | D | 5 | 04/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-02 | 2.00 | 2.50 | B | 7 | 04/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-02 | 2.50 | | D | 8 | 04/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-02 | 3.00 | 3.50 | B | 10 | 04/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-02 | 3.50 | | D | 11 | 04/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-02 | 4.00 | 4.50 | B | 13 | 04/02/21 | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-02 | 4.50 | | D | 14 | 04/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-02 | 5.00 | 5.50 | B | 16 | 04/02/21 | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-02 | 5.50 | | D | 17 | 04/02/21 | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-02 | 6.50 | 7.00 | B | 19 | 04/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-02 | 7.00 | | D | 20 | 04/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-02 | 7.10 | 7.30 | B | 22 | 04/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-02 | 7.30 | | D | 23 | 04/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-04 | 0.00 | 1.00 | B | 1 | 01/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-04 | 1.00 | | D | 2 | 01/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-04 | 1.00 | 1.50 | B | 4 | 01/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-04 | 1.50 | | D | 5 | 01/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-04 | 2.00 | 2.45 | U100 | 6 | 01/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-04 | 2.50 | | D | 7 | 01/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-04 | 3.00 | 3.50 | B | 9 | 01/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-04 | 3.50 | | D | 10 | 01/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-04 | 4.00 | 4.50 | B | 12 | 01/02/21 | | | | | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-04 | 4.50 | | D | 13 | 01/02/21 | | | | | | | | 1 | | 1 | 1 | | 1 | | | | | | | | | | | | | | | | | | | | | | | ALS 210414-113 |
| BH-04 | 5.00 | 5.50 | B | 15 | 01/02/21 | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-04 | 5.50 | | D | 16 | 01/02/21 | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-04 | 6.50 | 7.00 | B | 18 | 01/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-04 | 7.00 | | D | 19 | 01/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-05 | 0.00 | 1.00 | B | 1 | 02/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-05 | 1.00 | | D | 2 | 02/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-05 | 1.00 | 1.45 | U100 | 3 | 02/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-05 | 1.00 | 1.50 | B | 4 | 02/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-05 | 1.50 | | D | 5 | 02/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-05 | 1.50 | 2.00 | B | 7 | 02/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-05 | 2.00 | | D | 8 | 02/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-05 | 2.50 | 2.95 | U100 | 9 | 02/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-05 | 3.00 | | D | 10 | 02/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-05 | 3.50 | 4.00 | B | 12 | 02/02/21 | | | | | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

0 = test scheduled,
1 = test completed as scheduled,
0* = sample not suitable for scheduled test

| | | | | | |
|---|---|---|---|---|---|
| Project ID | 2020MH103 | Client | Bord na Mona | Remarks | |
| Project Name | **Ballivor Wind Farm** | Report Date | 23/04/2021 09:51 | | |
| Schedule ID | 2020MH103_1+2 | Scheduled Date | 17/2 and 22/2/21 | | |

| Sample Details | | | | | | | Classification | | | | | | Chemical / Concrete | | | | | | | | Compaction | | | | | | Compressibility | | | | Strength (Total) | | | | | | | Shear Stregth (Effective Stress) | | | Rock | | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Depth (m) | Base Depth | Sample Type | Sample Ref | Date Sampled | Storage | Moisture Content | Atterberg 4 Point | Particle Density by Gas Jar | Particle Density by Small Pyknometer | Particle Size Distribution | Hydrometer | Organic Content | Loss On Ignition | Sulphate Total | Sulphate Water Gravimetric | *Total Sulphur | ph | Chloride Content | Chloride Content Acid | Compaction Light | Compaction Heavy | Compaction Vibrating Hammer | Moisture Condition Value | Moisture Condition Relationship | CBR | Consolidation | Press ures | Swelling Pressure Test | Laboratory Vane test | Small Direct Shearbox | Ring shear Test | Triaxial Quick Undrained | (Specify Cell Pressure) | Triaxial UU Multi Stage | Triaxial UU Multi Specimen | Consolidated Drained Triaxial Test | Consolidated Undrained Triaxial Test | Consolidated Undrained Triaxial Multis | Rock Uniaxial compression | Point Load | notes |
| BH-05 | 4.00 | | D | 13 | 02/02/21 | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-05 | 4.50 | 5.00 | B | 15 | 02/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-05 | 5.00 | | D | 16 | 02/02/21 | | | | | | | | 1 | | 1 | 1 | | 1 | | | | | | | | | | | | | | | | | | | | | | | ALS 210414-113 |
| BH-05 | 5.50 | 6.00 | B | 18 | 02/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-05 | 6.00 | | D | 19 | 02/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-05 | 6.50 | 7.00 | B | 21 | 02/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-05 | 7.00 | | D | 22 | 02/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-06 | 0.00 | 1.00 | B | 1 | 03/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-06 | 1.00 | | D | 2 | 03/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-06 | 1.00 | 1.50 | B | 4 | 03/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-06 | 1.50 | | D | 5 | 03/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-06 | 2.00 | 2.50 | B | 7 | 03/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-06 | 2.50 | | D | 8 | 03/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-06 | 3.00 | 3.50 | B | 10 | 03/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-06 | 3.50 | | D | 11 | 03/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-06 | 4.00 | 4.50 | B | 13 | 03/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-06 | 4.50 | | D | 14 | 03/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-06 | 5.00 | 5.50 | B | 16 | 03/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-06 | 5.50 | | D | 17 | 03/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-06 | 6.50 | 7.00 | B | 19 | 03/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-06 | 7.00 | | D | 20 | 03/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-07 | 0.00 | 1.00 | B | 1 | 03/03/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-07 | 1.00 | | D | 2 | 03/03/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-07 | 1.00 | 1.50 | B | 4 | 03/03/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-07 | 1.50 | | D | 5 | 03/03/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-07 | 2.00 | 2.45 | U100 | 6 | 03/03/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-07 | 2.00 | 2.50 | B | 7 | 03/03/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-07 | 2.50 | | D | 8 | 03/03/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-07 | 3.00 | 3.50 | B | 10 | 03/03/21 | | | | | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-07 | 3.50 | | D | 11 | 03/03/21 | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-07 | 4.00 | 4.50 | B | 13 | 03/03/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-07 | 4.50 | | D | 14 | 03/03/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-07 | 5.00 | 5.50 | B | 16 | 03/03/21 | | | | | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-07 | 5.50 | | D | 17 | 03/03/21 | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-08 | 0.00 | 1.00 | B | 1 | 10/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-08 | 1.00 | | D | 2 | 10/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-08 | 1.00 | 1.45 | U100 | 3 | 10/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-08 | 1.50 | | D | 4 | 10/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-08 | 2.00 | 2.50 | B | 6 | 10/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-08 | 2.50 | | D | 7 | 10/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-08 | 3.00 | 3.50 | B | 9 | 10/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

0 = test scheduled,
1 = test completed as scheduled,
0* = sample not suitable for scheduled test

| | |
|---|---|
| Project ID | 2020MH103 |
| Project Name | **Ballivor Wind Farm** |
| Schedule ID | 2020MH103_1+2 |

| | |
|---|---|
| Client | Bord na Mona |
| Report Date | 23/04/2021 09:51 |
| Scheduled Date | 17/2 and 22/2/21 |

| |
|---|
| Remarks |

| Sample Details | | | | | | | Classification | | | | | | Chemical / Concrete | | | | | | | | Compaction | | | | | | Compressibility | | | | Strength (Total) | | | | | | | Shear Stregth (Effective Stress) | | | Rock | | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Depth (m) | Base Depth | Sample Type | Sample Ref | Date Sampled | Storage | Moisture Content | Atterberg 4 Point | Particle Density by Gas Jar | Particle Density by Small Pyknometer | Particle Size Distribution | Hydrometer | Organic Content | Loss On Ignition | Sulphate Total | Sulphate Water Gravimetric | *Total Sulphur | ph | Chloride Content | Chloride Content Acid | Compaction Light | Compaction Heavy | Compaction Vibrating Hammer | Moisture Condition Value | Moisture Condition Relationship | CBR | Consolidation | Press ures | Swelling Pressure Test | Laboratory Vane test | Small Direct Shearbox | Ring shear Test | Triaxial Quick Undrained | (Specify Cell Pressure) | Triaxial UU Multi Stage | Triaxial UU Multi Specimen | Consolidated Drained Triaxial Test | Consolidated Undrained Triaxial Test | Consolidated Undrained Triaxial Multis | Rock Uniaxial compression | Point Load | notes |
| BH-08 | 3.50 | | D | 10 | 10/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-08 | 4.00 | 4.50 | B | 12 | 10/02/21 | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-08 | 4.50 | | D | 13 | 10/02/21 | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-08 | 5.00 | 5.50 | B | 15 | 10/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-08 | 5.50 | | D | 16 | 10/02/21 | | | | | | | | 1 | | 1 | 1 | | 1 | | | | | | | | | | | | | | | | | | | | | | | ALS 210414-113 |
| BH-09 | 0.00 | 1.00 | B | 1 | 04/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-09 | 1.00 | | D | 2 | 04/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-09 | 1.00 | 1.50 | B | 4 | 04/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-09 | 1.50 | | D | 5 | 04/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-09 | 2.00 | 2.50 | B | 7 | 04/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-09 | 2.50 | | D | 8 | 04/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-09 | 3.00 | 3.50 | B | 10 | 04/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-09 | 3.50 | | D | 11 | 04/02/21 | | | | | | | | 1 | | 1 | 1 | | 1 | | | | | | | | | | | | | | | | | | | | | | | ALS 210414-113 |
| BH-09 | 4.00 | 4.50 | B | 13 | 04/02/21 | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-09 | 4.50 | | D | 14 | 04/02/21 | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-10 | 0.00 | 1.00 | B | 1 | 05/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-10 | 1.00 | | D | 2 | 05/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-10 | 1.00 | 1.45 | U100 | 3 | 05/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-10 | 1.50 | | D | 4 | 05/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-10 | 2.00 | 2.50 | B | 7 | 05/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-10 | 2.50 | | D | 8 | 05/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-10 | 3.00 | 3.50 | B | 10 | 05/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-10 | 3.50 | | D | 11 | 05/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-10 | 4.00 | 4.50 | B | 13 | 05/02/21 | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-10 | 4.50 | | D | 14 | 05/02/21 | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-11 | 0.00 | 1.00 | B | 1 | 08/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-11 | 1.00 | | D | 2 | 08/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-11 | 1.00 | 1.50 | B | 4 | 08/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-11 | 1.50 | | D | 5 | 08/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-11 | 2.00 | 2.50 | B | 7 | 08/02/21 | | | | | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-11 | 2.50 | | D | 8 | 08/02/21 | | | | | | | | 1 | | 1 | 1 | | 1 | | | | | | | | | | | | | | | | | | | | | | | ALS 210414-113 |
| BH-11 | 3.00 | 3.50 | B | 10 | 08/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-11 | 3.50 | | D | 11 | 08/02/21 | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-11 | 4.00 | 4.50 | B | 13 | 08/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-11 | 4.50 | | D | 14 | 08/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-11 | 5.00 | 5.50 | B | 16 | 08/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-11 | 5.50 | | D | 17 | 08/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-12 | 0.00 | 1.00 | B | 1 | 09/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-12 | 1.00 | | D | 2 | 09/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-12 | 1.00 | 1.50 | B | 4 | 09/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-12 | 1.50 | | D | 5 | 09/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

0 = test scheduled,
1 = test completed as scheduled,
0* = sample not suitable for scheduled test

| | | | | | |
|---|---|---|---|---|---|
| Project ID | 2020MH103 | | Client | Bord na Mona | Remarks |
| Project Name | **Ballivor Wind Farm** | | Report Date | 23/04/2021 09:51 | |
| Schedule ID | 2020MH103_1+2 | | Scheduled Date | 17/2 and 22/2/21 | |

| Sample Details | | | | | | | Classification | | | | | | Chemical / Concrete | | | | | | | | | Compaction | | | | | Compressibility | | | | Strength (Total) | | | | | | | Shear Stregth (Effective Stress) | | | Rock | | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Depth (m) | Base Depth | Sample Type | Sample Ref | Date Sampled | Storage | Moisture Content | Atterberg 4 Point | Particle Density by Gas Jar | Particle Density by Small Pyknometer | Particle Size Distribution | Hydrometer | Organic Content | Loss On Ignition | Sulphate Total | Sulphate Water Gravimetric | *Total Sulphur | ph | Chloride Content | Chloride Content Acid | Compaction Light | Compaction Heavy | Compaction Vibrating Hammer | Moisture Condition Value | Moisture Condition Relationship | CBR | Consolidation | Press ures | Swelling Pressure Test | Laboratory Vane test | Small Direct Shearbox | Ring shear Test | Triaxial Quick Undrained | (Specify Cell Pressure) | Triaxial UU Multi Stage | Triaxial UU Multi Specimen | Consolidated Drained Triaxial Test | Consolidated Undrained Triaxial Test | Consolidated Undrained Triaxial Multis | Rock Uniaxial compression | Point Load | notes |
| BH-12 | 2.00 | 2.50 | B | 7 | 09/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-12 | 2.50 | | D | 8 | 09/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-12 | 3.00 | 3.50 | B | 10 | 09/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-12 | 3.50 | | D | 11 | 09/02/21 | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-12 | 4.00 | 4.50 | B | 13 | 09/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-12 | 4.50 | | D | 14 | 09/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-13 | 0.00 | 1.00 | B | 1 | 09/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-13 | 1.00 | | D | 2 | 09/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-13 | 1.00 | 1.50 | B | 4 | 09/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-13 | 1.50 | | D | 5 | 09/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-13 | 2.00 | 2.45 | U100 | 6 | 09/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-13 | 2.50 | | D | 7 | 09/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-13 | 3.00 | 3.50 | B | 9 | 09/02/21 | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-13 | 3.50 | | D | 10 | 09/02/21 | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-13 | 4.00 | 4.50 | B | 12 | 09/02/21 | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-13 | 4.50 | | D | 13 | 09/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-14 | 0.00 | 1.00 | B | 1 | 08/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-14 | 1.00 | | D | 2 | 08/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-14 | 1.00 | 1.50 | B | 4 | 08/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-14 | 1.50 | | D | 5 | 08/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-14 | 2.00 | 2.50 | B | 7 | 08/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-14 | 2.50 | | D | 8 | 08/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-14 | 3.00 | 3.50 | B | 10 | 08/02/21 | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-14 | 3.50 | | D | 11 | 08/02/21 | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-14 | 4.00 | 4.50 | B | 13 | 08/02/21 | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH-14 | 4.50 | | D | 14 | 08/02/21 | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BPA-BH01 | 0.00 | 1.00 | B | 1 | 16/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BPA-BH01 | 1.00 | | D | 2 | 16/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BPA-BH01 | 1.00 | 1.50 | B | 4 | 16/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BPA-BH01 | 1.50 | | D | 5 | 16/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BPA-BH01 | 2.00 | 2.50 | B | 7 | 16/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BPA-BH01 | 2.50 | | D | 8 | 16/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BPA-BH01 | 3.00 | 3.50 | B | 10 | 16/02/21 | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BPA-BH01 | 3.50 | | D | 11 | 16/02/21 | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BPA-BH01 | 4.00 | 4.50 | B | 13 | 16/02/21 | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BPA-BH01 | 4.50 | | D | 14 | 16/02/21 | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BPA-BH02 | 0.00 | 1.00 | B | 1 | 15/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BPA-BH02 | 1.00 | 1.50 | B | 4 | 15/02/21 | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BPA-BH02 | 1.00 | | D | 2 | 15/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BPA-BH02 | 1.50 | | D | 5 | 15/02/21 | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BPA-BH02 | 2.00 | 2.50 | B | 7 | 15/02/21 | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

0 = test scheduled,
1 = test completed as scheduled,
0* = sample not suitable for scheduled test

| | | | | | | |
|---|---|---|---|---|---|---|
| Project ID | 2020MH103 | | Client | Bord na Mona | Remarks | |
| Project Name | **Ballivor Wind Farm** | | Report Date | 23/04/2021 09:51 | | |
| Schedule ID | 2020MH103_1+2 | | Scheduled Date | 17/2 and 22/2/21 | | |

| Sample Details | | | | | | | Classification | | | | | | Chemical / Concrete | | | | | | | | | Compaction | | | | | | Compressibility | | | | Strength (Total) | | | | | | | Shear Stregth (Effective Stress) | | | Rock | | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Depth (m) | Base Depth | Sample Type | Sample Ref | Date Sampled | Storage | Moisture Content | Atterberg 4 Point | Particle Density by Gas Jar | Particle Density by Small Pyknometer | Particle Size Distribution | Hydrometer | Organic Content | Loss On Ignition | Sulphate Total | Sulphate Water Gravimetric | *Total Sulphur | ph | Chloride Content | Chloride Content Acid | Compaction Light | Compaction Heavy | Compaction Vibrating Hammer | Moisture Condition Value | Moisture Condition Relationship | CBR | Consolidation | Press ures | Swelling Pressure Test | Laboratory Vane test | Small Direct Shearbox | Ring shear Test | Triaxial Quick Undrained | (Specify Cell Pressure) | Triaxial UU Multi Stage | Triaxial UU Multi Specimen | Consolidated Drained Triaxial Test | Consolidated Undrained Triaxial Test | Consolidated Undrained Triaxial Multis | Rock Uniaxial compression | Point Load | notes |
| BPA-BH02 | 2.50 | | D | 8 | 15/02/21 | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BPA-BH02 | 3.00 | 3.50 | B | 10 | 15/02/21 | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BPA-BH02 | 3.50 | | D | 11 | 15/02/21 | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BPA-BH02 | 4.00 | 4.50 | B | 13 | 15/02/21 | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BPA-BH02 | 4.50 | | D | 14 | 15/02/21 | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BPA-BH02 | 5.00 | 5.50 | B | 16 | 15/02/21 | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BPA-BH02 | 5.50 | | D | 17 | 15/02/21 | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BPA-BH03 | 0.00 | 1.00 | B | 1 | 15/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BPA-BH03 | 1.00 | | D | 2 | 15/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BPA-BH03 | 1.00 | 1.50 | B | 4 | 15/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BPA-BH03 | 1.50 | | D | 5 | 15/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BPA-BH03A | 0.00 | 1.00 | B | 1 | 15/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BPA-BH03A | 1.00 | | D | 2 | 15/02/21 | | | | | | | | 1 | | 1 | 1 | | 1 | | | | | | | | | | | | | | | | | | | | | | | ALS 210414-113 |
| BPA-BH03A | 1.00 | 1.50 | B | 4 | 15/02/21 | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BPA-BH03A | 1.50 | | D | 5 | 15/02/21 | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BPA-BH03A | 2.00 | 2.50 | B | 7 | 15/02/21 | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BPA-BH03A | 2.50 | | D | 8 | 15/02/21 | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BPA-BH03A | 3.00 | 3.50 | B | 10 | 15/02/21 | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BPA-BH03A | 3.50 | | D | 11 | 15/02/21 | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BPA-BH03A | 4.00 | 4.50 | B | 13 | 15/02/21 | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BPA-BH03A | 4.50 | | D | 14 | 15/02/21 | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BPA-TP01 | 3.20 | 3.40 | B | 1 | 12/02/21 | | 1 | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BPA-TP01 | 4.00 | 4.20 | B | 2 | 12/02/21 | | | | | | 1 | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | |
| BPA-TP02 | 1.50 | 1.70 | D | 2 | 12/02/21 | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BPA-TP02 | 1.50 | 1.70 | B | 1 | 12/02/21 | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BPA-TP02 | 2.50 | 2.70 | B | 3 | 12/02/21 | | 1 | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-01 | 2.10 | 2.30 | B | 1 | 03/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-01 | 2.10 | 2.30 | D | 2 | 03/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-01 | 3.30 | 3.50 | B | 3 | 03/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-02 | 1.60 | 1.80 | D | 2 | 02/02/21 | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-02 | 1.60 | 1.80 | B | 1 | 02/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-02 | 2.80 | 3.00 | B | 3 | 02/02/21 | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-02 | 2.80 | 3.00 | D | 4 | 02/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-03 | 0.50 | 0.70 | B | 1 | 01/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-03 | 2.00 | 2.20 | B | 3 | 01/02/21 | | | | | | | | 1 | | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | ALS 210303-77 |
| TP-03 | 2.00 | 2.20 | D | 2 | 01/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-03 | 3.20 | 3.40 | D | 4 | 01/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-04 | 1.00 | 1.20 | B | 1 | 04/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-04 | 1.70 | 1.90 | D | 3 | 04/02/21 | | 1 | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-04 | 1.70 | 1.90 | B | 2 | 04/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-04 | 2.20 | 2.40 | B | 4 | 04/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

0 = test scheduled,
1 = test completed as scheduled,
0* = sample not suitable for scheduled test

| | | | | | | |
|---|---|---|---|---|---|---|
| Project ID | 2020MH103 | | Client | Bord na Mona | Remarks | |
| Project Name | **Ballivor Wind Farm** | | Report Date | 23/04/2021 09:51 | | |
| Schedule ID | 2020MH103_1+2 | | Scheduled Date | 17/2 and 22/2/21 | | |

| Sample Details | | | | | | | Classification | | | | | | Chemical / Concrete | | | | | | | | | Compaction | | | | | Compressibility | | | | Strength (Total) | | | | | | | Shear Stregth (Effective Stress) | | | Rock | | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Depth (m) | Base Depth | Sample Type | Sample Ref | Date Sampled | Storage | Moisture Content | Atterberg 4 Point | Particle Density by Gas Jar | Particle Density by Small Pyknometer | Particle Size Distribution | Hydrometer | Organic Content | Loss On Ignition | Sulphate Total | Sulphate Water Gravimetric | *Total Sulphur | ph | Chloride Content | Chloride Content Acid | Compaction Light | Compaction Heavy | Compaction Vibrating Hammer | Moisture Condition Value | Moisture Condition Relationship | CBR | Consolidation | Press ures | Swelling Pressure Test | Laboratory Vane test | Small Direct Shearbox | Ring shear Test | Triaxial Quick Undrained | (Specify Cell Pressure) | Triaxial UU Multi Stage | Triaxial UU Multi Specimen | Consolidated Drained Triaxial Test | Consolidated Undrained Triaxial Test | Consolidated Undrained Triaxial Multis | Rock Uniaxial compression | Point Load | notes |
| TP-05 | 1.80 | 2.00 | B | 1 | 04/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-07 | 1.00 | 1.20 | B | 1 | 01/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-07 | 3.60 | 3.80 | B | 2 | 01/02/21 | | | | | | | | 1 | | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | ALS 210303-77 |
| TP-07 | 3.60 | 3.80 | D | 3 | 01/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-08 | 1.20 | 1.40 | B | 1 | 02/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-08 | 2.20 | 2.40 | B | 2 | 02/02/21 | | 1 | 1 | | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-08 | 2.20 | 2.40 | D | 3 | 02/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-08 | 3.60 | 3.80 | B | 4 | 02/02/21 | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | |
| TP-08 | 3.60 | 3.80 | D | 5 | 02/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-10 | 2.50 | 2.70 | B | 1 | 04/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-10 | 3.50 | 3.70 | B | 2 | 04/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-10 | 3.50 | 3.70 | D | 3 | 04/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-11 | 1.50 | 1.70 | B | 1 | 01/02/21 | | | | | | | | 1 | | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | ALS 210303-77 |
| TP-11 | 1.50 | 1.70 | D | 2 | 01/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-11 | 3.00 | 3.20 | B | 3 | 01/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-11 | 3.00 | 3.20 | D | 4 | 01/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-12 | 1.80 | 2.00 | D | 2 | 03/02/21 | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-12 | 1.80 | 2.00 | B | 1 | 03/02/21 | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | |
| TP-12 | 3.00 | 3.20 | B | 3 | 03/02/21 | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-12 | 3.00 | 3.20 | D | 4 | 03/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-12 | 4.00 | 4.20 | B | 5 | 03/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-13 | 2.00 | 2.20 | B | 1 | 04/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-13 | 2.00 | 2.20 | D | 2 | 04/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-13 | 3.00 | 3.20 | D | 4 | 04/02/21 | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-13 | 3.00 | 3.20 | B | 3 | 04/02/21 | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-13 | 4.00 | 4.20 | B | 5 | 04/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-14 | 2.20 | 2.40 | B | 1 | 02/02/21 | | | | | | | | 1 | | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | ALS 210303-77 |
| TP-14 | 2.20 | 2.40 | D | 2 | 02/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-14 | 3.40 | 3.60 | B | 3 | 02/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-15 | 1.00 | 1.20 | B | 1 | 03/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-15 | 2.50 | 2.70 | B | 2 | 03/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-15 | 2.50 | 2.70 | D | 3 | 03/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-15 | 3.80 | 4.00 | B | 4 | 03/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-15 | 3.80 | 4.00 | D | 5 | 03/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-18 | 2.20 | 2.40 | B | 1 | 03/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-18 | 2.20 | 2.40 | D | 2 | 03/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-18 | 3.20 | 3.40 | B | 3 | 03/02/21 | | 1 | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-20 | 1.30 | 1.50 | B | 1 | 02/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-20 | 2.40 | 2.60 | D | 3 | 02/02/21 | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-20 | 2.40 | 2.60 | B | 2 | 02/02/21 | | | | | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-22 | 2.50 | 2.70 | B | 1 | 01/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

0 = test scheduled,
1 = test completed as scheduled,
0* = sample not suitable for scheduled test

| | | | | | |
|---|---|---|---|---|---|
| Project ID | 2020MH103 | Client | Bord na Mona | Remarks | |
| Project Name | **Ballivor Wind Farm** | Report Date | 23/04/2021 09:51 | | |
| Schedule ID | 2020MH103_1+2 | Scheduled Date | 17/2 and 22/2/21 | | |

| Sample Details | | | | | | | Classification | | | | | | Chemical / Concrete | | | | | | | | | Compaction | | | | | Compressibility | | | | Strength (Total) | | | | | | | Shear Stregth (Effective Stress) | | | Rock | | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Depth (m) | Base Depth | Sample Type | Sample Ref | Date Sampled | Storage | Moisture Content | Atterberg 4 Point | Particle Density by Gas Jar | Particle Density by Small Pyknometer | Particle Size Distribution | Hydrometer | Organic Content | Loss On Ignition | Sulphate Total | Sulphate Water Gravimetric | *Total Sulphur | ph | Chloride Content | Chloride Content Acid | Compaction Light | Compaction Heavy | Compaction Vibrating Hammer | Moisture Condition Value | Moisture Condition Relationship | CBR | Consolidation | Press ures | Swelling Pressure Test | Laboratory Vane test | Small Direct Shearbox | Ring shear Test | Triaxial Quick Undrained | (Specify Cell Pressure) | Triaxial UU Multi Stage | Triaxial UU Multi Specimen | Consolidated Drained Triaxial Test | Consolidated Undrained Triaxial Test | Consolidated Undrained Triaxial Multis | Rock Uniaxial compression | Point Load | notes |
| TP-22 | 2.50 | 2.70 | D | 2 | 01/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-22 | 4.20 | 4.40 | B | 3 | 01/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-23 | 1.00 | 1.20 | B | 1 | 02/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-23 | 2.50 | 2.70 | B | 2 | 02/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-23 | 2.50 | 2.70 | D | 3 | 02/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-24 | 2.10 | 2.30 | B | 1 | 03/02/21 | | | | | | | | 1 | | 1 | 1 | 1 | | | | | | | 1 | | | | | | | | | | | | | | | | | ALS 210303-77 |
| TP-24 | 2.10 | 2.30 | D | 2 | 03/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-24 | 3.30 | 3.50 | D | 4 | 03/02/21 | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-24 | 3.30 | 3.50 | B | 3 | 03/02/21 | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-25 | 1.70 | 1.90 | D | 2 | 03/02/21 | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-25 | 1.70 | 1.90 | B | 1 | 03/02/21 | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-25 | 2.80 | 3.00 | B | 3 | 03/02/21 | | 1 | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-26 | 2.20 | 2.40 | B | 1 | 03/02/21 | | | | | | | | 1 | | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | ALS 210316-78 |
| TP-26 | 2.20 | 2.40 | D | 2 | 03/02/21 | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-26 | 3.40 | 3.60 | B | 3 | 03/02/21 | | | | | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-26 | 3.40 | 3.60 | D | 4 | 03/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-27 | 1.40 | 1.60 | B | 1 | 03/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-27 | 2.40 | 2.60 | B | 2 | 03/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-28 | 0.60 | 0.80 | B | 1 | 03/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-28 | 1.60 | 1.80 | B | 2 | 03/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-28 | 1.60 | 1.80 | D | 3 | 03/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-28 | 2.60 | 2.80 | B | 4 | 03/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-28 | 3.80 | 4.00 | B | 5 | 03/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-29 | 2.60 | 2.80 | B | 2 | 03/02/21 | | 1 | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-29 | 2.60 | 2.80 | B | 1 | 03/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-29 | 3.40 | 3.60 | D | 3 | 03/02/21 | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-29 | 3.40 | 3.60 | B | 4 | 03/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-A | 2.00 | 2.20 | B | 1 | 05/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-A | 2.70 | 2.90 | D | 3 | 05/02/21 | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-A | 2.70 | 2.90 | B | 2 | 05/02/21 | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-A | 3.00 | 3.20 | B | 4 | 05/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-B | 2.40 | 2.60 | D | 2 | 08/02/21 | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-B | 2.40 | 2.60 | B | 1 | 08/02/21 | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-B | 3.70 | 3.90 | B | 3 | 08/02/21 | | | | | | | | 1 | | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | ALS 210316-78 |
| TP-B | 3.70 | 3.90 | D | 4 | 08/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-C | 1.20 | 1.40 | B | 1 | 04/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-C | 1.20 | 1.40 | D | 2 | 04/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-C | 1.20 | 1.40 | B | 1 | 04/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-C | 1.20 | 1.40 | D | 2 | 04/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-C | 2.50 | 2.70 | D | 4 | 04/02/21 | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-C | 2.50 | 2.70 | B | 3 | 04/02/21 | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

0 = test scheduled,
1 = test completed as scheduled,
0* = sample not suitable for scheduled test

| | | | | | |
|---|---|---|---|---|---|
| Project ID | 2020MH103 | | Client | Bord na Mona | Remarks |
| Project Name | **Ballivor Wind Farm** | | Report Date | 23/04/2021 09:51 | |
| Schedule ID | 2020MH103_1+2 | | Scheduled Date | 17/2 and 22/2/21 | |

| Sample Details | | | | | | | Classification | | | | | | Chemical / Concrete | | | | | | | | | Compaction | | | | | | Compressibility | | | | Strength (Total) | | | | | | | Shear Stregth (Effective Stress) | | | Rock | | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Depth (m) | Base Depth | Sample Type | Sample Ref | Date Sampled | Storage | Moisture Content | Atterberg 4 Point | Particle Density by Gas Jar | Particle Density by Small Pyknometer | Particle Size Distribution | Hydrometer | Organic Content | Loss On Ignition | Sulphate Total | Sulphate Water Gravimetric | *Total Sulphur | ph | Chloride Content | Chloride Content Acid | Compaction Light | Compaction Heavy | Compaction Vibrating Hammer | Moisture Condition Value | Moisture Condition Relationship | CBR | Consolidation | Press ures | Swelling Pressure Test | Laboratory Vane test | Small Direct Shearbox | Ring shear Test | Triaxial Quick Undrained | (Specify Cell Pressure) | Triaxial UU Multi Stage | Triaxial UU Multi Specimen | Consolidated Drained Triaxial Test | Consolidated Undrained Triaxial Test | Consolidated Undrained Triaxial Multis | Rock Uniaxial compression | Point Load | notes |
| TP-C | 2.50 | 2.70 | B | 3 | 04/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-C | 2.50 | 2.70 | D | 4 | 04/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-D | 1.60 | 1.80 | B | 1 | 04/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-E | 2.05 | 2.25 | D | 2 | 05/02/21 | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-E | 2.05 | 2.25 | B | 1 | 05/02/21 | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-E | 3.10 | 3.30 | B | 3 | 05/02/21 | | | | | | | | 1 | | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | ALS 210316-78 |
| TP-E | 3.10 | 3.30 | D | 4 | 05/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-F | 2.30 | 2.50 | D | 2 | 08/02/21 | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-F | 2.30 | 2.50 | B | 1 | 08/02/21 | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-F | 2.30 | 2.50 | B | 1 | 08/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-F | 2.30 | 2.50 | D | 2 | 08/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-F | 3.30 | 3.50 | B | 3 | 08/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-F | 3.30 | 3.50 | D | 4 | 08/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-G | 1.50 | 1.70 | B | 1 | 11/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-G | 3.80 | 4.00 | B | 2 | 11/02/21 | | 1 | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-H | 1.50 | 1.70 | B | 1 | 11/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-H | 1.50 | 1.70 | D | 2 | 11/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-H | 2.30 | 2.50 | B | 3 | 11/02/21 | | 1 | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-H | 2.30 | 2.50 | B | 3 | 11/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-H | 2.30 | 2.50 | B | 4 | 11/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-I | 2.00 | 2.20 | B | 1 | 10/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-I | 3.50 | 3.70 | B | 2 | 10/02/21 | | 1 | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-J | 1.70 | 1.90 | B | 1 | 10/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-J | 2.70 | 2.90 | B | 2 | 10/02/21 | | 1 | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-K | 2.00 | 2.20 | B | 1 | 10/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-K | 2.80 | 3.00 | B | 2 | 10/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-K | 3.80 | 4.00 | B | 3 | 10/02/21 | | 1 | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-L | 0.90 | 1.10 | B | 1 | 10/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-L | 0.90 | 1.10 | D | 2 | 10/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-L | 2.00 | 2.20 | B | 3 | 10/02/21 | | 1 | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-M | 1.60 | 1.80 | B | 1 | 10/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-M | 3.10 | 3.30 | B | 2 | 10/02/21 | | 1 | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-N | 1.10 | 1.30 | B | 1 | 08/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-N | 1.10 | 1.30 | D | 2 | 08/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-N | 2.50 | 2.70 | B | 3 | 08/02/21 | | | | | | | | 1 | | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | ALS 210316-78 |
| TP-N | 2.50 | 2.70 | D | 4 | 08/02/21 | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-N | 2.50 | 2.70 | D | 4 | 08/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-N | 3.60 | 3.80 | B | 5 | 08/02/21 | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-N | 3.60 | 3.80 | B | 5 | 08/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-O | 1.00 | 1.20 | B | 1 | 05/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-O | 3.00 | 3.20 | D | 3 | 05/02/21 | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

0 = test scheduled,
1 = test completed as scheduled,
0* = sample not suitable for scheduled test

| | | | | | | |
|---|---|---|---|---|---|---|
| Project ID | 2020MH103 | | Client | Bord na Mona | Remarks | |
| Project Name | **Ballivor Wind Farm** | | Report Date | 23/04/2021 09:51 | | |
| Schedule ID | 2020MH103_1+2 | | Scheduled Date | 17/2 and 22/2/21 | | |

| Sample Details | | | | | | | Classification | | | | | | Chemical / Concrete | | | | | | | | | Compaction | | | | | Compressibility | | | | Strength (Total) | | | | | | | Shear Stregth (Effective Stress) | | | Rock | | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Depth (m) | Base Depth | Sample Type | Sample Ref | Date Sampled | Storage | Moisture Content | Atterberg 4 Point | Particle Density by Gas Jar | Particle Density by Small Pyknometer | Particle Size Distribution | Hydrometer | Organic Content | Loss On Ignition | Sulphate Total | Sulphate Water Gravimetric | *Total Sulphur | ph | Chloride Content | Chloride Content Acid | Compaction Light | Compaction Heavy | Compaction Vibrating Hammer | Moisture Condition Value | Moisture Condition Relationship | CBR | Consolidation | Press ures | Swelling Pressure Test | Laboratory Vane test | Small Direct Shearbox | Ring shear Test | Triaxial Quick Undrained | (Specify Cell Pressure) | Triaxial UU Multi Stage | Triaxial UU Multi Specimen | Consolidated Drained Triaxial Test | Consolidated Undrained Triaxial Test | Consolidated Undrained Triaxial Multis | Rock Uniaxial compression | Point Load | notes |
| TP-O | 3.00 | 3.20 | B | 2 | 05/02/21 | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-O | 4.00 | 4.20 | B | 4 | 05/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-O | 4.00 | 4.20 | D | 5 | 05/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-P | 1.50 | 1.70 | B | 1 | 05/02/21 | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-P | 1.50 | 1.70 | B | 1 | 05/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-P | 4.40 | 4.50 | B | 2 | 05/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-Q | 1.00 | 1.20 | B | 1 | 09/02/21 | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-Q | 1.00 | 1.20 | B | 1 | 09/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-Q | 2.20 | 2.40 | D | 3 | 09/02/21 | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-Q | 2.20 | 2.40 | B | 2 | 09/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-Q | 2.20 | 2.40 | D | 3 | 09/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-R | 4.40 | 4.60 | D | 2 | 09/02/21 | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-R | 4.40 | 4.60 | B | 1 | 09/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-R | 4.40 | 4.60 | D | 2 | 09/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-S | 1.00 | 1.20 | D | 2 | 09/02/21 | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-S | 1.00 | 1.20 | B | 1 | 09/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-S | 1.00 | 1.20 | D | 2 | 09/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-S | 1.60 | 1.80 | B | 3 | 09/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-S | 3.60 | 3.80 | B | 4 | 09/02/21 | | 1 | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-T | 1.30 | 1.50 | B | 1 | 09/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-T | 1.30 | 1.50 | D | 2 | 09/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-T | 2.80 | 3.00 | B | 3 | 09/02/21 | | | | | | 1 | | 1 | | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | ALS 210316-78 |
| TP-T | 2.80 | 3.00 | D | 4 | 09/02/21 | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-T | 3.80 | 4.00 | B | 5 | 09/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-T | 3.80 | 4.00 | D | 6 | 09/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-U | 2.00 | 2.20 | B | 1 | 09/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-V | 3.00 | 3.20 | B | 1 | 09/02/21 | | 1 | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-W | 3.40 | 3.60 | B | 1 | 10/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-W | 4.00 | 4.20 | B | 2 | 10/02/21 | | 1 | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-X | 4.10 | 4.30 | D | 2 | 05/02/21 | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-X | 4.10 | 4.30 | B | 1 | 05/02/21 | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-X | 4.10 | 4.30 | B | 1 | 05/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-X | 4.10 | 4.30 | D | 2 | 05/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-Y | 3.80 | 4.00 | B | 1 | 08/02/21 | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-Y | 3.80 | 4.00 | B | 1 | 08/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-Z | 1.00 | 1.20 | B | 1 | 08/02/21 | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-Z | 1.00 | 1.20 | B | 1 | 08/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-Z | 1.90 | 2.10 | B | 2 | 08/02/21 | | | | | | | | 1 | | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | ALS 210316-78 |
| TP-Z | 1.90 | 2.10 | D | 3 | 08/02/21 | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-Z | 1.90 | 2.10 | D | 3 | 08/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP-Z | 2.90 | 3.10 | B | 4 | 08/02/21 | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

0 = test scheduled,
1 = test completed as scheduled,
0* = sample not suitable for scheduled test

| | | | | | |
|---|---|---|---|---|---|
| Project ID | 2020MH103 | Client | Bord na Mona | Remarks | |
| Project Name | **Ballivor Wind Farm** | Report Date | 23/04/2021 09:51 | | |
| Schedule ID | 2020MH103_1+2 | Scheduled Date | 17/2 and 22/2/21 | | |

| Sample Details | | | | | | | Classification | | | | | | Chemical / Concrete | | | | | | | | | Compaction | | | | | Compressibility | | | | Strength (Total) | | | | | | | Shear Stregth (Effective Stress) | | | Rock | | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Depth (m) | Base Depth | Sample Type | Sample Ref | Date Sampled | Storage | Moisture Content | Atterberg 4 Point | Particle Density by Gas Jar | Particle Density by Small Pyknometer | Particle Size Distribution | Hydrometer | Organic Content | Loss On Ignition | Sulphate Total | Sulphate Water Gravimetric | *Total Sulphur | ph | Chloride Content | Chloride Content Acid | Compaction Light | Compaction Heavy | Compaction Vibrating Hammer | Moisture Condition Value | Moisture Condition Relationship | CBR | Consolidation | Press ures | Swelling Pressure Test | Laboratory Vane test | Small Direct Shearbox | Ring shear Test | Triaxial Quick Undrained | (Specify Cell Pressure) | Triaxial UU Multi Stage | Triaxial UU Multi Specimen | Consolidated Drained Triaxial Test | Consolidated Undrained Triaxial Test | Consolidated Undrained Triaxial Multis | Rock Uniaxial compression | Point Load | notes |
| TP-Z | 2.90 | 3.10 | B | 4 | 08/02/21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Scheduled | | | | | | 67 | 39 | 0 | 0 | 62 | 8 | 17 | 0 | 17 | 17 | 11 | 11 | 0 | 0 | 1 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Completed | | | | | | 67 | 39 | 0 | 0 | 62 | 8 | 17 | 0 | 17 | 17 | 11 | 11 | 0 | 0 | 1 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

0 = test scheduled,
1 = test completed as scheduled,
0* = sample not suitable for scheduled test

# Summary of Classification Test Results

Project No.: 2020MH103

Project Name: Ballivor Wind Farm

| Hole No. | Sample Ref | Top | Base | Type | | Soil Description | Density bulk Mg/m3 | Density dry Mg/m3 | w % | Passing 425µm % | LL % | PL % | PI % | Particle density Mg/m3 | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BH-02 | 17 | 5.50 | | D | | Grey sandy silty coarse GRAVEL. | | | 9.5 | 25 | | | | | NP |
| BH-04 | 16 | 5.50 | | D | | Dark grey slightly sandy gravelly SILT. | | | 22.0 | 54 | 33 | 26 | 7 | | ML |
| BH-05 | 13 | 4.00 | | D | | Grey slightly sandy gravelly SILT. | | | 12.0 | 52 | 22 | 16 | 6 | | ML |
| BH-07 | 11 | 3.50 | | D | | Grey slightly sandy gravelly silty CLAY. | | | 12.0 | 48 | 24 | 16 | 8 | | CL |
| BH-07 | 17 | 5.50 | | D | | Dark grey slightly sandy slightly gravelly SILT. | | | 12.0 | 58 | 22 | 16 | 6 | | ML |
| BH-08 | 13 | 4.50 | | D | | Dark grey slightly sandy slightly gravelly clayey SILT. | | | 12.0 | 56 | 28 | 17 | 11 | | CL |
| BH-09 | 14 | 4.50 | | D | | Grey slightly gravelly slightly sandy silty CLAY. | | | 14.0 | 64 | 23 | 16 | 7 | | CL |
| BH-10 | 14 | 4.50 | | D | | Grey very sandy very silty medium GRAVEL. | | | 18.0 | 45 | | | | | NP |
| BH-11 | 11 | 3.50 | | D | | Grey slightly gravelly sandy silty CLAY. | | | 23.0 | 53 | 25 | 16 | 9 | | CL |
| BH-12 | 11 | 3.50 | | D | | Dark grey slightly gravelly slightly sandy SILT. | | | 13.0 | 56 | 57 | 39 | 18 | | MH |
| BH-13 | 10 | 3.50 | | D | | Dark grey slightly sandy gravelly silty CLAY. | | | 27.0 | 63 | 37 | 23 | 14 | | CI |
| BH-14 | 11 | 3.50 | | D | | Dark grey slightly sandy slightly gravelly SILT. | | | 49.0 | | | | | | |
| BH-14 | 14 | 4.50 | | D | | Dark grey slightly silty very sandy medium and fine GRAVEL. | | | 7.6 | | | | | | |
| BPA-BH01 | 11 | 3.50 | | D | | Dark grey sandy very silty medium GRAVEL. | | | 43.0 | 27 | 85 | 58 | 27 | | |
| BPA-BH01 | 14 | 4.50 | | D | | Dark grey very silty very sandy medium GRAVEL. | | | 18.0 | 29 | 37 | 28 | 9 | | MI |
| BPA-BH02 | 5 | 1.50 | | D | | Dark grey slightly sandy gravelly SILT. | | | 34.0 | 49 | 61 | 37 | 24 | | MH |
| BPA-BH02 | 8 | 2.50 | | D | | Dark grey slightly sandy slightly gravelly SILT. | | | 28.0 | 47 | 56 | 41 | 15 | | MH |
| BPA-BH02 | 11 | 3.50 | | D | | Dark grey silty very gravelly coarse SAND. | | | 20.0 | | | | | | |
| BPA-BH02 | 14 | 4.50 | | D | | Dark grey silty very gravelly coarse SAND. | | | 11.0 | | | | | | |
| BPA-BH02 | 17 | 5.50 | | D | | Dark brown very gravelly very silty coarse SAND. | | | 14.0 | | | | | | |
| BPA-BH03A | 5 | 1.50 | | D | | Grey slightly gravelly slightly sandy SILT. | | | 42.0 | 83 | 38 | 35 | 3 | | MI |
| BPA-BH03A | 8 | 2.50 | | D | | Dark grey slightly sandy slightly gravelly SILT. | | | 34.0 | | | | | | |
| BPA-BH03A | 11 | 3.50 | | D | | Dark grey very sandy very silty medium GRAVEL. | | | 22.0 | | | | | | |
| BPA-BH03A | 14 | 4.50 | | D | | Grey silty sandy f,m,c GRAVEL. | | | 14.0 | | | | | | |
| BPA-TP01 | 1 | 3.20 | 3.40 | B | | Dark grey very sandy very silty medium GRAVEL. | | | 26.0 | 42 | | | | | |
| BPA-TP02 | 2 | 1.50 | 1.70 | D | | Dark brown gravelly sandy SILT. | | | 35.0 | 72 | 39 | 28 | 11 | | MI |

All tests performed in accordance with BS1377:1990 unless specified otherwise

Key: w = water content, LL = Liquid Limit, PL = Plastic Limit, PI = Plasticity Index

Density test: wd - water displacement; wi - immersion in water

Linear measurement unless : 4pt cone unless : 1pt - single point test; NP - Non Plastic

Particle density: sp - small pyknometer; gj - gas jar

Date Printed: 23/04/2021

QC From No: R1

Approved By: DCD

Table 1 sheet 1

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

# Summary of Classification Test Results

Project No.: 2020MH103

Project Name: Ballivor Wind Farm

| Hole No. | Sample Ref | Top | Base | Type | | Soil Description | Density bulk Mg/m3 | Density dry Mg/m3 | w % | Passing 425µm % | LL % | PL % | PI % | Particle density Mg/m3 | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BPA-TP02 | 3 | 2.50 | 2.70 | B | | Dark grey very gravelly very silty coarse SAND. | | | 22.0 | 50 | | | | | |
| TP-02 | 2 | 1.60 | 1.80 | D | | Dark grey slightly gravelly sandy SILT. | | | 25.0 | 87 | | | | | NP |
| TP-04 | 3 | 1.70 | 1.90 | D | | Grey slightly sandy gravelly SILT. Gravel is medium. | | | 36.0 | 42 | | | | | |
| TP-08 | 3 | 2.20 | 2.40 | D | | Light grey slightly gravelly sandy SILT. | | | 16.0 | 64 | 19 | 16 | 3 | | ML |
| TP-12 | 2 | 1.80 | 2.00 | D | | Dark grey slightly sandy SILT. | | | 46.0 | 87 | 53 | 31 | 22 | | MH |
| TP-13 | 4 | 3.00 | 3.20 | D | | Grey slightly sandy gravelly SILT. | | | 13.0 | 51 | 22 | 13 | 9 | | CL |
| TP-18 | 3 | 3.20 | 3.40 | B | | Dark grey very silty very sandy medium GRAVEL. | | | 11.0 | 33 | | | | | |
| TP-20 | 3 | 2.40 | 2.60 | D | | Dark grey slightly sandy gravelly SILT. | | | 15.0 | 53 | 28 | 18 | 10 | | CL |
| TP-24 | 4 | 3.30 | 3.50 | D | | Dark grey very sandy very silty GRAVEL. | | | 9.9 | 41 | 25 | 15 | 10 | | ML |
| TP-25 | 2 | 1.70 | 1.90 | D | | Dark grey slightly gravelly slightly sandy SILT. | | | 18.0 | 87 | 25 | 18 | 7 | | CL |
| TP-25 | 3 | 2.80 | 3.00 | B | | Dark grey very silty very gravelly SAND. | | | 13.0 | 48 | | | | | |
| TP-26 | 2 | 2.20 | 2.40 | D | | Grey slightly gravelly sandy SILT. Sand is medium. | | | 14.0 | 56 | | | | | NP |
| TP-29 | 3 | 3.40 | 3.60 | D | | Dark grey slightly gravelly sandy silty CLAY. | | | 12.0 | 67 | 28 | 15 | 13 | | CL |
| TP-A | 3 | 2.70 | 2.90 | D | | Grey slightly gravelly sandy SILT. Sand is medium. | | | 18.0 | 73 | | | | | NP |
| TP-B | 2 | 2.40 | 2.60 | D | | Grey-brown gravelly very sandy SILT. | | | 54.0 | 75 | 51 | 46 | 5 | | MH |
| TP-C | 4 | 2.50 | 2.70 | D | | Grey very gravelly very silty SAND. | | | 12.0 | 54 | 26 | 17 | 9 | | CL |
| TP-E | 2 | 2.05 | 2.25 | D | | Dark brown slightly gravelly slightly sandy SILT. | | | 58.0 | 80 | 70 | 42 | 28 | | MV |
| TP-F | 2 | 2.30 | 2.50 | D | | Dark grey slightly gravelly slightly sandy SILT. | | | 26.0 | 73 | 30 | 21 | 9 | | CL |
| TP-G | 2 | 3.80 | 4.00 | B | | Dark grey silty sandy coarse GRAVEL. | | | 19.0 | 18 | | | | | |
| TP-H | 3 | 2.30 | 2.50 | B | | Grey silty gravelly medium SAND. | | | 26.0 | 54 | | | | | |
| TP-I | 2 | 3.50 | 3.70 | B | | Dark grey slightly silty very sandy medium GRAVEL. | | | 14.0 | 8 | | | | | |
| TP-J | 2 | 2.70 | 2.90 | B | | Dark gey slightly silty very sandy medium GRAVEL. | | | 16.0 | 6 | | | | | |
| TP-K | 3 | 3.80 | 4.00 | B | | Grey slightly silty very sandy medium GRAVEL. | | | 17.0 | 4 | | | | | |
| TP-L | 3 | 2.00 | 2.20 | B | | Dark grey slightly gravelly silty fine and medium SAND. | | | 23.0 | 75 | | | | | |
| TP-M | 2 | 3.10 | 3.30 | B | | Dark grey silty very sandy coarse GRAVEL. | | | 17.0 | 19 | | | | | |
| TP-N | 4 | 2.50 | 2.70 | D | | Grey slightly gravelly slightly sandy silty CLAY. | | | 12.0 | 57 | 23 | 15 | 8 | | CL |

All tests performed in accordance with BS1377:1990 unless specified otherwise

Key: w = water content, LL = Liquid Limit, PL = Plastic Limit, PI = Plasticity Index

Density test: wd - water displacement; wi - immersion in water

Linear measurement unless : 4pt cone unless : 1pt - single point test

Liquid Limit: NP - Non Plastic

Particle density: sp - small pyknometer; gj - gas jar

Date Printed: 23/04/2021

QC From No: R1

Approved By: DCD

Table 1 sheet 2

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

# Summary of Classification Test Results

| Project No. | Project Name |
|---|---|
| 2020MH103 | Ballivor Wind Farm |

| Hole No. | Sample | | | | | Soil Description | Density bulk / dry Mg/m3 | | *w* % | Passing 425µm % | LL % | PL % | PI % | Particle density Mg/m3 | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ref | Top | Base | Type | | | | | | | | | | | |
| TP-O | 3 | 3.00 | 3.20 | D | | Dark brown gravelly very sandy SILT. | | | 43.0 | 83 | | | | | NP |
| TP-P | 1 | 1.50 | 1.70 | B | | Black Peat. | | | 907.0 | | | | | | |
| TP-Q | 1 | 1.00 | 1.20 | B | | Black Peat. | | | 797.0 | | | | | | |
| TP-Q | 3 | 2.20 | 2.40 | D | | Grey slightly sandy gravely silty CLAY.. | | | 18.0 | 79 | 25 | 18 | 7 | | CL |
| TP-R | 2 | 4.40 | 4.60 | D | | Grey silty CLAY. | | | 23.0 | 99 | 33 | 23 | 10 | | CL |
| TP-S | 2 | 1.00 | 1.20 | D | | Brownish-grey slightly gravelly slightly sandy SILT. | | | 34.0 | 77 | 39 | 30 | 9 | | MI |
| TP-S | 4 | 3.60 | 3.80 | B | | Light grey silty very sandy medium GRAVEL. | | | 15.0 | 29 | | | | | |
| TP-T | 4 | 2.80 | 3.00 | D | | Grey very gravelly very sandy SILT. | | | 12.0 | 60 | 25 | 16 | 9 | | CL |
| TP-V | 1 | 3.00 | 3.20 | B | | Dark grey silty very sasndy medium GRAVEL. | | | 7.9 | 11 | | | | | |
| TP-W | 2 | 4.00 | 4.20 | B | | Grey slightly silty sandy medium GRAVEL. | | | 18.0 | 6 | | | | | |
| TP-X | 2 | 4.10 | 4.30 | D | | Dark grey slightly gravelly sandy SILT. Sand is fine. | | | 36.0 | 82 | | | | | NP |
| TP-Y | 1 | 3.80 | 4.00 | B | | Black Peat. | | | 644.0 | | | | | | |
| TP-Z | 1 | 1.00 | 1.20 | B | | Black Peat. | | | 756.0 | | | | | | |
| TP-Z | 4 | 2.90 | 3.10 | B | | Grey slightly sandy gravelly silty CLAY. | | | 12.0 | 56 | 22 | 14 | 8 | | CL |

All tests performed in accordance with BS1377:1990 unless specified otherwise

Key w = water content, LL = Liquid Limit, PL = Plastic Limit, PI = Plasticity Index

Density test | Liquid Limit | Particle density

Linear measurement unless : | 4pt cone unless : | sp - small pyknometer

wd - water displacement | 1pt - single point test | gj - gas jar

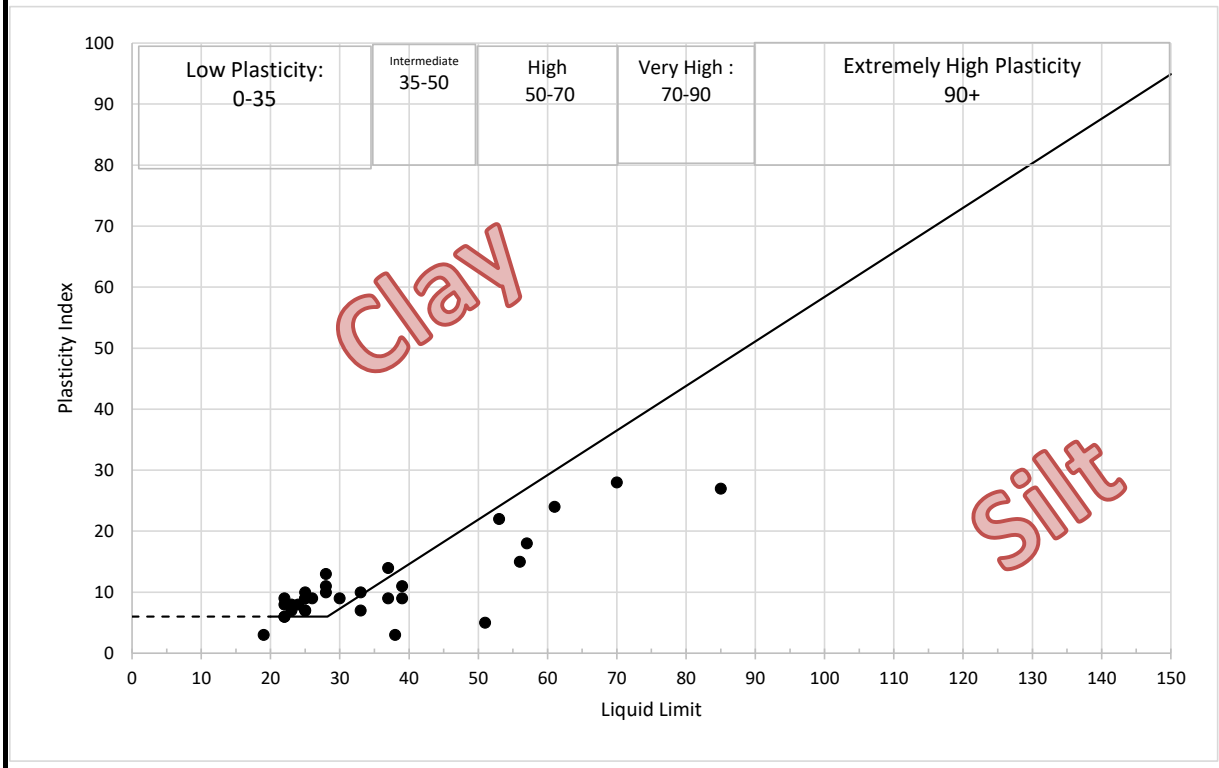
wi - immersion in water | NP - Non Plastic

| Date Printed | Approved By | Table |
|---|---|---|
| 23/04/2021 | | 1 |
| QC From No: R1 | DCD | sheet 3 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | Plasticity (A-Line) Chart | Project Number |
|---|---|---|
| Project Name: | **Ballivor Wind Farm** | |
| Location: | | 2020MH103 |




Abreviations in the remarks column of the Classification Summary Sheet: C = Clay, M = Silt

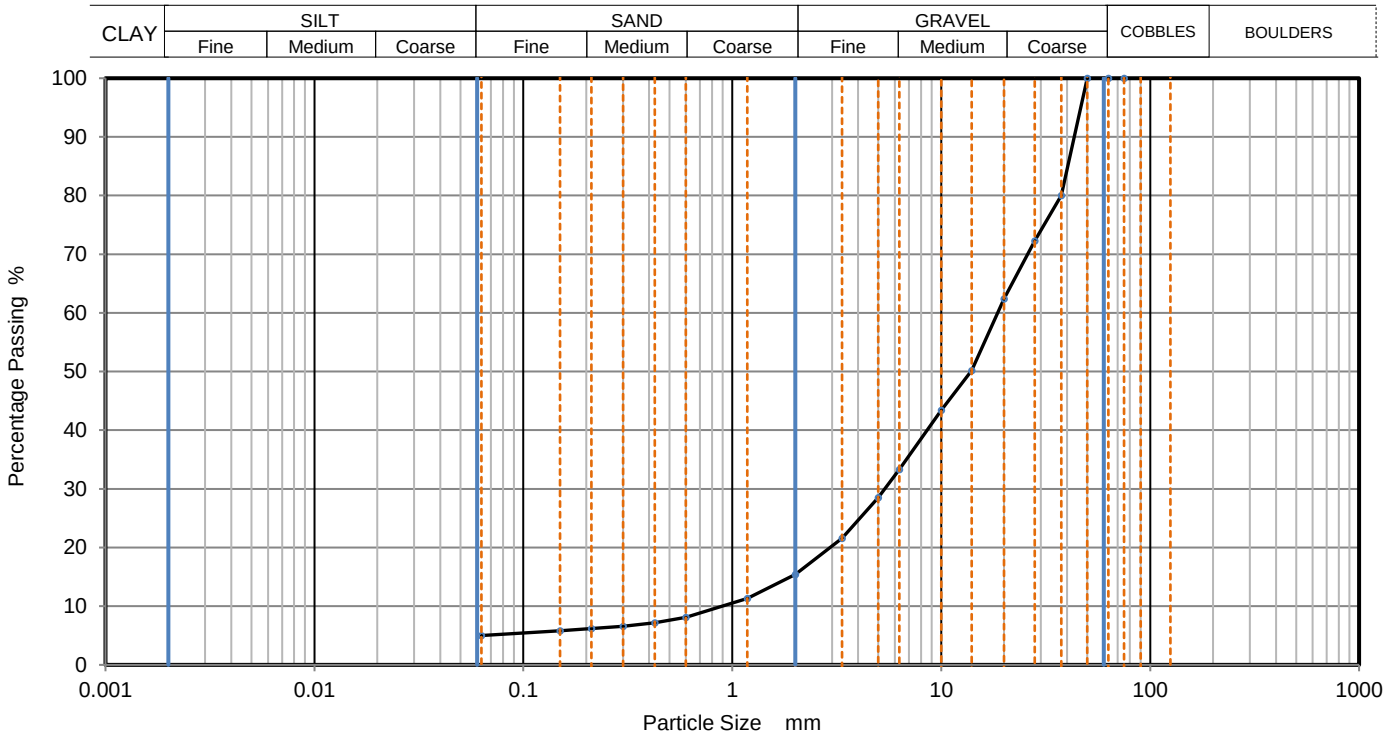
Plasticity abeviations: L = Low, I = Intermediate = H = High, V = Very High, E = Extremely High.

The letter O is added to the symbol of any material containing a significant proportion of organic material.

Chart taken from BS5930: 2010

QC Form: R1

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | BH-02 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 13 |
| Soil Description | Grey slightly silty sandy medium and coarse GRAVEL. | | | Depth, m | 4.00 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL12021030312 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 80 | | |
| 28 | 72 | | |
| 20 | 62 | | |
| 14 | 50 | | |
| 10 | 43 | | |
| 6.3 | 33 | | |
| 5 | 29 | | |
| 3.35 | 22 | | |
| 2 | 15 | | |
| 1.18 | 11 | | |
| 0.6 | 8 | | |
| 0.425 | 7 | | |
| 0.3 | 7 | | |
| 0.212 | 6 | | |
| 0.15 | 6 | | |
| 0.063 | 5 | | |

| | |
|---|---|
| Dry Mass of sample, g | 1288 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 85 |
| Sand | 11 |
| | |
| Fines <0.063mm | 5 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 18.6 |
| D30 | mm | 5.38 |
| D10 | mm | 0.895 |
| Uniformity Coefficient | | 21 |
| Curvature Coefficient | | 1.7 |

Remarks

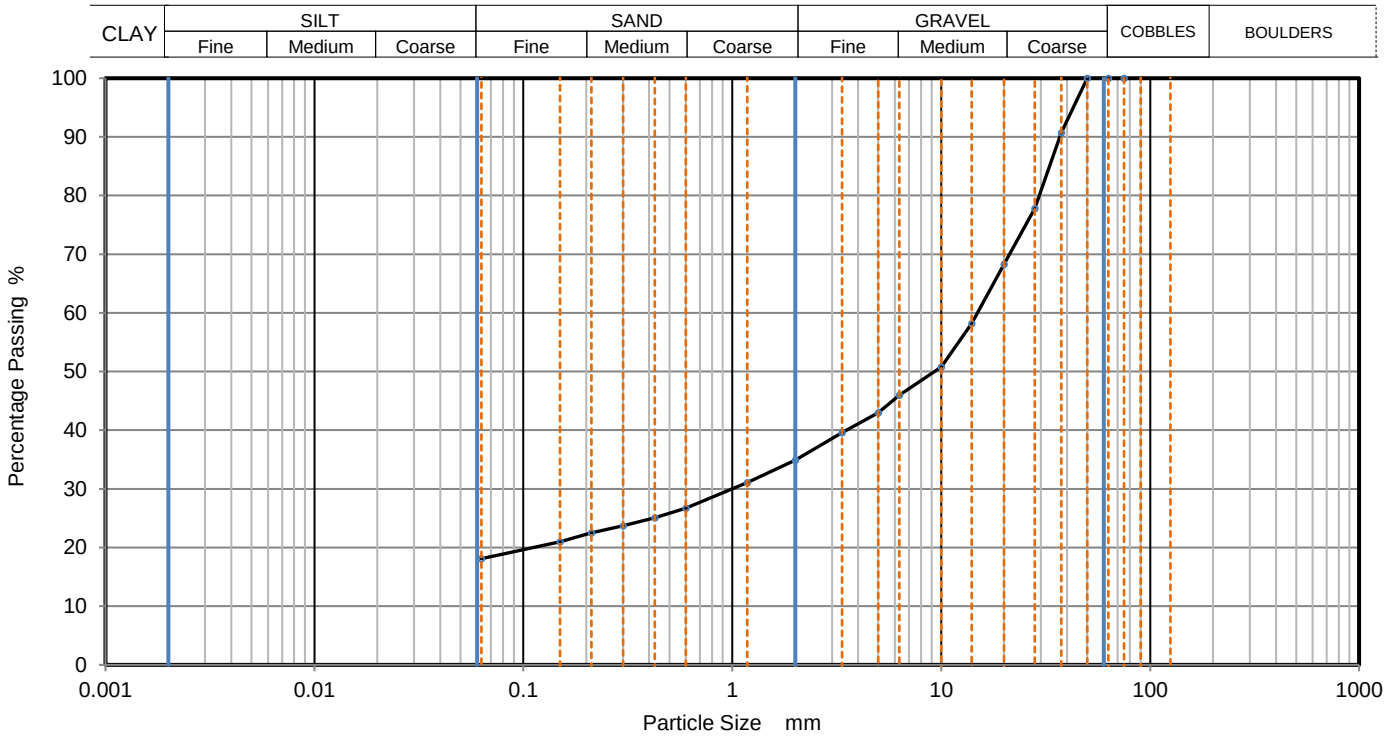
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:43 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | BH-02 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 16 |
| Soil Description | Grey sandy silty coarse GRAVEL. | | | Depth, m | 5.00 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL12021030315 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 91 | | |
| 28 | 78 | | |
| 20 | 68 | | |
| 14 | 58 | | |
| 10 | 51 | | |
| 6.3 | 46 | | |
| 5 | 43 | | |
| 3.35 | 40 | | |
| 2 | 35 | | |
| 1.18 | 31 | | |
| 0.6 | 27 | | |
| 0.425 | 25 | | |
| 0.3 | 24 | | |
| 0.212 | 23 | | |
| 0.15 | 21 | | |
| 0.063 | 18 | | |

| | |
|---|---|
| Dry Mass of sample, g | 926 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 65 |
| Sand | 17 |
| | |
| Fines <0.063mm | 18 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 14.9 |
| D30 | mm | 1 |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

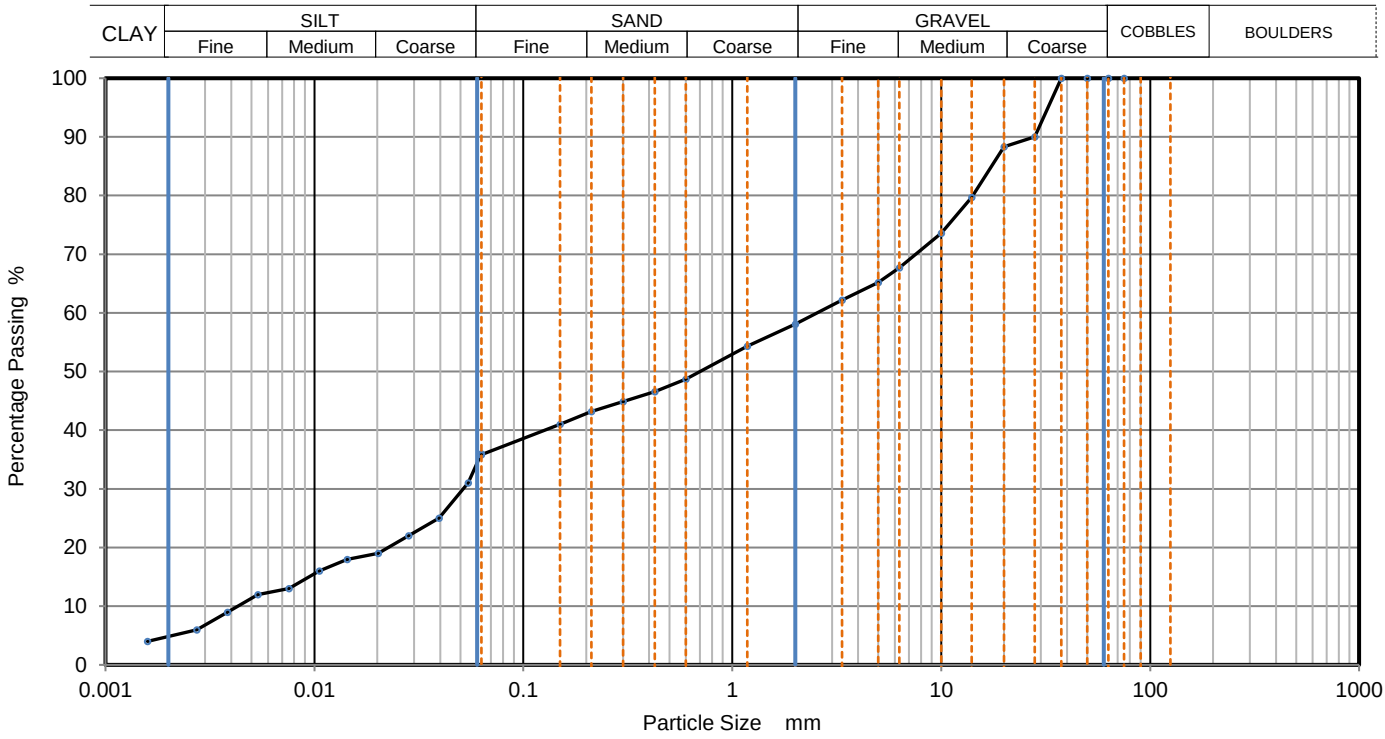
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:43 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | BH-04 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 12 |
| Soil Description | Dark grey slightly sandy gravelly SILT. Gravel is medium. | | | Depth, m | 4.00 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clauses 9.2 and 9.5 | | | KeyLAB ID | IDL12021030334 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | 0.0630 | 36 |
| | | 0.0544 | 31 |
| 75 | 100 | 0.0394 | 25 |
| 63 | 100 | 0.0282 | 22 |
| 50 | 100 | 0.0202 | 19 |
| 37.5 | 100 | 0.0144 | 18 |
| 28 | 90 | 0.0105 | 16 |
| 20 | 88 | 0.0075 | 13 |
| 14 | 80 | 0.0054 | 12 |
| 10 | 74 | 0.0038 | 9 |
| 6.3 | 68 | 0.0027 | 6 |
| 5 | 65 | 0.0016 | 4 |
| 3.35 | 62 | | |
| 2 | 58 | | |
| 1.18 | 54 | | |
| 0.6 | 49 | Particle density (assumed) | |
| 0.425 | 47 | 2.65 Mg/m3 | |
| 0.3 | 45 | | |
| 0.212 | 43 | | |
| 0.15 | 41 | | |
| 0.063 | 36 | | |

| Dry Mass of sample, g | 511 |
|---|---|

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 42 |
| Sand | 22 |
| Silt | 31 |
| Clay | 5 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 2.55 |
| D30 | mm | 0.0507 |
| D10 | mm | 0.00431 |
| Uniformity Coefficient | | 590 |
| Curvature Coefficient | | 0.23 |

Remarks

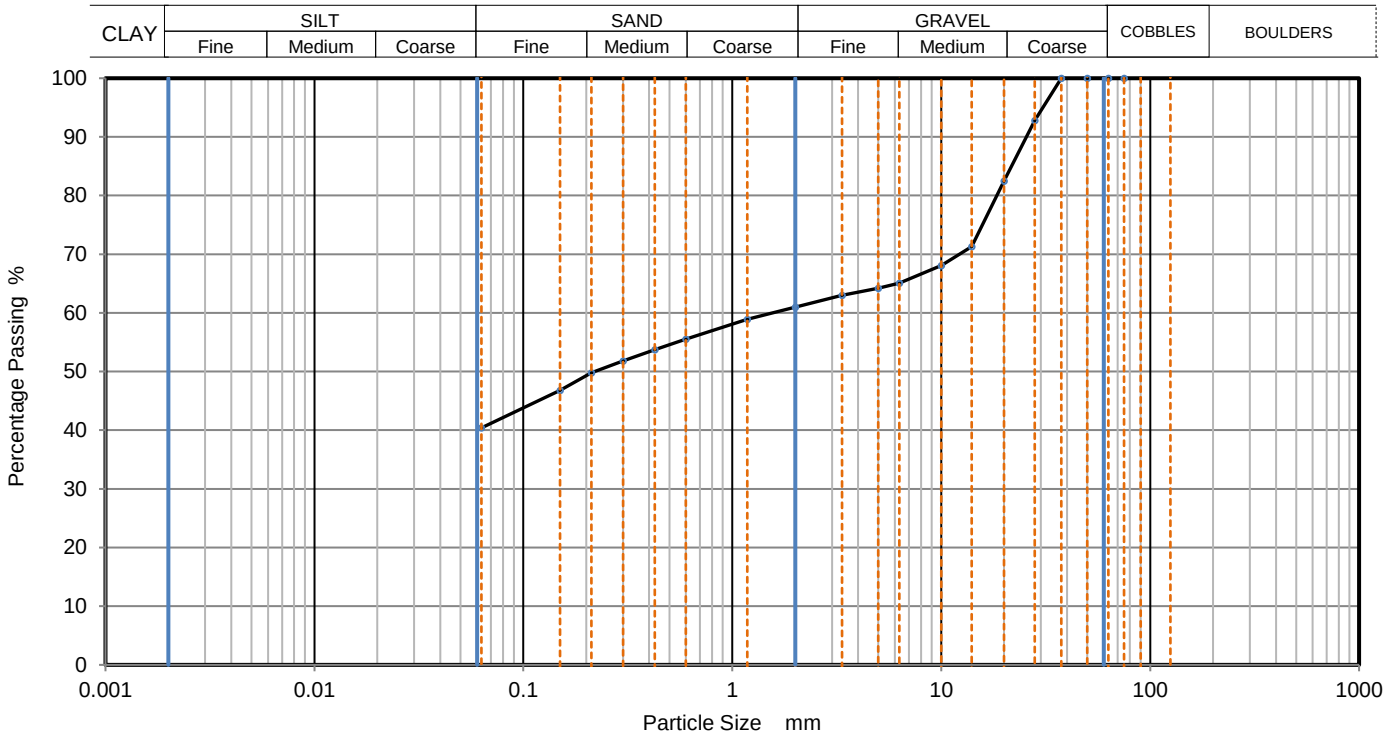
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:43 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | BH-04 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 15 |
| Soil Description | Dark grey slightly sandy gravelly SILT. | | | Depth, m | 5.00 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL12021030337 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 93 | | |
| 20 | 83 | | |
| 14 | 71 | | |
| 10 | 68 | | |
| 6.3 | 65 | | |
| 5 | 64 | | |
| 3.35 | 63 | | |
| 2 | 61 | | |
| 1.18 | 59 | | |
| 0.6 | 56 | | |
| 0.425 | 54 | | |
| 0.3 | 52 | | |
| 0.212 | 50 | | |
| 0.15 | 47 | | |
| 0.063 | 40 | | |

| | |
|---|---|
| Dry Mass of sample, g | 582 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 39 |
| Sand | 21 |
| | |
| Fines <0.063mm | 40 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 1.55 |
| D30 | mm | |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

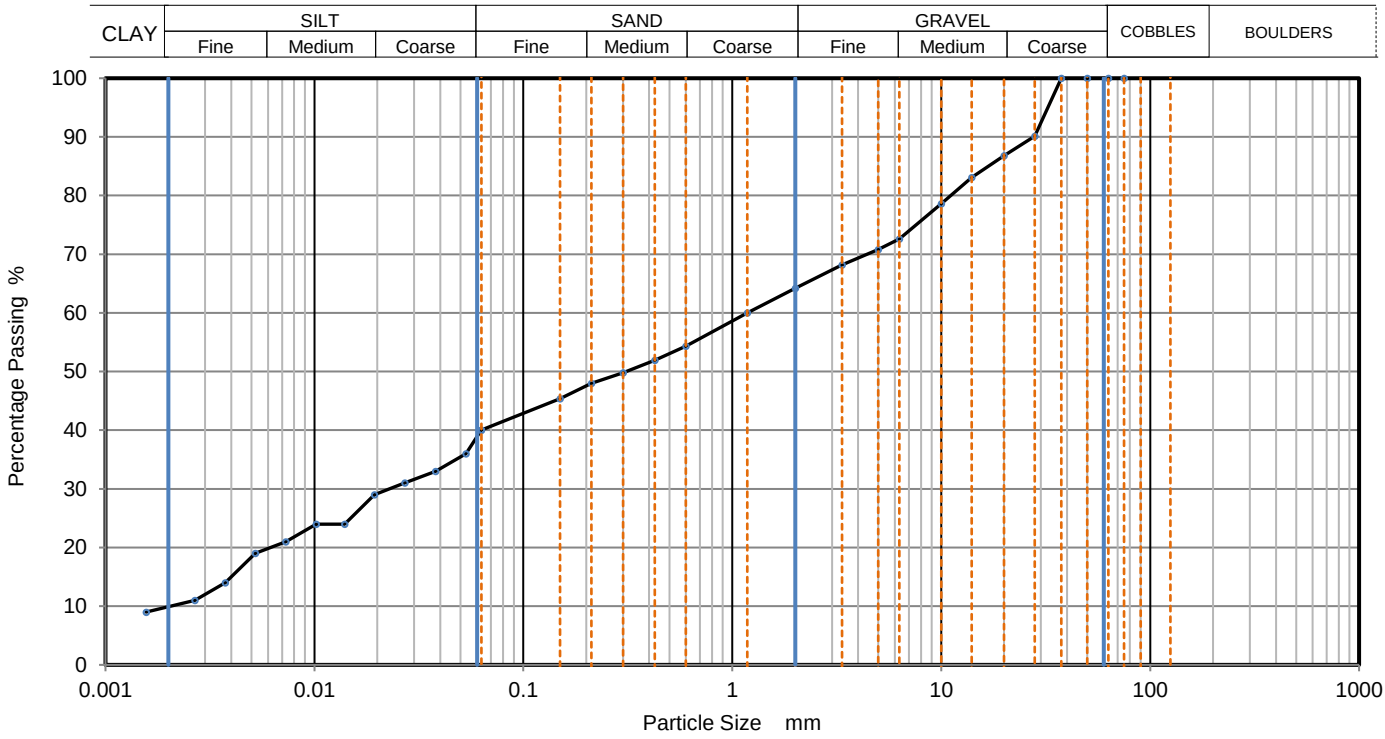
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:43 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | BH-05 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 12 |
| Soil Description | Grey slightly sandy gravelly SILT. | | | Depth, m | 3.50 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clauses 9.2 and 9.5 | | | KeyLAB ID | IDL12021030354 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | 0.0630 | 40 |
| | | 0.0530 | 36 |
| 75 | 100 | 0.0380 | 33 |
| 63 | 100 | 0.0270 | 31 |
| 50 | 100 | 0.0194 | 29 |
| 37.5 | 100 | 0.0139 | 24 |
| 28 | 90 | 0.0102 | 24 |
| 20 | 87 | 0.0073 | 21 |
| 14 | 83 | 0.0052 | 19 |
| 10 | 79 | 0.0037 | 14 |
| 6.3 | 73 | 0.0027 | 11 |
| 5 | 71 | 0.0016 | 9 |
| 3.35 | 68 | | |
| 2 | 64 | | |
| 1.18 | 60 | | |
| 0.6 | 54 | Particle density (assumed) | |
| 0.425 | 52 | 2.65 | Mg/m3 |
| 0.3 | 50 | | |
| 0.212 | 48 | | |
| 0.15 | 45 | | |
| 0.063 | 40 | | |

| Dry Mass of sample, g | 742 |
|---|---|

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 36 |
| Sand | 24 |
| Silt | 30 |
| Clay | 10 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 1.19 |
| D30 | mm | 0.0229 |
| D10 | mm | 0.00205 |
| Uniformity Coefficient | | 580 |
| Curvature Coefficient | | 0.22 |

Remarks

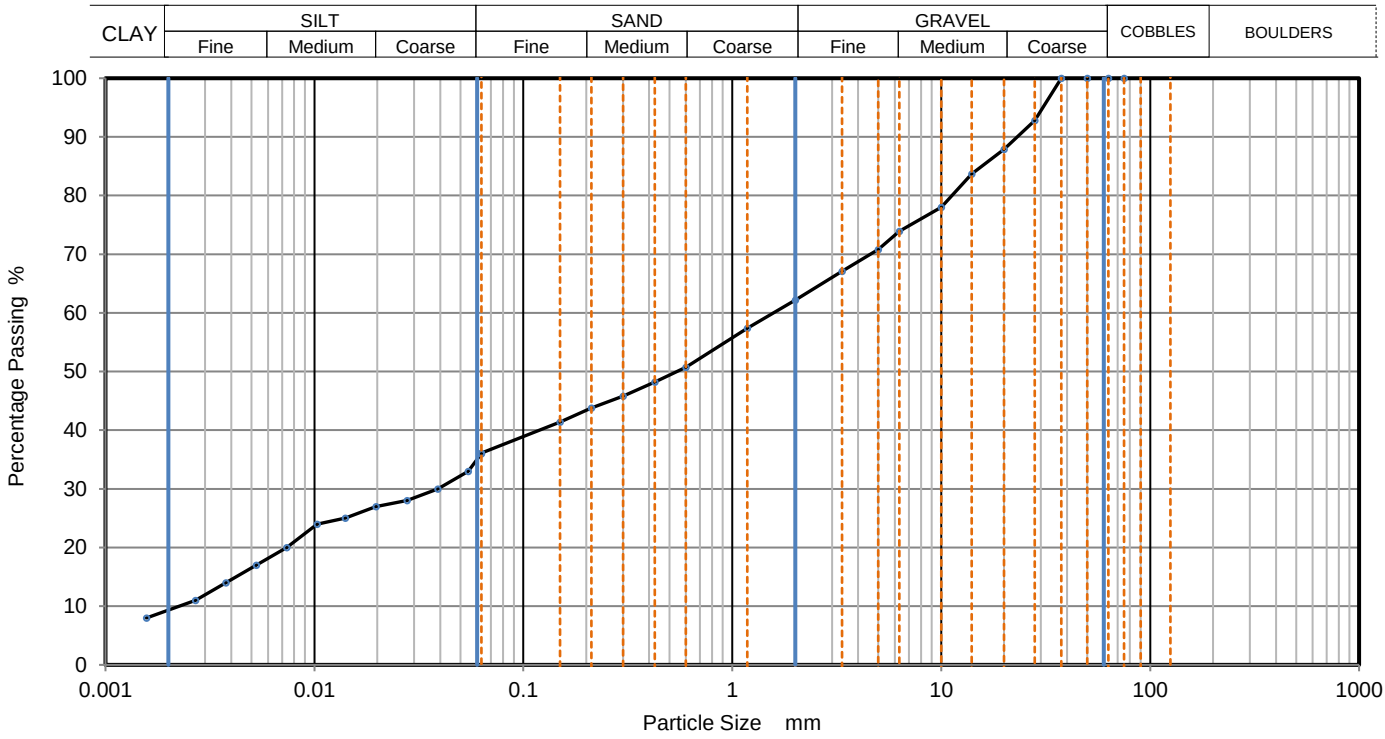
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:43 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | BH-07 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 10 |
| Soil Description | Grey slightly sandy gravelly silty CLAY. | | | Depth, m | 3.00 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clauses 9.2 and 9.5 | | | KeyLAB ID | IDL12021030395 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | 0.0630 | 36 |
| | | 0.0544 | 33 |
| 75 | 100 | 0.0390 | 30 |
| 63 | 100 | 0.0277 | 28 |
| 50 | 100 | 0.0197 | 27 |
| 37.5 | 100 | 0.0140 | 25 |
| 28 | 93 | 0.0103 | 24 |
| 20 | 88 | 0.0074 | 20 |
| 14 | 84 | 0.0053 | 17 |
| 10 | 78 | 0.0038 | 14 |
| 6.3 | 74 | 0.0027 | 11 |
| 5 | 71 | 0.0016 | 8 |
| 3.35 | 67 | | |
| 2 | 62 | | |
| 1.18 | 57 | | |
| 0.6 | 51 | Particle density (assumed) | |
| 0.425 | 48 | 2.65 | Mg/m3 |
| 0.3 | 46 | | |
| 0.212 | 44 | | |
| 0.15 | 41 | | |
| 0.063 | 36 | | |

| Dry Mass of sample, g | 547 |
|---|---|

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 38 |
| Sand | 26 |
| Silt | 27 |
| Clay | 9 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 1.57 |
| D30 | mm | 0.0397 |
| D10 | mm | 0.00227 |
| Uniformity Coefficient | | 690 |
| Curvature Coefficient | | 0.44 |

Remarks

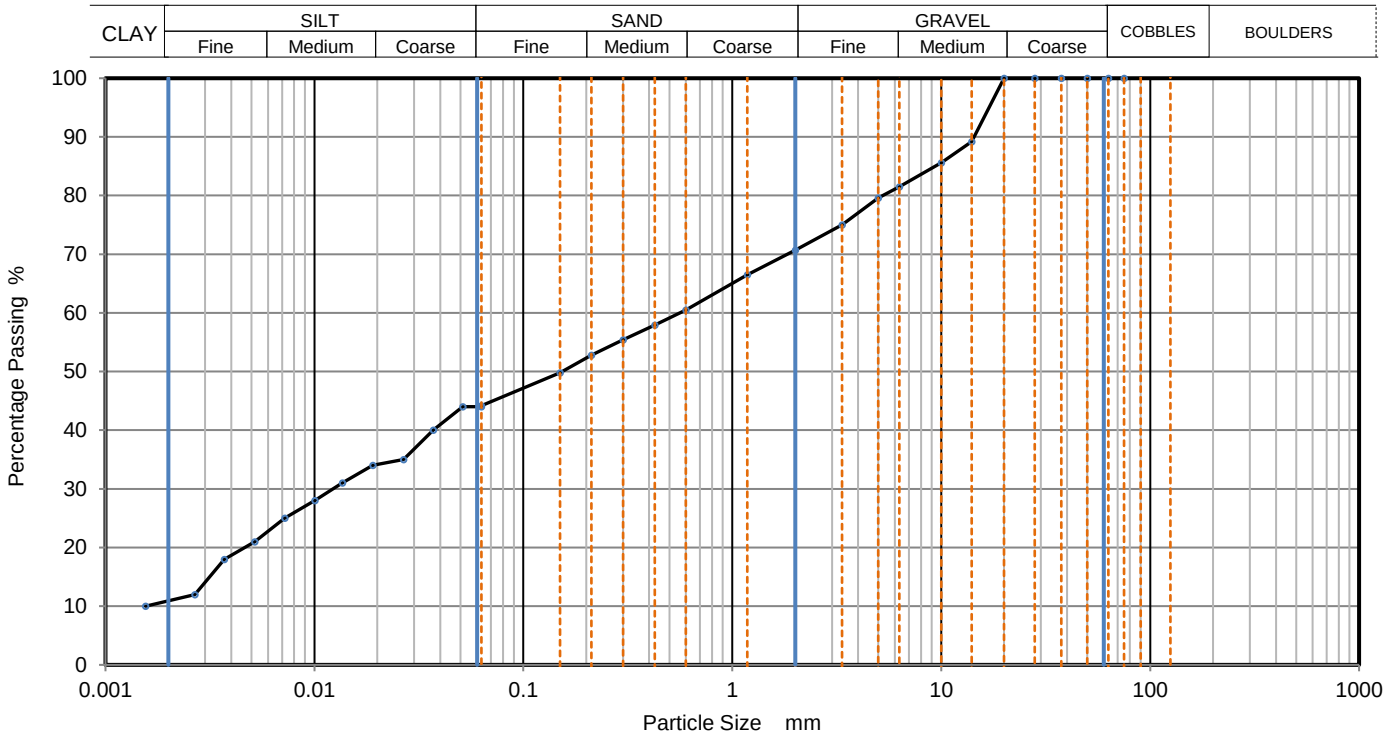
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:43 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | BH-07 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 16 |
| Soil Description | Dark grey slightly sandy slightly gravelly SILT. | | | Depth, m | 5.00 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clauses 9.2 and 9.5 | | | KeyLAB ID | IDL120210303101 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | 0.0630 | 44 |
| | | 0.0512 | 44 |
| 75 | 100 | 0.0370 | 40 |
| 63 | 100 | 0.0267 | 35 |
| 50 | 100 | 0.0190 | 34 |
| 37.5 | 100 | 0.0136 | 31 |
| 28 | 100 | 0.0101 | 28 |
| 20 | 100 | 0.0072 | 25 |
| 14 | 89 | 0.0052 | 21 |
| 10 | 86 | 0.0037 | 18 |
| 6.3 | 82 | 0.0027 | 12 |
| 5 | 80 | 0.0016 | 10 |
| 3.35 | 75 | | |
| 2 | 71 | | |
| 1.18 | 67 | | |
| 0.6 | 61 | Particle density (assumed) | |
| 0.425 | 58 | 2.65 Mg/m3 | |
| 0.3 | 55 | | |
| 0.212 | 53 | | |
| 0.15 | 50 | | |
| 0.063 | 44 | | |

| Dry Mass of sample, g | 739 |
|---|---|

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 29 |
| Sand | 27 |
| Silt | 33 |
| Clay | 11 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.564 |
| D30 | mm | 0.0124 |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

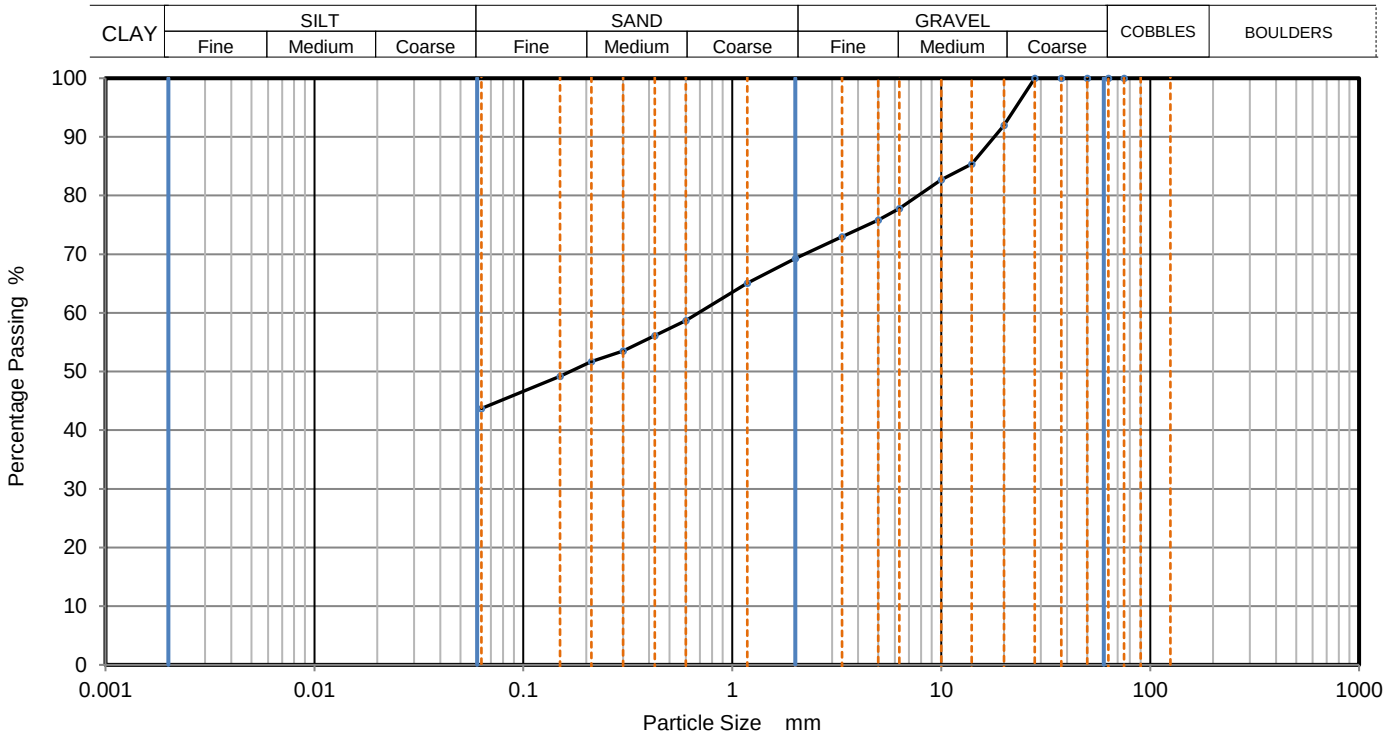
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:44 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | BH-08 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 12 |
| Soil Description | Dark grey slightly sandy slightly gravelly SILT. | | | Depth, m | 4.00 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL120210303115 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 92 | | |
| 14 | 85 | | |
| 10 | 83 | | |
| 6.3 | 78 | | |
| 5 | 76 | | |
| 3.35 | 73 | | |
| 2 | 69 | | |
| 1.18 | 65 | | |
| 0.6 | 59 | | |
| 0.425 | 56 | | |
| 0.3 | 54 | | |
| 0.212 | 52 | | |
| 0.15 | 49 | | |
| 0.063 | 44 | | |

| | |
|---|---|
| Dry Mass of sample, g | 565 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 31 |
| Sand | 26 |
| | |
| Fines <0.063mm | 44 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.686 |
| D30 | mm | |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

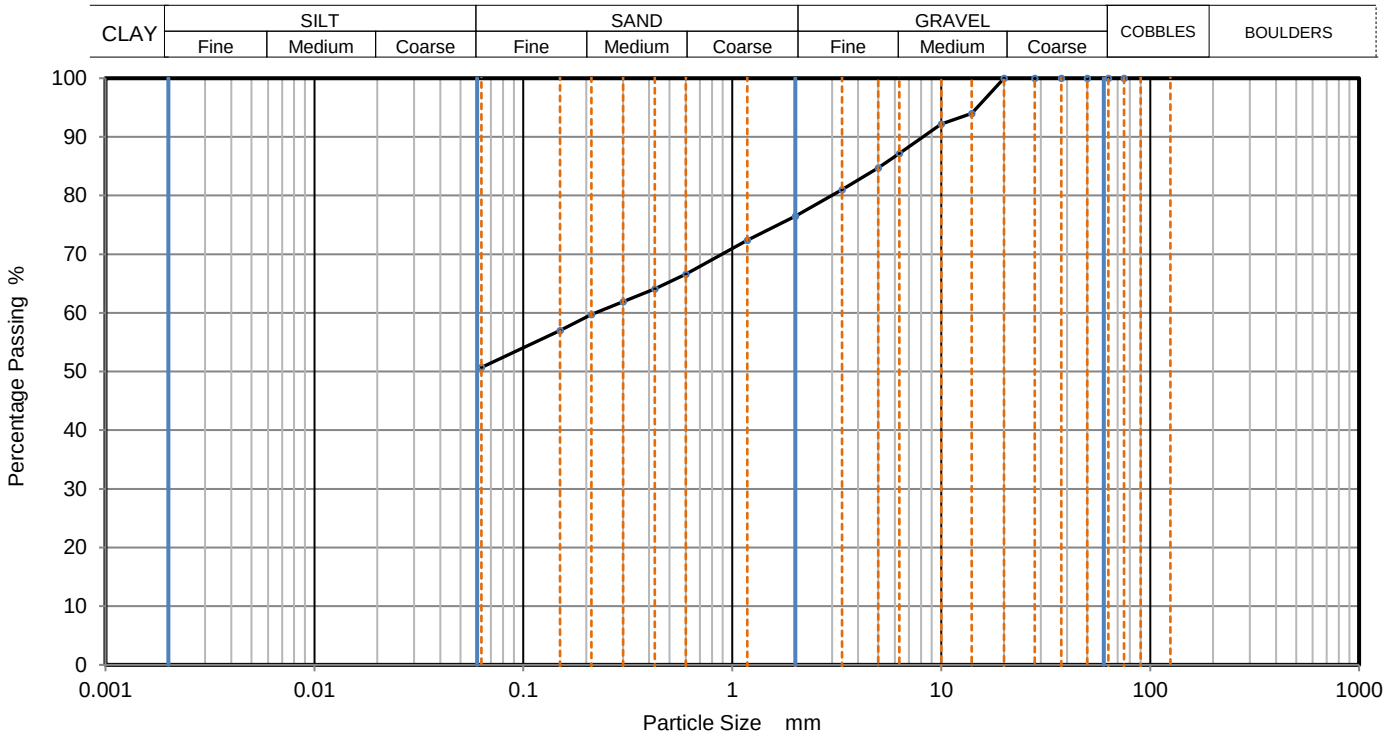
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:44 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | BH-09 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 13 |
| Soil Description | Grey slightly gravelly slightly sandy silty CLAY. | | | Depth, m | 4.00 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL120210303133 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 94 | | |
| 10 | 92 | | |
| 6.3 | 87 | | |
| 5 | 85 | | |
| 3.35 | 81 | | |
| 2 | 77 | | |
| 1.18 | 72 | | |
| 0.6 | 67 | | |
| 0.425 | 64 | | |
| 0.3 | 62 | | |
| 0.212 | 60 | | |
| 0.15 | 57 | | |
| 0.063 | 51 | | |

| | |
|---|---|
| Dry Mass of sample, g | 594 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 24 |
| Sand | 26 |
| | |
| Fines <0.063mm | 51 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.221 |
| D30 | mm | |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

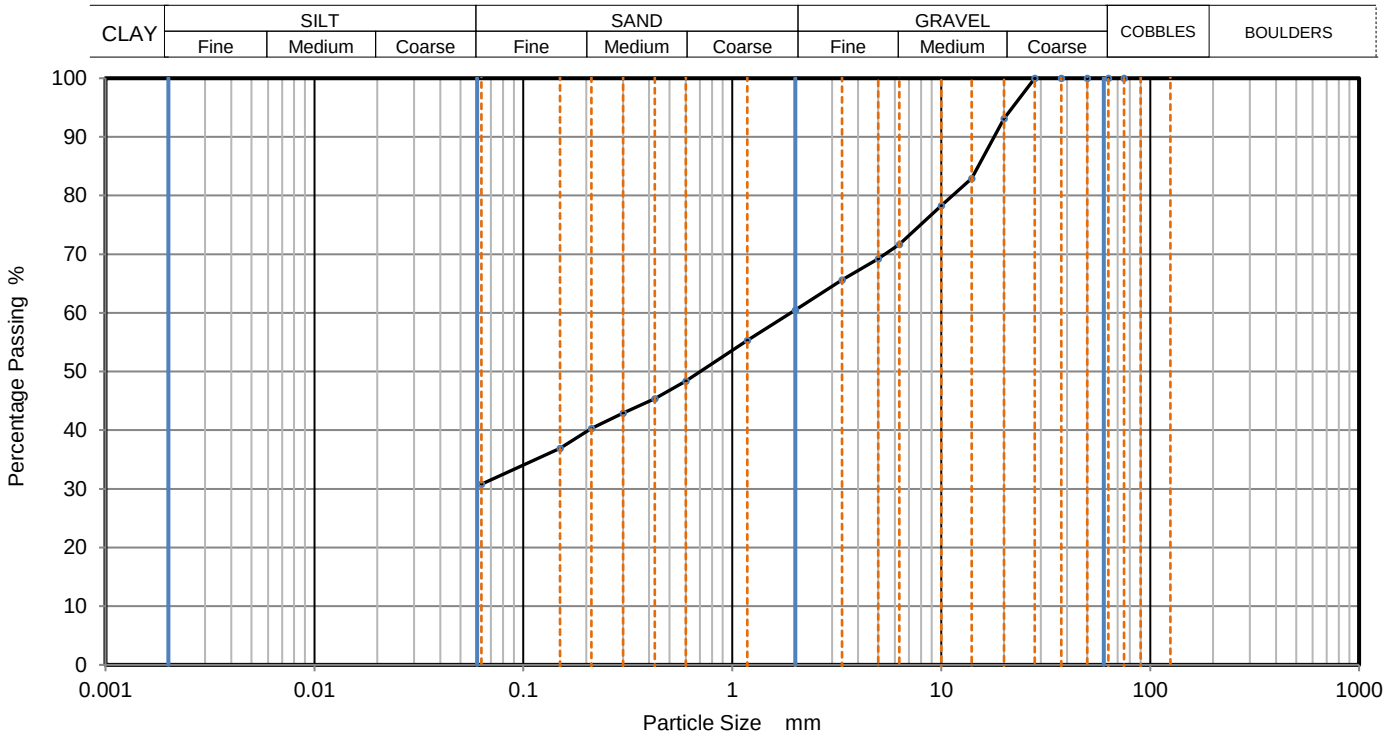
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:44 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | BH-10 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 13 |
| Soil Description | Grey very sandy very silty medium GRAVEL. | | | Depth, m | 4.00 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL120210303147 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 93 | | |
| 14 | 83 | | |
| 10 | 78 | | |
| 6.3 | 72 | | |
| 5 | 69 | | |
| 3.35 | 66 | | |
| 2 | 61 | | |
| 1.18 | 55 | | |
| 0.6 | 48 | | |
| 0.425 | 45 | | |
| 0.3 | 43 | | |
| 0.212 | 40 | | |
| 0.15 | 37 | | |
| 0.063 | 31 | | |

| | |
|---|---|
| Dry Mass of sample, g | 686 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 40 |
| Sand | 30 |
| | |
| Fines <0.063mm | 31 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 1.9 |
| D30 | mm | |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

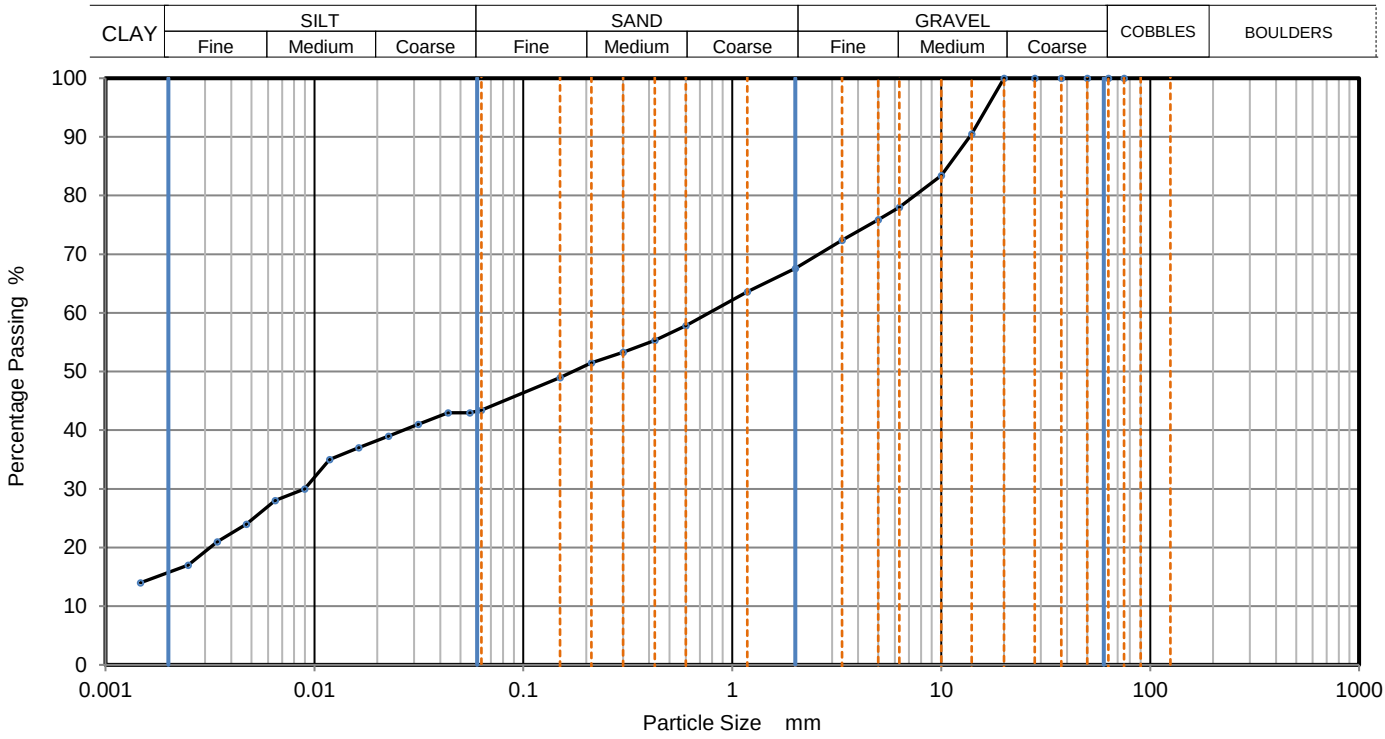
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:44 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | BH-11 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 7 |
| Soil Description | Grey very sandy very gravelly SILT. Gravel is medium. | | | Depth, m | 2.00 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clauses 9.2 and 9.5 | | | KeyLAB ID | IDL120210303156 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | 0.0553 | 43 |
| | | 0.0436 | 43 |
| 75 | 100 | 0.0314 | 41 |
| 63 | 100 | 0.0226 | 39 |
| 50 | 100 | 0.0163 | 37 |
| 37.5 | 100 | 0.0118 | 35 |
| 28 | 100 | 0.0090 | 30 |
| 20 | 100 | 0.0065 | 28 |
| 14 | 91 | 0.0047 | 24 |
| 10 | 83 | 0.0034 | 21 |
| 6.3 | 78 | 0.0025 | 17 |
| 5 | 76 | 0.0015 | 14 |
| 3.35 | 72 | | |
| 2 | 68 | | |
| 1.18 | 64 | | |
| 0.6 | 58 | Particle density (assumed) | |
| 0.425 | 55 | 2.65 | Mg/m3 |
| 0.3 | 53 | | |
| 0.212 | 52 | | |
| 0.15 | 49 | | |
| 0.063 | 43 | | |

| Dry Mass of sample, g | 576 |
|---|---|

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 32 |
| Sand | 24 |
| Silt | 28 |
| Clay | 16 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.778 |
| D30 | mm | 0.00856 |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

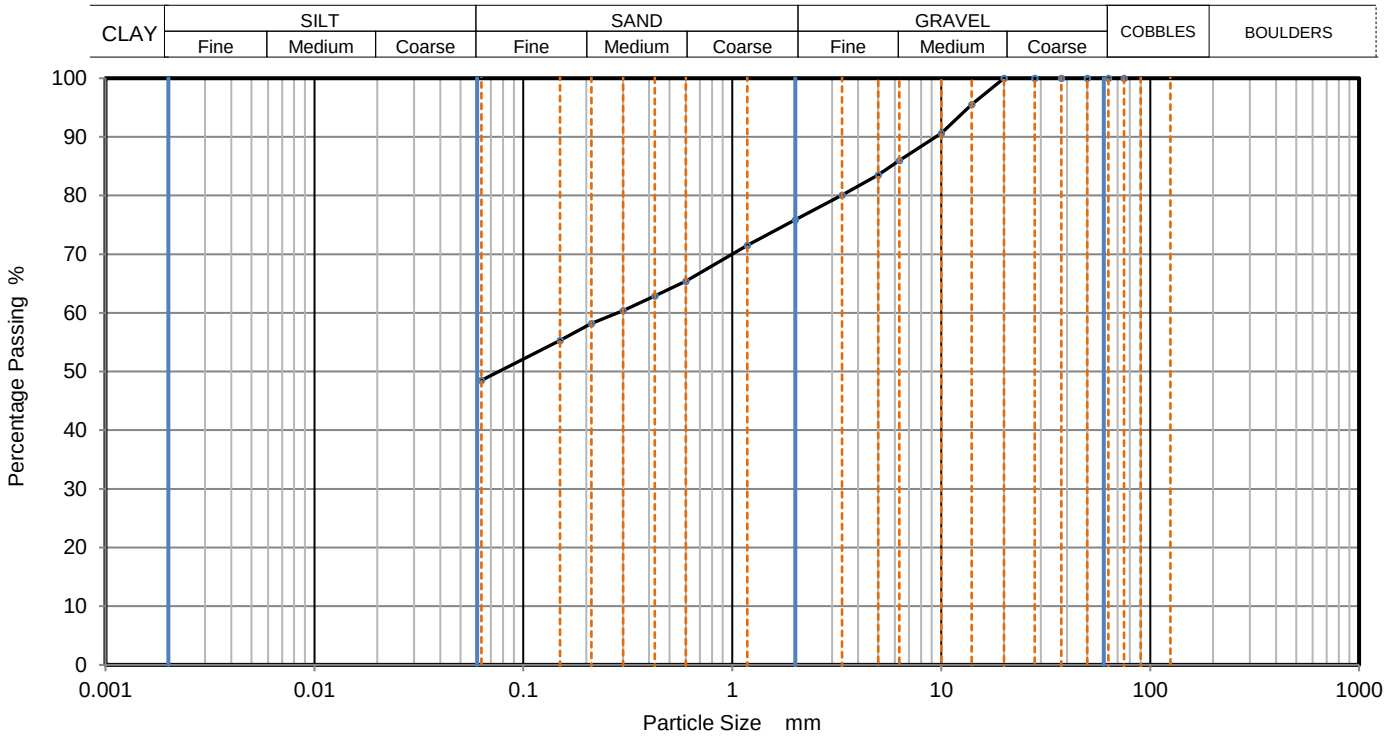
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:44 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | BH-13 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 9 |
| Soil Description | Dark grey slightly gravelly slightly sandy SILT. | | | Depth, m | 3.00 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL120210303189 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 96 | | |
| 10 | 91 | | |
| 6.3 | 86 | | |
| 5 | 84 | | |
| 3.35 | 80 | | |
| 2 | 76 | | |
| 1.18 | 72 | | |
| 0.6 | 65 | | |
| 0.425 | 63 | | |
| 0.3 | 60 | | |
| 0.212 | 58 | | |
| 0.15 | 55 | | |
| 0.063 | 49 | | |

| | |
|---|---|
| Dry Mass of sample, g | 459 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 24 |
| Sand | 27 |
| | |
| Fines <0.063mm | 49 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.282 |
| D30 | mm | |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

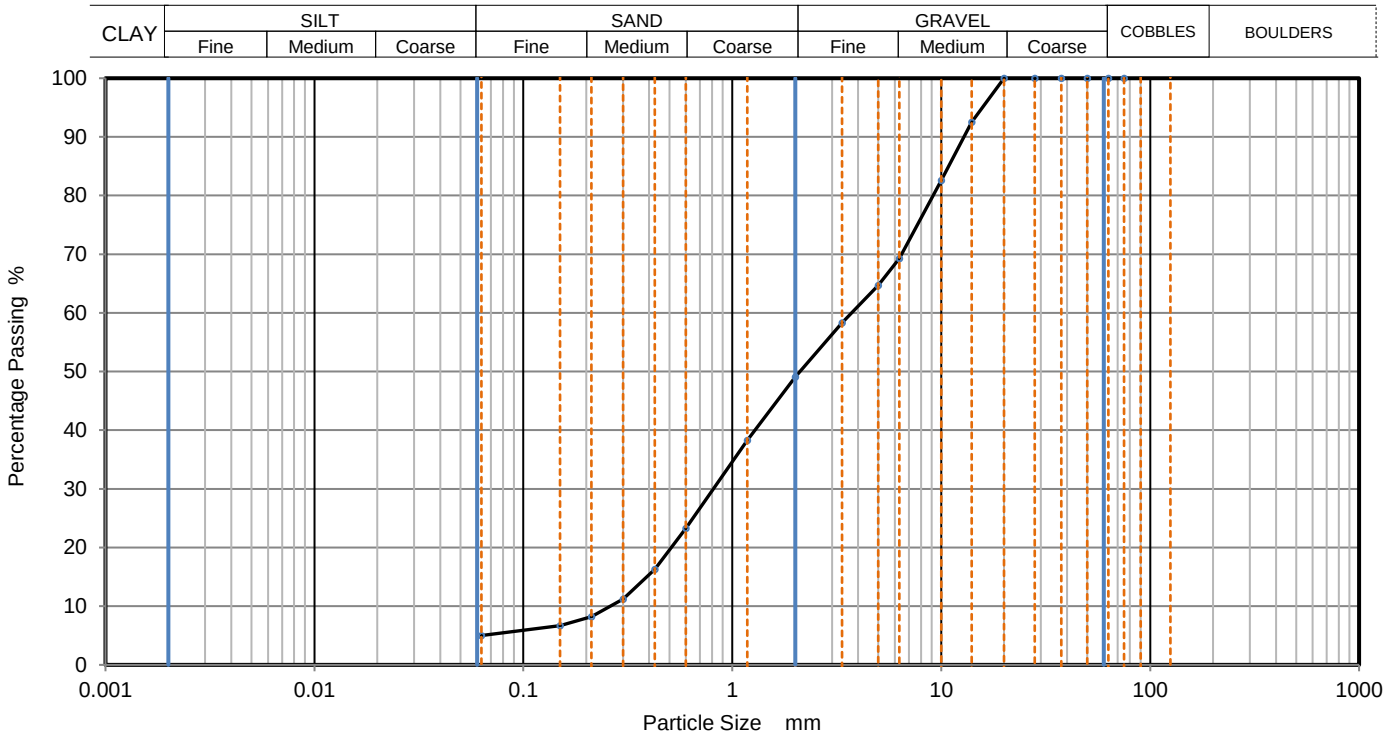
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:44 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | BH-13 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 12 |
| Soil Description | Dark grey silty very sandy medium and fine GRAVEL. | | | Depth, m | 4.00 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL120210303192 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 93 | | |
| 10 | 83 | | |
| 6.3 | 69 | | |
| 5 | 65 | | |
| 3.35 | 58 | | |
| 2 | 49 | | |
| 1.18 | 38 | | |
| 0.6 | 23 | | |
| 0.425 | 16 | | |
| 0.3 | 11 | | |
| 0.212 | 8 | | |
| 0.15 | 7 | | |
| 0.063 | 5 | | |

| Dry Mass of sample, g | 742 |
|---|---|

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 51 |
| Sand | 44 |
| | |
| Fines <0.063mm | 5 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 3.73 |
| D30 | mm | 0.811 |
| D10 | mm | 0.262 |
| Uniformity Coefficient | | 14 |
| Curvature Coefficient | | 0.67 |

Remarks

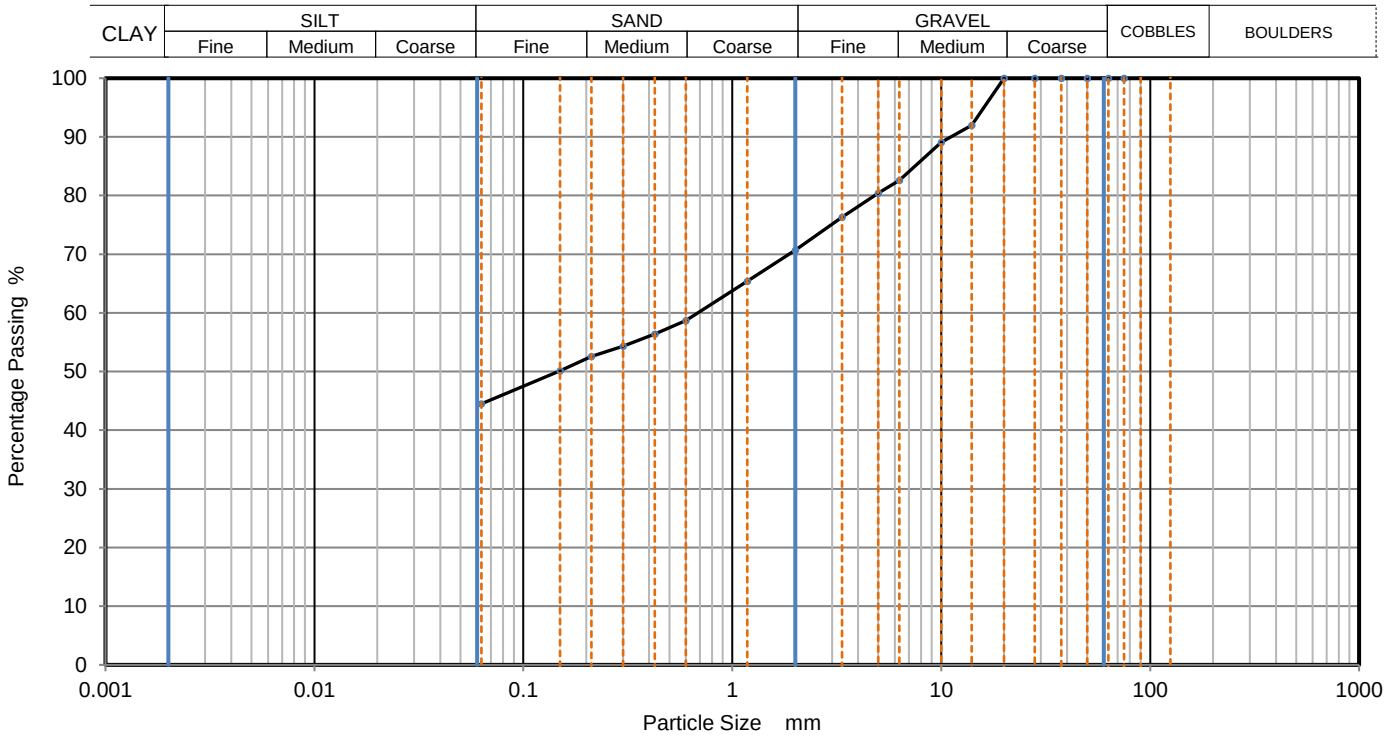
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:44 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | BH-14 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 10 |
| Soil Description | Dark grey slightly sandy slightly gravelly SILT. | | | Depth, m | 3.00 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL120210303203 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 92 | | |
| 10 | 89 | | |
| 6.3 | 83 | | |
| 5 | 80 | | |
| 3.35 | 76 | | |
| 2 | 71 | | |
| 1.18 | 65 | | |
| 0.6 | 59 | | |
| 0.425 | 56 | | |
| 0.3 | 54 | | |
| 0.212 | 53 | | |
| 0.15 | 50 | | |
| 0.063 | 45 | | |

| | |
|---|---|
| Dry Mass of sample, g | 310 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 29 |
| Sand | 26 |
| | |
| Fines <0.063mm | 44 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.683 |
| D30 | mm | |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

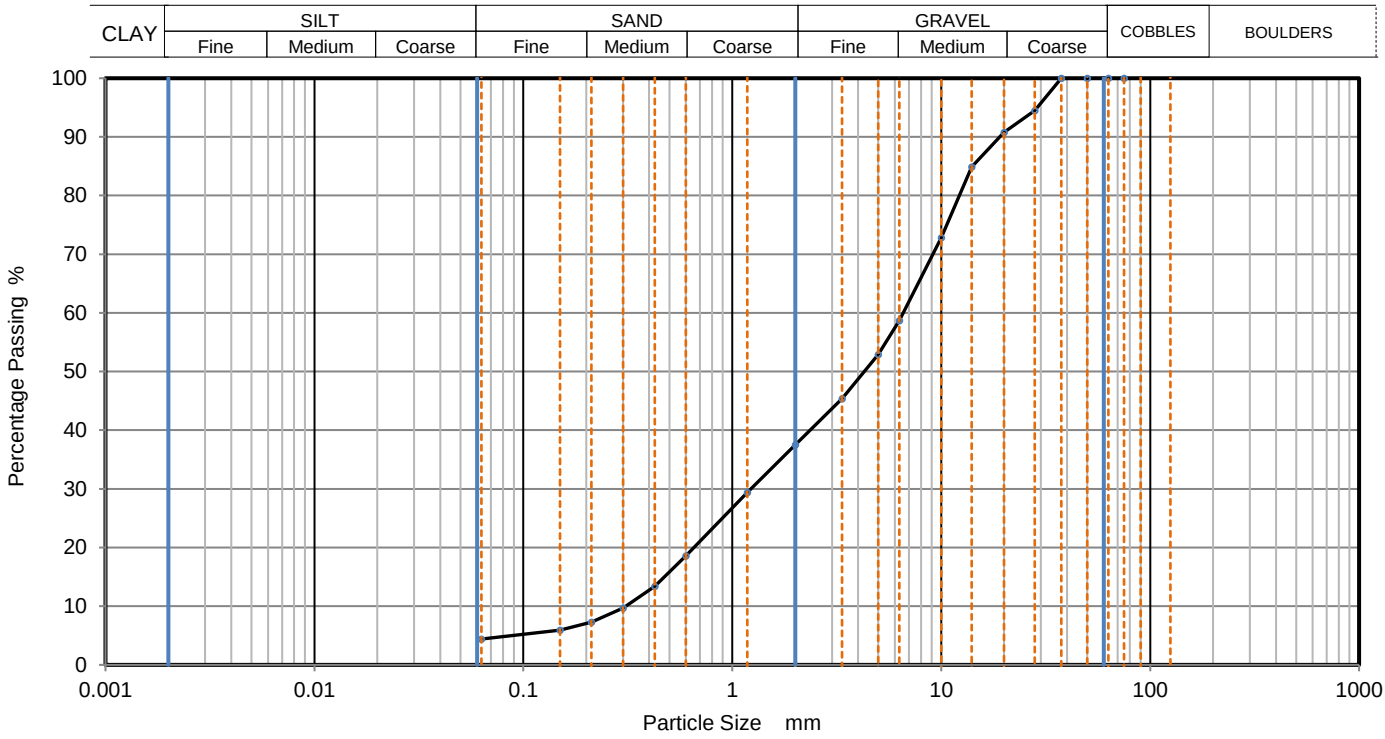
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:44 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | BH-14 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 13 |
| Soil Description | Dark grey slightly silty very sandy medium and fine GRAVEL. | | | Depth, m | 4.00 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL120210303206 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 95 | | |
| 20 | 91 | | |
| 14 | 85 | | |
| 10 | 73 | | |
| 6.3 | 59 | | |
| 5 | 53 | | |
| 3.35 | 45 | | |
| 2 | 38 | | |
| 1.18 | 29 | | |
| 0.6 | 19 | | |
| 0.425 | 13 | | |
| 0.3 | 10 | | |
| 0.212 | 7 | | |
| 0.15 | 6 | | |
| 0.063 | 4 | | |

| | |
|---|---|
| Dry Mass of sample, g | 762 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 63 |
| Sand | 33 |
| | |
| Fines <0.063mm | 4 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 6.58 |
| D30 | mm | 1.23 |
| D10 | mm | 0.309 |
| Uniformity Coefficient | | 21 |
| Curvature Coefficient | | 0.75 |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:44 | **1** |
| | | | | QC From No:R2 |

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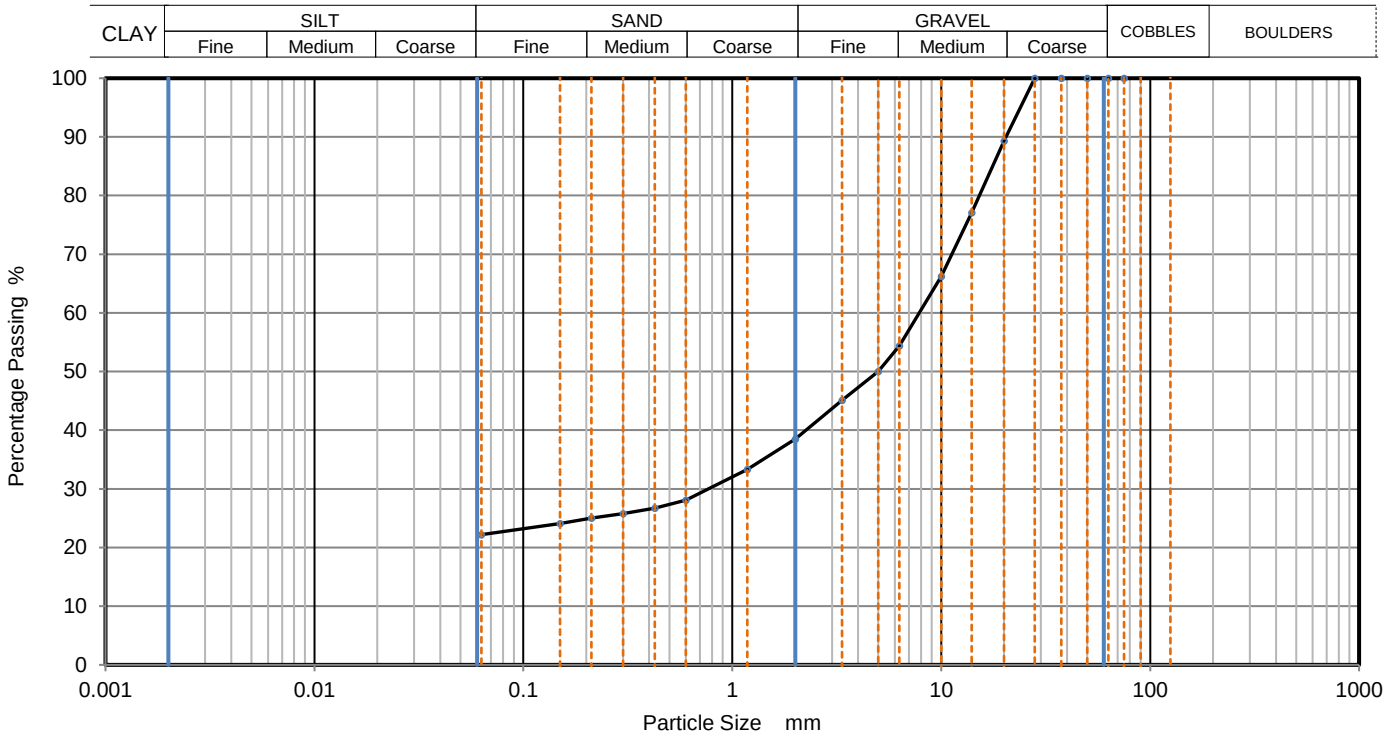
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | BPA-BH01 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 10 |
| Soil Description | Dark grey sandy very silty medium GRAVEL. | | | Depth, m | 3.00 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL120210303218 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 89 | | |
| 14 | 77 | | |
| 10 | 66 | | |
| 6.3 | 54 | | |
| 5 | 50 | | |
| 3.35 | 45 | | |
| 2 | 39 | | |
| 1.18 | 33 | | |
| 0.6 | 28 | | |
| 0.425 | 27 | | |
| 0.3 | 26 | | |
| 0.212 | 25 | | |
| 0.15 | 24 | | |
| 0.063 | 22 | | |

| | |
|---|---|
| Dry Mass of sample, g | 388 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 62 |
| Sand | 16 |
| | |
| Fines <0.063mm | 22 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 7.84 |
| D30 | mm | 0.77 |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:44 | **1** QC From No:R2 |

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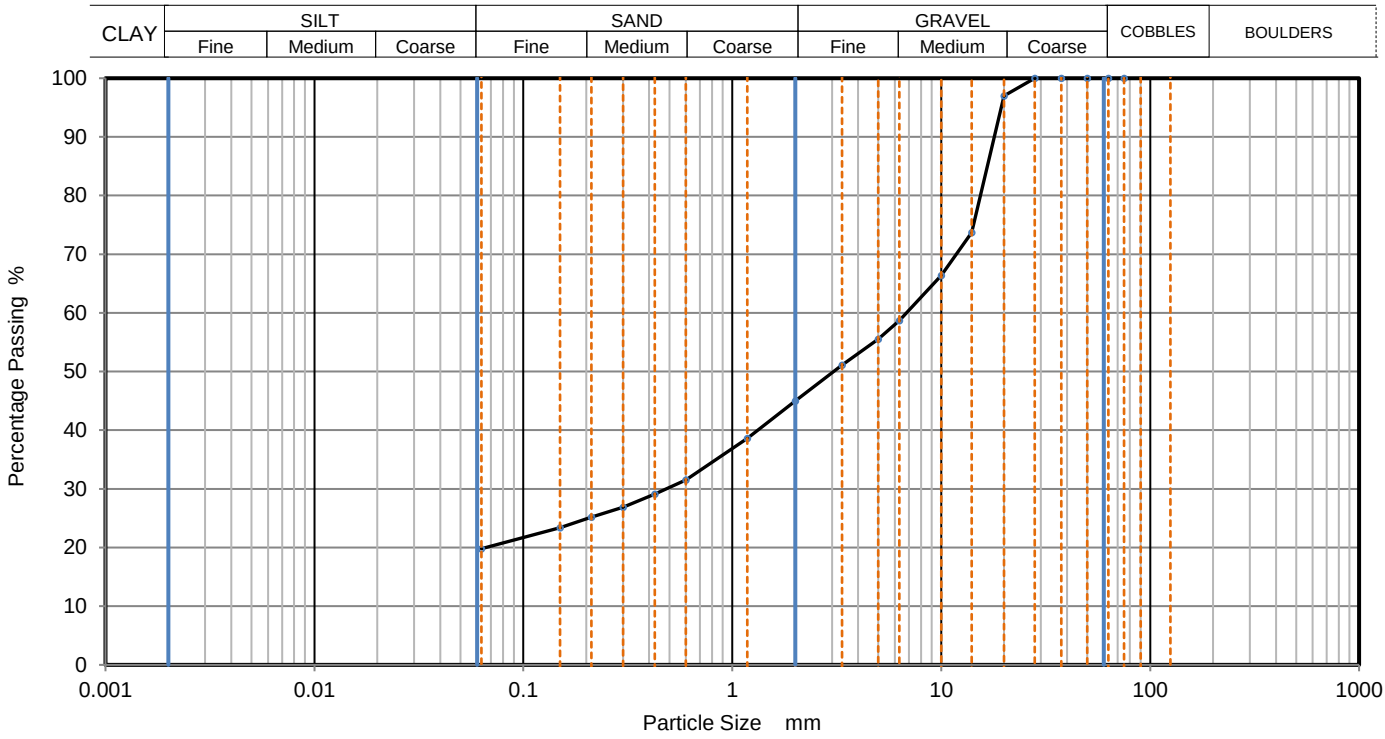
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | BPA-BH01 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 13 |
| Soil Description | Dark grey very silty very sandy medium GRAVEL. | | | Depth, m | 4.00 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL120210303221 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 97 | | |
| 14 | 74 | | |
| 10 | 66 | | |
| 6.3 | 59 | | |
| 5 | 56 | | |
| 3.35 | 51 | | |
| 2 | 45 | | |
| 1.18 | 39 | | |
| 0.6 | 32 | | |
| 0.425 | 29 | | |
| 0.3 | 27 | | |
| 0.212 | 25 | | |
| 0.15 | 23 | | |
| 0.063 | 20 | | |

| | |
|---|---|
| Dry Mass of sample, g | 594 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 55 |
| Sand | 25 |
| | |
| Fines <0.063mm | 20 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 6.83 |
| D30 | mm | 0.483 |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:44 | **1** QC From No:R2 |

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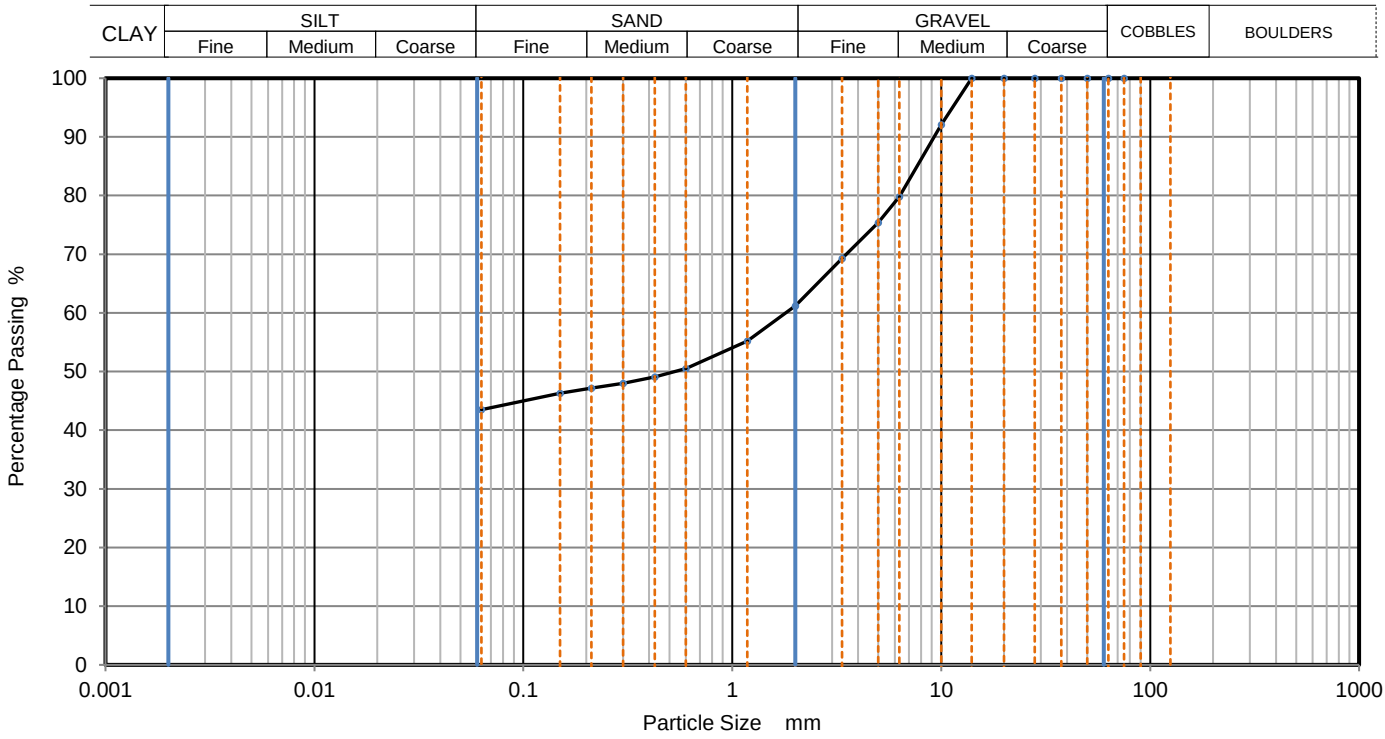
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | BPA-BH02 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 4 |
| Soil Description | Dark grey slightly sandy gravelly SILT. | | | Depth, m | 1.00 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL120210303227 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 100 | | |
| 10 | 92 | | |
| 6.3 | 80 | | |
| 5 | 75 | | |
| 3.35 | 69 | | |
| 2 | 61 | | |
| 1.18 | 55 | | |
| 0.6 | 51 | | |
| 0.425 | 49 | | |
| 0.3 | 48 | | |
| 0.212 | 47 | | |
| 0.15 | 46 | | |
| 0.063 | 44 | | |

| Dry Mass of sample, g | 365 |
|---|---|

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 39 |
| Sand | 18 |
| | |
| Fines <0.063mm | 44 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 1.79 |
| D30 | mm | |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

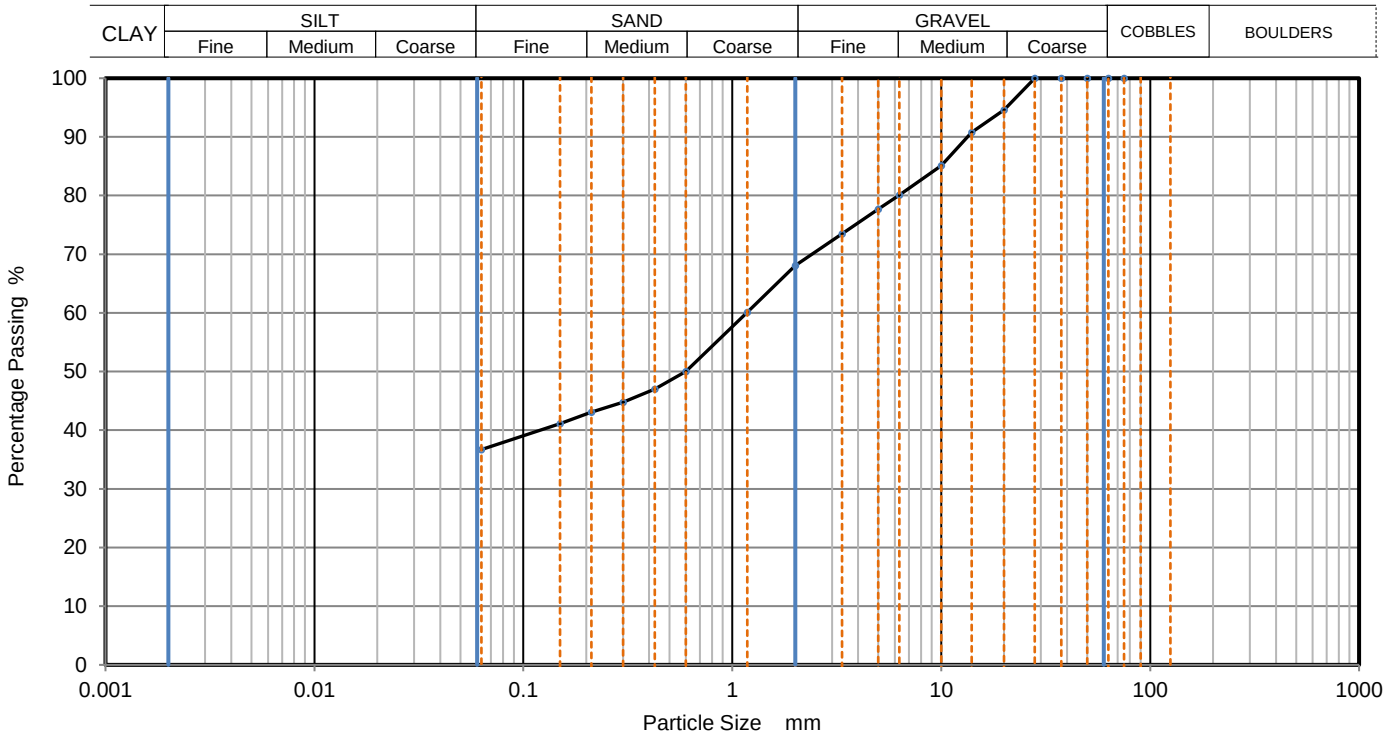
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:44 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | BPA-BH02 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 7 |
| Soil Description | Dark grey slightly sandy slightly gravelly SILT. | | | Depth, m | 2.00 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL120210303230 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 95 | | |
| 14 | 91 | | |
| 10 | 85 | | |
| 6.3 | 80 | | |
| 5 | 78 | | |
| 3.35 | 74 | | |
| 2 | 68 | | |
| 1.18 | 60 | | |
| 0.6 | 50 | | |
| 0.425 | 47 | | |
| 0.3 | 45 | | |
| 0.212 | 43 | | |
| 0.15 | 41 | | |
| 0.063 | 37 | | |

| Dry Mass of sample, g | 473 |
|---|---|

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 32 |
| Sand | 31 |
| | |
| Fines <0.063mm | 37 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 1.17 |
| D30 | mm | |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

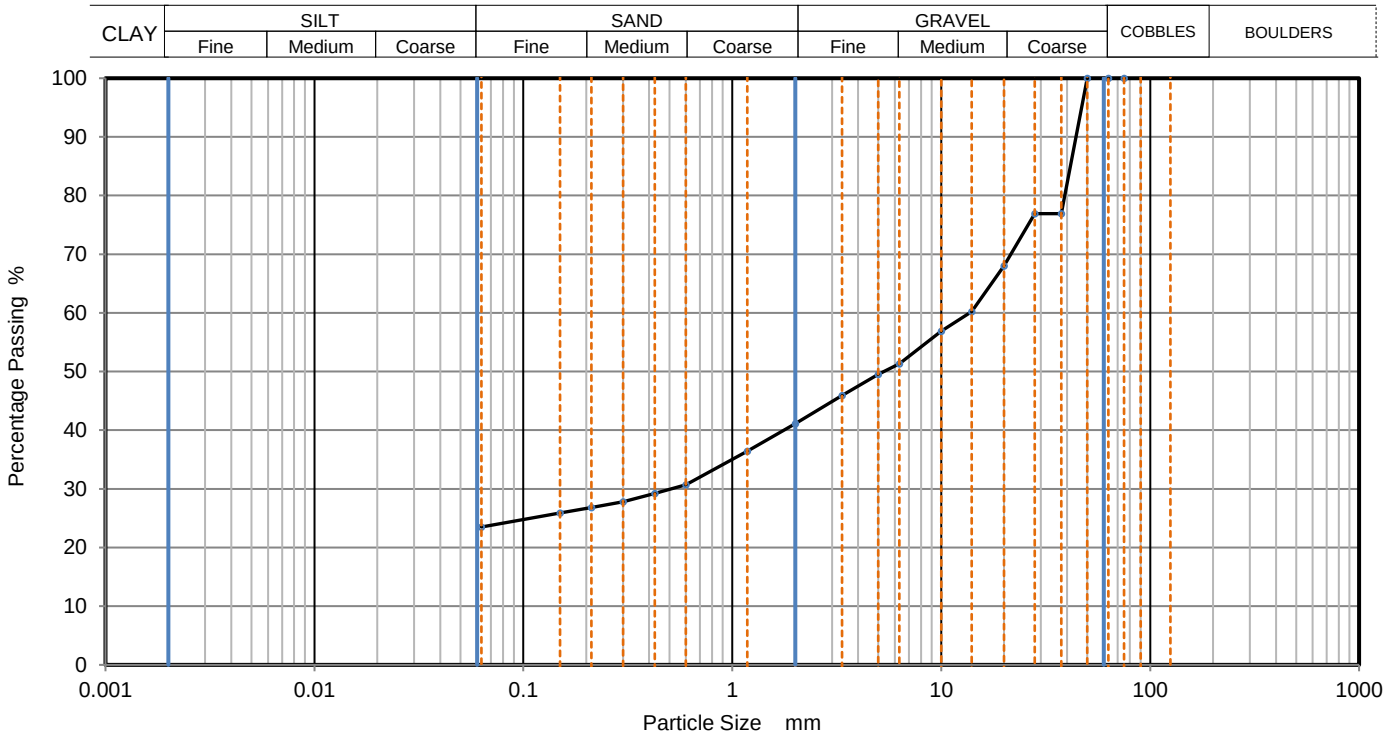
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:44 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | BPA-BH02 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 10 |
| Soil Description | Grey sandy very silty coarse GRAVEL. | | | Depth, m | 3.00 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL120210303233 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 77 | | |
| 28 | 77 | | |
| 20 | 68 | | |
| 14 | 60 | | |
| 10 | 57 | | |
| 6.3 | 51 | | |
| 5 | 50 | | |
| 3.35 | 46 | | |
| 2 | 41 | | |
| 1.18 | 36 | | |
| 0.6 | 31 | | |
| 0.425 | 29 | | |
| 0.3 | 28 | | |
| 0.212 | 27 | | |
| 0.15 | 26 | | |
| 0.063 | 24 | | |

| Dry Mass of sample, g | 669 |
|---|---|

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 59 |
| Sand | 18 |
| | |
| Fines <0.063mm | 23 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 13.8 |
| D30 | mm | 0.515 |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

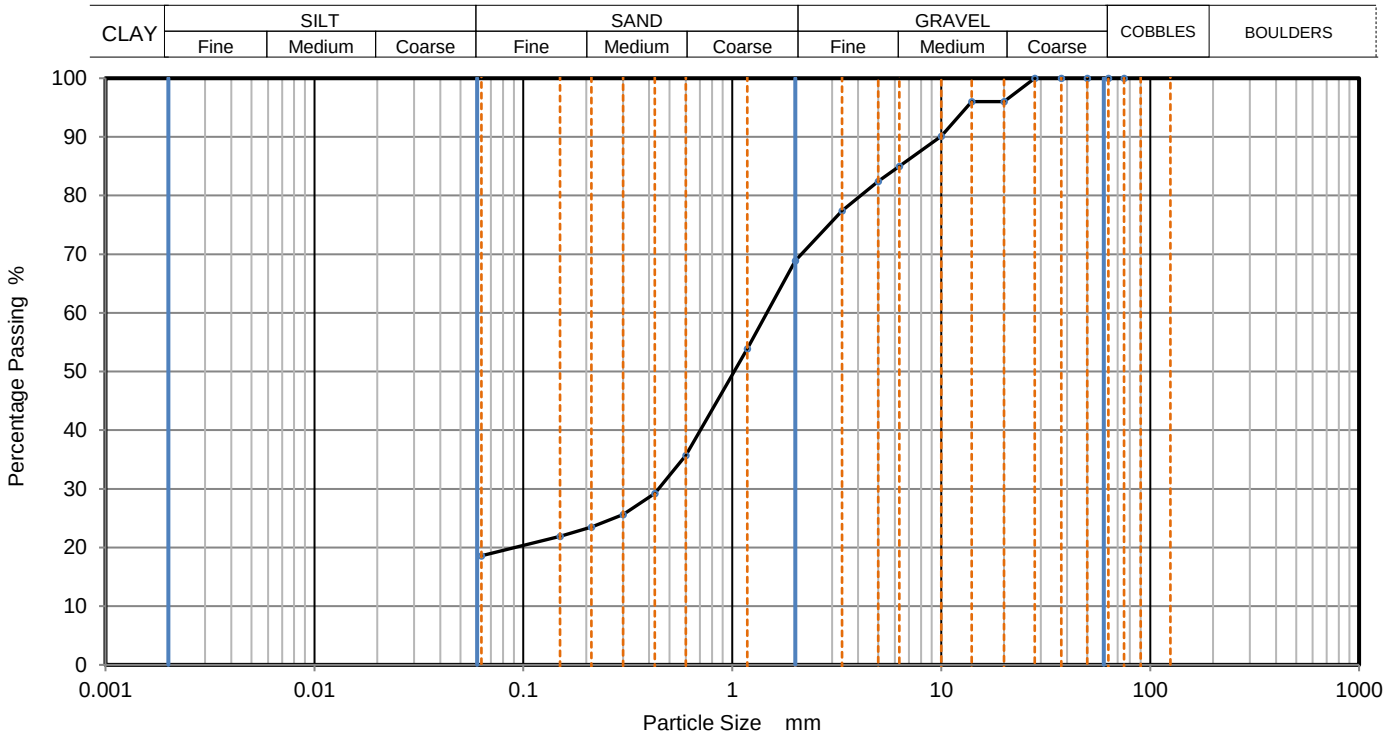
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:44 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | BPA-BH02 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 13 |
| Soil Description | Dark grey silty very gravelly coarse SAND. | | | Depth, m | 4.00 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL120210303236 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 96 | | |
| 14 | 96 | | |
| 10 | 90 | | |
| 6.3 | 85 | | |
| 5 | 82 | | |
| 3.35 | 77 | | |
| 2 | 69 | | |
| 1.18 | 54 | | |
| 0.6 | 36 | | |
| 0.425 | 29 | | |
| 0.3 | 26 | | |
| 0.212 | 24 | | |
| 0.15 | 22 | | |
| 0.063 | 19 | | |

| | |
|---|---|
| Dry Mass of sample, g | 667 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 31 |
| Sand | 50 |
| | |
| Fines <0.063mm | 19 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 1.46 |
| D30 | mm | 0.442 |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

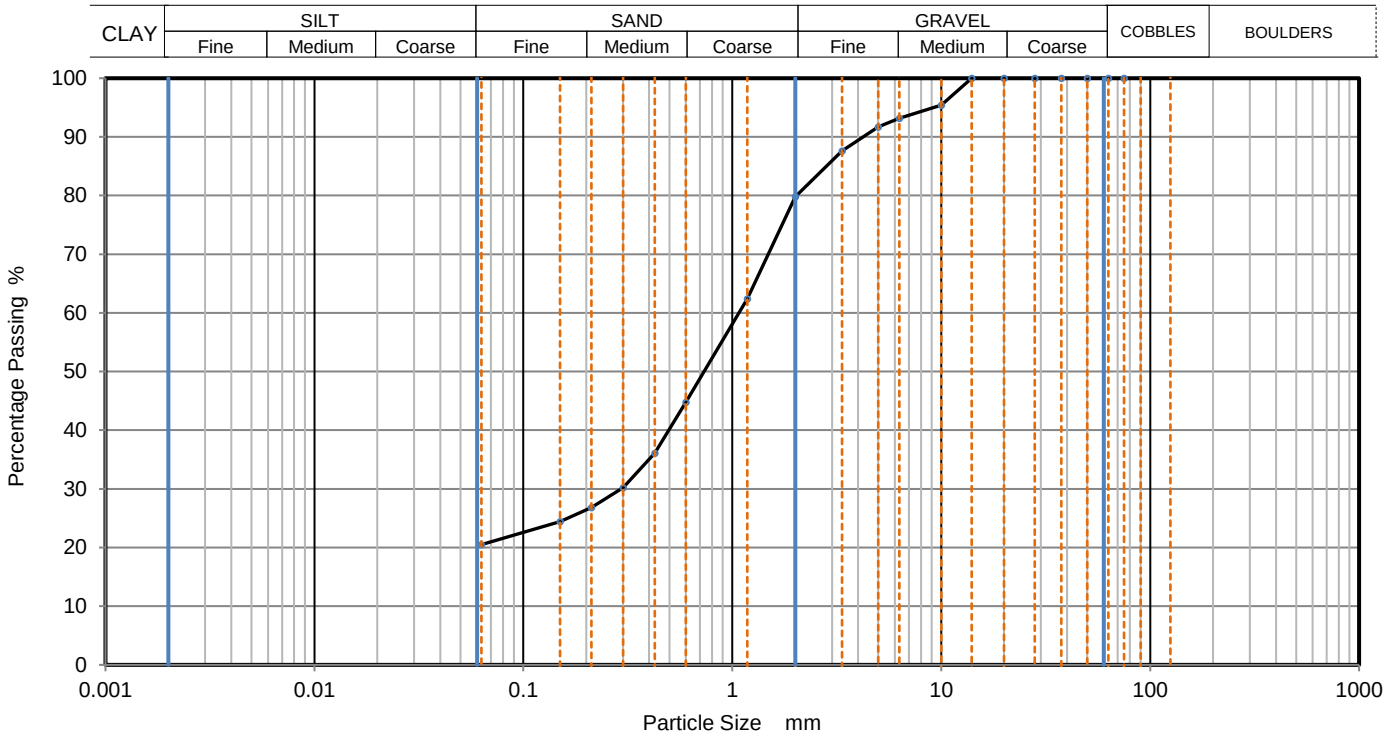
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:44 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | BPA-BH02 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 16 |
| Soil Description | Dark brown very gravelly very silty coarse SAND. | | | Depth, m | 5.00 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL120210303239 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 100 | | |
| 10 | 95 | | |
| 6.3 | 93 | | |
| 5 | 92 | | |
| 3.35 | 88 | | |
| 2 | 80 | | |
| 1.18 | 62 | | |
| 0.6 | 45 | | |
| 0.425 | 36 | | |
| 0.3 | 30 | | |
| 0.212 | 27 | | |
| 0.15 | 24 | | |
| 0.063 | 21 | | |

| Dry Mass of sample, g | 539 |
|---|---|

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 20 |
| Sand | 59 |
| | |
| Fines <0.063mm | 21 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 1.08 |
| D30 | mm | 0.294 |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

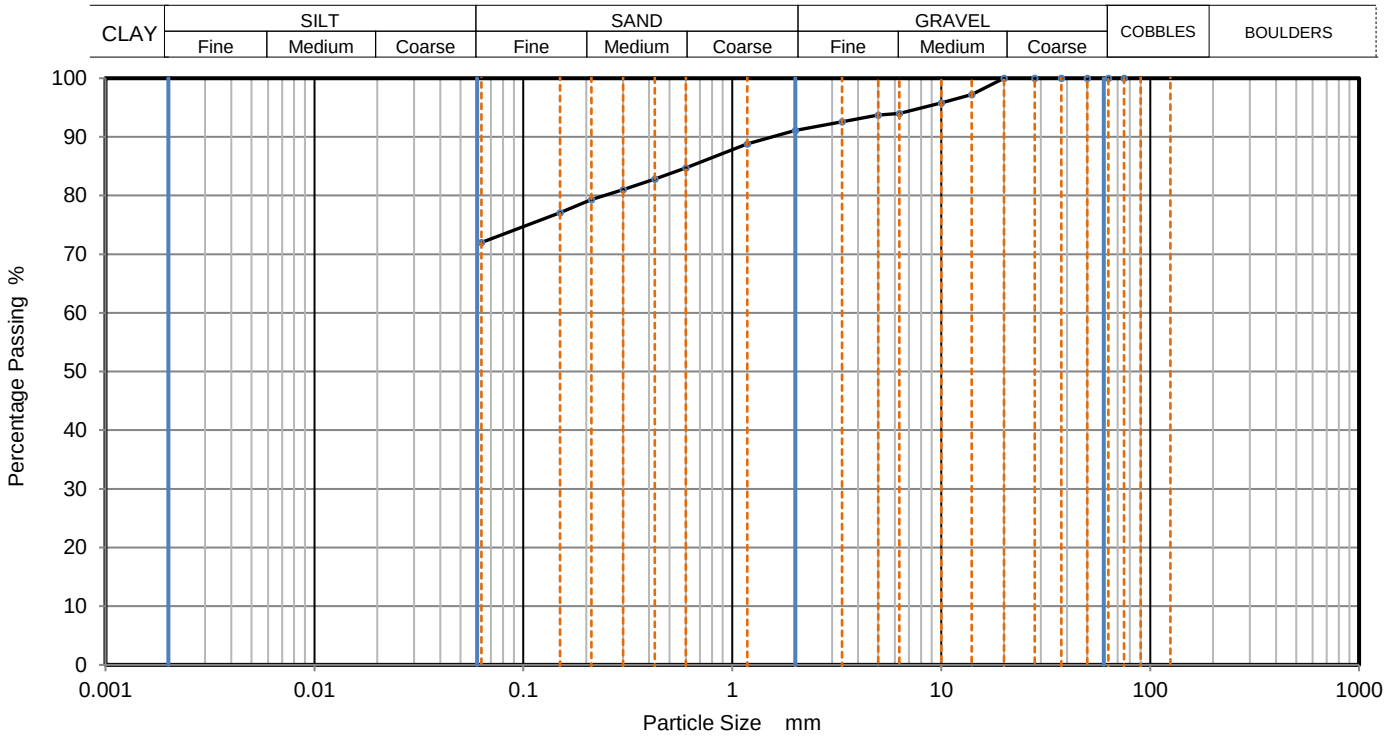
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:44 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | BPA-BH03A |
| Site Name | Ballivor Wind Farm | | | Sample No. | 4 |
| Soil Description | Grey slightly gravelly slightly sandy SILT. | | | Depth, m | 1.00 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL120210303250 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 97 | | |
| 10 | 96 | | |
| 6.3 | 94 | | |
| 5 | 94 | | |
| 3.35 | 93 | | |
| 2 | 91 | | |
| 1.18 | 89 | | |
| 0.6 | 85 | | |
| 0.425 | 83 | | |
| 0.3 | 81 | | |
| 0.212 | 79 | | |
| 0.15 | 77 | | |
| 0.063 | 72 | | |

| | |
|---|---|
| Dry Mass of sample, g | 430 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 9 |
| Sand | 19 |
| | |
| Fines <0.063mm | 72 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | |
| D30 | mm | |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

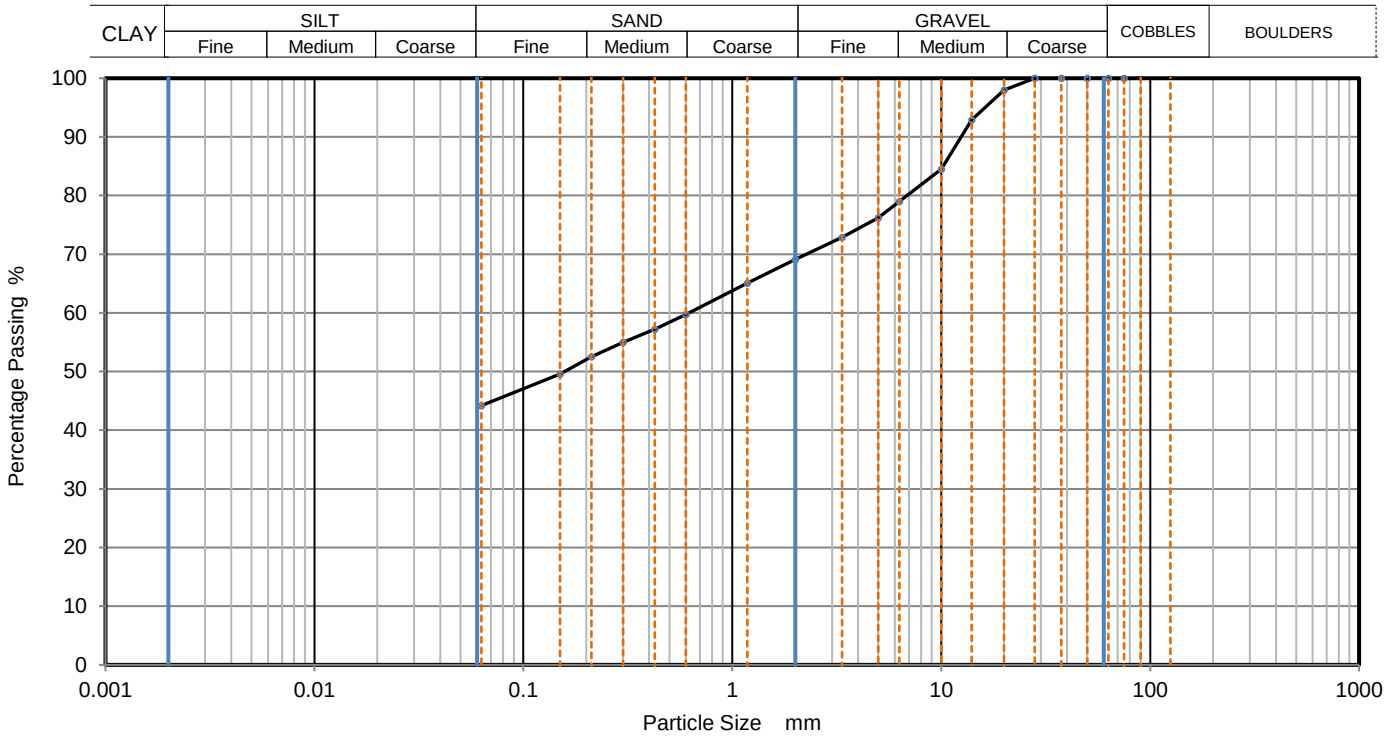
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:44 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | BPA-BH03A |
| Site Name | Ballivor Wind Farm | | | Sample No. | 7 |
| Soil Description | Dark grey slightly sandy slightly gravelly SILT. | | | Depth, m | 2.00 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL120210303253 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 98 | | |
| 14 | 93 | | |
| 10 | 85 | | |
| 6.3 | 79 | | |
| 5 | 76 | | |
| 3.35 | 73 | | |
| 2 | 69 | | |
| 1.18 | 65 | | |
| 0.6 | 60 | | |
| 0.425 | 57 | | |
| 0.3 | 55 | | |
| 0.212 | 53 | | |
| 0.15 | 50 | | |
| 0.063 | 44 | | |

| | |
|---|---|
| Dry Mass of sample, g | 528 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 31 |
| Sand | 25 |
| | |
| Fines <0.063mm | 44 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.626 |
| D30 | mm | |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

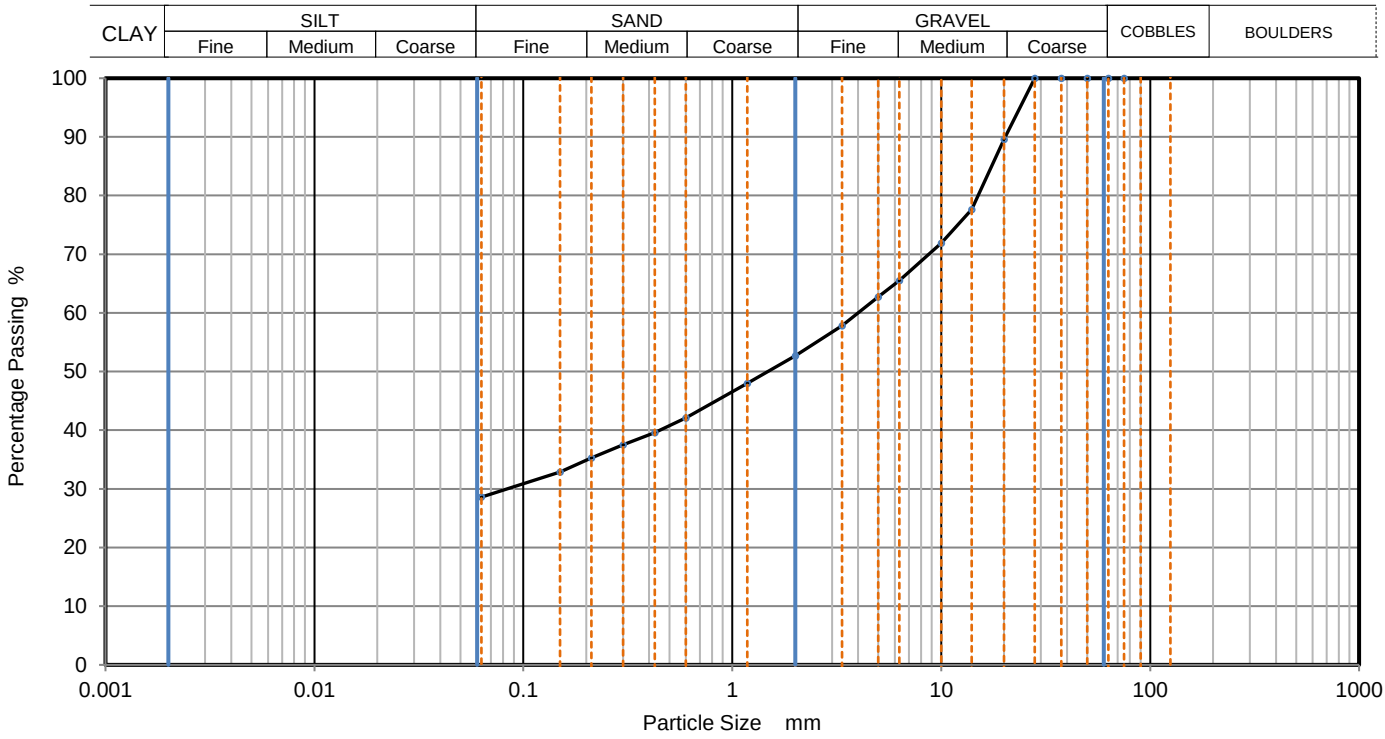
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:44 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | BPA-BH03A |
| Site Name | Ballivor Wind Farm | | | Sample No. | 10 |
| Soil Description | Dark grey very sandy very silty medium GRAVEL. | | | Depth, m | 3.00 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL120210303256 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 90 | | |
| 14 | 78 | | |
| 10 | 72 | | |
| 6.3 | 66 | | |
| 5 | 63 | | |
| 3.35 | 58 | | |
| 2 | 53 | | |
| 1.18 | 48 | | |
| 0.6 | 42 | | |
| 0.425 | 40 | | |
| 0.3 | 38 | | |
| 0.212 | 35 | | |
| 0.15 | 33 | | |
| 0.063 | 29 | | |

| Dry Mass of sample, g | 646 |
|---|---|

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 47 |
| Sand | 24 |
| | |
| Fines <0.063mm | 29 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 4 |
| D30 | mm | 0.0833 |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

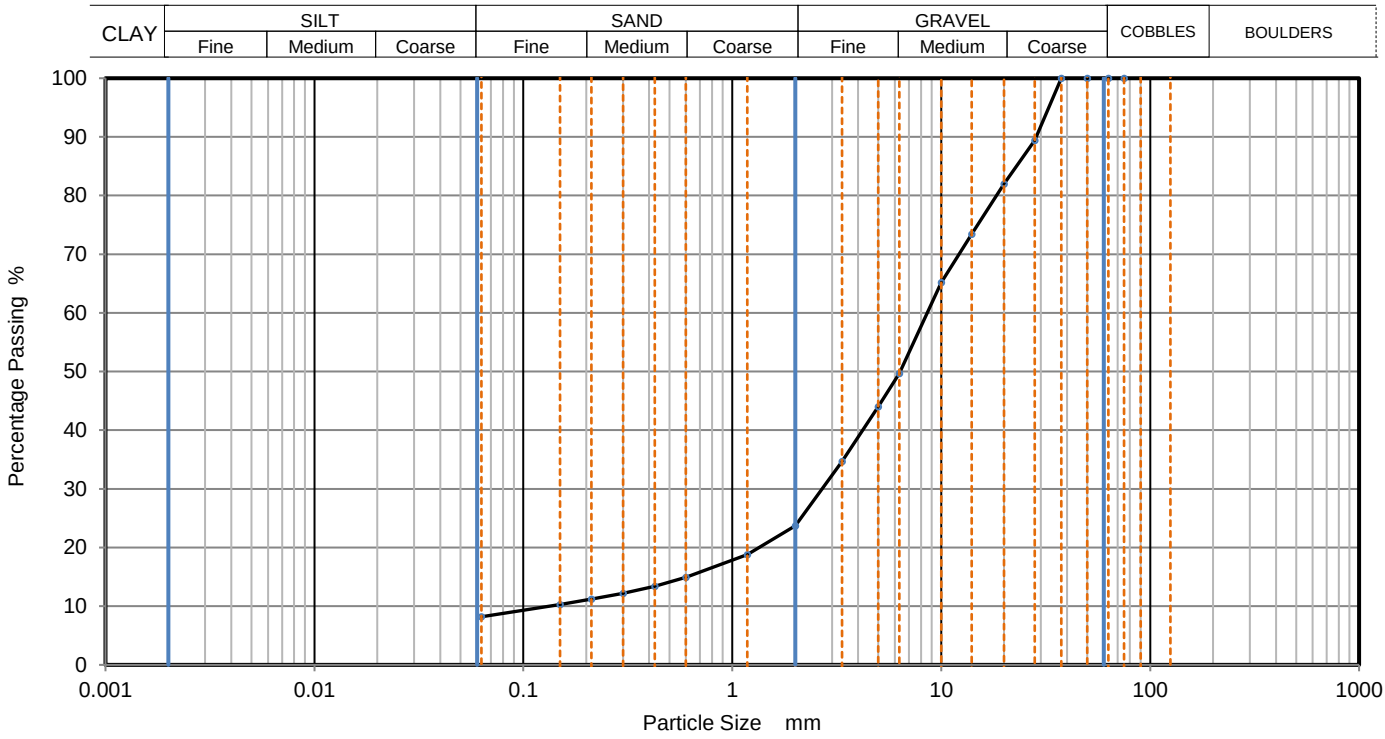
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:44 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | BPA-BH03A |
| Site Name | Ballivor Wind Farm | | | Sample No. | 13 |
| Soil Description | Grey silty sandy f,m,c GRAVEL. | | | Depth, m | 4.00 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL120210303259 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 89 | | |
| 20 | 82 | | |
| 14 | 73 | | |
| 10 | 65 | | |
| 6.3 | 50 | | |
| 5 | 44 | | |
| 3.35 | 35 | | |
| 2 | 24 | | |
| 1.18 | 19 | | |
| 0.6 | 15 | | |
| 0.425 | 13 | | |
| 0.3 | 12 | | |
| 0.212 | 11 | | |
| 0.15 | 10 | | |
| 0.063 | 8 | | |

| | |
|---|---|
| Dry Mass of sample, g | 863 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 76 |
| Sand | 16 |
| | |
| Fines <0.063mm | 8 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 8.56 |
| D30 | mm | 2.69 |
| D10 | mm | 0.132 |
| Uniformity Coefficient | | 65 |
| Curvature Coefficient | | 6.4 |

Remarks

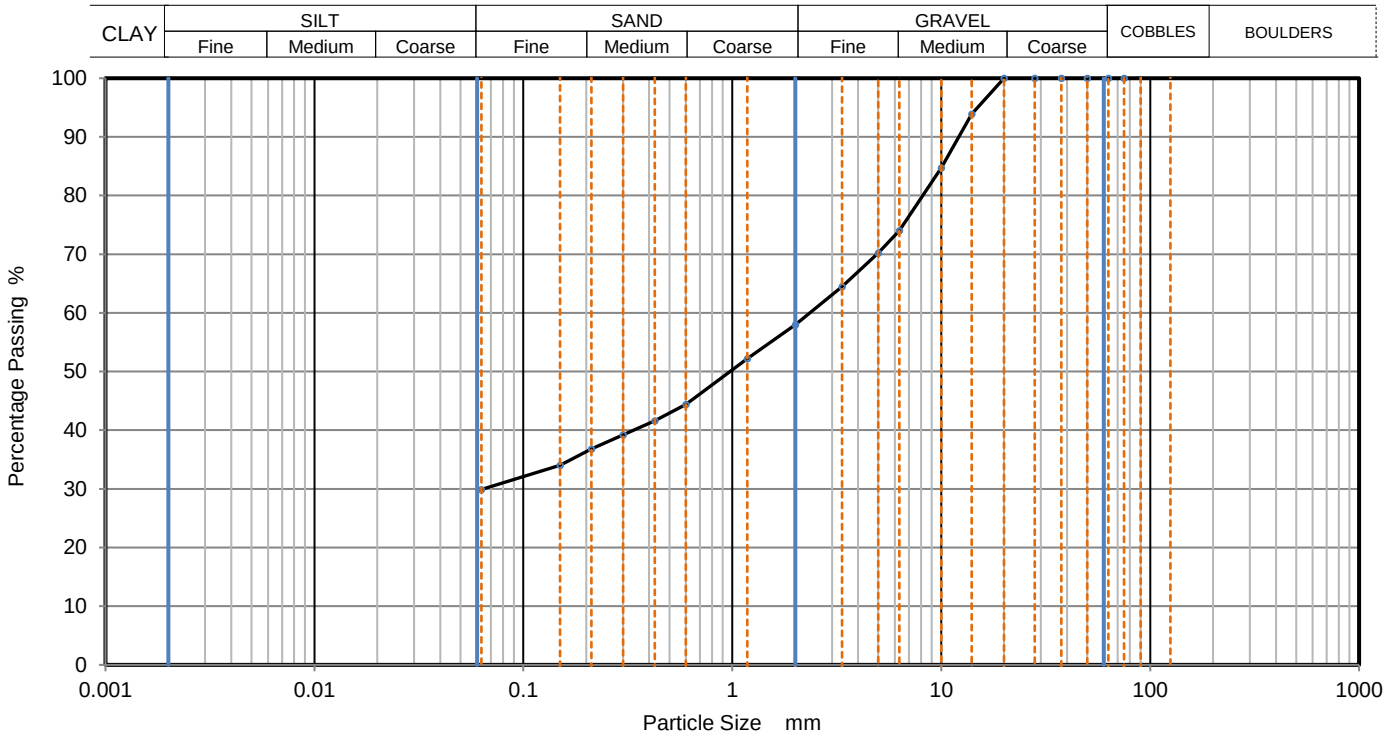
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:44 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | BPA-TP01 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 1 |
| Soil Description | Dark grey very sandy very silty medium GRAVEL. | | | Depth, m | 3.20 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL12021021748 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 94 | | |
| 10 | 85 | | |
| 6.3 | 74 | | |
| 5 | 70 | | |
| 3.35 | 65 | | |
| 2 | 58 | | |
| 1.18 | 52 | | |
| 0.6 | 44 | | |
| 0.425 | 42 | | |
| 0.3 | 39 | | |
| 0.212 | 37 | | |
| 0.15 | 34 | | |
| 0.063 | 30 | | |

| Dry Mass of sample, g | 742 |
|---|---|

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 42 |
| Sand | 28 |
| | |
| Fines <0.063mm | 30 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 2.35 |
| D30 | mm | 0.0646 |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

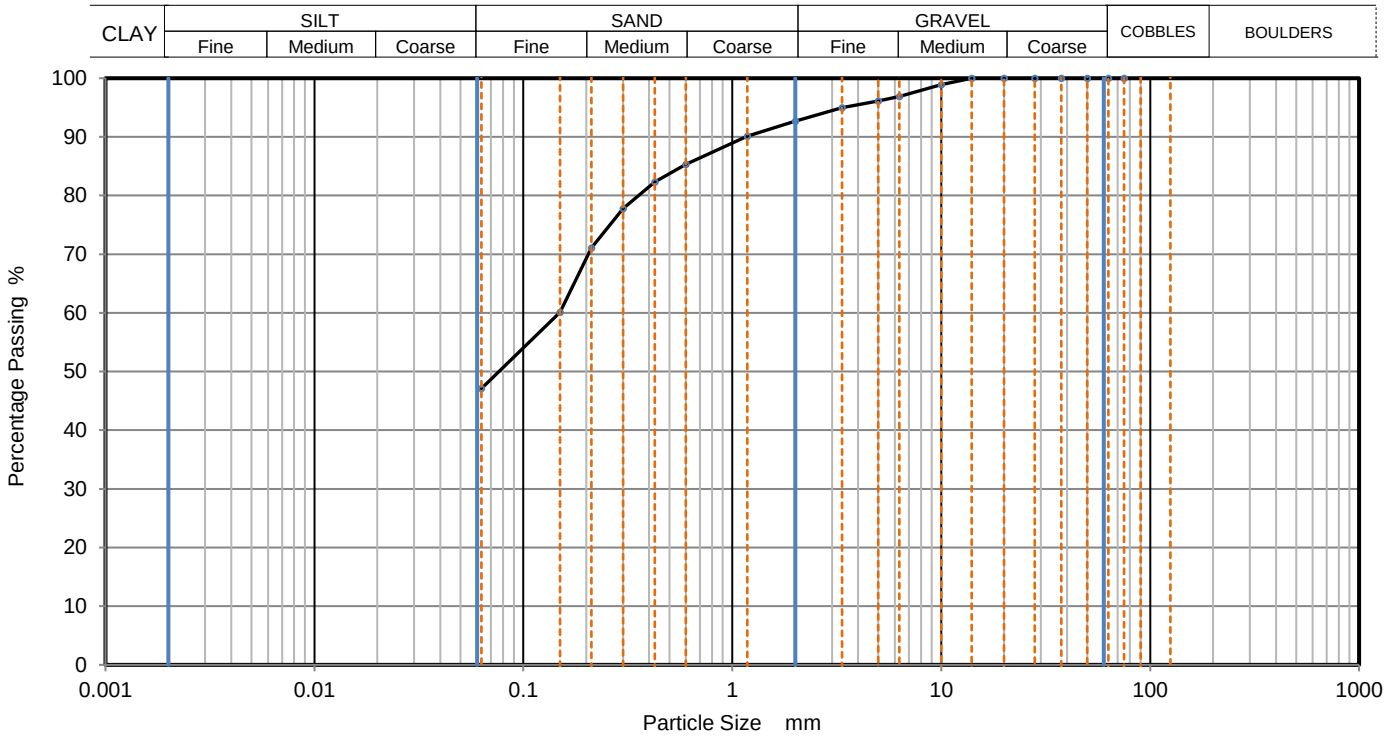
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:44 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | BPA-TP01 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 2 |
| Soil Description | Dark grey slightly gravelly sandy SILT. Sand is fine. | | | Depth, m | 4.00 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL12021021749 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 100 | | |
| 10 | 99 | | |
| 6.3 | 97 | | |
| 5 | 96 | | |
| 3.35 | 95 | | |
| 2 | 93 | | |
| 1.18 | 90 | | |
| 0.6 | 85 | | |
| 0.425 | 82 | | |
| 0.3 | 78 | | |
| 0.212 | 71 | | |
| 0.15 | 60 | | |
| 0.063 | 47 | | |

| | |
|---|---|
| Dry Mass of sample, g | 553 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 7 |
| Sand | 46 |
| | |
| Fines <0.063mm | 47 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.149 |
| D30 | mm | |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

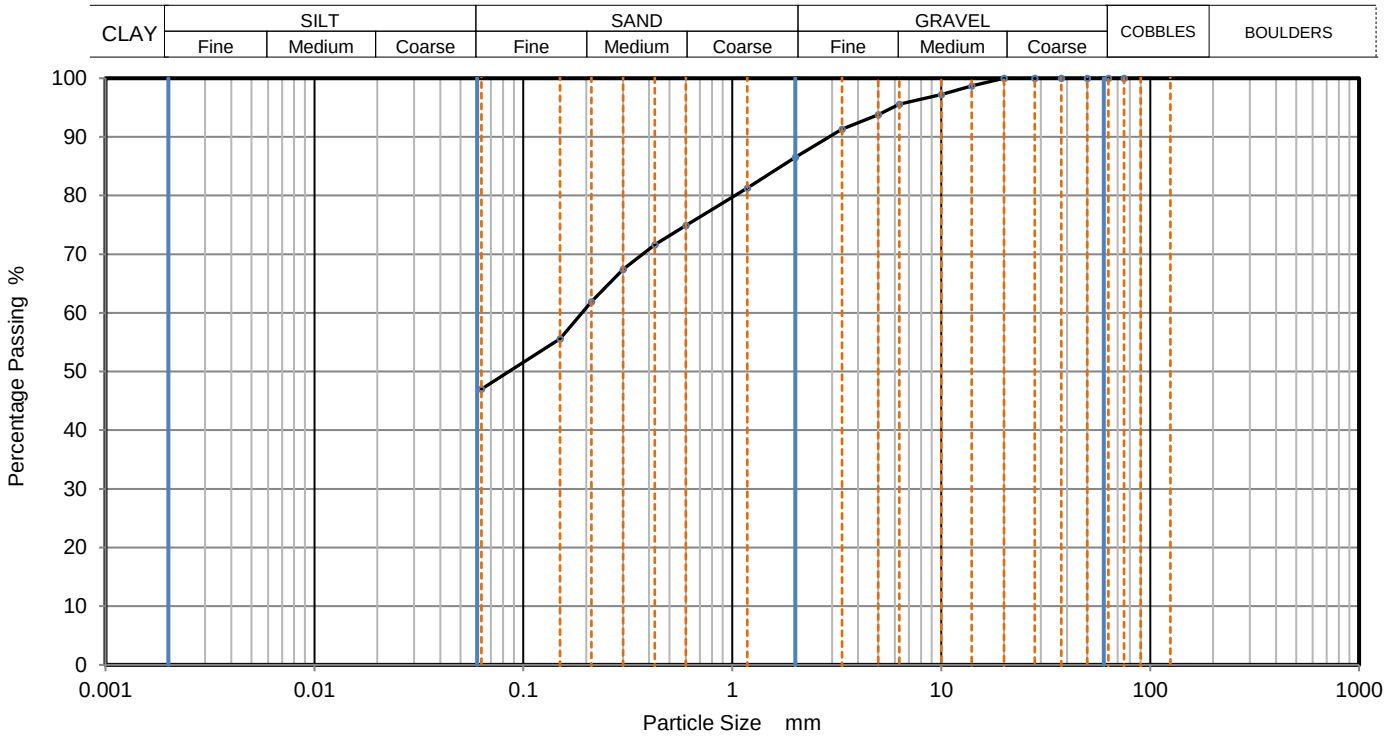
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:44 | **1** |
| | | | | QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | BPA-TP02 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 1 |
| Soil Description | Dark brown gravelly sandy SILT. | | | Depth, m | 1.50 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL12021021751 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 99 | | |
| 10 | 97 | | |
| 6.3 | 96 | | |
| 5 | 94 | | |
| 3.35 | 91 | | |
| 2 | 87 | | |
| 1.18 | 81 | | |
| 0.6 | 75 | | |
| 0.425 | 72 | | |
| 0.3 | 67 | | |
| 0.212 | 62 | | |
| 0.15 | 56 | | |
| 0.063 | 47 | | |

| | |
|---|---|
| Dry Mass of sample, g | 635 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 14 |
| Sand | 40 |
| | |
| Fines <0.063mm | 47 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.191 |
| D30 | mm | |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

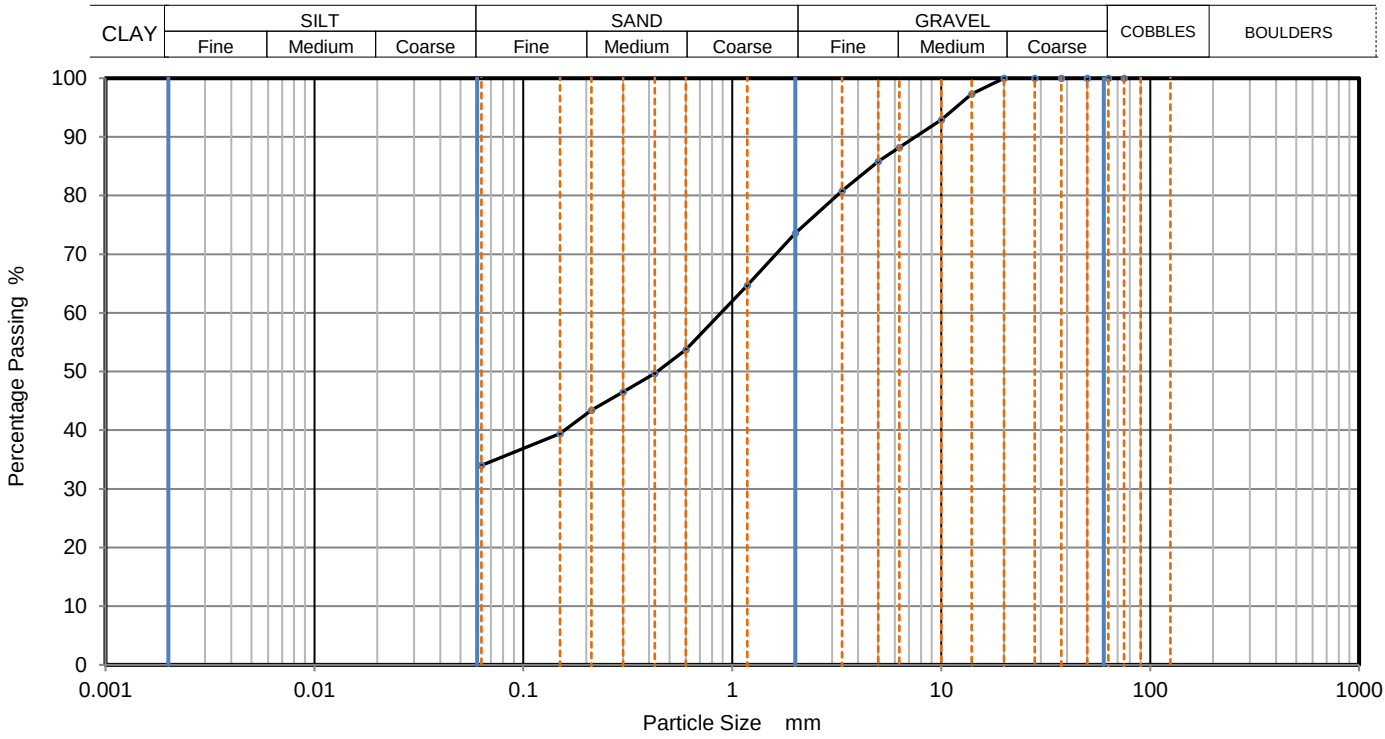
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:44 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | BPA-TP02 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 3 |
| Soil Description | Dark grey very gravelly very silty coarse SAND. | | | Depth, m | 2.50 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL12021021753 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 97 | | |
| 10 | 93 | | |
| 6.3 | 88 | | |
| 5 | 86 | | |
| 3.35 | 81 | | |
| 2 | 74 | | |
| 1.18 | 65 | | |
| 0.6 | 54 | | |
| 0.425 | 50 | | |
| 0.3 | 47 | | |
| 0.212 | 43 | | |
| 0.15 | 39 | | |
| 0.063 | 34 | | |

| Dry Mass of sample, g | 667 |
|---|---|

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 26 |
| Sand | 40 |
| | |
| Fines <0.063mm | 34 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.885 |
| D30 | mm | |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

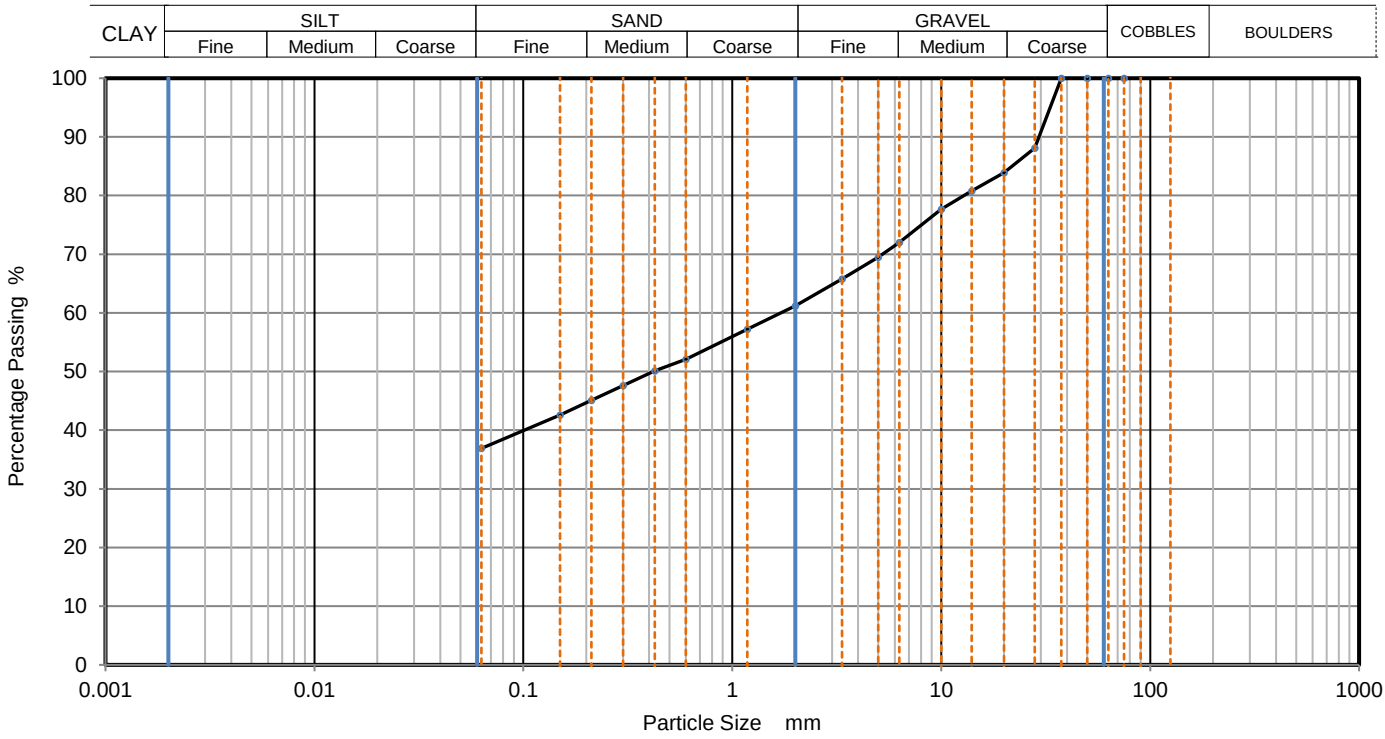
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:44 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | TP-02 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 3 |
| Soil Description | Light grey slightly sandy gravelly SILT. | | | Depth, m | 2.80 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL12021021760 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 88 | | |
| 20 | 84 | | |
| 14 | 81 | | |
| 10 | 78 | | |
| 6.3 | 72 | | |
| 5 | 70 | | |
| 3.35 | 66 | | |
| 2 | 61 | | |
| 1.18 | 57 | | |
| 0.6 | 52 | | |
| 0.425 | 50 | | |
| 0.3 | 48 | | |
| 0.212 | 45 | | |
| 0.15 | 43 | | |
| 0.063 | 37 | | |

| Dry Mass of sample, g | 811 |
|---|---|

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 39 |
| Sand | 24 |
| | |
| Fines <0.063mm | 37 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 1.7 |
| D30 | mm | |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

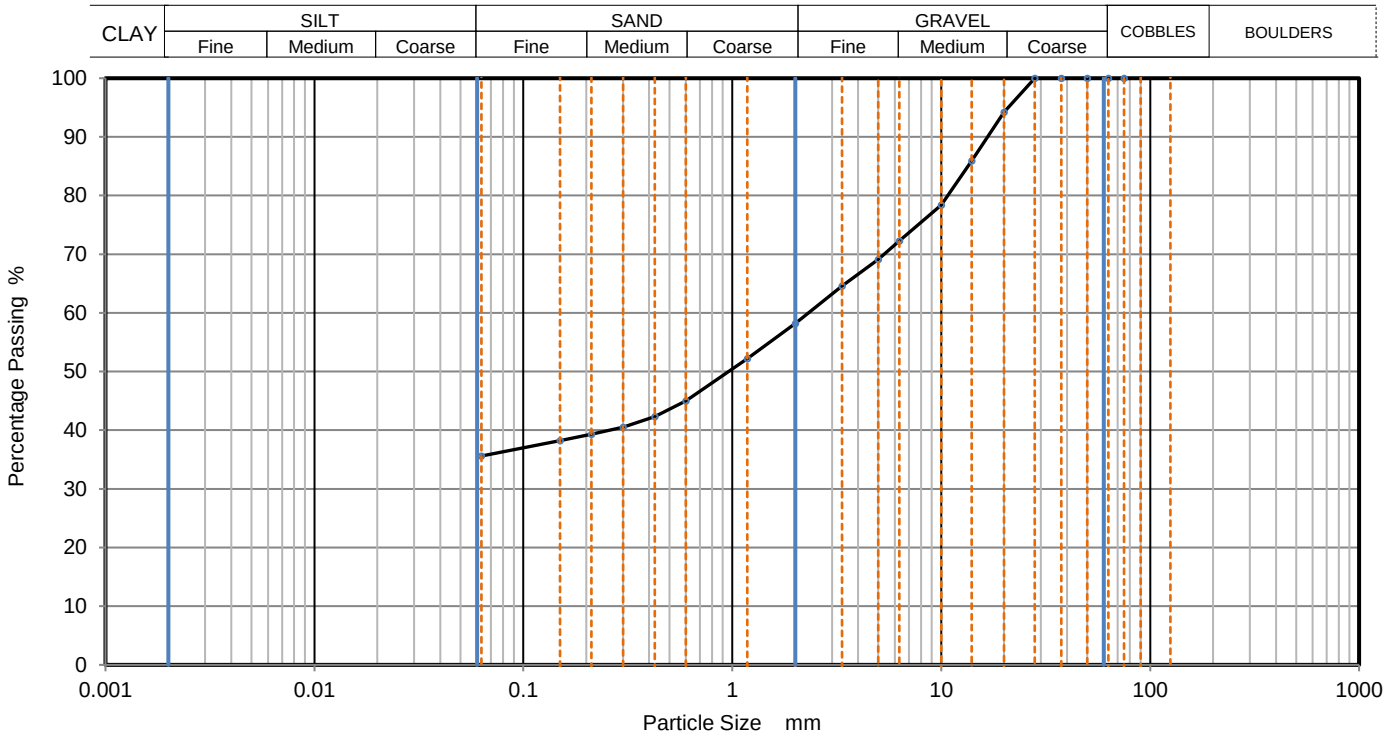
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:44 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | TP-04 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 3 |
| Soil Description | Grey slightly sandy gravelly SILT. Gravel is medium. | | | Depth, m | 1.70 |
| Specimen Reference | | Specimen Depth | m | Sample Type | D |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL12021021769 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 94 | | |
| 14 | 86 | | |
| 10 | 78 | | |
| 6.3 | 72 | | |
| 5 | 69 | | |
| 3.35 | 65 | | |
| 2 | 58 | | |
| 1.18 | 52 | | |
| 0.6 | 45 | | |
| 0.425 | 42 | | |
| 0.3 | 41 | | |
| 0.212 | 39 | | |
| 0.15 | 38 | | |
| 0.063 | 36 | | |

| | |
|---|---|
| Dry Mass of sample, g | 744 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 42 |
| Sand | 23 |
| | |
| Fines <0.063mm | 36 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 2.31 |
| D30 | mm | |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

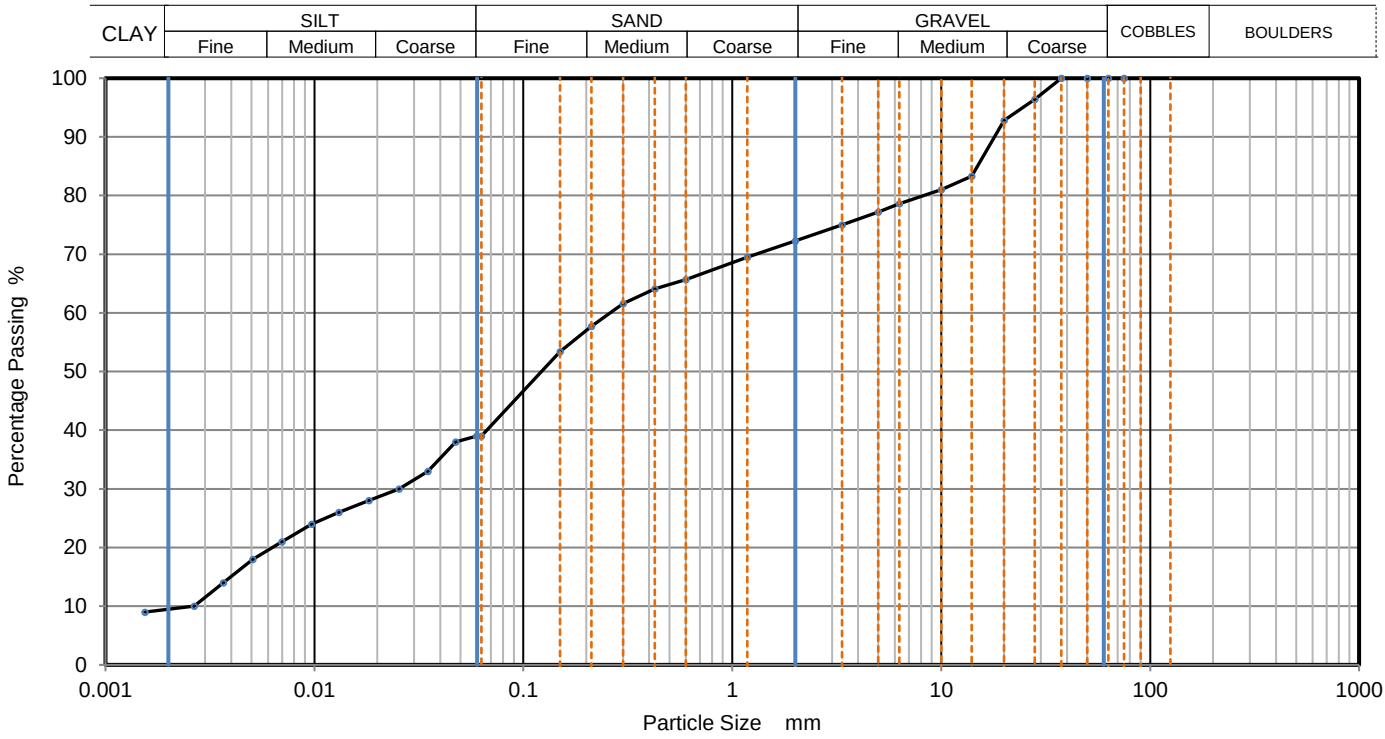
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:45 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | TP-08 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 2 |
| Soil Description | Light grey slightly gravelly slightly sandy SILT. | | | Depth, m | 2.20 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clauses 9.2 and 9.5 | | | KeyLAB ID | IDL12021021778 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | 0.0596 | 39 |
| | | 0.0474 | 38 |
| 75 | 100 | 0.0349 | 33 |
| 63 | 100 | 0.0254 | 30 |
| 50 | 100 | 0.0182 | 28 |
| 37.5 | 100 | 0.0131 | 26 |
| 28 | 96 | 0.0097 | 24 |
| 20 | 93 | 0.0070 | 21 |
| 14 | 83 | 0.0051 | 18 |
| 10 | 81 | 0.0037 | 14 |
| 6.3 | 79 | 0.0027 | 10 |
| 5 | 77 | 0.0015 | 9 |
| 3.35 | 75 | | |
| 2 | 72 | | |
| 1.18 | 70 | | |
| 0.6 | 66 | Particle density (assumed) | |
| 0.425 | 64 | 2.65 Mg/m3 | |
| 0.3 | 62 | | |
| 0.212 | 58 | | |
| 0.15 | 53 | | |
| 0.063 | 39 | | |

| Dry Mass of sample, g | 854 |
|---|---|

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 28 |
| Sand | 33 |
| Silt | 29 |
| Clay | 10 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.26 |
| D30 | mm | 0.0261 |
| D10 | mm | 0.00234 |
| Uniformity Coefficient | | 110 |
| Curvature Coefficient | | 1.1 |

Remarks

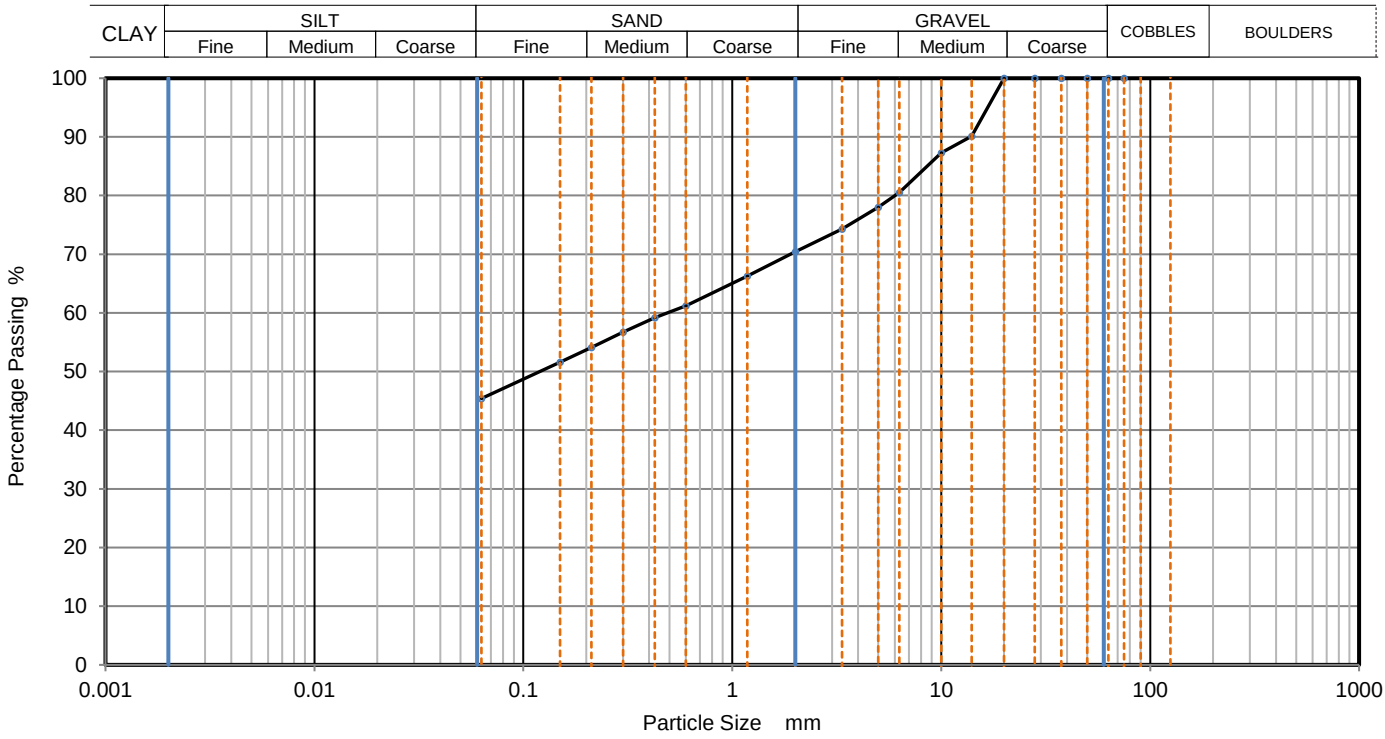
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:45 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | TP-12 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 3 |
| Soil Description | Dark grey slightly sandy slightly gravelly SILT. | | | Depth, m | 3.00 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL12021021793 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 90 | | |
| 10 | 87 | | |
| 6.3 | 81 | | |
| 5 | 78 | | |
| 3.35 | 74 | | |
| 2 | 70 | | |
| 1.18 | 66 | | |
| 0.6 | 61 | | |
| 0.425 | 59 | | |
| 0.3 | 57 | | |
| 0.212 | 54 | | |
| 0.15 | 52 | | |
| 0.063 | 45 | | |

| | |
|---|---|
| Dry Mass of sample, g | 751 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 30 |
| Sand | 25 |
| | |
| Fines <0.063mm | 45 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.489 |
| D30 | mm | |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

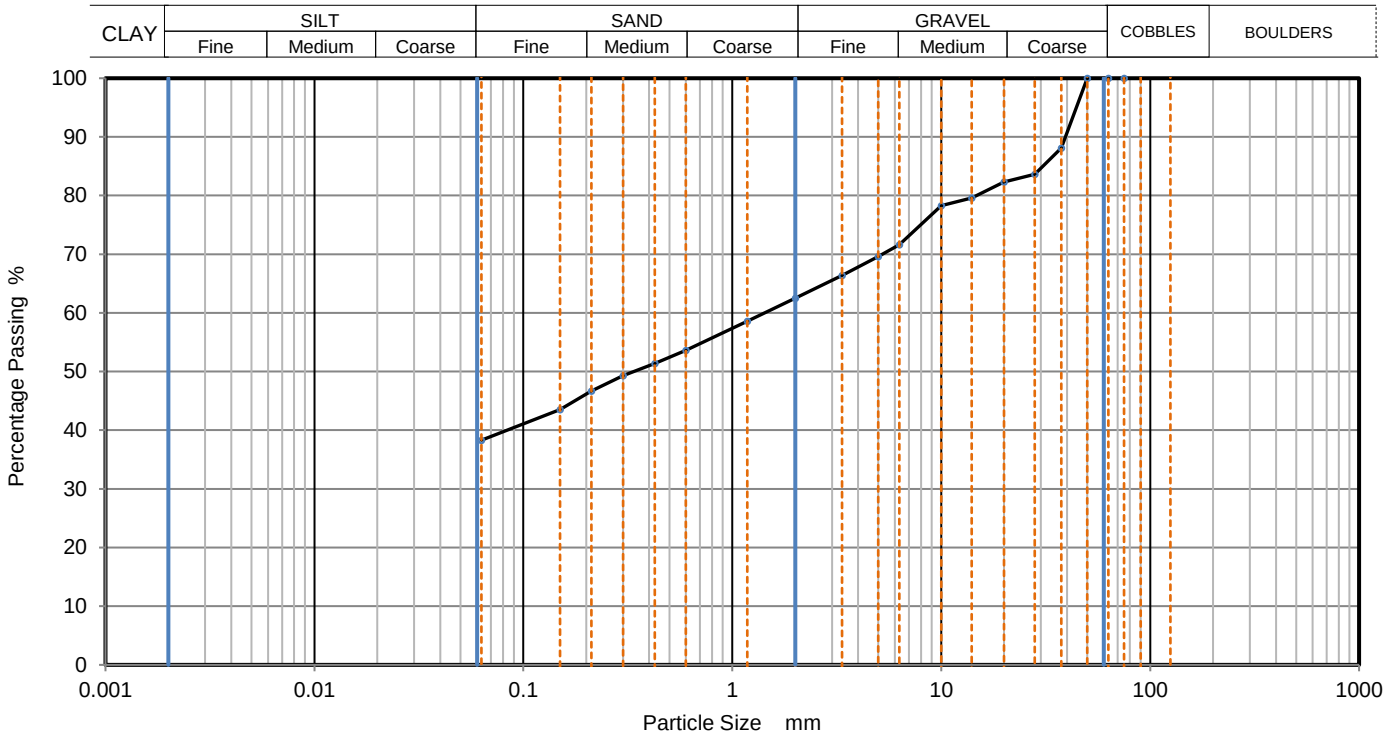
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:45 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | TP-13 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 3 |
| Soil Description | Grey slightly sandy gravelly clayey SILT. | | | Depth, m | 3.00 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL12021021799 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 88 | | |
| 28 | 84 | | |
| 20 | 82 | | |
| 14 | 80 | | |
| 10 | 78 | | |
| 6.3 | 72 | | |
| 5 | 70 | | |
| 3.35 | 66 | | |
| 2 | 63 | | |
| 1.18 | 59 | | |
| 0.6 | 54 | | |
| 0.425 | 51 | | |
| 0.3 | 49 | | |
| 0.212 | 47 | | |
| 0.15 | 44 | | |
| 0.063 | 38 | | |

| Dry Mass of sample, g | 925 |
|---|---|

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 38 |
| Sand | 24 |
| | |
| Fines <0.063mm | 38 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 1.43 |
| D30 | mm | |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

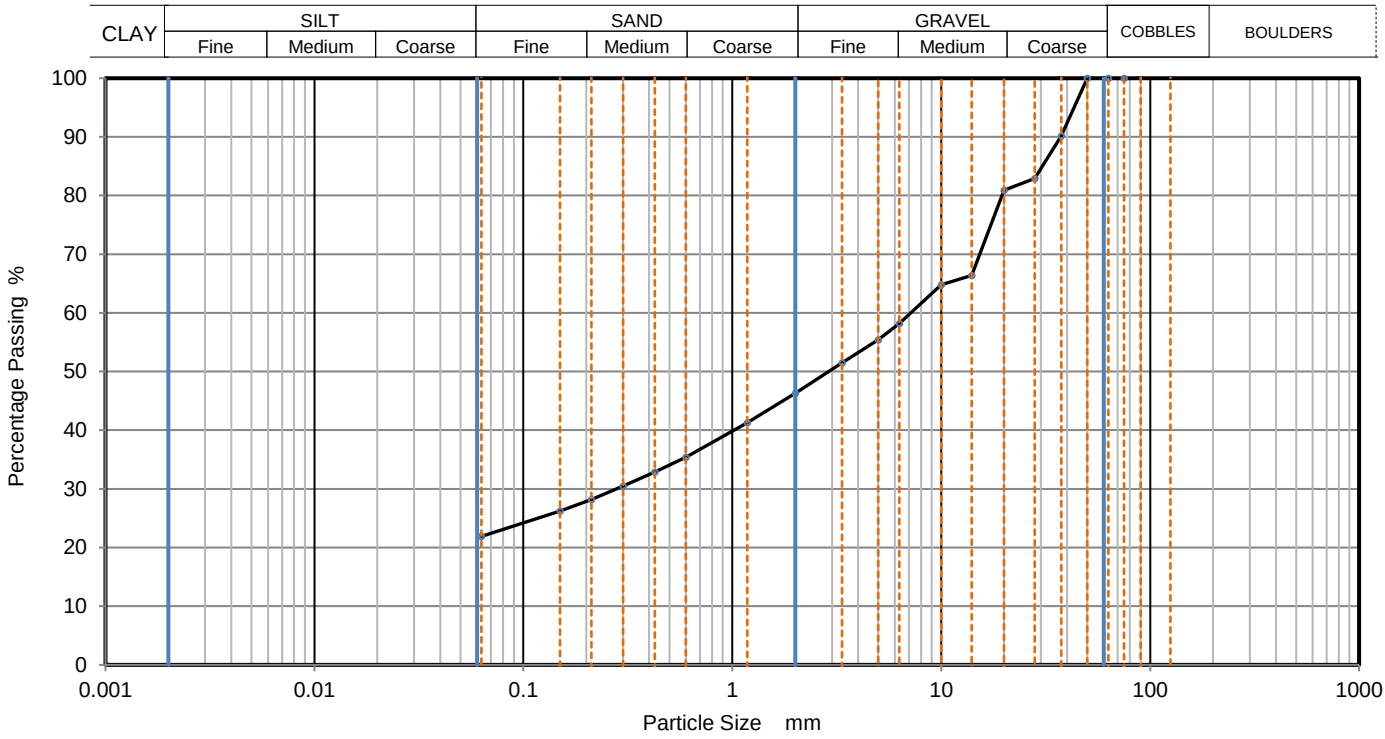
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:45 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | TP-18 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 3 |
| Soil Description | Dark grey very silty very sandy medium GRAVEL. | | | Depth, m | 3.20 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL120210217114 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 90 | | |
| 28 | 83 | | |
| 20 | 81 | | |
| 14 | 66 | | |
| 10 | 65 | | |
| 6.3 | 58 | | |
| 5 | 55 | | |
| 3.35 | 52 | | |
| 2 | 46 | | |
| 1.18 | 41 | | |
| 0.6 | 35 | | |
| 0.425 | 33 | | |
| 0.3 | 31 | | |
| 0.212 | 28 | | |
| 0.15 | 26 | | |
| 0.063 | 22 | | |

| | |
|---|---|
| Dry Mass of sample, g | 918 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 54 |
| Sand | 24 |
| | |
| Fines <0.063mm | 22 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 7.16 |
| D30 | mm | 0.278 |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

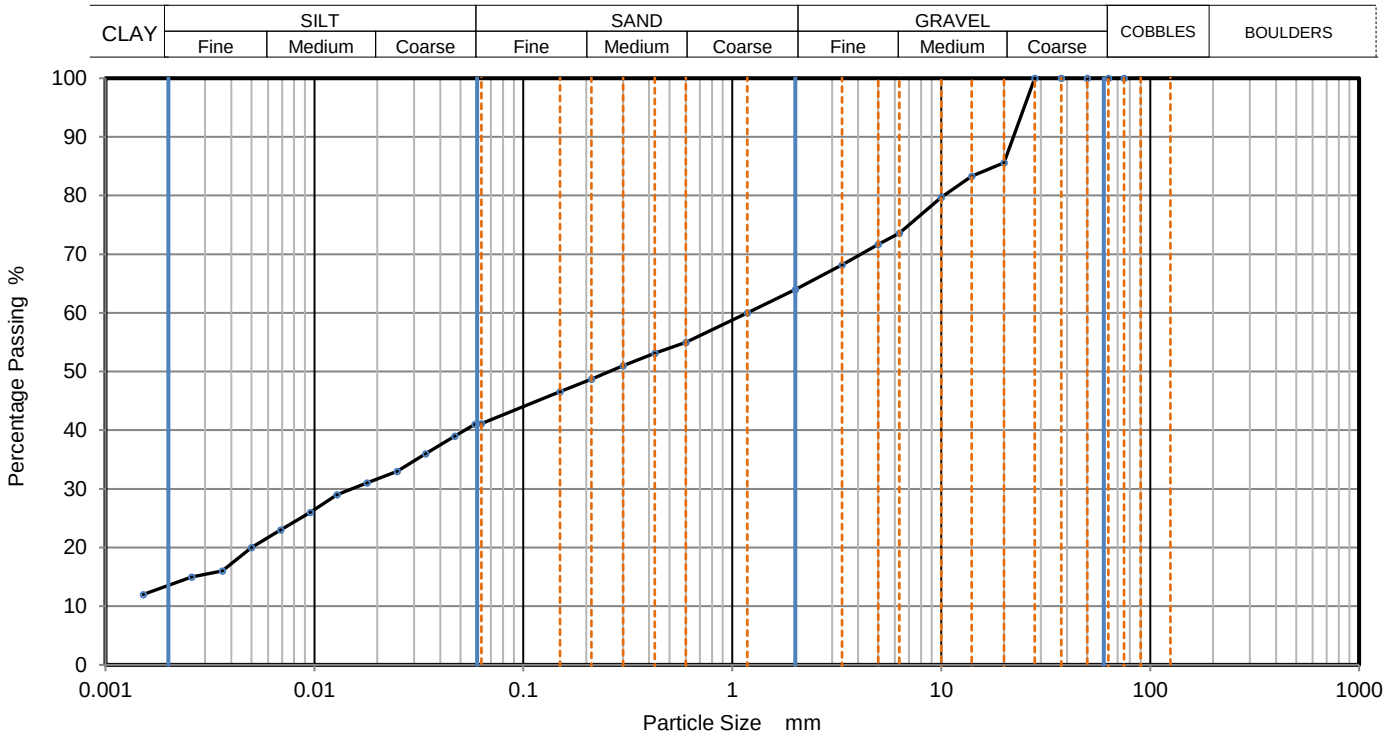
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:45 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | TP-20 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 2 |
| Soil Description | Dark grey slightly sandy gravelly SILT. | | | Depth, m | 2.40 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clauses 9.2 and 9.5 | | | KeyLAB ID | IDL120210217117 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | 0.0586 | 41 |
| | | 0.0470 | 39 |
| 75 | 100 | 0.0341 | 36 |
| 63 | 100 | 0.0249 | 33 |
| 50 | 100 | 0.0179 | 31 |
| 37.5 | 100 | 0.0128 | 29 |
| 28 | 100 | 0.0096 | 26 |
| 20 | 86 | 0.0069 | 23 |
| 14 | 83 | 0.0050 | 20 |
| 10 | 80 | 0.0036 | 16 |
| 6.3 | 74 | 0.0026 | 15 |
| 5 | 72 | 0.0015 | 12 |
| 3.35 | 68 | | |
| 2 | 64 | | |
| 1.18 | 60 | | |
| 0.6 | 55 | Particle density (assumed) | |
| 0.425 | 53 | 2.65 | Mg/m3 |
| 0.3 | 51 | | |
| 0.212 | 49 | | |
| 0.15 | 47 | | |
| 0.063 | 41 | | |

| Dry Mass of sample, g | 984 |
|---|---|

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 36 |
| Sand | 23 |
| Silt | 28 |
| Clay | 14 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 1.18 |
| D30 | mm | 0.0154 |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

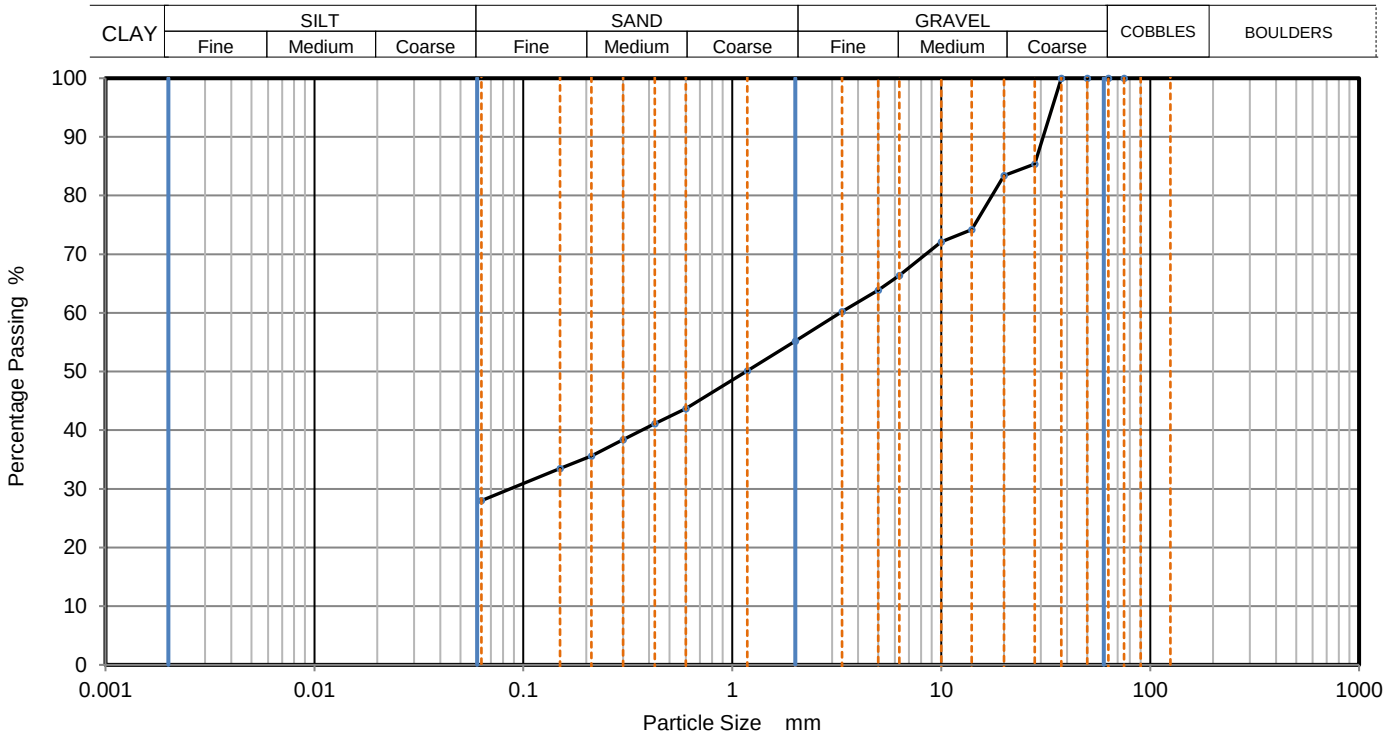
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:45 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | TP-24 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 3 |
| Soil Description | Dark grey very sandy very silty GRAVEL. | | | Depth, m | 3.30 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL120210217128 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 85 | | |
| 20 | 83 | | |
| 14 | 74 | | |
| 10 | 72 | | |
| 6.3 | 66 | | |
| 5 | 64 | | |
| 3.35 | 60 | | |
| 2 | 55 | | |
| 1.18 | 50 | | |
| 0.6 | 44 | | |
| 0.425 | 41 | | |
| 0.3 | 38 | | |
| 0.212 | 36 | | |
| 0.15 | 34 | | |
| 0.063 | 28 | | |

| | |
|---|---|
| Dry Mass of sample, g | 1019 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 45 |
| Sand | 27 |
| | |
| Fines <0.063mm | 28 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 3.27 |
| D30 | mm | 0.0862 |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

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|---|---|---|---|---|
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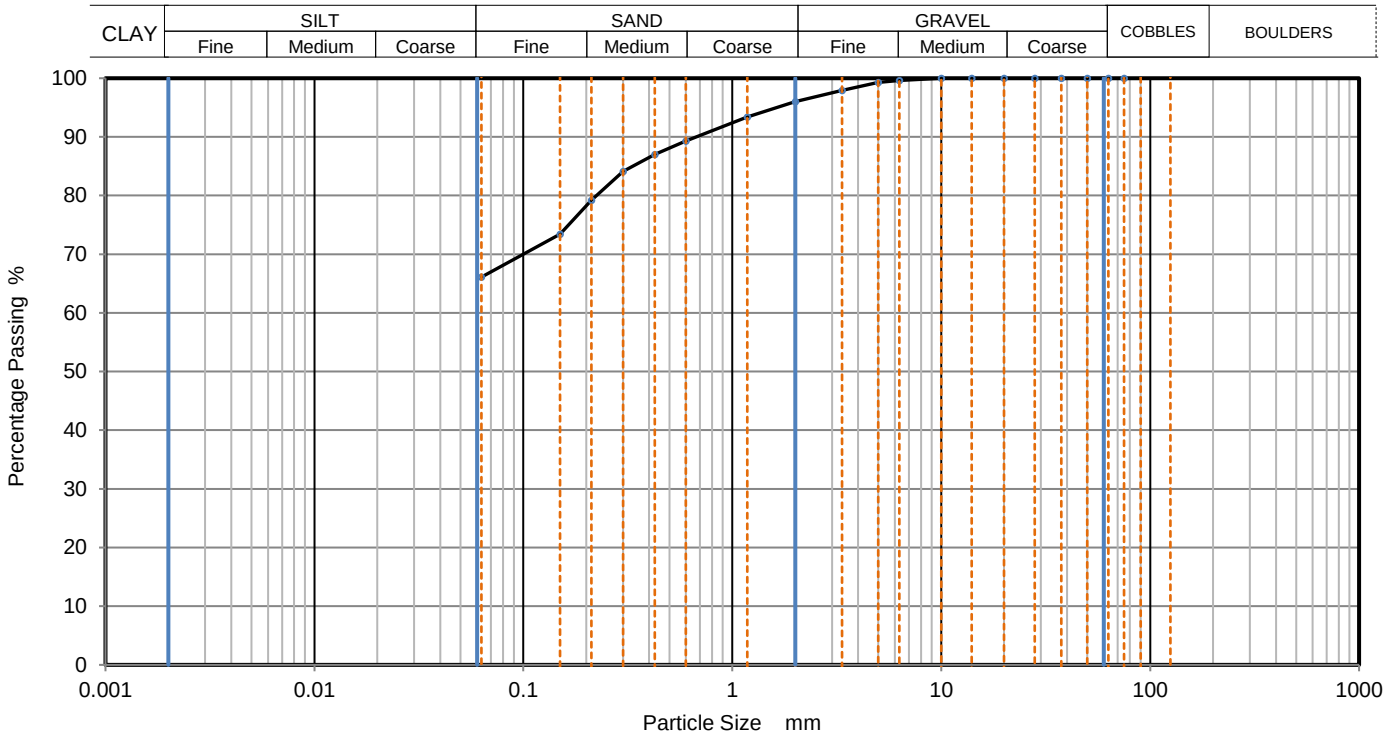
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | TP-25 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 1 |
| Soil Description | Dark grey slightly gravelly slightly sandy SILT. | | | Depth, m | 1.70 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL120210217131 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 100 | | |
| 10 | 100 | | |
| 6.3 | 100 | | |
| 5 | 99 | | |
| 3.35 | 98 | | |
| 2 | 96 | | |
| 1.18 | 93 | | |
| 0.6 | 89 | | |
| 0.425 | 87 | | |
| 0.3 | 84 | | |
| 0.212 | 79 | | |
| 0.15 | 73 | | |
| 0.063 | 66 | | |

| | |
|---|---|
| Dry Mass of sample, g | 642 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 4 |
| Sand | 30 |
| | |
| Fines <0.063mm | 66 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | |
| D30 | mm | |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:45 | **1** QC From No:R2 |

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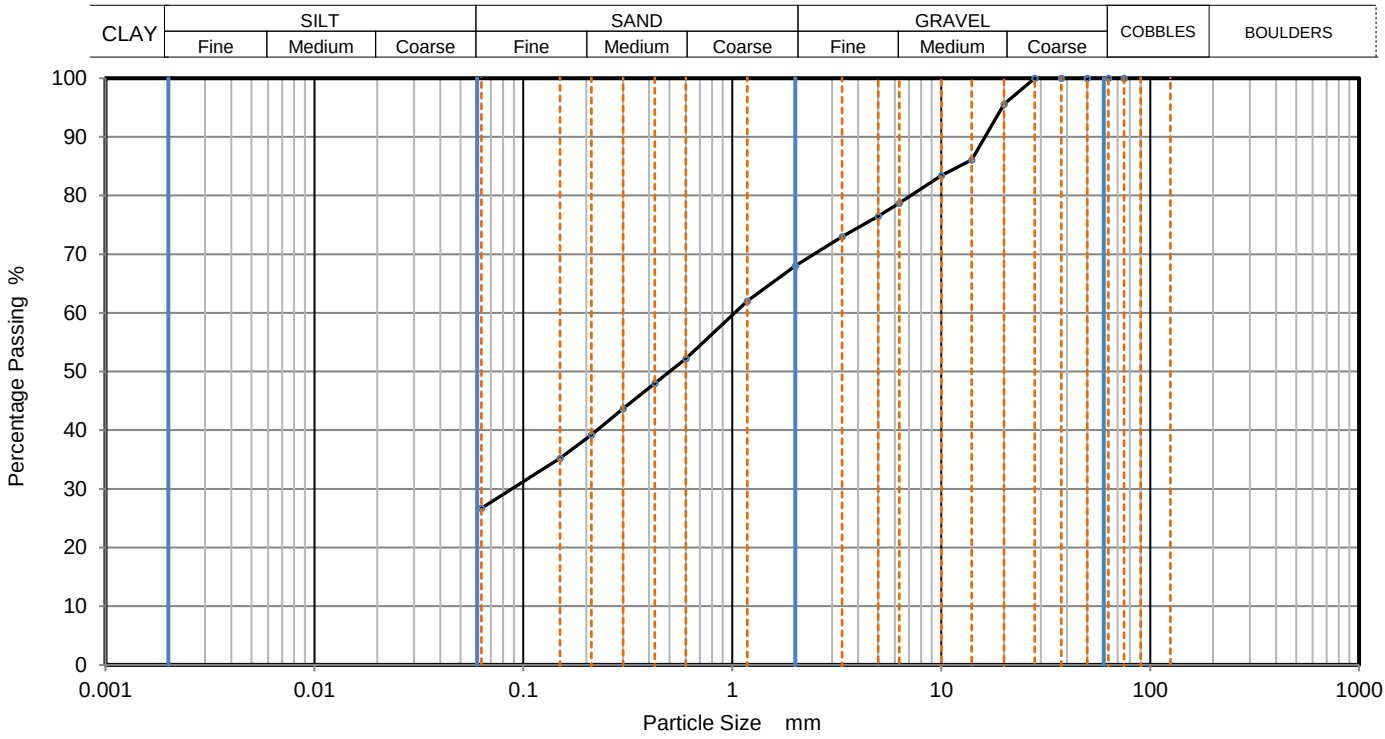
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | TP-25 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 3 |
| Soil Description | Dark grey very silty very gravelly SAND. | | | Depth, m | 2.80 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL120210217133 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 96 | | |
| 14 | 86 | | |
| 10 | 83 | | |
| 6.3 | 79 | | |
| 5 | 77 | | |
| 3.35 | 73 | | |
| 2 | 68 | | |
| 1.18 | 62 | | |
| 0.6 | 52 | | |
| 0.425 | 48 | | |
| 0.3 | 44 | | |
| 0.212 | 39 | | |
| 0.15 | 35 | | |
| 0.063 | 27 | | |

| Dry Mass of sample, g | 724 |
|---|---|

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 32 |
| Sand | 41 |
| | |
| Fines <0.063mm | 27 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 1.03 |
| D30 | mm | 0.0881 |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
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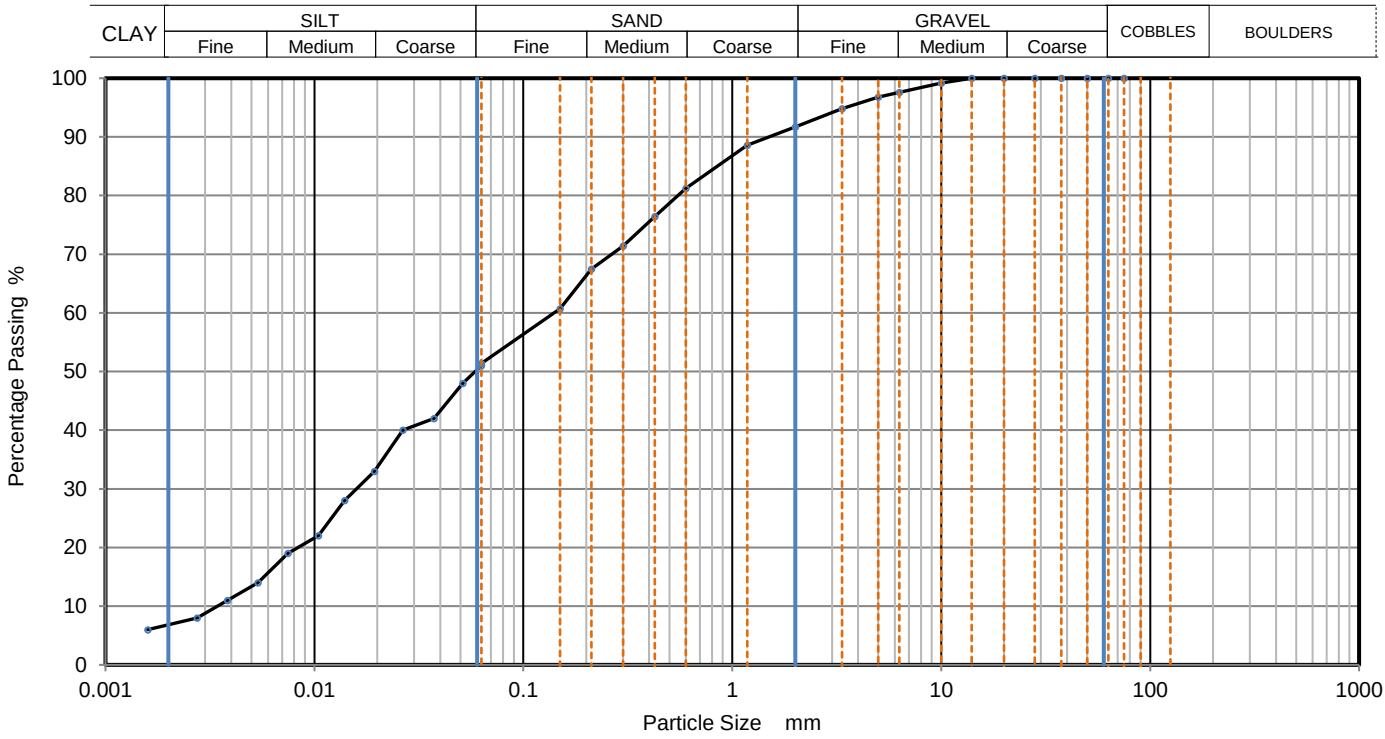
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | TP-26 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 3 |
| Soil Description | Dark grey slightly gravelly sandy SILT. | | | Depth, m | 3.40 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clauses 9.2 and 9.5 | | | KeyLAB ID | IDL120210217136 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | 0.0630 | 51 |
| | | 0.0512 | 48 |
| 75 | 100 | 0.0373 | 42 |
| 63 | 100 | 0.0265 | 40 |
| 50 | 100 | 0.0194 | 33 |
| 37.5 | 100 | 0.0140 | 28 |
| 28 | 100 | 0.0104 | 22 |
| 20 | 100 | 0.0075 | 19 |
| 14 | 100 | 0.0054 | 14 |
| 10 | 99 | 0.0038 | 11 |
| 6.3 | 98 | 0.0027 | 8 |
| 5 | 97 | 0.0016 | 6 |
| 3.35 | 95 | | |
| 2 | 92 | | |
| 1.18 | 89 | | |
| 0.6 | 81 | Particle density (assumed) | |
| 0.425 | 76 | 2.65 Mg/m3 | |
| 0.3 | 71 | | |
| 0.212 | 68 | | |
| 0.15 | 61 | | |
| 0.063 | 51 | | |

| Dry Mass of sample, g | 687 |
|---|---|

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 8 |
| Sand | 40 |
| Silt | 45 |
| Clay | 7 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.141 |
| D30 | mm | 0.016 |
| D10 | mm | 0.00348 |
| Uniformity Coefficient | | 40 |
| Curvature Coefficient | | 0.52 |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:45 | **1** QC From No:R2 |

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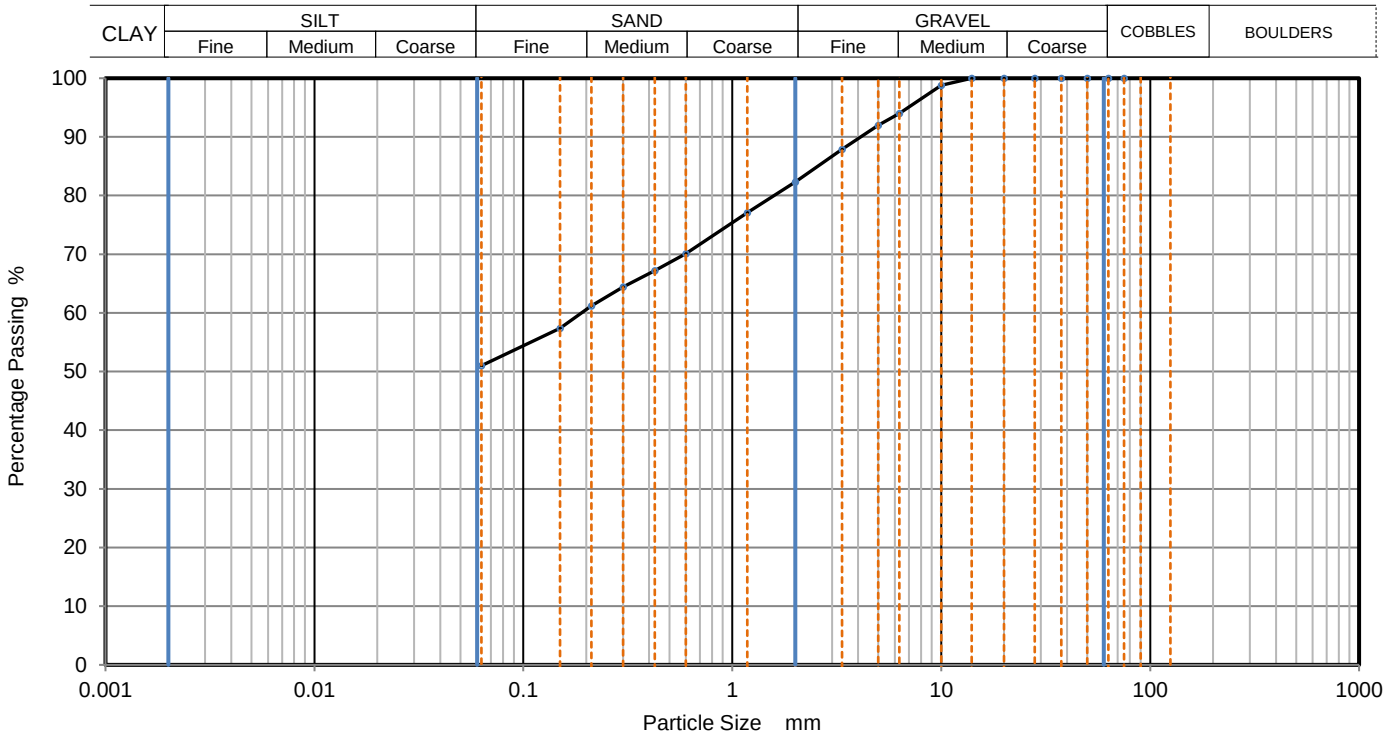
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

# PARTICLE SIZE DISTRIBUTION

| | | | | | |
|---|---|---|---|---|---|
| | | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | TP-29 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 2 |
| Soil Description | Dark grey slightly gravelly slightly sandy SILT. | | | Depth, m | 2.60 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL120210217147 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 100 | | |
| 10 | 99 | | |
| 6.3 | 94 | | |
| 5 | 92 | | |
| 3.35 | 88 | | |
| 2 | 82 | | |
| 1.18 | 77 | | |
| 0.6 | 70 | | |
| 0.425 | 67 | | |
| 0.3 | 64 | | |
| 0.212 | 61 | | |
| 0.15 | 57 | | |
| 0.063 | 51 | | |

| | |
|---|---|
| Dry Mass of sample, g | 510 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 18 |
| Sand | 31 |
| | |
| Fines <0.063mm | 51 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.19 |
| D30 | mm | |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

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| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:45 | **1** |
| | | | | QC From No:R2 |

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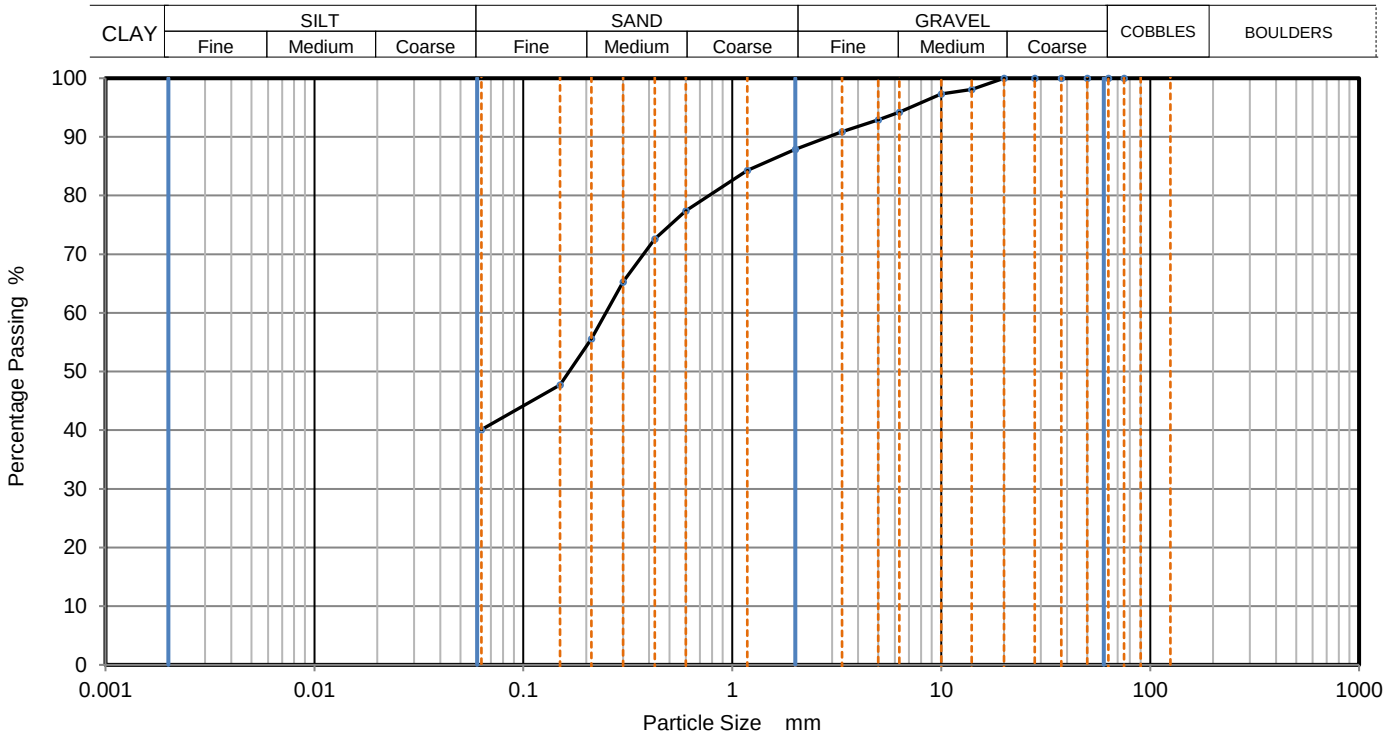
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | TP-A |
| Site Name | Ballivor Wind Farm | | | Sample No. | 2 |
| Soil Description | Grey slightly gravelly sandy SILT. Sand is medium. | | | Depth, m | 2.70 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL1202102192 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 98 | | |
| 10 | 97 | | |
| 6.3 | 94 | | |
| 5 | 93 | | |
| 3.35 | 91 | | |
| 2 | 88 | | |
| 1.18 | 84 | | |
| 0.6 | 77 | | |
| 0.425 | 73 | | |
| 0.3 | 65 | | |
| 0.212 | 56 | | |
| 0.15 | 48 | | |
| 0.063 | 40 | | |

| | |
|---|---|
| Dry Mass of sample, g | 591 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 12 |
| Sand | 48 |
| | |
| Fines <0.063mm | 40 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.248 |
| D30 | mm | |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:45 | **1** QC From No:R2 |

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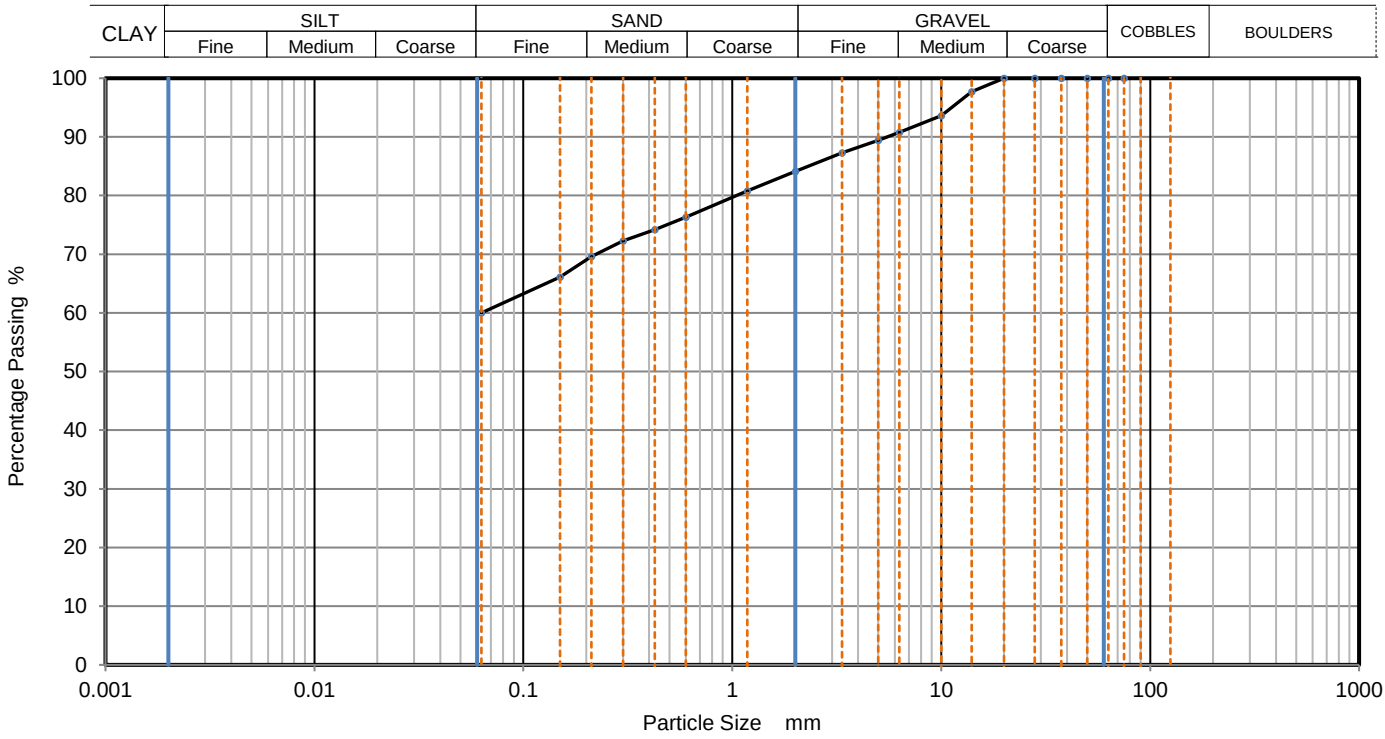
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | TP-B |
| Site Name | Ballivor Wind Farm | | | Sample No. | 1 |
| Soil Description | Grey-brown gravelly very sandy SILT. | | | Depth, m | 2.40 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL1202102196 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 98 | | |
| 10 | 94 | | |
| 6.3 | 91 | | |
| 5 | 89 | | |
| 3.35 | 87 | | |
| 2 | 84 | | |
| 1.18 | 81 | | |
| 0.6 | 76 | | |
| 0.425 | 74 | | |
| 0.3 | 72 | | |
| 0.212 | 70 | | |
| 0.15 | 66 | | |
| 0.063 | 60 | | |

| | |
|---|---|
| Dry Mass of sample, g | 317 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 16 |
| Sand | 24 |
| | |
| Fines <0.063mm | 60 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.0631 |
| D30 | mm | |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:45 | **1** QC From No:R2 |

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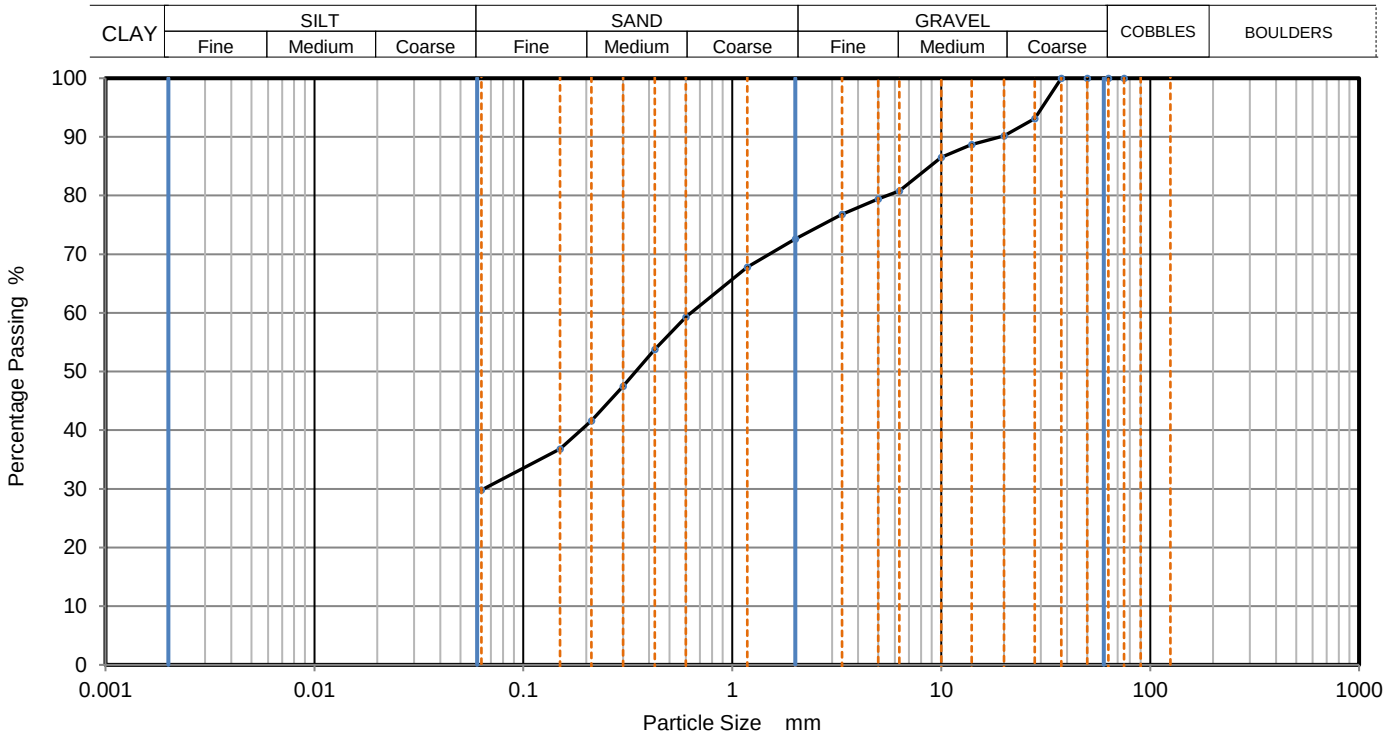
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | TP-C |
| Site Name | Ballivor Wind Farm | | | Sample No. | 3 |
| Soil Description | Grey very gravelly very silty SAND. | | | Depth, m | 2.50 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL12021021913 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 93 | | |
| 20 | 90 | | |
| 14 | 89 | | |
| 10 | 87 | | |
| 6.3 | 81 | | |
| 5 | 79 | | |
| 3.35 | 77 | | |
| 2 | 73 | | |
| 1.18 | 68 | | |
| 0.6 | 59 | | |
| 0.425 | 54 | | |
| 0.3 | 48 | | |
| 0.212 | 42 | | |
| 0.15 | 37 | | |
| 0.063 | 30 | | |

| | |
|---|---|
| Dry Mass of sample, g | 650 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 27 |
| Sand | 43 |
| | |
| Fines <0.063mm | 30 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.635 |
| D30 | mm | 0.0642 |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

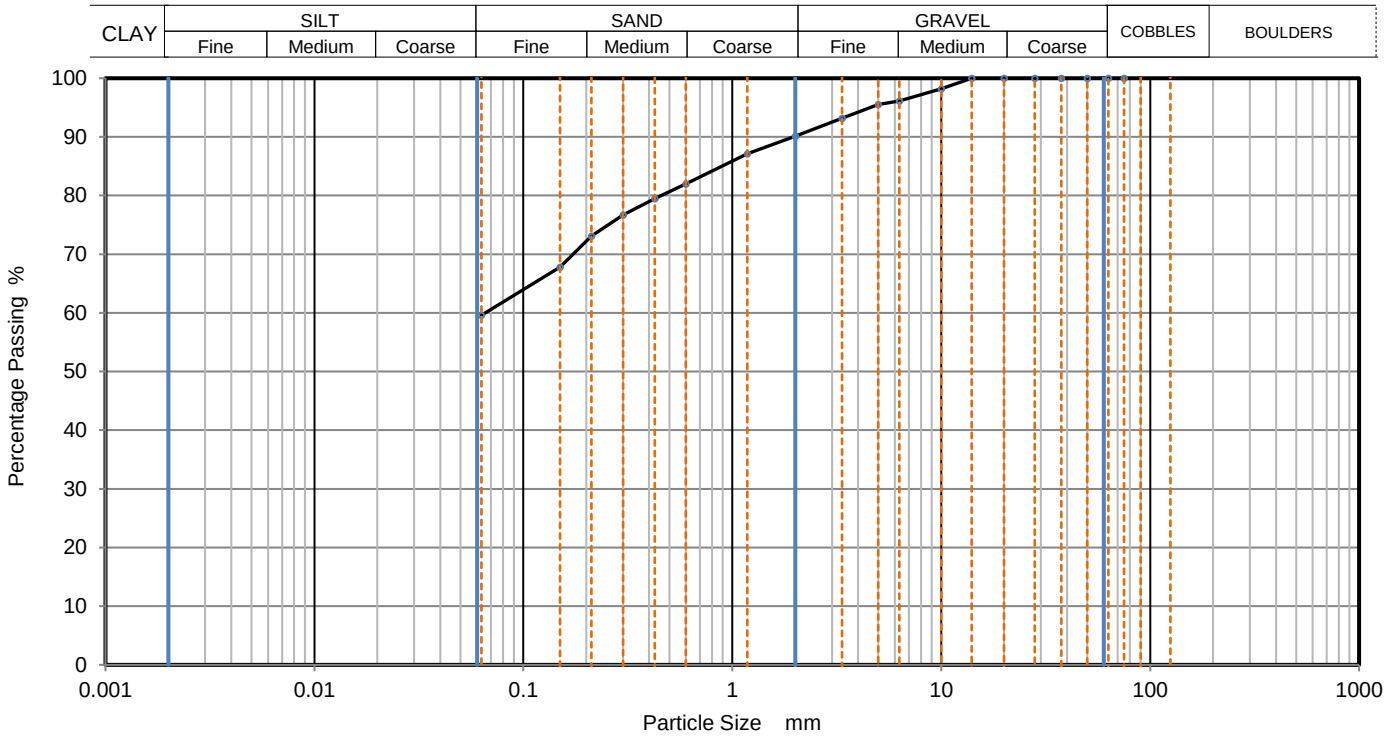
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:45 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | TP-E |
| Site Name | Ballivor Wind Farm | | | Sample No. | 1 |
| Soil Description | Dark brown slightly gravelly slightly sandy SILT. | | | Depth, m | 2.05 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL12021021918 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 100 | | |
| 10 | 98 | | |
| 6.3 | 96 | | |
| 5 | 96 | | |
| 3.35 | 93 | | |
| 2 | 90 | | |
| 1.18 | 87 | | |
| 0.6 | 82 | | |
| 0.425 | 80 | | |
| 0.3 | 77 | | |
| 0.212 | 73 | | |
| 0.15 | 68 | | |
| 0.063 | 60 | | |

| | |
|---|---|
| Dry Mass of sample, g | 308 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 10 |
| Sand | 31 |
| | |
| Fines <0.063mm | 60 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.0655 |
| D30 | mm | |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

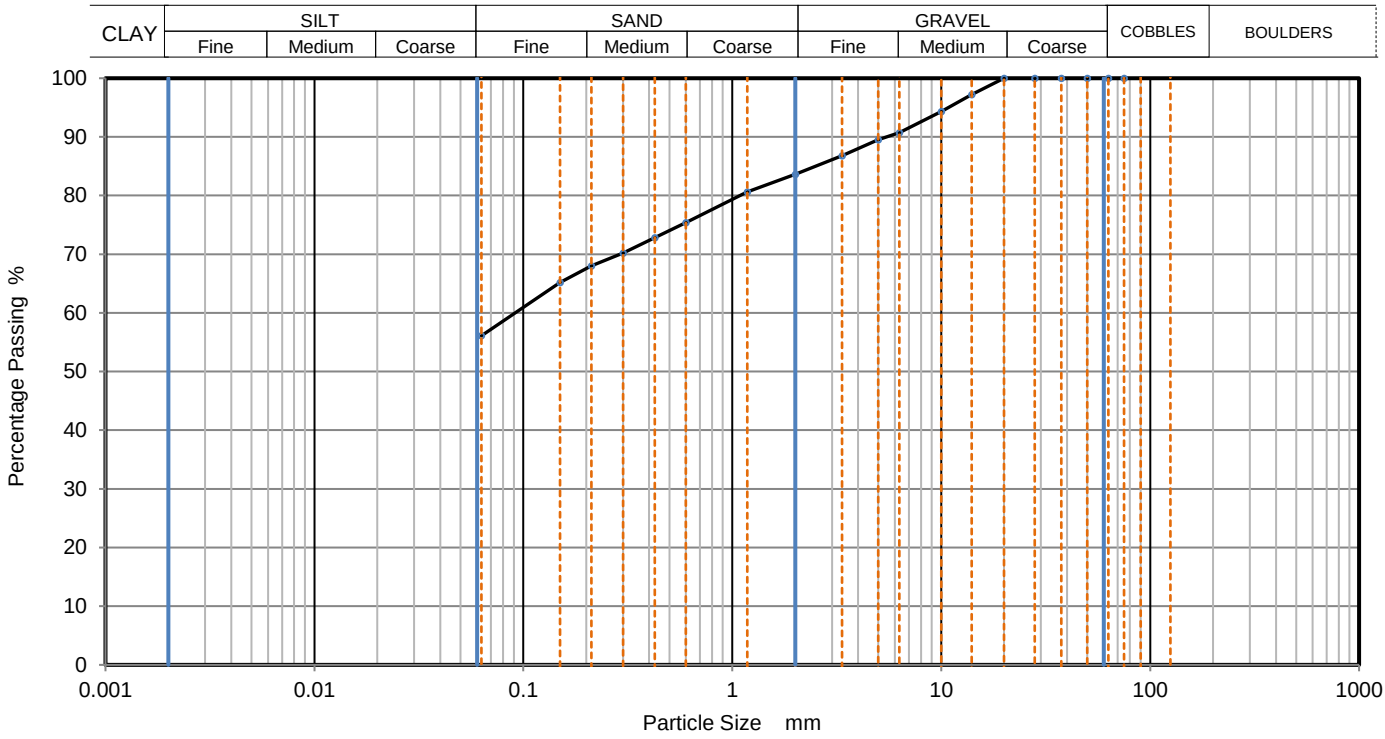
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:45 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | TP-F |
| Site Name | Ballivor Wind Farm | | | Sample No. | 1 |
| Soil Description | Dark grey slightly gravelly slightly sandy silty CLAY. | | | Depth, m | 2.30 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL12021021923 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 97 | | |
| 10 | 94 | | |
| 6.3 | 91 | | |
| 5 | 90 | | |
| 3.35 | 87 | | |
| 2 | 84 | | |
| 1.18 | 81 | | |
| 0.6 | 75 | | |
| 0.425 | 73 | | |
| 0.3 | 70 | | |
| 0.212 | 68 | | |
| 0.15 | 65 | | |
| 0.063 | 56 | | |

| | |
|---|---|
| Dry Mass of sample, g | 363 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 16 |
| Sand | 28 |
| | |
| Fines <0.063mm | 56 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.0916 |
| D30 | mm | |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:45 | **1** QC From No:R2 |

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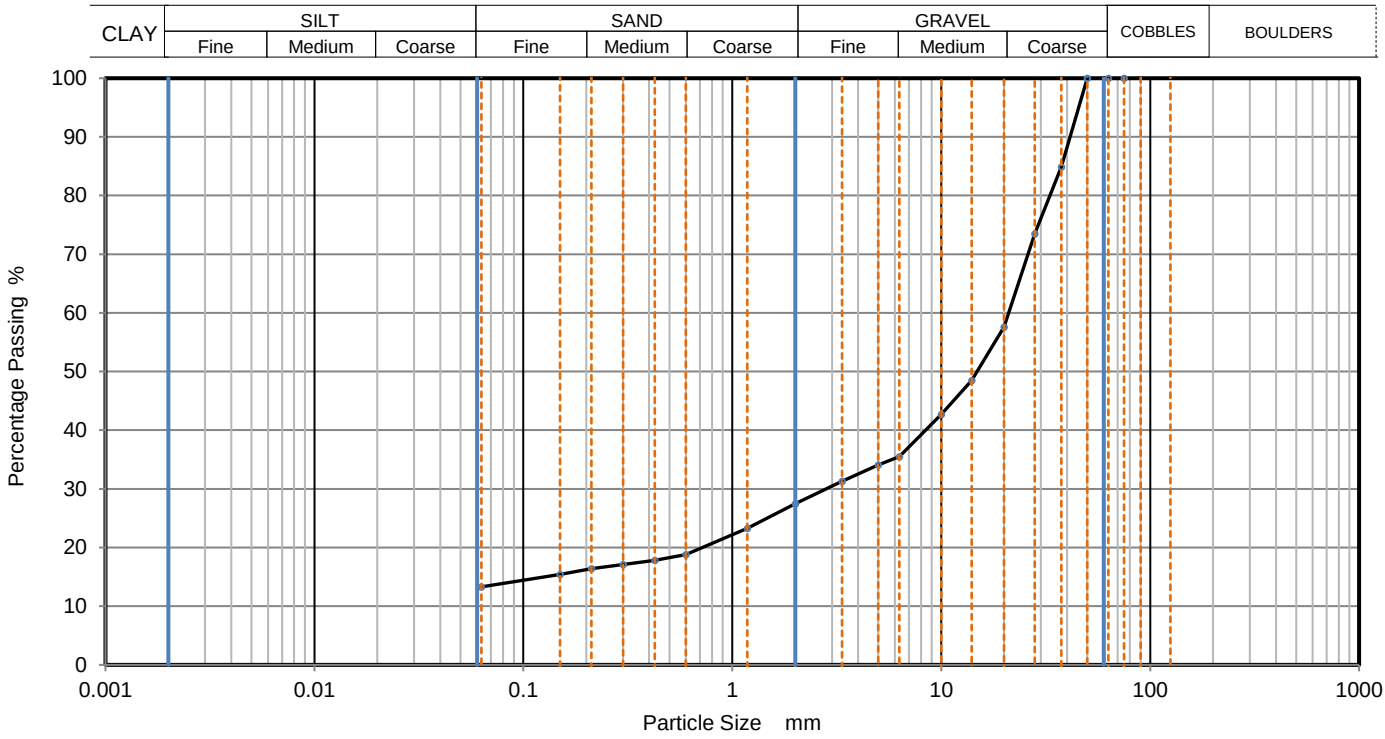
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | TP-G |
| Site Name | Ballivor Wind Farm | | | Sample No. | 2 |
| Soil Description | Dark grey silty sandy coarse GRAVEL. | | | Depth, m | 3.80 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL12021021929 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 85 | | |
| 28 | 74 | | |
| 20 | 58 | | |
| 14 | 49 | | |
| 10 | 43 | | |
| 6.3 | 36 | | |
| 5 | 34 | | |
| 3.35 | 31 | | |
| 2 | 28 | | |
| 1.18 | 23 | | |
| 0.6 | 19 | | |
| 0.425 | 18 | | |
| 0.3 | 17 | | |
| 0.212 | 16 | | |
| 0.15 | 15 | | |
| 0.063 | 13 | | |

| Dry Mass of sample, g | 965 |
|---|---|

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 73 |
| Sand | 14 |
| | |
| Fines <0.063mm | 13 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 21.1 |
| D30 | mm | 2.81 |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:45 | **1** |
| | | | | QC From No:R2 |

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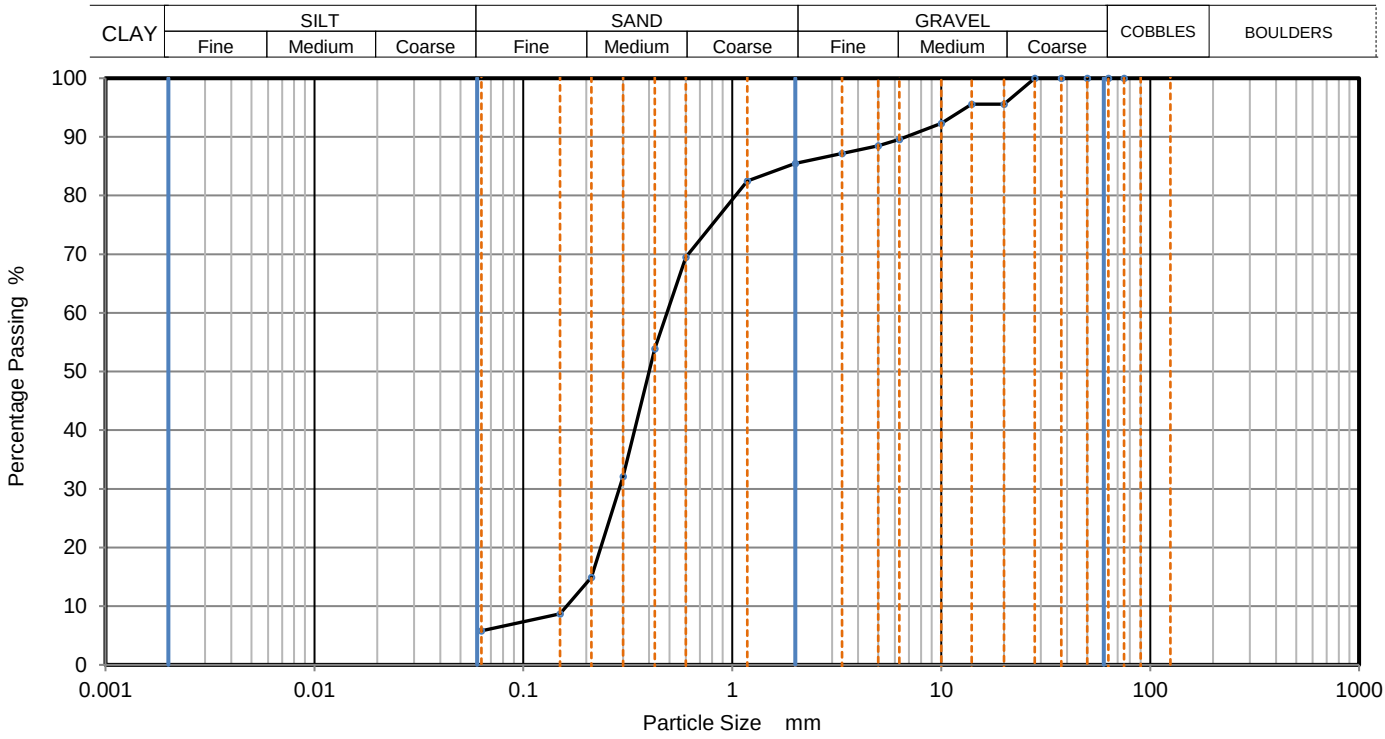
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

# PARTICLE SIZE DISTRIBUTION

| | | | | | |
|---|---|---|---|---|---|
| | | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | TP-H |
| Site Name | Ballivor Wind Farm | | | Sample No. | 3 |
| Soil Description | Grey silty gravelly medium SAND. | | | Depth, m | 2.30 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL12021021933 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 96 | | |
| 14 | 96 | | |
| 10 | 92 | | |
| 6.3 | 90 | | |
| 5 | 89 | | |
| 3.35 | 87 | | |
| 2 | 86 | | |
| 1.18 | 83 | | |
| 0.6 | 70 | | |
| 0.425 | 54 | | |
| 0.3 | 32 | | |
| 0.212 | 15 | | |
| 0.15 | 9 | | |
| 0.063 | 6 | | |

Dry Mass of sample, g: 534

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 15 |
| Sand | 80 |
| | |
| Fines <0.063mm | 6 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.486 |
| D30 | mm | 0.287 |
| D10 | mm | 0.161 |
| Uniformity Coefficient | | 3 |
| Curvature Coefficient | | 1.1 |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:45 | **1** QC From No:R2 |

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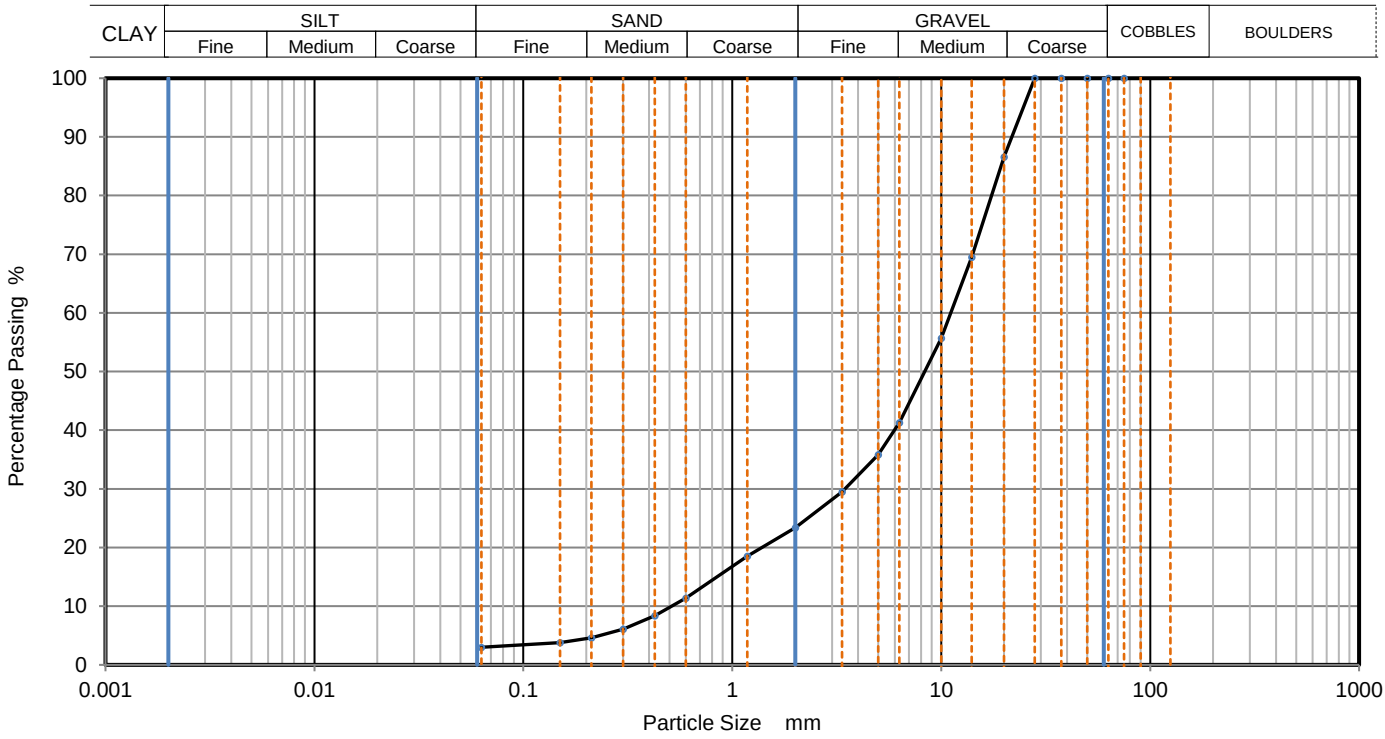
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | TP-I |
| Site Name | Ballivor Wind Farm | | | Sample No. | 2 |
| Soil Description | Dark grey slightly silty very sandy medium GRAVEL. | | | Depth, m | 3.50 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL12021021937 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 87 | | |
| 14 | 70 | | |
| 10 | 56 | | |
| 6.3 | 41 | | |
| 5 | 36 | | |
| 3.35 | 30 | | |
| 2 | 23 | | |
| 1.18 | 19 | | |
| 0.6 | 11 | | |
| 0.425 | 8 | | |
| 0.3 | 6 | | |
| 0.212 | 5 | | |
| 0.15 | 4 | | |
| 0.063 | 3 | | |

| | |
|---|---|
| Dry Mass of sample, g | 909 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 77 |
| Sand | 21 |
| | |
| Fines <0.063mm | 3 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 11.1 |
| D30 | mm | 3.46 |
| D10 | mm | 0.511 |
| Uniformity Coefficient | | 22 |
| Curvature Coefficient | | 2.1 |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:45 | **1** QC From No:R2 |

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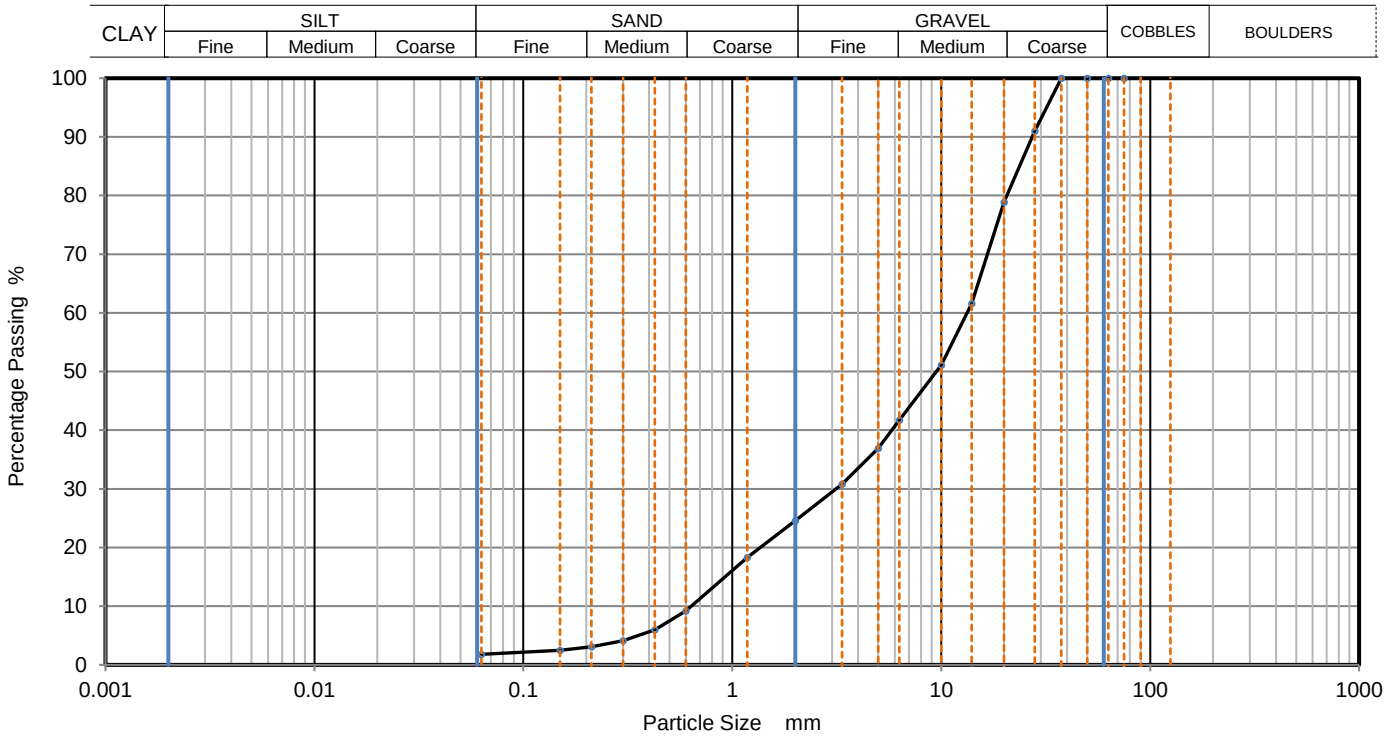
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | TP-J |
| Site Name | Ballivor Wind Farm | | | Sample No. | 2 |
| Soil Description | Dark gey slightly silty very sandy medium GRAVEL. | | | Depth, m | 2.70 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL12021021940 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 91 | | |
| 20 | 79 | | |
| 14 | 62 | | |
| 10 | 51 | | |
| 6.3 | 42 | | |
| 5 | 37 | | |
| 3.35 | 31 | | |
| 2 | 25 | | |
| 1.18 | 18 | | |
| 0.6 | 9 | | |
| 0.425 | 6 | | |
| 0.3 | 4 | | |
| 0.212 | 3 | | |
| 0.15 | 3 | | |
| 0.063 | 2 | | |

| | |
|---|---|
| Dry Mass of sample, g | 743 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 75 |
| Sand | 23 |
| | |
| Fines <0.063mm | 2 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 13.3 |
| D30 | mm | 3.13 |
| D10 | mm | 0.635 |
| Uniformity Coefficient | | 21 |
| Curvature Coefficient | | 1.2 |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

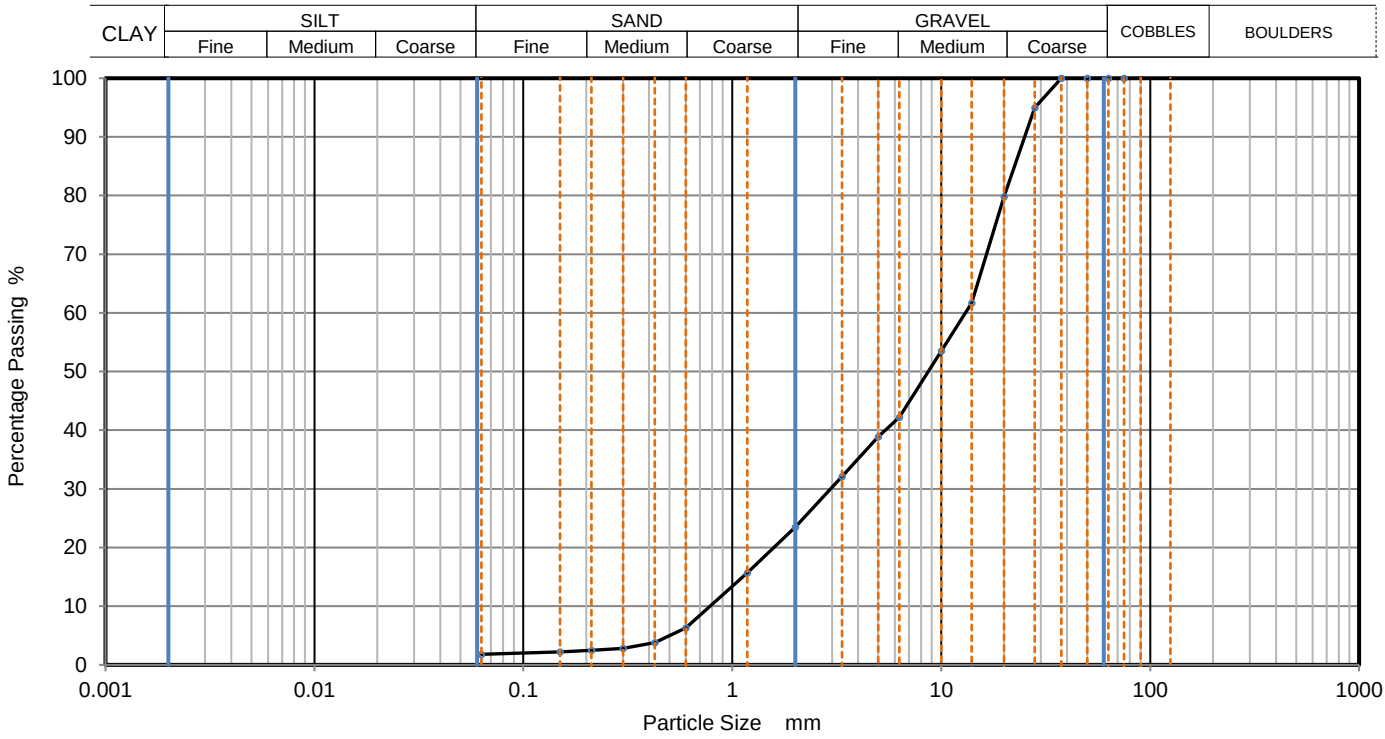
| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:45 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

# PARTICLE SIZE DISTRIBUTION

| | | | | | |
|---|---|---|---|---|---|
| | | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | TP-K |
| Site Name | Ballivor Wind Farm | | | Sample No. | 3 |
| Soil Description | Grey slightly silty very sandy medium GRAVEL. | | | Depth, m | 3.80 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL12021021944 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 95 | | |
| 20 | 80 | | |
| 14 | 62 | | |
| 10 | 54 | | |
| 6.3 | 42 | | |
| 5 | 39 | | |
| 3.35 | 32 | | |
| 2 | 24 | | |
| 1.18 | 16 | | |
| 0.6 | 6 | | |
| 0.425 | 4 | | |
| 0.3 | 3 | | |
| 0.212 | 3 | | |
| 0.15 | 2 | | |
| 0.063 | 2 | | |

| Dry Mass of sample, g | 826 |
|---|---|

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 77 |
| Sand | 22 |
| | |
| Fines <0.063mm | 2 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 13 |
| D30 | mm | 2.96 |
| D10 | mm | 0.781 |
| Uniformity Coefficient | | 17 |
| Curvature Coefficient | | 0.86 |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

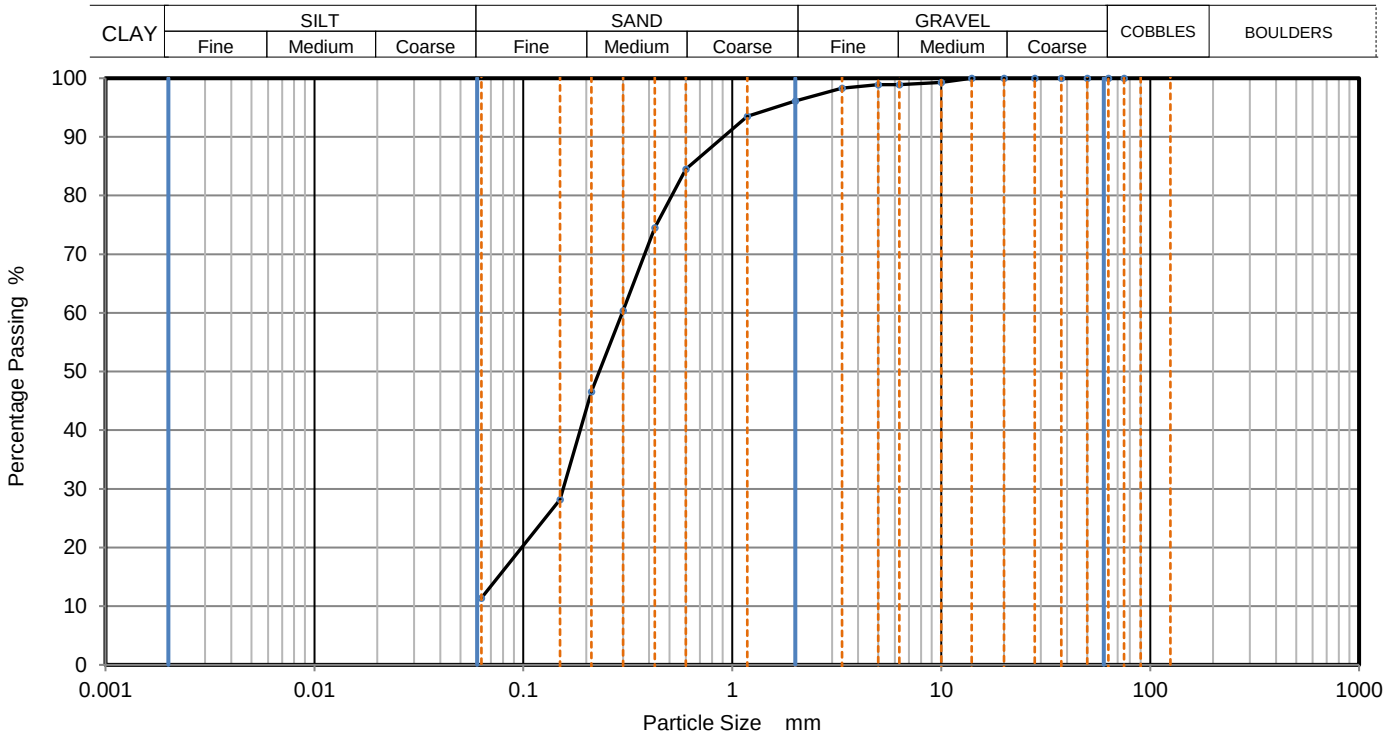
| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:45 | **1** |
| | | | | QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

# PARTICLE SIZE DISTRIBUTION

| | | | | | |
|---|---|---|---|---|---|
| | | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | TP-L |
| Site Name | Ballivor Wind Farm | | | Sample No. | 3 |
| Soil Description | Dark grey slightly gravelly silty fine and medium SAND. | | | Depth, m | 2.00 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL12021021947 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 100 | | |
| 10 | 99 | | |
| 6.3 | 99 | | |
| 5 | 99 | | |
| 3.35 | 98 | | |
| 2 | 96 | | |
| 1.18 | 94 | | |
| 0.6 | 85 | | |
| 0.425 | 75 | | |
| 0.3 | 60 | | |
| 0.212 | 47 | | |
| 0.15 | 28 | | |
| 0.063 | 11 | | |

| | |
|---|---|
| Dry Mass of sample, g | 537 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 4 |
| Sand | 85 |
| | |
| Fines <0.063mm | 11 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.297 |
| D30 | mm | 0.155 |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:45 | **1** QC From No:R2 |

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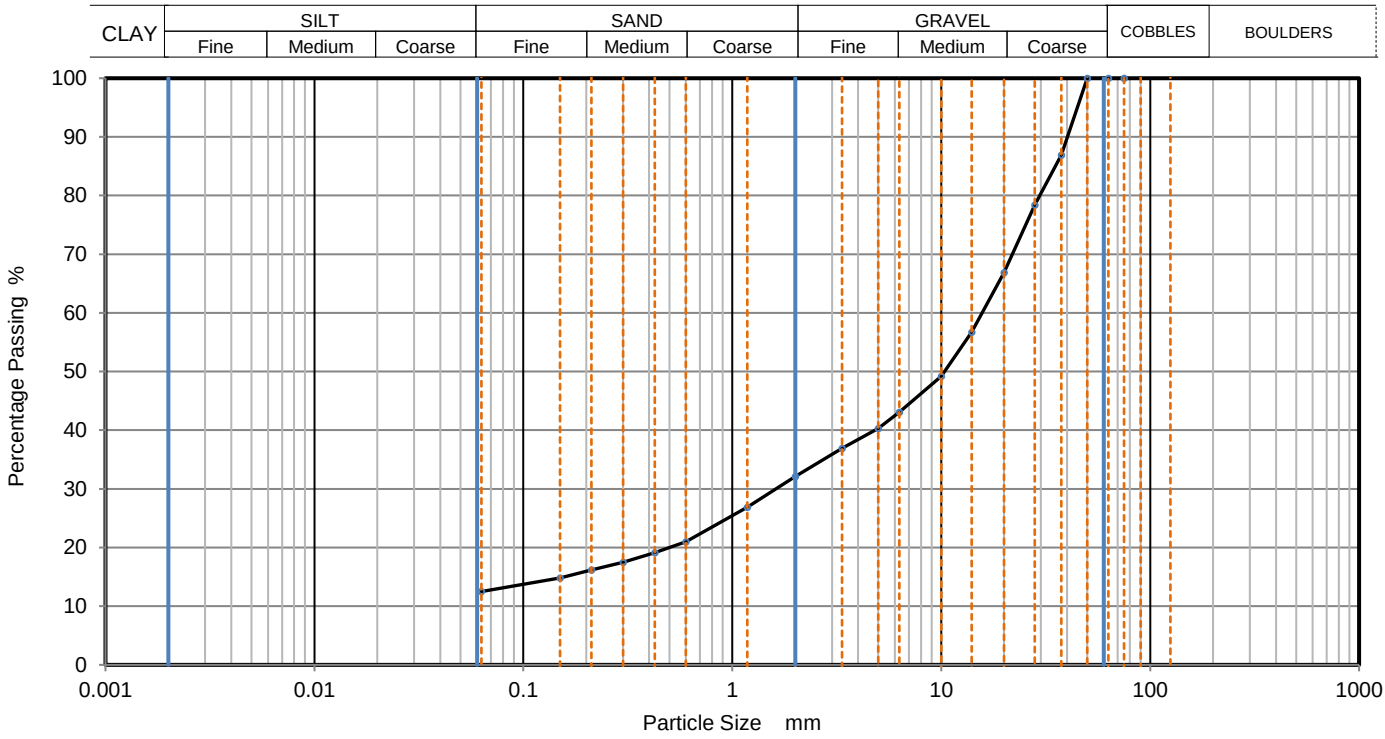
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | TP-M |
| Site Name | Ballivor Wind Farm | | | Sample No. | 2 |
| Soil Description | Dark grey silty very sandy coarse GRAVEL. | | | Depth, m | 3.10 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL12021021950 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 87 | | |
| 28 | 78 | | |
| 20 | 67 | | |
| 14 | 57 | | |
| 10 | 49 | | |
| 6.3 | 43 | | |
| 5 | 40 | | |
| 3.35 | 37 | | |
| 2 | 32 | | |
| 1.18 | 27 | | |
| 0.6 | 21 | | |
| 0.425 | 19 | | |
| 0.3 | 18 | | |
| 0.212 | 16 | | |
| 0.15 | 15 | | |
| 0.063 | 13 | | |

| | |
|---|---|
| Dry Mass of sample, g | 1177 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 68 |
| Sand | 20 |
| | |
| Fines <0.063mm | 13 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 15.7 |
| D30 | mm | 1.61 |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

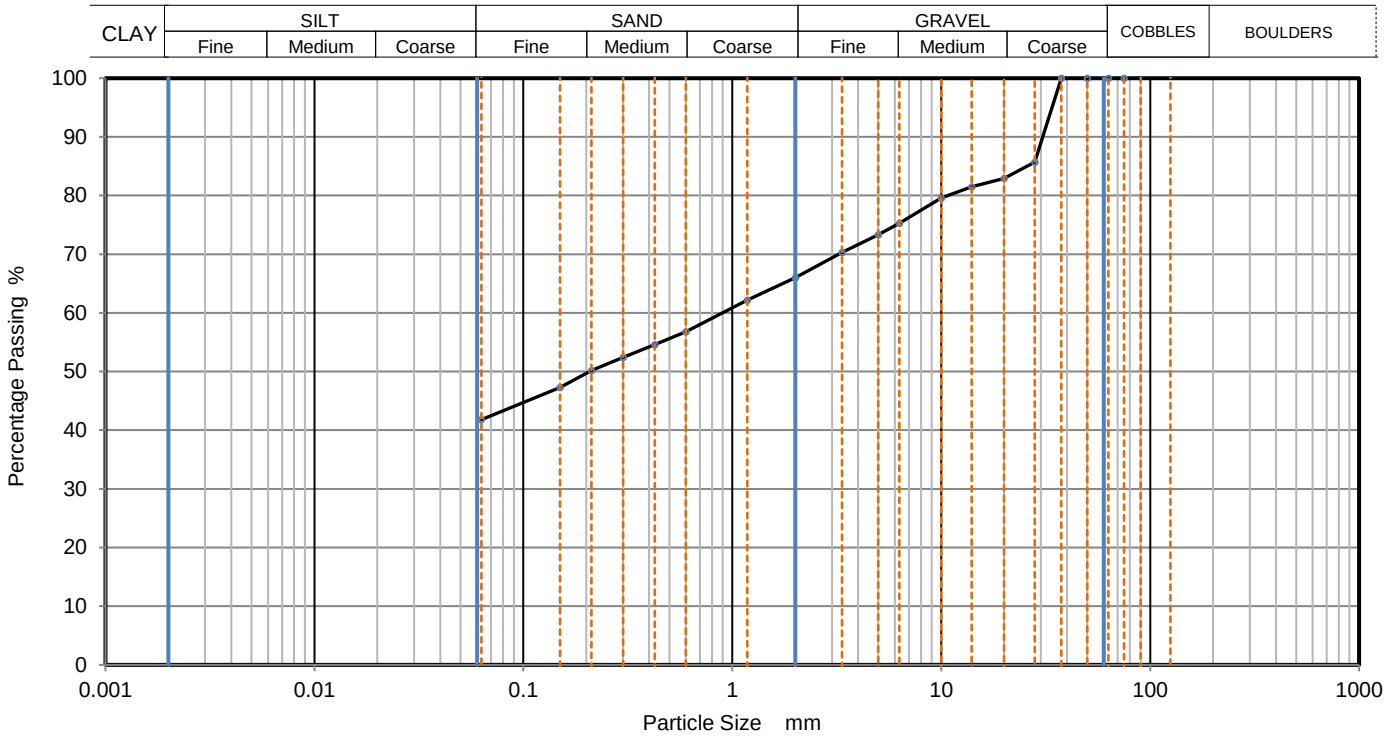
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:45 | **1** |
| | | | | QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | TP-N |
| Site Name | Ballivor Wind Farm | | | Sample No. | 5 |
| Soil Description | Grey slightly sandy gravelly SILT. | | | Depth, m | 3.60 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL12021021956 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 86 | | |
| 20 | 83 | | |
| 14 | 82 | | |
| 10 | 80 | | |
| 6.3 | 75 | | |
| 5 | 73 | | |
| 3.35 | 70 | | |
| 2 | 66 | | |
| 1.18 | 62 | | |
| 0.6 | 57 | | |
| 0.425 | 55 | | |
| 0.3 | 52 | | |
| 0.212 | 50 | | |
| 0.15 | 47 | | |
| 0.063 | 42 | | |

| Dry Mass of sample, g | 698 |
|---|---|

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 34 |
| Sand | 24 |
| | |
| Fines <0.063mm | 42 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.899 |
| D30 | mm | |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

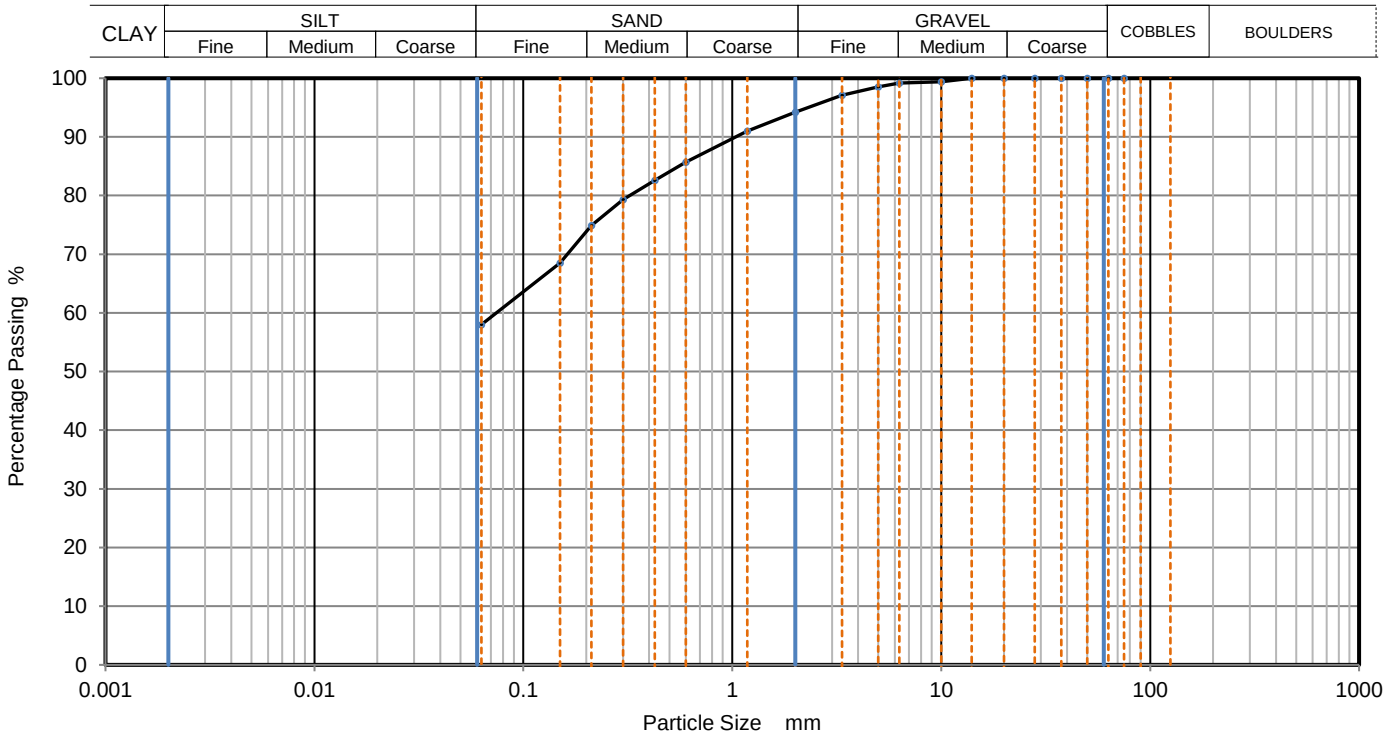
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:45 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | TP-O |
| Site Name | Ballivor Wind Farm | | | Sample No. | 2 |
| Soil Description | Dark brown gravelly very sandy SILT. | | | Depth, m | 3.00 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL12021021959 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 100 | | |
| 10 | 99 | | |
| 6.3 | 99 | | |
| 5 | 99 | | |
| 3.35 | 97 | | |
| 2 | 94 | | |
| 1.18 | 91 | | |
| 0.6 | 86 | | |
| 0.425 | 83 | | |
| 0.3 | 79 | | |
| 0.212 | 75 | | |
| 0.15 | 69 | | |
| 0.063 | 58 | | |

| | |
|---|---|
| Dry Mass of sample, g | 458 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 6 |
| Sand | 36 |
| | |
| Fines <0.063mm | 58 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.0742 |
| D30 | mm | |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

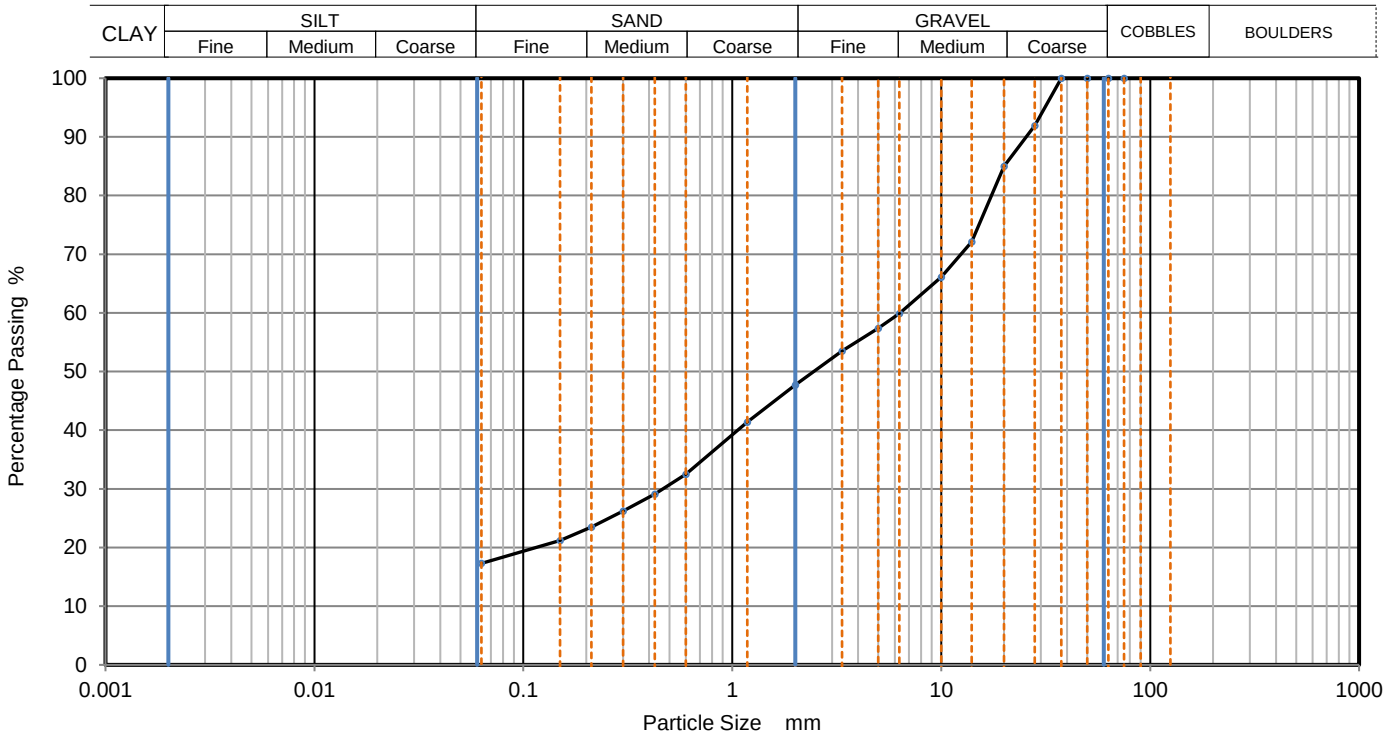
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:45 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | TP-S |
| Site Name | Ballivor Wind Farm | | | Sample No. | 4 |
| Soil Description | Light grey silty very sandy medium GRAVEL. | | | Depth, m | 3.60 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL12021021977 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 92 | | |
| 20 | 85 | | |
| 14 | 72 | | |
| 10 | 66 | | |
| 6.3 | 60 | | |
| 5 | 57 | | |
| 3.35 | 54 | | |
| 2 | 48 | | |
| 1.18 | 41 | | |
| 0.6 | 33 | | |
| 0.425 | 29 | | |
| 0.3 | 26 | | |
| 0.212 | 24 | | |
| 0.15 | 21 | | |
| 0.063 | 17 | | |

| | |
|---|---|
| Dry Mass of sample, g | 834 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 52 |
| Sand | 31 |
| | |
| Fines <0.063mm | 17 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 6.33 |
| D30 | mm | 0.467 |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

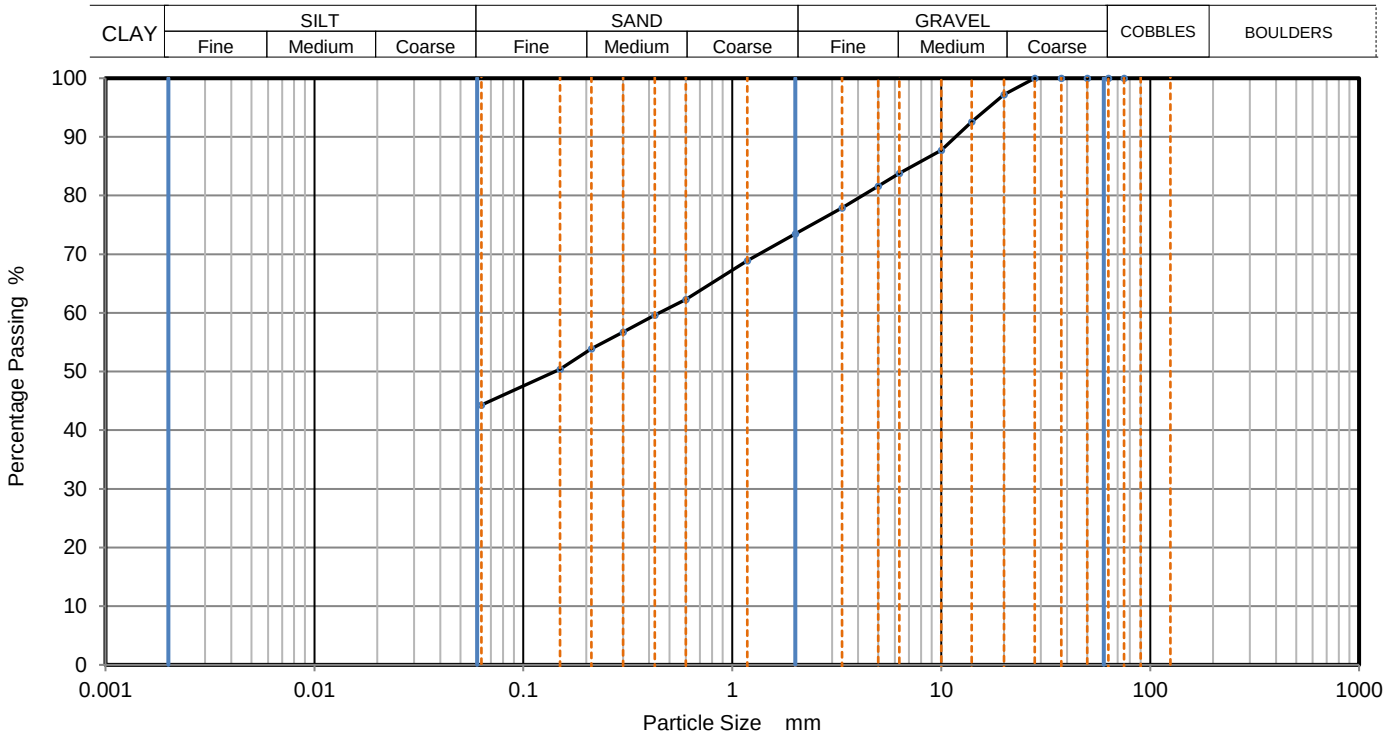
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:46 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | TP-T |
| Site Name | Ballivor Wind Farm | | | Sample No. | 3 |
| Soil Description | Grey slightly sandy gravely SILT. | | | Depth, m | 2.80 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL12021021981 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 97 | | |
| 14 | 93 | | |
| 10 | 88 | | |
| 6.3 | 84 | | |
| 5 | 82 | | |
| 3.35 | 78 | | |
| 2 | 74 | | |
| 1.18 | 69 | | |
| 0.6 | 62 | | |
| 0.425 | 60 | | |
| 0.3 | 57 | | |
| 0.212 | 54 | | |
| 0.15 | 50 | | |
| 0.063 | 44 | | |

| | |
|---|---|
| Dry Mass of sample, g | 776 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 27 |
| Sand | 29 |
| | |
| Fines <0.063mm | 44 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.447 |
| D30 | mm | |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

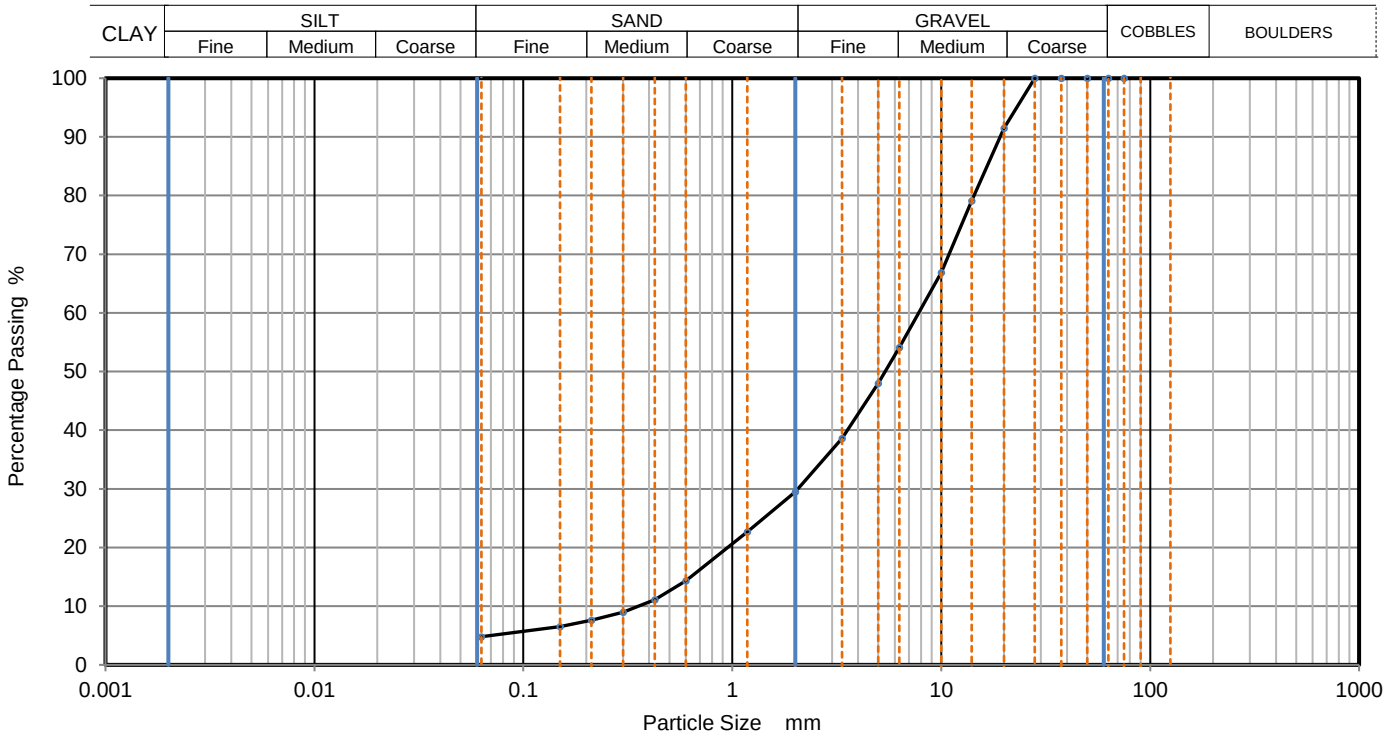
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:46 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | TP-V |
| Site Name | Ballivor Wind Farm | | | Sample No. | 1 |
| Soil Description | Dark grey silty very sasndy medium GRAVEL. | | | Depth, m | 3.00 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL12021021988 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 92 | | |
| 14 | 79 | | |
| 10 | 67 | | |
| 6.3 | 54 | | |
| 5 | 48 | | |
| 3.35 | 39 | | |
| 2 | 30 | | |
| 1.18 | 23 | | |
| 0.6 | 14 | | |
| 0.425 | 11 | | |
| 0.3 | 9 | | |
| 0.212 | 8 | | |
| 0.15 | 7 | | |
| 0.063 | 5 | | |

| | |
|---|---|
| Dry Mass of sample, g | 649 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 71 |
| Sand | 25 |
| | |
| Fines <0.063mm | 5 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 7.79 |
| D30 | mm | 2.05 |
| D10 | mm | 0.353 |
| Uniformity Coefficient | | 22 |
| Curvature Coefficient | | 1.5 |

Remarks

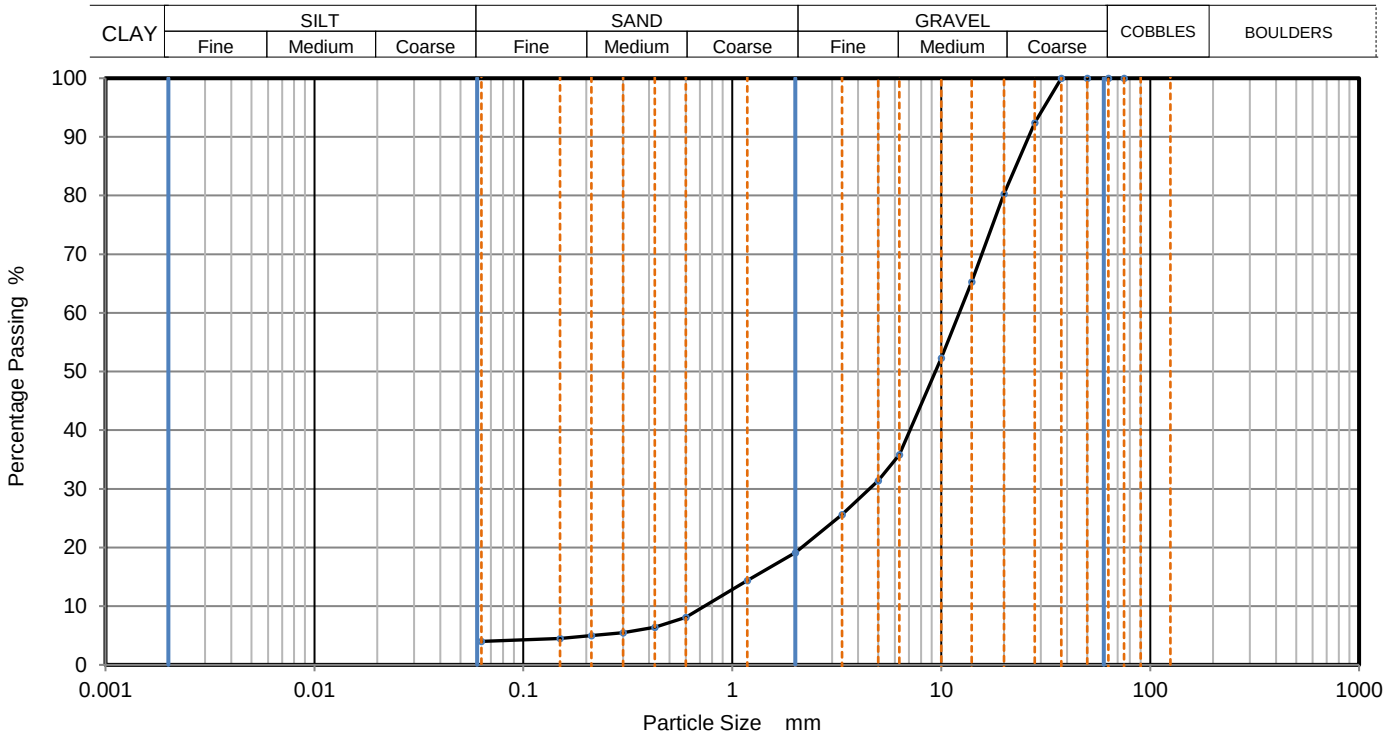
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:46 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | TP-W |
| Site Name | Ballivor Wind Farm | | | Sample No. | 2 |
| Soil Description | Grey slightly silty sandy medium GRAVEL. | | | Depth, m | 4.00 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL12021021991 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 92 | | |
| 20 | 80 | | |
| 14 | 65 | | |
| 10 | 52 | | |
| 6.3 | 36 | | |
| 5 | 31 | | |
| 3.35 | 26 | | |
| 2 | 19 | | |
| 1.18 | 14 | | |
| 0.6 | 8 | | |
| 0.425 | 6 | | |
| 0.3 | 6 | | |
| 0.212 | 5 | | |
| 0.15 | 5 | | |
| 0.063 | 4 | | |

| | |
|---|---|
| Dry Mass of sample, g | 831 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 81 |
| Sand | 15 |
| | |
| Fines <0.063mm | 4 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 12.2 |
| D30 | mm | 4.53 |
| D10 | mm | 0.735 |
| Uniformity Coefficient | | 17 |
| Curvature Coefficient | | 2.3 |

Remarks

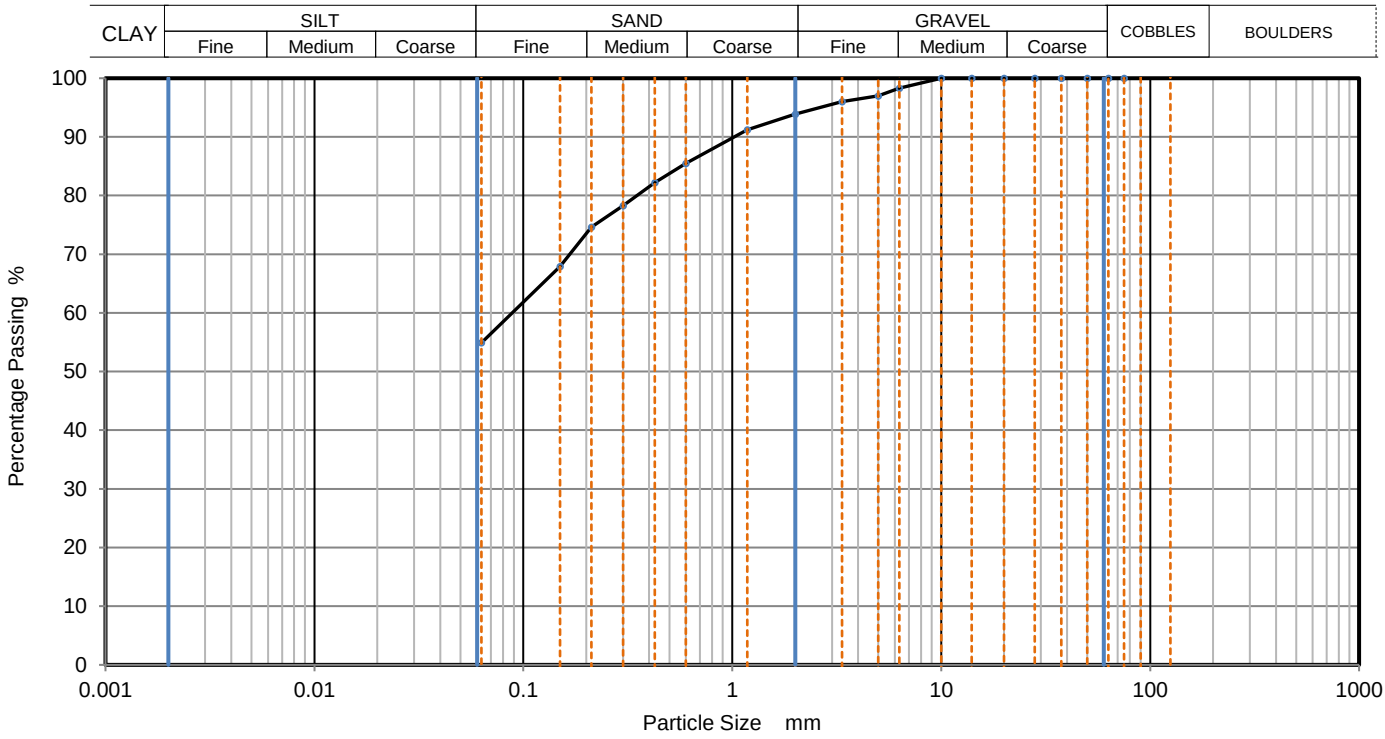
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:46 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | TP-X |
| Site Name | Ballivor Wind Farm | | | Sample No. | 1 |
| Soil Description | Dark grey slightly gravelly sandy SILT. Sand is fine. | | | Depth, m | 4.10 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL12021021993 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 100 | | |
| 10 | 100 | | |
| 6.3 | 98 | | |
| 5 | 97 | | |
| 3.35 | 96 | | |
| 2 | 94 | | |
| 1.18 | 91 | | |
| 0.6 | 86 | | |
| 0.425 | 82 | | |
| 0.3 | 78 | | |
| 0.212 | 75 | | |
| 0.15 | 68 | | |
| 0.063 | 55 | | |

| | |
|---|---|
| Dry Mass of sample, g | 404 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 6 |
| Sand | 39 |
| | |
| Fines <0.063mm | 55 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.0885 |
| D30 | mm | |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

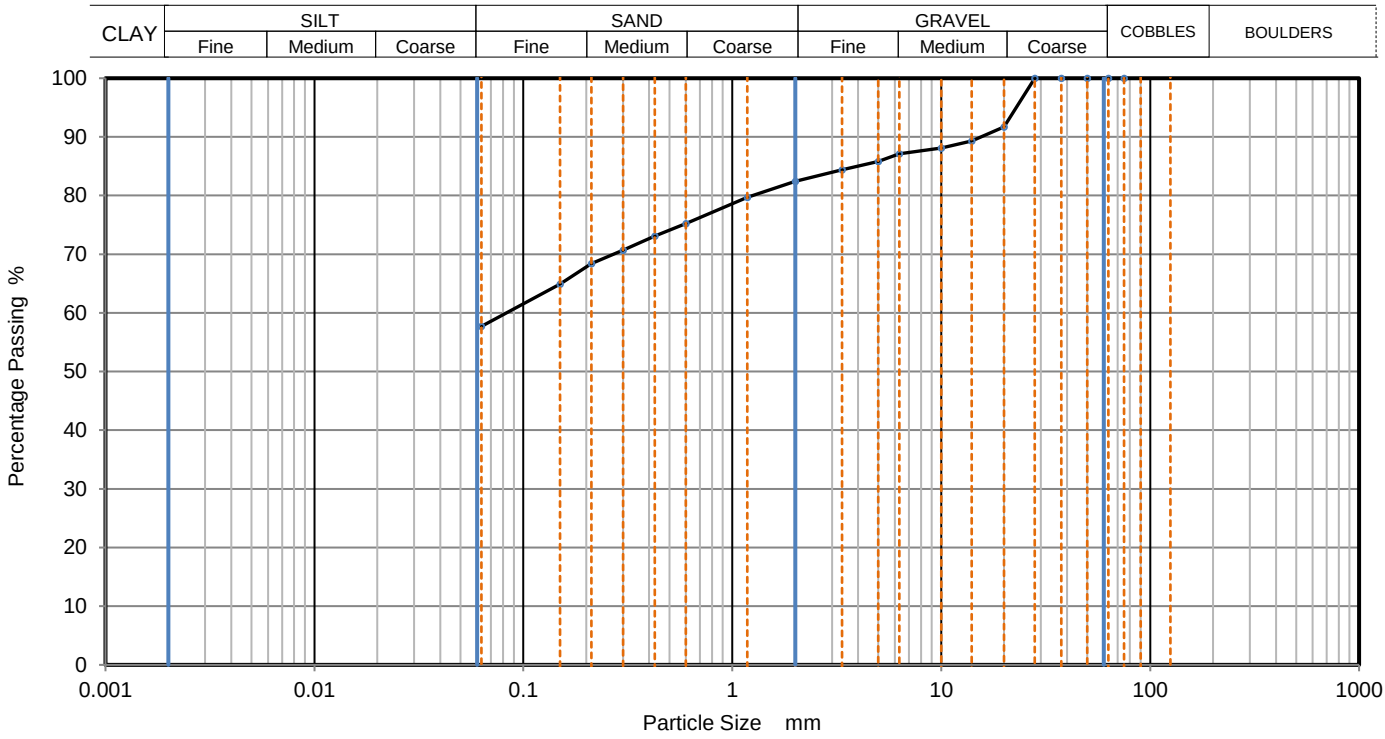
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:46 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020MH103** |
| | | | | Borehole/Pit No. | TP-Z |
| Site Name | Ballivor Wind Farm | | | Sample No. | 3 |
| Soil Description | Grey slightly gravelly slightly sandy SILT. | | | Depth, m | 1.90 |
| Specimen Reference | | Specimen Depth | m | Sample Type | D |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL120210219100 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 92 | | |
| 14 | 89 | | |
| 10 | 88 | | |
| 6.3 | 87 | | |
| 5 | 86 | | |
| 3.35 | 84 | | |
| 2 | 82 | | |
| 1.18 | 80 | | |
| 0.6 | 75 | | |
| 0.425 | 73 | | |
| 0.3 | 71 | | |
| 0.212 | 68 | | |
| 0.15 | 65 | | |
| 0.063 | 58 | | |

| Dry Mass of sample, g | 536 |
|---|---|

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 18 |
| Sand | 25 |
| | |
| Fines <0.063mm | 58 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.0834 |
| D30 | mm | |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 23/04/2021 09:46 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

IDL

# Moisture Condition Value at Natural Moisture Content
## Summary of Results

Project No.: 2020MH103

Project Name: Ballivor Wind Farm

| Hole No. | Sample | | | | Soil Description | Retained on 20mm sieve % | Moisture Content <20mm % | Moisture Condition Value | Method of Interpretation | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| | Ref | Top | Base | Type | | | | | | |
| TP-08 | 4 | 3.60 | 3.80 | B | Grey slightly gravelly slightly sandy SILT. | 8 | 13.8 | 8.8 | Steepest straight line | |
| TP-12 | 1 | 1.80 | 2.00 | B | Dark grey slightly sandy SILT. | 0 | 71.4 | 10.5 | Steepest straight line | |
| TP-24 | 1 | 2.10 | 2.30 | B | Dark grey slightly sandy gravelly SILT. | 17 | 18.3 | 9.3 | Steepest straight line | |

Key

Test performed in accordance with BS1377:Part4:1990, clause 5.4 unless annotated otherwise

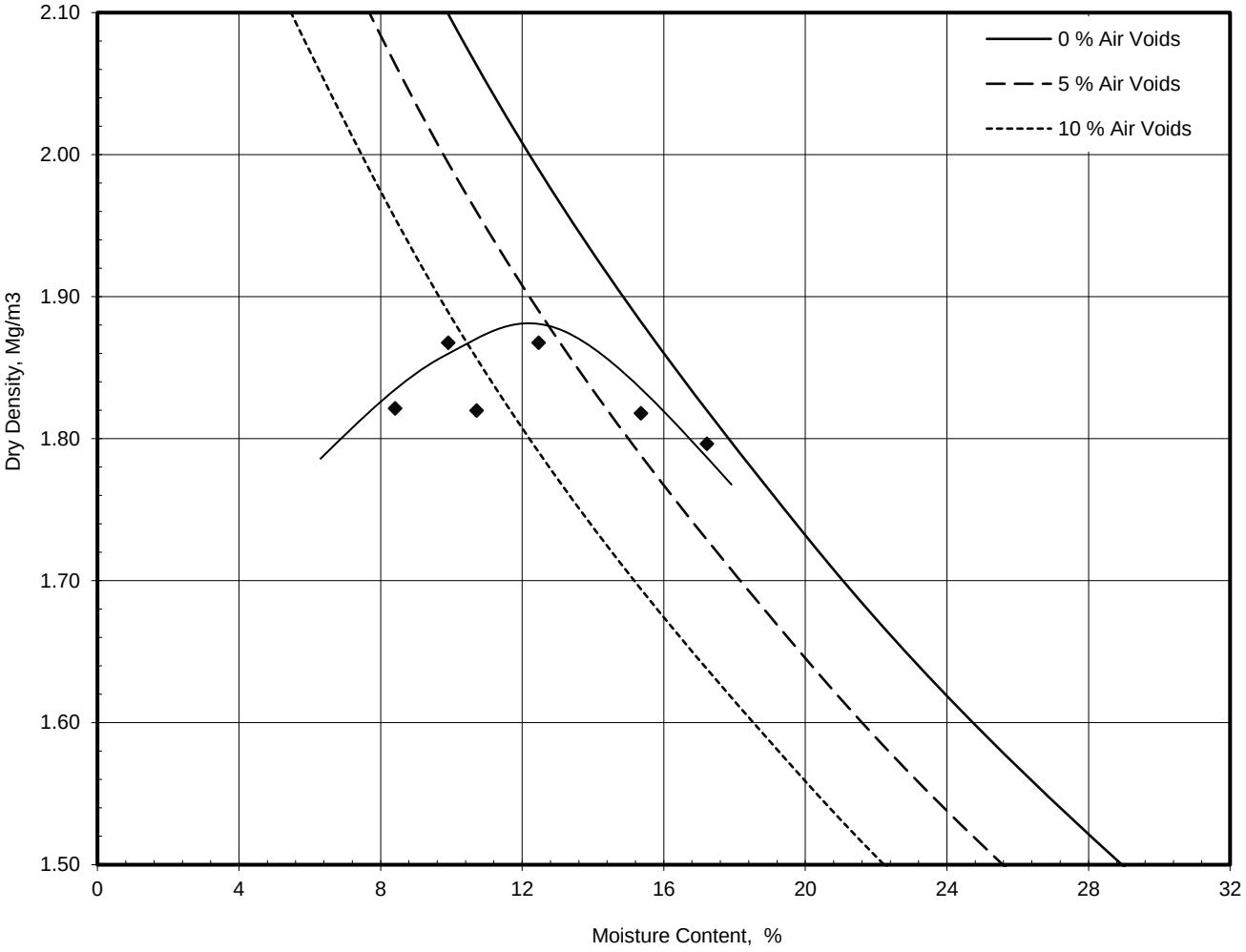
Date Printed: 23/04/2021

Approved By: DCD

Table

sheet

| | Dry Density / Moisture Content Relationship<br>Light Compaction | | | Job Ref | 2020MH103 |
|---|---|---|---|---|---|
| | | | | Borehole / Pit No | BPA-TP01 |
| Site Name | **Ballivor Wind Farm** | | | Sample No | 2 |
| Soil Description | Dark grey slightly gravelly sandy SILT. Sand is fine. | | | Depth | 4.00 m |
| Specimen Ref. | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 4:1990, clause 3.4, 2.5kg rammer | | | Keylab ID | IDL12021021749 |
| | | | | Compaction Test Reference/No. | |




| Preparation | | Material used was natural |
|---|---|---|
| Mould Type | | CBR |
| Samples Used | | Composite specimens tested |
| Material Retained on 37.5 mm Sieve | % | 0 |
| Material Retained on 20.0 mm Sieve | % | 0 |
| Particle Density - | Mg/m³ | 2.65 |

| | | |
|---|---|---|
| **Maximum Dry Density** | Mg/m³ | **1.87** |
| **Optimum Moisture Content** | % | **12** |

| Operator | Checked | Approved | Remarks | QC Form R4 |
|---|---|---|---|---|
| Administrator | DCD | DCD | | Sheet 1 of 1 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

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CH5 3US
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Fax: (01244) 528701
email: hawardencustomerservices@alsglobal.com
Website: www.alsenvironmental.co.uk

Irish Drilling Limited
Old Galway Road
Loughrea
Co. Galway

**Attention:** Dympna Darcy

# CERTIFICATE OF ANALYSIS

| | |
|---|---|
| **Date of report Generation:** | 10 March 2021 |
| **Customer:** | Irish Drilling Limited |
| **Sample Delivery Group (SDG):** | 210303-77 |
| **Your Reference:** | 2020MH103 |
| **Location:** | Ballivor Wind Farm |
| **Report No:** | 590091 |

We received 11 samples on Wednesday March 03, 2021 and 11 of these samples were scheduled for analysis which was completed on Wednesday March 10, 2021. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden (Method codes TM) or ALS Life Sciences Ltd Aberdeen (Method codes S).

All sample data is provided by the customer. The reported results relate to the sample supplied, and on the basis that this data is correct.
Incorrect sampling dates and/or sample information will affect the validity of results.
The customer is not permitted to reproduce this report except in full without the approval of the laboratory.

Approved By:

**Sonia McWhan**

Operations Manager

# CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210303-77 | **Client Reference:** | 2020MH103 | **Report Number:** | 590091 |
| **Location:** | Ballivor Wind Farm | **Order Number:** | 9570 | **Superseded Report:** | |

## Received Sample Overview

| Lab Sample No(s) | Customer Sample Ref. | AGS Ref. | Depth (m) | Sampled Date |
|---|---|---|---|---|
| 23826868 | TP-03 | B3 | 2.00 - 2.20 | 01/02/2021 |
| 23826886 | TP-07 | B2 | 3.60 - 3.80 | 01/02/2021 |
| 23826893 | TP-11 | B1 | 1.50 - 1.70 | 01/02/2021 |
| 23826899 | TP-14 | B1 | 2.20 - 2.40 | 02/02/2021 |
| 23826907 | TP-24 | B1 | 2.10 - 2.30 | 03/02/2021 |
| 23826910 | TP-26 | B1 | 2.20 - 2.40 | 03/02/2021 |
| 23826916 | TP-B | B3 | 3.70 - 3.90 | 08/02/2021 |
| 23826919 | TP-E | B3 | 3.10 - 3.30 | 05/02/2021 |
| 23826924 | TP-N | B3 | 2.50 - 2.70 | 08/02/2021 |
| 23826873 | TP-T | B3 | 2.80 - 3.00 | 09/02/2021 |
| 23826879 | TP-Z | B2 | 1.90 - 2.10 | 08/02/2021 |

**Only received samples which have had analysis scheduled will be shown on the following pages.**

Validated

# CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210303-77 | **Client Reference:** | 2020MH103 | **Report Number:** | 590091 |
| **Location:** | Ballivor Wind Farm | **Order Number:** | 9570 | **Superseded Report:** | |

**Results Legend**

X **Test**

N **No Determination Possible**

Sample Types -

S - Soil/Solid
UNS - Unspecified Solid
GW - Ground Water
SW - Surface Water
LE - Land Leachate
PL - Prepared Leachate
PR - Process Water
SA - Saline Water
TE - Trade Effluent
TS - Treated Sewage
US - Untreated Sewage
RE - Recreational Water
DW - Drinking Water Non-regulatory
UNL - Unspecified Liquid
SL - Sludge
G - Gas
OTH - Other

| | | | Lab Sample No(s) | Customer Sample Reference | AGS Reference | Depth (m) | Container | Sample Type |
|---|---|---|---|---|---|---|---|---|
| | | | 23826868 | TP-03 | B3 | 2.00 - 2.20 | 250g Amber Jar (ALE210) | S |
| | | | 23826886 | TP-07 | B2 | 3.60 - 3.80 | 250g Amber Jar (ALE210) | S |
| | | | 23826893 | TP-11 | B1 | 1.50 - 1.70 | 250g Amber Jar (ALE210) | S |
| | | | 23826899 | TP-14 | B1 | 2.20 - 2.40 | 250g Amber Jar (ALE210) | S |
| | | | 23826907 | TP-24 | B1 | 2.10 - 2.30 | 250g Amber Jar (ALE210) | S |
| | | | 23826910 | TP-26 | B1 | 2.20 - 2.40 | 250g Amber Jar (ALE210) | S |
| | | | 23826916 | TP-B | B3 | 3.70 - 3.90 | 250g Amber Jar (ALE210) | S |
| | | | 23826919 | TP-E | B3 | 3.10 - 3.30 | 250g Amber Jar (ALE210) | S |
| | | | 23826924 | TP-N | B3 | 2.50 - 2.70 | 250g Amber Jar (ALE210) | S |
| | | | 23826873 | TP-T | B3 | 2.80 - 3.00 | 250g Amber Jar (ALE210) | S |
| | | | 23826879 | TP-Z | B2 | 1.90 - 2.10 | 250g Amber Jar (ALE210) | S |
| Anions by Kone (soil) | All | NDPs: 0 Tests: 11 | X | X | X | X | X | X | X | X | X | X | X |
| pH | All | NDPs: 0 Tests: 11 | X | X | X | X | X | X | X | X | X | X | X |
| Sample description | All | NDPs: 0 Tests: 11 | X | X | X | X | X | X | X | X | X | X | X |
| Total Organic Carbon | All | NDPs: 0 Tests: 11 | X | X | X | X | X | X | X | X | X | X | X |
| Total Sulphate | All | NDPs: 0 Tests: 11 | X | X | X | X | X | X | X | X | X | X | X |
| Total Sulphur | All | NDPs: 0 Tests: 11 | X | X | X | X | X | X | X | X | X | X | X |

# CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210303-77 | **Client Reference:** | 2020MH103 | **Report Number:** | 590091 |
| **Location:** | Ballivor Wind Farm | **Order Number:** | 9570 | **Superseded Report:** | |

# Sample Descriptions

## Grain Sizes

| very fine | <0.063mm | fine | 0.063mm - 0.1mm | medium | 0.1mm - 2mm | coarse | 2mm - 10mm | very coarse | >10mm |
|---|---|---|---|---|---|---|---|---|---|

| Lab Sample No(s) | Customer Sample Ref. | Depth (m) | Colour | Description | Inclusions | Inclusions 2 |
|---|---|---|---|---|---|---|
| 23826868 | TP-03 | 2.00 - 2.20 | Grey | Sandy Silt Loam | Stones | None |
| 23826886 | TP-07 | 3.60 - 3.80 | Grey | Silt Loam | Stones | Vegetation |
| 23826893 | TP-11 | 1.50 - 1.70 | Dark Brown | Loamy Sand | Stones | Vegetation |
| 23826899 | TP-14 | 2.20 - 2.40 | Black | Silty Clay Loam | Stones | Vegetation |
| 23826907 | TP-24 | 2.10 - 2.30 | Black | Sandy Clay Loam | Stones | Vegetation |
| 23826910 | TP-26 | 2.20 - 2.40 | Black | Sandy Silt Loam | Stones | Vegetation |
| 23826916 | TP-B | 3.70 - 3.90 | Grey | Silty Clay Loam | Stones | Vegetation |
| 23826919 | TP-E | 3.10 - 3.30 | Dark Brown | Clay Loam | Stones | None |
| 23826924 | TP-N | 2.50 - 2.70 | Grey | Sandy Clay Loam | Stones | Vegetation |
| 23826873 | TP-T | 2.80 - 3.00 | Grey | Sandy Clay Loam | Stones | None |
| 23826879 | TP-Z | 1.90 - 2.10 | Dark Brown | Sandy Clay Loam | Stones | Vegetation |

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally ocurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

Validated

# CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210303-77 | **Client Reference:** | 2020MH103 | **Report Number:** | 590091 |
| **Location:** | Ballivor Wind Farm | **Order Number:** | 9570 | **Superseded Report:** | |

**Results Legend**

| | |
|---|---|
| # | ISO17025 accredited. |
| M | mCERTS accredited. |
| aq | Aqueous / settled sample. |
| diss.filt | Dissolved / filtered sample. |
| tot.unfilt | Total / unfiltered sample. |
| * | Subcontracted - refer to subcontractor report for accreditation status. |
| ** | % recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery |
| (F) | Trigger breach confirmed |
| 1-4+$@ | Sample deviation (see appendix) |

| Component | LOD/Units | Method | Customer Sample Ref. | TP-03 | TP-07 | TP-11 | TP-14 | TP-24 | TP-26 |
|---|---|---|---|---|---|---|---|---|---|
| | | | Depth (m) | 2.00 - 2.20 | 3.60 - 3.80 | 1.50 - 1.70 | 2.20 - 2.40 | 2.10 - 2.30 | 2.20 - 2.40 |
| | | | Sample Type | Soil/Solid (S) | Soil/Solid (S) | Soil/Solid (S) | Soil/Solid (S) | Soil/Solid (S) | Soil/Solid (S) |
| | | | Date Sampled | 01/02/2021 | 01/02/2021 | 01/02/2021 | 02/02/2021 | 03/02/2021 | 03/02/2021 |
| | | | Sample Time | . | . | . | . | . | . |
| | | | Date Received | 03/03/2021 | 03/03/2021 | 03/03/2021 | 03/03/2021 | 03/03/2021 | 03/03/2021 |
| | | | SDG Ref | 210303-77 | 210303-77 | 210303-77 | 210303-77 | 210303-77 | 210303-77 |
| | | | Lab Sample No.(s) | 23826868 | 23826886 | 23826893 | 23826899 | 23826907 | 23826910 |
| | | | AGS Reference | B3 | B2 | B1 | B1 | B1 | B1 |
| Moisture Content Ratio (% of as received sample) | % | PM024 | | 31 | 18 | 22 | 23 | 13 | 12 |
| Sulphur, Total | <0.02 % | TM132 | | <0.02 @ | 0.036 @ | 0.0214 @ | <0.02 @ | 0.0301 @ | 0.0351 @ |
| Soil Organic Matter (SOM) | <0.35 % | TM132 | | 1.36 @ # | 0.541 @ # | 1.23 @ # | 0.945 @ # | 0.555 @ # | 0.579 @ # |
| pH | 1 pH Units | TM133 | | 8.03 @ M | 8.4 @ M | 7.84 @ M | 7.39 @ M | 8.69 @ M | 8.74 @ M |
| Sulphate, Total | <48 mg/kg | TM221 | | 157 M | 249 M | <48 M | <48 M | 358 M | 199 M |
| Water Soluble Sulphate as SO4 2:1 Extract | <0.004 g/l | TM243 | | 0.0185 @ M | 0.0137 @ M | 0.0076 @ M | 0.0096 @ M | 0.0115 @ M | 0.0193 @ M |

Validated

# CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210303-77 | **Client Reference:** | 2020MH103 | **Report Number:** | 590091 |
| **Location:** | Ballivor Wind Farm | **Order Number:** | 9570 | **Superseded Report:** | |

**Results Legend**

| | |
|---|---|
| # | ISO17025 accredited. |
| M | mCERTS accredited. |
| aq | Aqueous / settled sample. |
| diss.filt | Dissolved / filtered sample. |
| tot.unfilt | Total / unfiltered sample. |
| * | Subcontracted - refer to subcontractor report for accreditation status. |
| ** | % recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery |
| (F) | Trigger breach confirmed |
| 1-4+$@ | Sample deviation (see appendix) |

| Component | LOD/Units | Method | Customer Sample Ref. | TP-B | TP-E | TP-N | TP-T | TP-Z |
|---|---|---|---|---|---|---|---|---|
| | | | Depth (m) | 3.70 - 3.90 | 3.10 - 3.30 | 2.50 - 2.70 | 2.80 - 3.00 | 1.90 - 2.10 |
| | | | Sample Type | Soil/Solid (S) | Soil/Solid (S) | Soil/Solid (S) | Soil/Solid (S) | Soil/Solid (S) |
| | | | Date Sampled | 08/02/2021 | 05/02/2021 | 08/02/2021 | 09/02/2021 | 08/02/2021 |
| | | | Sample Time | . | . | . | . | . |
| | | | Date Received | 03/03/2021 | 03/03/2021 | 03/03/2021 | 03/03/2021 | 03/03/2021 |
| | | | SDG Ref | 210303-77 | 210303-77 | 210303-77 | 210303-77 | 210303-77 |
| | | | Lab Sample No.(s) | 23826916 | 23826919 | 23826924 | 23826873 | 23826879 |
| | | | AGS Reference | B3 | B3 | B3 | B3 | B2 |
| Moisture Content Ratio (% of as received sample) | % | PM024 | | 13 | 12 | 8.1 | 11 | 24 |
| Sulphur, Total | <0.02 % | TM132 | | 0.0276 @ | <0.02 @ | 0.031 @ | 0.027 @ | 0.0242 @ |
| Soil Organic Matter (SOM) | <0.35 % | TM132 | | 0.462 @ # | 0.371 @ # | <0.35 @ # | 0.464 @ # | 1.42 @ # |
| pH | 1 pH Units | TM133 | | 8.66 M | 8.48 @ M | 8.59 M | 8.69 M | 7.66 M |
| Sulphate, Total | <48 mg/kg | TM221 | | 342 M | 48.8 M | 114 M | 282 M | <48 M |
| Water Soluble Sulphate as SO4 2:1 Extract | <0.004 g/l | TM243 | | <0.004 @ M | 0.01 @ M | 0.0056 @ M | 0.0045 M | 0.0078 @ M |

# CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210303-77 | **Client Reference:** | 2020MH103 | **Report Number:** | 590091 |
| **Location:** | Ballivor Wind Farm | **Order Number:** | 9570 | **Superseded Report:** | |

## Table of Results - Appendix

| Method No | Reference | Description |
|---|---|---|
| PM024 | Modified BS 1377 | Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material |
| TM132 | In - house Method | ELTRA CS800 Operators Guide |
| TM133 | BS 1377: Part 3 1990;BS 6068-2.5 | Determination of pH in Soil and Water using the GLpH pH Meter |
| TM221 | Inductively Coupled Plasma - Atomic Emission Spectroscopy. An Atlas of Spectral Information: Winge, Fassel, Peterson and Floyd | Determination of Acid extractable Sulphate in Soils by IRIS Emission Spectrometer |
| TM243 | | Mixed Anions In Soils By Kone |

NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden (Method codes TM) or ALS Life Sciences Ltd Aberdeen (Method codes S).

Validated

# CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210303-77 | **Client Reference:** | 2020MH103 | **Report Number:** | 590091 |
| **Location:** | Ballivor Wind Farm | **Order Number:** | 9570 | **Superseded Report:** | |

## Test Completion Dates

| Lab Sample No(s) | 23826868 | 23826886 | 23826893 | 23826899 | 23826907 | 23826910 | 23826916 | 23826919 | 23826924 | 23826873 |
|---|---|---|---|---|---|---|---|---|---|---|
| Customer Sample Ref. | TP-03 | TP-07 | TP-11 | TP-14 | TP-24 | TP-26 | TP-B | TP-E | TP-N | TP-T |
| AGS Ref. | B3 | B2 | B1 | B1 | B1 | B1 | B3 | B3 | B3 | B3 |
| Depth | 2.00 - 2.20 | 3.60 - 3.80 | 1.50 - 1.70 | 2.20 - 2.40 | 2.10 - 2.30 | 2.20 - 2.40 | 3.70 - 3.90 | 3.10 - 3.30 | 2.50 - 2.70 | 2.80 - 3.00 |
| Type | Soil/Solid (S) | Soil/Solid (S) | Soil/Solid (S) | Soil/Solid (S) | Soil/Solid (S) | Soil/Solid (S) | Soil/Solid (S) | Soil/Solid (S) | Soil/Solid (S) | Soil/Solid (S) |
| Anions by Kone (soil) | 08-Mar-2021 | 08-Mar-2021 | 10-Mar-2021 | 08-Mar-2021 | 08-Mar-2021 | 08-Mar-2021 | 08-Mar-2021 | 10-Mar-2021 | 10-Mar-2021 | 08-Mar-2021 |
| pH | 04-Mar-2021 | 04-Mar-2021 | 04-Mar-2021 | 04-Mar-2021 | 04-Mar-2021 | 04-Mar-2021 | 04-Mar-2021 | 08-Mar-2021 | 04-Mar-2021 | 04-Mar-2021 |
| Sample description | 03-Mar-2021 | 03-Mar-2021 | 03-Mar-2021 | 03-Mar-2021 | 03-Mar-2021 | 03-Mar-2021 | 03-Mar-2021 | 03-Mar-2021 | 03-Mar-2021 | 03-Mar-2021 |
| Total Organic Carbon | 09-Mar-2021 | 09-Mar-2021 | 09-Mar-2021 | 09-Mar-2021 | 09-Mar-2021 | 09-Mar-2021 | 09-Mar-2021 | 10-Mar-2021 | 10-Mar-2021 | 09-Mar-2021 |
| Total Sulphate | 10-Mar-2021 | 09-Mar-2021 | 10-Mar-2021 | 09-Mar-2021 | 10-Mar-2021 | 09-Mar-2021 | 10-Mar-2021 | 10-Mar-2021 | 10-Mar-2021 | 10-Mar-2021 |
| Total Sulphur | 09-Mar-2021 | 09-Mar-2021 | 08-Mar-2021 | 09-Mar-2021 | 09-Mar-2021 | 09-Mar-2021 | 09-Mar-2021 | 10-Mar-2021 | 10-Mar-2021 | 09-Mar-2021 |

| Lab Sample No(s) | 23826879 |
|---|---|
| Customer Sample Ref. | TP-Z |
| AGS Ref. | B2 |
| Depth | 1.90 - 2.10 |
| Type | Soil/Solid (S) |
| Anions by Kone (soil) | 08-Mar-2021 |
| pH | 04-Mar-2021 |
| Sample description | 03-Mar-2021 |
| Total Organic Carbon | 09-Mar-2021 |
| Total Sulphate | 10-Mar-2021 |
| Total Sulphur | 09-Mar-2021 |

# Appendix General

1. Results are expressed on a dry weight basis (dried at 35ºC) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH4 by the BRE method, VOC TICs and SVOC TICs.

2. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

3. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

4. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

5. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

6. NDP - No determination possible due to insufficient/unsuitable sample.

7. Results relate only to the items tested.

8. LoDs (Limit of Detection) for wet tests reported on a dry weight basis are not corrected for moisture content.

9. **Surrogate recoveries** - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect.

10. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

11. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

12. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

13. For leachate preparations other than Zero Headspace Extraction (ZHE) volatile loss may occur.

14. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

15. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5-C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

16. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

17. **Tentatively Identified Compounds (TICs)** are non-target peaks in VOC and SVOC analysis. All non-target peaks detected with a concentration above the LoD are subjected to a mass spectral library search. Non-target peaks with a library search confidence of >75% are reported based on the best mass spectral library match. When a non-target peak with a library search confidence of <75% is detected it is reported as "mixed hydrocarbons". Non-target compounds identified from the scan data are semi-quantified relative to one of the deuterated internal standards, under the same chromatographic conditions as the target compounds. This result is reported as a semi-quantitative value and reported as Tentatively Identified Compounds (TICs). TICs are outside the scope of UKAS accreditation and are not moisture corrected.

18. **Sample Deviations**

If a sample is classed as deviated then the associated results may be compromised.

| | |
|---|---|
| 1 | **Container with Headspace provided for volatiles analysis** |
| 2 | **Incorrect container received** |
| 3 | **Deviation from method** |
| 4 | **Matrix interference** |
| ♦ | **Sample holding time exceeded in laboratory** |
| @ | **Sample holding time exceeded due to late arrival of instructions or samples** |
| § | **Sampled on date not provided** |

19. **Asbestos**

When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

**Identification of Asbestos in Bulk Materials & Soils**

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

| Asbestos Type | Common Name |
|---|---|
| Chrysotile | White Asbestos |
| Amosite | Brown Asbestos |
| Crocidolite | Blue Asbestos |
| Fibrous Actinolite | - |
| Fibrous Anthophyllite | - |
| Fibrous Tremolite | - |

**Visual Estimation Of Fibre Content**

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace - Where only one or two asbestos fibres were identified.

**Respirable Fibres**

Respirable fibres are defined as fibres of <3 µm diameter, longer than 5 µm and with aspect ratios of at least 3:1 that can be inhaled into the lower regions of the lung and are generally acknowledged to be most important predictor of hazard and risk for cancers of the lung.
Standing Committee of Analysts, *The Quantification of Asbestos in Soil (2017).*

**Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.**

**The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.**

Unit 7-8 Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden
Deeside
CH5 3US
Tel: (01244) 528700
Fax: (01244) 528701
email: hawardencustomerservices@alsglobal.com
Website: www.alsenvironmental.co.uk

Irish Drilling Limited
Old Galway Road
Loughrea
Co. Galway

**Attention:** Dympna Darcy

# CERTIFICATE OF ANALYSIS

| | |
|---|---|
| **Date of report Generation:** | 23 March 2021 |
| **Customer:** | Irish Drilling Limited |
| **Sample Delivery Group (SDG):** | 210316-78 |
| **Your Reference:** | 2020MH103 |
| **Location:** | Ballivor Wind Farm |
| **Report No:** | 591774 |

We received 6 samples on Tuesday March 16, 2021 and 6 of these samples were scheduled for analysis which was completed on Tuesday March 23, 2021. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden (Method codes TM) or ALS Life Sciences Ltd Aberdeen (Method codes S).

All sample data is provided by the customer. The reported results relate to the sample supplied, and on the basis that this data is correct.
Incorrect sampling dates and/or sample information will affect the validity of results.
The customer is not permitted to reproduce this report except in full without the approval of the laboratory.

Approved By:



**Sonia McWhan**

Operations Manager

# CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210316-78 | **Client Reference:** | 2020MH103 | **Report Number:** | 591774 |
| **Location:** | Ballivor Wind Farm | **Order Number:** | 9570 | **Superseded Report:** | |

## Received Sample Overview

| Lab Sample No(s) | Customer Sample Ref. | AGS Ref. | Depth (m) | Sampled Date |
|---|---|---|---|---|
| 23907976 | TP-26 | B1 | 2.20 - 2.40 | 03/02/2021 |
| 23907979 | TP-B | B3 | 3.70 - 3.90 | 08/02/2021 |
| 23907995 | TP-E | B3 | 3.10 - 3.30 | 05/02/2021 |
| 23907998 | TP-N | B3 | 2.50 - 2.70 | 08/02/2021 |
| 23908000 | TP-T | B3 | 2.80 - 3.00 | 09/02/2021 |
| 23908005 | TP-Z | B2 | 1.90 - 2.10 | 08/02/2021 |

**Only received samples which have had analysis scheduled will be shown on the following pages.**

Validated

# CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210316-78 | **Client Reference:** | 2020MH103 | **Report Number:** | 591774 |
| **Location:** | Ballivor Wind Farm | **Order Number:** | 9570 | **Superseded Report:** | |

**Results Legend**

X **Test**

N **No Determination Possible**

Sample Types -

S - Soil/Solid
UNS - Unspecified Solid
GW - Ground Water
SW - Surface Water
LE - Land Leachate
PL - Prepared Leachate
PR - Process Water
SA - Saline Water
TE - Trade Effluent
TS - Treated Sewage
US - Untreated Sewage
RE - Recreational Water
DW - Drinking Water Non-regulatory
UNL - Unspecified Liquid
SL - Sludge
G - Gas
OTH - Other

| | | | Lab Sample No(s) | Customer Sample Reference | AGS Reference | Depth (m) | Container | Sample Type |
|---|---|---|---|---|---|---|---|---|
| | | | 2307976 | TP-26 | B1 | 2.20 - 2.40 | 250g Amber Jar (ALE210) | S |
| | | | 2307979 | TP-B | B3 | 3.70 - 3.90 | 250g Amber Jar (ALE210) | S |
| | | | 2307995 | TP-E | B3 | 3.10 - 3.30 | 250g Amber Jar (ALE210) | S |
| | | | 2307998 | TP-N | B3 | 2.50 - 2.70 | 250g Amber Jar (ALE210) | S |
| | | | 2308000 | TP-T | B3 | 2.80 - 3.00 | 250g Amber Jar (ALE210) | S |
| | | | 2308005 | TP-Z | B2 | 1.90 - 2.10 | 250g Amber Jar (ALE210) | S |
| Anions by Kone (soil) | All | NDPs: 0 Tests: 6 | X | X | X | X | X | X |
| pH | All | NDPs: 0 Tests: 6 | X | X | X | X | X | X |
| Sample description | All | NDPs: 0 Tests: 6 | X | X | X | X | X | X |
| Total Organic Carbon | All | NDPs: 0 Tests: 6 | X | X | X | X | X | X |
| Total Sulphate | All | NDPs: 0 Tests: 6 | X | X | X | X | X | X |
| Total Sulphur | All | NDPs: 0 Tests: 6 | X | X | X | X | X | X |

# CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210316-78 | **Client Reference:** | 2020MH103 | **Report Number:** | 591774 |
| **Location:** | Ballivor Wind Farm | **Order Number:** | 9570 | **Superseded Report:** | |

# Sample Descriptions

## Grain Sizes

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **very fine** | <0.063mm | **fine** | 0.063mm - 0.1mm | **medium** | 0.1mm - 2mm | **coarse** | 2mm - 10mm | **very coarse** | >10mm |

| Lab Sample No(s) | Customer Sample Ref. | Depth (m) | Colour | Description | Inclusions | Inclusions 2 |
|---|---|---|---|---|---|---|
| 23907976 | TP-26 | 2.20 - 2.40 | Dark Brown | Sandy Clay | Stones | None |
| 23907979 | TP-B | 3.70 - 3.90 | Dark Brown | Sandy Loam | Vegetation | Stones |
| 23907995 | TP-E | 3.10 - 3.30 | Light Brown | Sandy Clay Loam | Stones | None |
| 23907998 | TP-N | 2.50 - 2.70 | Light Brown | Sandy Clay Loam | Stones | None |
| 23908000 | TP-T | 2.80 - 3.00 | Dark Brown | Sandy Loam | Vegetation | Stones |
| 23908005 | TP-Z | 1.90 - 2.10 | Dark Brown | Sandy Loam | Vegetation | Stones |

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally ocurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

Validated

# CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210316-78 | **Client Reference:** | 2020MH103 | **Report Number:** | 591774 |
| **Location:** | Ballivor Wind Farm | **Order Number:** | 9570 | **Superseded Report:** | |

**Results Legend**

| | |
|---|---|
| # | ISO17025 accredited. |
| M | mCERTS accredited. |
| aq | Aqueous / settled sample. |
| diss.filt | Dissolved / filtered sample. |
| tot.unfilt | Total / unfiltered sample. |
| * | Subcontracted - refer to subcontractor report for accreditation status. |
| ** | % recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery |
| (F) | Trigger breach confirmed |
| 1-4+$@ | Sample deviation (see appendix) |

| Component | LOD/Units | Method | Customer Sample Ref. | TP-26 | TP-B | TP-E | TP-N | TP-T | TP-Z |
|---|---|---|---|---|---|---|---|---|---|
| | | | Depth (m) | 2.20 - 2.40 | 3.70 - 3.90 | 3.10 - 3.30 | 2.50 - 2.70 | 2.80 - 3.00 | 1.90 - 2.10 |
| | | | Sample Type | Soil/Solid (S) | Soil/Solid (S) | Soil/Solid (S) | Soil/Solid (S) | Soil/Solid (S) | Soil/Solid (S) |
| | | | Date Sampled | 03/02/2021 | 08/02/2021 | 05/02/2021 | 08/02/2021 | 09/02/2021 | 08/02/2021 |
| | | | Sample Time | . | . | . | . | . | . |
| | | | Date Received | 16/03/2021 | 16/03/2021 | 16/03/2021 | 16/03/2021 | 16/03/2021 | 16/03/2021 |
| | | | SDG Ref | 210316-78 | 210316-78 | 210316-78 | 210316-78 | 210316-78 | 210316-78 |
| | | | Lab Sample No.(s) | 23907976 | 23907979 | 23907995 | 23907998 | 23908000 | 23908005 |
| | | | AGS Reference | B1 | B3 | B3 | B3 | B3 | B2 |
| Moisture Content Ratio (% of as received sample) | % | PM024 | | 11 | 13 | 10 | 9.8 | 11 | 22 |
| Sulphur, Total | <0.02 % | TM132 | | 0.032 @ | 0.0247 @ | 0.0249 @ | 0.0267 @ | 0.0259 @ | <0.02 @ |
| Soil Organic Matter (SOM) | <0.35 % | TM132 | | 0.497 @ # | 0.352 @ # | <0.35 @ # | <0.35 @ # | 0.414 @ # | 0.895 @ # |
| pH | 1 pH Units | TM133 | | 8.54 @ M | 8.5 @ M | 8.58 @ M | 8.67 @ M | 8.44 @ M | 8.08 @ M |
| Sulphate, Total | <48 mg/kg | TM221 | | 439 M | 563 M | 392 M | 408 M | 401 M | 111 M |
| Water Soluble Sulphate as SO4 2:1 Extract | <0.004 g/l | TM243 | | 0.0238 @ M | 0.0075 @ M | 0.0093 @ M | 0.0064 @ M | 0.0054 @ M | 0.0106 @ M |

# Table of Results - Appendix

| Method No | Reference | Description |
|---|---|---|
| PM024 | Modified BS 1377 | Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material |
| TM132 | In - house Method | ELTRA CS800 Operators Guide |
| TM133 | BS 1377: Part 3 1990;BS 6068-2.5 | Determination of pH in Soil and Water using the GLpH pH Meter |
| TM221 | Inductively Coupled Plasma - Atomic Emission Spectroscopy. An Atlas of Spectral Information: Winge, Fassel, Peterson and Floyd | Determination of Acid extractable Sulphate in Soils by IRIS Emission Spectrometer |
| TM243 | | Mixed Anions In Soils By Kone |

NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden (Method codes TM) or ALS Life Sciences Ltd Aberdeen (Method codes S).

# CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210316-78 | **Client Reference:** | 2020MH103 | **Report Number:** | 591774 |
| **Location:** | Ballivor Wind Farm | **Order Number:** | 9570 | **Superseded Report:** | |

## Test Completion Dates

| Lab Sample No(s) | 23907976 | 23907979 | 23907995 | 23907998 | 23908000 | 23908005 |
|---|---|---|---|---|---|---|
| **Customer Sample Ref.** | TP-26 | TP-B | TP-E | TP-N | TP-T | TP-Z |
| **AGS Ref.** | B1 | B3 | B3 | B3 | B3 | B2 |
| **Depth** | 2.20 - 2.40 | 3.70 - 3.90 | 3.10 - 3.30 | 2.50 - 2.70 | 2.80 - 3.00 | 1.90 - 2.10 |
| **Type** | Soil/Solid (S) | Soil/Solid (S) | Soil/Solid (S) | Soil/Solid (S) | Soil/Solid (S) | Soil/Solid (S) |
| Anions by Kone (soil) | 22-Mar-2021 | 22-Mar-2021 | 22-Mar-2021 | 22-Mar-2021 | 22-Mar-2021 | 22-Mar-2021 |
| pH | 19-Mar-2021 | 19-Mar-2021 | 19-Mar-2021 | 19-Mar-2021 | 19-Mar-2021 | 19-Mar-2021 |
| Sample description | 16-Mar-2021 | 17-Mar-2021 | 16-Mar-2021 | 16-Mar-2021 | 17-Mar-2021 | 17-Mar-2021 |
| Total Organic Carbon | 23-Mar-2021 | 23-Mar-2021 | 23-Mar-2021 | 23-Mar-2021 | 23-Mar-2021 | 23-Mar-2021 |
| Total Sulphate | 23-Mar-2021 | 23-Mar-2021 | 23-Mar-2021 | 23-Mar-2021 | 23-Mar-2021 | 23-Mar-2021 |
| Total Sulphur | 23-Mar-2021 | 22-Mar-2021 | 22-Mar-2021 | 22-Mar-2021 | 22-Mar-2021 | 22-Mar-2021 |

# Appendix General

1. Results are expressed on a dry weight basis (dried at 35ºC) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH4 by the BRE method, VOC TICs and SVOC TICs.

2. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

3. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

4. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

5. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

6. NDP - No determination possible due to insufficient/unsuitable sample.

7. Results relate only to the items tested.

8. LoDs (Limit of Detection) for wet tests reported on a dry weight basis are not corrected for moisture content.

9. **Surrogate recoveries** - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect.

10. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

11. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

12. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

13. For leachate preparations other than Zero Headspace Extraction (ZHE) volatile loss may occur.

14. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

15. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5-C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

16. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

17. **Tentatively Identified Compounds (TICs)** are non-target peaks in VOC and SVOC analysis. All non-target peaks detected with a concentration above the LoD are subjected to a mass spectral library search. Non-target peaks with a library search confidence of >75% are reported based on the best mass spectral library match. When a non-target peak with a library search confidence of <75% is detected it is reported as "mixed hydrocarbons". Non-target compounds identified from the scan data are semi-quantified relative to one of the deuterated internal standards, under the same chromatographic conditions as the target compounds. This result is reported as a semi-quantitative value and reported as Tentatively Identified Compounds (TICs). TICs are outside the scope of UKAS accreditation and are not moisture corrected.

18. **Sample Deviations**

If a sample is classed as deviated then the associated results may be compromised.

| | |
|---|---|
| 1 | **Container with Headspace provided for volatiles analysis** |
| 2 | **Incorrect container received** |
| 3 | **Deviation from method** |
| 4 | **Matrix interference** |
| ♦ | **Sample holding time exceeded in laboratory** |
| @ | **Sample holding time exceeded due to late arrival of instructions or samples** |
| § | **Sampled on date not provided** |

19. **Asbestos**

When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

**Identification of Asbestos in Bulk Materials & Soils**

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

| Asbestos Type | Common Name |
|---|---|
| Chrysotile | White Asbestos |
| Amosite | Brown Asbestos |
| Crocidolite | Blue Asbestos |
| Fibrous Actinolite | - |
| Fibrous Anthophyllite | - |
| Fibrous Tremolite | - |

**Visual Estimation Of Fibre Content**

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace - Where only one or two asbestos fibres were identified.

**Respirable Fibres**

Respirable fibres are defined as fibres of <3 µm diameter, longer than 5 µm and with aspect ratios of at least 3:1 that can be inhaled into the lower regions of the lung and are generally acknowledged to be most important predictor of hazard and risk for cancers of the lung.
Standing Committee of Analysts, *The Quantification of Asbestos in Soil (2017).*

**Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.**

**The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.**

Unit 7-8 Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden
Deeside
CH5 3US
Tel: (01244) 528700
Fax: (01244) 528701
email: hawardencustomerservices@alsglobal.com
Website: www.alsenvironmental.co.uk

Irish Drilling Limited
Old Galway Road
Loughrea
Co. Galway

**Attention:** Dympna Darcy

# CERTIFICATE OF ANALYSIS

| | |
|---|---|
| **Date of report Generation:** | 22 April 2021 |
| **Customer:** | Irish Drilling Limited |
| **Sample Delivery Group (SDG):** | 210414-113 |
| **Your Reference:** | 2020MH103 |
| **Location:** | Ballivor Wind Farm |
| **Report No:** | 594997 |

We received 6 samples on Wednesday April 14, 2021 and 6 of these samples were scheduled for analysis which was completed on Wednesday April 21, 2021. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden (Method codes TM) or ALS Life Sciences Ltd Aberdeen (Method codes S).

All sample data is provided by the customer. The reported results relate to the sample supplied, and on the basis that this data is correct.
Incorrect sampling dates and/or sample information will affect the validity of results.
The customer is not permitted to reproduce this report except in full without the approval of the laboratory.

Approved By:

**Sonia McWhan**

Operations Manager

# CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210414-113 | **Client Reference:** | 2020MH103 | **Report Number:** | 594997 |
| **Location:** | Ballivor Wind Farm | **Order Number:** | 9570 | **Superseded Report:** | |

## Received Sample Overview

| Lab Sample No(s) | Customer Sample Ref. | AGS Ref. | Depth (m) | Sampled Date |
|---|---|---|---|---|
| 24074793 | BH-04 | D13 | 4.50 - 4.50 | 01/02/2021 |
| 24074799 | BH-05 | D16 | 5.00 - 5.00 | 02/02/2021 |
| 24074803 | BH-08 | D16 | 5.50 - 5.50 | 10/02/2021 |
| 24074809 | BH-09 | D11 | 3.50 - 3.50 | 04/02/2021 |
| 24074812 | BH-11 | D8 | 2.50 - 2.50 | 08/02/2021 |
| 24074814 | BPA-BH03A | D2 | 1.00 - 1.00 | 15/02/2021 |

**Only received samples which have had analysis scheduled will be shown on the following pages.**

Validated

# CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210414-113 | **Client Reference:** | 2020MH103 | **Report Number:** | 594997 |
| **Location:** | Ballivor Wind Farm | **Order Number:** | 9570 | **Superseded Report:** | |

**Results Legend**

X **Test**

N **No Determination Possible**

Sample Types -

S - Soil/Solid
UNS - Unspecified Solid
GW - Ground Water
SW - Surface Water
LE - Land Leachate
PL - Prepared Leachate
PR - Process Water
SA - Saline Water
TE - Trade Effluent
TS - Treated Sewage
US - Untreated Sewage
RE - Recreational Water
DW - Drinking Water Non-regulatory
UNL - Unspecified Liquid
SL - Sludge
G - Gas
OTH - Other

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Lab Sample No(s)** | | | 24074793 | 24074799 | 24074803 | 24074809 | 24074812 | 24074814 |
| **Customer Sample Reference** | | | BH-04 | BH-05 | BH-08 | BH-09 | BH-11 | BPA-BH03A |
| **AGS Reference** | | | D13 | D16 | D16 | D11 | D8 | D2 |
| **Depth (m)** | | | 4.50 - 4.50 | 5.00 - 5.00 | 5.50 - 5.50 | 3.50 - 3.50 | 2.50 - 2.50 | 1.00 - 1.00 |
| **Container** | | | 250g Amber Jar (ALE210) | 250g Amber Jar (ALE210) | 250g Amber Jar (ALE210) | 250g Amber Jar (ALE210) | 250g Amber Jar (ALE210) | 250g Amber Jar (ALE210) |
| **Sample Type** | | | S | S | S | S | S | S |
| Anions by Kone (soil) | All | NDPs: 0 Tests: 6 | X | X | X | X | X | X |
| pH | All | NDPs: 0 Tests: 6 | X | X | X | X | X | X |
| Sample description | All | NDPs: 0 Tests: 6 | X | X | X | X | X | X |
| Total Organic Carbon | All | NDPs: 0 Tests: 6 | X | X | X | X | X | X |
| Total Sulphate | All | NDPs: 0 Tests: 6 | X | X | X | X | X | X |

# CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210414-113 | **Client Reference:** | 2020MH103 | **Report Number:** | 594997 |
| **Location:** | Ballivor Wind Farm | **Order Number:** | 9570 | **Superseded Report:** | |

# Sample Descriptions

## Grain Sizes

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **very fine** | <0.063mm | **fine** | 0.063mm - 0.1mm | **medium** | 0.1mm - 2mm | **coarse** | 2mm - 10mm | **very coarse** | >10mm |

| Lab Sample No(s) | Customer Sample Ref. | Depth (m) | Colour | Description | Inclusions | Inclusions 2 |
|---|---|---|---|---|---|---|
| 24074793 | BH-04 | 4.50 - 4.50 | Grey | Loamy Sand | Stones | None |
| 24074799 | BH-05 | 5.00 - 5.00 | Grey | Sandy Clay | Stones | None |
| 24074803 | BH-08 | 5.50 - 5.50 | Grey | Sandy Clay | Stones | N/A |
| 24074809 | BH-09 | 3.50 - 3.50 | Grey | Sandy Clay | Stones | None |
| 24074812 | BH-11 | 2.50 - 2.50 | Dark Brown | Sandy Loam | Stones | None |
| 24074814 | BPA-BH03A | 1.00 - 1.00 | Dark Brown | Silt Loam | Stones | None |

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally ocurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

Validated

# CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210414-113 | **Client Reference:** | 2020MH103 | **Report Number:** | 594997 |
| **Location:** | Ballivor Wind Farm | **Order Number:** | 9570 | **Superseded Report:** | |

**Results Legend**

| | |
|---|---|
| # | ISO17025 accredited. |
| M | mCERTS accredited. |
| aq | Aqueous / settled sample. |
| diss.filt | Dissolved / filtered sample. |
| tot.unfilt | Total / unfiltered sample. |
| * | Subcontracted - refer to subcontractor report for accreditation status. |
| ** | % recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery |
| (F) | Trigger breach confirmed |
| 1-4+$@ | Sample deviation (see appendix) |

| Component | LOD/Units | Method | Customer Sample Ref. | BH-04 | BH-05 | BH-08 | BH-09 | BH-11 | BPA-BH03A |
|---|---|---|---|---|---|---|---|---|---|
| | | | Depth (m) | 4.50 - 4.50 | 5.00 - 5.00 | 5.50 - 5.50 | 3.50 - 3.50 | 2.50 - 2.50 | 1.00 - 1.00 |
| | | | Sample Type | Soil/Solid (S) | Soil/Solid (S) | Soil/Solid (S) | Soil/Solid (S) | Soil/Solid (S) | Soil/Solid (S) |
| | | | Date Sampled | 01/02/2021 | 02/02/2021 | 10/02/2021 | 04/02/2021 | 08/02/2021 | 15/02/2021 |
| | | | Sample Time | . | . | . | . | . | . |
| | | | Date Received | 14/04/2021 | 14/04/2021 | 14/04/2021 | 14/04/2021 | 14/04/2021 | 14/04/2021 |
| | | | SDG Ref | 210414-113 | 210414-113 | 210414-113 | 210414-113 | 210414-113 | 210414-113 |
| | | | Lab Sample No.(s) | 24074793 | 24074799 | 24074803 | 24074809 | 24074812 | 24074814 |
| | | | AGS Reference | D13 | D16 | D16 | D11 | D8 | D2 |
| Moisture Content Ratio (% of as received sample) | % | PM024 | | 24 | 17 | 11 | 10 | 14 | 56 |
| Soil Organic Matter (SOM) | <0.35 % | TM132 | | 1.71 @ # | 0.878 @ # | 0.834 @ # | 0.421 @ # | 0.615 @ # | 17.4 @ # |
| pH | 1 pH Units | TM133 | | 7.75 @ M | 8.26 @ M | 8.45 @ M | 8.44 @ M | 8.43 @ M | 6.4 @ M |
| Sulphate, Total | <48 mg/kg | TM221 | | 422 M | 418 M | 379 M | 373 M | 425 M | 143 M |
| Water Soluble Sulphate as SO4 2:1 Extract | <0.004 g/l | TM243 | | 0.006 @ M | 0.0115 @ M | 0.0247 @ M | <0.004 @ M | 0.007 @ M | 0.0435 @ M |

# Table of Results - Appendix

| Method No | Reference | Description |
|---|---|---|
| PM024 | Modified BS 1377 | Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material |
| TM132 | In - house Method | ELTRA CS800 Operators Guide |
| TM133 | BS 1377: Part 3 1990;BS 6068-2.5 | Determination of pH in Soil and Water using the GLpH pH Meter |
| TM221 | Inductively Coupled Plasma - Atomic Emission Spectroscopy. An Atlas of Spectral Information: Winge, Fassel, Peterson and Floyd | Determination of Acid extractable Sulphate in Soils by IRIS Emission Spectrometer |
| TM243 | | Mixed Anions In Soils By Kone |

NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden (Method codes TM) or ALS Life Sciences Ltd Aberdeen (Method codes S).

# CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| **SDG:** | 210414-113 | **Client Reference:** | 2020MH103 | **Report Number:** | 594997 |
| **Location:** | Ballivor Wind Farm | **Order Number:** | 9570 | **Superseded Report:** | |

## Test Completion Dates

| Lab Sample No(s) | 24074793 | 24074799 | 24074803 | 24074809 | 24074812 | 24074814 |
|---|---|---|---|---|---|---|
| **Customer Sample Ref.** | BH-04 | BH-05 | BH-08 | BH-09 | BH-11 | BPA-BH03A |
| **AGS Ref.** | D13 | D16 | D16 | D11 | D8 | D2 |
| **Depth** | 4.50 - 4.50 | 5.00 - 5.00 | 5.50 - 5.50 | 3.50 - 3.50 | 2.50 - 2.50 | 1.00 - 1.00 |
| **Type** | Soil/Solid (S) | Soil/Solid (S) | Soil/Solid (S) | Soil/Solid (S) | Soil/Solid (S) | Soil/Solid (S) |
| Anions by Kone (soil) | 18-Apr-2021 | 18-Apr-2021 | 18-Apr-2021 | 18-Apr-2021 | 19-Apr-2021 | 19-Apr-2021 |
| pH | 15-Apr-2021 | 15-Apr-2021 | 15-Apr-2021 | 15-Apr-2021 | 16-Apr-2021 | 16-Apr-2021 |
| Sample description | 14-Apr-2021 | 14-Apr-2021 | 14-Apr-2021 | 14-Apr-2021 | 15-Apr-2021 | 15-Apr-2021 |
| Total Organic Carbon | 20-Apr-2021 | 20-Apr-2021 | 20-Apr-2021 | 20-Apr-2021 | 20-Apr-2021 | 20-Apr-2021 |
| Total Sulphate | 19-Apr-2021 | 19-Apr-2021 | 19-Apr-2021 | 19-Apr-2021 | 21-Apr-2021 | 21-Apr-2021 |

# Appendix General

1. Results are expressed on a dry weight basis (dried at 35ºC) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH4 by the BRE method, VOC TICs and SVOC TICs.

2. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

3. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

4. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

5. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

6. NDP - No determination possible due to insufficient/unsuitable sample.

7. Results relate only to the items tested.

8. LoDs (Limit of Detection) for wet tests reported on a dry weight basis are not corrected for moisture content.

9. **Surrogate recoveries** - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect.

10. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

11. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

12. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

13. For leachate preparations other than Zero Headspace Extraction (ZHE) volatile loss may occur.

14. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

15. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5-C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

16. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

17. **Tentatively Identified Compounds (TICs)** are non-target peaks in VOC and SVOC analysis. All non-target peaks detected with a concentration above the LoD are subjected to a mass spectral library search. Non-target peaks with a library search confidence of >75% are reported based on the best mass spectral library match. When a non-target peak with a library search confidence of <75% is detected it is reported as "mixed hydrocarbons". Non-target compounds identified from the scan data are semi-quantified relative to one of the deuterated internal standards, under the same chromatographic conditions as the target compounds. This result is reported as a semi-quantitative value and reported as Tentatively Identified Compounds (TICs). TICs are outside the scope of UKAS accreditation and are not moisture corrected.

18. **Sample Deviations**

If a sample is classed as deviated then the associated results may be compromised.

| | |
|---|---|
| 1 | **Container with Headspace provided for volatiles analysis** |
| 2 | **Incorrect container received** |
| 3 | **Deviation from method** |
| 4 | **Matrix interference** |
| ♦ | **Sample holding time exceeded in laboratory** |
| @ | **Sample holding time exceeded due to late arrival of instructions or samples** |
| § | **Sampled on date not provided** |

19. **Asbestos**

When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

**Identification of Asbestos in Bulk Materials & Soils**

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

| Asbestos Type | Common Name |
|---|---|
| Chrysotile | White Asbestos |
| Amosite | Brown Asbestos |
| Crocidolite | Blue Asbestos |
| Fibrous Actinolite | - |
| Fibrous Anthophyllite | - |
| Fibrous Tremolite | - |

**Visual Estimation Of Fibre Content**

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace - Where only one or two asbestos fibres were identified.

**Respirable Fibres**

Respirable fibres are defined as fibres of <3 µm diameter, longer than 5 µm and with aspect ratios of at least 3:1 that can be inhaled into the lower regions of the lung and are generally acknowledged to be most important predictor of hazard and risk for cancers of the lung.
Standing Committee of Analysts, *The Quantification of Asbestos in Soil (2017).*

**Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.**

**The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.**

# Appendix 05
# Photographs (Trial Pits)



Figure 1 H:\20MH103_BallivorWF\Tp1...jpg



Figure 3 H:\20MH103_BallivorWF\Tp1.jpg



Figure 2 H:\20MH103_BallivorWF\Tp1..jpg



Figure 4 H:\20MH103_BallivorWF\Tp2...jpg



Figure 5 H:\20MH103_BallivorWF\Tp2..jpg



Figure 7 H:\20MH103_BallivorWF\Tp3...jpg



Figure 6 H:\20MH103_BallivorWF\Tp2.jpg



Figure 8 H:\20MH103_BallivorWF\Tp3..jpg



Figure 9 H:\20MH103_BallivorWF\Tp3.jpg



Figure 11 H:\20MH103_BallivorWF\Tp4..jpg



Figure 10 H:\20MH103_BallivorWF\Tp4...jpg



Figure 12 H:\20MH103_BallivorWF\Tp4.jpg



Figure 13 H:\20MH103_BallivorWF\Tp5...jpg



Figure 15 H:\20MH103_BallivorWF\Tp5.jpg



Figure 14 H:\20MH103_BallivorWF\Tp5..jpg



Figure 16 H:\20MH103_BallivorWF\Tp7...jpg



Figure 17 H:\20MH103_BallivorWF\Tp7..jpg



Figure 19 H:\20MH103_BallivorWF\Tp8...jpg



Figure 18 H:\20MH103_BallivorWF\Tp7.jpg



Figure 20 H:\20MH103_BallivorWF\Tp8..jpg



Figure 21 H:\20MH103_BallivorWF\Tp8.jpg



Figure 23 H:\20MH103_BallivorWF\Tp10..jpg



Figure 22 H:\20MH103_BallivorWF\Tp10...jpg



Figure 24 H:\20MH103_BallivorWF\Tp10.jpg



Figure 25 H:\20MH103_BallivorWF\Tp11...jpg



Figure 27 H:\20MH103_BallivorWF\Tp11.jpg



Figure 26 H:\20MH103_BallivorWF\Tp11..jpg



Figure 28 H:\20MH103_BallivorWF\Tp12...jpg



Figure 29 H:\20MH103_BallivorWF\Tp12..jpg



Figure 30 H:\20MH103_BallivorWF\Tp12.jpg



Figure 31 H:\20MH103_BallivorWF\Tp13...jpg



Figure 32 H:\20MH103_BallivorWF\Tp13..jpg



Figure 33 H:\20MH103_BallivorWF\Tp13.jpg



Figure 35 H:\20MH103_BallivorWF\Tp14..jpg



Figure 34 H:\20MH103_BallivorWF\Tp14...jpg



Figure 36 H:\20MH103_BallivorWF\Tp14.jpg



Figure 37 H:\20MH103_BallivorWF\Tp15...jpg



Figure 39 H:\20MH103_BallivorWF\Tp15.jpg



Figure 38 H:\20MH103_BallivorWF\Tp15..jpg



Figure 40 H:\20MH103_BallivorWF\Tp17...jpg



Figure 41 H:\20MH103_BallivorWF\Tp17..jpg



Figure 43 H:\20MH103_BallivorWF\Tp18...jpg



Figure 42 H:\20MH103_BallivorWF\Tp17.jpg



Figure 44 H:\20MH103_BallivorWF\Tp18..jpg



Figure 45 H:\20MH103_BallivorWF\Tp18.jpg



Figure 46 H:\20MH103_BallivorWF\Tp20...jpg



Figure 47 H:\20MH103_BallivorWF\Tp20..jpg



Figure 48 H:\20MH103_BallivorWF\Tp20.jpg



Figure 49 H:\20MH103_BallivorWF\Tp22...jpg



Figure 51 H:\20MH103_BallivorWF\Tp22.jpg



Figure 50 H:\20MH103_BallivorWF\Tp22..jpg



Figure 52 H:\20MH103_BallivorWF\Tp23...jpg



Figure 53 H:\20MH103_BallivorWF\Tp23..jpg



Figure 54 H:\20MH103_BallivorWF\Tp23.jpg



Figure 55 H:\20MH103_BallivorWF\Tp24...jpg



Figure 56 H:\20MH103_BallivorWF\Tp24..jpg



Figure 57 H:\20MH103_BallivorWF\Tp24.jpg



Figure 58 H:\20MH103_BallivorWF\Tp25...jpg



Figure 59 H:\20MH103_BallivorWF\Tp25..jpg



Figure 60 H:\20MH103_BallivorWF\Tp25.jpg



Figure 61 H:\20MH103_BallivorWF\Tp26...jpg



Figure 63 H:\20MH103_BallivorWF\Tp26.jpg



Figure 62 H:\20MH103_BallivorWF\Tp26..jpg



Figure 64 H:\20MH103_BallivorWF\Tp27...jpg



Figure 65 H:\20MH103_BallivorWF\Tp27..jpg



Figure 67 H:\20MH103_BallivorWF\Tp28...jpg



Figure 66 H:\20MH103_BallivorWF\Tp27.jpg



Figure 68 H:\20MH103_BallivorWF\Tp28..jpg



Figure 69 H:\20MH103_BallivorWF\Tp28.jpg



Figure 71 H:\20MH103_BallivorWF\Tp29..jpg



Figure 70 H:\20MH103_BallivorWF\Tp29...jpg



Figure 72 H:\20MH103_BallivorWF\Tp29.jpg



Figure 73 H:\20MH103_BallivorWF\Bpa-tp1...jpg



Figure 74 H:\20MH103_BallivorWF\Bpa-tp1..jpg



Figure 75 H:\20MH103_BallivorWF\Bpa-tp1.jpg



Figure 76 H:\20MH103_BallivorWF\Bpa-tp2...jpg



Figure 77 H:\20MH103_BallivorWF\Bpa-tp2..jpg



Figure 78 H:\20MH103_BallivorWF\Bpa-tp2.jpg



Figure 79 H:\20MH103_BallivorWF\TpA...jpg



Figure 81 H:\20MH103_BallivorWF\TpA.jpg



Figure 80 H:\20MH103_BallivorWF\TpA..jpg



Figure 82 H:\20MH103_BallivorWF\TpB...jpg



Figure 83 H:\20MH103_BallivorWF\TpB..jpg



Figure 85 H:\20MH103_BallivorWF\TpC...jpg



Figure 84 H:\20MH103_BallivorWF\TpB.jpg



Figure 86 H:\20MH103_BallivorWF\TpC..jpg



Figure 87 H:\20MH103_BallivorWF\Tpc.jpg



Figure 88 H:\20MH103_BallivorWF\TpD...jpg



Figure 89 H:\20MH103_BallivorWF\TpD..jpg



Figure 90 H:\20MH103_BallivorWF\TpD.jpg



Figure 91 H:\20MH103_BallivorWF\TpE...jpg



Figure 93 H:\20MH103_BallivorWF\TpE.jpg



Figure 92 H:\20MH103_BallivorWF\TpE..jpg



Figure 94 H:\20MH103_BallivorWF\TpF...jpg



Figure 95 H:\20MH103_BallivorWF\TpF..jpg



Figure 96 H:\20MH103_BallivorWF\TpF.jpg



Figure 97 H:\20MH103_BallivorWF\TpG...jpg



Figure 98 H:\20MH103_BallivorWF\TpG..jpg



Figure 99 H:\20MH103_BallivorWF\TpG.jpg



Figure 101 H:\20MH103_BallivorWF\TpH..jpg



Figure 100 H:\20MH103_BallivorWF\TpH...jpg



Figure 102 H:\20MH103_BallivorWF\TpH.jpg



Figure 103 H:\20MH103_BallivorWF\TpI...jpg



Figure 105 H:\20MH103_BallivorWF\TpI.jpg



Figure 104 H:\20MH103_BallivorWF\TpI..jpg



Figure 106 H:\20MH103_BallivorWF\TpJ...jpg



Figure 107 H:\20MH103_BallivorWF\TpJ..jpg



Figure 109 H:\20MH103_BallivorWF\TpK...jpg



Figure 108 H:\20MH103_BallivorWF\TpJ.jpg



Figure 110 H:\20MH103_BallivorWF\TpK..jpg



Figure 111 H:\20MH103_BallivorWF\TpK.jpg



Figure 113 H:\20MH103_BallivorWF\TpL..jpg



Figure 112 H:\20MH103_BallivorWF\TpL...jpg



Figure 114 H:\20MH103_BallivorWF\TpL.jpg



Figure 115 H:\20MH103_BallivorWF\TpM...jpg



Figure 117 H:\20MH103_BallivorWF\TpM.jpg



Figure 116 H:\20MH103_BallivorWF\TpM..jpg



Figure 118 H:\20MH103_BallivorWF\TpN...jpg



Figure 119 H:\20MH103_BallivorWF\TpN..jpg



Figure 121 H:\20MH103_BallivorWF\TpO...jpg



Figure 120 H:\20MH103_BallivorWF\TpN.jpg



Figure 122 H:\20MH103_BallivorWF\TpO..jpg



Figure 123 H:\20MH103_BallivorWF\TpO.jpg



Figure 125 H:\20MH103_BallivorWF\TpP..jpg



Figure 124 H:\20MH103_BallivorWF\TpP...jpg



Figure 126 H:\20MH103_BallivorWF\TpP.jpg



Figure 127 H:\20MH103_BallivorWF\TpQ...jpg



Figure 129 H:\20MH103_BallivorWF\TpQ.jpg



Figure 128 H:\20MH103_BallivorWF\TpQ..jpg



Figure 130 H:\20MH103_BallivorWF\TpR...jpg



Figure 131 H:\20MH103_BallivorWF\TpR..jpg



Figure 133 H:\20MH103_BallivorWF\TpS...jpg



Figure 132 H:\20MH103_BallivorWF\TpR.jpg



Figure 134 H:\20MH103_BallivorWF\TpS..jpg



Figure 135 H:\20MH103_BallivorWF\TpS.jpg



Figure 137 H:\20MH103_BallivorWF\TpT..jpg



Figure 136 H:\20MH103_BallivorWF\TpT...jpg



Figure 138 H:\20MH103_BallivorWF\TpT.jpg



Figure 139 H:\20MH103_BallivorWF\TpU...jpg



Figure 141 H:\20MH103_BallivorWF\TpU.jpg



Figure 140 H:\20MH103_BallivorWF\TpU..jpg



Figure 142 H:\20MH103_BallivorWF\TpV...jpg



Figure 143 H:\20MH103_BallivorWF\TpV..jpg



Figure 145 H:\20MH103_BallivorWF\TpW...jpg



Figure 144 H:\20MH103_BallivorWF\TpV.jpg



Figure 146 H:\20MH103_BallivorWF\TpW..jpg



Figure 147 H:\20MH103_BallivorWF\TpW.jpg



Figure 149 H:\20MH103_BallivorWF\TpX..jpg



Figure 148 H:\20MH103_BallivorWF\TpX...jpg



Figure 150 H:\20MH103_BallivorWF\TpX.jpg



Figure 151 H:\20MH103_BallivorWF\TpY...jpg



Figure 153 H:\20MH103_BallivorWF\TpY.jpg



Figure 152 H:\20MH103_BallivorWF\TpY..jpg



Figure 154 H:\20MH103_BallivorWF\TpZ...jpg

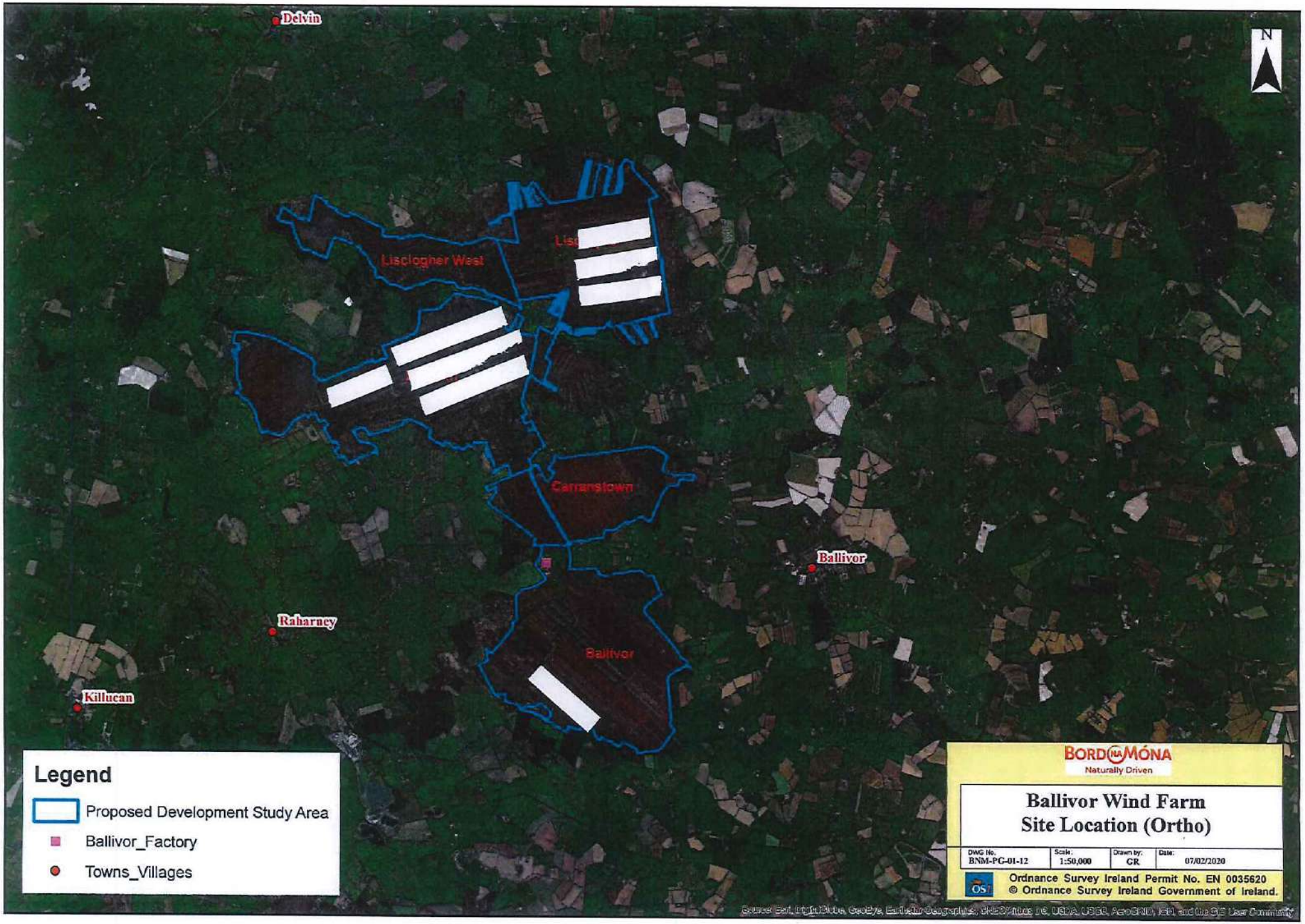


Figure 155 H:\20MH103_BallivorWF\TpZ..jpg



Figure 156 H:\20MH103_BallivorWF\TpZ.jpg

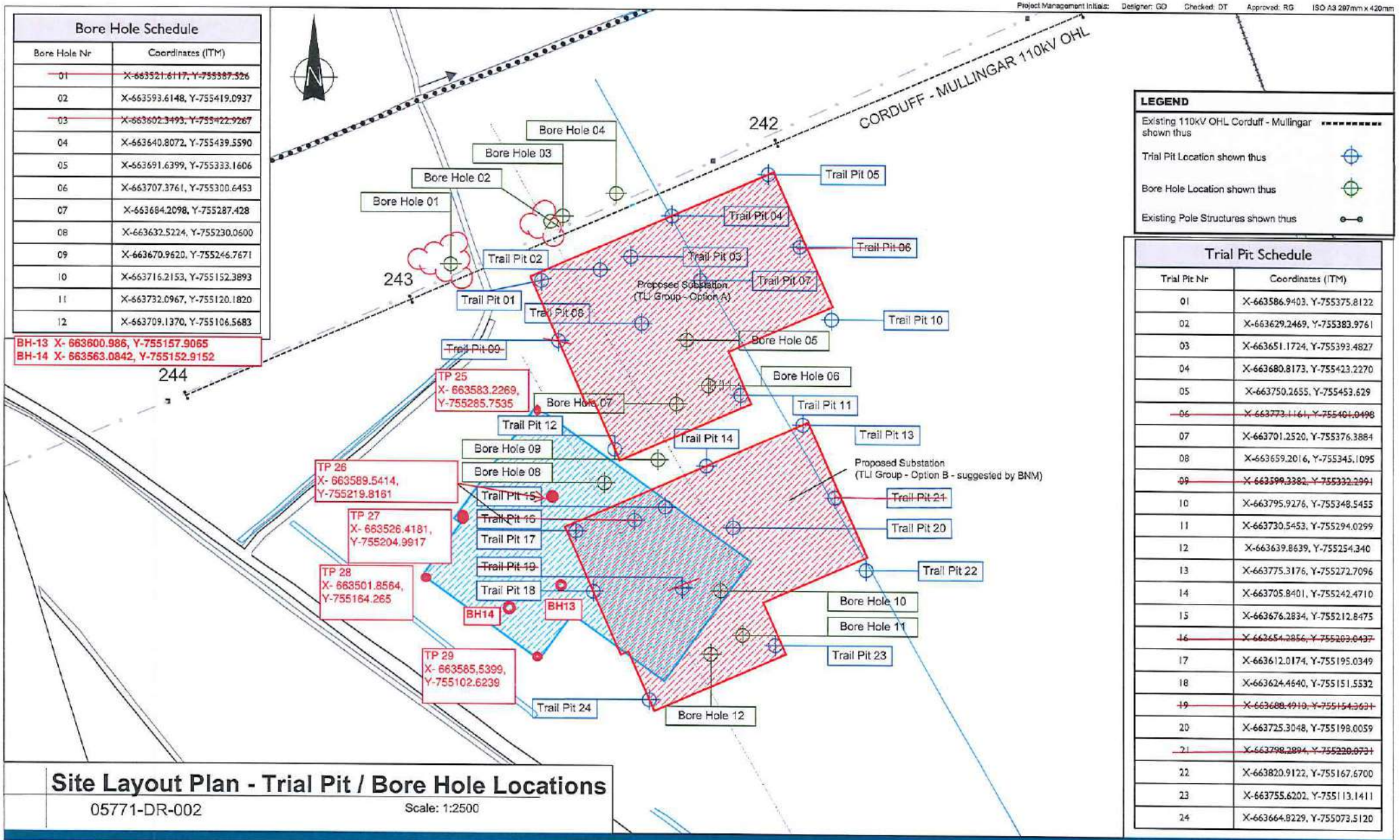
# Appendix 06
# Site Plans


Delvin
Lisclogher West
Carranstown
Ballivor
Raharney
Killucan
N
Legend
Proposed Development Study Area
Ballivor_Factory
Towns_Villages
BORD NA MÓNA
Naturally Driven
Ballivor Wind Farm
Site Location (Ortho)
DWG No. BNM-PG-01-12
Scale: 1:50,000
Drawn by: GR
Date: 07/02/2020
Ordnance Survey Ireland Permit No. EN 0035620
© Ordnance Survey Ireland Government of Ireland.

Project Management Initials: Designer: GD Checked: DT Approved: RG ISO A3 297mm x 420mm

| Bore Hole Schedule | |
|---|---|
| Bore Hole Nr | Coordinates (ITM) |
| ~~01~~ | ~~X-663521.6117, Y-755387.526~~ |
| 02 | X-663593.6148, Y-755419.0937 |
| ~~03~~ | ~~X-663602.3493, Y-755422.9267~~ |
| 04 | X-663640.8072, Y-755439.5590 |
| 05 | X-663691.6399, Y-755333.1606 |
| 06 | X-663707.3761, Y-755300.6453 |
| 07 | X-663684.2098, Y-755287.428 |
| 08 | X-663632.5224, Y-755230.0600 |
| 09 | X-663670.9620, Y-755246.7671 |
| 10 | X-663716.2153, Y-755152.3893 |
| 11 | X-663732.0967, Y-755120.1820 |
| 12 | X-663709.1370, Y-755106.5683 |

BH-13 X- 663600.986, Y-755157.9065
BH-14 X- 663563.0842, Y-755152.9152




**LEGEND**

- Existing 110kV OHL Corduff - Mullingar shown thus
- Trial Pit Location shown thus
- Bore Hole Location shown thus
- Existing Pole Structures shown thus

| Trial Pit Schedule | |
|---|---|
| Trial Pit Nr | Coordinates (ITM) |
| 01 | X-663586.9403, Y-755375.8122 |
| 02 | X-663629.2469, Y-755383.9761 |
| 03 | X-663651.1724, Y-755393.4827 |
| 04 | X-663680.8173, Y-755423.2270 |
| 05 | X-663750.2655, Y-755453.629 |
| ~~06~~ | ~~X-663773.1161, Y-755401.0498~~ |
| 07 | X-663701.2520, Y-755376.3884 |
| 08 | X-663659.2016, Y-755345.1095 |
| ~~09~~ | ~~X-663599.3382, Y-755332.2991~~ |
| 10 | X-663795.9276, Y-755348.5455 |
| 11 | X-663730.5453, Y-755294.0299 |
| 12 | X-663639.8639, Y-755254.340 |
| 13 | X-663775.3176, Y-755272.7096 |
| 14 | X-663705.8401, Y-755242.4710 |
| 15 | X-663676.2834, Y-755212.8475 |
| ~~16~~ | ~~X-663654.2856, Y-755203.0437~~ |
| 17 | X-663612.0174, Y-755195.0349 |
| 18 | X-663624.4640, Y-755151.5532 |
| ~~19~~ | ~~X-663688.4910, Y-755154.3631~~ |
| 20 | X-663725.3048, Y-755198.0059 |
| ~~21~~ | ~~X-663798.2894, Y-755220.0731~~ |
| 22 | X-663820.9122, Y-755167.6700 |
| 23 | X-663755.6202, Y-755113.1411 |
| 24 | X-663664.8229, Y-755073.5120 |

# Site Layout Plan - Trial Pit / Bore Hole Locations

05771-DR-002 Scale: 1:2500


tli GROUP
Head Office
Beenreigh,
Abbeydorney,
Tralee, Co. Kerry
Ireland
Tel: 00353 66 7135710


CLIENT: Bord na Móna – Naturally Driven

PROJECT: Ballivor Wind Farm
Grid Connection Loop-In Substation

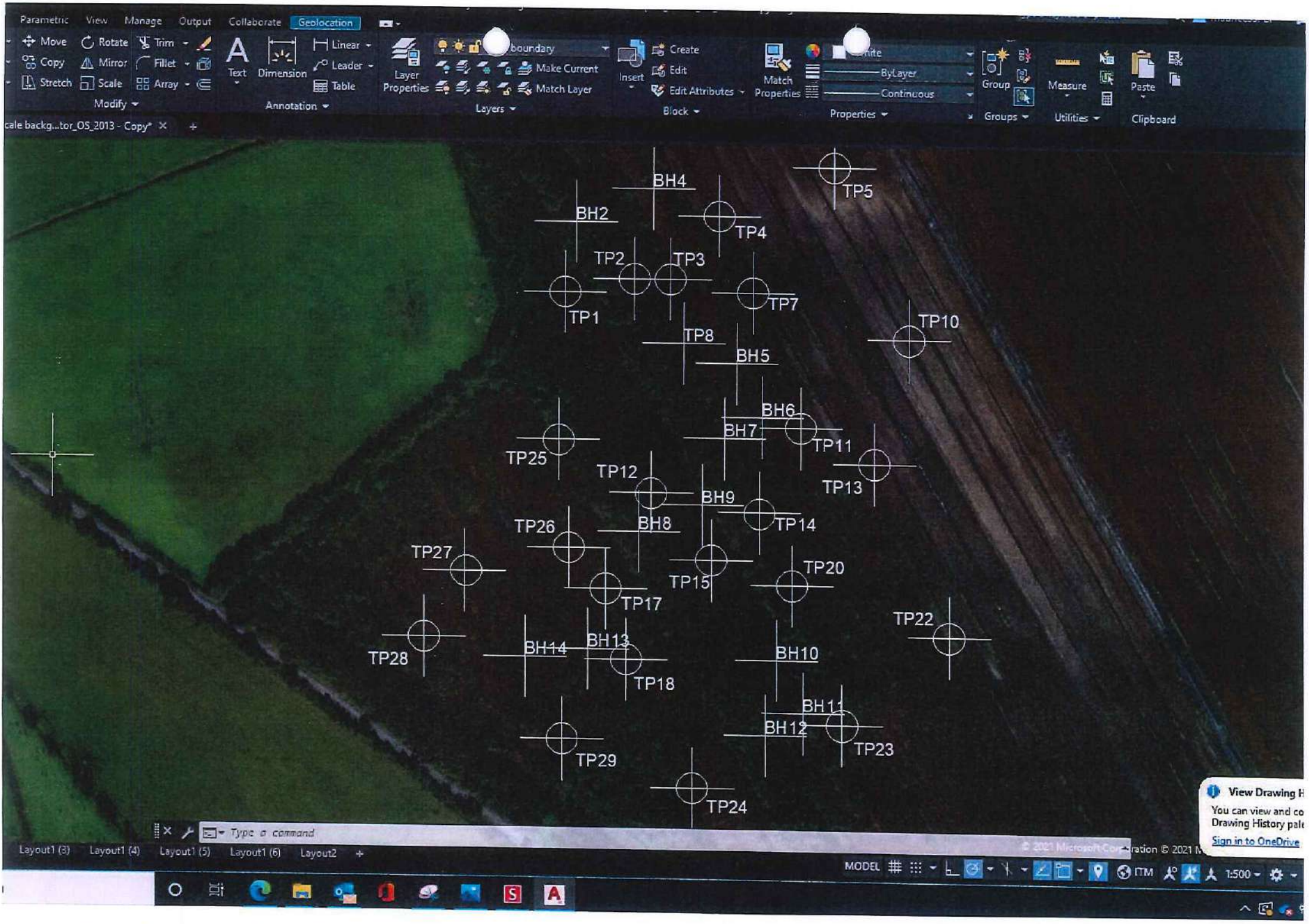
PROJECT NUMBER: 05-771

SHEET NUMBER: 05771-DR-002

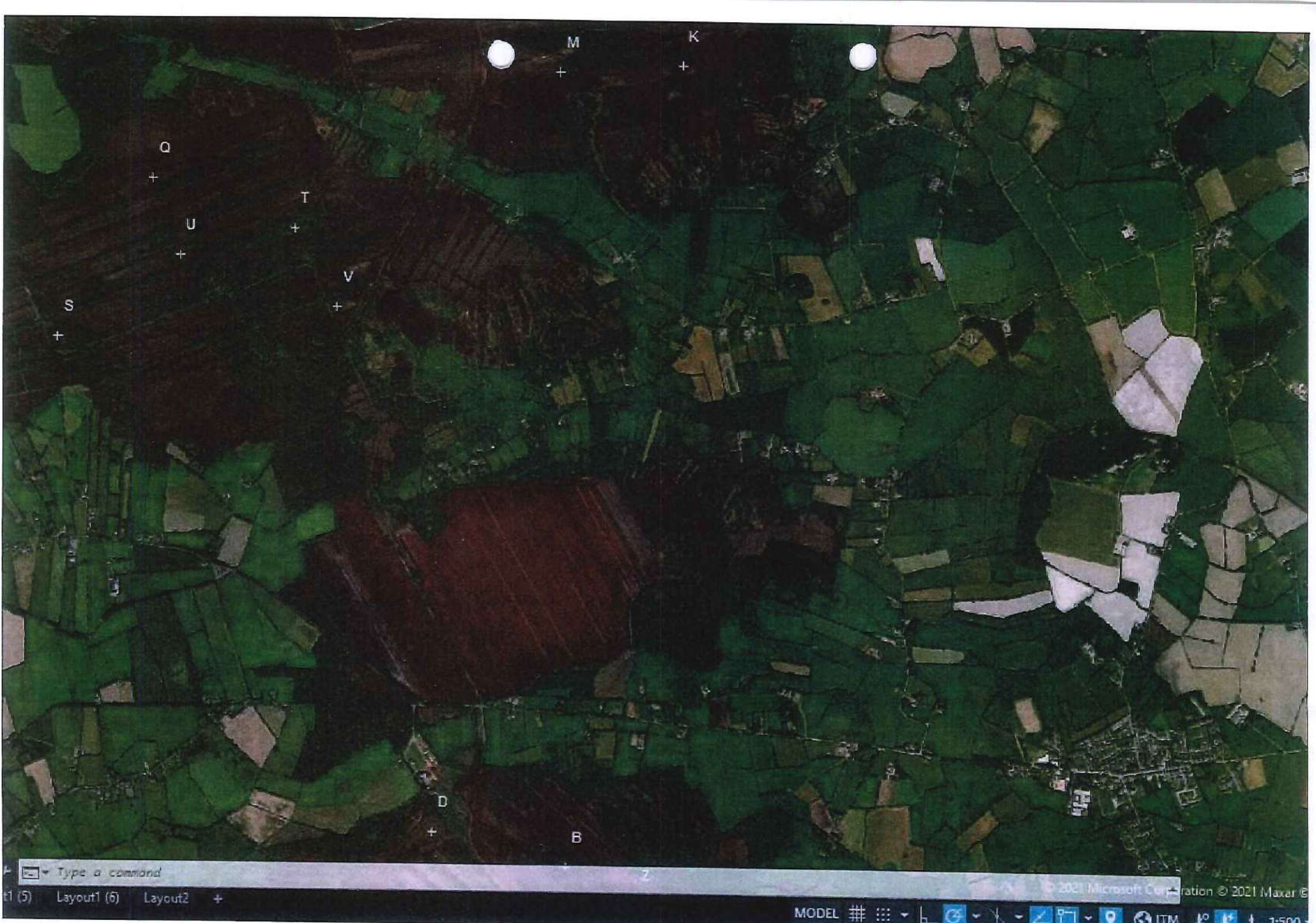
SHEET TITLE: Site Layout Plan - Trial Pit / Bore Hole Locations

DRAWING STATUS: For Information

| ISSUE/REVISION | | |
|---|---|---|
| | | |
| | | |
| P01 | 08.01.21 | Issued for Information |
| P00 | 15.09.20 | Issued for Informtion |
| I/R | DATE | DESCRIPTION |


Parametric
View
Manage
Output
Collaborate
Geolocation
Move
Rotate
Trim
Copy
Mirror
Fillet
Stretch
Scale
Array
Modify
Text
Dimension
Linear
Leader
Table
Annotation
Layer Properties
Make Current
Match Layer
Layers
Insert
Create
Edit
Edit Attributes
Block
Match Properties
ByLayer
Continuous
Properties
Group
Groups
Measure
Utilities
Paste
Clipboard
BH4
BH2
TP5
TP4
TP2
TP3
TP1
TP7
TP10
TP8
BH5
BH6
BH7
TP11
TP25
TP12
TP13
BH9
TP14
TP26
BH8
TP27
TP15
TP20
TP17
TP22
TP28
BH14
BH13
BH10
TP18
BH11
BH12
TP23
TP29
TP24
Type a command
Layout1 (3)
Layout1 (4)
Layout1 (5)
Layout1 (6)
Layout2
MODEL
1:500
View Drawing H
You can view and co
Drawing History pal
Sign in to OneDrive


D
B
Z
C
N
F
Y
E
A
O
X
P
Type a command
Layout1 (6)
Layout2
MODEL
ITM
1:500


M
K
Q
T
U
V
S
D
B
Type a command
Layout1 (6)
Layout2
MODEL
ITM
1:500


BPA-BH1
BPA-TP1
BPA-BH2
BPA-TP2
BPA-BH3

# Appendix 07
# Digital Data (AGS Files)

# IRISH DRILLING LIMITED

LOUGHREA, CO. GALWAY, IRELAND

**CONTRACT DRILLING**
**SITE INVESTIGATION**

Phone: (091) 841 274
Fax: (091) 847 687

email: info@irishdrilling.ie


# BALLIVOR WIND FARM

## SITE INVESTIGATION CONTRACT FACTUAL REPORT

## ADDITIONAL WORKS

Bord na Mona,
Newbridge,
Co. Kildare.

Fehily Timoney & Company,
Consulting Engineers,
Singleton's Lane,
Bagenalstown,
Carlow.

| | Prepared by | Approved by | Rev. Issue Date: | Revision No. |
|---|---|---|---|---|
| | Ronan Killeen | Declan Joyce | 30th August 2021 | 20 _MH_103/02 |
| Signature | | | | |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Operations Manager: MICHAEL MAHON Registered Office: OLD GALWAY ROAD, LOUGHREA, CO. GALWAY Registered No. 379801

FOREWORD

The borehole records have been compiled from an examination of the samples by a Geotechnical Engineer and from the Drillers' descriptions.

The report presents an opinion on the configuration of the strata within the site based on the borehole results. The assumptions, though reasonable, are given for guidance only and no liability can be accepted for changes in conditions not revealed by the boreholes.

The fieldwork was carried out in accordance with IS EN 1997-2 and BS5930, 2015 Code of Practice for Site Investigations with precedence given to IS EN 1997-2 where applicable.

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## 1.0 Introduction.

Irish Drilling Ltd. (IDL) was instructed by Fehily Timoney & Company, Consulting Engineers, on behalf of Bord na Mona, to carry out a site investigation at the site of the proposed Ballivor Wind Farm.

This site investigation was carried out to provide detailed factual geotechnical information of the underlying ground conditions at the proposed wind farm site.

The fieldwork commenced on August 5th 2021 and was completed on August 11th 2021.

## 2.0 Site & Geology

The site is located near Ballivor, County Meath.

The fieldwork was carried out predominantly on peat lands owned by Bord na Mona.

Site Plans, prepared by the client's representatives and amended by IDL to show approximate 'as-built' locations, are included with this report.

Geological Survey Maps of the area indicate that the site is underlain by the Lower Carboniferous Limestone Rock Formation.

## 3.0 Fieldwork.

The following plant was mobilised to site to carry out fieldwork operations:

1nr. GT1100 GoTract Rotary Core Drill Rig.

Fieldwork carried out to date has included the following:

Five rotary core boreholes were carried out to establish overburden conditions and rockhead and to establish the nature and integrity of the underlying rock.

The rotary core boreholes were completed using wireline drilling techniques, with HQ size (64mm core diameter, 96mm hole diameter) drill strings to recover soil and rock core samples.

A water based flush system was used as the drilling medium while a biodegradable polymer gel was also used where necessary to aid the drilling and soil / rock recovery process.

The samples were stored in wooden boxes and returned to the laboratory where there were logged and photographed by a Geotechnical Engineer and presented for testing.

The rotary core boreholes were carried out to a depth of 11.00m below ground level.

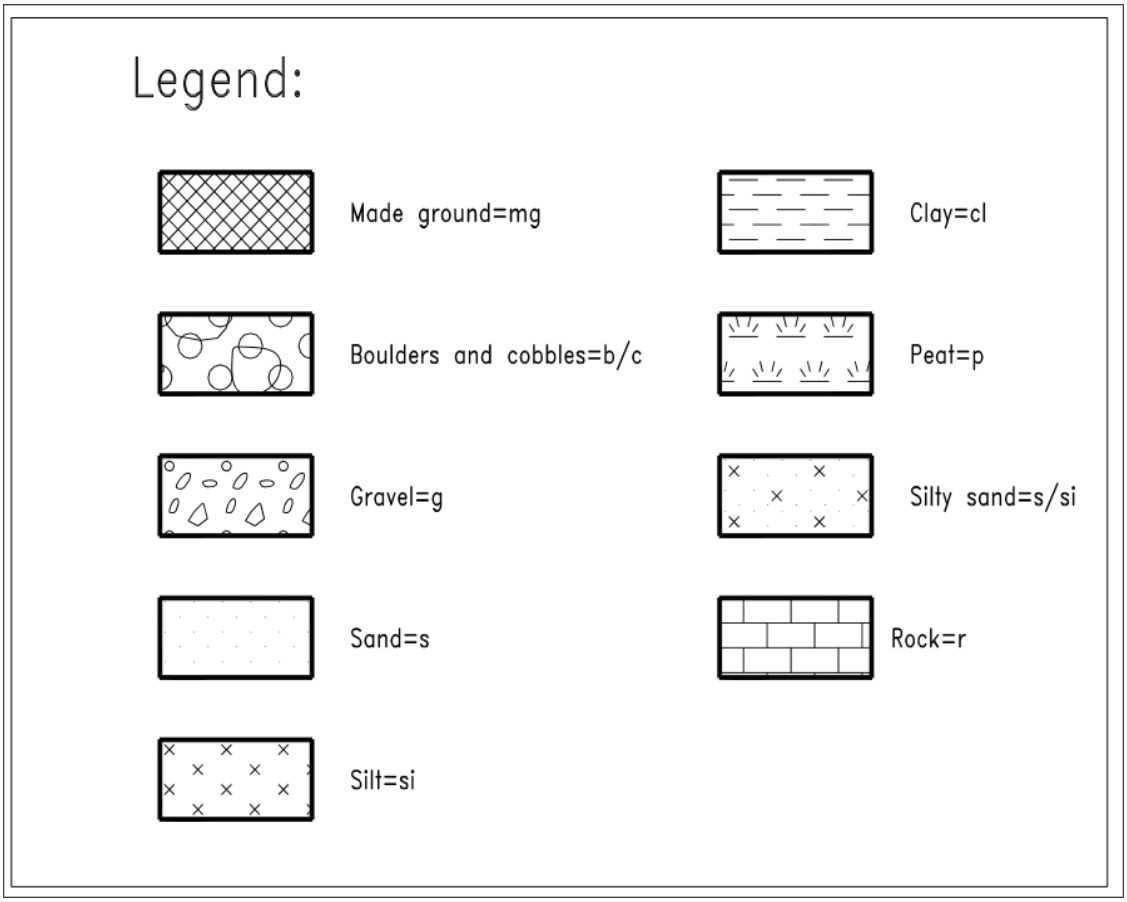
A 50mm diameter standpipe was installed in all the rotary core boreholes to allow for the monitoring of groundwater levels over a prolonged period of time.

The borehole locations were set out on site using a Trimble CU Bluetooth GPS Surveying Unit and the co-ordinates are included on the logs presented in the appendices.

All fieldwork co-ordinates are reported to Irish Transverse Mercator (ITM) with Reduced Levels recorded relative to Malin Head Datum and with an accuracy level of + or – 0.10m.

The fieldwork was carried out in accordance with IS EN 1997-2 and BS5930, 2015 Code of Practice for Site Investigations with precedence given to IS EN 1997-2 where applicable.

The following Key Legend Table details the symbology used on the engineering logs to describe ground conditions encountered:




Ground conditions encountered during the completion of the fieldwork were typical and as expected for this region and predominantly consisted of Glacial Tills overlying possible bedrock.

The Glacial Tills in general consisted of silty sands and gravels with occasional, some or many cobbles and boulders.

Bedrock was not encountered in any of the boreholes before borehole termination at 11.00m below ground level.

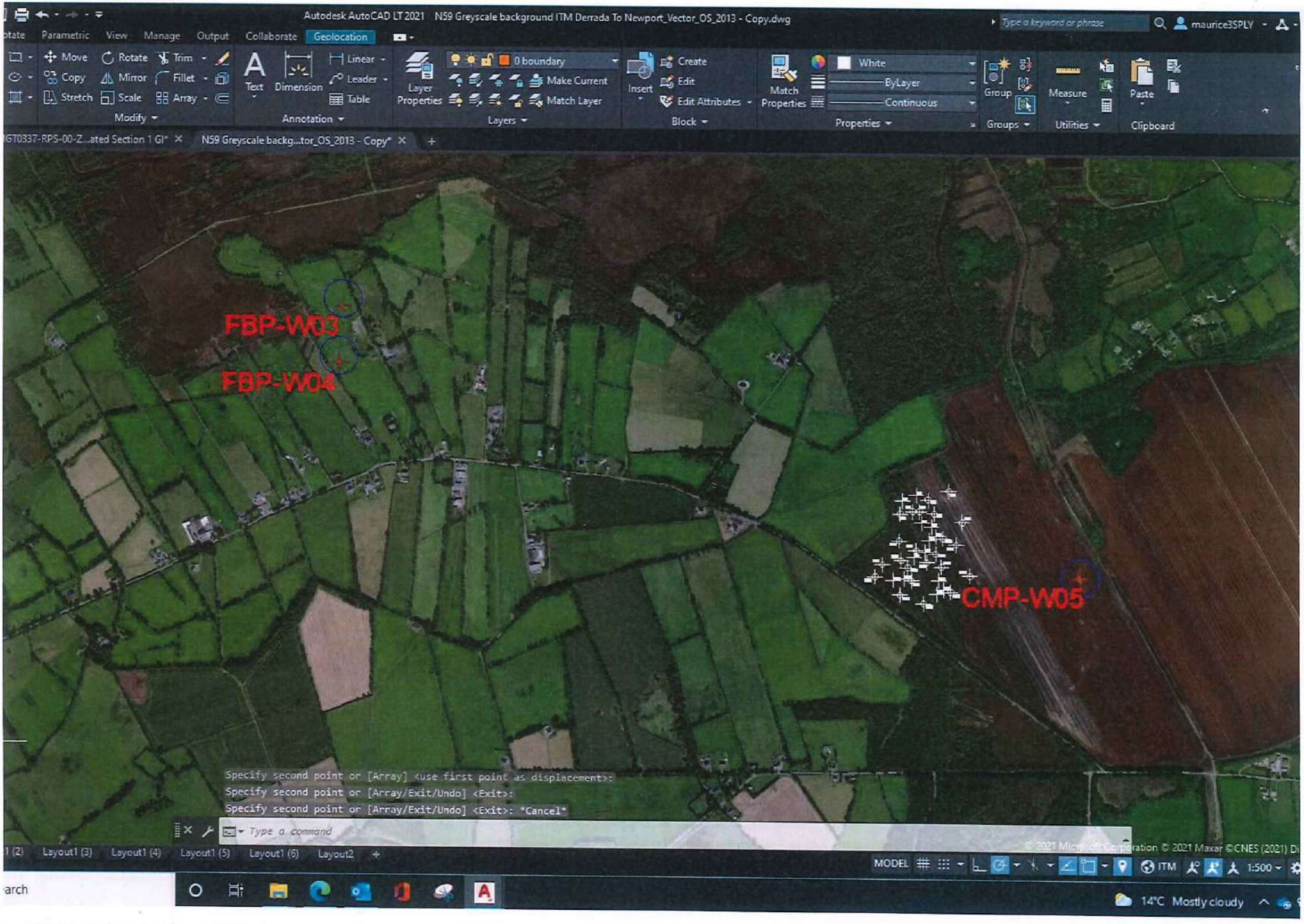
For detailed descriptions of the ground conditions encountered please refer to the engineering logs included in the appendices of this report.

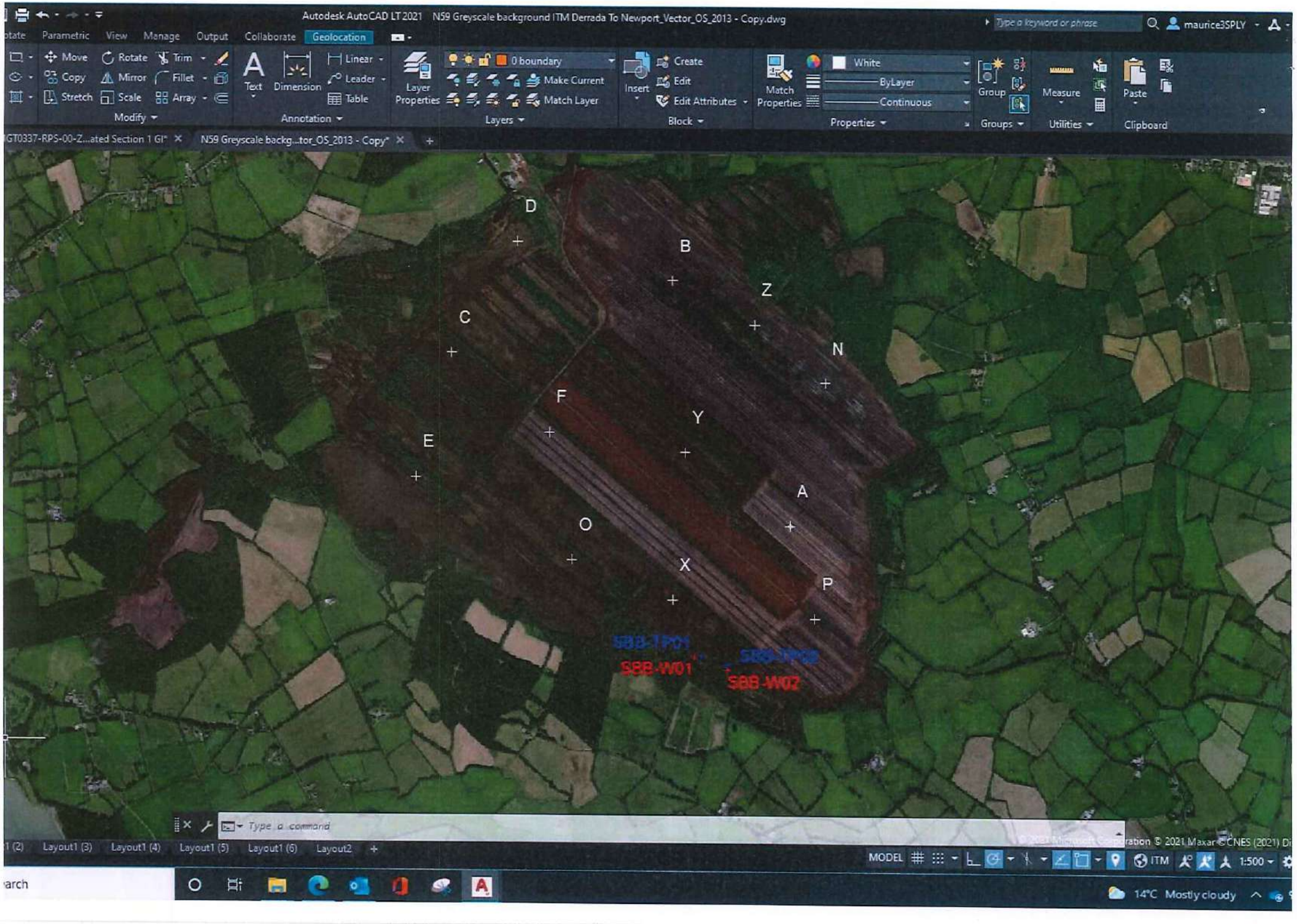
The soil and rock descriptions as noted on the borehole logs are in general visual descriptions as observed and logged by our Engineers and are described in accordance with IS EN 1997-2 and BS5930, 2015 Code of Practice for Site Investigations.

Soils descriptions (cohesive or otherwise) are also initially assessed based on the texture and 'feel' of the soil materials as witnessed by our Geotechnical Engineers and in accordance with IS EN 1997-2 and BS5930.

The records of all fieldwork and photographs are included in the appendices of this Factual Report.

Ronan Killeen
Chartered Engineer
Irish Drilling Limited
August 30th 2021


Autodesk AutoCAD LT 2021 N59 Greyscale background ITM Derrada To Newport_Vector_OS_2013 - Copy.dwg
Parametric View Manage Output Collaborate Geolocation
Move Rotate Trim Copy Mirror Fillet Stretch Scale Array Modify
Text Dimension Linear Leader Table Annotation
Layer Properties 0 boundary Make Current Match Layer Layers
Insert Create Edit Edit Attributes Block
Match Properties White ByLayer Continuous Properties
Group Groups
Measure Utilities
Paste Clipboard
FBP-W03
FBP-W04
CMP-W05
Specify second point or [Array] <use first point as displacement>:
Specify second point or [Array/Exit/Undo] <Exit>:
Specify second point or [Array/Exit/Undo] <Exit>: *Cancel*
Type a command
Layout1 (3) Layout1 (4) Layout1 (5) Layout1 (6) Layout2
MODEL ITM 1:500
14°C Mostly cloudy


Autodesk AutoCAD LT 2021 N59 Greyscale background ITM Derrada To Newport_Vector_OS_2013 - Copy.dwg
Parametric View Manage Output Collaborate Geolocation
Move Rotate Trim Copy Mirror Fillet Stretch Scale Array
Modify
Text Dimension Linear Leader Table
Annotation
Layer Properties 0 boundary Make Current Match Layer
Layers
Insert Create Edit Edit Attributes
Block
Match Properties White ByLayer Continuous
Properties
Group
Groups
Measure
Utilities
Paste
Clipboard
D
B
Z
C
N
F
Y
E
A
O
X
P
SBB-TP01
SBB-W01
SBB-TP02
SBB-W02
Type a command
Layout1 (3) Layout1 (4) Layout1 (5) Layout1 (6) Layout2
MODEL ITM 1:500
14°C Mostly cloudy

# Appendix 01
# Borehole Records (Rotary Core)

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# DRILLHOLE LOG

| Project | Location | DRILLHOLE No |
|---|---|---|
| Ballivor Wind Farm | Ballivor, Co. Meath | **CMP-W05** |

| Job No | Date | Ground Level (m OD) | Co-Ordinates () |
|---|---|---|---|
| 2020MH103 | 11-08-21<br>11-08-21 | 76.84 | E 664,190.1 N 755,162.7 |

| Engineer | Sheet | Rev. |
|---|---|---|
| FTCO/MKO | 1 of 2 | DRAFT |

| RUN DETAILS | | | | | STRATA | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Depth / Date | TCR (SCR) RQD | (SPT) Fracture Spacing | Red'cd Level | Legend | Depth (Thick-ness) | DESCRIPTION: Discontinuities / Detail | DESCRIPTION: Main | Geology | Instrument / Backfill |
| 0.00 | 0 (-) - | NA | | | (1.50) | 0.00 - 11.00 : overburden. | Open hole drilling - no recovery. | | |
| 1.50 | | | 75.34 | | 1.50 | | | | |
| 3.00 | 40 (-) - | | | | | | Greyish brown slightly silty slightly sandy subangular to subrounded fine to coarse assorted light and dark grey limestone GRAVEL with cobbles and boulders. Sand is fine to coarse. Cobbles are of brown sandstone and assorted grey limestone. | | |
| 6.00 | 47 (-) - | | | | | | | | |
| 9.00 | 43 (-) - | NA | | | (9.50) | | | | |
| | 55 | | | | | | Core run 9.00m to 11.00m: 1 No dark grey silty fine grained limestone boulder 230mm in length. | | |

## Drilling Progress and Water Observations

| Date | Time | Depth | Casing Depth | Casing Dia | Core Dia mm | Water Strike | Water Standing |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

## Rotary Flush

| From (m) | To (m) | Type | Return (%) |
|---|---|---|---|
| 0 | 5.00 | water | 100 |
| 5 | 11.00 | water | <100 |

## GENERAL REMARKS

50mm standpipe installed. Response zone - 5.00m to 11.00m bgl.

| All dimensions in metres Scale 1:62.5 | Client: Bord na Mona | Method/ Plant Used: Hydreq | Bit: HQ Design | Driller: GF | Logged By: EAT |
|---|---|---|---|---|---|

IDL AGS UK DH (SPTS) BALLIVOR RC NEW FILE 1 AUG 26 2021.GPJ IDL TP TEMPLATE.GDT 27/8/21

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# DRILLHOLE LOG

| Project | Location | DRILLHOLE No |
|---|---|---|
| Ballivor Wind Farm | Ballivor, Co. Meath | **CMP-W05** |

| Job No | Date | Ground Level (m OD) | Co-Ordinates () |
|---|---|---|---|
| 2020MH103 | 11-08-21<br>11-08-21 | 76.84 | E 664,190.1 N 755,162.7 |

| Engineer | Sheet | Rev. |
|---|---|---|
| FTCO/MKO | 2 of 2 | DRAFT |

| RUN DETAILS | | | | | STRATA | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Depth<br>Date | TCR<br>(SCR)<br>RQD | (SPT)<br>Fracture<br>Spacing | Red'cd Level | Legend | Depth (Thick-ness) | DESCRIPTION<br>Discontinuities | Detail | Main | Geology | Instrument/ Backfill |
| T1.08 11.00 | (-)<br>- | | 65.84 | | 11.00 | | | BH terminated at 11.00m bgl on REs instruction. | | |

| Drilling Progress and Water Observations | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | Time | Depth | Casing Depth | Casing Dia | Core Dia mm | Water Strike | Water Standing |
| 11-08-21 | 14.00 | 11.00 | 1.50 | 99 | 63 | | |

| Rotary Flush | | | |
|---|---|---|---|
| From (m) | To (m) | Type | Return (%) |
| | | | |

**GENERAL REMARKS**

50mm standpipe installed. Response zone - 5.00m to 11.00m bgl.

| All dimensions in metres<br>Scale 1:62.5 | Client: Bord na Mona | Method/ Plant Used: Hydreq | Bit: HQ<br>Design | Driller: GF | Logged By: EAT |
|---|---|---|---|---|---|

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# DRILLHOLE LOG

| Project | Location | DRILLHOLE No |
|---|---|---|
| Ballivor Wind Farm | Ballivor, Co. Meath | **FBP-W03** |

| Job No | Date | Ground Level (m OD) | Co-Ordinates () |
|---|---|---|---|
| 2020MH103 | 05-08-21<br>05-08-21 | 82.35 | E 661,711.1 N 756,061.8 |

| Engineer | Sheet | Rev. |
|---|---|---|
| FTCO/MKO | 1 of 2 | DRAFT |

| RUN DETAILS | | | | | STRATA | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Depth / Date | TCR (SCR) RQD | (SPT) Fracture Spacing | Red'cd Level | Legend | Depth (Thick-ness) | DESCRIPTION: Discontinuities / Detail | DESCRIPTION: Main | Geology | Instrument/ Backfill |
| 0.00 | 0 (-) - | NA | | | (1.50) | 0.00 - 11.00 : overburden. | Open hole drilling - no recovery. | | |
| 1.50 | | | 80.85 | | 1.50 | | | | |
| | 67 (-) - | | | | | | Brown slightly gravelly silty fine and medium SAND with cobbles. Gravel is subrounded fine to coarse of brown sandstone and assorted grey limestone. Cobbles are of assorted grey limestone. | | |
| 3.00 | | | | | | | | | |
| | 63 (-) - | | | | | | | | |
| 6.00 | | | | | | | | | |
| | | NA | | | (9.50) | | | | |
| | 60 (-) - | | | | | | | | |
| 9.00 | | | | | | | | | |
| | 70 | | | | | | | | |

## Drilling Progress and Water Observations

| Date | Time | Depth | Casing Depth | Casing Dia | Core Dia mm | Water Strike | Water Standing |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

## Rotary Flush

| From (m) | To (m) | Type | Return (%) |
|---|---|---|---|
| 0 | 11.00 | water | 100 |

## GENERAL REMARKS

50mm standpipe installed. Response zone - 5.00m to 11.00m bgl.

| All dimensions in metres Scale 1:62.5 | Client: Bord na Mona | Method/ Plant Used: Hydreq | Bit: HQ Design | Driller: GF | Logged By: EAT |
|---|---|---|---|---|---|

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# DRILLHOLE LOG

| Project | Location | DRILLHOLE No |
|---|---|---|
| Ballivor Wind Farm | Ballivor, Co. Meath | **FBP-W03** |

| Job No | Date | Ground Level (m OD) | Co-Ordinates () |
|---|---|---|---|
| 2020MH103 | 05-08-21<br>05-08-21 | 82.35 | E 661,711.1 N 756,061.8 |

| Engineer | Sheet | Rev. |
|---|---|---|
| FTCO/MKO | 2 of 2 | DRAFT |

| RUN DETAILS | | | | | STRATA | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Depth<br>Date | TCR<br>(SCR)<br>RQD | (SPT)<br>Fracture<br>Spacing | Red'cd Level | Legend | Depth<br>(Thick-<br>ness) | DESCRIPTION<br>Discontinuities | Detail | Main | Geology | Instrument/<br>Backfill |
| 05.08 11.00 | (-)<br>- | | 71.35 | | 11.00 | | | Brown slightly gravelly silty fine and medium SAND with cobbles. Gravel is subrounded fine to coarse of brown sandstone and assorted grey limestone. Cobbles are of assorted grey limestone. *(continued)* | | |
| | | | | | | | | BH terminated at 11.00m bgl on REs instruction. | | |

## Drilling Progress and Water Observations

| Date | Time | Depth | Casing Depth | Casing Dia | Core Dia mm | Water Strike | Water Standing |
|---|---|---|---|---|---|---|---|
| 05-08-21 | 14.00 | 11.00 | 1.50 | 99 | 63 | | |

## Rotary Flush

| From (m) | To (m) | Type | Return (%) |
|---|---|---|---|
| | | | |

## GENERAL REMARKS

50mm standpipe installed. Response zone - 5.00m to 11.00m bgl.

| All dimensions in metres<br>Scale 1:62.5 | Client: Bord na Mona | Method/ Plant Used: Hydreq | Bit: HQ<br>Design | Driller: GF | Logged By: EAT |
|---|---|---|---|---|---|

IDL AGS UK DH (SPTS) BALLIVOR RC NEW FILE 1 AUG 26 2021.GPJ IDL TP TEMPLATE.GDT 27/8/21

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# DRILLHOLE LOG

| Project | Location | DRILLHOLE No |
|---|---|---|
| Ballivor Wind Farm | Ballivor, Co. Meath | **FBP-W04** |

| Job No | Date | Ground Level (m OD) | Co-Ordinates () |
|---|---|---|---|
| 2020MH103 | 05-08-21<br>05-08-21 | 85.88 | E 661,699.0 N 755,871.2 |

| Engineer | Sheet | Rev. |
|---|---|---|
| FTCO/MKO | 1 of 2 | DRAFT |

| RUN DETAILS | | | | | STRATA | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Depth / Date | TCR (SCR) RQD | (SPT) Fracture Spacing | Red'cd Level | Legend | Depth (Thick-ness) | DESCRIPTION: Discontinuities / Detail | DESCRIPTION: Main | Geology | Instrument / Backfill |
| 0.00 | 0 (-) - | NA | | | (1.50) | 0.00 - 11.00 : overburden. | Open hole drilling - no recovery. | | |
| 1.50 | | | 84.38 | | 1.50 | | | | |
| | 100 (-) - | | | | | | Brownish grey silty slightly fine to coarse SAND with cobbles. Gravel is subrounded to rounded fine to coarse of assorted grey limestone. Cobbles are of assorted grey limestone. | | |
| 3.00 | | | | | | | | | |
| | 80 (-) - | | | | | | | | |
| 6.00 | | | | | | | | | |
| | 67 (-) - | NA | | | (9.50) | | | | |
| 9.00 | | | | | | | | | |
| | 85 | | | | | | | | |

## Drilling Progress and Water Observations

| Date | Time | Depth | Casing Depth | Casing Dia | Core Dia mm | Water Strike | Water Standing |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

## Rotary Flush

| From (m) | To (m) | Type | Return (%) |
|---|---|---|---|
| 0 | 11.00 | water | 100 |

## GENERAL REMARKS

50mm standpipe installed. Response zone - 5.00m to 11.00m bgl.

| All dimensions in metres Scale 1:62.5 | Client: Bord na Mona | Method/ Plant Used: Hydreq | Bit: HQ Design | Driller: GF | Logged By: EAT |
|---|---|---|---|---|---|

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# DRILLHOLE LOG

| Project | Location | DRILLHOLE No |
|---|---|---|
| Ballivor Wind Farm | Ballivor, Co. Meath | **FBP-W04** |

| Job No | Date | Ground Level (m OD) | Co-Ordinates () |
|---|---|---|---|
| 2020MH103 | 05-08-21<br>05-08-21 | 85.88 | E 661,699.0 N 755,871.2 |

| Engineer | Sheet | Rev. |
|---|---|---|
| FTCO/MKO | 2 of 2 | DRAFT |

| RUN DETAILS | | | | | STRATA | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Depth<br>Date | TCR<br>(SCR)<br>RQD | (SPT)<br>Fracture<br>Spacing | Red'cd<br>Level | Legend | Depth<br>(Thick-<br>ness) | DESCRIPTION<br>Discontinuities | Detail | Main | Geology | Instrument/<br>Backfill |
| 05.08 11.00 | (-)<br>- | | 74.88 | | 11.00 | | | Brownish grey silty slightly fine to coarse SAND with cobbles. Gravel is subrounded to rounded fine to coarse of assorted grey limestone. Cobbles are of assorted grey limestone. *(continued)* | | |
| | | | | | | | | BH terminated at 11.00m bgl on REs instruction. | | |

## Drilling Progress and Water Observations

| Date | Time | Depth | Casing Depth | Casing Dia | Core Dia mm | Water Strike | Water Standing |
|---|---|---|---|---|---|---|---|
| 05-08-21 | 17.30 | 11.00 | 1.50 | 99 | 63 | | |

## Rotary Flush

| From (m) | To (m) | Type | Return (%) |
|---|---|---|---|
| | | | |

## GENERAL REMARKS

50mm standpipe installed. Response zone - 5.00m to 11.00m bgl.

| All dimensions in metres<br>Scale 1:62.5 | Client: Bord na Mona | Method/ Plant Used: Hydreq | Bit: HQ<br>Design | Driller: GF | Logged By: EAT |
|---|---|---|---|---|---|

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# DRILLHOLE LOG

| Project | Location | DRILLHOLE No |
|---|---|---|
| Ballivor Wind Farm | Ballivor, Co. Meath | **SBB-W01** |

| Job No | Date | Ground Level (m OD) | Co-Ordinates () |
|---|---|---|---|
| 2020MH103 | 09-08-21<br>09-08-21 | 71.77 | E 665,282.3 N 751,468.4 |

Engineer: FTCO/MKO

Sheet 1 of 2

Rev. DRAFT

| RUN DETAILS | | | | | STRATA | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Depth / Date | TCR (SCR) RQD | (SPT) Fracture Spacing | Red'cd Level | Legend | Depth (Thick-ness) | DESCRIPTION: Discontinuities / Detail | DESCRIPTION: Main | Geology | Instrument/ Backfill |
| 0.00 | 0 (-) - | NA | | | (1.50) | 0.00 - 11.00 : overburden. | Open hole drilling - no recovery. | | |
| 1.50 | | | 70.27 | | 1.50 | | | | |
| | 40 (-) - | | | | | | Brown slightly silty sandy subrounded to rounded fine to coarse assorted brown sandstone and assorted light and dark grey limestone GRAVEL. Sand is fine to coarse. | | |
| 3.00 | | | | | | | | | |
| | 27 (-) - | | | | | | | | |
| 6.00 | | | | | | | | | |
| | 25 (-) - | NA | | | (9.50) | | | | |
| 9.00 | | | | | | | | | |
| | 38 | | | | | | | | |

## Drilling Progress and Water Observations

| Date | Time | Depth | Casing Depth | Casing Dia | Core Dia mm | Water Strike | Water Standing |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

## Rotary Flush

| From (m) | To (m) | Type | Return (%) |
|---|---|---|---|
| 0 | 5.00 | water | 100 |
| 5 | 11.00 | water | <100 |

## GENERAL REMARKS

50mm standpipe installed. Response zone - 5.00m to 11.00m bgl.

| All dimensions in metres Scale 1:62.5 | Client: Bord na Mona | Method/ Plant Used: Hydreq | Bit: HQ Design | Driller: GF | Logged By: EAT |
|---|---|---|---|---|---|

IDL AGS UK DH (SPTS) BALLIVOR RC NEW FILE 1 AUG 26 2021.GPJ IDL TP TEMPLATE.GDT 27/8/21

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# DRILLHOLE LOG

| Project | Location | DRILLHOLE No |
|---|---|---|
| Ballivor Wind Farm | Ballivor, Co. Meath | **SBB-W01** |

| Job No | Date | Ground Level (m OD) | Co-Ordinates () |
|---|---|---|---|
| 2020MH103 | 09-08-21<br>09-08-21 | 71.77 | E 665,282.3 N 751,468.4 |

| Engineer | Sheet | Rev. |
|---|---|---|
| FTCO/MKO | 2 of 2 | DRAFT |

| RUN DETAILS | | | | | STRATA | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Depth<br>Date | TCR<br>(SCR)<br>RQD | (SPT)<br>Fracture<br>Spacing | Red'cd Level | Legend | Depth<br>(Thick-<br>ness) | DESCRIPTION<br>Discontinuities | Detail | Main | Geology | Instrument/<br>Backfill |
| 09.08 11.00 | (-)<br>- | | 60.77 | | 11.00 | | | Brown slightly silty sandy subrounded to rounded fine to coarse assorted brown sandstone and assorted light and dark grey limestone GRAVEL. Sand is fine to coarse. *(continued)* | | |
| | | | | | | | | BH terminated at 11.00m bgl on REs instruction. | | |

## Drilling Progress and Water Observations

| Date | Time | Depth | Casing Depth | Casing Dia | Core Dia mm | Water Strike | Water Standing |
|---|---|---|---|---|---|---|---|
| 09-08-21 | 14.00 | 11.00 | 1.50 | 99 | 63 | | |

## Rotary Flush

| From (m) | To (m) | Type | Return (%) |
|---|---|---|---|
| | | | |

## GENERAL REMARKS

50mm standpipe installed. Response zone - 5.00m to 11.00m bgl.

| All dimensions in metres<br>Scale 1:62.5 | Client: Bord na Mona | Method/ Plant Used: Hydreq | Bit: HQ<br>Design | Driller: GF | Logged By: EAT |
|---|---|---|---|---|---|

IDL AGS UK DH (SPTS) BALLIVOR RC NEW FILE 1 AUG 26 2021.GPJ IDL TP TEMPLATE.GDT 27/8/21

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# DRILLHOLE LOG

| Project | Location | DRILLHOLE No |
|---|---|---|
| Ballivor Wind Farm | Ballivor, Co. Meath | **SBB-W02** |

| Job No | Date | Ground Level (m OD) | Co-Ordinates () |
|---|---|---|---|
| 2020MH103 | 10-08-21<br>10-08-21 | 77.33 | E 665,464.3 N 751,452.5 |

| Engineer | Sheet | Rev. |
|---|---|---|
| FTCO/MKO | 1 of 2 | DRAFT |

| RUN DETAILS | | | | | STRATA | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Depth / Date | TCR (SCR) RQD | (SPT) Fracture Spacing | Red'cd Level | Legend | Depth (Thick-ness) | DESCRIPTION: Discontinuities / Detail | DESCRIPTION: Main | Geology | Instrument/ Backfill |
| 0.00 | 0 (-) - | NA | | | (1.50) | 0.00 - 11.00 : overburden. | Open hole drilling - no recovery. | | |
| 1.50 | | | 75.83 | | 1.50 | | | | |
| | 40 (-) - | | | | | | Brown slightly silty sandy subrounded to rounded fine to coarse assorted brown sandstone and assorted light and dark grey limestone GRAVEL. Sand is fine to coarse. | | |
| 3.00 | | | | | | | | | |
| | 45 (-) - | | | | | | | | |
| 6.00 | | NA | | | (9.50) | | | | |
| | 50 (-) - | | | | | | | | |
| 9.00 | | | | | | | 9.00m: becoming sandy. Sand is fine. | | |
| | 85 | | | | | | | | |

| Drilling Progress and Water Observations | | | | | | | | Rotary Flush | | | | GENERAL REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Depth | Casing Depth | Casing Dia | Core Dia mm | Water Strike | Water Standing | From (m) | To (m) | Type | Return (%) | |
| | | | | | | | | 0 | 11.00 | water | 100 | 50mm standpipe installed. Response zone - 5.00m to 11.00m bgl. |

| All dimensions in metres Scale 1:62.5 | Client: Bord na Mona | Method/ Plant Used: Hydreq | Bit: HQ Design | Driller: GF | Logged By: EAT |
|---|---|---|---|---|---|

IDL AGS UK DH (SPTS) BALLIVOR RC NEW FILE 1 AUG 26 2021.GPJ IDL TP TEMPLATE.GDT 27/8/21

Irish drilling LTD

# DRILLHOLE LOG

| Project | Location | DRILLHOLE No |
|---|---|---|
| Ballivor Wind Farm | Ballivor, Co. Meath | **SBB-W02** |

| Job No | Date | Ground Level (m OD) | Co-Ordinates () |
|---|---|---|---|
| 2020MH103 | 10-08-21<br>10-08-21 | 77.33 | E 665,464.3 N 751,452.5 |

| Engineer | Sheet | Rev. |
|---|---|---|
| FTCO/MKO | 2 of 2 | DRAFT |

| RUN DETAILS | | | | | STRATA | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Depth<br>Date | TCR<br>(SCR)<br>RQD | (SPT)<br>Fracture<br>Spacing | Red'cd Level | Legend | Depth<br>(Thick-<br>ness) | DESCRIPTION<br>Discontinuities | Detail | Main | Geology | Instrument/<br>Backfill |
| T0.08 11.00 | (-)<br>- | | 66.33 | | 11.00 | | | Brown slightly silty sandy subrounded to rounded fine to coarse assorted brown sandstone and assorted light and dark grey limestone GRAVEL. Sand is fine to coarse. *(continued)* | | |
| | | | | | | | | BH terminated at 11.00m bgl on REs instruction. | | |

| Drilling Progress and Water Observations | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | Time | Depth | Casing Depth | Casing Dia | Core Dia mm | Water Strike | Water Standing |
| 10-08-21 | 14.00 | 11.00 | 1.50 | 99 | 63 | | |

| Rotary Flush | | | |
|---|---|---|---|
| From (m) | To (m) | Type | Return (%) |
| | | | |

**GENERAL REMARKS**

50mm standpipe installed. Response zone - 5.00m to 11.00m bgl.

| All dimensions in metres<br>Scale 1:62.5 | Client: Bord na Mona | Method/ Plant Used: Hydreq | Bit: HQ<br>Design | Driller: GF | Logged By: EAT |
|---|---|---|---|---|---|

IDL AGS UK DH (SPTS) BALLIVOR RC NEW FILE 1 AUG 26 2021.GPJ IDL TP TEMPLATE.GDT 27/8/21

# Appendix 02
# Photographs (Rotary Core)


Ballivor
Wind Farm
Co. Meath
2020 MH 103
CMP W 05
Box
1.2
START
1.5M
6M
9M
11M
10 20 30 40 50 60 70 80 90 100 110 120 130 140 150


Ballivor
Wind Farm
Co. Meath
2020 MH 103
FBP W 03
Box
1.2
START
1.5M
6M
9M
11M
10 20 30 40 50 60 70 80 90 100 110 120 130 140 150


Ballivor
Wind Farm
Co. Meath
2020 MH 103
FBP W 0 4
Box
1.2.3
START
1.5M
3M
6M
9M
11M


Ballivor
Wind Farm
Co. Meath
2020 MH 103
SBB W 0 1
Box
1.
START
1.5
3M
6M
9M


Ballivor
Wind Farm
Co. Meath
2020 MH 103
SBB W 0 2
Box
1.2.
3m
6m
9m
11M
11m EOH

# Appendix 03
# Digital Data (AGS Files)

| TP ID | BPA-TP-05 | BPA-TP-06 | BPA-TP-07 | BPA-TP-08 | BPA-TP-09 | BPA-TP-10 | BPA-TP-11 | TP-ENT1 |
|---|---|---|---|---|---|---|---|---|
| **Soil** | 0.2 m peat<br>0.4 Firm grey Sandy gravelly SILT<br>0.5 silty or very silty v Sandy GRAVEL | 0.2 m peat<br>0.3 m Sandy silty GRAVEL<br>0.5 soft gravelly Sandy SILT<br>1.7 silty Sandy GRAVEL with low cobbles boulders | 0.2 peat<br>0..5 Firm grey brown Sandy gravelly CLAY with low cobbles and low Boulder coment. Boulder 500 mm<br>2.0 Grey silty very Sandy GRAVEL. Cobbles and boulders increasing with deprh | 1.1 very soft peat<br>1.5 Soft light brown CLAY<br>1.6 grey silty Sandy GRAVEL | 0.2 peat<br>0.6 Firm light brown mottled grey with dark grey angular gravels<br>0.7 grey silty Sandy GRAVEL | 0.1 m topsoil<br>0.5 m grey slight silty Sandy GRAVEL with low cobbles and low Boulder | 0.8 soft - very soft PEAT<br>1.5 grey silty Sandy GRAVEL | 0.8 soft - very soft PEAT<br>1.2 m firm Light brown brown Sandy CLAY<br>1.8 m Grey silty Sandy GRAVEL with low cobble |
| **Bottom of Pit** | 0.5 | 1.7 | 2 | 1.6 | 0.7 | 0.5 | 1.5 | 1.8 |
| **Depth of Peat** | 0.2 | 0.2 | 0.2 | 1.1 | 0.2 | 0.1 | 0.8 | 0.8 |
| **Depth to Gravel** | 0.4 | 0.5 | 0.5 | 1.5 | 0.6 | 0.1 | 0.8 | 1.2 |
| **Samples** | | Sample 1.1 | Sample 2.0 | | Sample 0.7 m | | Sample 1.5 | Sample 1.7 m |
| **Water remarks** | Dry | 1.7 slight seepage | Dry | Dry | Dry | Dry | Dry | Dry |
| **Stablity** | Stable | Stable | Stable refuse on boulders | Stable | Stable | Stable | Stable | Stable |
| **x** | 664203 | 664245 | 664217 | 664131 | 664215 | 664121 | 664261 | 664577 |
| **y** | 754860 | 754938 | 755206 | 755370 | 755116 | 755363 | 755321 | 754536 |
| **z (taken from 2020 LiDAR)** | 76.9 | 74.2 | 74.8 | 76.4 | 75.4 | 77.4 | 79.2 | 76.9 |
| **Date** | 19/03/2021 | 19/03/2021 | 19/03/2021 | 19/03/2021 | 19/03/2021 | 19/03/2021 | 19/03/2021 | 19/03/2021 |

Excavator: Hitachi Zaxis 120 - Wide Tracked Excavtor with Wide Ditching Bucket for all Pits

**Groundwater Readings**

Bpa bh01
Dry throughout
no water inside standpipe -
depth measured = 4. 8 m BGL

Bpabh3
Water 2.5 m bgl

| TP-ENT2 | TP-ENT3 | TP-SUB-01 | TP-SUB-02 | TP-SUB-04 | TP-SUB-05 | TP-SUB-07 | TP-SUB-08a | TP-SUB-09 |
|---|---|---|---|---|---|---|---|---|
| 1.4 m soft - very soft PEAT | 0.8 soft - very soft PEAT | 2.0 m soft - very soft PEAT | 0.6 m peat | 2.1 soft - very soft with light brown decomposed wood and occasional logs | 1.8 m soft - very soft with light brown decomposed wood and occasional logs | 1.7 soft - very soft PEAT | 0.5 peat | 2.3 m soft - very soft with light brown decomposed wood and occasional logs |
| 1.7 soft light brown Andy gravelly CLAY | 1.9 Firm grey Sandy gravelly CLAY | 2.9 Firm grey slightly Sandy SILT | 1.2 soft grey Sandy very gravelly SILT | 2.2 Firm grey slight Sandy slight gravelly SILT | 2.4 firm sl Sandy gravelly CLAY | 2.2 firm Sandy gravelly SILT | 2.0 Silty gravelly Sand low cobbles | 2.5 Soft SILT |
| 1.8 Grey silty Sandy GRAVEL with low cobble | 2.2 very CLAYey Sandy GRAVEL or GRAVELly Sandy CLAY | | 3.7 m silty Sandy GRAVEL with medium cobble and low boulder | | 2.5 soft sl Sandy gravelly SILT with traces of green SILT | | | 2.7 firm slightly Sandy SILT |
| 1.8 | 2.2 | 2.9 | 3.7 | 2.2 | 2.5 | 2.2 | 2 | 2.7 |
| 1.4 | 0.8 | 2 | 0.6 | 2.1 | 1.8 | 1.7 | 0.5 | 2.3 |
| 1.7 | 1.9 | | 1.2 | | | | 0.5 | |
| Seepage at 0.9<br>Stable | Dry<br>Stable | Slight to moderate seepage from 2 m | Sample at 3.3 m<br>2.4 moderate seepage<br>Side walls undermining | Dry<br>Stable | Dry<br>Stable | Sample 2.2<br>Dry<br>Stable | Sample 2 m<br>Moderate water 2m<br>Stable | Slight seepage at base<br>Stable |
| 664557 | 664521 | 664104 | 664204 | 664137 | 664123 | 664155 | 664140 | 664169 |
| 754562 | 754542 | 754822 | 754797 | 754775 | 754744 | 754836 | 754754 | 754744 |
| 76.4 | 76.7 | 73.8 | 75.3 | 76.1 | 75.7 | 75.1 | 75.9 | 74.9 |
| 19/03/2021 | 19/03/2021 | 18/03/2021 | 18/03/2021 | 18/03/2021 | 18/03/2021 | 18/03/2021 | 18/03/2021 | 18/03/2021 |

| TP-SUB-10 | TP-SUB-11 | TP-SUB-12 | TP-SUB-13 | TP-SUB-14 | TP-SUB-16 | TP-SUB-17 |
|---|---|---|---|---|---|---|
| 2.1 soft - very soft with light brown decomposed wood and occasional logs | 2.4 m soft - very soft with light brown decomposed wood and occasional logs | 2.4 soft - very soft with light brown decomposed wood and occasional logs | 2.5 soft - very soft with light brown decomposed wood and occasional logs | 1.7 m soft - very soft PEAT | 2.4 soft - very soft with light brown decomposed wood and occasional logs | 3.6 soft - very soft with light brown decomposed wood and occasional logs |
| 2.3 soft grey Sandy Silt | 2.7 grey soft Sandy SILT | 2.7 firm Sandy gravelly SILT | 2.7 soft to firm Sandy SILT | 2.4 soft slightly Sandy SILT | 2.8 soft grey sl. Sandy SILT | 4.0 soft grey Sandy sl gravelly SILT |
| 2.5 firm to stiff Sandy gravelly SILT | 3.1 grey silty very gravelly SAND | | 2.9 silty Sandy GRAVEL | 2.5 very silty Sandy GRAVEL | 3.3 firm grey very Sandy slightly grav SILT | 4.3 silty Sandy GRAVEL |
| 2.5 | 3.1 | 2.7 | 2.9 | 2.5 | 3.3 | 4.3 |
| 2.1 | 2.4 | 2.4 | 2.5 | 1.7 | 2.4 | 3.6 |
| | 2.7 | | 2.7 | 2.4 | | 4 |
| Slow seepage at 1.9 m and 2.5 m<br>Stable | Dry<br>Stable | Sample 2.7<br>Moderate seepage at 2.2<br>Stable | Sample 2.8<br>Dry<br>Stable | Moderate water seepage 2.4 m<br>Stable | Sample 3.3 m<br>Dry<br>Stable | Dry<br>Stable |
| 664142 | 664216 | 664175 | 664210 | 664209 | 664253 | 664251 |
| 755052 | 755098 | 754989 | 754983 | 754951 | 755035 | 755013 |
| 74.1 | 75.0 | 74.2 | 75.6 | 74.0 | 74.5 | 75.6 |
| 18/03/2021 | 18/03/2021 | 18/03/2021 | 18/03/2021 | 18/03/2021 | 18/03/2021 | 18/03/2021 |

| | | | | | |
|---|---|---|---|---|---|
| Project ID | 2020Lab104 | Client | | Remarks | Turnaround |
| Project Name | Ballivor Wind Farm | Due Date | 31/03/2021 15:50 | | |
| Schedule ID | 2020Lab104_2 | Scheduled Date | 31/03/2021 15:52 | | |

| Sample Details | | | | | | | Classification | | | | | | Chemical / Concrete | | | | | | | | | Compaction | | | | | Compressibility | | | | Strength (Total) | | | | | | | Shear Stregth (Effective Stress) | | | Rock | | Other | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Depth (m) | Base Depth | Sample Type | Sample Ref | Date Sampled | Storage | Moisture Content | Atterberg 4 Point | Particle Density by Gas Jar | Particle Density by Small Pyknometer | Particle Size Distribution | Hydrometer | Organic Content | Loss On Ignition | Sulphate Total | Sulphate Water Gravimetric | Carbonate Titration | ph | Chloride Content | Chloride Content Acid | Compaction Light | Compaction Heavy | Compaction Vibrating Hammer | Moisture Condition Value | Moisture Condition Relationship | CBR | Consolidation | Pressures | Swelling Pressure Test | Laboratory Vane test | Small Direct Shearbox | Ring shear Test | Triaxial Quick Undrained | (Specify Cell Pressure) | Triaxial UU Multi Stage | Triaxial UU Multi Specimen | Consolidated Drained Triaxial Test | Consolidated Undrained Triaxial Test | Consolidated Undrained Triaxial Multis | Rock Uniaxial compression | Point Load | Sample Description Test | | | | | | |
| BPA-TP-06 | 1.10 | | B | 1 | 19/03/21 | AU86 | 1 | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | | | |
| BPA-TP-07 | 2.00 | | B | 1 | 19/03/21 | AU86 | 1 | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | | | |
| BPA-TP-09 | 0.70 | | B | 1 | 19/03/21 | AU86 | 1 | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | | | |
| BPA-TP-11 | 1.50 | | B | 1 | 19/03/21 | AU86 | 1 | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | | | |
| TP-ENT1 | 1.70 | | B | 1 | 19/03/21 | AU86 | 1 | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | | | |
| TP-SUB-02 | 3.30 | | B | 1 | 19/03/21 | AU86 | 1 | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | | | |
| TP-SUB-07 | 2.20 | | B | 1 | 19/03/21 | AU86 | 1 | 1 | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | | | |
| TP-SUB-08A | 2.00 | | B | 1 | 19/03/21 | AU86 | 1 | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | | | |
| TP-SUB-12 | 2.70 | | B | 1 | 19/03/21 | AU86 | 1 | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | | | |
| TP-SUB-13 | 2.80 | | B | 1 | 18/03/21 | AU86 | 1 | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | | | |
| TP-SUB-16 | 3.30 | | B | 1 | 18/03/21 | AU86 | 1 | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | | | |

0 = test scheduled,
1 = test completed as scheduled,
0* = sample not suitable for scheduled test

# Summary of Classification Test Results

| Project No. | Project Name |
|---|---|
| 2020Lab104 | Ballivor Wind Farm |

| Hole No. | Sample | | | | | Soil Description | Density bulk | Density dry | w | Passing 425µm | LL | PL | PI | Particle density | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ref | Top | Base | Type | | | Mg/m3 | | % | % | % | % | % | Mg/m3 | |
| BPA-TP-06 | 1 | 1.10 | | B | | Grey very sandy very silty fine GRAVEL. | | | 23.0 | 35 | | | | | |
| BPA-TP-07 | 1 | 2.00 | | B | | Grey very silty very sandy fine and medium GRAVEL. Sand is coarse. | | | 14.0 | 28 | | | | | |
| BPA-TP-09 | 1 | 0.70 | | B | | Grey sandy very silty medium and coarse GRAVEL. | | | 23.0 | 29 | | | | | |
| BPA-TP-11 | 1 | 1.50 | | B | | Grey silty sandy medium GRAVEL. | | | 15.0 | 18 | | | | | |
| TP-ENT1 | 1 | 1.70 | | B | | Brown sandy silty medium and coarse GRAVEL. | | | 12.0 | 21 | | | | | |
| TP-SUB-02 | 1 | 3.30 | | B | | Grey silty very sandy medium GRAVEL. | | | 18.0 | 20 | | | | | |
| TP-SUB-07 | 1 | 2.20 | | B | | Brown gravelly very sandy SILT. | | | 28.0 | 70 | | | | | NP |
| TP-SUB-08A | 1 | 2.00 | | B | | Grey silty very sandy medium and fine GRAVEL. | | | 9.9 | 17 | | | | | |
| TP-SUB-12 | 1 | 2.70 | | B | | Grey slightly gravelly slightly sandy SILT. | | | 21.0 | 69 | | | | | |
| TP-SUB-13 | 1 | 2.80 | | B | | Grey very silty very sandy medium GRAVEL. | | | 12.0 | 40 | | | | | |
| TP-SUB-16 | 1 | 3.30 | | B | | Grey sandy SILT. Sand is fine. | | | 23.0 | 95 | | | | | |

All tests performed in accordance with BS1377:1990 unless specified otherwise

Key w = water content, LL = Liquid Limit, PL = Plastic Limit, PI = Plasticity Index

Density test: Linear measurement unless : wd - water displacement; wi - immersion in water

Liquid Limit: 4pt cone unless : 1pt - single point test; NP - Non Plastic

Particle density: sp - small pyknometer; gj - gas jar

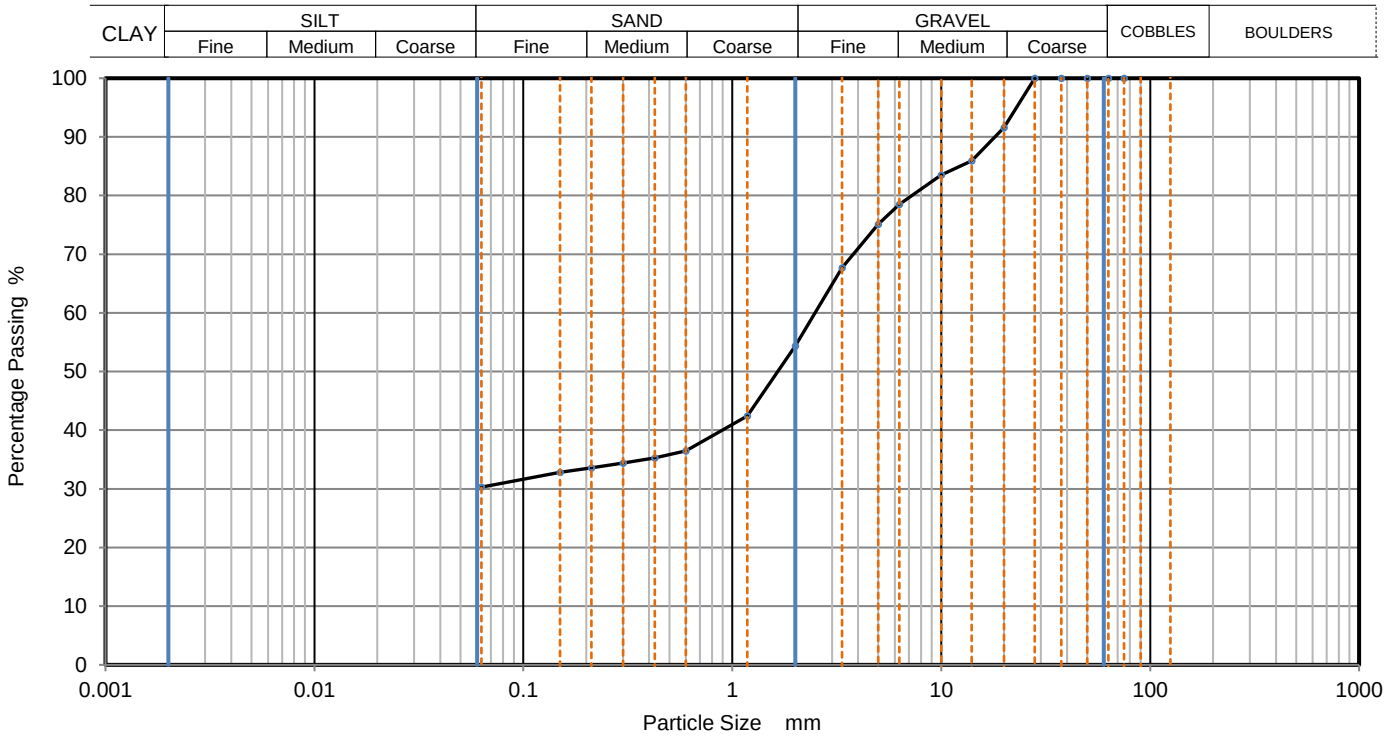
| Date Printed | Approved By | Table |
|---|---|---|
| 14/04/2021 | | 1 |
| QC From No: R1 | | sheet 1 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

# PARTICLE SIZE DISTRIBUTION

| | | | | | |
|---|---|---|---|---|---|
| | | | | Job Ref | **2020Lab104** |
| | | | | Borehole/Pit No. | BPA-TP-06 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 1 |
| Soil Description | Grey very sandy very silty fine GRAVEL. | | | Depth, m | 1.10 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL1202103310 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 92 | | |
| 14 | 86 | | |
| 10 | 84 | | |
| 6.3 | 79 | | |
| 5 | 75 | | |
| 3.35 | 68 | | |
| 2 | 54 | | |
| 1.18 | 42 | | |
| 0.6 | 37 | | |
| 0.425 | 35 | | |
| 0.3 | 34 | | |
| 0.212 | 34 | | |
| 0.15 | 33 | | |
| 0.063 | 30 | | |

| Dry Mass of sample, g | 460 |
|---|---|

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 46 |
| Sand | 24 |
| | |
| Fines <0.063mm | 30 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 2.48 |
| D30 | mm | |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

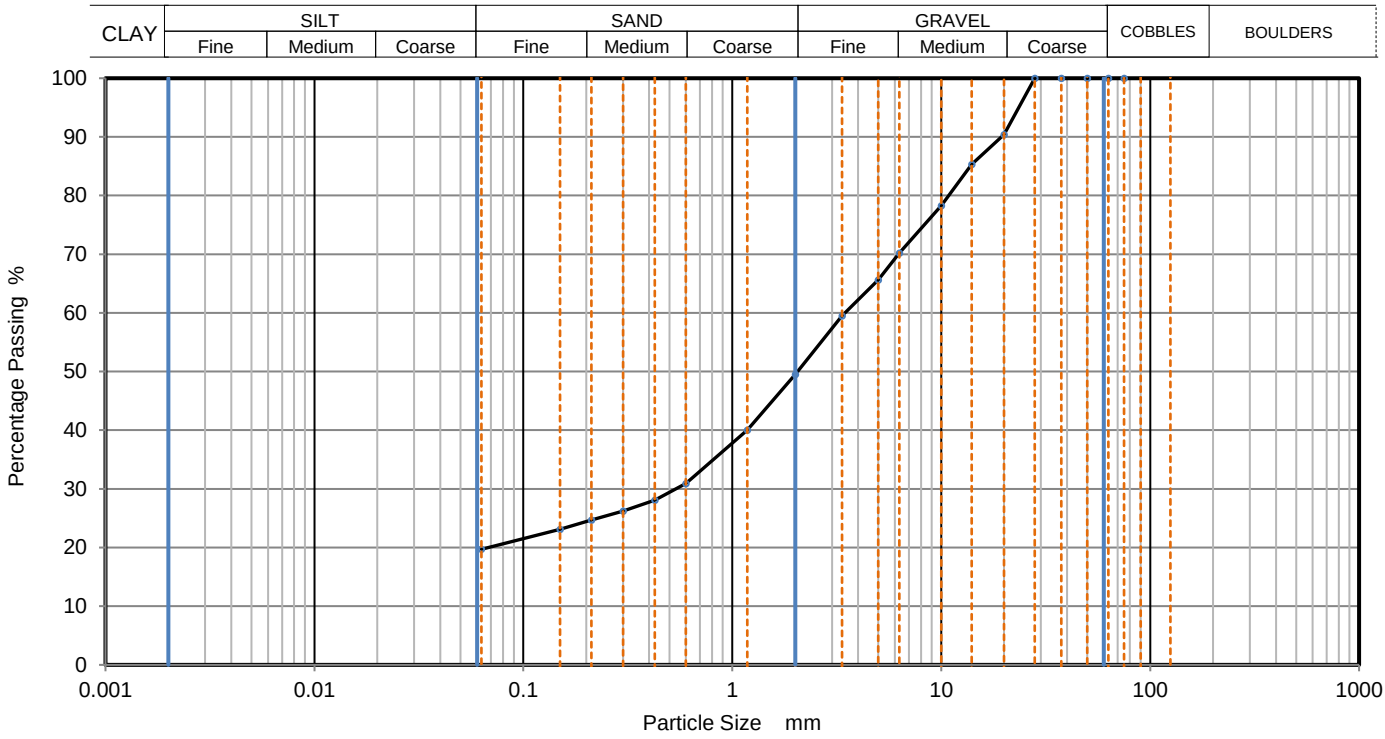
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 14/04/2021 11:12 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020Lab104** |
| | | | | Borehole/Pit No. | BPA-TP-07 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 1 |
| Soil Description | Grey very silty very sandy fine and medium GRAVEL. Sand is coarse. | | | Depth, m | 2.00 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL1202103311 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 90 | | |
| 14 | 85 | | |
| 10 | 78 | | |
| 6.3 | 70 | | |
| 5 | 66 | | |
| 3.35 | 60 | | |
| 2 | 50 | | |
| 1.18 | 40 | | |
| 0.6 | 31 | | |
| 0.425 | 28 | | |
| 0.3 | 26 | | |
| 0.212 | 25 | | |
| 0.15 | 23 | | |
| 0.063 | 20 | | |

| | |
|---|---|
| Dry Mass of sample, g | 519 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 51 |
| Sand | 30 |
| | |
| Fines <0.063mm | 20 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 3.46 |
| D30 | mm | 0.538 |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

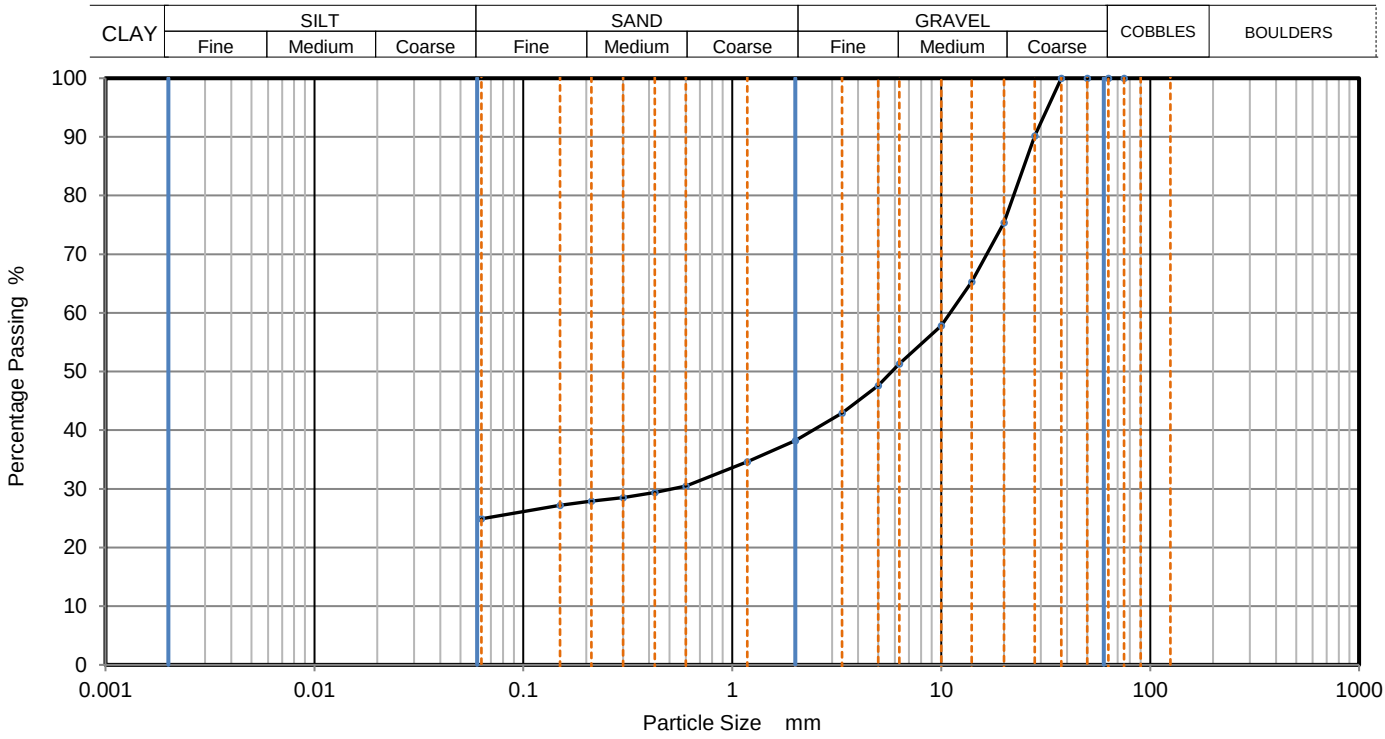
Preparation and testing in accordance with BS1377 unless noted below

| Operator | Checked | Approved | Sheet printed | |
|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 14/04/2021 11:12 | **1** QC From No:R2 |

Tested in: Irish Drilling Ltd.(IDL), Old Galway Road, Loughrea, Co. Galway, Ireland. H62VX39

Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020Lab104** |
| | | | | Borehole/Pit No. | BPA-TP-09 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 1 |
| Soil Description | Grey sandy very silty medium and coarse GRAVEL. | | | Depth, m | 0.70 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL1202103312 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 90 | | |
| 20 | 75 | | |
| 14 | 65 | | |
| 10 | 58 | | |
| 6.3 | 51 | | |
| 5 | 48 | | |
| 3.35 | 43 | | |
| 2 | 38 | | |
| 1.18 | 35 | | |
| 0.6 | 31 | | |
| 0.425 | 29 | | |
| 0.3 | 29 | | |
| 0.212 | 28 | | |
| 0.15 | 27 | | |
| 0.063 | 25 | | |

| | |
|---|---|
| Dry Mass of sample, g | 530 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 62 |
| Sand | 13 |
| | |
| Fines <0.063mm | 25 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 11.1 |
| D30 | mm | 0.508 |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

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|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 14/04/2021 11:12 | **1** QC From No:R2 |

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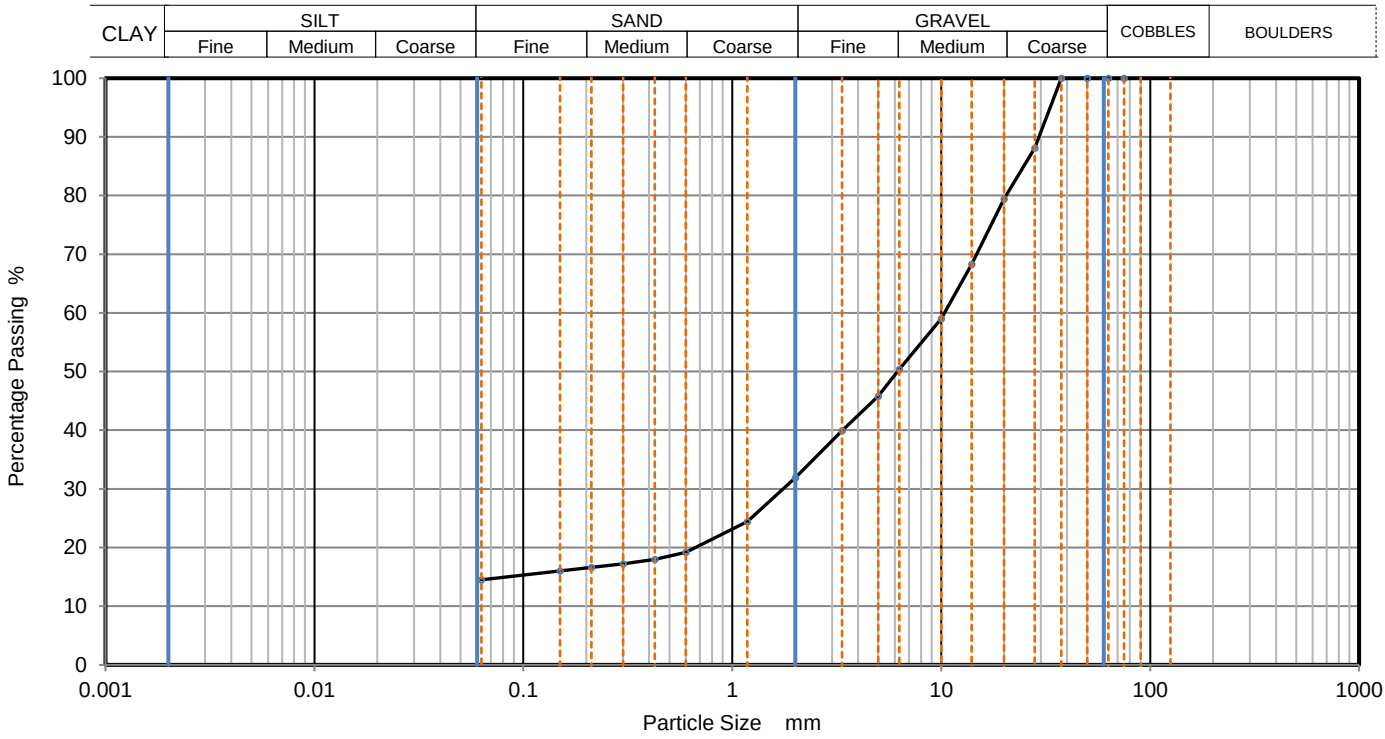
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020Lab104** |
| | | | | Borehole/Pit No. | BPA-TP-11 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 1 |
| Soil Description | Grey silty sandy medium GRAVEL. | | | Depth, m | 1.50 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL1202103313 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 88 | | |
| 20 | 79 | | |
| 14 | 68 | | |
| 10 | 59 | | |
| 6.3 | 50 | | |
| 5 | 46 | | |
| 3.35 | 40 | | |
| 2 | 32 | | |
| 1.18 | 24 | | |
| 0.6 | 19 | | |
| 0.425 | 18 | | |
| 0.3 | 17 | | |
| 0.212 | 17 | | |
| 0.15 | 16 | | |
| 0.063 | 15 | | |

| | |
|---|---|
| Dry Mass of sample, g | 462 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 68 |
| Sand | 18 |
| | |
| Fines <0.063mm | 14 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 10.4 |
| D30 | mm | 1.75 |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

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|---|---|---|---|---|
| | | Dympna Darcy B.Sc. | 14/04/2021 11:12 | **1** QC From No:R2 |

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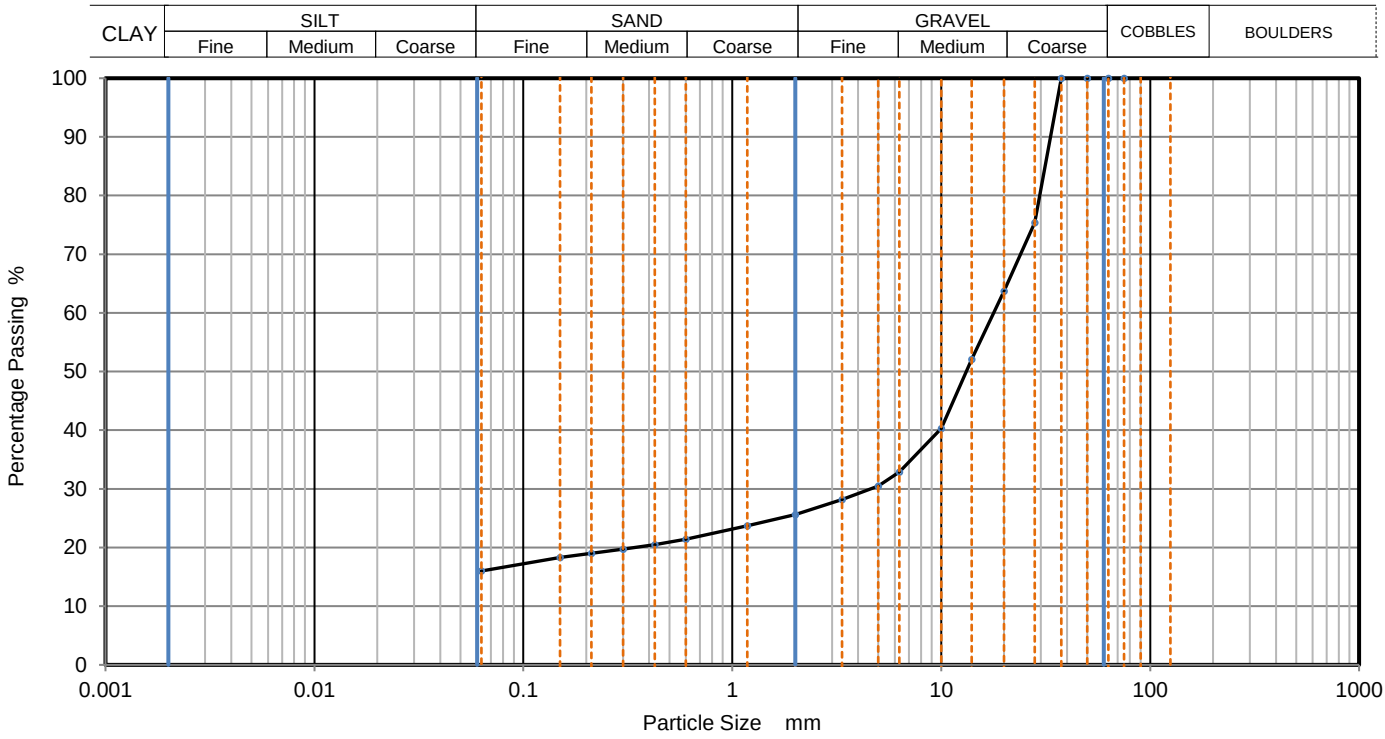
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020Lab104** |
| | | | | Borehole/Pit No. | TP-ENT1 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 1 |
| Soil Description | Brown sandy silty medium and coarse GRAVEL. | | | Depth, m | 1.70 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL1202103314 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 75 | | |
| 20 | 64 | | |
| 14 | 52 | | |
| 10 | 40 | | |
| 6.3 | 33 | | |
| 5 | 31 | | |
| 3.35 | 28 | | |
| 2 | 26 | | |
| 1.18 | 24 | | |
| 0.6 | 21 | | |
| 0.425 | 21 | | |
| 0.3 | 20 | | |
| 0.212 | 19 | | |
| 0.15 | 18 | | |
| 0.063 | 16 | | |

| Dry Mass of sample, g | 615 |
|---|---|

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 74 |
| Sand | 10 |
| | |
| Fines <0.063mm | 16 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 17.8 |
| D30 | mm | 4.59 |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

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|---|---|---|---|---|
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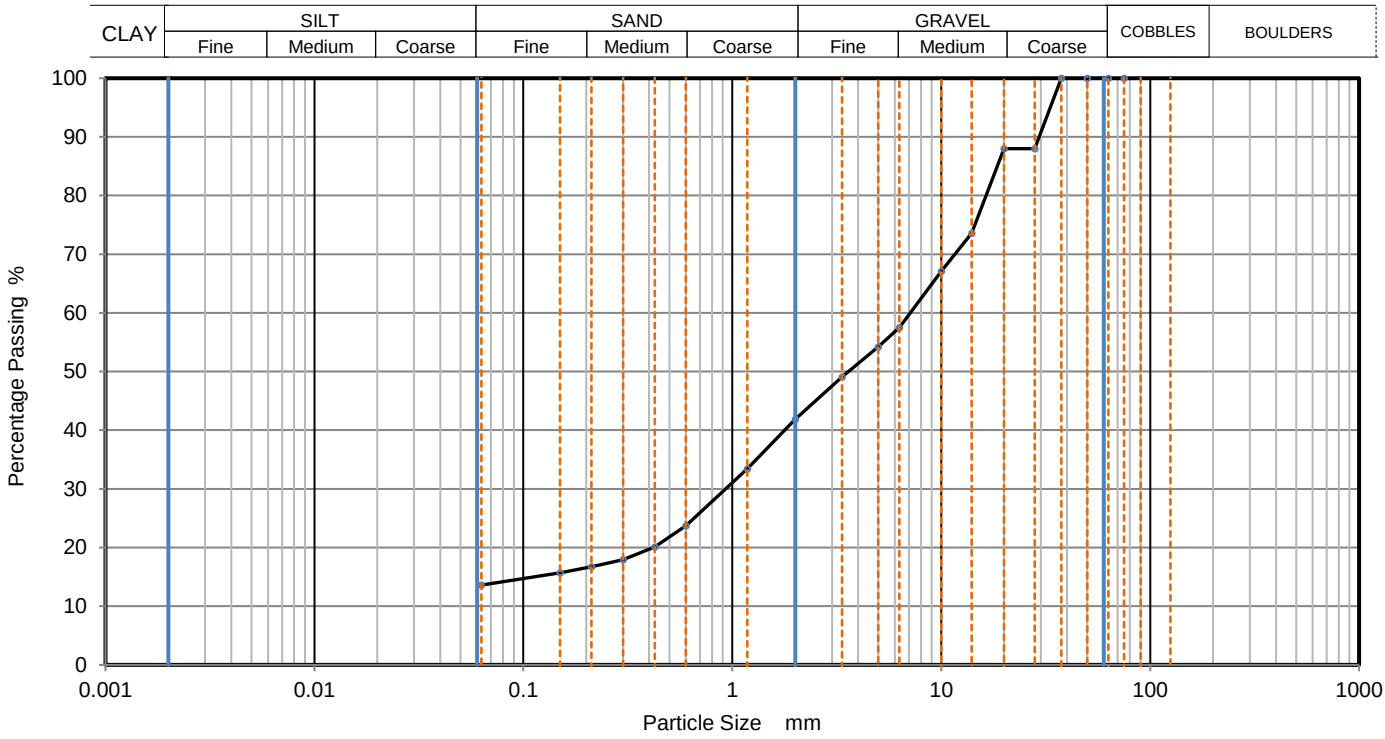
# PARTICLE SIZE DISTRIBUTION

| | | | | | |
|---|---|---|---|---|---|
| | | | | Job Ref | **2020Lab104** |
| | | | | Borehole/Pit No. | TP-SUB-02 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 1 |
| Soil Description | Grey silty very sandy medium GRAVEL. | | | Depth, m | 3.30 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL1202103315 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 88 | | |
| 20 | 88 | | |
| 14 | 74 | | |
| 10 | 67 | | |
| 6.3 | 58 | | |
| 5 | 54 | | |
| 3.35 | 49 | | |
| 2 | 42 | | |
| 1.18 | 33 | | |
| 0.6 | 24 | | |
| 0.425 | 20 | | |
| 0.3 | 18 | | |
| 0.212 | 17 | | |
| 0.15 | 16 | | |
| 0.063 | 14 | | |

| | |
|---|---|
| Dry Mass of sample, g | 732 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 58 |
| Sand | 28 |
| | |
| Fines <0.063mm | 14 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 7.12 |
| D30 | mm | 0.929 |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

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|---|---|---|---|---|
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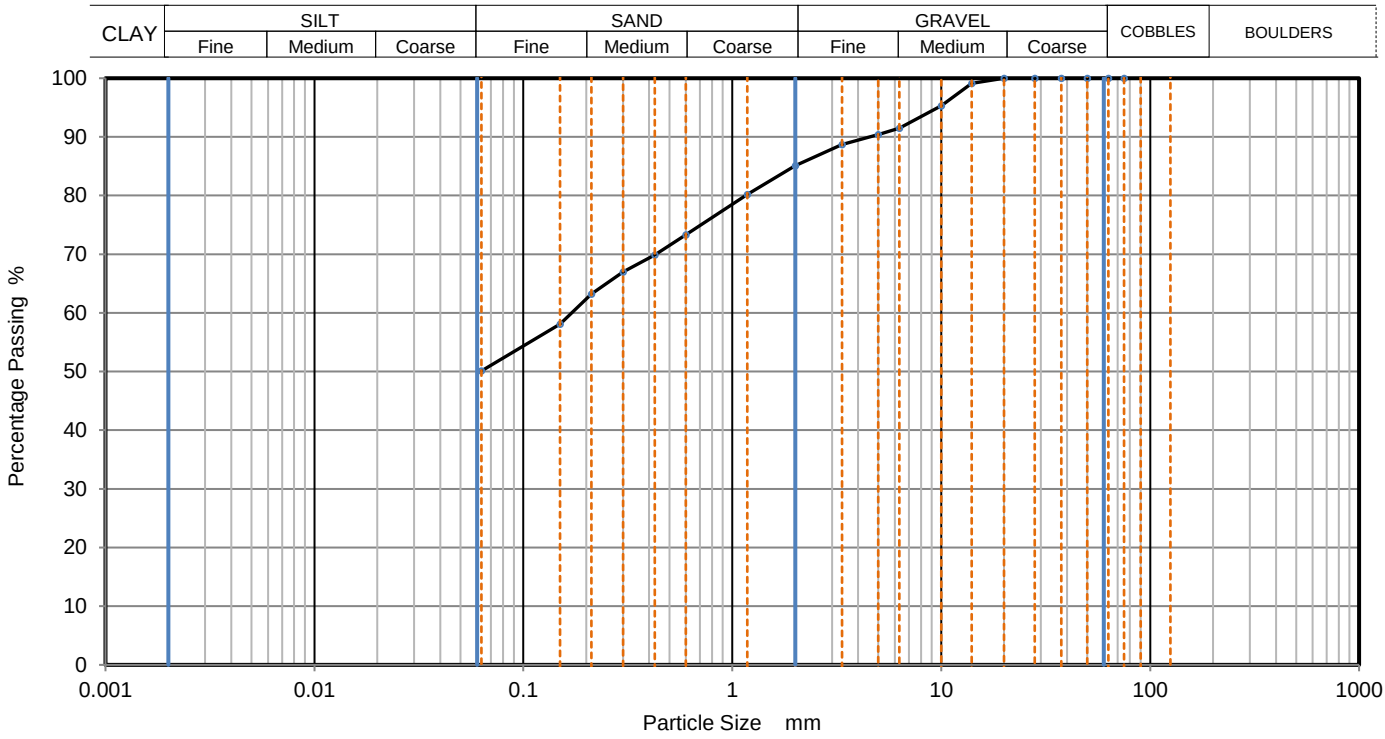
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020Lab104** |
| | | | | Borehole/Pit No. | TP-SUB-07 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 1 |
| Soil Description | Brown gravelly very sandy SILT. | | | Depth, m | 2.20 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL1202103316 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 99 | | |
| 10 | 95 | | |
| 6.3 | 92 | | |
| 5 | 90 | | |
| 3.35 | 89 | | |
| 2 | 85 | | |
| 1.18 | 80 | | |
| 0.6 | 73 | | |
| 0.425 | 70 | | |
| 0.3 | 67 | | |
| 0.212 | 63 | | |
| 0.15 | 58 | | |
| 0.063 | 50 | | |

| | |
|---|---|
| Dry Mass of sample, g | 504 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 15 |
| Sand | 35 |
| | |
| Fines <0.063mm | 50 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.17 |
| D30 | mm | |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

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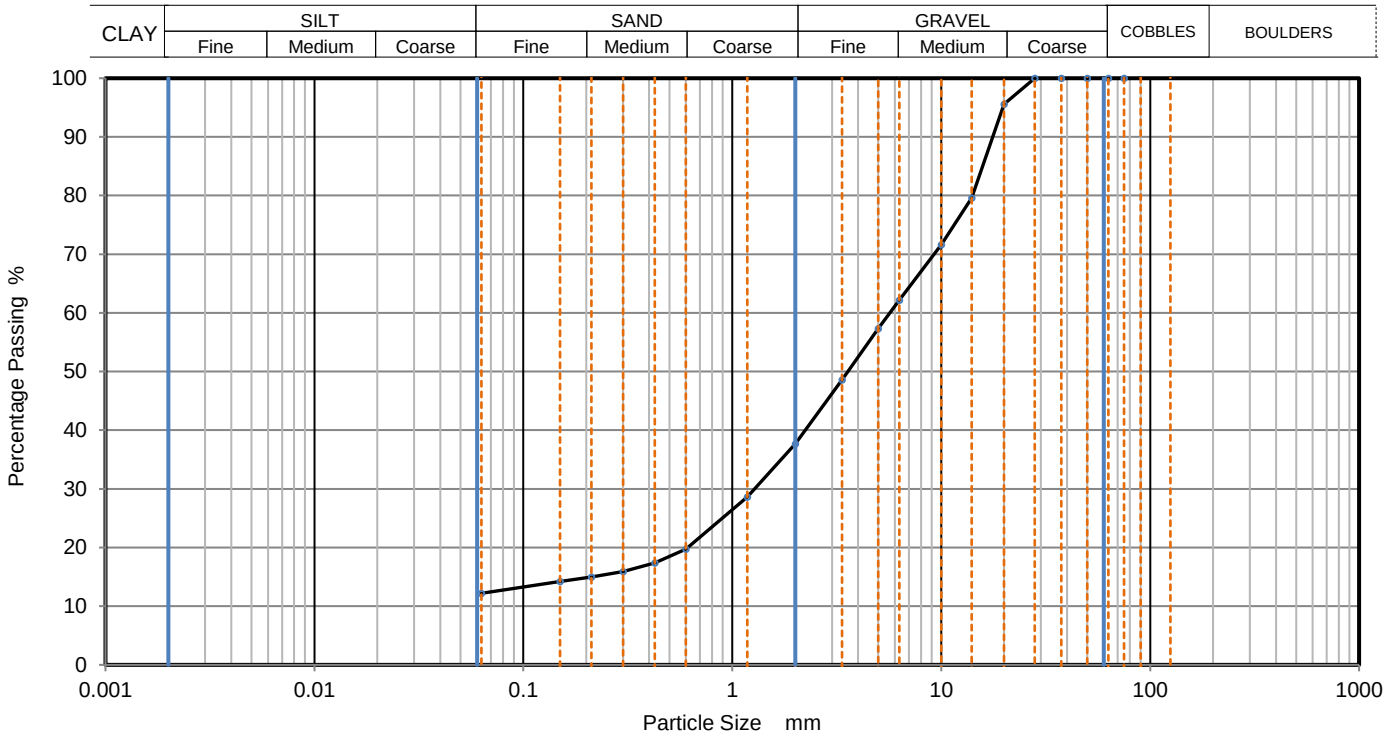
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020Lab104** |
| | | | | Borehole/Pit No. | TP-SUB-08A |
| Site Name | Ballivor Wind Farm | | | Sample No. | 1 |
| Soil Description | Grey silty very sandy medium and fine GRAVEL. | | | Depth, m | 2.00 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL1202103317 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 96 | | |
| 14 | 80 | | |
| 10 | 72 | | |
| 6.3 | 62 | | |
| 5 | 57 | | |
| 3.35 | 49 | | |
| 2 | 38 | | |
| 1.18 | 29 | | |
| 0.6 | 20 | | |
| 0.425 | 17 | | |
| 0.3 | 16 | | |
| 0.212 | 15 | | |
| 0.15 | 14 | | |
| 0.063 | 12 | | |

| Dry Mass of sample, g | 643 |
|---|---|

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 62 |
| Sand | 26 |
| | |
| Fines <0.063mm | 12 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 5.68 |
| D30 | mm | 1.28 |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

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|---|---|---|---|---|
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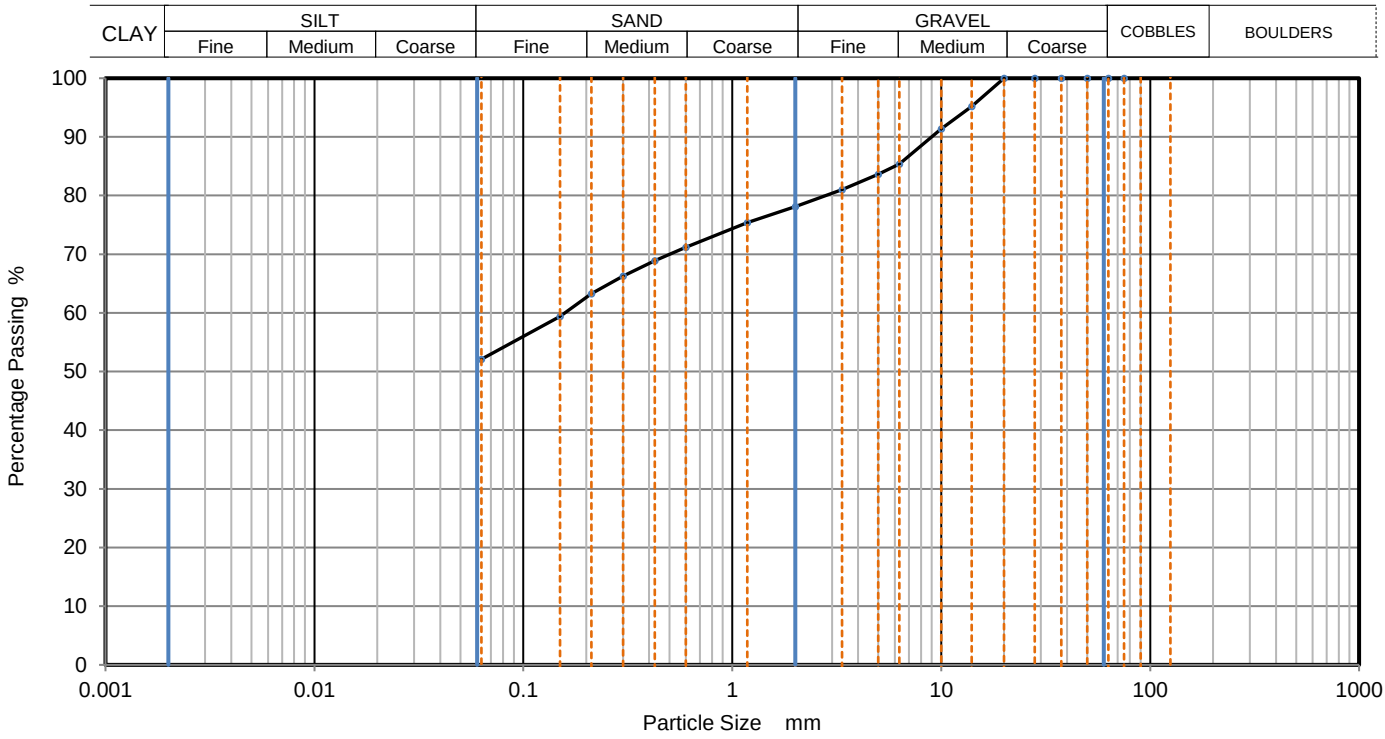
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020Lab104** |
| | | | | Borehole/Pit No. | TP-SUB-12 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 1 |
| Soil Description | Grey slightly gravelly slightly sandy SILT. | | | Depth, m | 2.70 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL1202103318 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 95 | | |
| 10 | 91 | | |
| 6.3 | 85 | | |
| 5 | 84 | | |
| 3.35 | 81 | | |
| 2 | 78 | | |
| 1.18 | 75 | | |
| 0.6 | 71 | | |
| 0.425 | 69 | | |
| 0.3 | 66 | | |
| 0.212 | 63 | | |
| 0.15 | 59 | | |
| 0.063 | 52 | | |

| | |
|---|---|
| Dry Mass of sample, g | 555 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 22 |
| Sand | 26 |
| | |
| Fines <0.063mm | 52 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 0.158 |
| D30 | mm | |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

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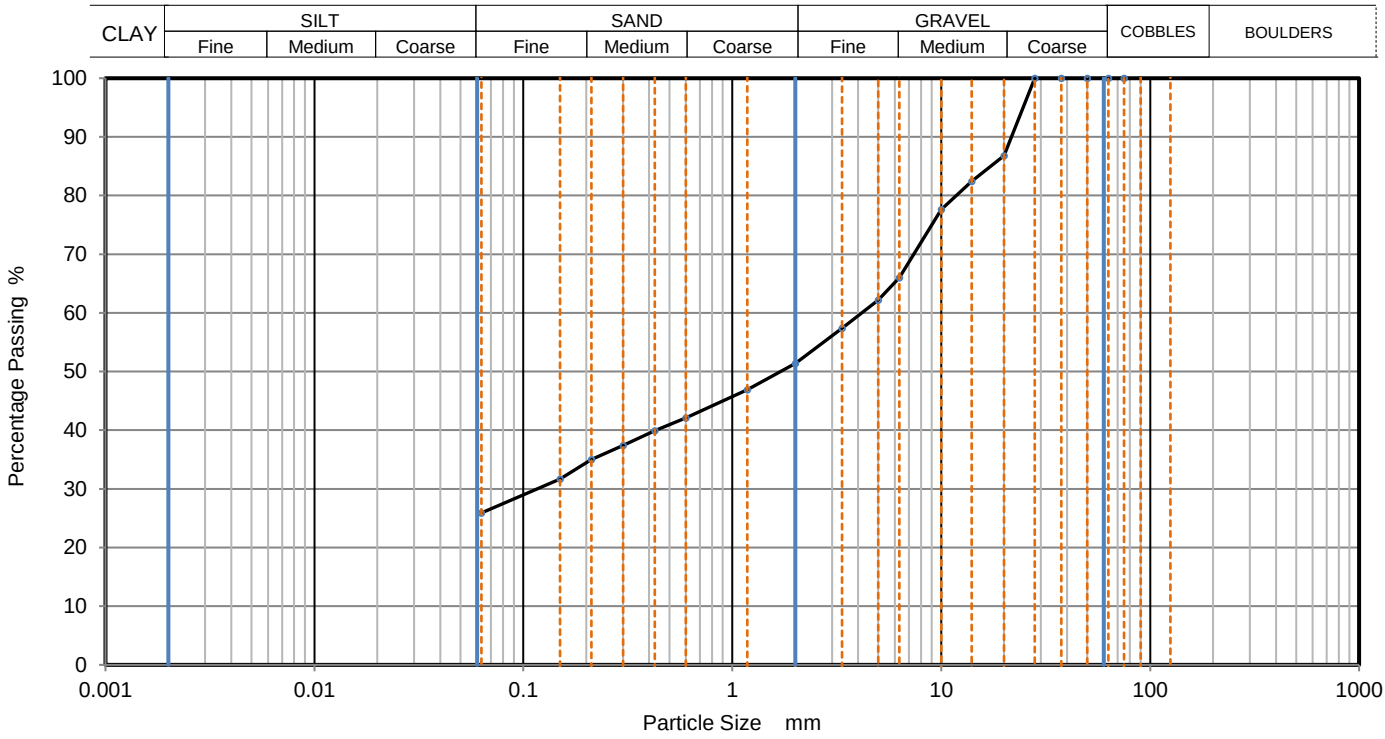
| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020Lab104** |
| | | | | Borehole/Pit No. | TP-SUB-13 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 1 |
| Soil Description | Grey very silty very sandy medium GRAVEL. | | | Depth, m | 2.80 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL1202103319 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 87 | | |
| 14 | 82 | | |
| 10 | 78 | | |
| 6.3 | 66 | | |
| 5 | 62 | | |
| 3.35 | 57 | | |
| 2 | 51 | | |
| 1.18 | 47 | | |
| 0.6 | 42 | | |
| 0.425 | 40 | | |
| 0.3 | 37 | | |
| 0.212 | 35 | | |
| 0.15 | 32 | | |
| 0.063 | 26 | | |

| | |
|---|---|
| Dry Mass of sample, g | 513 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 49 |
| Sand | 26 |
| | |
| Fines <0.063mm | 26 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | 4.16 |
| D30 | mm | 0.116 |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

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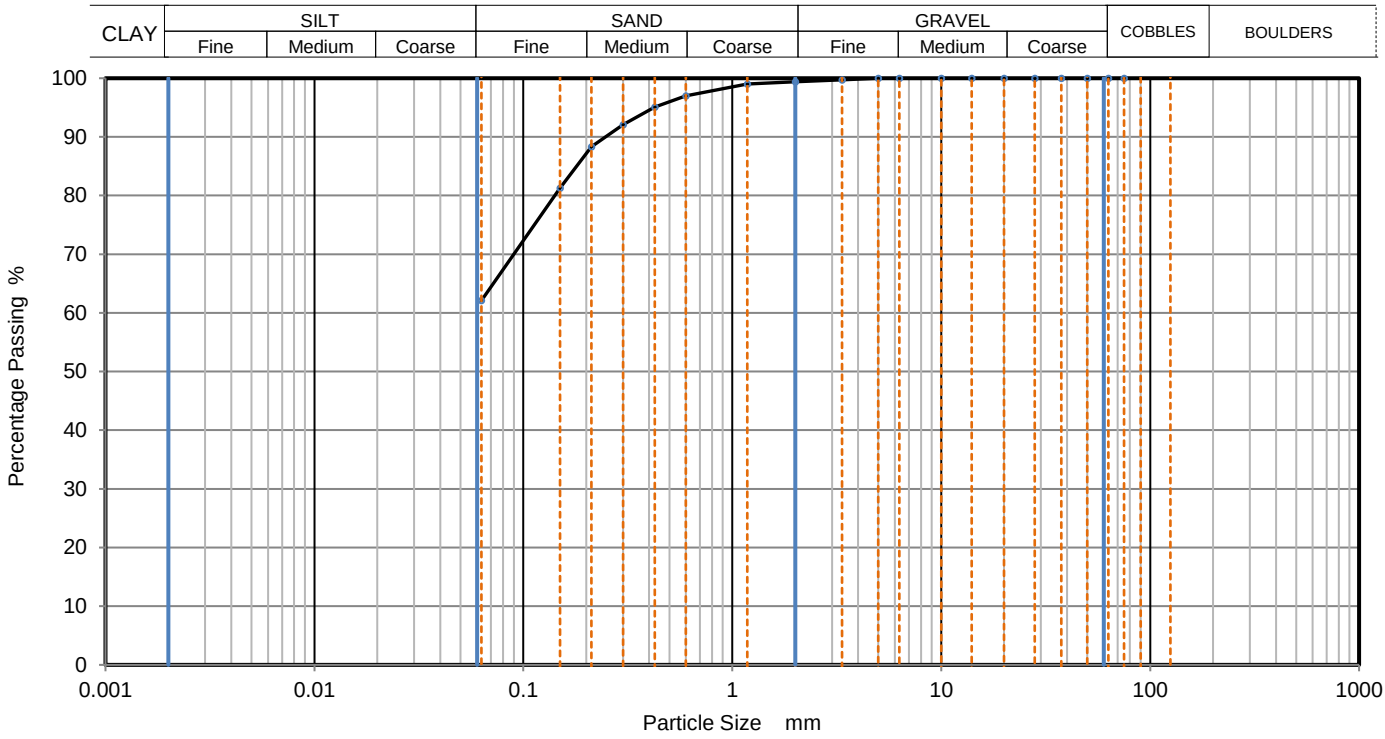
Approved Signatures: Dympna Darcy (DCD) Lab Manager, Declan Joyce (DJ) Chartered Geotechnical Engineer, Ronan Killeen (RK) Quality Manager.

| | | | | | |
|---|---|---|---|---|---|
| IRISH DRILLING LIMITED | **PARTICLE SIZE DISTRIBUTION** | | | Job Ref | **2020Lab104** |
| | | | | Borehole/Pit No. | TP-SUB-16 |
| Site Name | Ballivor Wind Farm | | | Sample No. | 1 |
| Soil Description | Grey sandy SILT. Sand is fine. | | | Depth, m | 3.30 |
| Specimen Reference | | Specimen Depth | m | Sample Type | B |
| Test Method | BS1377:Part 2:1990, clause 9.2 | | | KeyLAB ID | IDL12021033110 |




| Sieving | | Sedimentation | |
|---|---|---|---|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| | | | |
| | | | |
| 75 | 100 | | |
| 63 | 100 | | |
| 50 | 100 | | |
| 37.5 | 100 | | |
| 28 | 100 | | |
| 20 | 100 | | |
| 14 | 100 | | |
| 10 | 100 | | |
| 6.3 | 100 | | |
| 5 | 100 | | |
| 3.35 | 100 | | |
| 2 | 99 | | |
| 1.18 | 99 | | |
| 0.6 | 97 | | |
| 0.425 | 95 | | |
| 0.3 | 92 | | |
| 0.212 | 88 | | |
| 0.15 | 81 | | |
| 0.063 | 62 | | |

| | |
|---|---|
| Dry Mass of sample, g | 476 |

| **Sample Proportions** | % dry mass |
|---|---|
| Very coarse | 0 |
| Gravel | 1 |
| Sand | 37 |
| | |
| Fines <0.063mm | 62 |

| **Grading Analysis** | | |
|---|---|---|
| D100 | mm | |
| D60 | mm | |
| D30 | mm | |
| D10 | mm | |
| Uniformity Coefficient | | |
| Curvature Coefficient | | |

Remarks

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# APPENDIX 7-2

***PEAT AND SPOIL MANAGEMENT PLAN***

# PEAT AND SPOIL MANAGEMENT PLAN
# BALLIVOR WIND FARM

**REVISION CONTROL TABLE, CLIENT, KEYWORDS AND ABSTRACT**
**User is responsible for Checking the Revision Status of This Document**

| Rev. No. | Description of Changes | Prepared by: | Checked by: | Approved by: | Date: |
|---|---|---|---|---|---|
| 0 | Draft for Comment | AW/IH | IH | BDH | 03.12.2021 |
| 1 | Updated following Comment | AW/IH | IH | TC | 03.03.2023 |

**Client:** MKO Ltd

**Keywords:** **Peat, Spoil, Management, Excavation, Borrow Pits**

**Abstract:** Fehily Timoney and Company (FT) were engaged by McCarthy Keville O'Sullivan (MKO) to compile a Peat and Spoil Management Plan (PSMP) for Ballivor wind farm. The purpose of this report is to provide a Peat and Spoil Management Plan for the construction phase of the wind farm. The report describes how peat and spoil which will be excavated from infrastructure locations such as turbine bases and roads and will be handled and placed/reinstated onsite. The report also provides construction details for the types of roads which will be put in place at the site and proposed peat and spoil placement/reinstatement areas which will be developed at the site.

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# 1. INTRODUCTION

## 1.1 Fehily Timoney and Company

Fehily Timoney and Company (FT) is an Irish engineering, environmental science and planning consultancy with offices in Cork, Dublin and Carlow. The practice was established in 1990 and currently has c.95 members of staff, including engineers, scientists, planners and technical support staff. We deliver projects in Ireland and internationally in our core competency areas of Waste Management, Environment and Energy, Civils Infrastructure, Planning and GIS and Data Management.

FT have been involved in over 100 wind farm developments in both Ireland and the UK at various stages of development i.e. preliminary feasibility, planning, design, construction and operational stage and have established themselves as one of the leading engineering consultancies in peat stability assessment, geohazard mapping in peat land areas, investigation of peat failures and site assessment of peat.

## 1.2 Project Description

Fehily Timoney and Company (FT) was engaged in February 2020 by McCarthy Keville O'Sullivan (MKO) on behalf of Bord na Mona to compile a Peat and Spoil Management Plan for the Ballivor wind farm site.

The proposed Ballivor wind farm is at a site located approximately 4km west of Ballivor, on the border between Co. Meath and Co. Westmeath.

The site is relatively flat-lying with drainage channels running typically northwest to southeast. The site is split into three areas, two areas to the north of the R156 regional road and one to the south. The land uses and types within the proposed development site are a mixture of bare cutover and cutaway peat, re-vegetation of bare peat and commercial Bord na Móna operated bog land. Several Bord na Mona rail lines also pass through the site.

Bord na Móna has considerable experience in the handling of peat in these circumstances, both during peat production operations and during wind farm construction projects. This experience has shown that the most environmentally sensitive and stable way of handling and moving of peat is its placement across the site and at locations as close as possible to the excavation areas.

The development comprises of the following:

(1) 26 no. wind turbines with a maximum overall blade tip height of up to 190-200 metres and all associated hard-standing areas

(2) 2 no. borrow pits located in Carranstown Bog, and in third party land in the townland of Craddanstown

(3) 2 no. permanent Anemometry Mast up to a height of 115m

(4) Provision of new site access roads( 30km) and associated drainage

(5) Temporary construction compounds

(6) All associated underground electrical and communications cabling connecting the turbines to the proposed substation in Grange More.

(7) All works associated with the connection of the proposed wind farm to the national electricity grid.

(8) All associated site development works

The peat depth data was recorded by FT during the site walkovers from the 8th to the 10th June 2021 and the 22nd to the 24th June 2021 and has been used in the assessment of peat stability for the proposed wind farm site.

Ground investigation in the form of trial pits and boreholes were carried out by FT and Irish Drilling ltd. (IDL) during the following dates:

- 17th – 21st August 2020
- 1st – 16th February 2021
- 19th July 2021
- 5th -11th August 2021

Trial pitting was also carried out by Bord na Mona on 18th and 19th March 2021.

## 1.3 Purpose

The purpose of this report is to provide a peat and spoil management plan with particular reference to peat stability for the construction phase of the project. The intention of the report is to describe how peat and spoil which will be excavated from infrastructure locations such as turbine bases and roads and will be handled and placed/reinstated onsite in an appropriate manner.

The report also provides construction details for the types of roads which will be put in place at the site and associated proposed peat and spoil placement/reinstatement areas which will be developed at the site.

This peat & spoil management plan also includes a monitoring programme which will be implemented during the construction phase of the wind farm and a contingency plan should peat instability/failure occur at the site.

As for all construction projects, a detailed engineering construction design must be carried out by the appointed construction stage designer prior to any construction work commencing on site. This must take account of the consented project details and any conditions imposed by that consent.

The contents of the peat and spoil management plan and peat stability monitoring programme will be updated in the Construction & Environmental management Plan (CEMP) for the construction phase in line with any planning conditions that may apply.

The peat and spoil management plan contains drainage guidelines for construction works and for management of peat on site. It should be noted that the control of water quality and drainage measures for site is outlined in detail in Chapter 4 and Chapter 9 of the Environmental Impact Assessment Report (EIAR).

## 1.4 Peat Instability Definition

Peat instability in this report is defined as a mass movement of a body of peat that would have a significant adverse impact on the surrounding environment. Peat instability excludes localised movement of peat that would occur below a floating access road, creep movement or localised erosion type events.

Adherence to the peat and spoil management plan should reasonably minimise the potential for all such peat movements. However, it is noted that due to the soft ground nature of the peat terrain it is not possible to completely avoid localised peat movement.

**PLAN**
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## Road Type Legend:

Type A - Upgrade of Existing Excavated Access Tracks

Type B - Upgrade of Existing Floated Access Tracks

Type C - New Excavate & Replace Access Road

Type D - New Floated Access Road

T22 T23 T24 T25 T26 T21 T20 T19 J08 J07 T15 T14 T16 J03 T18 J04 J02 T13 J05 T17 J06 MM2 J01

Proposed Turbine & Hardstanding

Proposed New Access Road

Proposed Permanent Amenity Car Park

Proposed Temporary Construction Compound

Site Boundary

Proposed Met Mast 2

Proposed Temporary Access Track

Borrow Pit 2

Proposed Site Offices

Access for delivery and Removal of Machinery to Borrow Pit

Proposed Substation

Corduff - Mullingar 110kv OHL

Borrow Pit 1B

0m 100m 200m 300m 400m 500m 600m 700m 800m 900m 1000m

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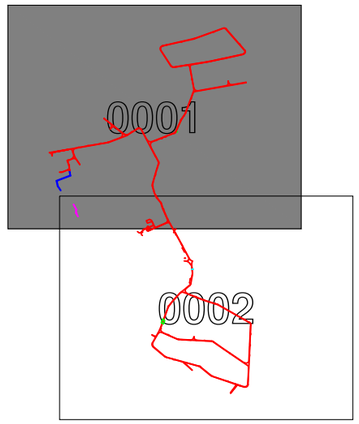


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**FIGURE 1-1 : ROAD CONSTRUCTION TYPES PLAN SHEET 1 OF 2**

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# PLAN

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## Road Type Legend:

Type A -
Upgrade of Existing
Excavated Access Tracks

Type B -
Upgrade of Existing
Floated Access Tracks

Type C -
New Excavate &
Replace Access Road

Type D -
New Floated Access Road

Access for delivery and Removal of Machinery to Borrow Pit
Proposed Substation
Corduff - Mullingar 110kv OHL
Borrow Pit 1B
J01
ENT01
ENT02
Proposed Drain
Borrow Pit 1A
Proposed Site Offices
J09
T12
T01
T02
Site Boundary
Proposed Met Mast 1
T11
J13
J12
MM1
T06
T03
Proposed Turbine & Hardstanding
T05
T04
Proposed New Access Road
T10
J11
T09
T08
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T07

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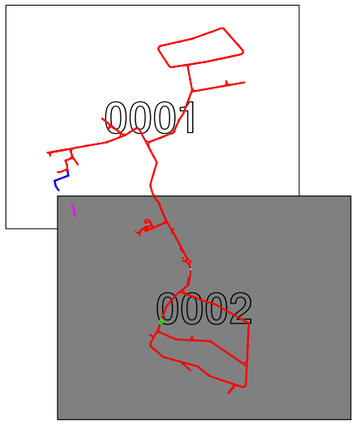


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**FIGURE 1-1 : ROAD CONSTRUCTION TYPES PLAN SHEET 2 OF 2**

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# 2. CONSTRUCTION ACTIVITIES COVERED BY PEAT AND SPOIL MANAGEMENT PLAN

## 2.1 Construction Activities

For the construction phase of the Ballivor wind farm the activities that will generate peat and spoil are as follows:

(1) Upgrade of existing access tracks (excavate and replace tracks)

(2) Construction of new excavated roads through peat

(3) Excavation and placement of arisings

(4) Excavations in peat for turbine bases, hardstands and all other infrastructure foundations

(5) Excavations in peat for underground cables

Peat and spoil management of the above construction activities are covered individually in this report.

## 2.2 Road Construction Types

To provide access within the site and to connect the wind turbines and associated infrastructure existing tracks will need to be upgraded and new access roads will need to be constructed. The road construction preliminary design has taken into account the following key factors:

(1) Buildability considerations

(2) Minimising excavation arisings

(3) Serviceability requirements for construction and wind turbine delivery and maintenance vehicles

(4) Requirement to minimise disruption to peat hydrology

Whilst the above key factors are used to determine the road design the actual construction technique employed for a particular length of road will be determined by the prevailing ground conditions encountered along that length of road.

The general road construction techniques to be considered are given in Table 2-1.

It should be noted that this report does not include a detailed design for the access roads on the Ballivor wind farm site. This report includes the most suitable type of road construction envisaged for each section of access road based on the ground/site conditions recorded during the site walkovers. Where floating roads are proposed in this report, a typical methodology is presented, and a confirmatory ground investigation will be carried out prior to construction on site.

### Table 2.1: General Road Construction Techniques

| Construction Method | Typical Site Conditions | | | Comment |
|---|---|---|---|---|
| | Construction Type | Typical Peat Depth (m) | Typical Slope Inclination (degs) | |
| Upgrade of existing access roads | Type A and B | - | Varies | Upgrade existing excavated access roads to the required width and finished with a layer of selected granular fill – Figure 1-1 |
| Construction of new excavated roads through peat | Type C | <1.0 | Varies | New access road construction technique envisaged for various locations on site – Figure 1-1 |
| Construction of new floating roads over peat | Type D | >1.0 | <5 | New access road construction technique envisaged for various locations on site – Figure 1-1 |

Further details on access road construction types A to D are given in Sections 3, 4 and 5 of the report.

Figure 1-1 shows the proposed road construction types for site.

# 3. UPGRADE OF EXISTING ACCESS ROADS – TYPE A AND B

Minimal, localised sections of existing access tracks are present on the site. Upgrading works are likely to involve both widening and resurfacing of the existing access tracks. The proposed locations for upgrade of the existing access roads on site are shown in Figure 1-1 and details are shown in Figure 3-1 and 3-2.

## 3.1 Upgrading Existing Access Tracks Construction Methodology

This methodology includes procedures that are to be included in the construction to minimise any adverse impact on peat stability. The methodology is not intended to cover all aspects of construction such as drainage and environmental considerations, which are discussed in the EIAR.

(1) Access road construction shall be to the line and level requirements as per design/planning conditions.

(2) For upgrading of existing excavated access roads (Type A - Figure 3-1) the following guidelines apply:

(a) Excavation of the widened section of access road should take place to a competent stratum beneath the peat (as agreed with the designer) and backfilled with suitable granular fill.

(b) Benching of the excavation may be required between the existing section of access road and the widened section of access road depending on the depth of excavation required.

(c) The surface of the existing access road should be overlaid with up to 500mm of selected granular fill.

(d) Access roads to be finished with a layer of capping across the full width of the track.

(e) A layer of geogrid/geotextile may be required at the surface of the existing access road and at the base of the widened section of access road where the existing track shows signs of excessive rutting (to be confirmed by the designer).

(f) For excavations in peat, side slopes shall be not greater than 1 (v): 3 (h). This slope inclination should be reviewed during construction, as appropriate. Where areas of weaker peat are encountered then slacker slopes will be required to ensure stability.

(3) For upgrading of existing access tracks constructed using a floated construction technique (Figure 3-2) the following guidelines apply:

(a) The surface of the existing access track should be graded/tidied up prior to the placement any geogrid/geotextile, where necessary (to prevent damaging the geogrid/geotextile).

(b) Where granular fill has been used in the existing access track make-up, a layer of geogrid should be placed on top of the existing access track.

(c) The geogrid may be overlaid with up to 500mm of selected granular fill.

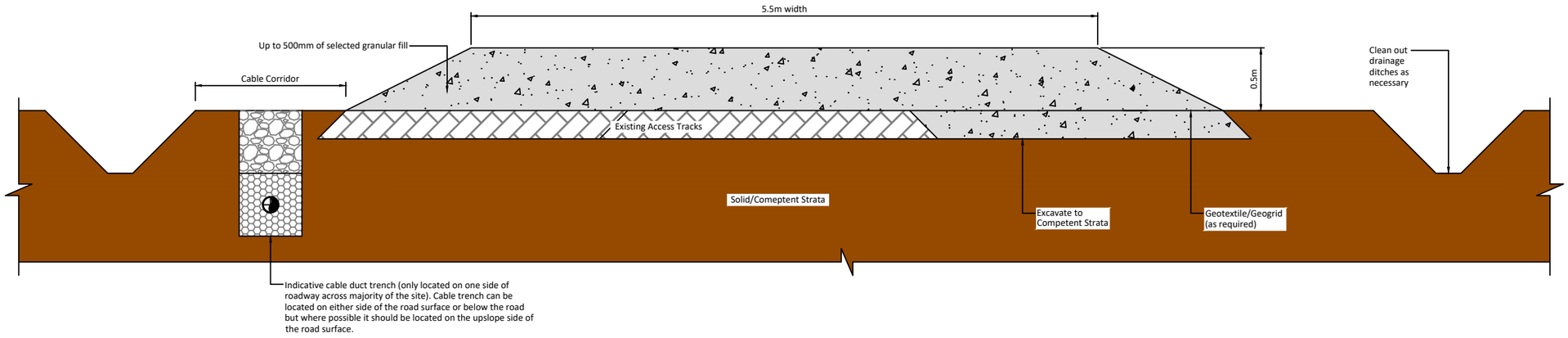
(d) Additional geogrid and granular fill may be required in certain sections of the works, such as where excessive rutting is noted in the existing track (to be confirmed by the designer).

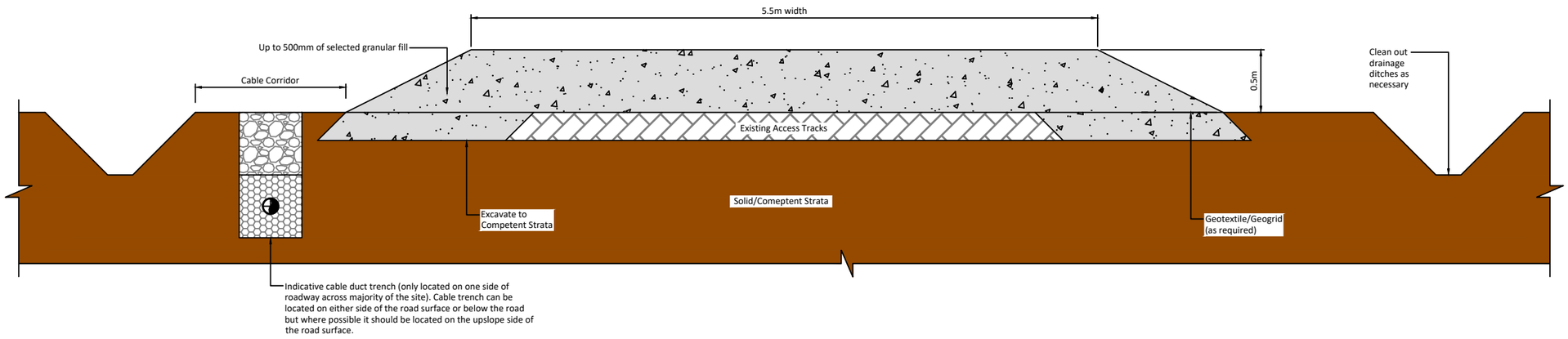
(4) On side long sloping ground any road widening works required will be done on the upslope side of the existing access road, where possible.

(5) At transitions between new floating and existing excavated roads a length of about 10m shall have all peat excavated and replaced with suitable fill. The surface of this fill shall be graded to accommodate wind turbine construction and delivery traffic.

(6) The finished road width will be 5.5m, including a running width of 5m, with wider sections on bends and corners.

(7) A final surface layer shall be placed over the existing access track, as per design requirements, to provide a road profile and graded to accommodate wind turbine construction and delivery traffic.

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## FIGURE 3-1 : TYPE A - UPGRADE OF EXISTING ACCESS TRACKS

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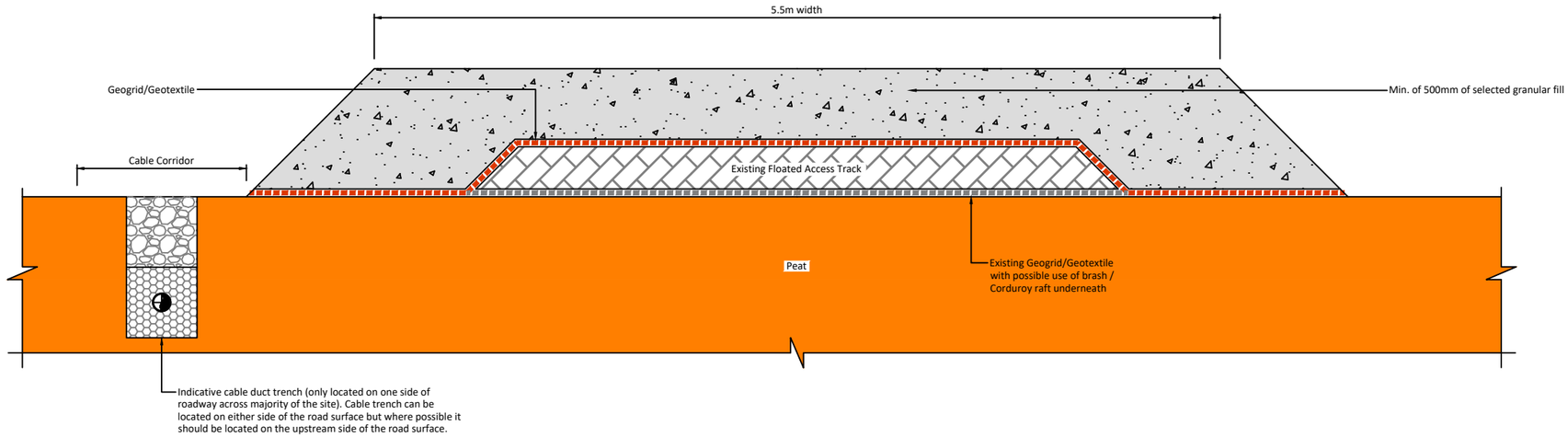


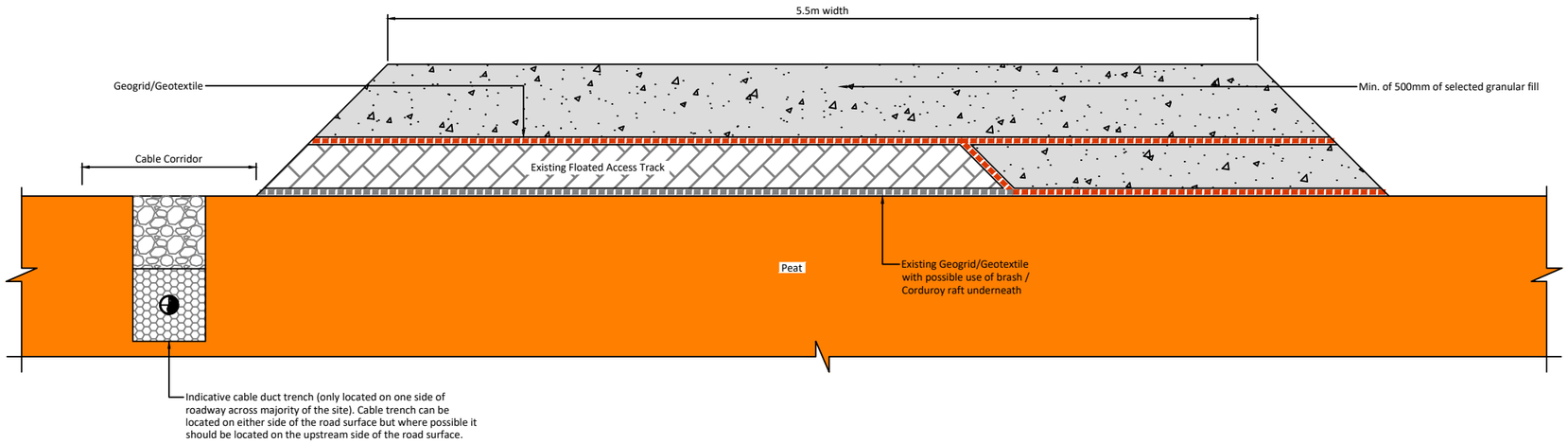


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## FIGURE 3-2 : TYPE B - UPGRADE OF EXISTING FLOATED ACCESS TRACKS

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####

# 4. CONSTRUCTION OF NEW EXCAVATED ROADS THROUGH PEAT – TYPE C

The excavation of peat and spoil and founding of access roads on competent stratum (below the peat) for new access roads will be carried out at various locations on the site. The proposed locations for new excavated access roads on site are shown in Figure 1-1 and details are shown in Figure 4-1.

Excavate and replace type access roads are the conventional method for construction of access roads on peatland sites and the preferred construction technique in shallow peat provided sufficient placement/reinstatement capacity is available on site for the excavated peat.

## 4.1 Excavated Road Construction Methodology

This methodology includes procedures that are to be included in the construction to minimise any adverse impact on peat stability. The methodology is not intended to cover all aspects of construction such as drainage and environmental considerations, which are discussed in the relevant Chapter of the EIAR.

(1) Prior to commencing the construction of the excavated roads movement monitoring posts will be installed in areas where the peat depth is greater than 2.0m.

(2) Interceptor drains will be installed upslope of the access road alignment to divert any surface water away from the construction area.

(3) Excavation will take place to a competent stratum beneath the peat.

(4) Road construction will be carried out in sections of approximately 50m lengths i.e. no more than 50m of access road should be excavated without re-placement with stone fill.

(5) Once excavated, peat will be placed within the borrow pit or be side-cast local to the excavation.

(6) Excavation of materials with respect to control of peat stability:

  (a) Acrotelm (to about 0.3 to 0.4m of peat) is generally required for landscaping and will be stripped and temporarily stockpiled for re-use as required. Acrotelm stripping will be undertaken prior to main excavations.

  (b) Where possible, the acrotelm shall be placed with the vegetation part of the sod facing the right way up to encourage growth of plants and vegetation.

  (c) All catotelm peat (peat below about 0.3 to 0.4m depth) shall be transported immediately on excavation to the designated placement areas.

(7) Side slopes in peat shall be not greater than 1 (v): 3 (h). This slope inclination will be reviewed during construction, as appropriate. Where areas of weaker peat are encountered then slacker slopes will be required. Battering of the side slopes of the excavations will be carried out as the excavation progresses.

(8) The excavated access road will be constructed with a minimum of 800mm of selected granular fill. Granular fill to be placed and compacted in layers in accordance with the TII Specification for Road Works.

(9) Access roads to be finished with a layer of capping across the full width of the road.

(10) A layer of geogrid/geotextile may be required at the surface of the competent stratum.

(11) At transitions between floating and excavated roads a length of road of about 10m shall have all peat excavated and replaced with suitable fill. The surface of this fill shall be graded so that the road surface transitions smoothly from floating to excavated road (Figure 5-2).

(12) Where slopes of greater than 5 degrees are encountered along with relatively deep peat (i.e. greater than 1.5m) and where it is proposed to construct the access road perpendicular to the slope contours it is best practice to start construction at the bottom of the slope and work towards the top, where possible. This method avoids any unnecessary loading to the adjacent peat and greatly reduces any risk of peat instability.

(13) A final surface layer shall be placed over the excavated road and graded to accommodate wind turbine construction and delivery traffic.

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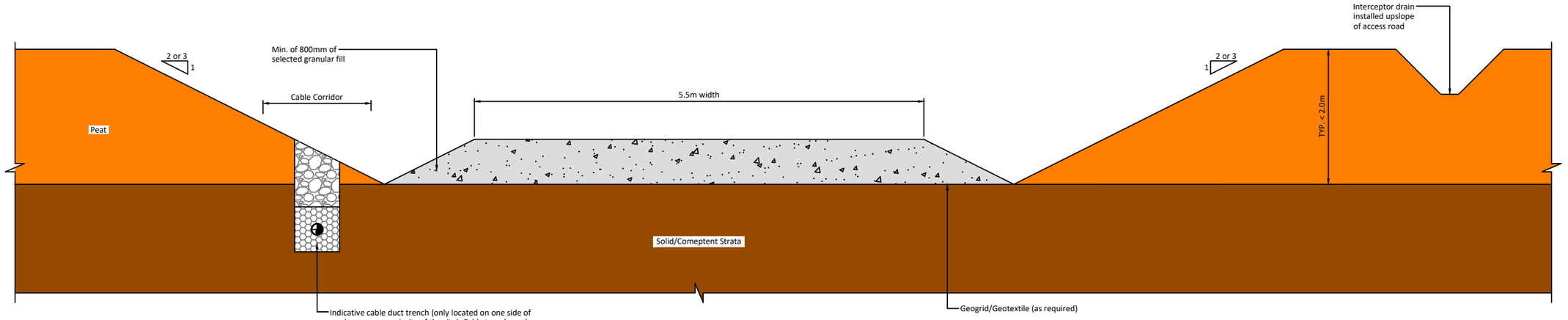


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# FIGURE 4-1 : TYPE C - NEW EXCAVATE AND REPLACE ACCESS ROAD

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# 5. CONSTRUCTION OF NEW FLOATED ROADS OVER PEAT – TYPE D

Floating roads will be the predominant road construction type across the site and will be used in areas where the peat depth is in excess of 1m. The use of new floated access tracks will be limited on site to areas of flatter terrain, i.e., less than a 5 degree slope. The proposed locations for floating roads across the are shown in Figure 1-1 and details shown in Figure 5-1.

A confirmatory stability analysis should be carried out by the designer where it is proposed to install floating access roads over the peat prior to any construction work commencing on site.

Floating roads minimise impact on the peat, particularly peat hydrology. As there is no excavation required no peat arisings are generated. However, where the underlying peat has insufficient bearing capacity or due to topographic restrictions an excavate and replace type access road may be more suitable (see Section 6), although this is not anticipated at the location of the floated roads.

## 5.1 Floating Road Construction Methodology

This methodology includes procedures that are to be included in the construction to minimise any adverse impact on peat stability. The methodology is not intended to cover all aspects of construction such as drainage and environmental considerations, which are considered in the relevant chapter of the EIAR.

Note: Details of geogrid arrangement will be provided by the specialist geogrid provider/designer.

(1) Prior to commencing floating road construction movement monitoring posts will be installed in areas where the peat depth is greater than 2m.

(2) Base geogrid to be laid directly onto the existing peat surface along the line of the road in accordance with geogrid provider's requirements.

(3) The typical make-up of the new floated access road is a minimum of 800mm of selected granular fill with 2 no. layers of geogrid with possibly the inclusion of a geotextile separator (Figure 5-1).

(4) Granular fill to be placed and compacted in layers in accordance with the TII Specification for Road Works, Series 600 (2013).

(5) Following the detailed design of the floated access roads it may be deemed necessary to include pressure berms either side of the access road in some of the deeper peat areas. The inclusion of a 2 to 5m wide pressure berm (typically 0.5m in height) either side of the access road will reduce the likelihood of potential bearing failures beneath the access road.

(6) The finished road width will be approximately 5.5m (5.0m running width), with wider sections on bends and corners.

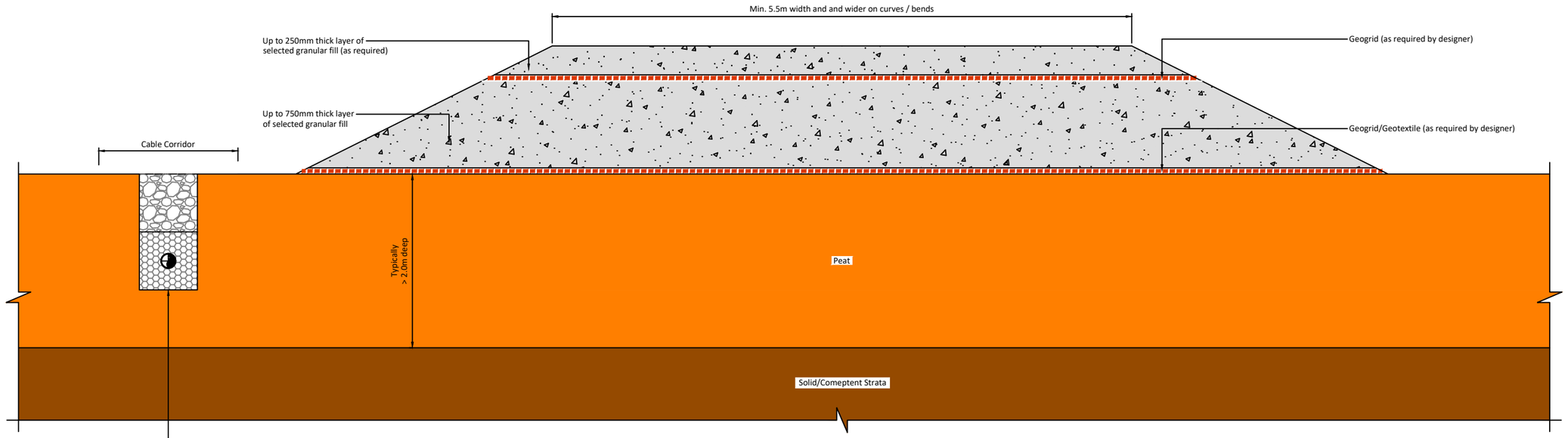
(7) Stone delivered to the floating road construction shall be end-tipped onto the constructed floating road. Direct tipping of stone onto the peat shall not be carried out.

(8) To avoid excessive impact loading on the peat due to concentrated end-tipping all stone delivered to the floating road shall be tipped over at least a 10m length of constructed floating road.

(9) Where it is not possible to end-tip over a 10m length of constructed floating road then dumpers delivering stone to the floating road shall carry a reduced stone load (not greater than half full) until such time as end-tipping can be carried out over a 10m length of constructed floating road.

(10) Following end-tipping a suitable bulldozer shall be employed to spread and place the tipped stone over the base geogrid along the line of the road.

(11) A final surface layer shall be placed over the full width of the floating road, as per design requirements, to provide a road profile and graded to accommodate wind turbine construction and delivery traffic.

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# FIGURE 5-1 : TYPE D - NEW FLOATED ACCESS ROAD

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# 6. GENERAL CONSTRUCTION GUIDELINES FOR ACCESS ROADS

The following general construction guidelines are given for the access roads on site.

(1) Where an open ditch is present alongside an existing/proposed floating access track, the ditch will need to be filled prior to upgrading/constructing the access track. It should be noted that the stability of a floating access road is notably reduced by the presence of adjacent ditches/excavations. The ditch shall be filled with suitable drainage stone. As applicable, a perforated pipe shall be laid into a ditch prior to filling so as to maintain water flow within the ditch.

(2) Where existing drainage crosses the road then it will be necessary to ensure that this drainage is not affected by settlement of the upgraded access road. Cross drains comprising flexible perforated pipes within a permeable stone fill surround will be used to maintain the existing drainage.

(3) No excavations (e.g. drainage, peat cuttings) shall be carried out within 5m distance of a completed floated access road edge, or at a distance determined following site inspection. The presence of excavations can destabilise the road. Temporary excavations should be excavated in short lengths and backfilled as soon as practicable.

(4) No excessive stockpiling of materials shall take place on or adjacent to floated access roads so as to avoid bearing failure of the underlying peat.

(5) End-tipping of stone onto the road during the construction/upgrading of the access road should be carefully monitored to ensure that excessive impact loading, which may adversely affect the underlying peat, is limited.

(6) Due to the nature of floating road construction it will be necessary to monitor the settlement/movement of the road. Survey points will be located along the road at 10m intervals in areas of deep peat (greater than 2.5m). These survey points shall be surveyed on a weekly basis, possibly more frequently when construction activities are ongoing in the area.

(7) It is recommended that the construction and upgrading of access roads in areas of deep peat (greater than 2.5m) is inspected on a routine basis during the works, particularly before/following trafficking by heavy vehicular loads.

(8) In the event of excessive vertical displacement of the road during/following construction then mitigation measures may be required to ensure the stability of the road. This may include:

  (a) Introduction of pressure berms either side of the road (that are 2 to 5m wide by 0.5m deep stone layer).

  (b) Where peat is relatively shallow then excavate peat and replace with suitable fill.

  (c) Slowing the rate of construction.

(9) Settlement of a floated access road is expected and will likely be in the order of several 100mm in the deeper peat areas; as such it may be necessary to re-level the road at convenient intervals during the works. The magnitude and extent of settlement is likely to be greater in areas of deeper peat with the rate of settlement reducing over time. Prior to completion of the works it is recommended that measures are taken to re-level the road, as necessary.

# 7. EXCAVATION AND STORAGE OF PEAT AND SPOIL

The site has been extensively harvested by Bord na Móna using mechanical cutting resulting in well drained and extensively trafficked peat. Bord na Móna has considerable experience in the handling of peat in these circumstances, both during peat production operations and during the rehabilitation processes associated with its cutaway bogs. This experience has shown that when the handling and moving of such peat is appropriately managed, stability or environmental issues are not expected to arise.

## 7.1 Excavation and Storage of Arisings Methodology

This methodology includes procedures that are to be included during construction to minimise any adverse impact on peat stability. The methodology is not intended to cover all aspects of construction such as drainage and environmental considerations.

All excavated peat and overburden will be placed/spread alongside the excavations for the infrastructure elements or, if required, transported to the two on-site borrow pits. As an example, Figure 7-1 shows a typical cross section with placed/spread excavated spoil either side of an access road. Further details are given in Section 7.4 of this report.

(1) All excavated peat and spoil shall be transported immediately on excavation to one of the on-site borrow pits (see Figure 1-1) or to designated peat storage areas alongside the access roads.

(2) Further details on the construction and reinstatement of the borrow pits are given in Section 7.4.

(3) Further details on the placement of excavated peat to designated peat storage areas alongside the access roads are given in Section 7.5.

(4) Some of the peat, in particular the acrotelm (upper layer of the peat), excavated during construction will be used for landscaping purposes.

## 7.2 Summary of Peat and Spoil Volumes on Site

A summary of the excavated peat and spoil volumes calculated for the proposed Ballivor wind farm site are given in Table 7-1.

**Table 7.1: Summary of Excvated Peat and Spoil Volumes on Site**

| Infrastructure Element [1] | Typical Dimensions | Peat Volume ($m^3$) [2] | Spoil (non-peat) Volume ($m^3$) [2] and [3] | Comment |
|---|---|---|---|---|
| 26 no. Turbines and Hardstands | 27m diameter excavation footprint for turbine foundation with 25 x 65m hardstand area. | 376,900 | 95,000 | |
| Access Roads | Assumed 5m running surface with 6m wide development footprint. | 2,600 | 5,100 | Excludes proposed floating sections of access road where no excavation of peat will take place (see Figure 1-1) |
| Meteorological Masts | 10 x 10m foundation footprint and 30 x 30m hardstanding area. | 3,500 | 504 | |
| Temporary Construction Compounds | Hardstanding areas vary. | 20,000 | 8,000 | |
| Substation | | 50,000 | 5,500 | |
| Borrow pits | On-site and off-site borrow pits | 98,400 | 53,880 | Peat and spoil generated from the off-site borrow pit will be backfilled into this borrow pit upon completion. |
| Cable route and grid connection | | 12,500 | | |
| | | | | |
| | **Total =** | **564,000$m^3$** | **168,000$m^3$** | **Total = 732,000$m^3$ (peat and spoil volume)** |

Note (1) The location of the infrastructure elements on site are shown on Figure 1-1.

Note (2) A factor of 20% (bulking factor of 15% and contingency factor of 5%) has been applied to the excavated peat and spoil volumes to allow for expected increase in volume upon excavation and to allow for a variation in ground conditions across the site.

## 7.3 Summary of Peat and Spoil Placement/Reinstatement Areas on Site

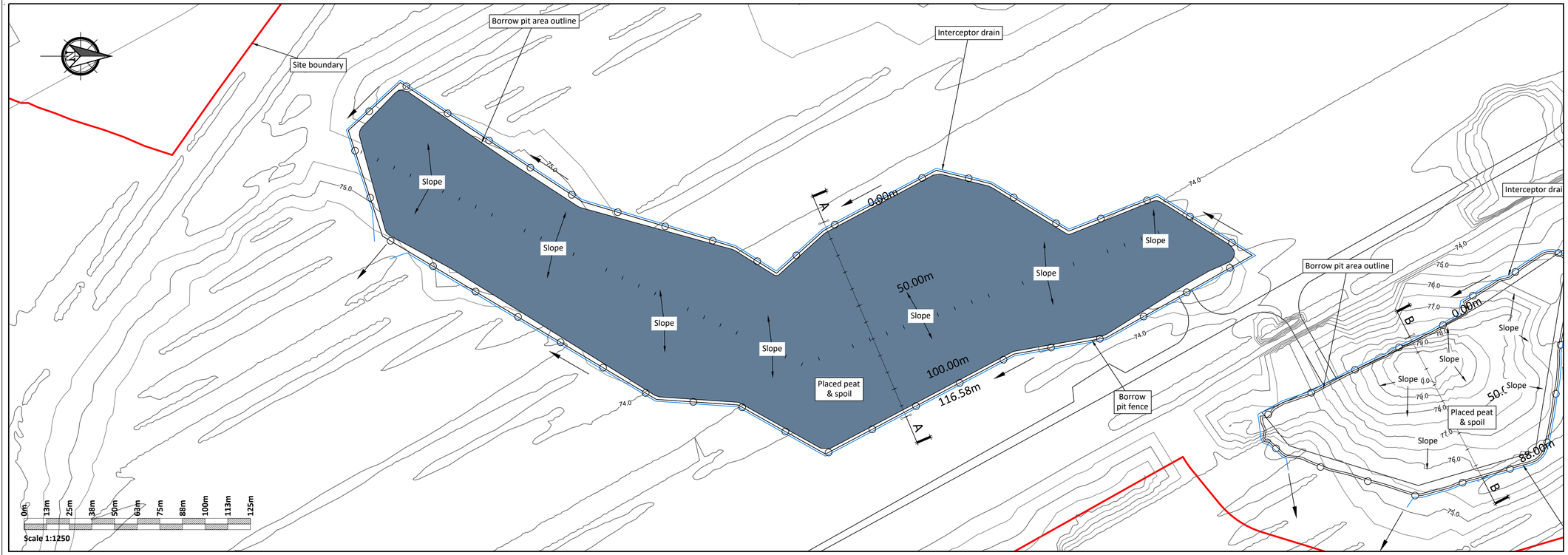
A summary of the potential peat and spoil placement/reinstatement areas at the Ballivor wind farm site are given in Table 7-2.

**Table 7.2: Summary of Peat and Spoil Placement/Reinstatement Areas on Site**

| Location (1) | Peat and Spoil Volume ($m^3$) | Comment |
|---|---|---|
| Borrow Pits | 290,000 | See Figure 7-1 to 7-3 for details. Peat and spoil generated from offsite borrow pit to be backfilled into pit upon completion. |
| Peat placement alongside designated access roads | 405,000 | 1.3m in height and 10m wide corridor on both sides of proposed infrastructure elements on site. For example, 10m wide corridor on both sides of proposed access roads, see Section 7.4 of the report for further details and Figure 7-5. The placement of peat alongside infrastructure elements also includes around hardstanding areas, either side of cable trenches, etc. |
| Landscaping (2) | 52,000 | It is estimated that approximately 2,000$m^3$ of peat will be required for landscaping purposes at each of the 26 no. turbine locations. |
| | | |
| **Total =** | **747,000$m^3$** | |

Note (1) The location of the proposed borrow pits at the site are shown on Figure 1-1.

Note (2) Some of the acrotelm (upper layer of the peat) excavated during construction will be used for landscaping purposes.




**PLAN**

**Scale 1:1250**

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## Construction Notes Borrow Pit:

(1) It is proposed to construct the borrow pit so that the base of the borrow pit is below the level of the adjacent section of access road.

(2) Slopes within the excavated formed around the perimeter of the borrow pit will be formed at stable inclinations to suit local in-situ conditions.

(3) Infilling of the peat & spoil should commence at the back edge of the borrow pit and progress towards the borrow pit entrance/buttress. Leaving in place upstands/segments of intact ground which will help to retain the placed peat & spoil and will allow the borrow pit to be developed and infilled in cells.

(4) A buttress is required at the downslope edge of the borrow pit to safely retain the infilled peat and spoil. The height of the buttresses constructed should be greater than the height of the infilled peat & spoil to prevent any surface peat & spoil run-off. A buttress up to 2m (approx.) in height is likely to be required.

(5) The buttress will be founded on competent strata. The founding stratum for the buttress should be inspected and approved by the project geotechnical engineer.

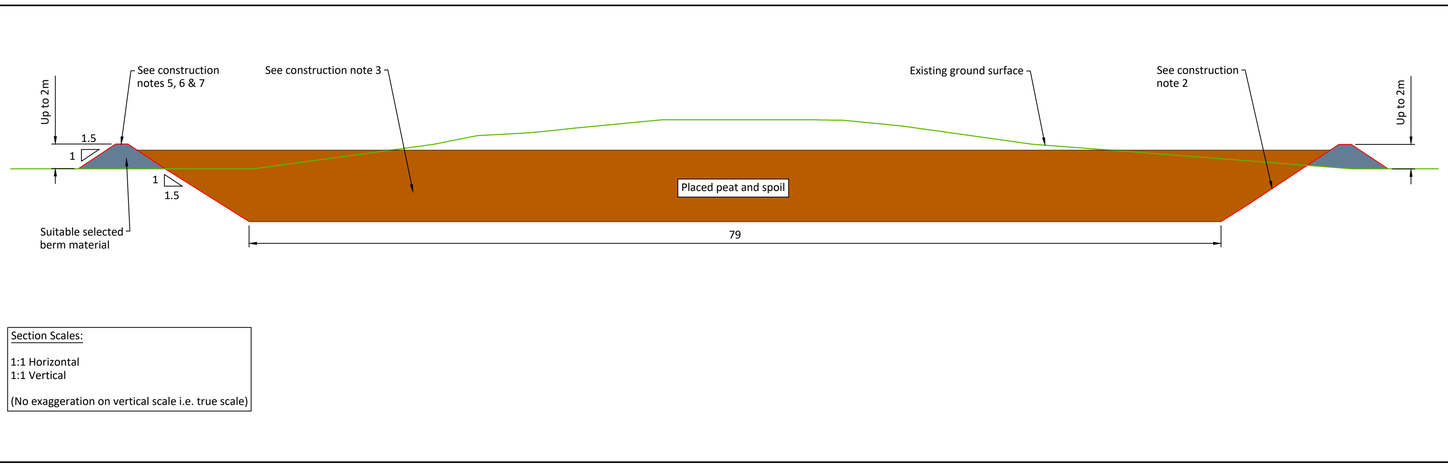
(6) In order to prevent water retention occurring behind the buttresses, the buttresses should be constructed of coarse boulder fill with a high permeability.

(7) The surface of the placed peat & spoil should be shaped to allow efficient run-off of surface water from the placed arising's.

(8) Control of groundwater within the borrow pit may be required and measures will be determined as part of the ground investigation programme.

(9) All the above-mentioned general guidelines and requirements should be confirmed by the designer prior to construction.

(10) Further guidelines on the construction of the borrow pit are included within Section 7.4 of the Peat & Spoil Management Plan




**SECTION A - A**

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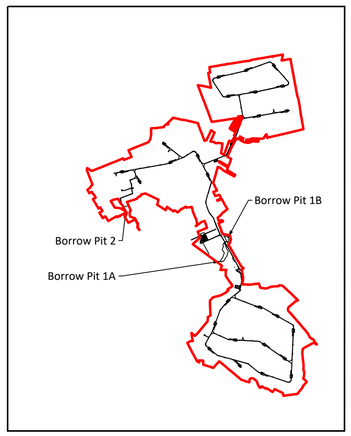


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Date - 06.03.23

# FIGURE 7-1 : BORROW PIT 1A PLAN AND CROSS SECTION

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Checked - IH

Rev - C

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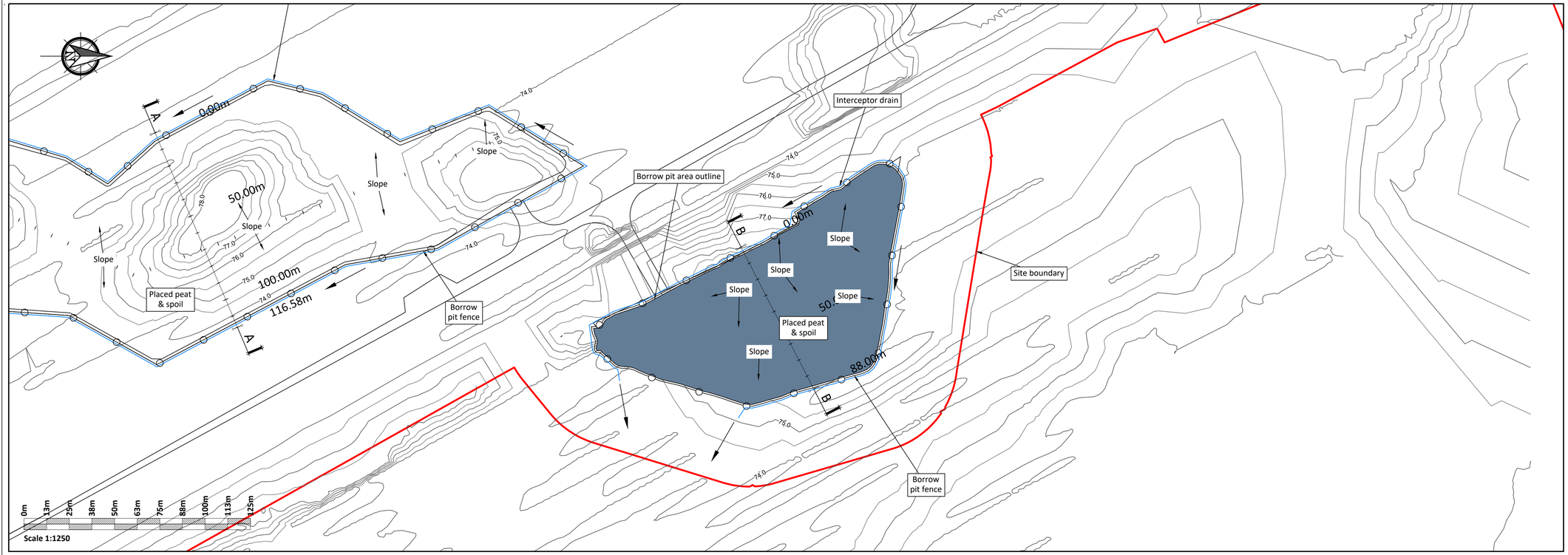
06 March 2023




## PLAN

**Scale 1:1250**

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## Construction Notes Borrow Pit:

(1) It is proposed to construct the borrow pit so that the base of the borrow pit is below the level of the adjacent section of access road.

(2) Slopes within the excavated formed around the perimeter of the borrow pit will be formed at stable inclinations to suit local in-situ conditions.

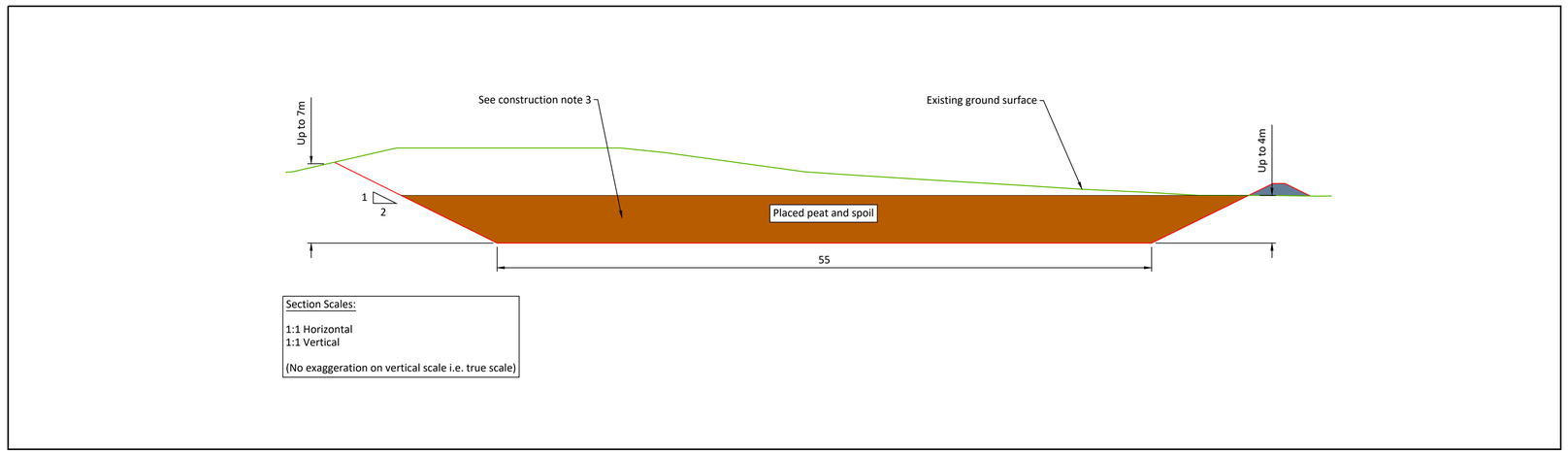
(3) Infilling of the peat & spoil should commence at the back edge of the borrow pit and progress towards the borrow pit entrance/buttress. Leaving in place upstands/segments of intact ground which will help to retain the placed peat & spoil and will allow the borrow pit to be developed and infilled in cells.

(4) The surface of the placed peat & spoil should be shaped to allow efficient run-off of surface water from the placed arising's.

(5) Control of groundwater within the borrow pit may be required and measures will be determined as part of the ground investigation programme.

(6) All the above-mentioned general guidelines and requirements should be confirmed by the designer prior to construction.

(7) Further guidelines on the construction of the borrow pit are included within Section 7.4 of the Peat & Spoil Management Plan




## SECTION B - B

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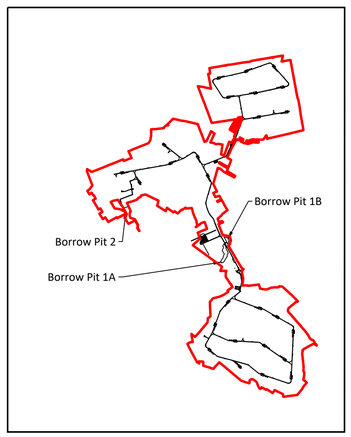


## KEYPLAN

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# FIGURE 7-2 : BORROW PIT 1B PLAN AND CROSS SECTION

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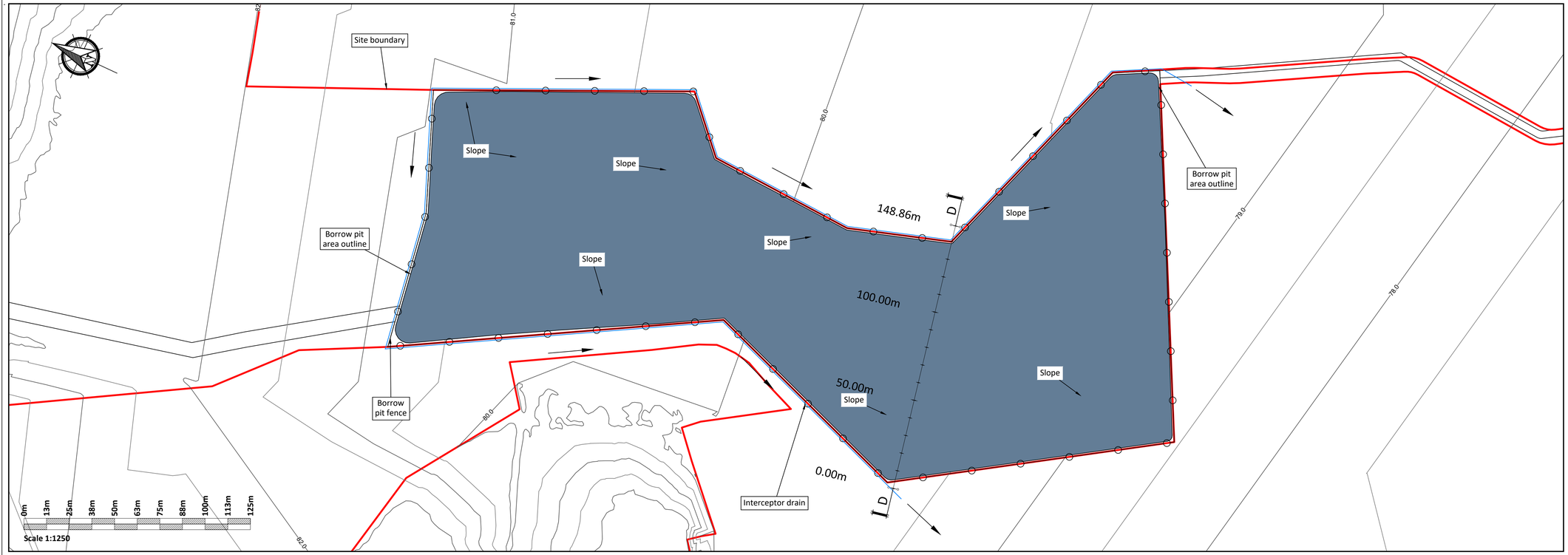


**PLAN**

**Scale 1:1250**

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## Construction Notes Borrow Pit:

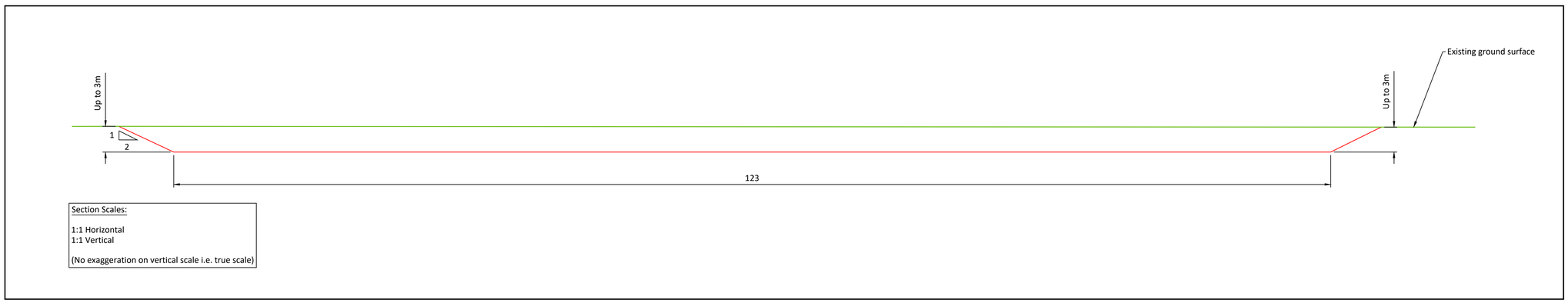
(1) It is proposed to construct the borrow pit so that the base of the borrow pit is below the level of the adjacent section of access road.

(2) Slopes within the excavated formed around the perimeter of the borrow pit will be formed at stable inclinations to suit local in-situ conditions.

(3) Control of groundwater within the borrow pit may be required and measures will be determined as part of the ground investigation programme.

(4) All the above-mentioned general guidelines and requirements should be confirmed by the designer prior to construction.

(5) Further guidelines on the construction of the borrow pit are included within Section 7.4 of the Peat & Spoil Management Plan

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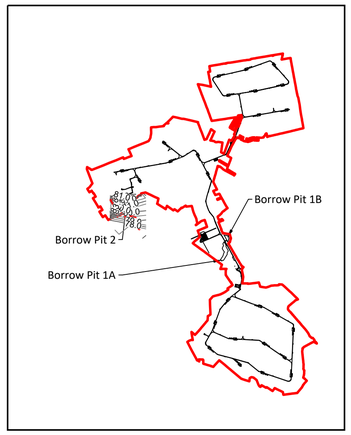


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# FIGURE 7-3 : BORROW PIT 2 PLAN AND CROSS SECTION

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Checked - IH

Rev - C

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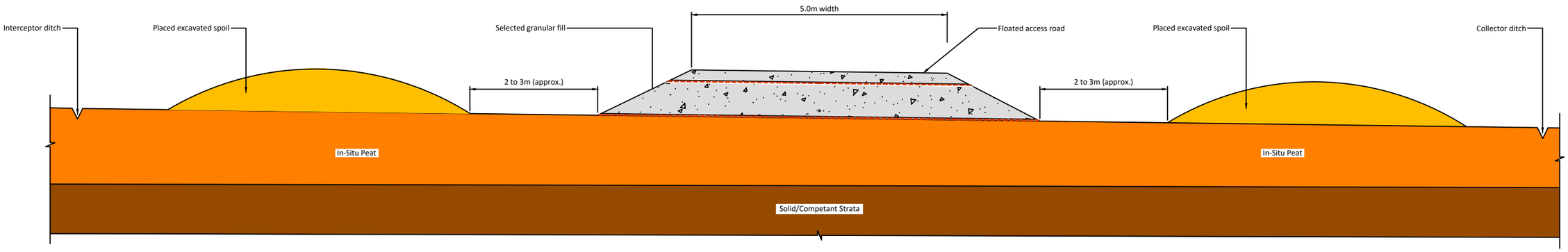
06 March 2023

Notes:

1) Spoil material will spread to a depth not exceeding 1m in height.
2) See section 7.4 of the Peat & Spoil Management Plan.
3) Indicative locations are given for drainage measures such as drainage ditches.

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# FIGURE 7-4 - PEAT & SPOIL PLACEMENT ALONGSIDE INFRASTRUCTURE ELEMENTS - TYPICAL DETAILS

Drawn - POR
Checked - IH
Rev - A

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Wednesday 3 November 2021

## 7.4 Guidelines for the Construction and Reinstatement of Borrow Pits

Three number locations have been identified as potential borrow pits and are shown on Figure 1-1. The peat depth within the development footprint of the borrow pits is around 0.5-1.5m.

Upon removal of the granular material from the borrow pits, it is proposed to reinstate the on-site borrow pits using excavated peat and spoil. The excavated granular material from the borrow pits will be used in the construction of the infrastructure elements (turbine bases, roads, etc.) at the wind farm. The contractor excavating the granular material will be required to develop the borrow pits in a way which will allow the excavated peat and spoil to be placed safely. It is proposed to construct cells within the borrow pits for the placement of the excavated peat and spoil. This is to allow for the safe placement and grading of the peat and spoil using dumper trucks and excavators. It also eliminates the need to construct above ground retaining structures which may have an unnecessary visual impact and increase the development footprint of the proposed wind farm. The text below provides design and construction guidelines for the borrow pits.

Figures 7-1 to 7-4 show typical construction details for the borrow pits.

The borrow pits shall be constructed as follows:

(1) The granular material within the proposed borrow pit footprints will be removed by excavation.

(2) It is proposed to construct the borrow pits so that the base of the borrow pits are below the level of the adjacent section of access road. As excavation progresses into the back edge of the borrow pits, the base of the borrow pits may be raised to suit local conditions. Localised deepening of the borrow pit floors may be required depending on extraction operations.

(3) Depending on the depth and type of granular material present in the borrow pits it may be possible to excavate the granular material from the borrow pits whilst leaving in place upstands/segments of granular material which will help to retain the placed peat and spoil. The upstands/segments of granular material will essentially act as engineered buttresses within the borrow pits.

(4) Slopes within the excavated granular material formed around the perimeter of the borrow pits will be formed at stable inclinations to suit local in-situ conditions. Exposed sections of the excavation slopes will be left with irregular faces and declivities to promote re-vegetation and provide a naturalistic appearance.

(5) The stability of the excavation faces within the borrow pits will be inspected by competent personnel upon excavation to ensure stability during construction works and in the long term. This inspection will allow unfavourable conditions to be identified and suitable mitigation measures to be applied.

(6) Where it is not possible to leave upstands/segments of intact granular material in place it may be necessary to construct buttresses within the borrow pits. The buttresses should be constructed of granular fill from the borrow pit excavation. The founding stratum for each buttress should be inspected and approved by a competent person.

(7) It may be necessary to construct the buttresses within the borrow pits in stages as infilling of peat and spoil behind the buttresses progress. The buttress should be constructed of granular fill and placed and compacted in suitable layers to form a buttress of sufficient stability to retain the placed peat and spoil, as necessary.

(8) Infilling of the peat and spoil should commence at the back edge of the borrow pit and progress towards the borrow pit entrance/buttress. The contractor excavating the granular material will be required to develop the borrow pits in a way which will allow the excavated peat and spoil to be reinstated safely.

(9) A number of buttresses to form cells with the borrow pits may be required to ensure access for trucks and excavators can be achieved. See Figures 7-1 to 7-4 for the location of the buttresses. The locations of the buttresses shown on Figures 7-1 to 7-4 for the borrow pit are indicative only and may change subject to local conditions encountered on site during construction.

(10) In order to prevent water retention occurring behind the buttresses, the buttress will be constructed of coarse boulder fill with a high permeability. The buttress will be constructed of well graded granular fill of about 100mm up to typically 500mm in size. Alternatively, drains will be placed through the buttresses to allow excess water to drain.

(11) Any buttresses should be wide enough to allow construction traffic access for tipping and grading during the placement of the excavated peat and spoil. The side slopes of the buttress should be constructed between 30 to 45 degrees.

(12) The height of the buttresses constructed should be greater than the height of the reinstated peat and spoil to prevent any surface peat and spoil run-off. Buttresses up to 2m in height are likely to be required.

(13) The use of temporary access ramps and long reach excavators during the placement of the excavated peat and spoil is likely to be required.

(14) The surface of the placed peat and spoil should be shaped to allow efficient run-off of surface water from the placed arisings.

(15) A layer of geogrid to strengthen the surface of the placed peat and spoil within the borrow pits may be required.

(16) An interceptor drain should also be installed upslope of the borrow pit, where necessary. This drain will divert any surface water away from the borrow pit and hence prevent water from ponding and lodging during construction and also when reinstated.

(17) Control of groundwater within the borrow pits may be required and measures will be determined as part of the ground investigation programme. A temporary pump and suitable outfall locations are likely to be required during construction.

(18) A silting pond will be required at the lower side/outfall location of the borrow pits.

(19) The acrotelm (upper fibrous layer) layer of peat shall be placed with the vegetation part of the sod facing the right way up to encourage growth of plants and vegetation at the surface of the peat and spoil within the borrow pits.

(20) All the above mentioned general guidelines and requirements will be confirmed by the designer prior to construction. A detailed construction methodology for the borrow pits should be compiled prior to construction.

## 7.5 Designated Peat Placement Areas alongside Infrastructure Elements

The following best practice guidelines for the placement of peat alongside the proposed infrastructure elements will be adhered to during construction.

(1) All excavated peat will be placed/spread alongside the proposed infrastructure elements on site, where possible. A typical example is given in Figure 7-5 which shows a cross section with placed peat either side of an access road.

(2) The peat placed adjacent to the proposed infrastructure elements should be restricted to a maximum height of 1m over a 10m wide corridor on both sides of the proposed infrastructure elements. It

should be noted that the designer should define/confirm the maximum restricted height for the placed peat.

(3) The placement of excavated peat and spoil is to be avoided without first establishing the adequacy of the ground to support the load. The placement of peat within the placement areas will likely require the use of long reach excavators, low ground pressure machinery and possibly bog mats in particular for drainage works.

(4) Where a peat stability analysis following the confirmatory ground investigation reveals areas with an unacceptable risk of peat instability, then no material shall be placed on to the peat surface.

(5) The surface of the placed peat will be shaped to allow efficient run-off of surface water. Where possible, shaping of the surface of the peat should be carried out as placement of peat within the placement area progresses. This will reduce the likelihood of debris run-off.

(6) Finished/shaped side slopes in the placed peat shall be not greater than 1 (v): 3 (h). This slope inclination will be reviewed during construction, as appropriate. Where areas of weaker peat and spoil are encountered then slacker slopes will be required.

(7) The acrotelm shall be placed with the vegetation part of the sod facing the right way up to encourage growth of plants and vegetation at the surface of the placed peat within the placement areas.

(8) Movement monitoring instrumentation may be required adjacent to the access road where peat has been placed. The locations where monitoring is required will be identified by the designer on site.

(9) An interceptor drain will be installed upslope of the designated peat placement areas to divert any surface water away from these areas. This will help reduce the likelihood of debris run-off.

(10) All the above mentioned general guidelines and requirements should be confirmed by the designer prior to construction.

# 8. EXCAVATIONS IN PEAT FOR TURBINE BASES, HARDSTANDINGS AND INFRASTRUCTURE FOUNDATIONS

From the available ground investigation data, it is estimated that all 26 no. turbine bases are likely to require piled foundations hence arisings from these types of foundations will be minimal. Following the installation and trimming of the piles for the foundations some excavation works are likely to be required. This will be confirmed at detailed design stage following confirmatory ground investigation.

Similarly, crane hardstandings, construction compound, substation platforms and met mast foundations are to be founded on competent overburden which will also require excavation through peat and spoil. Excavations for the borrow pits will also require the removal of peat.

## 8.1 Methodology

This methodology includes procedures that are to be included in the construction to minimise any adverse impact on peat stability. The methodology is not intended to cover all aspects of construction such as drainage and environmental considerations.

(1) With respect to placement of arisings from excavations the guidelines given in Section 7 are to be followed.

(2) All excavations within peat are to be adequately supported or peat slopes are to be battered to a safe slope inclination typically of 1 (v): 3 (h). This slope inclination will be reviewed during construction, as appropriate. Where areas of weaker peat are encountered then slacker slopes will be required.

(3) Excavations shall be kept reasonably free from water at all times. Water should be prevented from being impounded within excavations by either using drainage channels cut into the excavation face or by pumping.

(4) Where water is channelled or pumped from an excavation then this water is to be fed into an established watercourse or drainage ditch following suitable treatment.

# 9. EXCAVATIONS FOR UNDERGROUND CABLES

A connection between the Ballivor Wind Farm and the national electricity grid will be necessary to export electricity. It is proposed that the Ballivor Wind Farm will connect to the national grid via a new substation located in Grange More townland on the western side of the proposed wind farm development.

The proposed grid connection construction methodology, including proposals for water crossings on the underground cabling routes is described in the EIAR.

It is proposed to excavate the trenches for the underground cable at a uniform level in peat or other overburden material. The trenches will be 900mm wide and 1200mm deep.

The cable trench route is envisaged to encounter peat.

## 9.1 Methodology

This methodology includes procedures that are to be included in the construction to minimise any adverse impact on peat stability. The methodology is not intended to cover all aspects of construction such as drainage and environmental considerations.

(1) With respect to placement of arisings from excavations the guidelines given in Section 7 are to be followed.

(2) It is proposed to excavate the trenches for the underground cable at a uniform depth in peat or other overburden material.

(3) All excavations within peat are to be adequately supported or peat slopes are to be battered to a safe slope inclination typically of 1 (v): 3 (h). This slope inclination will be reviewed during construction, as appropriate. Where areas of weaker peat are encountered then slacker slopes will be required.

(4) Similarly, all excavations within non-peat overburden for the cable trench are to be adequately supported or battered to a safe slope inclination typically of 1 (v): 1.5 or 2 (h). This slope inclination will be reviewed during construction, as appropriate.

(5) Excavations shall be kept reasonably free from water at all times.

(6) Any material excavated from the cable trench which is deemed suitable for reinstatement of the trench will be used for this purpose i.e. stockpiled locally to the works and reused for backfilling.

(7) Any material not deemed suitable for the reinstatement of the cable trench will be landscaped locally to the trench, where possible.

# 10. GENERAL RECOMMENDATIONS FOR GOOD CONSTRUCTION PRACTICE

To minimise the risk of construction activity causing potential peat instability it is recommended that the Construction Method Statements (CMS) for the project will also take into account, but not be limited, to the general recommendations below together with the specific recommendations above.

(1) Avoidance of uncontrolled concentrated water discharge onto peat slopes identified as being unsuitable for such discharge. All water discharged form excavations during work shall be piped over areas specifically assessed as being unsuitable and hence directly into suitable drainage lines.

(2) Avoidance of unstable excavations. All excavations shall be suitably supported or battered to stable slopes to prevent collapse and development of tension cracks.

(3) Avoidance of placing fill and excavations in the vicinity of steeper peat slopes, that is at the crest or toe of the slope.

(4) Installation and regular monitoring of geotechnical instrumentation, as appropriate, during construction in areas of possible poor ground, such as deeper peat deposits (see Section 11).

(5) Site reporting procedures to ensure that working practices are suitable for the encountered ground conditions. Ground conditions to be assessed by suitably experienced geotechnical engineer.

(6) Regular briefing of all site staff (e.g. toolbox talks) to provide feedback on construction and ground performance and to promote reporting of any observed change in ground conditions.

(7) Routine inspection of wind farm site by Contractor to include an assessment of ground stability conditions (e.g. cracking, excessive floating road settlement, disrupted surface, closed-up drains) and drainage conditions (e.g. blocked drains, absence of water in previously flowing drains, springs, etc).

# 11. INSTRUMENTATION

## 11.1 Movement Monitoring Posts

To monitor possible peat movements, it is proposed to install sighting posts upslope and downslope of the access road at staggered intervals at locations where the peat depth is greater than 2.5m. Additional monitoring locations may be required at infrastructure locations with deeper peat deposits. Details of sighting posts are given below.

(1) A line of sighting posts shall comprise:

(a) A line of wooden stakes (typically 1 to 1.5m long) placed vertically into the peat to form a straight line.

(b) The sighting line shall comprise 6 no. posts at 5m centres that is a line some 25m long.

(c) A string line shall be attached to the first and last posts and all intervening posts shall be adjusted so they are just touching the string line.

(2) Lines of sighting posts shall be placed across the existing slope about 5m away from the area to be worked. It is recommended that the posts are located along the road at 10m intervals in areas of deep peat (greater than 2.5m). Where there are relatively steeper slopes or softer ground a sighting line shall be placed down the slope, or at any location where monitoring would be deemed useful.

(3) Each line of sighting posts shall be uniquely referenced with each post in the line given a reference. The post reference shall be marked on each post (e.g. reference 1-1, 1-2, 1-3, 1-4, 1-5, 1-6 for posts in line 1).

(4) The sighting lines shall be monitored at the beginning of each working day, and during the day where considered appropriate (e.g. when working activity is concentrated at a specific location).

(5) Monitoring of the posts shall comprise sighting along the line and recording any relative movement of posts from the string line.

(6) Where increased movements are recorded the frequency of monitoring shall be increased.

(7) A monitoring record shall be kept of the date, time and relative movement of each post, if any. This record shall be updated and stored as a spreadsheet.

# 12. CONTINGENCY MEASURES

## 12.1 Excessive Movement

Where there is excessive movement or continuing peat movement recorded at a monitoring location or identified at any location within the site but no apparent signs of distress to the peat (e.g. cracking, surface rippling) then the following shall be carried out.

(1) All activities (if any) shall cease within the affected area.

(2) Increased monitoring at the location shall be carried out. The area will be monitored, as appropriate, until such time as movements have ceased.

(3) Re-commencement of activities shall only start following a cessation of movement and agreement with all parties.

## 12.2 Onset of Peat Slide

In the unlikely event where there is the onset or actual detachment of peat (e.g. cracking, surface rippling) then the following shall be carried out.

(1) On alert of a peat slide incident, all activities (if any) in the area should cease and all available resources will be diverted to assist in the required mitigation procedures.

(2) Action will be taken to prevent a peat slide reaching any watercourse. This will take the form of the construction of check barrages on land. Due to the terrain and the inability to predict locations it may not be possible to implement any on-land prevention measures, in this case a watercourse check barrage will be implemented.

(3) All relevant authorities should be notified if a peat slide event occurs on site.

(4) For localised peat slides that do not represent a risk to a watercourse and have essentially come to rest the area will be stabilised initially by rock infill, if required. The failed area and surrounding area will then be assessed by a Geotechnical Engineer and stabilisation procedures implemented. The area will be monitored, as appropriate, until such time as movements have ceased.

## 12.3 Check Barrages

Whilst it is not anticipated from the analysis undertaken that a peat slide will occur on site, as a contingency a check barrage procedure is included below.

The check barrage procedure deals with preventing a peat slide from moving downstream within a watercourse.

The most effective method of preventing excessive peat slide debris from travelling downstream in a watercourse is the use of a check barrage. A check barrage comprises the placement of rock fill across a watercourse. The check barrage is a highly permeable construction that will allow the passage of water but will prevent peat debris from passing through. Rock fill should comprise well-graded coarse rock pieces from about 300mm up to typically 1000mm.

The size of the barrage will vary depending on the scale of the peat debris to be contained and the geometry of the watercourse at the barrage location. In general, due to the low speed of a peat slide there is generally little impact force and most of the lateral load is due to fluid pressure on the upslope face of the barrage.

Typically, the check barrage should fill the entire channel width of the watercourse up to a height of 3 to 4m with a crest width of typically 2m and side slopes of about 45 degrees depending on the geometry of the barrage location.

The check barrage procedure is as follows:

(1) Access to the check barrage location shall be along the existing access roads on the wind farm site and/or along public roads, where possible. When it is necessary to form the barrage then rock fill will be placed across the watercourse to effectively block the passage of peat debris.

(2) Operatives employed to carry out the construction of the check barrage would need to be inducted by means of a briefing by on-site supervisors as to the proposed location of the check barrage.

(3) The check barrage provides containment for peat debris in the highly unlikely event of a major peat slide. Further remedial measures, should they be required, will be assessed by the Contractor and the Project Geotechnical Engineer and carried out as soon as physically possible when the location and extent of the failure is established.

(4) Where a barrage was constructed as a precaution and no peat debris reached the watercourse then the barrage should be removed as soon as any measures to prevent further peat sliding is agreed with all parties.

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# APPENDIX 8-1

*Flood Risk Assessment*

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# PEAT EXTRACTION AT THE BALLIVOR BOG GROUP, CO. WESTMEATH/MEATH

## FLOOD RISK ASSESSMENT

**FINAL REPORT**

Prepared for:

**BORD NA MÓNA PLC**

Prepared by:

**HYDRO-ENVIRONMENTAL SERVICES**

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| **Signed:** |  <br>_____<br>**Michael Gill B.A., B.A.I., M.Sc., MIEI**<br>**Managing Director – Hydro-Environmental Services** |

*Disclaimer:*
*This report has been prepared by HES with all reasonable skill, care and diligence within the terms of the contract with the client, incorporating our terms and conditions and taking account of the resources devoted to it by agreement with the client. We disclaim any responsibility to the client and others in respect of any matters outside the scope of the above. The flood risk assessment undertaken as part of this study is site-specific and the report findings cannot be applied to other sites outside of the survey area which is defined by the site boundary. This report is confidential to the client and we accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies upon the report at their own risk.*

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# 1. INTRODUCTION

## 1.1 BACKGROUND

Hydro-Environmental Services (HES) were requested by MKO Ireland (MKO), on behalf of Bord na Móna PLC to undertake a Flood Risk Assessment (FRA) for Ballivor, Carranstown, Bracklin, Lisclogher, and Lisclogher West Bogs (i.e. the "Application Site") with respect to the following conditions:

- The current baseline hydrology of the bogs; and,
- Implementation of the proposed Rehabilitation Plan for the Ballivor Bog Group.

The Application Site is located c. 2.5 km south-southeast of Delvin, c. 3.7 km east of Raharney, and c. 2.2 km west of Ballivor Village in Counties Meath and Westmeath. The bogs which comprise the Application Site have been extensively modified, cutover and drained as a result of historic peat extraction dating back to 1948. Peat extraction formerly ceased in June 2020.

This FRA is intended to support the remedial EIAR submitted as part of the substitute consent application. The Project is described in full in Chapter 4 of the EIAR. For the purposes of this FRA, and consistent with the rEIAR, the various components are described and assessed using the following references: the 'Project', 'Peat Extraction Phase', 'Current Phase' and the 'Remedial Phase'.

The following assessment is carried out in accordance with '*The Planning System and Flood Risk Management Guidelines for Planning Authorities*' (DoEHLG, 2009).

## 1.2 STATEMENT OF QUALIFICATIONS

Hydro-Environmental Services ("HES") are a specialist geological, hydrological, hydrogeological and environmental practice that delivers a range of water and environmental management consultancy services to the private and public sectors across Ireland and Northern Ireland. HES was established in 2005, and our office is located in Dungarvan, County Waterford.

Our core area of expertise and experience in hydrology and hydrogeology, including flooding assessment and surface water modelling. We routinely work on surface water monitoring and modelling and prepare flood risk assessment reports.

Michael Gill PGeo (BA, BAI, MSc, MIEI) is an Environmental Engineer and Hydrogeologist with 22 years of environmental consultancy experience in Ireland. Michael has completed numerous hydrological and hydrogeological assessments for various developments across Ireland. Michael has significant experience in surface water drainage issues, SUDs design, and flood risk assessment.

Conor McGettigan (BSc, MSc) is an Environmental Scientist, with over 3 years' experience in the environmental sector in Ireland. Conor holds an M.Sc. in Applied Environmental Science (2020) and a B.Sc in Geology (2016) from University College Dublin. Conor routinely prepares flood risk assessments for a variety of proposed developments.

Jenny Law (BSc, MSc) is an environmental geoscientist holding a first honors degree in applied environmental geosciences from the University College Cork. Jenny has assisted in the preparation of the land, soils and geology and hydrology chapters for various environmental impact assessment reports, hydrological impact assessments, Water Framework Directive Assessment reports and Flood Risk Assessment reports for a variety of projects including wind farm developments and strategic housing developments.

## 1.3 REPORT LAYOUT

This FRA report has the following format:

- Section 2 describes the site setting and details of the Application Site;
- Section 3 outlines the hydrological and geological characteristics of the bogs and downstream surface water catchments and the existing site drainage;
- Section 4 presents the current site-specific flood risk conditions across the Application Site;
- Section 5 assesses the potential change in flood risk conditions (from the baseline) at the Application Site, and downstream of the bogs, as a result of the proposed Cutaway Bog Decommissioning and Rehabilitation Plans, and also cumulatively with the proposed Ballivor wind farm development; and,
- Section 6 presents the FRA report conclusions.

# 2. BACKGROUND INFORMATION

## 2.1 INTRODUCTION

This section provides details on the topographical setting of the Application Site along with a description of the historical peat extraction activities.

## 2.2 SITE LOCATION AND TOPOGRAPHY

The Application Site comprises 5 no. Bord na Móna bogs (Ballivor, Carranstown, Bracklin, Lisclogher, and Lisclogher West), located at the Westmeath-Meath County border. The Application Site is located 2.5 km south-southeast of Delvin, 3.7km east of Raharney and 2.2km west of Ballivor Village.

A site location map is shown as **Figure A** below.

The Application Site is intersected by the R156 which links the villages of Ballivor in the east to Raharney in the west. Ballivor Bog lies to the south of this regional road with the other bogs comprising the site lying to the north. A Bord na Móna works area, known as Ballivor Works, lies in the northwest of Ballivor Bog, outside the Application Site boundary, in the townland of Grange More and contains offices, storage sheds, roads and a peat loading area. The remainder of Ballivor Bog is located in the townlands of Robinstown and Clonycavan in the east and Riverdale, Clondalee More and Derryconor in the west. Ballivor Bog has a total area of 638ha and is served by a Bord na Móna railway network which extends from the peat loading area at Ballivor Works into the bog.

To the north of the R156, Carranstown Bog has an area of 304ha and lies in the townlands of Grangemore in the West and Carranstown Great, Carranstown Little and Killaconnigan in the east. The Bord na Móna railway links Carranstown to Ballivor to the south and Bracklin to the north. Towards the centre of the Ballivor Bog Group, Bracklin Bog has an area of 772ha. Bracklin Bog lies in the townlands of Coolronan in the east, Craddanstown and Bracklin in the centre and Ballynaskeagh, Mucklin and Killagh in the west.

Lisclogher Bog is located to the northeast of Bracklin Bog, approximately 4.3km southeast of the town of Delvin and has an area of 479ha. This bog is located in the townlands of Lisclogher Great, Coolronan, Bracklin, Cockstown and Clonleame. A minor road separates Lisclogher from Lisclogher West. Lisclogher West Bog lies to the west of Lisclogher Bog and has a total area of 228ha.

The current topography of the Application Site is relatively flat with an elevation range of between approximately 69 and 83mOD (metres above Ordnance Datum). Along the majority of the bog boundaries, a ~1-2m high peat headland exists which is a remnant of the original bog. Today these headlands and remnant peat banks create a boundary berm, forming a basin effect within some of the extraction areas of the 5 bogs. There are some areas of higher ground near the centre of Bracklin Bog, directly south of Bracklin Lough.

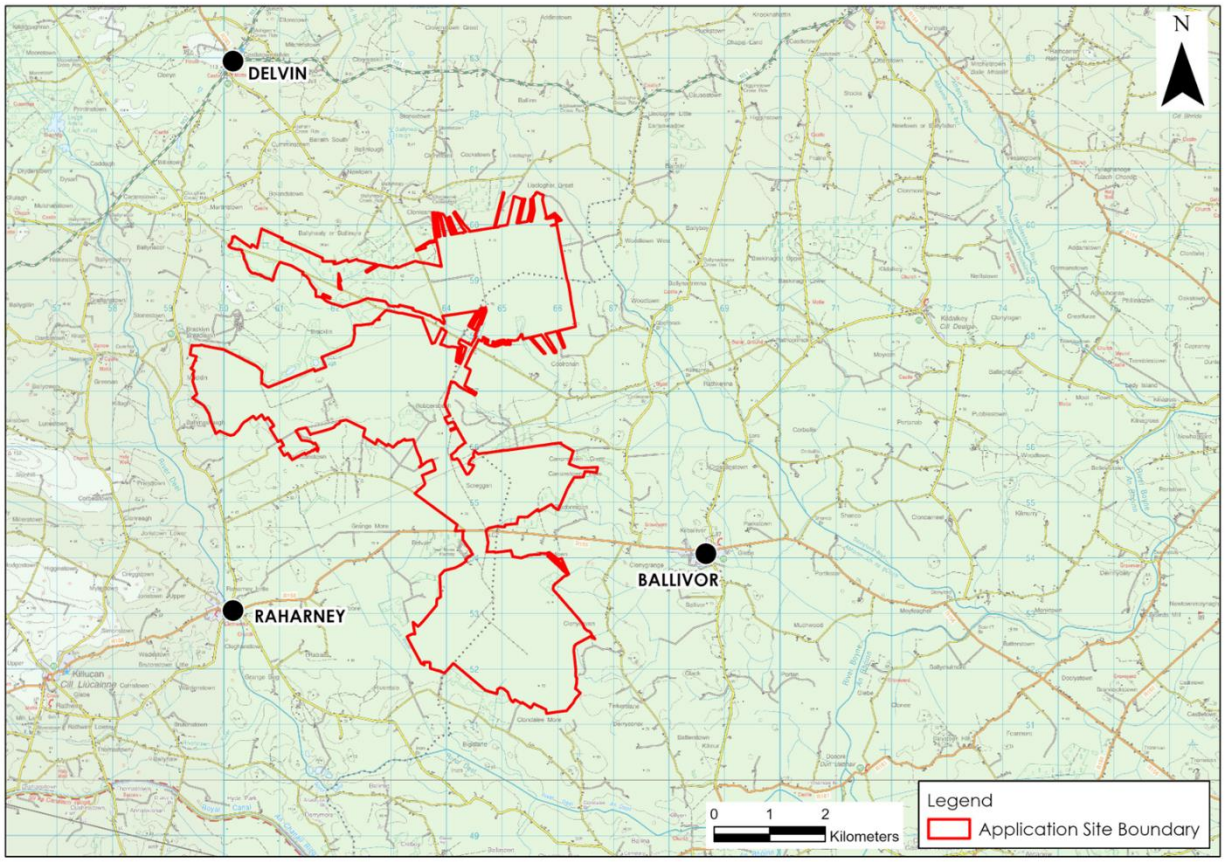


**Figure A: Application Site Location Map**

## 2.3 SITE HISTORY

The Application Site has been subject to drainage and peat extraction activities from 1948 up until the formal cessation of peat extraction activities in June 2020.

The primary hydrological and hydrogeological changes associated with the peat extraction process occurs during the initial drainage of the bog in advance of peat extraction. Constructed drainage ditches drain the upper surface of the bog by lowering the local peat water table. At this time, ancillary features were also constructed including railway lines, machine passes, canteens, work sites, welfare facilities, mobile fuel tanks, fixed fuel tanks and peat loading facilities. After the Application Site was drained, vegetation was removed from the bog surface, leaving only bare peat fields between the drains. During the peat extraction phase, only minimal landuse change occurs which predominantly relates to minor annual topographic changes (i.e., lower ground levels) caused by ongoing peat extraction.

The timing of the installation of drainage and initiation of peat extraction varies across the Application Site. Ballivor Bog was the first bog to be drained in 1948, with industrial peat extraction commencing in 1953. By the mid-1980s Carranstown, Bracklin and Lisclogher bogs had all been drained. Peat extraction began in Bracklin (main bog area), Lisclogher and Carranstown (western section) in 1957, 1960 and by 1988 respectively. Meanwhile drainage was inserted into Lisclogher West between 1973 and 1995, however, Lisclogher West was never subject to peat extraction.

Peat extraction within the Application Site has been regulated by the EPA under IPC Licence Registration No. P0501-01 since 2000. Prior to this date, the Bord na Móna had been completing environmental monitoring and control measures at the Application Site. These control measures were upgraded and enhanced in accordance with IPC Licence conditions from April 2000. The

bogs also have Surface Water Management Plans[1] which define how compliance with the IPC Licence is achieved.

Peat extraction at the Application Site formally ceased in June 2020. Following cessation of peat extraction, the site drainage system has continued to operate under the same drainage systems as during the peat extraction phase *i.e.* field drains, main drains, silt ponds and discharge outlets etc. During the Decommissioning and Rehabilitation Phase all activities continue to be monitored in accordance with IPC Licence conditions.

Drainage from the bogs is regulated by the shallow (low gradient) nature of the drainage, and by routing all bog drainage via field drains, main drains, headland drains, then from silt ponds to outfalls, with final discharge to natural watercourses. Therefore, existing discharge volumes from the Application Site to nearby surface watercourses will be comparable to surface water discharges during the Peat Extraction Phase (1988-2020).

[1] Current versions: SWMP 0501 Derrygreenagh 31.01.2020.pdf

# 3. EXISTING ENVIRONMENT AND CATCHMENT CHARACTERISTICS

## 3.1 INTRODUCTION

This section gives an overview of the hydrological and geological characteristics of the Application Site.

## 3.2 HYDROLOGY

### 3.2.1 Regional and Local Hydrology

Regionally the Application Site is located in the Boyne River surface water catchment within Hydrometric Area 7 of the Eastern River Basin District.

On a more local scale, the majority of the Application Site, including Carranstown Bog, Lisclogher Bog, Lisclogher West Bog, the majority of Bracklin Bog and the eastern part of Ballivor Bog, are located in the Boyne_SC_050 sub-catchment. The west of Ballivor Bog is situated in the Boyne_SC_040 sub-catchment. Meanwhile, the north-western section of Bracklin Bog is located in the Deel[Raharney]_SC_010 sub-catchment.

Within the Deel[Raharney]_SC_010, the River Deel (EPA Code: 07D01) flows to the southeast approximately 1km west of Bracklin Bog. The River Deel flows to the southeast entering the Boyne_040 sub-catchment to the south of Raharney before reaching its confluence with the River Boyne (EPA Code: 07B04) approximately 4.5km south of Ballivor village. Within the Boyne_050 sub-catchment, the Stonyford River (EPA Code: 07S02) flows to the southeast, approximately 700m east of Lisclogher Bog. The Stoneyford River discharges into the Boyne approximately 7.3km east of Ballivor Bog. The Boyne River then flows to the northeast, towards Navan becoming tidal to the west of my M1 motorway. The Boyne then flows through Drogheda and out to the Irish Sea between Haven and Mornington Point.

A regional hydrology map of the WFD sub-catchments is shown in **Figure B** below.

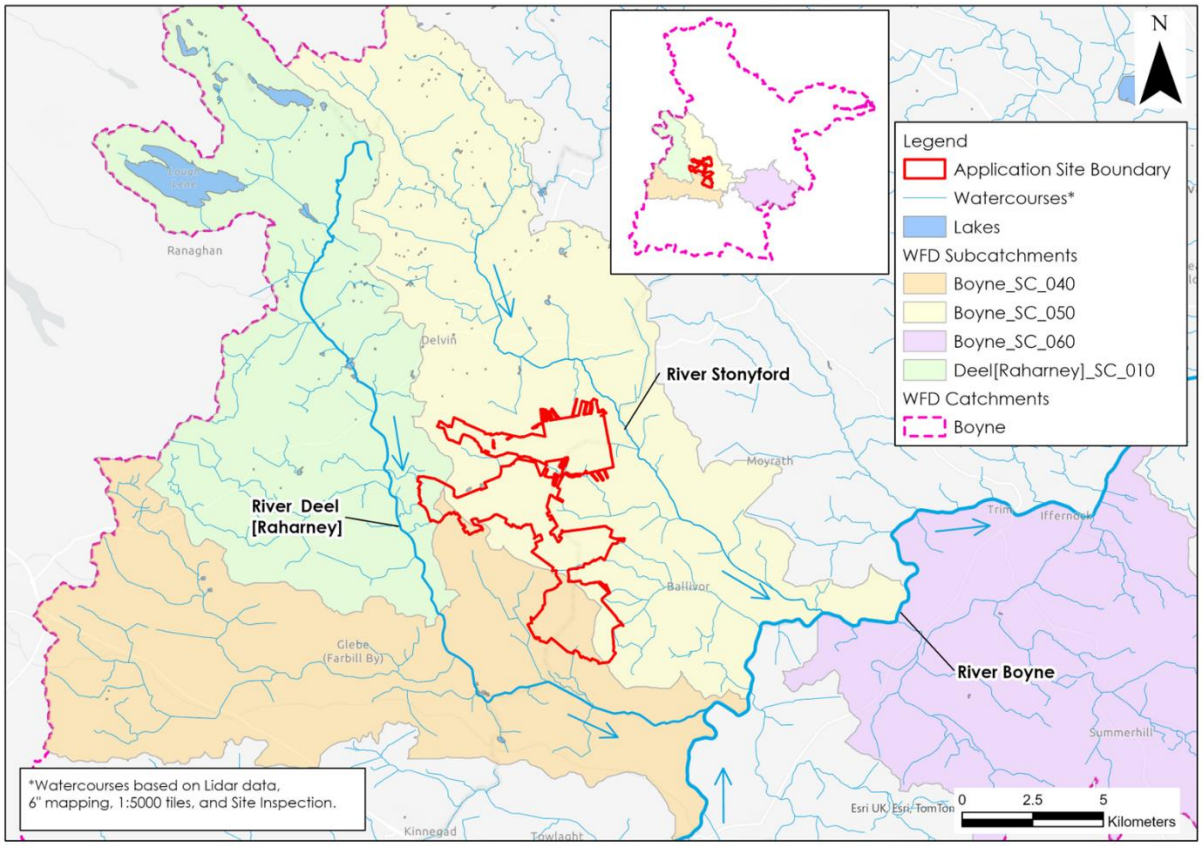


**Figure B: Regional Hydrology Map**

### 3.2.2 Rainfall and Evaporation

The SAAR (Standard Average Annual Rainfall) recorded at Ballivor rainfall station(~4.5km east of the site), the closest rainfall station to the Application Site with long term SAAR data, is 839mm (www.met.ie). The average potential evapotranspiration (PE) at Mullingar, approximately 17km west of the Application Site is taken to be 445mm (www.met.ie). The actual evapotranspiration (AE) is calculated to be 423mm (95% PE). Using the above values, the effective rainfall (ER)[2] for the area is calculated to be (ER = SAAR – AE) ~416mm/yr.

Based on recharge coefficient estimates from the GSI (www.gsi.ie), an estimate of 4% recharge is taken for the Application Site as an overall average. This value is for "Peat" with a "Low" to "Moderate" vulnerability rating. Areas, where peat is absent, may have slightly higher recharge rates, but on this site, these areas are generally very small and localised. The high drainage density in the area would also suggest that recharge rates are very low.

The lowest value in the available range was chosen to reflect the large coverage of blanket peat and high drainage density. Therefore, annual recharge and runoff rates for the Application Site are estimated to be 17mm/year and 399mm/year respectively.

Table A below presents return period rainfall depths for the area of the Application Site. These data are taken from https://www.met.ie/climate/services/rainfall-return-periods and they provide rainfall depths for various storm durations and sample return periods (1-year, 5-year, 30-year, 100-year). These extreme rainfall depths will be the basis of the proposed wind farm drainage hydraulic design as described further below.

[2] ER – Effective Rainfall is the excess rainfall after evaporation which produces overland flow and recharge to groundwater.

**Table A: Application Site Rainfall Return Period Depths (mm)**

| | Return Period (Years) | | | |
|---|---|---|---|---|
| **Duration** | **1** | **5** | **30** | **100** |
| **5 mins** | 3.5 | 5.5 | 9.0 | 12.1 |
| **15 mins** | 5.7 | 9.1 | 14.7 | 19.9 |
| **30 mins** | 7.4 | 11.6 | 18.5 | 24.7 |
| **1 hours** | 9.6 | 14.8 | 23.1 | 30.4 |
| **6 hours** | 19.1 | 28.0 | 41.3 | 52.6 |
| **12 hours** | 25.0 | 35.8 | 51.8 | 65.1 |
| **24 hours** | 32.6 | 45.7 | 64.8 | 80.5 |
| **2 days** | 38.5 | 52.8 | 73.2 | 89.5 |

**Estimated using growth factors as data not available from (www.met.ie)*

## 3.3 GEOLOGY

According to GSI mapping (www.gsi.ie), soils are mapped generally as cutover/cutaway peat (Cut) across the Application Site. Soils in the surrounding lands are dominated by basic deep well-drained mineral soils (BminDW), basic deep poorly drained mineral soils and localised pockets of basic poorly drained mineral soils with peaty topsoil (BminPDT). Meanwhile, acid poorly drained mineral soils with peaty topsoil are mapped to the south of Lisclogher Bog (AminPDPT). Mineral alluvium (AlluvMin) is mapped along the main watercourses.

The published subsoils map for the Application Site (www.gsi.ie) shows that cutover raised peat (Cut) underlies the Application Site. Other subsoil types mapped in the wider area include Glacial Tills derived from Limestone (TLs) and Gravels derived from Limestone (GLs). An area of Till derived from cherts (TCh) is also mapped to the southeast of Lisclogher Bog.

The soils and subsoils present at the Application Site have been verified during site walkover surveys and intrusive site investigations completed by HES on 18th May 2020, 15th – 17th September 2020, 5th October 2020, 1st December 2020, 22nd March 2021, 1st April 2021, 20th September 2021, 28th October 2021 and 19th January 2022. A total of 457 no. peat probes have been completed at the site (HES, FT and MKO), revealing a peat depth range of 0.4 to 5.7m with an average of 1.93m. Subsoils encountered during the peat probing investigations and 78 no. trial pits consisted of glacial tills comprising slightly sandy gravelly silt/clay and/or silty sands and gravels with come cobbles and boulders.

A local subsoils map is attached below as **Figure C**.

The underlying bedrock geology at the Application Site is mapped by the GSI as being Dinantian Pure Unbedded Limestones (DPUL, comprising Waulsortion Limestone) and Dinantian Upper Impure Limestones (DUIL) (comprising the Lucan Formation and the Tober Colleen Formation) (refer to **Figure D** below). These types of rocks are classified as Locally Important Aquifer - bedrock which is Moderately Productive only in Local Zones – and as a Poor Aquifer – bedrock which is generally unproductive except for Local Zones – respectively by the GSI (www.gsi.ie).

The Waulsortian Limestones, of lower Visean age, underlie the majority of the Application Site and consist of dominantly grey, crudely bedded or massive limestones. Meanwhile, the northeast of Bracklin and west of Lisclogher bogs are underlain by the limestone shales of the Lucan Formation and calcareous shale and limestone conglomerates of the Tober Colleen Formation which are Dinantian in age. No bedrock exposures were noted during the walkover surveys.

There are 4 no. mapped faults underlying the Application Site, 3 of which trend in a northeast-southwest direction. A northwest-southeast trending fault is also found in the west, underlying Bracklin Bog.

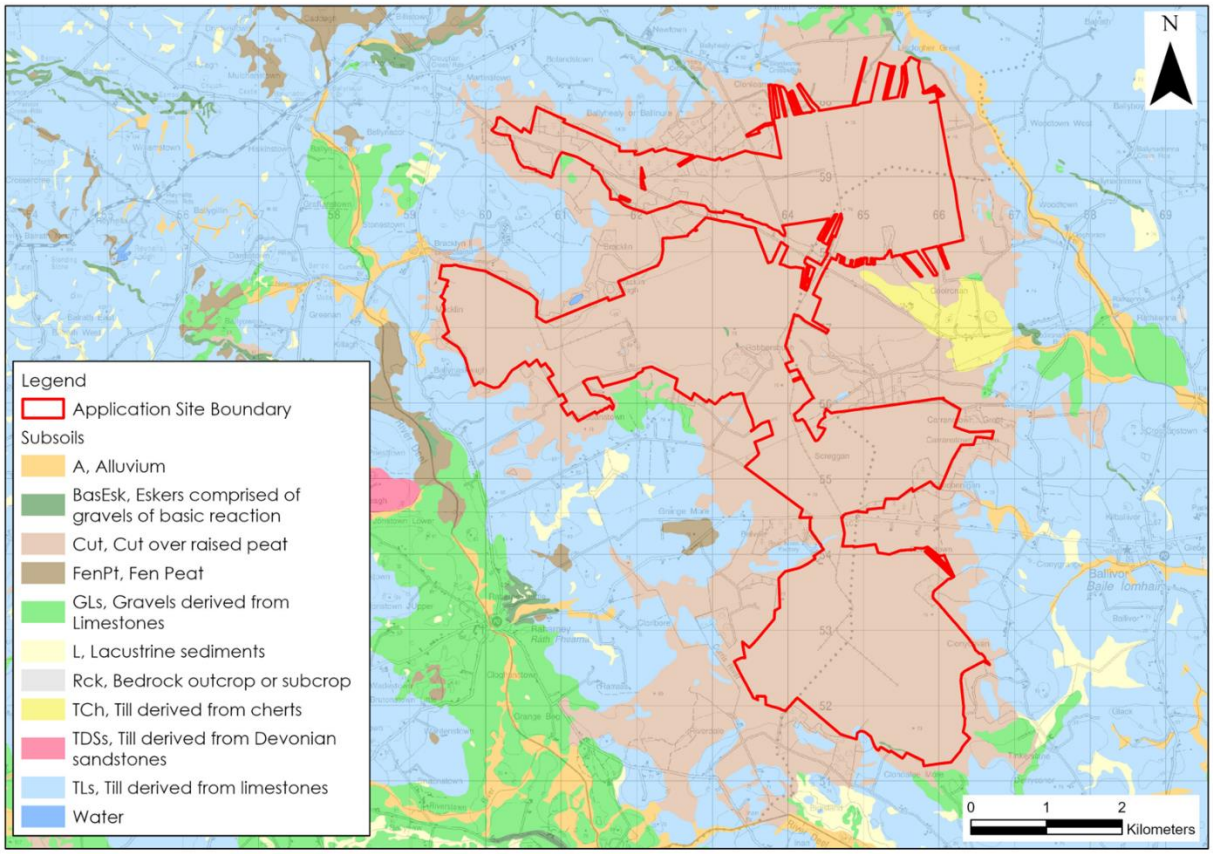


**Figure C: Local Subsoils Map**

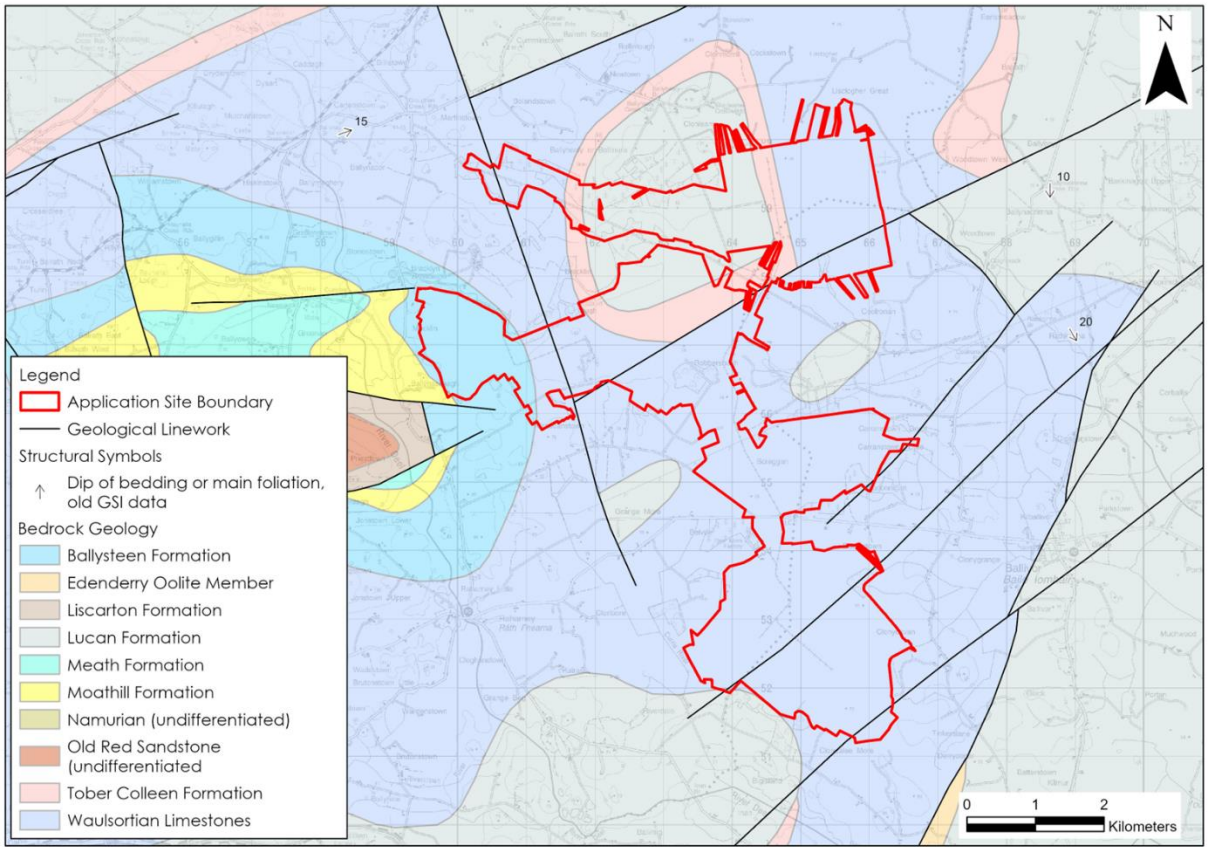


**Figure D: Bedrock Geology Map**

## 3.4 SITE DRAINAGE

### 3.4.1 Existing Site Drainage

Topography within the Application Site is relatively flat with an elevation range of between approximately 69 and 83mOD (metres above Ordnance Datum) with gentle slopes in some locations. Along many of the bog boundaries, a 1-2m high peat headland exists which is a remnant of the original bog. These headlands and in some areas remnant peat banks create a boundary berm, forming a basin effect within the previous peat extraction areas of each of the bogs. There are some areas of higher ground near the centre of Bracklin Bog, directly south of Bracklin Lough.

Surface water is drained from the Application Site via a network of field drains typically spaced at 15 to 20m intervals, piped drained drains, main drains, headland drains, and silt ponds. These drains discharge to collector/headland drains along the perimeter of the bog, which eventually discharges to a series of large silt (settlement) ponds. Drainage is then discharged to off-site drainage channels which flow into the local river network. The Application Site is primarily drained by gravity however historical records do indicate that 2 no. and 1 no. pumps have been used in the past to facilitate the drainage of Ballivor and Lisclogher Bogs respectively.

A flow diagram for the existing drainage system is shown as **Figure E** below.

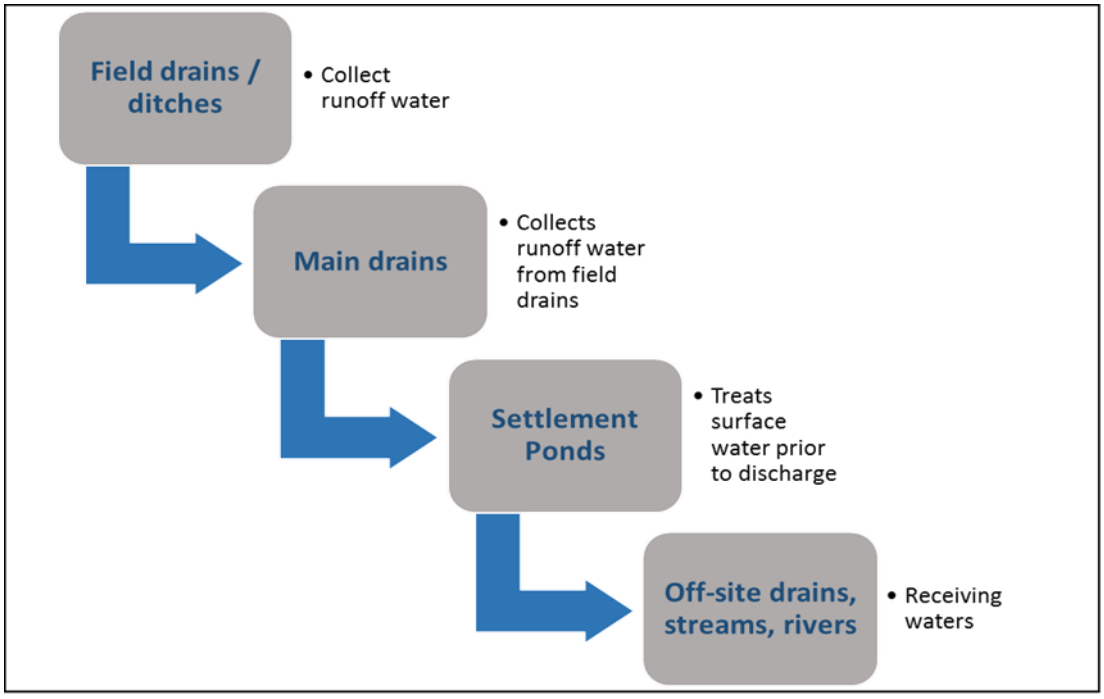


**Figure E: Process Flow Diagram for the Existing Site Drainage System**

A detailed hydrological audit of flowpaths from each bog to its eventual discharge point at the regional catchment scale was conducted for 5 no. bogs within the Application Site, including Ballivor, Carranstown, Bracklin, Lisclogher and Lisclogher West. The flowpaths are shown as **Figure F** to **Figure J**.

Drainage from the Ballivor Bog discharges through 6 no. outfalls (SW35, SW38, SW39, SW40, SW41 and SW41A) (refer to BNM-ECO-02-SP01: Sampling Points included in the Ballivor Bog 2024 Draft Cutaway Bog Decommissioning and Rehabilitation Plan). In the southwest of Ballivor Bog, SW41A discharges to Clondalee_More stream which in turn discharges to the Deel[Raharney] River. These waterbodies are mapped within the Deel(Raharney)_060 river waterbody. Further

downstream, the Deel River discharges into the Boyne_050 river waterbody. The SW35, SW38 and SW39 outfalls, located in the northeast of the bog, discharge to several unnamed drains/streams, which then discharge to the Ballivor River. In the southeast of the bog outfalls SW40 and SW41 discarge to the Derryconor stream, which then discharges to the Ballivor River. The Ballivor River is mapped within the Boyne_060 river waterbody. The Ballivor River then reaches a confluence with the River Boyne (Boyne_060). The River Boyne then continues through segments Boyne_070 to Boyne_180 before becoming tidal in the Boyne Estuary to the west of Drogheda.

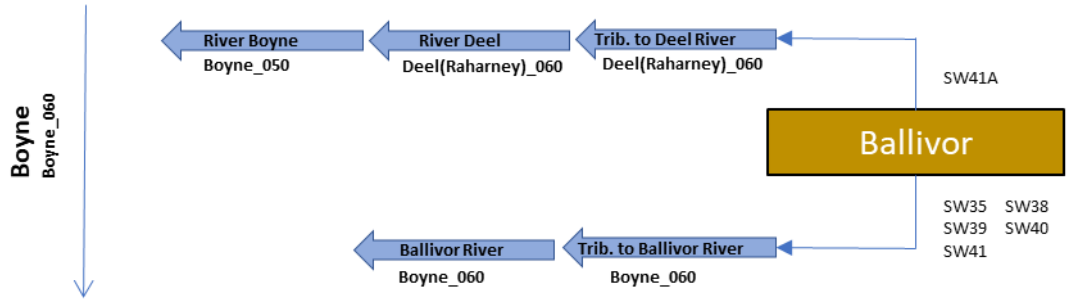


**Figure F: Existing Drainage Within Ballivor Bog**

Drainage from the Carranstown Bog discharges via 4 no. outfalls (SW31, SW32, SW33 and SW34) (refer to BNM-DR-23-20-13: General Drainage Map included in the Carranstown 2022 Cutaway Bog Decommissioning and Rehabilitation Plan). In the west, SW31 discharges to the Grange More stream which in turn discharges to the Craddanstown stream before discharging into the Deel[Raharney] River to the southwest of Ballivor Bog. These waterbodies are mapped within the Deel(Raharney)_060 river waterbody. The Deel River discharges into the Boyne_050 river waterbody. In the southeast of the bog, the SW33 ans S34 discharge to the Killaconnigan stream, which in turn discharges to the Ballivor River southwest of Ballivor village. Here the Ballivor River is mapped within the Boyne_060 river waterbody. In the northeast, SW32 outfalls to the Craddanstown Little stream which discharges into the Cartenstown stream and eventually the Stonyford River to the east of the bog. These waterbodies are mapped within the Stonyford_040 river waterbody. Further downstream the Stonyford River reaches a confluence with the River Boyne (Boyne_070). The River Boyne then continues through segments Boyne_080 to Boyne_180 before becoming tidal in the Boyne Estuary to the west of Drogheda.

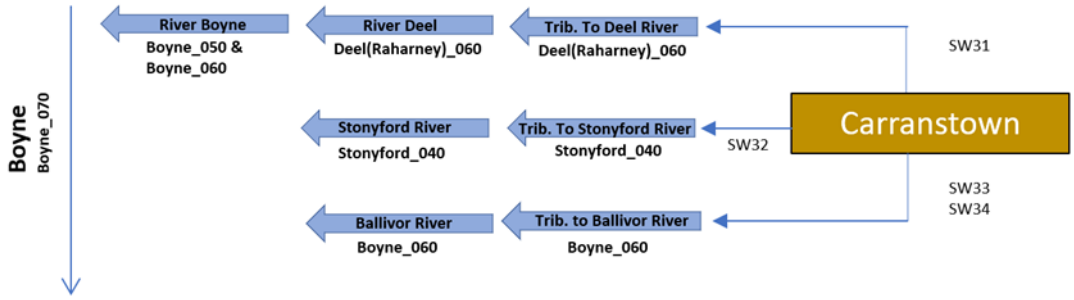


**Figure G: Existing Drainage Within Carranstown Bog**

Drainage from the Bracklin Bog discharges via 5 no. outfalls (SW26, SW27, SW28, SW29 and SW30), with all outfalls being located in Bracklin West (refer to BNM-ECO-03-02: Strcutures and Sampling Map included in the Bracklin Bog 2024 Draft Cutaway Bog Decommissioning and Rehabilitation Plan;). SW28, SW29 and SW30 discharge to the Greenan stream and the Ballynaskeagh stream respectively before discharging into the Deel River. These waterbodies are mapped in the Deel(Raharney)_030 river waterbody. The Deel River continues through segments Deel(Raharney)_040 and Deel(Raharney)_050. SW26 and SW27 outfall to the Craddanstown stream which forms part of the Deel(Raharney)_060 river waterbody. The Deel River discharges into the Boyne_050 river waterbody. The River Boyne then continues through

segments Boyne_060 to Boyne_180 before becoming tidal in the Boyne Estuary to the west of Drogheda.

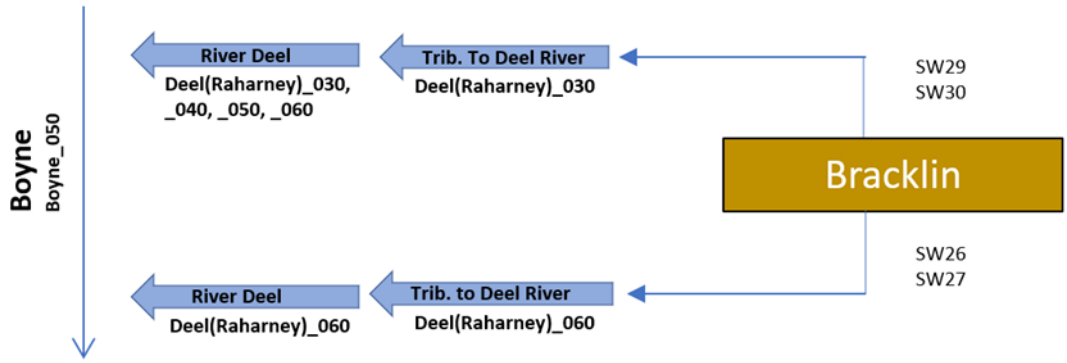


**Figure H: Existing Drainage Within Bracklin Bog**

Since the cessation of peat extraction, Lisclogher Bog has become overgrown with the Bord na Móna Lisclogher East 2024 Draft Cutaway Bog Decommissioning and Rehabilitation Plan stating that the drainage system is beginning to break down with many drains becoming blocked and filling with water. Drainage from Lisclogher Bog discharges via 1 no. outfall (SW25) located in the northeast of the bog (refer to BNM-ECO-01-SP01: Sampling Points Map included in the Lisclogher East 2024 Draft Cutaway Bog Decommissioning and Rehabilitation Plan). SW25 discharges to an unnamed stream which in turn discharges to the Stonyford River. These waterbodies are mapped in the Stonyford_030 river waterbody. The Stonyford River continues through the Stonyford_040 waterbody before discharging into the Boyne_070 waterbody.

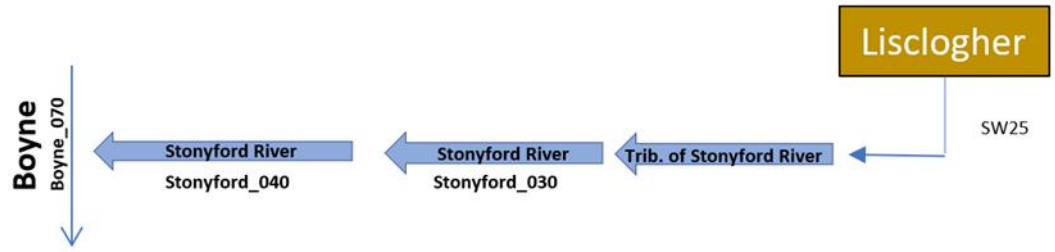


**Figure I: Hydrological Flow Path for Lisclogher Bog**

While Lisclogher West was never subject to peat extraction, ditches and drains were installed between 1973 and 1995. Drainage from Lisclogher West discharges via 6 no. outfalls (SW19 – SW24) located along the southern boundary of the bog (refer to BNM-ECO-04-SP01: Sampling Points Map included in the Lisclogher West 2023 Cutaway Bog Decommissioning and Rehabilitation Plan). These outfalls discharge to the Bolandstown stream which in turn discharges to the Cartenstown stream and then the Stonyford River. These waterbodies are mapped in the Stonyford_040 river waterbody. The Stonyford River discharges into the Boyne_070 waterbody approximately 5km southeast of the Ballivor village.

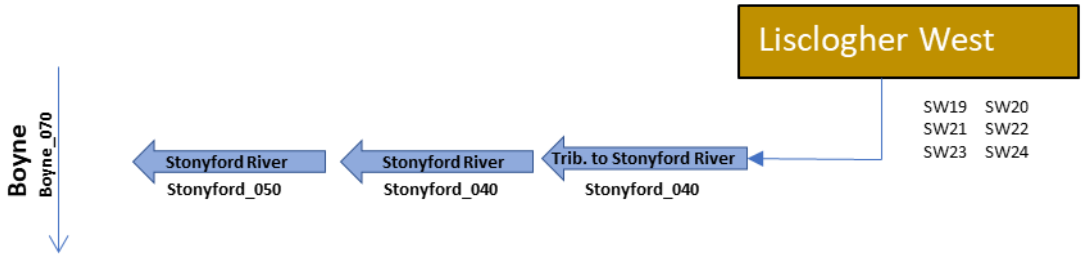


**Figure J: Hydrological Flow Path for Lisclogher West**

Additionally, Bord na Móna drainage mapping is available for 3 of the 5 no. bogs comprising the Application Site (Ballivor, Bracklin and Carranstown bogs). The respective settlement ponds and their outfall pipe elevations are presented in **Table B** below.

Outfall pipe elevations range from 66.99 – 79.13m OD (metres above Ordnance Datum) with the greatest outfall elevations recorded in Bracklin Bog. Outfalls generally discharge to nearby surface water bodies as mapped by the EPA or into smaller drains that flow towards these mapped watercourses.

**Table B: Bord na Móna outfall elevations**

| Settlement Pond ID | Easting | Northing | Bog Name | Outfall Pipe Elevation (m OD) | Nearby Surface Waterbody |
|---|---|---|---|---|---|
| **BR262** | 264995 | 251803 | Ballivor | 68.36 | Clondalee More Stream |
| **BR47** | 266375 | 251586 | Ballivor | 66.77 | Ballivor River |
| **BR48** | 266361 | 251599 | Ballivor | 66.99 | Ballivor River |
| **BR46** | 265879 | 253460 | Ballivor | 71.59 | Unnamed waterbody which discharges into Ballivor River |
| **BR45** | 265867 | 253506 | Ballivor | 71.47 | Unnamed waterbody which discharges into Ballivor River |
| **BR42** | 265139 | 254113 | Ballivor | N/A | N/A |
| **BN35&36** | 259502 | 257627 | Bracklin | 77.26 | Graffanstown Stream |
| **BN33** | 259429 | 256879 | Bracklin | 77.95 | Ballynaskeagh Stream |
| **BN34** | 259437 | 256862 | Bracklin | 77.64 | Ballynaskeagh Stream |
| **BN31&32** | 260577 | 256515 | Bracklin | 79.13 | N/A |
| **BN39** | 260945 | 256769 | Bracklin | N/A | N/A |
| **CN38&39** | 265306 | 255941 | Carranstown | 67.97 | N/A |
| **CN40** | 265648 | 254796 | Carranstown | 70.08 | Killaconnigan Stream |
| **CN41** | 265874 | 254978 | Carranstown | N/A | Killaconnigan Stream |

# 4. BASELINE FLOOD RISK DEFINITION

## 4.1 INTRODUCTION

The following assessment is carried out in accordance with '*The Planning System and Flood Risk Management Guidelines for Planning Authorities*' (DoEHLG, 2009). The basic objectives of these guidelines are to:

- Avoid inappropriate development in areas at risk of flooding;
- Avoid new developments increasing flood risk elsewhere, including that which may arise from surface water run-off;
- Ensure effective management of residual risks for development permitted in floodplains;
- Avoid unnecessary restriction of national, regional or local economic and social growth;
- Improve the understanding of flood risk among relevant stakeholders; and,
- Ensure that the requirements of EU and national law in relation to the natural environment and nature conservation are complied with at all stages of flood risk management.

## 4.2 FLOOD RISK ASSESSMENT PROCEDURE

This section of the report details the site-specific flood risk assessment carried out for the Ballivor Bog Sub-Group and surrounding area. The primary aim of the assessment is to consider all types of flood risks and the potential impact on the development. As per the relevant guidance (DOEHLG, 2009), the stages of a flood risk assessment are:

- *Flood risk identification* – identify whether there are surface water flooding issues at a site;
- *Initial flood risk assessment* - confirm sources of flooding that may affect a proposed development; and,
- *Detailed flood risk assessment* – quantitative appraisal of the potential risk to a proposed development.

As per the Guidelines, there are essentially two major causes of flooding:

**Coastal flooding,** which is caused by higher sea levels than normal, largely as a result of storm surges, resulting in the sea overflowing onto the land. Coastal flooding is influenced by the following three factors, which often work in combination:

- High tide level;

- Storm surges caused by low barometric pressure exacerbated by high winds (the highest surges can develop from hurricanes); and,

- Wave action, which is dependent on wind speed and direction, local topography and exposure.

Coastal Flooding is not applicable to the Application Site.

**Inland flooding** which is caused by prolonged and/or intense rainfall. Inland flooding can include a number of different types:

- Overland flow occurs when the amount of rainfall exceeds the infiltration capacity of the ground to absorb it. This excess water flows overland, ponding in natural hollows and low-lying areas or behind obstructions. This occurs as a rapid response to intense rainfall and eventually enters a piped or natural drainage system.

- River flooding occurs when the capacity of a watercourse is exceeded or the channel is blocked or restricted, and excess water spills out from the channel onto adjacent low-lying areas (the floodplain). This can occur rapidly in short steep rivers or after some time and some distance from where the rain fell in rivers with a gentler gradient.

- Flooding from artificial drainage systems results when flow entering a system, such as an urban stormwater drainage system, exceeds its discharge capacity and the system becomes blocked, and/or cannot discharge due to a high-water level in the receiving watercourse. This mostly occurs as a rapid response to intense rainfall. Together with overland flow, it is often known as pluvial flooding. Flooding arising from a lack of capacity in the urban drainage network has become an important source of flood risk, as evidenced during recent summers.

- Groundwater flooding occurs when the level of water stored in the ground rises as a result of prolonged rainfall to meet the ground surface and flows out over it, i.e. when the capacity of this underground reservoir is exceeded. Groundwater flooding tends to be very local and results from interactions of site-specific factors such as tidal variations. While water levels may rise slowly, they may be in place for extended periods. Hence, such flooding may often result in significant damage to property rather than be a potential risk to life.

- Estuarial flooding may occur due to a combination of tidal and fluvial flows, i.e., the interaction between rivers and the sea, with tidal levels being dominant in most cases. A combination of high flow in rivers and a high tide will prevent water flowing out to sea, tending to increase water levels inland, which may flood over riverbanks.

The Flood Risk Management Guidelines (DoEHLG, 2009) provide direction on flood risk and development. The guidelines recommend a precautionary approach when considering flood risk management and the core principle of the guidelines is to adopt a risk-based sequential approach to managing flood risk and to avoid development in areas that are at risk. The sequential approach is based on the identification of flood zones for inland and coastal flooding.

Flood zones are geographical areas within which the likelihood of flooding is in a particular range, and they are a key tool in flood risk management within the planning process as well as in flood warning and emergency planning.

There are three types or levels of flood zones defined within the guidelines:

**Flood Zone A** – where the probability of flooding from rivers and the sea is highest (greater than 1% (AEP)[3] or 1 in 100 for river flooding or 0.5% (AEP) or 1 in 200 for coastal flooding);

**Flood Zone B** – where the probability of flooding from rivers and the sea is moderate (between 0.1% (AEP) or 1 in 1000 and 1% (AEP) or 1 in 100 for river flooding and between 0.1% (AEP) or 1 in 1000 year and 0.5% (AEP) or 1 in 200 for coastal flooding); and,

**Flood Zone C** – where the probability of flooding from rivers and the sea is low (less than 0.1% (AEP) or 1 in 1000 for both river and coastal flooding). Flood Zone C covers all areas of the plan which are not in zones A or B.

Once a flood zone has been identified for a site, the guidelines set out the different types of development appropriate to each identified zone (pg. 25, Table 3.1 of the Guidelines). Exceptions to the restriction of development due to potential flood risks are provided for

*3 AEP – Annual Exceedance Probability*

through the application of a Justification Test (JT), where the planning need and the sustainable management of flood risk to an acceptable level must be demonstrated by the applicant.

The Justification Test (JT) has been designed to rigorously assess the appropriateness, or otherwise, of particular developments that, for the reasons outlined above, are being considered in areas of moderate or high flood risk. The test is comprised of two processes.

- The first is the **Plan-making Justification Test** described in chapter 4 of the Guidelines and used at the plan preparation and adoption stage where it is intended to zone or otherwise designate land which is at moderate or high risk of flooding. Plan making Justification Tests are made at Plan/Policy development stage such as County Development Plans, or Local Area Plans.

- The second is the **Development Management Justification Test** described in chapter 5 of the Guidelines and used at the planning application stage where it is intended to develop land at moderate or high risk of flooding for uses or development vulnerable to flooding that would generally be inappropriate for that land. For example, application of Development Management Justification Test would be required at a site-specific level, such as for this FRA assessment, if a Justification Test is required.

## 4.3 BASELINE FLOOD RISK ASSESSMENT

### 4.3.1 Flood Risk Identification

#### 4.3.1.1 Historical Mapping

To identify those areas as being at risk of flooding, historical mapping was consulted and reviewed. There is no text on local available historical 6" or 25" mapping that identify areas that are "*prone to flooding*" within the Application Site.

#### 4.3.1.2 Soils Maps - Fluvial Maps

A review of the soil types in the vicinity of the Application Site was undertaken as soils can be a good indicator of past flooding in an area. Due to past flooding of rivers deposits of transported silts/clays referred to as alluvium build up within the floodplain and hence the presence of these soils is a good indicator of potentially flood-prone areas.

Based on the EPA/GSI soil map for the area no regions of alluvium are mapped within the Application Site. Alluvium (fluvial deposits) is recorded along the Stoneyford River, to the east of the Application Site and along the Deel River to the west. Alluvium is also mapped locally on many of the tributaries of these rivers which drain the Application Site. In general, however, there is no significant alluvium deposition that would be associated with a flood plain or a large geographical area prone to flooding.

The EPA/GSI soil map for the area and on-site investigations reveal that the Application Site is underlain by poorly draining, waterlogged peaty soils. This would indicate that the area is historically prone to high water table levels. However, extensive drainage has occurred in the area for peat extraction and extraction and has lowered the local water table.

#### 4.3.1.3 OPW National Flood Hazard Mapping

The OPW National Flood Hazard Maps have no records of any recurring or historic flood incidences within the Application Site (www.floodinfo.ie).

The closest mapped historic flood event is found approximately 300m east of Ballivor Bog at Cloneycavan (Flood ID: 10583). This flood event dates from 14th August 2008 and is described as follows: "*After very heavy and prolonged rainfall in the Boyne Catchment area flooding*

*occurred in several parts of the catchment*" (www.floodinfo.ie). A photograph taken of this flood event on 16th August 2008 in Cloneycavan is included below as **Figure K**. A second historic flood event (Flood ID: 10586) dating from August 2008 is reported on the River Deel south of Raharney in the Anadruce area, approximately 3km southwest of Ballivor.

Several recurring flooding incidences (Flood ID: 2714, 2715, 2716) are mapped to the southwest of Raharney village along the R156 and in the vicinity of Kilucan (refer to **Figure L**). A report from the Mullingar Area Engineer states that some of these recurring flood incidents are due to annual flooding of low-lying land after heavy rain (Flood ID: 2715 and 2716) (www.floodinfo.ie). Meanwhile a stream to the east of Kilucan overflows its banks following heavy rainfall (Flood ID: 2714).

Downstream of the Application Site a historic flood event (Flood ID: 1954) dating from November 2002 is mapped on the Boyne at Derrindaly Bridge. Further downstream several historic and recurring flood incidents on the Boyne are recorded at Trim.



**Figure K: Flooding in the Cloneycavan area, to the east of Ballivor Bog on 16th August 2008 (www.floodmaps.ie).**

According to the OPW (www.floodmaps.ie), sections of the Application Site are classified as "*Benefiting Lands*". Benefiting lands are defined as a dataset prepared by the Office of Public Works identifying land that might benefit from the implementation of Arterial (Major) Drainage Schemes (under the Arterial Drainage Act 1945) and indicating areas of land subject to flooding or poor drainage. These lands tend to be located around the main rivers and streams which drain the individual bog basins.

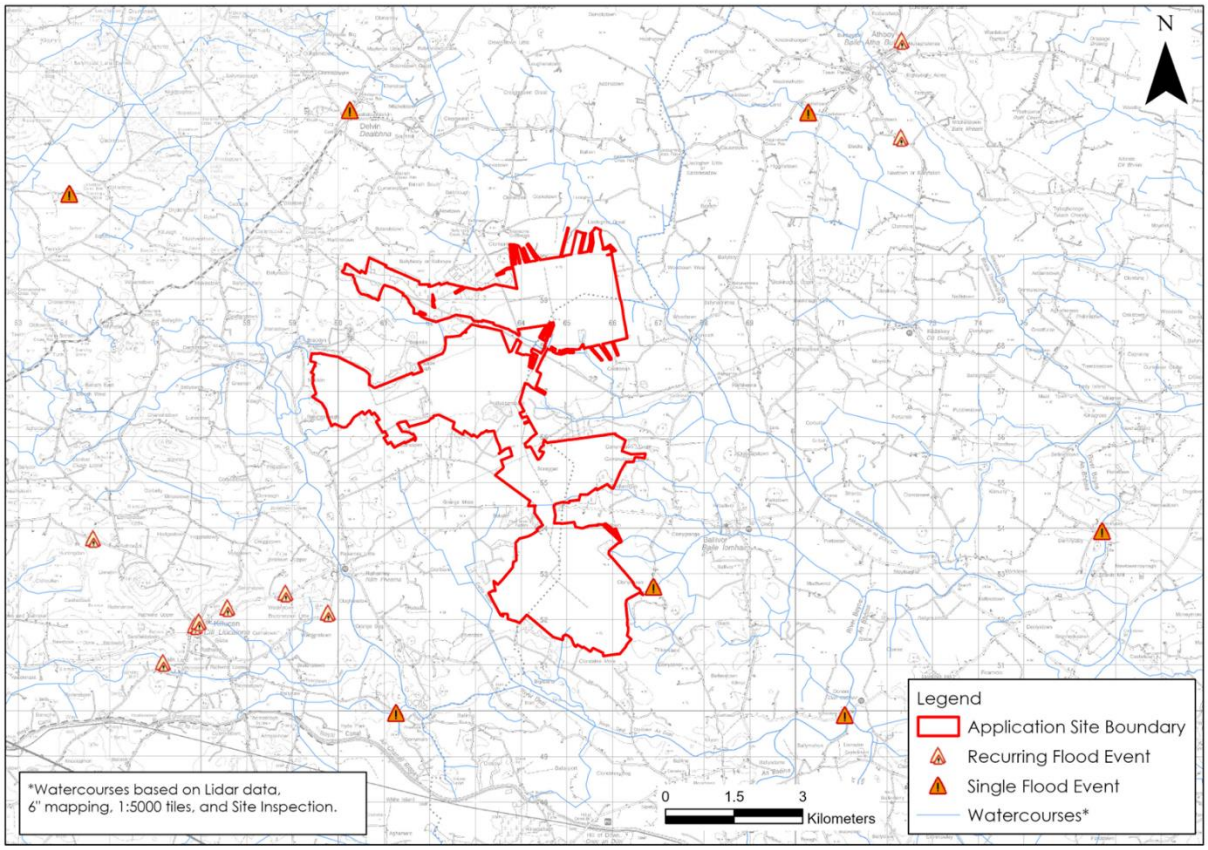


**Figure L: OPW Indicative Flood Map (www.floods.ie)**

#### 4.3.1.4 OPW National Indicative Fluvial Flood Mapping

The OPW National Indicative Flood Maps (available at www.Floodinfo.ie) shows the modelled extent of land that might be flooded by rivers during a flood event with an estimated probability of occurrence. These flood maps have been produced for catchments greater than 5km$^2$ in areas for which flood maps were not produced under the National CFRAM Programme.

For the present day scenario, which does not consider the effects of climate change, the OPW have mapped potential flood extents for waterbodies draining the Application Site.

Low (1,000-year flood event) and Medium (100-year flood event) probability fluvial flood zones are recorded along the Stonyford and Deel (Raharney) Rivers to the east and west of the Application Site respectively. These modelled fluvial flood zones remain largely localised to the immediate vicinity of the river channel. The vast majority of the Application Site is not mapped within the 100-year and 1,000-year flood zones and is therefore located in Flood Zone C and is at Low Risk of fluvial flooding.

Fluvial flood zones however are also mapped along the Cartenstown stream, a tributary of the Stonyford River. These modelled flood extents encroach upon Lisclogher Bog, with an area towards the centre of the bog mapped within the medium probability fluvial flood zone. However, site walkovers have revealed that Cartenstown Stream, mapped by the EPA to flow south-eastwards across Lisclogher Bog, does not exist. Such small local errors are infrequent in EPA mapping; however they do exist especially where manmade drainage has been imposed upon natural drainage regimes. This error casts doubt on the validity of the mapped flood zones as the modelling assumes the presence of the Cartenstown stream in this area.

No fluvial flood zones are mapped within Bracklin, Carranstown, Ballivor or Lisclogher West bogs. The closest mapped fluvial flood zones to the west of Bracklin Bog are found along the Greenan

stream to the northwest. Meanwhile, widespread fluvial Flood Zone A is mapped to the southwest of Ballivor Bog along the Craddanstown stream and the River Deel further south.

#### 4.3.1.5 CFRAM Fluvial Flood Mapping

Catchment Flood Risk Assessment and Management (CFRAM)[4] OPW Flood Risk Assessment Maps are now the primary reference for flood risk planning in Ireland and supersede the previous PFRA[5] maps.

CFRAM mapping has been completed downstream of the Application Site near Ballivor Village. CFRAM mapping has also been completed on the Stoneyford and Boyne Rivers further to the southeast and downstream of the Application Site.

Local CFRAM flood mapping is shown in **Figure M** below.

The modelled CFRAM flood extents at Ballivor show flood levels of 64.19 to 65.34m OD for the 10-year and 100-year flood events respectively (refer to **Table C** below). Note these flood elevations are well below the pipe outfall elevations in **Table B**.

**Table C: CFRAM Modelled Fluvial Water Levels (www.floodmaps.ie)**

| Node Label | Location Description | 10% AEP WL (mOD) | 1% AEP WL (mOD) | 0.1% AEP WL (mOD) |
|---|---|---|---|---|
| **00069** | Ballivor River, ~1.4km east of Ballivor Bog | 64.64 | 65.28 | 65.64 |
| **00023** | Ballivor River, ~1.7km east of Ballivor Bog | 64.19 | 64.77 | 65.11 |
| **00425** | Stoneyford River, ~2km southeast of Carranstown Bog | 64.82 | 65.34 | 65.66 |

*4 CFRAM is Catchment Flood Risk Assessment and Management. The national CFRAM programme commenced in Ireland in 2011 and is managed by the OPW. The CFRAM Programme is central to the medium to long-term strategy for the reduction and management of flood risk in Ireland.*

*5 Preliminary Flood Risk Assessment mapping.*

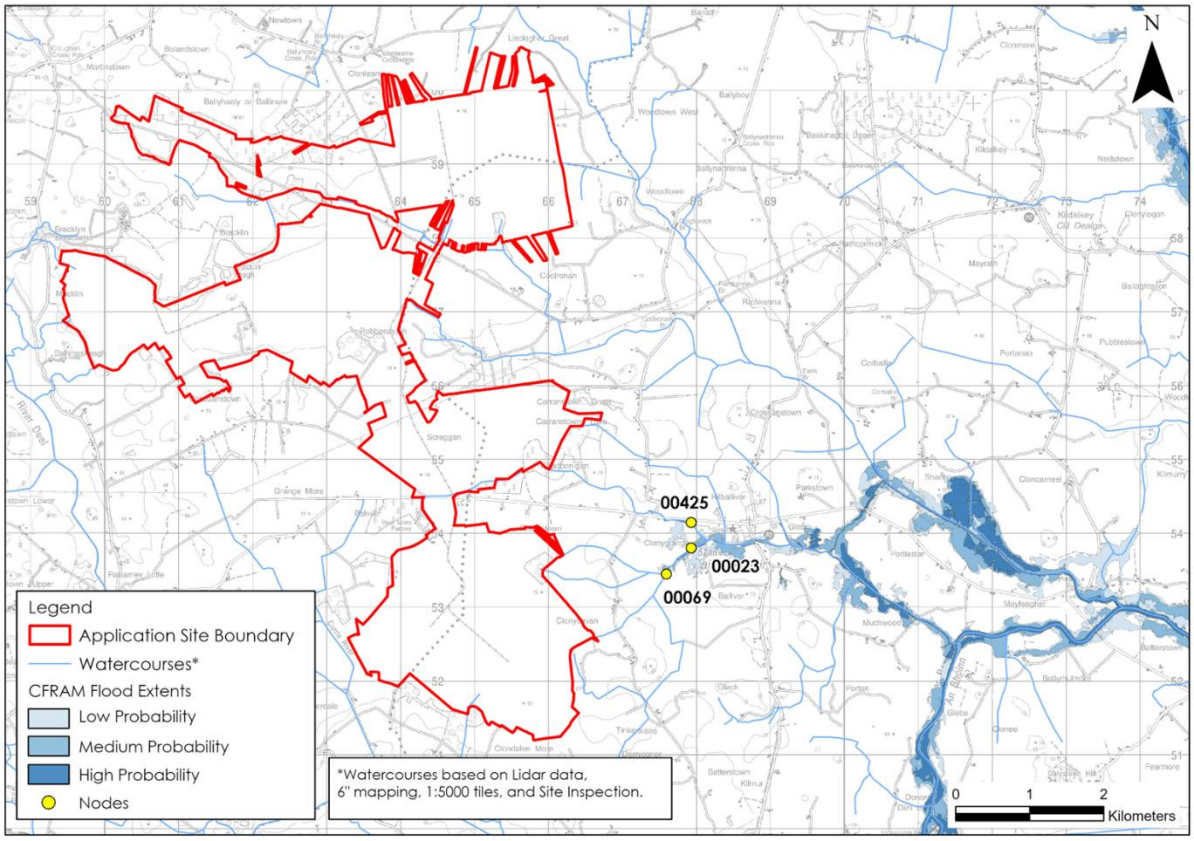


**Figure M: Local CFRAM Fluvial Flood Zone Mapping**

#### 4.3.1.6 GSI Historical Surface Water Flood Mapping

Furthermore, the GSI Winter (2015/2016) Surface Water Flooding Map[6] shows areas of fluvial and pluvial flood extents during the Winter 2015/2016 flood event (www.gsi.ie), which was the largest recorded flood event in many areas. This map does not record any mapped flood areas within the Application Site. A small area of surface water flooding is recorded to the north of Bracklin Bog (Bracklin West) associated with Bracklin Lough.

#### 4.3.1.7 Local Authority SFRA Flood Mapping

Local Authority Strategic Flood Risk Assessment (SFRA) mapping obtained from Meath and Westmeath County Councils is shown below in **Figure N**.

Within County Meath, SFRA mapping indicates flooding to the south of Lisclogher Bog on the Cartenstown stream and to the east of Bracklin and northeast of Carranstown Bog. Further south flood zones are also mapped along the Ballivor River to the east of Ballivor Bog at Cloneycavn and to the southwest along the Deel River in the townland of Clondalee More.

Within County Westmeath a significant portion of Lisclogher Bog is mapped as Flood Zone A (100-yr event). Mapped flooding here is likely associated with the Stonestown stream. No fluvial flood zones are mapped within Bracklin Bog or the western region of Ballivor Bog. The closest mapped fluvial flood zones to the west of Bracklin Bog are found along the Greenan stream. Meanwhile, widespread fluvial Flood Zone A is mapped to the southwest of Ballivor Bog along the Craddanstown stream and the River Deel further south.

[6] GSI Historical flood mapping principally developed using Sentinel-1 Satellite Imagery from the European Space Agency Copernicus Programme as well as any available historic records (from winter 2015/2016 or otherwise)

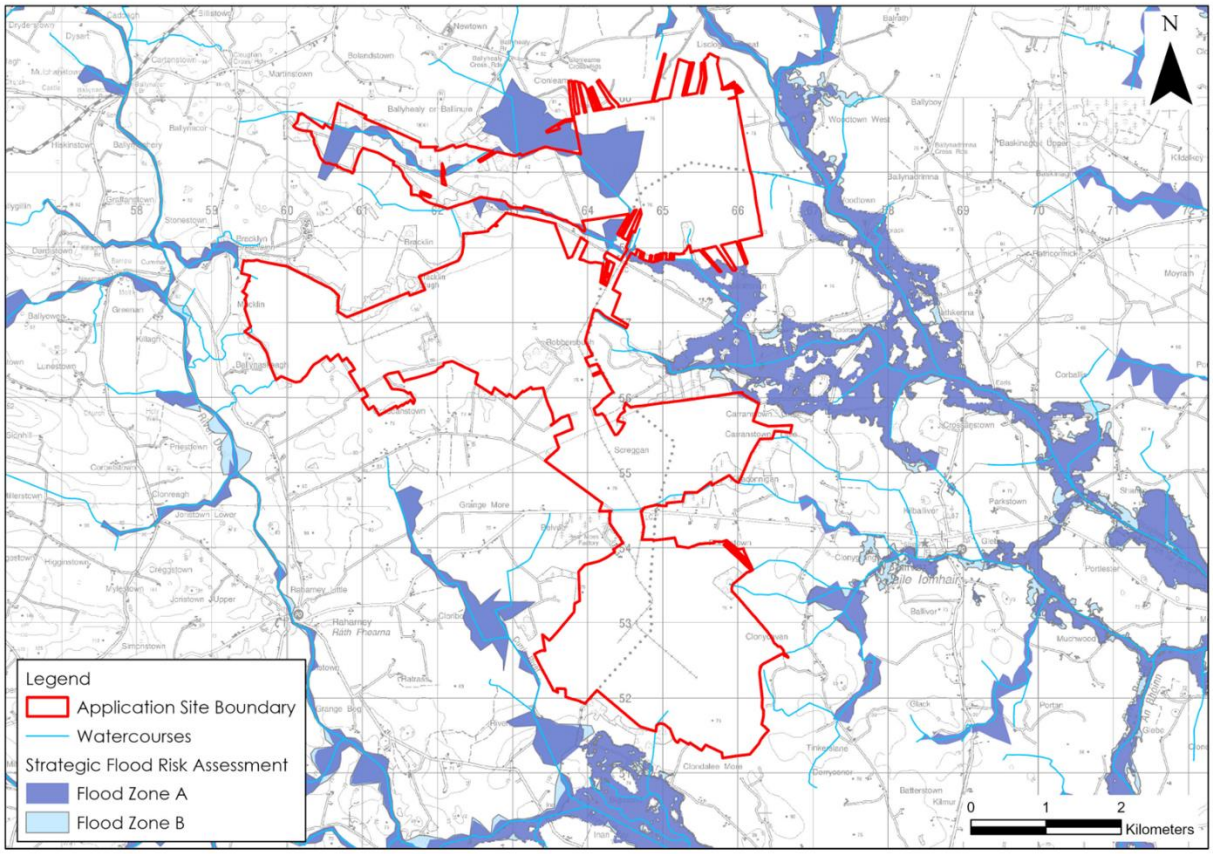


**Figure N: Local Authority SFRA Flood Mapping**

#### 4.3.1.8 Groundwater Flooding

The GSI Historical 2015/2016 groundwater flood map does not record any groundwater flooding within the area of the Application Site. Areas of historic groundwater flooding are mapped in the surrounding lands, the closest of which is found approximately 200m to the south of the Bracklin Bog.

Other areas of groundwater flooding are mapped approximately 1km to the southeast of Ballivor Bog and approximately 500m to the northwest of Lisclogher West. These are small-localised areas of groundwater flooding and will not be impacted by, or impact upon, activities at the site.

In addition the GSI predictive groundwater flood maps do not record any zones of groundwater flooding within the Application Site.

#### 4.3.1.9 Climate Change

National Indicative Fluvial Flood Mapping (NIFM) has also been completed for several climate change scenarios which assesses the potential changes in fluvial flood extents associated with climate change.

Fluvial flood modelling has been completed for 2 no. future scenarios, a Mid-Range Scenario and a High-End Future Scenario. The flood extents for the Mid-Range Future Scenario were modelled using a 20% increase in rainfall. Meanwhile the High-End Future Scenario was modelled using a 30% increase in rainfall and a sea level rise of 1,000mm.

For these future scenarios the modelled fluvial extents do not differ significantly from those described in **Section 4.3.1.4**. Fluvial flood zones associated with the High-End Future Scenario are shown in **Figure O** below.

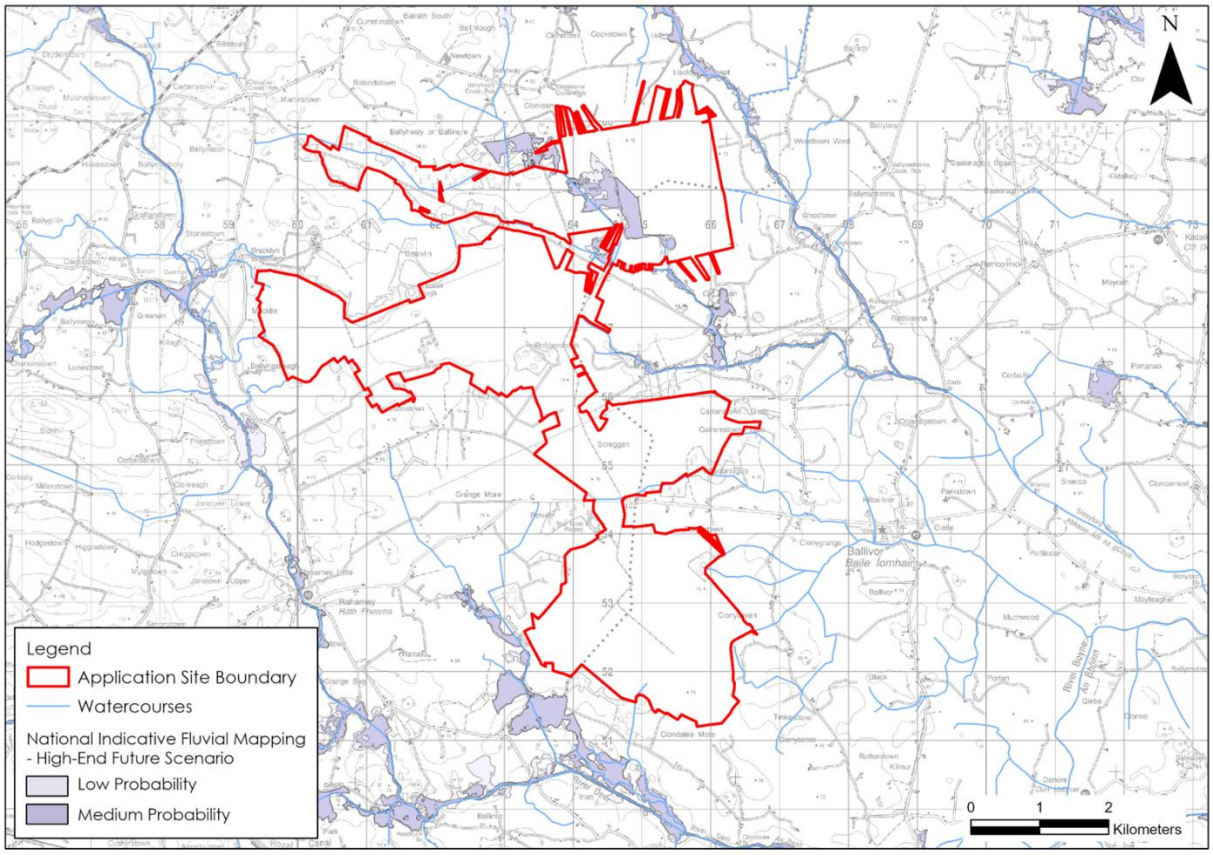


**Figure O: High-End Future Scenario Fluvial Flood Zones**

#### 4.3.1.10 Site Walkover Survey

Hydrological walkover surveys and observations on the site drainage patterns were undertaken by HES on 18th May 2020, 15th – 17th September 2020, 5th October 2020, 1st December 2020, 22nd March 2021, 1st April 2021, 20th September 2021, 28th October 2021, and 19th January 2022.

During the walkover survey landuse across much of the area was noted as comprising of cutover bog where peat extraction has previously occurred. Note that peat extraction formally ceased at the Application Site in June 2020. The bogs were noted to be drained by regularly spaced field drains which drain towards larger arterial drains. Certain areas of the site have become overgrown, with peat production ceasing in these areas some time ago allowing vegetation to recover and recolonise the bare peat fields. At the boundaries of the bogs surface water draining from the Application Site is routed via large settlement ponds prior to discharge to off-site drainage channels which flow into the local rivers and streams.

During the walkover survey, an error was observed in the EPA map of local rivers. The EPA map shows the Cartenstown stream to flow from Lisclogher west to the southeast across Lisclogher Bog. However, site walkovers have revealed that this section of mapped river does not exist. Such small (local) errors are infrequent in the digitised EPA river database, but they do exist, especially where manmade drainage has been imposed upon natural drainage patterns. This error also indicates that the SFRA flood zones mapped in this region are incorrect as they assume the presence of a surface watercourse.

Low lying areas within the Application Site were observed to hold surface water following heavy rainfall, but ponding only occurs to very shallow depths, (<0.2m) and only in certain areas does ponding persist in drier periods.

#### 4.3.1.11 Hydrological Flood Conceptual Model

Potential flooding in the vicinity of the Application Site can be described using the Source – Pathway – Receptor Model (S-P-R). The primary potential source of flooding in this area, and the one with the most consequence for the Application Site, is pluvial flooding.

During winter conditions the Application Site holds/retains rainwater following heavy rain. The depth of intermittent ponding is shallow (<0.2m). This retention of water on the bogs during such events will reduce downstream flooding risk. Potential receptors in the area are infrastructure, people, land and other private property.

### 4.3.2 Summary – Baseline Flood Risk Definition

Based on the information gained through the flood identification process and Initial Flood Risk Assessment process the sources of flood risk for the Application Site are outlined and assessed in **Table D.**

**Table D. S-P-R Assessment of Flood Sources for the Ballivor Bog Sub-Group.**

| Source | Pathway | Receptor | Comment |
|---|---|---|---|
| Fluvial | Overbank flooding of the Cartenstown Stream | Land, People, property, infrastructure, River Shannon Callows SAC | According to SFRA, there are areas within the Application Site potentially mapped in Fluvial Flood Zone A.<br><br>However, we have surveyed these locations and we confirm there is no watercourse in this area, and therefore conclude the SFRA mapping is incorrect, and that these locations are in Flood Zone C, with a high density of surface water drains. The remainder of the Application Site is also located in Flood Zone C (Low Risk). |
| Pluvial | Ponding of rainwater on-site | Land and infrastructure. | The Application Site is generally low lying and flat in places and therefore localised pluvial flood is very likely after heavy or prolonged rainfall. |
| Surface water | Surface ponding/ Overflow | Land and infrastructure. | Same as above (pluvial) |
| Groundwater | Rising groundwater levels | Land and infrastructure. | Based on the local hydrogeological regime and GSI groundwater flood mapping, no apparent risk from groundwater flooding. |
| Coastal/tidal | Not applicable | Land and infrastructure | The Application Site is >50km from the coast and there is no risk of coastal flooding. |

# 5. FLOOD RISK ASSESSMENT – REMEDIAL PHASE

## 5.1 DECOMMISSIONING AND REHABILIATION PLANS

It is currently proposed to implement a Cutaway Bog Decommissioning and Rehabilitation Plan at each of the bogs comprising the Application Site in order to stabilise and rehabilitate them, as outlined in detail in **Section 5.1.1**. The plans use bespoke interventions designed to first stabilise the environment and secondly to rehabilitate the Application Site as much as possible by placing the existing peatland environments on a path towards naturally functioning peatlands. Rehabilitation allows a site to naturally colonise with vegetation to stabilise the bare peat production fields and minimise potential downstream water pollution and increased surface water runoff.

Rehabilitation has already commenced on a section of Carranstown Bog and Lisclogher West Bog. These Decommissioning and Rehabilitation Plans are required in order to fulfil the requirements of Condition 10.2 of the IPC licence No. P0501-01. These Cutaway Bog Decommissioning and Rehabilitation Plans, attached as Appendix 4-2 to the rEIAR, will be subject to consultation as well as input from the EPA prior to their implementation across the Application Site (Note that the Decommissioning and Rehabilitation Plans for Carranstown and Lisclogher West have been agreed and are no longer in draft format) .

Bord na Móna's rehabilitation plans identify two scenarios present at the Application Site which will determine any additional targeted revegetation or rewetting measures to be implemented. Firstly, in the case that significant acid peat remains at the surface, there will be an assessment of the area to implement an intensive programme of drain-blocking and promote the re-establishment of more typical bog communities. Secondly, where alkaline peat is exposed at the surface the land is likely to revert to more alkaline poor fen/wetland or Birch dominated scrub ecosystems where the development of these communities will depend on the potential to rewet the site.

Much of the physical work associated with the rehabilitation plans will occur during the initial stages of the plan. Once drain blocking and other measures have been implemented the operational activities will comprise non-intrusive ecological and hydrological monitoring and may also include minimal maintenance and repair works if/as those works are deemed necessary.

The decommissioning and rehabilitation plans for the Application Site cannot be implemented without mitigation measures. All activities at the Application Site are required to operate in accordance with IPC Licence (P0501-01) until the licence is surrendered.

### 5.1.1 Proposed Rehabilitation Phase Site Drainage

Cutaway Bog Decommissioning and Rehabilitation Plans for each bog outline the proposed rehabilitation for the Application Site, including proposed site drainage, have been prepared and are summarised below in **Table E**.

**Table E: Types of and areas for rehabilitation measures at the Ballivor Bog Group**

***Note that the types of rehab and specific areas of rehab may vary in response to stakeholder consultation and refinement of the rehabilitation measures.***

| Bog | Type | Description | Area (Ha) |
|---|---|---|---|
| **Lisclogher** | Deep Peat Cutover Bog | Regular drain blocking (3 per100 m) and blocking outfalls and managing water levels with overflow pipes | 305.7 |
| | Dry Cutaway | Blocking outfalls and managing water levels with overflow pipes | 148.7 |
| | Marginal Land | No Work Required | 65.5 |
| | Other | Silt Ponds | 0.36 |
| **Carranstown** | Deep peat | More intensive drain blocking (max 7 per 100m), blocking outfalls and Sphagnum inoculation. Berms and field re-profiling (45x60m cell), blocking outfalls and managing overflows & drainage channels for excess water & Sphagnum Inoculation | 207.91 |
| | Dry Cutaway 2 | Regular drain blocking (3 per 100m) + blocking outfalls and managing water levels with overflow pipes + targeted fertiliser treatment | 26.62 |
| | Wetland | Turn off or reduce pumping to re-wet cutaway + blocking outfalls and managing water levels with overflow pipes + Targeted blocking of outfalls within a site + constructing larger berms to re-wet cutaway + transplanting Reeds and other rhizomes. More intensive drain blocking (max 7 per 100m), + blocking outfalls and managing overflows + transplanting Reeds and other rhizomes | 9.57 |
| | Marginal Land | No Work Required | 45.46 |
| | Other | Silt Ponds, Other Constraints (ROW) | 16.1 |
| **Lisclogher West** | Deep peat | More intensive drain blocking (max 7 per 100m), modifying outfalls | 132.6 |
| | Additional Works | Targeted Drain Blocking, where possible | 22.2 |
| | Marginal Land | No Work Required | 58.1 |
| | Other | Silt ponds, constrained areas | 25.4 |
| **Ballivor** | Deep Peat Cutover Bog | Regular drain blocking (3 per100m) and blocking outfalls and managing water levels with overflow pipes | 537.9 |
| | Dry Cutaway | Blocking outfalls and managing water levels with overflow pipes | 19.1 |
| | Marginal Land | No Work Required | 82.4 |
| | Other | Silt ponds | 5.79 |
| **Bracklin** | Deep Peat Cutover Bog | Regular drain blocking (3 per 100m) and blocking outfalls and managing water levels with overflow pipes | 362.4 |
| | Dry Cutaway | Modifying outfalls and managing water levels with overflow pipes | 169.9 |
| | Wetland | Modifying outfalls and managing water levels with overflow pipes | 12.3 |
| | Marginal Land | No Work Required | 221.2 |
| | Other | Silt pond | 2.07 |

## 5.2 BASELINE HYDROLOGY & FLOOD RISK FOR PROPOSED REHABILITATION PLAN

The Cutaway Bog Decommissioning and Rehabilitation Plans will be implemented within the Application Site. The baseline hydrology is therefore identical to the existing environment and catchment characteristics outlined in **Section 3** above. Similarly, the flood risk identification and assessment is identical to the flood risk identification and assessment as described above in **Section 4.3.1**.

## 5.3 DISCUSSION ON PROPOSED REHABILITATION PLAN FLOOD RISK & FLOOD RISK ASSESSMENT

Improvements in flow and water quality can be achieved through bog rehabilitation and rewetting at the Application Site. The Cutaway Bog Decommissioning and Rehabilitation Plans will generally involve the rewetting and revegetation of the drained cutover bogs. The greatest hydrological/hydrogeological effects would be experienced in those areas selected for rewetting following ecological surveying. Rewetting would be achieved through measures such as drain blocking. These plans will likely have a positive effect on hydrogeology within the site where groundwater tables in the peat bogs are stabilised and closer to the bog surface. Water storage capacity within the site will therefore improve and reducing the risk of flooding within the vicinity and downstream of the site. Elsewhere, where rewetting is not suitable the drainage regimes will remain relatively unchanged.

In order to be conservative, we have completed a Justification test below in **Section 5.4** for the proposed Decommissioning and Rehabilitation plans at the Application Site.

## 5.4 REQUIREMENT FOR A JUSTIFICATION TEST – PROPOSED REHABILITATION PLAN

A matrix of vulnerability versus flood zone is shown in **Table F**. This table is used to illustrate appropriate development types or indicate when a Justification Test is required.

It may be considered that the proposed rehabilitation plan can be categorised as a "Water Compatible development". The key rehabilitation plans to be implemented include regular drain blocking, blocking outfalls and managing water levels with overflow pipes which will improve water storage capacity within the Application Site and will therefore improve and reduce the risk of flooding within the vicinity and downstream of the Application Site. Consequently, the Remedial Measures Phase is not at risk of flooding and would not require further justification from a planning perspective.

**Table F: Matrix of Vulnerability versus Flood Zone**

| | Flood Zone A | Flood Zone B | Flood Zone C |
|---|---|---|---|
| Highly vulnerable development (including essential infrastructure) | Justification test | Justification test | Appropriate |
| Less vulnerable development | Justification test | Appropriate | Appropriate |
| Water Compatible development | Appropriate | Appropriate | **Appropriate** |

***Note:*** *Taken from Table 3.2 (DoEHLG, 2009)*
***Bold:*** *Applies to this project.*

## 5.5 FLOOD RISK IMPLICATIONS ASSOCIATED WITH THE PROPOSED BALLIVOR WIND FARM

Bord Na Mona Powergen Ltd propose to develop a wind farm at the Ballivor Bog Group (Ref. PA25M.316212). The wind farm will comprise of a total of 26 no. turbines, turbine hardstands, temporary construction compounds, borrow pits, an on-site 110kV substation and all associated works including site drainage works. The Ballivor Wind Farm development is subject to a separate Flood Risk Assessment (HES, 2023) which accompanied the planning application for the wind farm development.

The FRA for the wind farm development includes a flood risk identification study which identifies existing potential flood risks associated with the proposed Ballivor wind farm (similar to Section 4 above). The FRA for the wind farm also includes an assessment of the risk of the wind farm

development contributing to onsite and downstream flooding. The wind farm FRA found that the overall risk of flooding at the wind farm site (*i.e.* within the Ballivor Bog Group) is low and all proposed infrastructure, including the proposed substation location, will be located at or above Flood Zone C elevations. The FRA also concludes that the risk of the wind farm contributing to downstream flooding is very low.

Furthermore, the proposed Ballivor wind farm development and the Cutaway Bog Decommissioning and Rehabilitation Plans for the Application Site will not cause a cumulative increase in flood risk at the Ballivor Bog Group due to the following:

- All proposed wind farm development infrastructures, including the proposed onsite substation are located in Flood Zone C;
- The proposed wind farm drainage system will not significantly alter the existing drainage regime at the site;
- The proposed wind farm drainage will be fully integrated into the existing bog drainage system and rehabilitation plans;
- All surface water from the wind farm drainage system will be treated via silt traps and settlement ponds, to ensure there is no deterioration in downstream surface water quality;
- The proposed wind farm drainage system will be designed to provide surface water attenuation with the drainage system limiting discharge from the wind farm site to greenfield runoff rates; and,
- As a result, there will be no increase in surface water discharge from the site as a result of the wind farm development.

The overall aim of the Decommissioning and Rehabilitation Plans is to retain and slow down drainage within the Application Site which will result in areas of the site being wetter for longer. Therefore, the proposed rehabilitation works for the Bog Group and the wind farm development will not result in any increased downstream flood risk.

# 6. REPORT CONCLUSIONS

- A flood risk identification study was undertaken to identify existing potential flood risks associated with the Application Site and the potential flood risks associated with the proposed Cutaway Bog Decommissioning and Rehabilitation Plans within the Ballivor Bog Group in Co. Meath and Co. Westmeath. From this study:
    - No instances of historical flooding were identified in historic OS maps;
    - No instances of recurring flooding were identified on OPW maps within the Ballivor Bog Group;
    - The GSI Historical 2015/2016 flood map does not record any areas of surface water flooding within the Ballivor Bog Group;
    - The GSI Groundwater flood mapping does not record any flood zones within the Ballivor Bog Group;
    - CFRAM maps, for Ballivor village and the surrounding areas, do not show any flood zones within the Ballivor Bog Group; and,
    - Areas of the Ballivor Bog Group were identified within Local Authority SFRA flood zones as described below.
- The Local Authority Strategic Flood Risk Assessment (SFRA) mapping indicates that there are areas of the Ballivor Bog Group located in Fluvial Flood Zone A. The remainder of the Bogs are mapped in Flood Zone C (Low Risk);
    - However, site surveys reveal that the EPA incorrectly mapped a watercourse (the Cartenstown stream) to cross Lisclogher bog from the west and this indicates that the SFRA mapping in this area is inaccurate;
    - We conclude, based on site observation, lack of flooding in winter 2015/2016, and the high drainage density within the bog at this location, that the actual flood risk in this area is the same for the entire Lisclogher bog, and it should be mapped in Flood Zone C.
- CFRAM mapping includes modelled flood levels for the 10-year and 100-year flood events. These levels, modelled near Ballivor village, range from 64.19 – 65.34m OD and are well below the current outfall pipe elevations of the Application Site (67.97 – 79.13m OD). Therefore, the risk of fluvial flooding along the Ballivor River, located to the east of the site, backing up into the existing site drainage network is very low;
- The main risk of flooding across much of the Application Site is via pluvial flooding due to the low permeability of peat soils and subsoils;
- The Cutaway Bog Decommissioning and Rehabilitation Plans for the Application Site can be categorised as a "Water Compatible Development" and a justification test is not therefore required. The Cutaway Bog Decommissioning and Rehabilitation Plans are designed to improve the hydrological regime within the Ballivor Bog Group (by holding water on the bogs) and these measures will reduce flood risk in the vicinity and downstream of the Ballivor Bog Group; and,
- Cumulatively, the risk of the Cutaway Bog Decommissioning and Rehabilitation Plans and the proposed wind farm development contributing to downstream flooding is also very low, as the long-term plan is to retain and slow down drainage from the bogs, and this will result in sections of the site being wetter for longer and therefore promoting more Fen like conditions.

* * * * * * * * * * * * * * * * * * * * * * *

# 7. REFERENCES


| | | |
|---|---|---|
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| Cunnane & Lynn | 1975 | Flood Estimated Following the Flood Studies Report |
| CIRIA | 2004 | Development and Flood Risk – Guidance for the Construction Industry. |
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| Institute of Hydrology | 1994 | Flood Estimation in Small Catchments (IH 124). |
| Fitzgerald & Forrestal | 1996 | Month and Annual Averages of Rainfall for Ireland 1961 – 1990. |
| Met Eireann | 1996 | Monthly and Annual Averages of Rainfall for Ireland 1961-1990. |
| HES | 2023 | Proposed Ballivor Wind Farm, Co. Westmeath/Meath: Flood Risk Assessment |

# APPENDIX 8-2

***HYDROLOGY SURFACE WATER SAMPLING LABORATORY RESULTS***

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Report No: HYDR-246020421
Document No: EF0011

# CERTIFICATE OF ANALYSIS

**Client** **Hydro Environmental Services**
22 Lower Main Street
Dungarvan
Co. Waterford

**Date Received** 02/04/2021
**Date Reported** 07/04/2021
**Order Number** N/A

**For the Attention of:** Hydro Environmental Services

**Sample Reception** 18 sample(s) received in good condition.

**Comments** N/A

Report Authorised by: Rosemary Thomas

Rosemary Thomas
Environmental Chemistry Manager

*Conditions:*
*1. Results in this report relate only to the items tested*
*2. Reports may not be reproduced except in full without the approval of ALS Life Sciences Ltd*
*3. All queries regarding this report should be addressed to the Technical Manager at the above address*
*4. A * next to a method reference signifies that ALS Life Sciences Ltd is NOT INAB accredited for this method*
*5. Results reported as CFU/cm² are calculated based on information supplied by customer regarding area swabbed*
*6. SUBCON* indicates analysis subcontracted to approved subcontractors who do not hold accreditation for this test*
*7. SUBCON^ indicates analysis subcontracted to approved subcontractors who hold accreditation for this test*
*8. Where sampling is undertaken by ALS personnel, sampling activities are outside the scope of INAB accreditation*
*9. Dil next to a method reference indicates that a dilution of the water sample was undertaken during testing*

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Document No: EF0011

# CERTIFICATE OF ANALYSIS

**Date Received** 02/04/2021
**Date Reported** 07/04/2021
**Order Number** N/A

**Sample Type** Surface Water
**Client ID** Ballivor SW 1 Date sampled: 01.04.2021
**Date Tested** 02/04/2021
**ALS ID** 4420452

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | 40 | mg / l | P202 |
| Phosphorus | 0.11 | mg/l P | P207 |
| BOD 5 day Total with ATU | 2 | mg/l O2 | P280 |
| Orthophosphate | <0.02 | mg/l P | P281 |
| Chloride | 12.9 | mg/l Cl | P281 |
| Nitrate | 7.0 | mg/l NO3 | P281 |
| Nitrite | 0.08 | mg/l NO2 | P281 |
| Ammonia | 0.20 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 2.3 | mg/L N | P285 |

**Sample Type** Surface Water
**Client ID** Ballivor SW 2 Date sampled: 01.04.2021
**Date Tested** 02/04/2021
**ALS ID** 4420453

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | 9 | mg / l | P202 |
| Phosphorus | <0.10 | mg/l P | P207 |
| BOD 5 day Total with ATU | 1 | mg/l O2 | P280 |
| Orthophosphate | 0.03 | mg/l P | P281 |
| Chloride | 14.0 | mg/l Cl | P281 |
| Nitrate | 17.8 | mg/l NO3 | P281 |
| Nitrite | 0.05 | mg/l NO2 | P281 |
| Ammonia | 0.20 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 5.0 | mg/L N | P285 |

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Document No: EF0011

# CERTIFICATE OF ANALYSIS

**Date Received** 02/04/2021
**Date Reported** 07/04/2021
**Order Number** N/A

**Sample Type** Surface Water
**Client ID** Ballivor SW 3 Date sampled: 01.04.2021
**Date Tested** 02/04/2021
**ALS ID** 4420454

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | 8 | mg / l | P202 |
| Phosphorus | <0.10 | mg/l P | P207 |
| BOD 5 day Total with ATU | 2 | mg/l O2 | P280 |
| Orthophosphate | 0.02 | mg/l P | P281 |
| Chloride | 15.2 | mg/l Cl | P281 |
| Nitrate | 23.8 | mg/l NO3 | P281 |
| Nitrite | <0.05 | mg/l NO2 | P281 |
| Ammonia | 0.12 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 6.3 | mg/L N | P285 |

**Sample Type** Surface Water
**Client ID** Ballivor SW 4 Date sampled: 01.04.2021
**Date Tested** 02/04/2021
**ALS ID** 4420455

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | 80 | mg / l | P202 |
| Phosphorus | 0.42 | mg/l P | P207 |
| BOD 5 day Total with ATU | 2 | mg/l O2 | P280 |
| Orthophosphate | 0.33 | mg/l P | P281 |
| Chloride | 18.4 | mg/l Cl | P281 |
| Nitrate | <5.0 | mg/l NO3 | P281 |
| Nitrite | <0.05 | mg/l NO2 | P281 |
| Ammonia | 0.03 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 1.8 | mg/L N | P285 |

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**Date Received** 02/04/2021
**Date Reported** 07/04/2021
**Order Number** N/A

**Sample Type** Surface Water
**Client ID** Ballivor SW 5 Date sampled: 01.04.2021
**Date Tested** 02/04/2021
**ALS ID** 4420456

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | <5 | mg / l | P202 |
| Phosphorus | <0.10 | mg/l P | P207 |
| BOD 5 day Total with ATU | 2 | mg/l O2 | P280 |
| Orthophosphate | 0.02 | mg/l P | P281 |
| Chloride | 15.6 | mg/l Cl | P281 |
| Nitrate | 24.6 | mg/l NO3 | P281 |
| Nitrite | <0.05 | mg/l NO2 | P281 |
| Ammonia | 0.12 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 7.0 | mg/L N | P285 |

**Sample Type** Surface Water
**Client ID** Ballivor SW 6 Date sampled: 01.04.2021
**Date Tested** 02/04/2021
**ALS ID** 4420457

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | 6 | mg / l | P202 |
| Phosphorus | <0.10 | mg/l P | P207 |
| BOD 5 day Total with ATU | 1 | mg/l O2 | P280 |
| Orthophosphate | 0.02 | mg/l P | P281 |
| Chloride | 17.6 | mg/l Cl | P281 |
| Nitrate | 32.9 | mg/l NO3 | P281 |
| Nitrite | <0.05 | mg/l NO2 | P281 |
| Ammonia | 0.11 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 8.2 | mg/L N | P285 |

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**Date Received** 02/04/2021
**Date Reported** 07/04/2021
**Order Number** N/A

**Sample Type** Surface Water
**Client ID** Ballivor SW 7 Date sampled: 01.04.2021
**Date Tested** 02/04/2021
**ALS ID** 4420458

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | 8 | mg / l | P202 |
| Phosphorus | <0.10 | mg/l P | P207 |
| BOD 5 day Total with ATU | 2 | mg/l O2 | P280 |
| Orthophosphate | 0.03 | mg/l P | P281 |
| Chloride | 13.6 | mg/l Cl | P281 |
| Nitrate | <5.0 | mg/l NO3 | P281 |
| Nitrite | 0.05 | mg/l NO2 | P281 |
| Ammonia | 0.23 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 1.6 | mg/L N | P285 |

**Sample Type** Surface Water
**Client ID** Ballivor SW 8 Date sampled: 01.04.2021
**Date Tested** 02/04/2021
**ALS ID** 4420459

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | 32 | mg / l | P202 |
| Phosphorus | 0.10 | mg/l P | P207 |
| BOD 5 day Total with ATU | 2 | mg/l O2 | P280 |
| Orthophosphate | 0.03 | mg/l P | P281 |
| Chloride | 10.5 | mg/l Cl | P281 |
| Nitrate | 6.3 | mg/l NO3 | P281 |
| Nitrite | <0.05 | mg/l NO2 | P281 |
| Ammonia | 0.51 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 2.4 | mg/L N | P285 |

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**Date Received** 02/04/2021
**Date Reported** 07/04/2021
**Order Number** N/A

**Sample Type** Surface Water
**Client ID** Ballivor SW 9 Date sampled: 01.04.2021
**Date Tested** 02/04/2021
**ALS ID** 4420460

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | <5 | mg / l | P202 |
| Phosphorus | <0.10 | mg/l P | P207 |
| BOD 5 day Total with ATU | 2 | mg/l O2 | P280 |
| Orthophosphate | 0.02 | mg/l P | P281 |
| Chloride | 12.3 | mg/l Cl | P281 |
| Nitrate | 5.5 | mg/l NO3 | P281 |
| Nitrite | <0.05 | mg/l NO2 | P281 |
| Ammonia | 0.08 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 1.4 | mg/L N | P285 |

**Sample Type** Surface Water
**Client ID** Ballivor SW 10 Date sampled: 01.04.2021
**Date Tested** 02/04/2021
**ALS ID** 4420461

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | 14 | mg / l | P202 |
| Phosphorus | <0.10 | mg/l P | P207 |
| BOD 5 day Total with ATU | 2 | mg/l O2 | P280 |
| Orthophosphate | <0.02 | mg/l P | P281 |
| Chloride | 26.4 | mg/l Cl | P281 |
| Nitrate | 6.1 | mg/l NO3 | P281 |
| Nitrite | <0.05 | mg/l NO2 | P281 |
| Ammonia | 0.39 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 4.0 | mg/L N | P285 |

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**Date Received** 02/04/2021
**Date Reported** 07/04/2021
**Order Number** N/A

**Sample Type** Surface Water
**Client ID** Ballivor SW 11 Date sampled: 01.04.2021
**Date Tested** 02/04/2021
**ALS ID** 4420462

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | <5 | mg / l | P202 |
| Phosphorus | <0.10 | mg/l P | P207 |
| BOD 5 day Total with ATU | 4 | mg/l O2 | P280 |
| Orthophosphate | <0.02 | mg/l P | P281 |
| Chloride | 13.6 | mg/l Cl | P281 |
| Nitrate | <5.0 | mg/l NO3 | P281 |
| Nitrite | <0.05 | mg/l NO2 | P281 |
| Ammonia | 0.12 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 1.4 | mg/L N | P285 |

**Sample Type** Surface Water
**Client ID** Ballivor SW 12 Date sampled: 01.04.2021
**Date Tested** 02/04/2021
**ALS ID** 4420463

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | 11 | mg / l | P202 |
| Phosphorus | <0.10 | mg/l P | P207 |
| BOD 5 day Total with ATU | 1 | mg/l O2 | P280 |
| Orthophosphate | <0.02 | mg/l P | P281 |
| Chloride | 23.2 | mg/l Cl | P281 |
| Nitrate | 11.9 | mg/l NO3 | P281 |
| Nitrite | <0.05 | mg/l NO2 | P281 |
| Ammonia | 0.05 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 3.6 | mg/L N | P285 |

Report Authorised by: Rosemary Thomas

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Report No: HYDR-246020421

Document No: EF0011

# CERTIFICATE OF ANALYSIS

**Date Received** 02/04/2021
**Date Reported** 07/04/2021
**Order Number** N/A

**Sample Type** Surface Water
**Client ID** Ballivor SW 13 Date sampled: 01.04.2021
**Date Tested** 02/04/2021
**ALS ID** 4420464

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | 7 | mg / l | P202 |
| Phosphorus | <0.10 | mg/l P | P207 |
| BOD 5 day Total with ATU | 2 | mg/l O2 | P280 |
| Orthophosphate | 0.04 | mg/l P | P281 |
| Chloride | 17.2 | mg/l Cl | P281 |
| Nitrate | 7.8 | mg/l NO3 | P281 |
| Nitrite | 0.05 | mg/l NO2 | P281 |
| Ammonia | 0.12 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 1.9 | mg/L N | P285 |

**Sample Type** Surface Water
**Client ID** Ballivor SW 14 Date sampled: 01.04.2021
**Date Tested** 02/04/2021
**ALS ID** 4420465

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | 6 | mg / l | P202 |
| Phosphorus | 0.33 | mg/l P | P207 |
| BOD 5 day Total with ATU | 2 | mg/l O2 | P280 |
| Orthophosphate | 0.30 | mg/l P | P281 |
| Chloride | 13.0 | mg/l Cl | P281 |
| Nitrate | <5.0 | mg/l NO3 | P281 |
| Nitrite | <0.05 | mg/l NO2 | P281 |
| Ammonia | 0.56 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 2.5 | mg/L N | P285 |

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Report No: HYDR-246020421

Document No: EF0011

## CERTIFICATE OF ANALYSIS

**Date Received** 02/04/2021
**Date Reported** 07/04/2021
**Order Number** N/A

**Sample Type** Surface Water
**Client ID** Ballivor SW 15 Date sampled: 01.04.2021
**Date Tested** 02/04/2021
**ALS ID** 4420466

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | 6 | mg / l | P202 |
| Phosphorus | <0.10 | mg/l P | P207 |
| BOD 5 day Total with ATU | 1 | mg/l O2 | P280 |
| Orthophosphate | <0.02 | mg/l P | P281 |
| Chloride | 15.6 | mg/l Cl | P281 |
| Nitrate | 11.4 | mg/l NO3 | P281 |
| Nitrite | <0.05 | mg/l NO2 | P281 |
| Ammonia | 0.06 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 2.8 | mg/L N | P285 |

**Sample Type** Surface Water
**Client ID** Ballivor SW 16 Date sampled: 01.04.2021
**Date Tested** 02/04/2021
**ALS ID** 4420467

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | 6 | mg / l | P202 |
| Phosphorus | <0.10 | mg/l P | P207 |
| BOD 5 day Total with ATU | 2 | mg/l O2 | P280 |
| Orthophosphate | 0.04 | mg/l P | P281 |
| Chloride | 14.3 | mg/l Cl | P281 |
| Nitrate | <5.0 | mg/l NO3 | P281 |
| Nitrite | 0.05 | mg/l NO2 | P281 |
| Ammonia | 0.37 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 1.8 | mg/L N | P285 |

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Report No: HYDR-246020421

Document No: EF0011

# CERTIFICATE OF ANALYSIS

**Date Received** 02/04/2021
**Date Reported** 07/04/2021
**Order Number** N/A

**Sample Type** Surface Water
**Client ID** Ballivor SW 17 Date sampled: 01.04.2021
**Date Tested** 02/04/2021
**ALS ID** 4420468

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | 8 | mg / l | P202 |
| Phosphorus | <0.10 | mg/l P | P207 |
| BOD 5 day Total with ATU | 1 | mg/l O2 | P280 |
| Orthophosphate | <0.02 | mg/l P | P281 |
| Chloride | 15.5 | mg/l Cl | P281 |
| Nitrate | 9.0 | mg/l NO3 | P281 |
| Nitrite | <0.05 | mg/l NO2 | P281 |
| Ammonia | 0.05 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 2.2 | mg/L N | P285 |

**Sample Type** Surface Water
**Client ID** Ballivor SW 18 Date sampled: 01.04.2021
**Date Tested** 02/04/2021
**ALS ID** 4420469

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | 9 | mg / l | P202 |
| Phosphorus | 0.13 | mg/l P | P207 |
| BOD 5 day Total with ATU | 2 | mg/l O2 | P280 |
| Orthophosphate | 0.03 | mg/l P | P281 |
| Chloride | 10.4 | mg/l Cl | P281 |
| Nitrate | <5.0 | mg/l NO3 | P281 |
| Nitrite | <0.05 | mg/l NO2 | P281 |
| Ammonia | 0.03 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 1.4 | mg/L N | P285 |

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ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.166T

Report No: HYDR-759281021
Document No: EF0011

# CERTIFICATE OF ANALYSIS

**Client** **Hydro Environmental Services**
22 Lower Main Street
Dungarvan
Co. Waterford

**Date Received** 28/10/2021
**Date Reported** 18/11/2021
**Order Number** P1510

**For the Attention of:** Hydro Environmental Services

**Sample Reception** 18 sample(s) received in good condition.

**Comments** N/A

Report Authorised by: Rosemary Thomas

Rosemary Thomas
Environmental Chemistry Manager

*Conditions:*
*1. Results in this report relate only to the items tested*
*2. Reports may not be reproduced except in full without the approval of ALS Life Sciences Ltd*
*3. All queries regarding this report should be addressed to the Technical Manager at the above address*
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*7. SUBCON^ indicates analysis subcontracted to approved subcontractors who hold accreditation for this test*
*8. Where sampling is undertaken by ALS personnel, sampling activities are outside the scope of INAB accreditation*
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ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.166T

Report No: HYDR-759281021

Document No: EF0011

# CERTIFICATE OF ANALYSIS

**Date Received** 28/10/2021
**Date Reported** 18/11/2021
**Order Number** P1510

**Sample Type** Surface Water
**Client ID** Ballivor SW1
**Date Tested** 29/10/2021
**ALS ID** 4733798

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | 20 | mg / l | P202 |
| Phosphorus | <0.10 | mg/l P | P207 |
| BOD 5 day Total with ATU | 4 | mg/l O2 | P280 |
| Orthophosphate | 0.06 | mg/l P | P281 |
| Chloride | 14.1 | mg/l Cl | P281 |
| Nitrate | <5.0 | mg/l NO3 | P281 |
| Nitrite | 0.15 | mg/l NO2 | P281 |
| Ammonia | 0.60 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 1.8 | mg/L N | P285 |

**Sample Type** Surface Water
**Client ID** Ballivor SW2
**Date Tested** 29/10/2021
**ALS ID** 4733799

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | 19 | mg / l | P202 |
| Phosphorus | 0.16 | mg/l P | P207 |
| BOD 5 day Total with ATU | 4 | mg/l O2 | P280 |
| Orthophosphate | 0.02 | mg/l P | P281 |
| Chloride | 11.0 | mg/l Cl | P281 |
| Nitrate | 11.8 | mg/l NO3 | P281 |
| Nitrite | <0.05 | mg/l NO2 | P281 |
| Ammonia | 0.13 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 4.3 | mg/L N | P285 |

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# CERTIFICATE OF ANALYSIS

**Date Received** 28/10/2021
**Date Reported** 18/11/2021
**Order Number** P1510

**Sample Type** Surface Water
**Client ID** Ballivor SW3
**Date Tested** 29/10/2021
**ALS ID** 4733800

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | 10 | mg / l | P202 |
| Phosphorus | 0.18 | mg/l P | P207 |
| BOD 5 day Total with ATU | 4 | mg/l O2 | P280 |
| Orthophosphate | 0.04 | mg/l P | P281 |
| Chloride | 12.5 | mg/l Cl | P281 |
| Nitrate | 14.8 | mg/l NO3 | P281 |
| Nitrite | <0.05 | mg/l NO2 | P281 |
| Ammonia | 0.09 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 5.4 | mg/L N | P285 |

**Sample Type** Surface Water
**Client ID** Ballivor SW4
**Date Tested** 29/10/2021
**ALS ID** 4733801

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | 6 | mg / l | P202 |
| Phosphorus | 0.26 | mg/l P | P207 |
| BOD 5 day Total with ATU | 3 | mg/l O2 | P280 |
| Orthophosphate | 0.11 | mg/l P | P281 |
| Chloride | 10.0 | mg/l Cl | P281 |
| Nitrate | <5.0 | mg/l NO3 | P281 |
| Nitrite | <0.05 | mg/l NO2 | P281 |
| Ammonia | 0.05 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 1.7 | mg/L N | P285 |

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# CERTIFICATE OF ANALYSIS

**Date Received** 28/10/2021
**Date Reported** 18/11/2021
**Order Number** P1510

**Sample Type** Surface Water
**Client ID** Ballivor SW5
**Date Tested** 29/10/2021
**ALS ID** 4733802

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | 5 | mg / l | P202 |
| Phosphorus | 0.10 | mg/l P | P207 |
| BOD 5 day Total with ATU | 2 | mg/l O2 | P280 |
| Orthophosphate | 0.03 | mg/l P | P281 |
| Chloride | 11.0 | mg/l Cl | P281 |
| Nitrate | <5.0 | mg/l NO3 | P281 |
| Nitrite | <0.05 | mg/l NO2 | P281 |
| Ammonia | 0.20 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 1.7 | mg/L N | P285 |

**Sample Type** Surface Water
**Client ID** Ballivor SW6
**Date Tested** 29/10/2021
**ALS ID** 4733803

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | 6 | mg / l | P202 |
| Phosphorus | 0.26 | mg/l P | P207 |
| BOD 5 day Total with ATU | 4 | mg/l O2 | P280 |
| Orthophosphate | 0.03 | mg/l P | P281 |
| Chloride | 17.3 | mg/l Cl | P281 |
| Nitrate | 19.7 | mg/l NO3 | P281 |
| Nitrite | <0.05 | mg/l NO2 | P281 |
| Ammonia | 0.12 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 8.7 | mg/L N | P285 |

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# CERTIFICATE OF ANALYSIS

**Date Received** 28/10/2021
**Date Reported** 18/11/2021
**Order Number** P1510

**Sample Type** Surface Water
**Client ID** Ballivor SW7
**Date Tested** 29/10/2021
**ALS ID** 4733804

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | 14 | mg / l | P202 |
| Phosphorus | <0.10 | mg/l P | P207 |
| BOD 5 day Total with ATU | 3 | mg/l O2 | P280 |
| Orthophosphate | <0.02 | mg/l P | P281 |
| Chloride | 4.6 | mg/l Cl | P281 |
| Nitrate | 5.2 | mg/l NO3 | P281 |
| Nitrite | <0.05 | mg/l NO2 | P281 |
| Ammonia | 0.24 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 2.3 | mg/L N | P285 |

**Sample Type** Surface Water
**Client ID** Ballivor SW8
**Date Tested** 29/10/2021
**ALS ID** 4733805

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | 29 | mg / l | P202 |
| Phosphorus | 0.12 | mg/l P | P207 |
| BOD 5 day Total with ATU | 4 | mg/l O2 | P280 |
| Orthophosphate | <0.02 | mg/l P | P281 |
| Chloride | 8.1 | mg/l Cl | P281 |
| Nitrate | 8.5 | mg/l NO3 | P281 |
| Nitrite | <0.05 | mg/l NO2 | P281 |
| Ammonia | 0.14 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 4.4 | mg/L N | P285 |

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# CERTIFICATE OF ANALYSIS

**Date Received** 28/10/2021
**Date Reported** 18/11/2021
**Order Number** P1510

**Sample Type** Surface Water
**Client ID** Ballivor SW9
**Date Tested** 29/10/2021
**ALS ID** 4733806

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | <5 | mg / l | P202 |
| Phosphorus | 0.10 | mg/l P | P207 |
| BOD 5 day Total with ATU | 3 | mg/l O2 | P280 |
| Orthophosphate | 0.02 | mg/l P | P281 |
| Chloride | 8.0 | mg/l Cl | P281 |
| Nitrate | 10.2 | mg/l NO3 | P281 |
| Nitrite | 0.06 | mg/l NO2 | P281 |
| Ammonia | 0.08 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 3.4 | mg/L N | P285 |

**Sample Type** Surface Water
**Client ID** Ballivor SW10
**Date Tested** 29/10/2021
**ALS ID** 4733807

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | <5 | mg / l | P202 |
| Phosphorus | 0.14 | mg/l P | P207 |
| BOD 5 day Total with ATU | 2 | mg/l O2 | P280 |
| Orthophosphate | 0.05 | mg/l P | P281 |
| Chloride | 28.5 | mg/l Cl | P281 |
| Nitrate | 14.4 | mg/l NO3 | P281 |
| Nitrite | 0.05 | mg/l NO2 | P281 |
| Ammonia | 0.10 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 4.5 | mg/L N | P285 |

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# CERTIFICATE OF ANALYSIS

**Date Received** 28/10/2021
**Date Reported** 18/11/2021
**Order Number** P1510

**Sample Type** Surface Water
**Client ID** Ballivor SW11
**Date Tested** 29/10/2021
**ALS ID** 4733808

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | 8 | mg / l | P202 |
| Phosphorus | <0.10 | mg/l P | P207 |
| BOD 5 day Total with ATU | 4 | mg/l O2 | P280 |
| Orthophosphate | <0.02 | mg/l P | P281 |
| Chloride | 6.5 | mg/l Cl | P281 |
| Nitrate | <5.0 | mg/l NO3 | P281 |
| Nitrite | <0.05 | mg/l NO2 | P281 |
| Ammonia | 0.16 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 1.0 | mg/L N | P285 |

**Sample Type** Surface Water
**Client ID** Ballivor SW12
**Date Tested** 29/10/2021
**ALS ID** 4733809

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | 29 | mg / l | P202 |
| Phosphorus | 0.12 | mg/l P | P207 |
| BOD 5 day Total with ATU | 3 | mg/l O2 | P280 |
| Orthophosphate | <0.02 | mg/l P | P281 |
| Chloride | 16.9 | mg/l Cl | P281 |
| Nitrate | 9.2 | mg/l NO3 | P281 |
| Nitrite | 0.11 | mg/l NO2 | P281 |
| Ammonia | 0.11 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 3.4 | mg/L N | P285 |

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Report No: HYDR-759281021

Document No: EF0011

# CERTIFICATE OF ANALYSIS

**Date Received** 28/10/2021
**Date Reported** 18/11/2021
**Order Number** P1510

**Sample Type** Surface Water
**Client ID** Ballivor SW13
**Date Tested** 29/10/2021
**ALS ID** 4733810

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | 13 | mg / l | P202 |
| Phosphorus | 0.13 | mg/l P | P207 |
| BOD 5 day Total with ATU | 3 | mg/l O2 | P280 |
| Orthophosphate | 0.04 | mg/l P | P281 |
| Chloride | 13.7 | mg/l Cl | P281 |
| Nitrate | 7.0 | mg/l NO3 | P281 |
| Nitrite | 0.08 | mg/l NO2 | P281 |
| Ammonia | 0.18 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 3.0 | mg/L N | P285 |

**Sample Type** Surface Water
**Client ID** Ballivor SW14
**Date Tested** 29/10/2021
**ALS ID** 4733811

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | 9 | mg / l | P202 |
| Phosphorus | 0.16 | mg/l P | P207 |
| BOD 5 day Total with ATU | 4 | mg/l O2 | P280 |
| Orthophosphate | 0.06 | mg/l P | P281 |
| Chloride | 9.7 | mg/l Cl | P281 |
| Nitrate | <5.0 | mg/l NO3 | P281 |
| Nitrite | <0.05 | mg/l NO2 | P281 |
| Ammonia | 0.14 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 2.2 | mg/L N | P285 |

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# CERTIFICATE OF ANALYSIS

**Date Received** 28/10/2021
**Date Reported** 18/11/2021
**Order Number** P1510

**Sample Type** Surface Water
**Client ID** Ballivor SW15
**Date Tested** 29/10/2021
**ALS ID** 4733812

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | 31 | mg / l | P202 |
| Phosphorus | 0.16 | mg/l P | P207 |
| BOD 5 day Total with ATU | 3 | mg/l O2 | P280 |
| Orthophosphate | <0.02 | mg/l P | P281 |
| Chloride | 18.3 | mg/l Cl | P281 |
| Nitrate | 20.3 | mg/l NO3 | P281 |
| Nitrite | 0.15 | mg/l NO2 | P281 |
| Ammonia | 0.11 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 6.0 | mg/L N | P285 |

**Sample Type** Surface Water
**Client ID** Ballivor SW16
**Date Tested** 29/10/2021
**ALS ID** 4733813

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | <5 | mg / l | P202 |
| Phosphorus | <0.10 | mg/l P | P207 |
| BOD 5 day Total with ATU | 3 | mg/l O2 | P280 |
| Orthophosphate | 0.03 | mg/l P | P281 |
| Chloride | 10.7 | mg/l Cl | P281 |
| Nitrate | <5.0 | mg/l NO3 | P281 |
| Nitrite | 0.05 | mg/l NO2 | P281 |
| Ammonia | 0.20 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 1.7 | mg/L N | P285 |

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# CERTIFICATE OF ANALYSIS

**Date Received** 28/10/2021
**Date Reported** 18/11/2021
**Order Number** P1510

**Sample Type** Surface Water
**Client ID** Ballivor SW17
**Date Tested** 29/10/2021
**ALS ID** 4733814

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | 12 | mg / l | P202 |
| Phosphorus | 0.18 | mg/l P | P207 |
| BOD 5 day Total with ATU | 4 | mg/l O2 | P280 |
| Orthophosphate | 0.03 | mg/l P | P281 |
| Chloride | 12.0 | mg/l Cl | P281 |
| Nitrate | 15.3 | mg/l NO3 | P281 |
| Nitrite | <0.05 | mg/l NO2 | P281 |
| Ammonia | 0.09 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 5.8 | mg/L N | P285 |

**Sample Type** Surface Water
**Client ID** Ballivor SW18
**Date Tested** 29/10/2021
**ALS ID** 4733815

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | 51 | mg / l | P202 |
| Phosphorus | 0.10 | mg/l P | P207 |
| BOD 5 day Total with ATU | 3 | mg/l O2 | P280 |
| Orthophosphate | 0.04 | mg/l P | P281 |
| Chloride | 8.3 | mg/l Cl | P281 |
| Nitrate | <5.0 | mg/l NO3 | P281 |
| Nitrite | <0.05 | mg/l NO2 | P281 |
| Ammonia | 0.12 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 1.8 | mg/L N | P285 |

Report Authorised by: Rosemary Thomas

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Report No: HYDR-712190122
Document No: EF0011

# CERTIFICATE OF ANALYSIS

**Client** **Hydro Environmental Services**
22 Lower Main Street
Dungarvan
Co. Waterford

**Date Received** 19/01/2022
**Date Reported** 27/01/2022
**Order Number** N/A

**For the Attention of:** Hydro Environmental Services

**Sample Reception** 16 sample(s) received in good condition.

**Comments** N/A

Report Authorised by: Rosemary Thomas

Rosemary Thomas
Environmental Chemistry Manager

*Conditions:*
*1. Results in this report relate only to the items tested*
*2. Reports may not be reproduced except in full without the approval of ALS Life Sciences Ltd*
*3. All queries regarding this report should be addressed to the Technical Manager at the above address*
*4. A * next to a method reference signifies that ALS Life Sciences Ltd is NOT INAB accredited for this method*
*5. Results reported as CFU/cm² are calculated based on information supplied by customer regarding area swabbed*
*6. SUBCON* indicates analysis subcontracted to approved subcontractors who do not hold accreditation for this test*
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ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.166T

Report No: HYDR-712190122

Document No: EF0011

# CERTIFICATE OF ANALYSIS

**Date Received** 19/01/2022
**Date Reported** 27/01/2022
**Order Number** N/A

**Sample Type** Surface Water
**Client ID** SW 1
**Date Tested** 20/01/2022
**ALS ID** 4849635

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | 13 | mg / l | P202 |
| Phosphorus | <0.10 | mg/l P | P207 |
| BOD 5 day Total with ATU | 1 | mg/l O2 | P280 |
| Orthophosphate | 0.09 | mg/l P | P281 |
| Chloride | 22.0 | mg/l Cl | P281 |
| Nitrate | 13.2 | mg/l NO3 | P281 |
| Nitrite | <0.05 | mg/l NO2 | P281 |
| Ammonia | 0.25 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 3.0 | mg/L N | P285 |

**Sample Type** Surface Water
**Client ID** SW 2
**Date Tested** 20/01/2022
**ALS ID** 4849636

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | 6 | mg / l | P202 |
| Phosphorus | <0.10 | mg/l P | P207 |
| BOD 5 day Total with ATU | 2 | mg/l O2 | P280 |
| Orthophosphate | 0.09 | mg/l P | P281 |
| Chloride | 15.2 | mg/l Cl | P281 |
| Nitrate | 21.5 | mg/l NO3 | P281 |
| Nitrite | 0.11 | mg/l NO2 | P281 |
| Ammonia | 0.25 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 6.1 | mg/L N | P285 |

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Report No: HYDR-712190122

Document No: EF0011

# CERTIFICATE OF ANALYSIS

**Date Received** 19/01/2022
**Date Reported** 27/01/2022
**Order Number** N/A

**Sample Type** Surface Water
**Client ID** SW 3
**Date Tested** 20/01/2022
**ALS ID** 4849637

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | <5 | mg / l | P202 |
| Phosphorus | <0.10 | mg/l P | P207 |
| BOD 5 day Total with ATU | 1 | mg/l O2 | P280 |
| Orthophosphate | 0.02 | mg/l P | P281 |
| Chloride | 15.8 | mg/l Cl | P281 |
| Nitrate | 27.9 | mg/l NO3 | P281 |
| Nitrite | 0.09 | mg/l NO2 | P281 |
| Ammonia | 0.12 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 7.8 | mg/L N | P285 |

**Sample Type** Surface Water
**Client ID** SW 5
**Date Tested** 20/01/2022
**ALS ID** 4849639

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | <5 | mg / l | P202 |
| Phosphorus | <0.10 | mg/l P | P207 |
| BOD 5 day Total with ATU | 1 | mg/l O2 | P280 |
| Orthophosphate | <0.02 | mg/l P | P281 |
| Chloride | 15.9 | mg/l Cl | P281 |
| Nitrate | 28.4 | mg/l NO3 | P281 |
| Nitrite | 0.09 | mg/l NO2 | P281 |
| Ammonia | 0.12 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 9.4 | mg/L N | P285 |

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Document No: EF0011

# CERTIFICATE OF ANALYSIS

**Date Received** 19/01/2022
**Date Reported** 27/01/2022
**Order Number** N/A

**Sample Type** Surface Water
**Client ID** SW 6
**Date Tested** 20/01/2022
**ALS ID** 4849640

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | <5 | mg / l | P202 |
| Phosphorus | <0.10 | mg/l P | P207 |
| BOD 5 day Total with ATU | 1 | mg/l O2 | P280 |
| Orthophosphate | <0.02 | mg/l P | P281 |
| Chloride | 17.6 | mg/l Cl | P281 |
| Nitrate | 35.4 | mg/l NO3 | P281 |
| Nitrite | 0.06 | mg/l NO2 | P281 |
| Ammonia | 0.13 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 8.0 | mg/L N | P285 |

**Sample Type** Surface Water
**Client ID** SW 7
**Date Tested** 20/01/2022
**ALS ID** 4849641

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | <5 | mg / l | P202 |
| Phosphorus | <0.10 | mg/l P | P207 |
| BOD 5 day Total with ATU | 1 | mg/l O2 | P280 |
| Orthophosphate | 0.02 | mg/l P | P281 |
| Chloride | 12.9 | mg/l Cl | P281 |
| Nitrate | <5.0 | mg/l NO3 | P281 |
| Nitrite | <0.05 | mg/l NO2 | P281 |
| Ammonia | 0.46 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 2.1 | mg/L N | P285 |

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Document No: EF0011

## CERTIFICATE OF ANALYSIS

**Date Received** 19/01/2022
**Date Reported** 27/01/2022
**Order Number** N/A

**Sample Type** Surface Water
**Client ID** SW 8
**Date Tested** 20/01/2022
**ALS ID** 4849642

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | <5 | mg / l | P202 |
| Phosphorus | <0.10 | mg/l P | P207 |
| BOD 5 day Total with ATU | 1 | mg/l O2 | P280 |
| Orthophosphate | 0.02 | mg/l P | P281 |
| Chloride | 10.8 | mg/l Cl | P281 |
| Nitrate | 7.0 | mg/l NO3 | P281 |
| Nitrite | <0.05 | mg/l NO2 | P281 |
| Ammonia | 0.74 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 3.6 | mg/L N | P285 |

**Sample Type** Surface Water
**Client ID** SW 9
**Date Tested** 20/01/2022
**ALS ID** 4849643

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | <5 | mg / l | P202 |
| Phosphorus | <0.10 | mg/l P | P207 |
| BOD 5 day Total with ATU | 1 | mg/l O2 | P280 |
| Orthophosphate | <0.02 | mg/l P | P281 |
| Chloride | 13.1 | mg/l Cl | P281 |
| Nitrate | 7.3 | mg/l NO3 | P281 |
| Nitrite | <0.05 | mg/l NO2 | P281 |
| Ammonia | 0.03 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 1.8 | mg/L N | P285 |

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# CERTIFICATE OF ANALYSIS

**Date Received** 19/01/2022
**Date Reported** 27/01/2022
**Order Number** N/A

**Sample Type** Surface Water
**Client ID** SW 10
**Date Tested** 20/01/2022
**ALS ID** 4849644

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | <5 | mg / l | P202 |
| Phosphorus | <0.10 | mg/l P | P207 |
| BOD 5 day Total with ATU | 1 | mg/l O2 | P280 |
| Orthophosphate | <0.02 | mg/l P | P281 |
| Chloride | 22.8 | mg/l Cl | P281 |
| Nitrate | 21.8 | mg/l NO3 | P281 |
| Nitrite | <0.05 | mg/l NO2 | P281 |
| Ammonia | 0.04 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 7.0 | mg/L N | P285 |

**Sample Type** Surface Water
**Client ID** SW 11
**Date Tested** 20/01/2022
**ALS ID** 4849645

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | <5 | mg / l | P202 |
| Phosphorus | 0.11 | mg/l P | P207 |
| BOD 5 day Total with ATU | 2 | mg/l O2 | P280 |
| Orthophosphate | <0.02 | mg/l P | P281 |
| Chloride | 12.6 | mg/l Cl | P281 |
| Nitrate | <5.0 | mg/l NO3 | P281 |
| Nitrite | <0.05 | mg/l NO2 | P281 |
| Ammonia | 0.22 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 1.9 | mg/L N | P285 |

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## CERTIFICATE OF ANALYSIS

**Date Received** 19/01/2022
**Date Reported** 27/01/2022
**Order Number** N/A

**Sample Type** Surface Water
**Client ID** SW 12
**Date Tested** 20/01/2022
**ALS ID** 4849646

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | 28 | mg / l | P202 |
| Phosphorus | 0.15 | mg/l P | P207 |
| BOD 5 day Total with ATU | 1 | mg/l O2 | P280 |
| Orthophosphate | <0.02 | mg/l P | P281 |
| Chloride | 23.9 | mg/l Cl | P281 |
| Nitrate | 14.9 | mg/l NO3 | P281 |
| Nitrite | <0.05 | mg/l NO2 | P281 |
| Ammonia | 0.07 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 5.2 | mg/L N | P285 |

**Sample Type** Surface Water
**Client ID** SW 13
**Date Tested** 20/01/2022
**ALS ID** 4849647

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | <5 | mg / l | P202 |
| Phosphorus | <0.10 | mg/l P | P207 |
| BOD 5 day Total with ATU | 1 | mg/l O2 | P280 |
| Orthophosphate | 0.02 | mg/l P | P281 |
| Chloride | 20.9 | mg/l Cl | P281 |
| Nitrate | 11.8 | mg/l NO3 | P281 |
| Nitrite | <0.05 | mg/l NO2 | P281 |
| Ammonia | 0.06 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 3.1 | mg/L N | P285 |

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## CERTIFICATE OF ANALYSIS

**Date Received** 19/01/2022
**Date Reported** 27/01/2022
**Order Number** N/A

**Sample Type** Surface Water
**Client ID** SW 15
**Date Tested** 20/01/2022
**ALS ID** 4849649

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | 15 | mg / l | P202 |
| Phosphorus | <0.10 | mg/l P | P207 |
| BOD 5 day Total with ATU | <1 | mg/l O2 | P280 |
| Orthophosphate | <0.02 | mg/l P | P281 |
| Chloride | 16.6 | mg/l Cl | P281 |
| Nitrate | 13.2 | mg/l NO3 | P281 |
| Nitrite | <0.05 | mg/l NO2 | P281 |
| Ammonia | 0.07 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 3.8 | mg/L N | P285 |

**Sample Type** Surface Water
**Client ID** SW 16
**Date Tested** 20/01/2022
**ALS ID** 4849650

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | <5 | mg / l | P202 |
| Phosphorus | <0.10 | mg/l P | P207 |
| BOD 5 day Total with ATU | <1 | mg/l O2 | P280 |
| Orthophosphate | 0.02 | mg/l P | P281 |
| Chloride | 18.3 | mg/l Cl | P281 |
| Nitrate | 9.8 | mg/l NO3 | P281 |
| Nitrite | 0.05 | mg/l NO2 | P281 |
| Ammonia | 0.25 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 7.1 | mg/L N | P285 |

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Report No: HYDR-712190122

Document No: EF0011

# CERTIFICATE OF ANALYSIS

**Date Received** 19/01/2022
**Date Reported** 27/01/2022
**Order Number** N/A

**Sample Type** Surface Water
**Client ID** SW 17
**Date Tested** 20/01/2022
**ALS ID** 4849651

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | 5 | mg / l | P202 |
| Phosphorus | <0.10 | mg/l P | P207 |
| BOD 5 day Total with ATU | <1 | mg/l O2 | P280 |
| Orthophosphate | <0.02 | mg/l P | P281 |
| Chloride | 15.1 | mg/l Cl | P281 |
| Nitrate | 14.3 | mg/l NO3 | P281 |
| Nitrite | <0.05 | mg/l NO2 | P281 |
| Ammonia | 0.04 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 3.3 | mg/L N | P285 |

**Sample Type** Surface Water
**Client ID** SW 18
**Date Tested** 20/01/2022
**ALS ID** 4849652

| Test | Result | Unit | Method |
|---|---|---|---|
| Suspended Solids | 6 | mg / l | P202 |
| Phosphorus | <0.10 | mg/l P | P207 |
| BOD 5 day Total with ATU | 1 | mg/l O2 | P280 |
| Orthophosphate | 0.02 | mg/l P | P281 |
| Chloride | 12.3 | mg/l Cl | P281 |
| Nitrate | 6.2 | mg/l NO3 | P281 |
| Nitrite | <0.05 | mg/l NO2 | P281 |
| Ammonia | 0.09 | mg/l NH3-N | P281 |
| Nitrogen (Total) | 2.4 | mg/L N | P285 |

Report Authorised by: Rosemary Thomas

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Environmental Chemistry Manager

# APPENDIX 8-3

***PEATLAND HYDROLOGY STUDY***

HYDRO ENVIRONMENTAL SERVICES

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# PEATLAND HYDROLOGY STUDY AT 4 NO. BNM BOGS

PEATLAND HYDROLOGY STUDY REPORT

**FINAL REPORT**

Prepared for:

**BNM**

Prepared by:

**HYDRO-ENVIRONMENTAL SERVICES**

## DOCUMENT INFORMATION

| | |
|---|---|
| **Document Title:** | **PEATLAND HYDROLOGY STUDY AT 4 NO. BNM BOGS**<br><br>**PEATLAND HYDROLOGY STUDY REPORT** |
| **Issue Date:** | **25th July 2024** |
| **Project Number:** | **P1420-1** |
| **Project Reporting History:** | **none** |
| **Current revision no:** | **P1420-1_REV F0** |
| **Author:** | **Michael Gill** |
| **Signed:** |  <br>_____<br>**Michael Gill B.A., B.A.I., M.Sc., MIEI**<br>**Managing Director – Hydro-Environmental Services** |

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# 1. INTRODUCTION

## 1.1 BACKGROUND

Hydro-Environmental Services (HES) were commissioned by BnM to complete a hydrological study at 4 no. peat bogs. HES installed piezometers transects at the bogs to allow collection of seasonal water level data. Investigations and monitoring were completed at Garryduff, Blackwater, and Mongan bogs (Blackwater Group), and Derrycolumb bog (Mountdillon Group). BnM collected water level data at these 4 no. sites between September/October 2018 and February 2020. The purpose of the study was to determine likely zones of influence of drainage on BnM bog unit sites, and also to determine the likely zones of influence of BnM pumping stations. A site location map, showing the relative location of the study sites is included below as **Figure A**.

The hydrological study at these bogs had the following objectives:

- Setup and installation of hydrological monitoring transects that include monitoring points in shallow peat, deep peat and underlying mineral subsoil;
- Collect and analyse seasonal water level data; and,
- Inform how far the likely Zone of Influence of BnM bog drainage and pumping station dewatering has on surrounding peatland and aquifers.

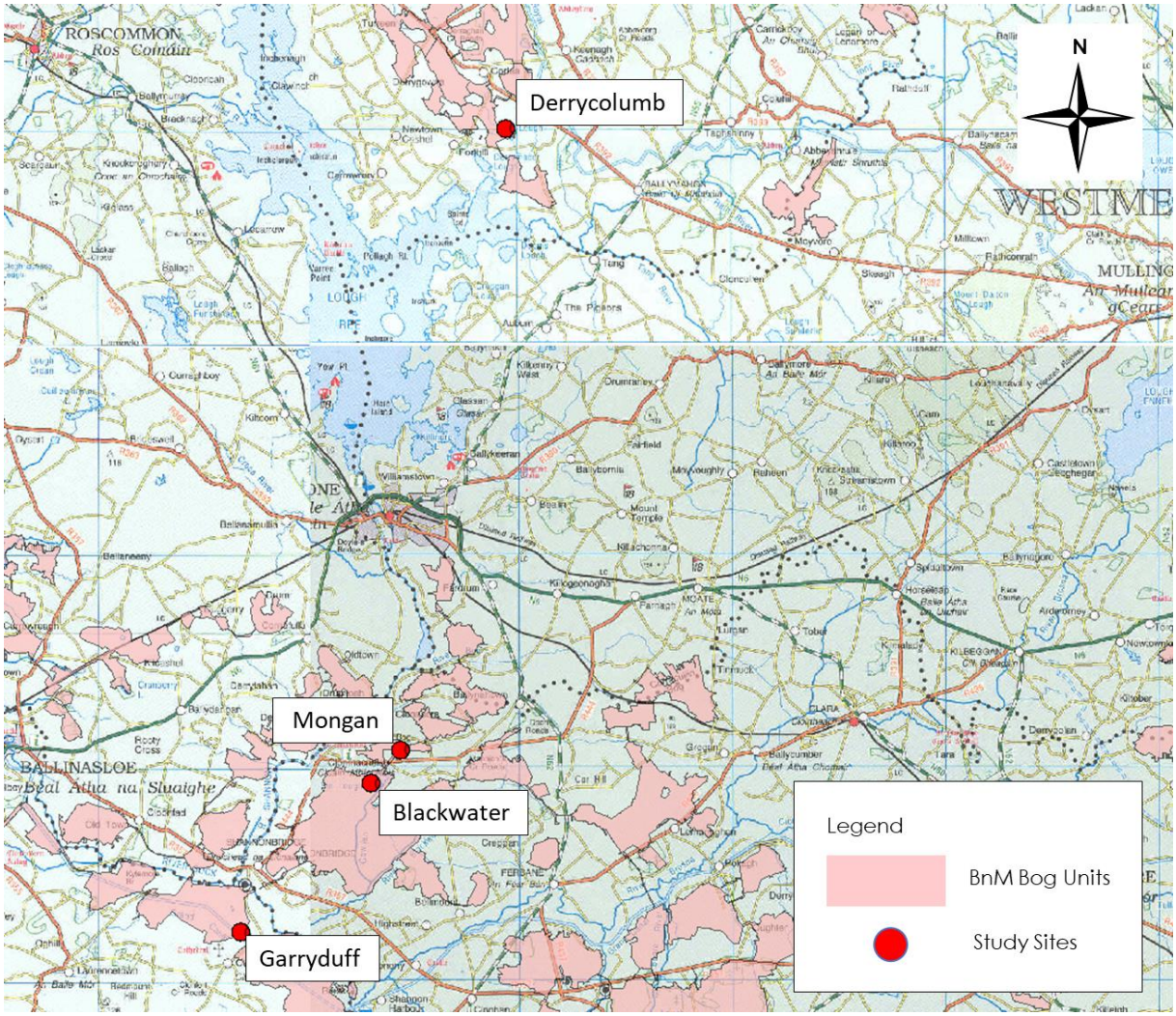



**Figure A: Study Sites Location Map**

# 2. SITE INVESTIGATION WORKS

## 2.1 BLACKWATER

Table A provides a is a summary of the site investigation and piezometer install works at the Blackwater Study site.

**Table A: Summary of piezometer install works at Blackwater Study site**

| Information Type | Data |
|---|---|
| Install Dates | July 2018 |
| No. of Transects | 3 (T1, T2, and T3) |
| No. of Shallow Phreatic Tubes | 43 |
| No. of Deep Peat Piezometers | 26 |
| No. of Mineral Soil Piezometers | 0 |
| Interval of Peat Depths Recorded (m) | 0.1-3.41 (n=42, σ=1.28)[1] |
| Dates of Water Level Monitoring (by BnM) | July 2018 to February 2020 (n=19) |

Full details of the site investigation and piezometer install works are attached in **Appendix I**. A map of the Blackwater piezometer install locations is shown below as **Figure B**.

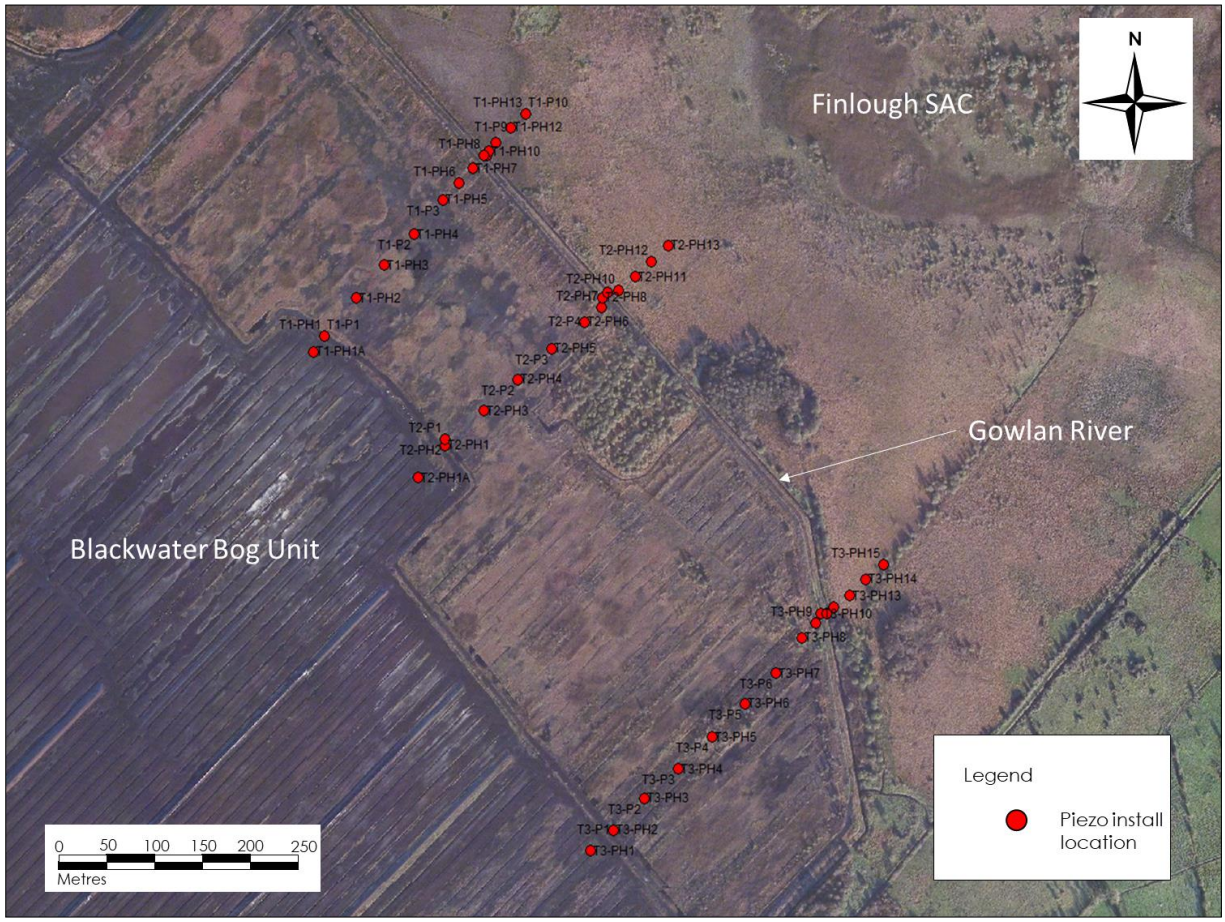



**Figure B: Blackwater - piezometer install location map**

[1] *n = no. of data points. σ = mean of data.*

## 2.2 DERRYCOLUMB

Table B provides a is a summary of the site investigation and piezometer install works at the Derrycolumb Study site.

**Table B: Summary of piezometer install works at Derrycolumb Study site**

| Information Type | Data |
|---|---|
| Install Dates | August 2018 |
| No. of Transects | 3 (T1, T1A, and T3) |
| No. of Shallow Phreatic Tubes | 18 |
| No. of Deep Peat Piezometers | 17 |
| No. of Mineral Soil Piezometers | 0 |
| Interval of Peat Depths Recorded (m) | 3.2->7.0 (n=18, σ=4.63) |
| Dates of Water Level Monitoring (by BnM) | Sept 2018 to November 2019 (n=14) |

Full details of the site investigation and piezometer install works are attached in **Appendix I**. A map of the Derrycolumb piezometer install locations is shown below as **Figure C**.

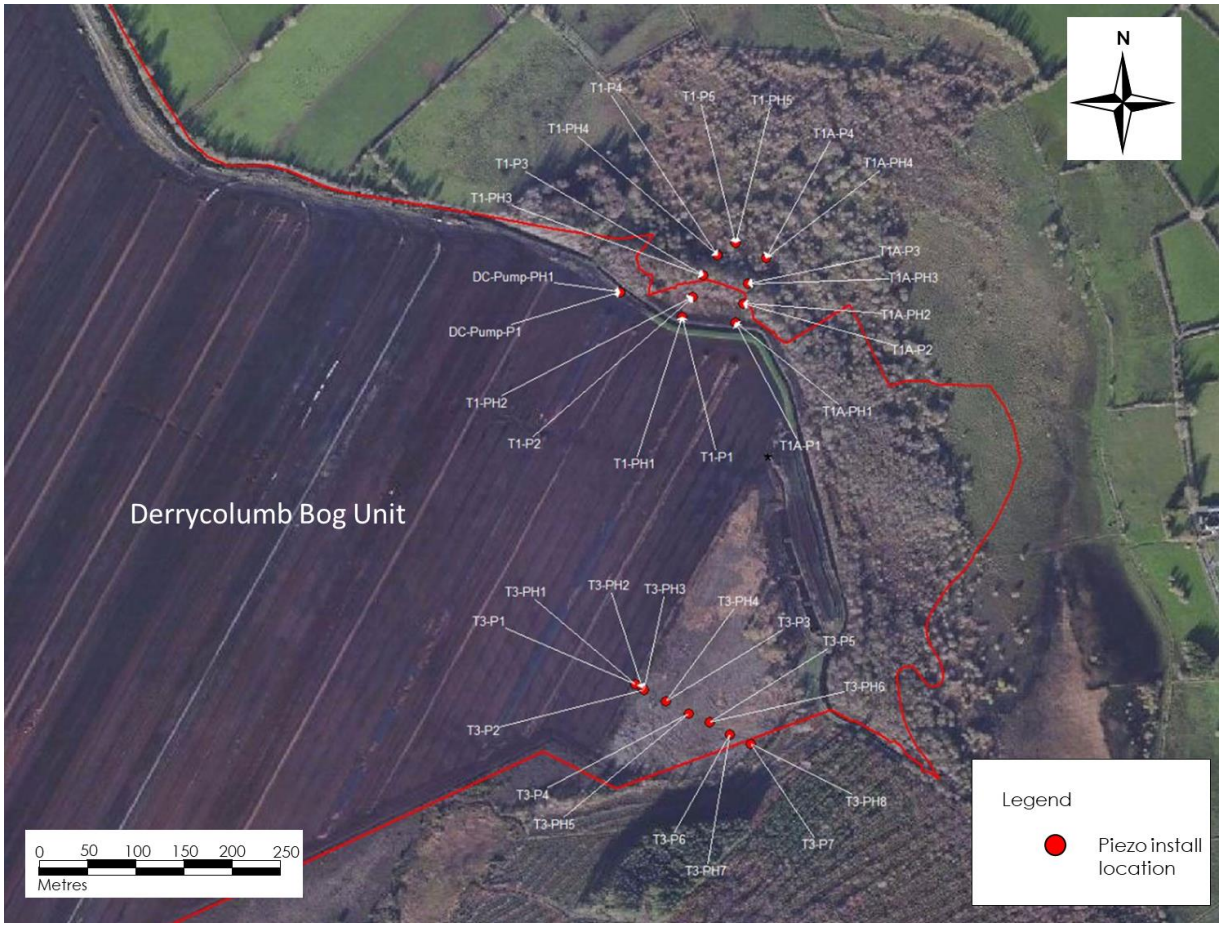



**Figure C: Derrycolumb - piezometer install location map**

## 2.3 MONGAN

Table C provides a is a summary of the site investigation and piezometer install works at the Mongan Study site.

**Table C: Summary of piezometer install works at Mongan Study site**

| Information Type | Data |
|---|---|
| Install Dates | August 2018 |
| No. of Transects | 3 (T1, T2, and T3) |
| No. of Shallow Phreatic Tubes | 26 |
| No. of Deep Peat Piezometers | 22 |
| No. of Mineral Soil Piezometers | 0 |
| Interval of Peat Depths Recorded (m) | 3.3-6.5 (n=26, σ=4.99) |
| Dates of Water Level Monitoring (by BnM) | Sept 2018 to February 2020 (n=19) |

Full details of the site investigation and piezometer install works are attached in **Appendix I**. A map of the Mongan piezometer install locations is shown below as **Figure D**.

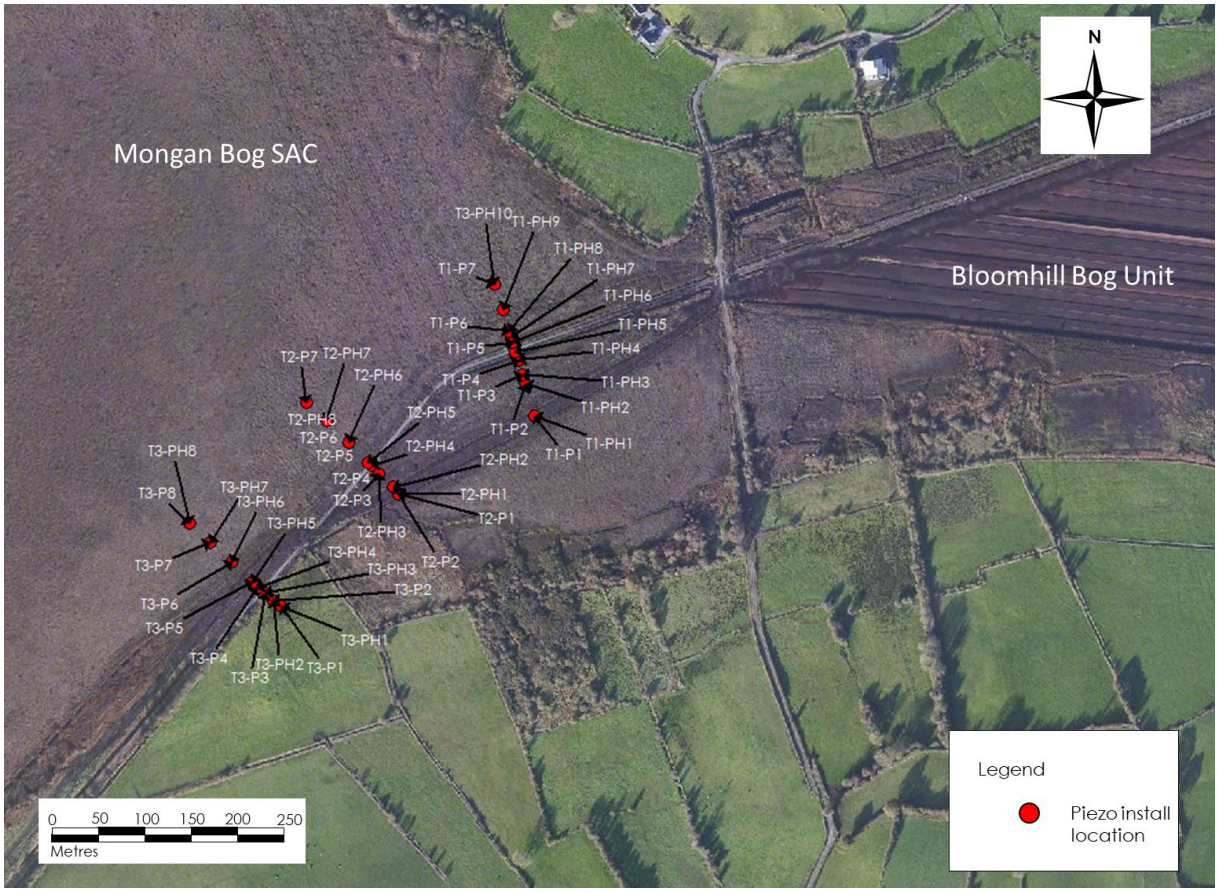



**Figure D: Mongan - piezometer install location map**

At Mongan bog, HES also completed a detailed survey of peat depths between Mongan bog and the adjacent Bloomhill bog unit. 34 no. peat depths were recorded. The minimum peat depth recorded was 1.55m, and the maximum peat depth recorded was 5.7m. The average peat depth recorded in the augering study area was 4.17m. Data from the Mongan augering study is attached in **Appendix II**.

## 2.4 GARRYDUFF

Table D provides a is a summary of the site investigation and piezometer install works at the Garryduff Study site.

**Table D: Summary of piezometer install works at Garryduff Study site**

| Information Type | Data |
|---|---|
| Install Dates | August 2018 |
| No. of Transects | 1 (T1) |
| No. of Shallow Phreatic Tubes | 4 |
| No. of Deep Peat Piezometers | 0 |
| No. of Mineral Soil Piezometers | 4 |
| Interval of Peat Depths Recorded (m) | 1.8-3.10 (n=4, σ=2.12) |
| Dates of Water Level Monitoring (by BnM) | Aug 2018 to December 2019 (n=18) |

Full details of the site investigation and piezometer install works are attached in **Appendix III**. A map of the Garryduff piezometer install locations is shown below as **Figure E**. An existing shallow and deep set of monitoring wells existed to the south of the pump station as shown on **Figure E.**

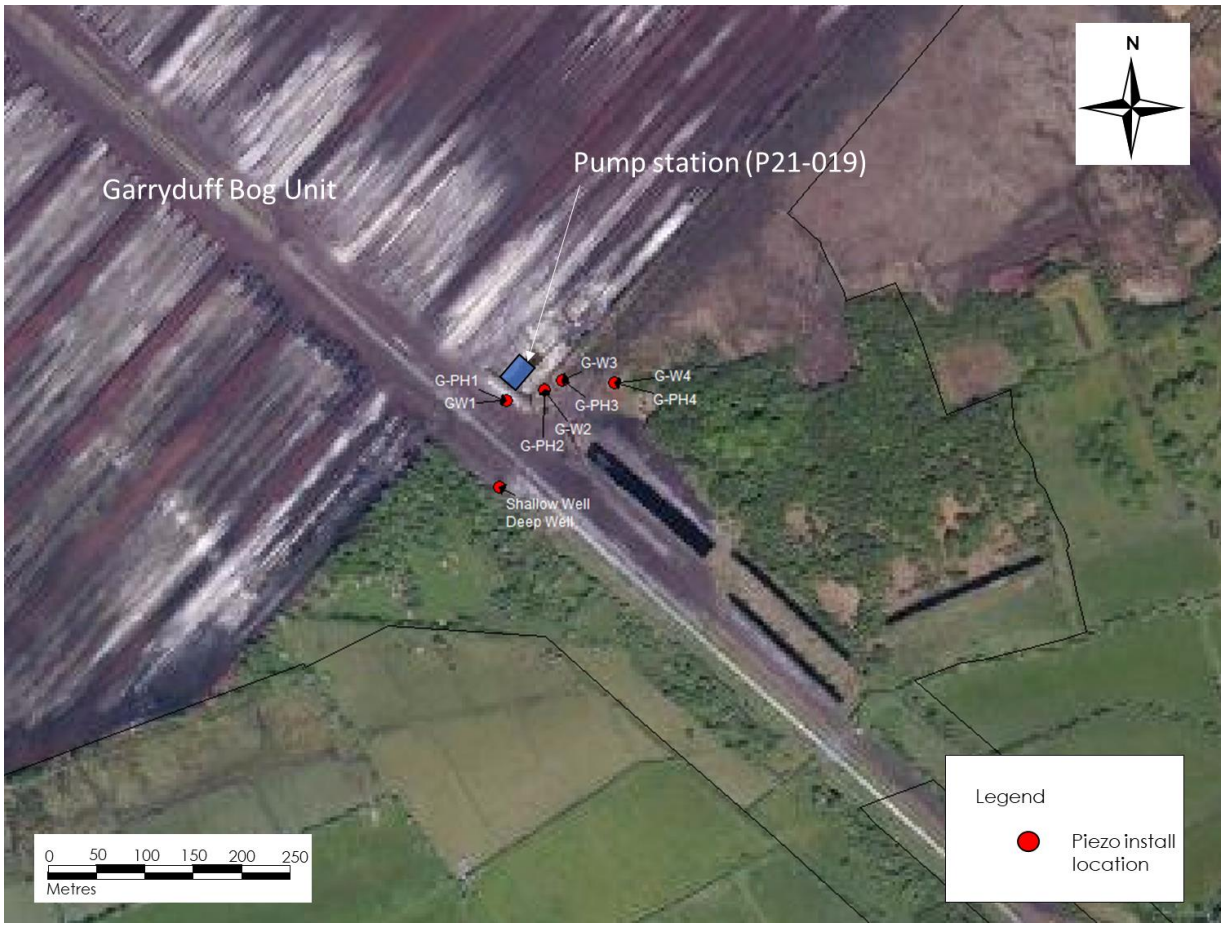



**Figure E: Garryduff - piezometer install location map**

# 3. HYDROLOGICAL ANALYSIS

## 3.1 BLACKWATER

Data and water level plots for the Blackwater study site are attached in **Appendix IV**.

The following is observed from analysis of the seasonal water level data:

- Water levels in cutover parts of Blackwater bog show less seasonal fluctuations than those to the north of the Gowlan River (within the designated Finlough SAC area);
- Beyond ~50m to the south of the Gowlan River, water levels in all phreatic tubes are consistently within 10cm or less of the residual peat surface level with only small temporal fluctuations. The field drains in this area are blocked and essentially those measures have stabilised the hydrology to the benefit of the local vegetation;
- Further to the south, where operational field drains occur along open production fields, water levels in the peat profile are deep, and well below ground level (up to 0.75m below ground level). This shows the influence of field drains, as within 20/30m where drains are locked water levels are consistently higher as outlined above; and,
- The influence of the Gowlan River on water levels is apparent, especially to the north of the river where seasonal fluctuations in water levels can be as deep as 1m below ground level.

## 3.2 DERRYCOLUMB

Data and water level plots for the Derrycolumb study site are attached in **Appendix V**.

The following is observed from analysis of the seasonal water level data:

- Water levels in piezometers [along T1 and T1A] close to the deep bog boundary drain [northeastern corner of the bog] and pumping station P05-031 show higher seasonal fluctuations than those to the north of the bog, remote from the deep bog boundary drain;
- Beyond ~50 to ~80m to the north of the deep bog boundary drain, along Transect 1 and Transect 1A, water levels in all phreatic tubes are consistently within 10cm or less of the natural peat surface level with only small temporal fluctuations. Beyond these distances the bog hydrology does not appear to be significantly altered by the drainage and pumping completed at Derrycolumb bog unit; and,
- Further to the south at T3, the facebank drain shows an influence on peat water levels to ~40m to the southeast of the facebank. Beyond ~40m water levels in all phreatic tubes are consistently within 10cm or less of the natural peat surface level with only small temporal fluctuations, and deeper piezometers also show normal temporal variations.

## 3.3 MONGAN

Data and water level plots for the Mongan study site are attached in **Appendix VI**.

The following is observed from analysis of the seasonal water level data:

- Water levels in piezometers along Transects T1, T2, and T3, close to rail line and associated drains show higher seasonal fluctuations than data from higher on the intact raised bog to the north;
- On the high bog there is a surface drain parallel to the facebank [on T1 and T2, not T3], and while this is blocked, it appears to have some continued influence on temporal (phreatic) water levels;

- Deep peat piezometers have water levels up to 1m below ground level, and this indicates a string downward gradient, and this is likely driven by deep perimeter drainage along the rail line, and the edge of the bog to the south;
- On the high bog within ~30 to ~40m of the rail line water levels in some phreatic tubes are occasionally (~50% of the time) within 10cm or less of the natural peat surface level, but with variable temporal fluctuations; and,
- From visual inspection there appears to be significant surface subsidence towards the rail line along the southern edge of Mongan bog.

## 3.4 GARRYDUFF

Data and water level plots for the Garryduff study site are attached in **Appendix VII**. Continuous water level monitoring was also completed in GW1 and GW2, and these data are plotted and also included in **Appendix VII**. On/off operational data (time series of when duty and standby pumps were on/off) for the pumping station was also provided by BnM.

The following is observed from analysis of the seasonal water level data:

- The pumping station is operated almost continuously, and it has a high low float switch, and a duty and standby pump set;
- Most of the water pumped is surface water, which feeds towards the sump via a network of field drains off the adjacent Garryduff bog unit;
- The pump sump is ~4.5m deep;
- Water level observations in the deep wells (GW1, GW2, GW3, and GW4) do not appear to respond (rise and fall) significantly to on/off pumping in the pump sump;
- Seasonal variations in deeper (mineral soil) water levels vary by ~1m. This is not significant;
- Shallow peat water levels do not appear to respond to pumping or changes of water level in the pump sump;
- Shallow peat water levels are influenced by deep drains at the edge of the bog; and,
- Water levels at GW4 and GPH4 do not appear to be influenced at all by drawdown at the pumping station. These wells are ~60m from the pumping station.

In order extrapolate our observations from Garryduff to all pumping sites, we have completed a sensitivity analysis on $R_0$ (radius of influence) calculations using the Sichardt equation (Section 6.2.1 of CIRIA, 2000)[2]. Using variations in permeability of the mineral soil profile, and varying the thickness of mineral soils, indicates that even in the most extreme of circumstances (i.e. using the most conservative values) the radius of influence of shallow pumping stations is <300m. this is without even trying to separate out groundwater flows from surface water flows (*i.e.* the analysis assumes all water is coming from groundwater, which is clearly not the case).

[2] Groundwater Control – Design and Practice, CIRIA C515, 2000.

# 4. SUMMARY CONCLUSIONS

We have used the water level data to attempt to determine conservative Zone of Influences for peat works field drains, deep perimeter drains, facebank drains, and pumping stations.

The following was observed:

- Without blocking or management, field drains can influence peat water levels at a distance of up to 30m;
- Deep perimeter bog drains can have an influence on peat water levels at a distance of between ~50-80m. Applying a zone of influence distance of 100m would be a conservative buffer;
- The influence of facebank drains depends on the height of the facebank. But data from Derrycolumb indicates that water levels on the high bog adjacent to a 1.5m high facebank (with drain along production side) are not significantly influenced by the facebank and associated drainage beyond ~40m distance. Applying a zone of influence distance of 60m would be a conservative buffer; and,
- Data from Garryduff bog indicates that the pumping station there (P21-019) does not significantly influence water levels in monitoring wells at a distance of ~60m from the pump sump. Additional hydrogeological modelling and analysis indicates that even when using the most conservative aquifer parameters the zone of influence of BnMs pumping stations (which are generally <5m deep) on local groundwater levels is likely to be <300m.

* * * * * * * * * * * * * * * * * * * *

# APPENDIX I: SITE INVESTIGATION DATA

| Bog | Date | Transect | Piezo type | Location ID | Easting | Northing | Top of Pipe (mOD) | Ground Level (mOD) | peat depth (m) | peat interval(mbgl) | marl interval (mbgl) | lacustrine clay interval (mbgl) | standpipe screen (mbgl) | piezoemter screen (mbgl) | upstand (m) | Top of Pipe (mOD) | Ground Level (mOD) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Blackwater | Jul-18 | T1 | phreatic | T1-PH1A | 202510.2 | 229238 | 37.544 | 36.459 | 0.4 | 0-0.4 | 0.4->1.2 | - | 0-1.0 | 1.10 | | 37.544 | 36.459 |
| Blackwater | Jul-18 | T1 | phreatic | T1-PH1 | 202528.1 | 229258.9 | 37.528 | 36.471 | 1.44 | 0-1.44 | 1.44->2.0 | - | 0-1.0 | - | 1.00 | 37.528 | 36.471 |
| Blackwater | Jul-18 | T1 | Piezo | T1-P1 | 202528.4 | 229258.7 | 37.518 | 36.54 | | | | | | 1.1-1.4 | 0.98 | 37.518 | 36.54 |
| Blackwater | Jul-18 | T1 | phreatic | T1-PH2 | 202567.5 | 229297.7 | 37.963 | 36.64 | 0.57 | 0-0.57 | 0.57->2.0 | - | 0-1.0 | - | 1.35 | 37.963 | 36.64 |
| Blackwater | Jul-18 | T1 | phreatic | T1-PH3 | 202601.4 | 229334.1 | 37.702 | 36.654 | 0.4 | 0-0.4 | 0.4->1.0 | - | 0-1.0 | - | 1.06 | 37.702 | 36.654 |
| Blackwater | Jul-18 | T1 | phreatic | T1-PH4 | 202635.4 | 229370.7 | 37.705 | 36.691 | 2.4 | 0-2.4 | 2.4->3.0 | - | 0-1.0 | | 1.03 | 37.705 | 36.691 |
| Blackwater | Jul-18 | T1 | Piezo | T1-P2 | 202635.4 | 229370.5 | 37.817 | 36.692 | | | | | | 2.0-2.3 | 1.13 | 37.817 | 36.692 |
| Blackwater | Jul-18 | T1 | phreatic | T1-PH5 | 202670 | 229406.5 | 38.113 | 37.203 | 1.16 | 0-1.116 | 1.16-1.56 | 1.56-2.36 (brown silt) | 0-1.0 | | 0.91 | 38.113 | 37.203 |
| Blackwater | Jul-18 | T1 | Piezo | T1-P3 | 202670.4 | 229406.3 | 38.169 | 37.17 | | | | | | 0.8-1.10 | 1.00 | 38.169 | 37.17 |
| Blackwater | Jul-18 | T1 | phreatic | T1-PH6 | 202687.7 | 229424.4 | 38.303 | 37.557 | 1.35 | 0-1.35 | 1.35->3.0 | - | 0-1.0 | | 1.00 | 38.303 | 37.557 |
| Blackwater | Jul-18 | T1 | Piezo | T1-P4 | 202687.8 | 229424.1 | 38.526 | 37.537 | | | | | | 1.0-1.3 | 0.78 | 38.526 | 37.537 |
| Blackwater | Jul-18 | T1 | phreatic | T1-PH7 | 202704.8 | 229441.9 | 39.049 | 38.137 | 2.4 | 0-2.4 | 2.4->3.0 | - | 0-1.0 | | 0.90 | 39.049 | 38.137 |
| Blackwater | Jul-18 | T1 | phreatic | T1-PH8 | 202714.1 | 229451.9 | 38.794 | 38.032 | 2.3 | 0-2.3 | 2.3-4.2 | 4.2->5.0 | 0-2.0 | | 0.77 | 38.794 | 38.032 |
| Blackwater | Jul-18 | T1 | Piezo | T1-P5 | 202714.3 | 229451.6 | 38.7 | 38.042 | | | | | | 2.0-2.3 | 0.70 | 38.7 | 38.042 |
| Blackwater | Jul-18 | T1 | phreatic | T1-PH9 | 202719.8 | 229457.1 | 38.845 | 37.729 | 2.4 | 0-2.4 | 2.4->3.0 | - | 0-1.0 | | 1.10 | 38.845 | 37.729 |
| Blackwater | Jul-18 | T1 | Piezo | T1-P6 | 202719.5 | 229457.2 | 38.675 | 37.714 | | | | | | 2.15-2.45 | 0.96 | 38.675 | 37.714 |
| Blackwater | Jul-18 | T1 | phreatic | T1-PH10 | 202723.8 | 229461.8 | 39.27.1 | 38.365 | 2.56 | 0-2.56 | 2.56->3.0 | - | 0-1.0 | | 0.92 | 39.271 | 38.365 |
| Blackwater | Jul-18 | T1 | Piezo | T1-P7 | 202724.1 | 229461.6 | 39.178 | 38.353 | | | | | | 2.25-2.55 | 0.86 | 39.178 | 38.353 |
| Blackwater | Jul-18 | T1 | phreatic | T1-PH11 | 202729.9 | 229468 | 39.572 | 38.893 | 2.8 | 0-2.8 | 2.8->3.0 | - | 0-1.0 | | 0.75 | 39.572 | 38.893 |
| Blackwater | Jul-18 | T1 | Piezo | T1-P8 | 202729.6 | 229468.4 | 39.57 | 38.894 | | | | | | 2.40-2.70 | 0.70 | 39.57 | 38.894 |
| Blackwater | Jul-18 | T1 | phreatic | T1-PH12 | 202747.6 | 229486.2 | 39.948 | 38.948 | 3.41 | 0-3.41 | 3.0->4.0 | - | 0-1.0 | | 1.00 | 39.948 | 38.948 |
| Blackwater | Jul-18 | T1 | Piezo | T1-P9 | 202747.5 | 229485.9 | 39.213 | 38.898 | | | | | | 2.8-3.1 | 0.35 | 39.213 | 38.898 |
| Blackwater | Jul-18 | T1 | phreatic | T1-PH13 | 202764.4 | 229503.4 | 39.534 | 38.546 | 2.05 | 0-2.05 | 2.05->3.0 | - | 0-1.0 | | 1.43 | 39.534 | 38.546 |
| Blackwater | Jul-18 | T1 | Piezo | T1-P10 | 202764.4 | 229503.5 | 39.952 | 38.569 | | | | | | 1.7-2.0 | 1.00 | 39.952 | 38.569 |
| Blackwater | Jul-18 | T2 | phreatic | T2-PH1A | 202633.8 | 229111.5 | 38.242 | 36.71 | 1.95 | 0-1.95 | 1.95->2.5 | | 0-1.0 | | 1.55 | 38.242 | 36.71 |
| Blackwater | Jul-18 | T2 | phreatic | T2-PH1 | 202671.9 | 229140.9 | 37.523 | 36.421 | | in pond | | | 0-1.0 | | 1.06 | 37.523 | 36.421 |
| Blackwater | Jul-18 | T2 | phreatic | T2-PH2 | 202679.7 | 229147.4 | 37.878 | 36.888 | 0.75 | 0-0.75 | 0.75->2.0 | - | 0-1.0 | | 1.01 | 37.878 | 36.888 |
| Blackwater | Jul-18 | T2 | Piezo | T2-P1 | 202679.9 | 229147.2 | 37.832 | 36.849 | | | | | | 0.45-0.75 | 1.00 | 37.832 | 36.849 |
| Blackwater | Jul-18 | T2 | phreatic | T2-PH3 | 202717.9 | 229179.7 | 37.533 | 36.724 | 0.4 | 0-0.4 | 0.4->2.0 | - | 0-1.0 | | 0.82 | 37.533 | 36.724 |
| Blackwater | Jul-18 | T2 | phreatic | T2-PH4 | 202755.6 | 229212.2 | 37.773 | 36.77 | 1.67 | 0-1.67 | 1.67->2.5 | - | 0-1.0 | | 1.02 | 37.773 | 36.77 |
| Blackwater | Jul-18 | T2 | Piezo | T2-P2 | 202755.8 | 229212.1 | 37.758 | 36.776 | | | | | | 1.25-1.55 | 1.00 | 37.758 | 36.776 |
| Blackwater | Jul-18 | T2 | phreatic | T2-PH5 | 202794.3 | 229244.6 | 38.096 | 37.061 | 1.1 | 0-1.1 | 1.1->2.0 | - | 0-1.0 | | 1.05 | 38.096 | 37.061 |
| Blackwater | Jul-18 | T2 | Piezo | T2-P3 | 202794 | 229244.8 | 38.05 | 37.08 | | | | | | 0.7-1.0 | 1.00 | 38.05 | 37.08 |
| Blackwater | Jul-18 | T2 | phreatic | T2-PH6 | 202832.9 | 229278.1 | 38.216 | 37.287 | 1.44 | 0-1.44 | 1.44->2.0 | - | 0-1.0 | | 0.93 | 38.216 | 37.287 |
| Blackwater | Jul-18 | T2 | Piezo | T2-P4 | 202832.7 | 229278.3 | 38.279 | 37.25 | | | | | | 1.1-1.4 | 1.02 | 38.279 | 37.25 |
| Blackwater | Jul-18 | T2 | phreatic | T2-PH7 | 202851.7 | 229293.2 | 38.78 | 37.759 | 2.05 | 0-2.05 | 2.05->3.0 | - | 0-1.0 | | 1.05 | 38.78 | 37.759 |
| Blackwater | Jul-18 | T2 | Piezo | T2-P5 | 202851.6 | 229293.5 | 38.79 | 37.785 | | | | | | 1.7-2.0 | 1.02 | 38.79 | 37.785 |
| Blackwater | Jul-18 | T2 | phreatic | T2-PH8 | 202857.3 | 229302.1 | 38.337 | 37.484 | 1.8 | 0-1.8 | 1.8->2.2 | - | 0-1.5 | | 0.865 | 38.337 | 37.484 |
| Blackwater | Jul-18 | T2 | Piezo | T2-P6 | 202857 | 229302.1 | 38.041 | 37.48 | | | | | | 1.5-1.8 | 0.55 | 38.041 | 37.48 |
| Blackwater | Jul-18 | T2 | phreatic | T2-PH9 | 202861.8 | 229307.6 | 38.056 | 36.912 | 0.8 | 0-0.8 | 0.8->2.0 | - | 0-0.8 | | 1.14 | 38.056 | 36.912 |
| Blackwater | Jul-18 | T2 | Piezo | T2-P7 | 202861.6 | 229307.7 | 38.194 | 36.922 | | | | | | 0.5-0.8 | 1.275 | 38.194 | 36.922 |
| Blackwater | Jul-18 | T2 | phreatic | T2-PH10 | 202873.5 | 229312.1 | 38.076 | 37.532 | 0.7 | 0-0.7 | 0.7->1.6 | - | 0-0.8 | | | 38.076 | 37.532 |
| Blackwater | Jul-18 | T2 | Piezo | T2-P8 | 202873.5 | 229312 | 38.194 | 37.533 | | | | | | 0.4-0.7 | 0.7 | 38.194 | 37.533 |
| Blackwater | Jul-18 | T2 | phreatic | T2-PH11 | 202892.3 | 229327.8 | 39.514 | 37.991 | 0.5 | 0-0.5 | - | 0.5->1.0 | 0-1.0 | | 1.58 | 39.514 | 37.991 |
| Blackwater | Jul-18 | T2 | phreatic | T2-PH12 | 202912 | 229344.5 | 39.473 | 38.055 | 0.25 | 0-0.25 | | 0.25->1.0 | 0-1.0 | | 1.62 | 39.473 | 38.055 |
| Blackwater | Jul-18 | T2 | phreatic | T2-PH13 | 202931.8 | 229361.1 | 39.359 | 37.993 | 0.15 | 0-0.15 | - | 0.15->1.0 | 0-1.0 | | 1.52 | 39.359 | 37.993 |
| Blackwater | Aug-18 | T3 | phreatic | T3-PH1 | 202840.9 | 228696 | 37.848 | 36.81 | 0.85 | 0-0.85 | 0.85->1.0 | - | 0-1.0 | | 1.04 | 37.848 | 36.81 |
| Blackwater | Aug-18 | T3 | phreatic | T3-PH2 | 202870.9 | 228723.5 | 38.077 | 37.216 | 1.2 | 0-1.2 | 1.2-1.6 | 1.6->2.0 | 0-1.0 | | 0.875 | 38.077 | 37.216 |
| Blackwater | Aug-18 | T3 | Piezo | T3-P1 | 202870.7 | 228723.7 | 38.297 | 37.221 | | | | | | 0.9-1.2 | 1.085 | 38.297 | 37.221 |
| Blackwater | Aug-18 | T3 | phreatic | T3-PH3 | 202906.9 | 228757.5 | 38.605 | 37.535 | 2.25 | 0-2.25 | 2.25->3.0 | - | 0-1.0 | | 1.07 | 38.605 | 37.535 |
| Blackwater | Aug-18 | T3 | Piezo | T3-P2 | 202906.7 | 228757.7 | 37.844 | 37.353 | | | | | | 1.8-2.1 | 0.32 | 37.844 | 37.353 |
| Blackwater | Aug-18 | T3 | phreatic | T3-PH4 | 202944.5 | 228790.6 | 37.643 | 37.114 | 1.73 | 0-1.73 | 1.73->2.6 | | 0-1.0 | | 1.05 | 37.643 | 37.114 |
| Blackwater | Aug-18 | T3 | Piezo | T3-P3 | 202944.7 | 228790.3 | 38.18 | 37.094 | | | | | | 1.4-1.7 | 0.55 | 38.18 | 37.094 |
| Blackwater | Aug-18 | T3 | phreatic | T3-PH5 | 202980.9 | 228827.2 | 38.651 | 37.244 | 1.8 | 0-1.8 | 1.8->2.6 | - | 0-1.0 | | 1.37 | 38.651 | 37.244 |
| Blackwater | Aug-18 | T3 | Piezo | T3-P4 | 202980.6 | 228827.5 | 37.764 | 37.275 | | | | | | 1.4-1.7 | 0.48 | 37.764 | 37.275 |
| Blackwater | Aug-18 | T3 | phreatic | T3-PH6 | 203016.9 | 228864.3 | 38.473 | 37.383 | 1.5 | 0-1.5 | 1.5->2.6 | - | 0-1.0 | | 1.1 | 38.473 | 37.383 |
| Blackwater | Aug-18 | T3 | Piezo | T3-P5 | 203016.7 | 228864.7 | 38.238 | 37.379 | | | | | | 1.1-1.4 | 0.87 | 38.238 | 37.379 |
| Blackwater | Aug-18 | T3 | phreatic | T3-PH7 | 203054.6 | 228897.5 | 38.338 | 37.334 | 1.3 | 0-1.3 | 1.3->2.0 | - | 0-1.0 | | 1.02 | 38.338 | 37.334 |
| Blackwater | Aug-18 | T3 | Piezo | T3-P6 | 203054.3 | 228897.7 | 37.822 | 37.327 | | | | | | 0.9-1.2 | 0.5 | 37.822 | 37.327 |
| Blackwater | Aug-18 | T3 | phreatic | T3-PH8 | 203089.9 | 228934.5 | 38.471 | 37.47 | 1.2 | 0-1.2 | 1.2->2.0 | - | 0-1.0 | | 1.02 | 38.471 | 37.47 |
| Blackwater | Aug-18 | T3 | phreatic | T3-PH9 | 203105.6 | 228951.4 | 38.436 | 37.306 | 0.8 | 0-0.8 | 0.8->2.0 | - | 0-1.0 | | 1.18 | 38.436 | 37.306 |
| Blackwater | Aug-18 | T3 | phreatic | T3-PH10 | 203111.8 | 228960.5 | 38.218 | 37.186 | 0.8 | 0-0.8 | 0.8->1.6 | - | 0-1.0 | | 1.01 | 38.218 | 37.186 |
| Blackwater | Aug-18 | T3 | Piezo | T3-P7 | 203111.8 | 228960.8 | 37.751 | 37.191 | | | | | | 0.5-0.8 | 0.56 | 37.751 | 37.191 |
| Blackwater | Aug-18 | T3 | phreatic | T3-PH11 | 203118.7 | 228962.2 | 37.809 | 36.838 | 0.75 | 0-0.75 | 0.75->1.2 | - | 0-0.7 | | 0.8 | 37.809 | 36.838 |
| Blackwater | Aug-18 | T3 | Piezo | T3-P8 | 203118.7 | 228962.4 | 37.372 | 36.816 | | | | | | 0.3-0.7 | 0.72 | 37.372 | 36.816 |
| Blackwater | Aug-18 | T3 | phreatic | T3-PH12 | 203127 | 228968 | 38.882 | 37.273 | 0.15 | 0-0.15 | 0.15->1.0 | - | 0-1.0 | | 1.6 | 38.882 | 37.273 |
| Blackwater | Aug-18 | T3 | phreatic | T3-PH13 | 203147.4 | 228982 | 39.219 | 37.824 | 0.15 | 0-0.15 | 0.15->1.0 | - | 0-1.0 | | 1.52 | 39.219 | 37.824 |
| Blackwater | Aug-18 | T3 | phreatic | T3-PH14 | 203165.7 | 229000.5 | 39.225 | 37.764 | 0.12 | 0-0.12 | - | 0.12->1.0 | 0-1.0 | | 1.52 | 39.225 | 37.764 |
| Blackwater | Aug-18 | T3 | phreatic | T3-PH15 | 203186.1 | 229016.3 | 39.225 | 37.693 | 0.1 | 0-0.1 | - | 0.1->1.0 | 0-1.0 | | 1.575 | 39.225 | 37.693 |
| Blackwater | Aug-18 | T3 | phreatic | T3-PH1 Replaced | 602791.0 | 728724.2 | | | | | | | | | | 37.59 | |

| Bog | Date | Transect | Piezo type | Location ID | Easting | Northing | peat depth (m) | peat interval(mbgl) | marl interval (mbgl) | lacustrine clay interval (mbgl) | standpipe screen (mbgl) | piezoemter screen (mbgl) | upstand (m) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Derrycolumb | Aug-18 | T1 | phreatic | T1-PH1 | 209308 | 260082 | 6.54 | 0-6.54 | 6.54->7.0 | - | 0.26-1.26 | | 0.74 |
| Derrycolumb | Aug-18 | T1 | Piezo | T1-P1 | 209308 | 260082 | | | | | | 5.7-6.0 | 0.33 |
| Derrycolumb | Aug-18 | T1 | phreatic | T1-PH2 | 209319 | 260103 | 5.7 | 0-5.7 | 5.7->6.0 | - | 0-1.0 | | 0.92 |
| Derrycolumb | Aug-18 | T1 | Piezo | T1-P2 | 209319 | 260103 | | | | | | 5.3-5.6 | 0.81 |
| Derrycolumb | Sep-18 | T1 | phreatic | T1-PH3 | 209329 | 260125 | 3.2 | 0-3.2 | 3.2->4.0 | | 0-1.0 | | 0.98 |
| Derrycolumb | Sep-18 | T1 | Piezo | T1-P3 | 209329 | 260125 | | | | | | 2.8-3.1 | 0.3 |
| Derrycolumb | Sep-18 | T1 | phreatic | T1-PH4 | 209344 | 260140 | 5.1 | 0-5.1 | | 5.1-6.1 | 0-1.0 | | 0.89 |
| Derrycolumb | Sep-18 | T1 | Piezo | T1-P4 | 209344 | 260140 | | | | | | 4.7-5.0 | 1.05 |
| Derrycolumb | Sep-18 | T1 | phreatic | T1-PH5 | 209363 | 260159 | 4 | >4.0 | | | 0-1.0 | | 0.98 |
| Derrycolumb | Sep-18 | T1 | Piezo | T1-P5 | 209363 | 260159 | | | | | | 2.6-2.9 | 0.54 |
| Derrycolumb | Aug-18 | T1A | phreatic | T1A-PH1 | 209363 | 260076 | 7 | >7 | - | - | 0.34-1.34 | | 0.66 |
| Derrycolumb | Aug-18 | T1A | Piezo | T1A-P1 | 209363 | 260076 | | | | | | 5.1-5.4 | 0.39 |
| Derrycolumb | Aug-18 | T1A | phreatic | T1A-PH2 | 209371 | 260096 | 5.5 | 0-5.5 | 5.5-5.8 | | 0-1.0 | | 0.84 |
| Derrycolumb | Aug-18 | T1A | Piezo | T1A-P2 | 209371 | 260096 | | | | | | 4.0-4.3 | 0.72 |
| Derrycolumb | Sep-18 | T1A | phreatic | T1A-PH3 | 209376 | 260116 | 3.8 | 0-3.8 | 3.8->4.0 | | 0-1.0 | | 1 |
| Derrycolumb | Sep-18 | T1A | Piezo | T1A-P3 | 209376 | 260116 | | | | | | 3.2-3.5 | 0.97 |
| Derrycolumb | Sep-18 | T1A | phreatic | T1A-PH4 | 209394 | 260143 | 4 | >4.0 | | | 0-1.0 | | 0.93 |
| Derrycolumb | Sep-18 | T1A | Piezo | T1A-P4 | 209394 | 260143 | | | | | | 2.3-2.6 | 0.8 |
| Derrycolumb | Aug-18 | T3 | phreatic | T3-PH1 | 209264 | 259702 | 3.5 | 0-3.5 | 3.5-4.1 | 4.1->5.0 | 0-2.0 | | 1 |
| Derrycolumb | Aug-18 | T3 | piezo | T3-P1 | 209264 | 259702 | | | | | | 3.0-3.3 | 0.13 |
| Derrycolumb | Aug-18 | T3 | phreatic | T3-PH2 | 209271 | 259698 | 3.5 | 0-3.5 | | | 0-1.0 | | 0.66 |
| Derrycolumb | Aug-18 | T3 | phreatic | T3-PH3 | 209273 | 259696 | 3.7 | 0-3.7 | 3.7-4.0 | 4.0->5 | 0-1.0 | | 1.03 |
| Derrycolumb | Aug-18 | T3 | Piezo | T3-P2 | 209273 | 259696 | | | | | | 2.97-3.27 | 0.17 |
| Derrycolumb | Aug-18 | T3 | phreatic | T3-PH4 | 209296 | 259685 | 4.56 | 0-4.56 | 4.56->5.0 | - | 0-1.0 | | 1 |
| Derrycolumb | Aug-18 | T3 | Piezo | T3-P3 | 209296 | 259685 | | | | | | 4.17-4.47 | 0.93 |
| Derrycolumb | Aug-18 | T3 | phreatic | T3-PH5 | 209319 | 259672 | 5.5 | 0-5.5 | 5.5->6.0 | - | 0-1.0 | | 1.02 |
| Derrycolumb | Aug-18 | T3 | Piezo | T3-P4 | 209319 | 259672 | | | | | | 4.6-4.9 | 0.5 |
| Derrycolumb | Aug-18 | T3 | phreatic | T3-PH6 | 209341 | 259663 | 5.2 | 0-5.2 | 5.2->6.0 | - | 0-1.0 | | 1.04 |
| Derrycolumb | Aug-18 | T3 | Piezo | T3-P5 | 209341 | 259663 | | | | | | 4.88-5.18 | 0.67 |
| Derrycolumb | Aug-18 | T3 | phreatic | T3-PH7 | 209362 | 259651 | 5.45 | 0-5.45 | 5.45->6.0 | - | 0-1.0 | | 1.01 |
| Derrycolumb | Aug-18 | T3 | Piezo | T3-P6 | 209362 | 259651 | | | | | | 4.9-5.2 | 0.54 |
| Derrycolumb | Aug-18 | T3 | phreatic | T3-PH8 | 209384 | 259641 | 3.7 | 0-3.7 | 3.7->5.2 | - | 0-1.0 | | 1.05 |
| Derrycolumb | Aug-18 | T3 | Piezo | T3-P7 | 209384 | 259641 | | | | | | 3.10-3.40 | 0.14 |
| Derrycolumb | Sep-18 | T4 | phreatic | DC-Pump-PH1 | 209244 | 260107 | 3.4 | 0-3.4 | 3.4->4.0 | | 0.3-1.3 | | 0.7 |
| Derrycolumb | Sep-18 | T4 | Piezo | DC-Pump-P1 | 209244 | 260107 | | | | | | 2.8-3.1 | 0.27 |

| Bog | Date | Transect | Piezo type | Location ID | Easting | Northing | peat depth (m) | peat interval(mbgl) | marl interval (mbgl) | lacustrine clay interval (mbgl) | standpipe screen (mbgl) | piezoemter screen (mbgl) | upstand (m) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mongan | Aug-18 | T1 | phreatic | T1-PH1 | 204306 | 230832 | 5.48 | 0-5.48 | none | 5.48->5.78 | 0-1.0 | | 1.00 |
| Mongan | Aug-18 | T1 | Piezo | T1-P1 | 204306 | 230832 | | | | | | 4.8-5.1 | 1.29 |
| Mongan | Aug-18 | T1 | phreatic | T1-PH2 | 204299 | 230859 | 5.09 | 0-5.09 | none | 5.09->5.34 | 0.5-1.5 | | 0.50 |
| Mongan | Aug-18 | T1 | Piezo | T1-P2 | 204299 | 230859 | | | | | | 4.7-5.0 | 1.06 |
| Mongan | Aug-18 | T1 | phreatic | T1-PH3 | 204295 | 230868 | 4.41 | 0-4.41 | none | | 0.5-1.5 | | 0.50 |
| Mongan | Aug-18 | T1 | Piezo | T1-P3 | 204295 | 230868 | | | | | | 3.9-4.2 | 0.98 |
| Mongan | Aug-18 | T1 | phreatic | T1-PH4 | 204292 | 230880 | 5.1 | 0-5.10 | none | 5.1->5.35 | 0.5-1.5 | | 0.50 |
| Mongan | Aug-18 | T1 | Piezo | T1-P4 | 204292 | 230880 | | | | | | 4.7-5.0 | 1.43 |
| Mongan | Aug-18 | T1 | phreatic | T1-PH5 | 204289 | 230888 | 5 | >5.0 | | | 0-1.0 | | 1.00 |
| Mongan | Aug-18 | T1 | phreatic | T1-PH6 | 204287 | 230896 | 5.28 | 0-5.28 | none | | 0-1.0 | | 1.02 |
| Mongan | Aug-18 | T1 | Piezo | T1-P5 | 204287 | 230896 | | | | | | 4.7-5.0 | 1.43 |
| Mongan | Aug-18 | T1 | phreatic | T1-PH7 | 204286 | 230900 | 5 | >5.0 | | | 0-1.0 | | 0.98 |
| Mongan | Aug-18 | T1 | phreatic | T1-PH8 | 204284 | 230905 | 5.4 | 0-5.4 | none | | 0-1.0 | | 0.60 |
| Mongan | Aug-18 | T1 | Piezo | T1-P6 | 204284 | 230905 | | | | | | 5.0-5.3 | 1.09 |
| Mongan | Aug-18 | T1 | phreatic | T1-PH9 | 204278 | 230924 | 5.2 | >5.2 | | | 0-1.0 | | 1.00 |
| Mongan | Aug-18 | T1 | phreatic | T3-PH10 | 204271 | 230946 | 6.5 | 0-6.5 | none | 6.5->6.8 | 0-1.0 | | 1.02 |
| Mongan | Aug-18 | T1 | Piezo | T1-P7 | 204271 | 230946 | | | | | | 4.85-5.15 | 1.27 |
| Mongan | Aug-18 | T2 | phreatic | T2-PH1 | 204187 | 230763 | 4.7 | 0-4.7 | none | 4.7->4.95 | 0.5-1.5 | | 0.5 |
| Mongan | Aug-18 | T2 | piezo | T2-P1 | 204187 | 230763 | | | | | | 3.75-4.05 | 0.96 |
| Mongan | Aug-18 | T2 | phreatic | T2-PH2 | 204183 | 230769 | 4.72 | 0-4.72 | none | 4.7->5.0 | 0.5-1.5 | | 0.48 |
| Mongan | Aug-18 | T2 | piezo | T2-P2 | 204183 | 230769 | | | | | | 4.1-4.4 | 0.98 |
| Mongan | Aug-18 | T2 | phreatic | T2-PH3 | 204170 | 230760 | 4.75 | 0-4.75 | none | | 0.5-1.5 | | 0.5 |
| Mongan | Aug-18 | T2 | piezo | T2-P3 | 204170 | 230760 | | | | | | 4.4-4.7 | 0.68 |
| Mongan | Aug-18 | T2 | phreatic | T2-PH4 | 204163 | 230788 | 5.05 | 0-5.05 | none | 4.05->4.35 | 0-1.0 | | 1 |
| Mongan | Aug-18 | T2 | piezo | T2-P4 | 204163 | 230788 | | | | | | 4.7-5.0 | 0.9 |
| Mongan | Aug-18 | T2 | phreatic | T2-PH5 | 204160 | 230790 | 4 | >4.0 | | | 0-1.0 | | 0.95 |
| Mongan | Aug-18 | T2 | phreatic | T2-PH6 | 204143 | 230807 | 5.3 | 0-5.3 | none | 4.3->4.65 | 0-1.0 | | 1 |
| Mongan | Aug-18 | T2 | piezo | T2-P5 | 204143 | 230807 | | | | | | 4.6-4.9 | 0.52 |
| Mongan | Aug-18 | T2 | phreatic | T2-PH7 | 204124 | 230826 | 5.45 | 0-5.45 | none | 5.45->5.68 | 0-1.0 | | 0.98 |
| Mongan | Aug-18 | T2 | piezo | T2-P6 | 204124 | 230826 | | | | | | 5.05-5.35 | 1.05 |
| Mongan | Aug-18 | T2 | phreatic | T2-PH8 | 204106 | 230842 | 5.7 | 0-5.7 | none | 5.7->5.95 | 0-1.0 | | 1.05 |
| Mongan | Aug-18 | T2 | piezo | T2-P7 | 204106 | 230842 | | | | | | 5-5.3 | 0.8 |
| Mongan | Aug-18 | T3 | phreatic | T3-PH1 | 204085 | 230664 | 3.3 | 0-3.3 | none | 3.3->3.65 | 0.5-1.5 | | 1.18 |
| Mongan | Aug-18 | T3 | Piezo | T3-P1 | 204085 | 230664 | | | | | | 2.43-2.73 | 0.67 |
| Mongan | Aug-18 | T3 | phreatic | T3-PH2 | 204077 | 230669 | 3.4 | 0-3.4 | none | 3.4->3.8 | 0.5-1.5 | | 1 |
| Mongan | Aug-18 | T3 | Piezo | T3-P2 | 204077 | 230669 | | | | | | 2.5-2.8 | 0.6 |
| Mongan | Aug-18 | T3 | phreatic | T3-PH3 | 204071 | 230675 | 4.62 | 0-4.62 | none | 4.62>4.9 | 0-1.0 | | 1.2 |
| Mongan | Aug-18 | T3 | Piezo | T3-P3 | 204071 | 230675 | | | | | | 4.05-4.35 | 1 |
| Mongan | Aug-18 | T3 | phreatic | T3-PH4 | 204063 | 230680 | 4.7 | 0-4.7 | none | 4.7->5.0 | 0-1.0 | | 1.01 |
| Mongan | Aug-18 | T3 | Piezo | T3-P4 | 204063 | 230680 | | | | | | 4.25-4.55 | 0.6 |
| Mongan | Aug-18 | T3 | phreatic | T3-PH5 | 204059 | 230685 | 4.85 | 0-4.85 | none | 4.85>5.25 | 0-1.0 | | 1.06 |
| Mongan | Aug-18 | T3 | Piezo | T3-P5 | 204059 | 230685 | | | | | | 4.4-4.7 | 0.7 |
| Mongan | Aug-18 | T3 | phreatic | T3-PH6 | 204041 | 230703 | 5.2 | 0-5.2 | none | 5.2>5.45 | 0-1.0 | | 1 |
| Mongan | Aug-18 | T3 | Piezo | T3-P6 | 204041 | 230703 | | | | | | 4.4-4.7 | 0.7 |
| Mongan | Aug-18 | T3 | phreatic | T3-PH7 | 204022 | 230719 | 5.7 | 0-5.7 | none | 5.7>5.99 | 0-1.0 | | 1 |
| Mongan | Aug-18 | T3 | Piezo | T3-P7 | 204022 | 230719 | | | | | | 5.1-5.4 | 1 |
| Mongan | Aug-18 | T3 | phreatic | T3-PH8 | 204004 | 230736 | 5.75 | 0-5.75 | none | 5.75>6.0 | 0-1.0 | | 1.2 |
| Mongan | Aug-18 | T3 | Piezo | T3-P8 | 204004 | 230736 | | | | | | 4.95-5.25 | 1.16 |

# APPENDIX II: MONGAN BOG – AUGERING DATA

| Bog | Location | Easting | Northing | peat depth (mbgl) | Mineral Soil Depth (mbgl) and description | Base type |
|---|---|---|---|---|---|---|
| Mongan | GC2 | 204493 | 230953 | 3.70 | no clay | hard base @ 3.7mbgl |
| Mongan | GC3 | 204543 | 230969 | 4.20 | 4.2-4.5 - lacustrine clay | hard base at 4.5mbgl |
| Mongan | GC4 | 204592 | 230989 | 4.60 | 4.6-4.8 - lacustrine clay | hard base at 4.8mbgl |
| Mongan | GC5 | 204386 | 230931 | 4.74 | no clay | hard base @ 4.74mbgl |
| Mongan | GC6 | 204436 | 230938 | 4.90 | 4.9-5.2 - soft lacustrine clay | hard base @ 5.2mbgl |
| Mongan | GC7 | 204470 | 230923 | 3.80 | grey fine soft clay | hard base @ 3.8mbgl |
| Mongan | GC8 | 204497 | 230928 | 4.05 | 4.05-4.15 - lacustrine clay | hard base @4.15mbgl |
| Mongan | GC9 | 204546 | 230943 | 3.80 | no clay | hard gravel @3.8mbgl |
| Mongan | GC10 | 204594 | 230952 | 4.62 | 4.62-4.82 - lacustrine clay | hard base @ 4.82mbgl |
| Mongan | GC11 | 204644 | 230964 | 4.60 | sandy/gravelly base | hard base @ 4.6mbgl |
| Mongan | GC12 | 204692 | 230971 | 2.75 | 2.75-2.95 - soft lacustrine clay | hard base @ 2.95mbgl |
| Mongan | GC13 | 204395 | 230885 | 5.25 | 5.25-5.35 - wet sand and gravel<br>5.35-5.55 - Lacustrine clay | hard base @ 5.55mbgl |
| Mongan | GC14 | 204439 | 230892 | 2.85 | 2.85-2.95 - light brown sand | hard base @ 2.95mbgl |
| Mongan | GC15 | 204479 | 230876 | 2.40 | no clay | hard base @ 2.4mbgl |
| Mongan | GC16 | 204507 | 230884 | 5.02 | 5.02-5.22- lacustrine clay | hard base @5.22mbgl |
| Mongan | GC16a | 204555 | 230883 | 4.60 | no clay | hard base @ 4.6mbgl |
| Mongan | GC17 | 204550 | 230912 | 3.35 | 3.35-3.55 - black lacustrine clay | hard base @3.55mbgl |
| Mongan | GC18 | 204597 | 230907 | 2.90 | 2.9-3.1 - lacustrine clay | hard base @ 3.10mbgl |
| Mongan | GC19 | 204636 | 230904 | 3.75 | 3.75-3.85 - lacustrine lay | hard base @ 3.85mbgl |
| Mongan | GC20 | 204682 | 230919 | 3.00 | no clay | hard base @ 3.0mbgl |
| Mongan | GC21 | 204404 | 230833 | 5.40 | 5.4-5.6 - grey lacustrine clay | hard base @ 5.6mbgl |
| Mongan | GC22 | 204454 | 230838 | 5.42 | 5.42-5.6 - grey lacustrine clay | hard base @ 5.6mbgl |
| Mongan | GC23 | 204485 | 230826 | 4.00 | 4.0-4.1 - grey sand<br>4.1-4.4 - grey lacustrine clay | hard base @ 4.4mbgl |
| Mongan | GC24 | 204516 | 230834 | 4.25 | 4.25-4.65 - light brown clay | hard base @ 4.65mbgl |
| Mongan | GC25 | 204565 | 230844 | 5.37 | 5.37-5.6 - lacustrine clay | hard base @ 5.6mbgl |
| Mongan | GC26 | 204613 | 230854 | 5.55 | no clay | hard base @ 5.55mbgl |
| Mongan | GC27 | 204657 | 230863 | 5.40 | 5.4-5.6 - lacustrine clay | hard base @ 5.6mbgl |
| Mongan | GC28 | 204710 | 230870 | 3.50 | 3.5-3.7 - lacustrine clay | hard base @ 3.7mbgl |
| Mongan | GC29 | 204408 | 230791 | 5.70 | no clay | hard base @ 5.7mbgl |
| Mongan | GC30 | 204458 | 230796 | 5.55 | no clay | hard base @ 5.55mbgl |
| Mongan | GC31 | 204489 | 230778 | 4.67 | 4.67-5.0 - grey lacustrine clay | hard base @ 5.0mbgl |
| Mongan | GC32 | 204522 | 230798 | 4.40 | 4.4-4.6 - lacustrine clay | hard base @ 4.6mbgl |
| Mongan | GC33 | 204573 | 230798 | 1.55 | 1.55-1.77 - lacustrine clay | hard base @ 1.77mbgl |
| Mongan | GC34 | 204617 | 230810 | 2.15 | no clay | hard base @ 2.15mbgl |

## APPENDIX III: GARRYDUFF WS LOGS

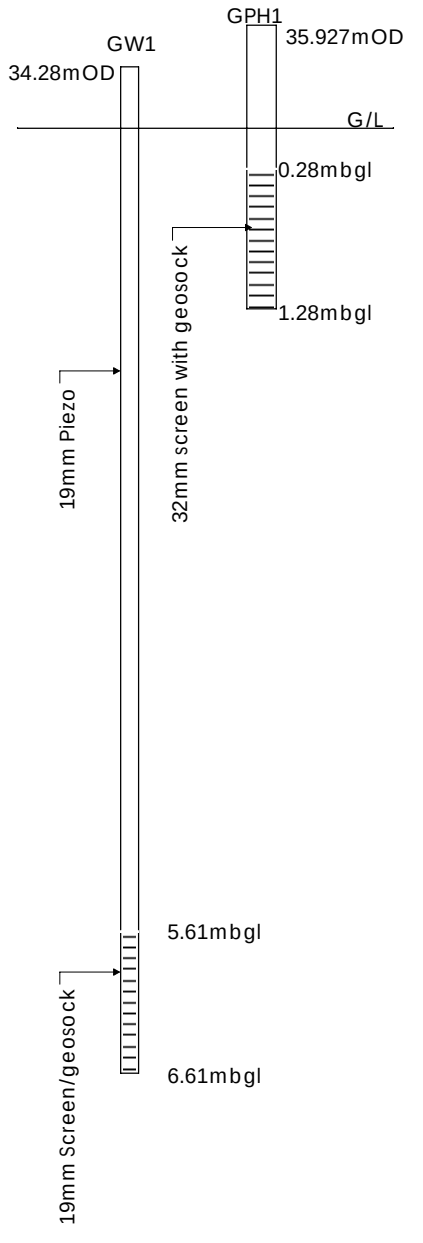
# CAMERA SURVEY LOG

**WELL NUMBER:** GW1

**PROJECT NUMBER:** P1420-1
**SITE:** Garyduff, Clonfert, Co. Galway
**CLIENT:** Bord na Mona
**DRILLING CONTRACTOR:** HES

**DATE STARTED:** 02/08/2018
**DATE FINISHED:** 09/08/2018
**LOGGED BY:** M. Gill
**DRILLING TYPE:** Hand augering and window sampling

**EASTING:** 196606
**NORTHING:** 222257
**ELEVATION:** 33.884 mOD

| Well Completion Description | Comments | Water Strikes | Elevation | Meters Below Ground Surface | Lithology | Formation Description |
|---|---|---|---|---|---|---|
|  | 3" PVC casing installed from ground level to top of mineral soil. Deep piezometer is installed wihtin this casing, with screened section installed below the base of the 3" casing.<br><br>The 3" casing was pushed into the ground using a 360 excavator, and the insdie of the casing was cleaned out using handheld auger and bailer.<br><br>GW1: bentonite seal from 5.5mbgl to ground level<br><br>GW1: coarse sand installed from 6.61 to 5.5mbgl | | 33.88<br>32.08<br>29.73<br>29.21<br>27.27 | 0<br>5 | | Ground Surface<br>Peat<br>Light brown, soft Shell Marl<br>Grey, sticky Lacustine CLAY<br>Hard, grey gravelly Silt/Clay - Limestone Till<br>E.O.H 6.61mbgl<br>Total Depth of Borehole |

**REMARKS**

**PAGE** 1 of 1

**SCALE**

**HYDRO-ENVIRONMENTAL SERVICES** 22 Lower Main Street Dungarvan Co. Waterford Tel: 058-44122 Fax: 058-44244 Email: info@hydroenvironmental.ie

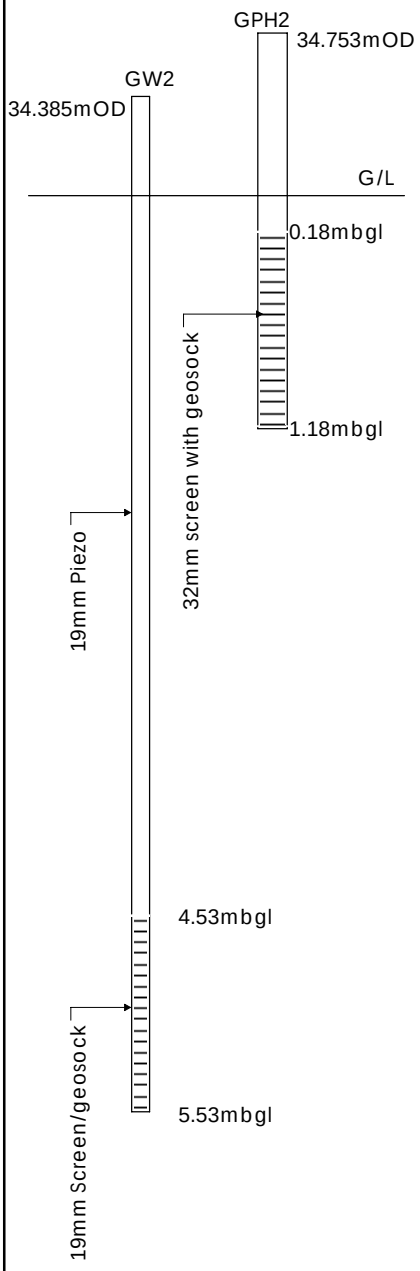
# CAMERA SURVEY LOG

**WELL NUMBER:** GW2

**PROJECT NUMBER:** P1420-1
**SITE:** Garyduff, Clonfert, Co. Galway
**CLIENT:** Bord na Mona
**DRILLING CONTRACTOR:** HES

**DATE STARTED:** 02/08/2018
**DATE FINISHED:** 09/08/2018
**LOGGED BY:** M. Gill
**DRILLING TYPE:** Hand augering and window sampling

**EASTING:** 196640
**NORTHING:** 222266
**ELEVATION:** 33.901mOD

| Well Completion Description | Comments | Water Strikes | Elevation | Meters Below Ground Surface | Lithology | Formation Description |
|---|---|---|---|---|---|---|
|  | 3" PVC casing installed from ground level to top of mineral soil. Deep piezometer is installed within and below this casing. Screened section installed below base of 3" casing.<br><br>The 3" casing was pushed into the ground using a 360 excavator, and the insdie of the casing was cleaned out using handheld auger and bailer.<br><br>GW2: bentonite seal from 4.4mbgl to ground level<br><br>GW2: Coarse sand from 4.4mbgl to 5.53mbgl | | 33.90<br>32.80<br>32.10<br>29.65<br>29.30<br>28.37 | 0<br>5 | | Ground Surface<br>Dry, hard Peat<br>Softer, damp brown Peat<br>Light brown, soft Shell Marl<br>Grey sticky Clay - Lacustine deposits<br>Wet, Sandy Mineral Soil - Limestone Till<br>E.O.H 5.53mbgl<br>Total Depth of Borehole |



**REMARKS**

**PAGE** 1 of 1

**SCALE**

**HYDRO-ENVIRONMENTAL SERVICES** 22 Lower Main Street Dungarvan Co. Waterford Tel: 058-44122 Fax: 058-44244 Email: info@hydroenvironmental.ie

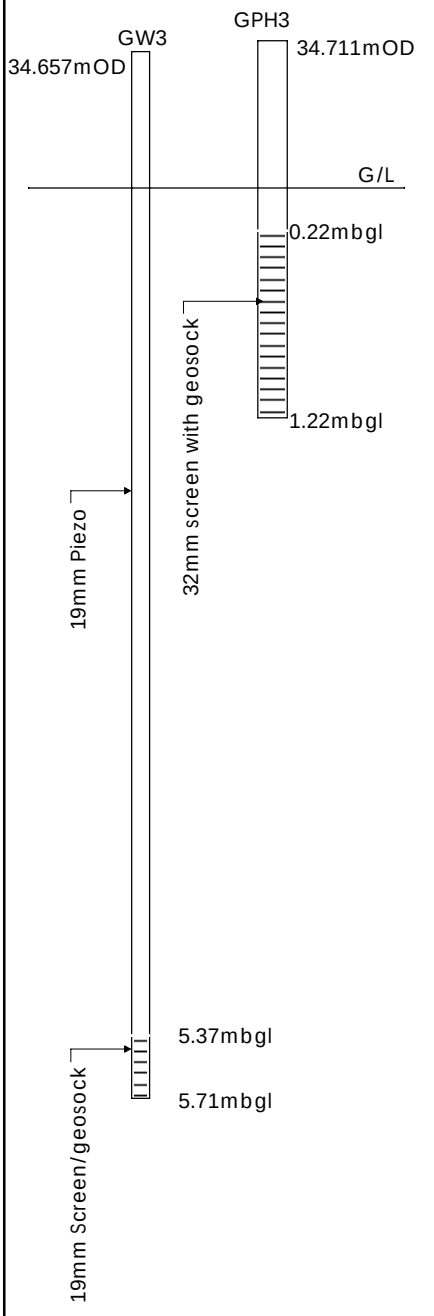
# CAMERA SURVEY LOG

**WELL NUMBER:** GW3

**PROJECT NUMBER:** P1420-1
**SITE:** Garyduff, Clonfert, Co. Galway
**CLIENT:** Bord na Mona
**DRILLING CONTRACTOR:** HES

**DATE STARTED:** 02/08/2018
**DATE FINISHED:** 09/08/2018
**LOGGED BY:** M. Gill
**DRILLING TYPE:** Hand augering and window sampling

**EASTING:** 196655
**NORTHING:** 222275
**ELEVATION:** 33.914mOD

| Well Completion Description | Comments | Water Strikes | Elevation | Meters Below Ground Surface | Lithology | Formation Description |
|---|---|---|---|---|---|---|
|  | 3" PVC casing installed from ground level to top of mineral soil. Deep piezometer is installed within and below this casing. Screened section installed below base of 3" casing.<br><br>The 3" casing was pushed into the ground using a 360 excavator, and the insdie of the casing was cleaned out using handheld auger and bailer.<br><br>GW3: bentonite seal from 4.6mbgl to ground level<br><br>GW3: Coarse sand from 4.6mbgl to 5.71mbgl | | 0.00<br>-1.20<br>-1.80<br>-4.00<br>-4.60<br>-5.71 | 0<br>5 | | Ground Surface<br>Dry, hard Peat<br>Softer, damp brown Peat<br>Light brown, soft Shell Marl<br>Grey, soft, sticky Silt/Clay - Lacustine deposits<br>Wet, grey, sandy Mineral Soil - Limestone Till<br>E.O.H 5.71mbgl<br>Total Depth of Borehole |



**REMARKS**

**PAGE** 1 of 1

**SCALE**

**HYDRO-ENVIRONMENTAL SERVICES** 22 Lower Main Street Dungarvan Co. Waterford Tel: 058-44122 Fax: 058-44244 Email: info@hydroenvironmental.ie

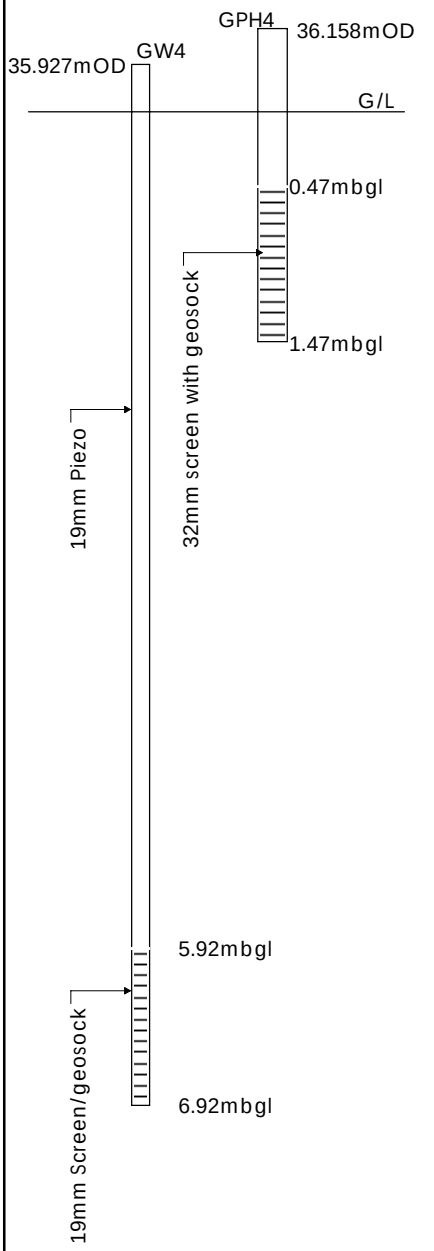
# CAMERA SURVEY LOG

**WELL NUMBER:** GW4

**PROJECT NUMBER:** P1420-1
**SITE:** Garyduff, Clonfert, Co. Galway
**CLIENT:** Bord na Mona
**DRILLING CONTRACTOR:** HES

**DATE STARTED:** 02/08/2018
**DATE FINISHED:** 09/08/2018
**LOGGED BY:** M. Gill
**DRILLING TYPE:** Hand augering and window sampling

**EASTING:** 196702
**NORTHING:** 222272
**ELEVATION:** 35.645mOD

| Well Completion Description | Comments | Water Strikes | Elevation | Meters Below Ground Surface | Lithology | Formation Description |
|---|---|---|---|---|---|---|
|  | 3" PVC casing installed from ground level to top of mineral soil. Deep piezometer is installed within and below this casing. Screened section installed below base of 3" casing.<br><br>The 3" casing was pushed into the ground using a 360 excavator, and the insdie of the casing was cleaned out using handheld auger and bailer.<br><br>GW4: bentonite seal from 4.8mbgl to ground level<br><br>GW4: Coarse sand from 4.8mbgl to 6.92 | | 35.65<br>34.55<br>32.55<br>30.75<br>28.73 | 0<br>5 | | Ground Surface<br>Dry, hard dark brown Peat<br>Damp, brown soft Peat<br>Light brown, soft Shell Marl<br>Stiff, grey, clayey, gravelly SILT - Limestone Till (Hammering in hard gravel)<br>E.O.H 6.92mbgl<br>Total Depth of Borehole |

**REMARKS**

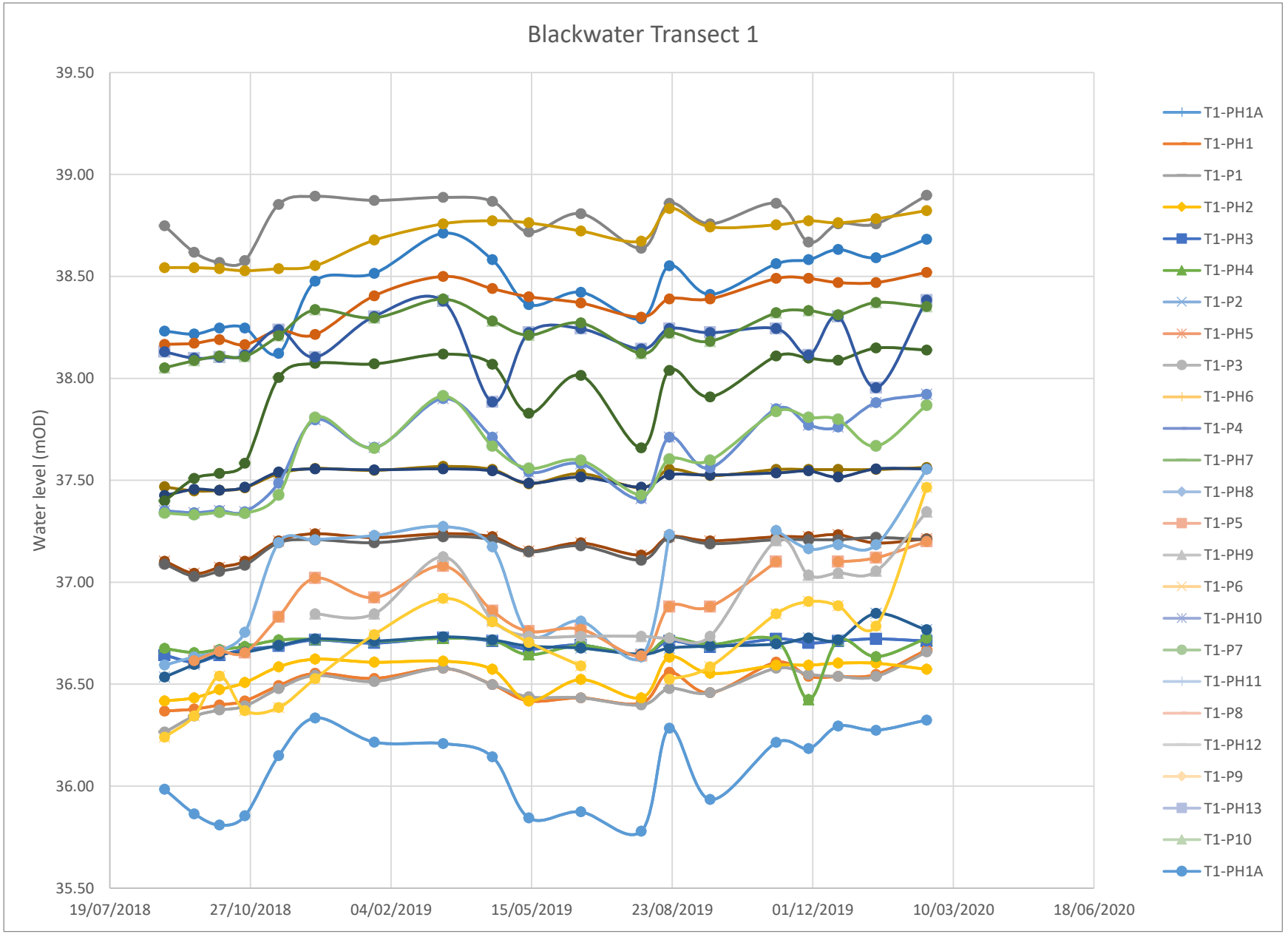
**PAGE** 1 of 1

**SCALE**

**HYDRO-ENVIRONMENTAL SERVICES** 22 Lower Main Street Dungarvan Co. Waterford Tel: 058-44122 Fax: 058-44244 Email: info@hydroenvironmental.ie

## APPENDIX IV: SUMMARY OF BNM WATER LEVEL DATA – BLACKWATER

| Location ID | 27/08/2018 | 17/09/2018 | 05/10/2018 | 23/10/2018 | 16/11/2018 | 12/12/2018 | 23/01/2019 | 13/03/2019 | 17/04/2019 | 13/05/2019 | 19/06/2019 | 01/08/2019 | 21/08/2019 | 19/09/2019 | 05/11/2019 | 28/11/2019 | 19/12/2019 | 15/01/2020 | 20/02/2020 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| T1-PH1A | 35.98 | 35.86 | 35.81 | 35.85 | 36.15 | 36.33 | 36.22 | 36.21 | 36.14 | 35.84 | 35.87 | 35.78 | 36.28 | 35.93 | 36.21 | 36.18 | 36.29 | 36.27 | 36.32 |
| T1-PH1 | 36.37 | 36.38 | 36.40 | 36.42 | 36.49 | 36.55 | 36.53 | 36.58 | 36.50 | 36.42 | 36.43 | 36.41 | 36.56 | 36.46 | 36.61 | 36.54 | 36.54 | 36.55 | 36.67 |
| T1-P1 | 36.27 | 36.34 | 36.37 | 36.39 | 36.48 | 36.54 | 36.51 | 36.58 | 36.50 | 36.44 | 36.43 | 36.40 | 36.48 | 36.46 | 36.58 | 36.55 | 36.54 | 36.54 | 36.66 |
| T1-PH2 | 36.42 | 36.43 | 36.47 | 36.51 | 36.59 | 36.62 | 36.61 | 36.61 | 36.57 | 36.42 | 36.52 | 36.43 | 36.63 | 36.55 | 36.59 | 36.59 | 36.60 | 36.60 | 36.57 |
| T1-PH3 | 36.64 | 36.61 | 36.64 | 36.67 | 36.69 | 36.72 | 36.70 | 36.73 | 36.71 | 36.67 | 36.69 | 36.64 | 36.71 | 36.68 | 36.72 | 36.70 | 36.71 | 36.72 | 36.71 |
| T1-PH4 | 36.68 | 36.66 | 36.67 | 36.69 | 36.72 | 36.72 | 36.71 | 36.73 | 36.72 | 36.65 | 36.69 | 36.65 | 36.73 | 36.70 | 36.72 | 36.43 | 36.72 | 36.64 | 36.73 |
| T1-P2 | 36.54 | 36.60 | 36.65 | 36.66 | 36.69 | 36.72 | 36.71 | 36.73 | 36.72 | 36.69 | 36.68 | 36.65 | 36.68 | 36.69 | 36.70 | 36.73 | 36.72 | 36.85 | 36.77 |
| T1-PH5 | 37.10 | 37.04 | 37.07 | 37.10 | 37.20 | 37.24 | 37.22 | 37.24 | 37.22 | 37.15 | 37.19 | 37.13 | 37.22 | 37.20 | 37.22 | 37.22 | 37.23 | 37.19 | 37.21 |
| T1-P3 | 37.09 | 37.03 | 37.05 | 37.08 | 37.19 | 37.21 | 37.19 | 37.22 | 37.21 | 37.15 | 37.18 | 37.11 | 37.22 | 37.19 | 37.21 | 37.21 | 37.21 | 37.22 | 37.21 |
| T1-PH6 | 37.47 | 37.45 | 37.45 | 37.46 | 37.53 | 37.56 | 37.55 | 37.57 | 37.55 | 37.48 | 37.53 | 37.46 | 37.55 | 37.52 | 37.55 | 37.55 | 37.55 | 37.55 | 37.56 |
| T1-P4 | 37.43 | 37.46 | 37.45 | 37.47 | 37.54 | 37.56 | 37.55 | 37.56 | 37.55 | 37.49 | 37.52 | 37.47 | 37.53 | 37.53 | 37.54 | 37.55 | 37.52 | 37.56 | 37.56 |
| T1-PH7 | 37.40 | 37.51 | 37.53 | 37.58 | 38.00 | 38.07 | 38.07 | 38.12 | 38.07 | 37.83 | 38.01 | 37.66 | 38.04 | 37.91 | 38.11 | 38.10 | 38.09 | 38.15 | 38.14 |
| T1-PH8 | 36.59 | 36.63 | 36.66 | 36.75 | 37.19 | 37.21 | 37.23 | 37.27 | 37.17 | 36.74 | 36.81 | 36.63 | 37.23 |  | 37.25 | 37.16 | 37.18 | 37.18 | 37.55 |
| T1-P5 |  | 36.62 | 36.66 | 36.66 | 36.83 | 37.02 | 36.93 | 37.08 | 36.86 | 36.76 | 36.77 | 36.64 | 36.88 | 36.88 | 37.10 |  | 37.10 | 37.12 | 37.20 |
| T1-PH9 |  |  |  |  |  | 36.85 | 36.85 | 37.13 | 36.82 | 36.74 | 36.74 | 36.74 | 36.73 | 36.74 | 37.21 | 37.04 | 37.05 | 37.06 | 37.35 |
| T1-P6 | 36.24 | 36.35 | 36.54 | 36.37 | 36.39 | 36.53 | 36.74 | 36.92 | 36.81 | 36.71 | 36.59 |  | 36.53 | 36.59 | 36.85 | 36.91 | 36.89 | 36.79 | 37.47 |
| T1-PH10 | 37.35 | 37.34 | 37.35 | 37.35 | 37.49 | 37.80 | 37.66 | 37.90 | 37.71 | 37.54 | 37.58 | 37.41 | 37.71 | 37.56 | 37.85 | 37.77 | 37.76 | 37.88 | 37.92 |
| T1-P7 | 37.34 | 37.33 | 37.34 | 37.34 | 37.43 | 37.81 | 37.66 | 37.91 | 37.67 | 37.56 | 37.60 | 37.43 | 37.60 | 37.60 | 37.84 | 37.81 | 37.80 | 37.67 | 37.87 |
| T1-PH11 | 38.23 | 38.22 | 38.25 | 38.25 | 38.12 | 38.48 | 38.52 | 38.71 | 38.58 | 38.36 | 38.42 | 38.29 | 38.55 | 38.41 | 38.56 | 38.58 | 38.63 | 38.59 | 38.68 |
| T1-P8 | 38.17 | 38.17 | 38.19 | 38.17 | 38.24 | 38.22 | 38.41 | 38.50 | 38.44 | 38.40 | 38.37 | 38.30 | 38.39 | 38.39 | 38.49 | 38.49 | 38.47 | 38.47 | 38.52 |
| T1-PH12 | 38.75 | 38.62 | 38.57 | 38.58 | 38.85 | 38.89 | 38.87 | 38.89 | 38.87 | 38.72 | 38.81 | 38.64 | 38.86 | 38.76 | 38.86 | 38.67 | 38.76 | 38.76 | 38.90 |
| T1-P9 | 38.54 | 38.54 | 38.54 | 38.53 | 38.54 | 38.55 | 38.68 | 38.76 | 38.77 | 38.76 | 38.72 | 38.67 | 38.83 | 38.74 | 38.75 | 38.77 | 38.76 | 38.78 | 38.82 |
| T1-PH13 | 38.13 | 38.10 | 38.10 | 38.11 | 38.24 | 38.10 | 38.30 | 38.38 | 37.88 | 38.22 | 38.24 | 38.14 | 38.24 | 38.22 | 38.24 | 38.11 | 38.30 | 37.95 | 38.38 |
| T1-P10 | 38.05 | 38.09 | 38.11 | 38.11 | 38.21 | 38.34 | 38.30 | 38.39 | 38.28 | 38.21 | 38.27 | 38.12 | 38.22 | 38.18 | 38.32 | 38.33 | 38.31 | 38.37 | 38.35 |
| T2-PH1A | 36.15 | 36.10 | 36.12 | 36.10 | 36.39 | 36.61 | 36.45 | 36.49 | 36.36 | 36.08 | 36.11 | 36.01 | 36.45 | 36.15 | 36.43 | 36.43 | 36.53 | 36.53 | 36.57 |
| T2-PH1 | 36.37 | 36.39 | 36.42 | 36.45 | 36.56 | 36.61 | 36.56 | 36.64 | 36.54 | 36.45 | 36.47 | 36.45 | 36.57 | 36.43 | 36.64 | 36.60 | 36.55 | 36.60 | 36.07 |
| T2-PH2 | 36.55 | 36.50 | 36.49 | 36.51 | 36.65 | 36.44 | 36.67 | 36.68 | 36.63 | 36.48 | 36.53 | 36.44 | 36.67 | 36.56 | 36.67 | 36.55 | 36.62 | 36.72 | 36.43 |
| T2-P1 | 36.55 |  | 36.50 |  | 36.64 | 36.69 | 36.65 | 36.67 | 36.63 | 36.48 | 36.53 |  | 36.66 | 36.55 | 36.66 | 36.65 | 36.66 | 36.69 | 36.72 |
| T2-PH3 | 36.62 | 36.60 | 36.64 | 36.66 | 36.70 | 36.72 | 36.71 | 36.71 | 36.71 | 36.61 | 36.69 | 36.58 | 36.69 | 36.68 | 36.69 | 36.71 | 36.71 | 36.72 | 36.72 |
| T2-PH4 | 36.71 | 36.66 | 36.70 | 36.74 | 36.77 | 36.79 | 36.77 | 36.79 | 36.77 | 36.69 | 36.73 | 36.67 | 36.77 | 36.74 | 36.76 | 36.76 | 36.76 | 36.78 | 36.67 |
| T2-P2 | 36.53 | 36.63 | 36.68 | 36.71 | 36.76 | 36.80 | 36.79 | 36.81 | 36.78 | 36.75 | 36.76 | 36.69 | 36.75 | 36.75 | 36.87 | 36.77 | 36.79 | 36.81 | 36.80 |
| T2-PH5 | 36.85 | 36.81 | 36.83 | 36.85 | 36.94 | 36.98 | 36.96 | 36.99 | 36.95 | 36.83 | 36.90 | 36.81 | 37.00 | 36.89 | 36.97 | 36.97 | 37.00 | 37.03 | 37.02 |
| T2-P3 | 36.71 | 36.81 | 36.83 | 36.86 | 36.96 | 36.99 | 36.97 | 37.03 | 36.95 | 36.87 | 37.03 | 36.85 | 36.97 | 36.92 | 36.99 | 36.99 | 36.98 | 37.01 | 37.03 |
| T2-PH6 | 37.02 | 36.96 | 36.98 | 37.01 | 37.18 | 37.20 | 37.19 | 37.23 | 37.20 | 37.06 | 37.14 | 37.02 | 37.23 | 37.12 | 37.21 | 37.13 | 37.10 | 37.13 | 37.32 |
| T2-P4 | 36.82 | 36.89 | 36.94 | 36.98 | 37.11 | 37.17 | 37.15 | 37.21 | 37.18 | 37.09 | 37.23 | 37.03 | 37.16 | 37.12 | 37.18 | 37.18 | 37.18 | 37.17 | 37.18 |
| T2-PH7 | 37.12 | 36.93 | 36.91 | 36.96 | 37.14 | 37.18 | 37.18 | 37.22 | 37.15 | 36.98 | 37.08 | 36.96 | 37.20 | 37.07 | 37.20 | 37.18 | 37.21 | 37.21 | 37.33 |
| T2-P5 | 36.60 | 36.73 | 36.76 | 36.78 | 36.79 | 36.82 | 36.92 | 36.99 | 37.01 | 37.00 | 36.98 | 36.92 | 36.96 | 36.96 | 36.98 | 37.00 | 37.08 | 37.11 | 37.11 |
| T2-PH8 | 36.21 | 36.18 | 36.19 | 36.22 | 36.53 | 36.68 | 36.67 | 36.72 | 36.66 | 36.36 | 36.49 | 36.33 | 36.69 | 36.59 | 36.95 |  |  |  |  |
| T2-P6 | 36.17 | 36.17 | 36.23 | 36.24 | 36.45 | 36.53 | 36.50 | 36.69 | 36.57 | 36.26 | 36.47 | 36.35 | 36.63 | 36.48 | 36.92 |  |  | 36.82 | 37.10 |
| T2-PH9 | 36.27 | 36.27 | 36.25 |  | 36.33 | 36.41 | 36.38 | 36.60 | 36.41 | 36.27 | 36.27 | 36.26 | 36.52 | 36.31 | 36.88 | 36.41 | 36.41 | 36.33 | 36.99 |
| T2-P7 |  |  |  |  | 36.27 | 36.39 | 36.34 | 36.63 | 36.38 |  | 36.28 | 36.08 | 36.24 | 36.15 | 36.65 |  | 36.30 | 36.57 | 36.95 |
| T2-PH10 | 36.10 | 36.04 | 36.05 | 36.07 | 36.21 | 36.41 | 36.36 | 36.42 | 36.40 | 36.28 | 36.21 | 36.15 | 36.41 | 36.28 | 36.41 | 36.41 | 36.43 | 36.47 | 36.15 |
| T2-P8 |  |  |  |  | 37.19 | 37.36 | 37.34 | 37.40 | 37.34 | 37.30 | 37.30 | 37.17 | 37.32 | 37.30 | 37.45 | 37.38 | 37.36 | 37.17 | 37.42 |
| T2-PH11 | 37.53 | 37.49 | 37.48 | 37.50 | 37.65 | 37.78 | 37.77 | 37.79 | 37.76 | 37.69 | 37.71 | 37.60 | 37.76 | 37.70 | 37.76 | 37.76 | 37.77 | 37.78 | 37.64 |
| T2-PH12 | 37.67 | 37.63 | 37.63 | 37.65 | 37.78 | 37.89 | 37.88 | 37.89 | 37.87 | 37.83 | 37.85 | 37.74 | 37.87 | 37.86 | 37.88 | 37.89 | 37.88 | 37.89 | 37.89 |
| T2-PH13 | 37.66 | 37.62 | 37.62 | 37.64 | 37.76 | 37.89 | 37.89 | 37.90 | 37.89 | 37.83 | 37.86 | 37.75 | 37.90 | 37.83 | 37.88 | 37.90 | 37.68 | 37.92 | 37.90 |
| T3-PH1 | 36.217 | 36.178 | 36.128 | 36.183 | 36.405 | 36.408 |  |  |  |  |  |  |  |  | 36.628 | 36.618 | 36.658 | 36.648 | 36.728 |
| T3-PH2 | 36.735 | 36.692 | 36.682 | 36.722 | 37.032 | 37.062 | 37.047 | 37.077 | 37.017 | 36.807 | 36.837 | 36.737 | 37.057 | 36.877 | 37.047 | 37.037 | 37.047 | 37.067 | 37.127 |
| T3-P1 | 36.647 | 36.677 | 36.712 | 36.727 | 36.897 | 37.027 | 36.989 | 37.072 | 36.987 | 36.817 | 36.827 | 36.757 | 36.907 | 36.887 | 37.037 | 37.047 | 37.027 | 37.027 | 37.097 |
| T3-PH3 |  | 36.78 | 36.83 | 36.84 | 37.17 | 37.365 | 37.265 | 37.35 | 37.265 | 37.005 | 37.08 | 36.955 | 37.335 | 37.095 | 37.305 | 37.475 | 37.295 | 37.265 | 37.355 |
| T3-P2 | 36.682 | 36.779 | 36.799 | 36.814 | 36.899 | 37.099 | 37.147 | 37.229 | 37.164 | 37.134 | 37.054 | 36.994 | 37.044 | 37.104 | 37.184 | 37.274 | 37.244 | 37.224 | 37.234 |
| T3-PH4 | 36.488 | 36.508 | 36.533 | 36.543 | 36.708 | 36.838 | 36.888 | 36.928 | 36.873 | 36.843 | 36.818 | 36.723 | 36.833 | 36.823 | 36.883 | 36.893 | 36.903 | 36.913 | 36.923 |
| T3-P3 | 36.515 | 36.5 | 36.51 | 36.56 | 36.778 | 36.88 | 36.867 | 36.895 | 36.88 | 36.8 | 36.82 | 36.7 | 36.85 | 36.82 | 36.88 | 36.86 | 36.87 | 36.87 | 36.93 |
| T3-PH5 | 36.393 |  |  |  | 36.559 | 37.056 | 37.006 | 37.046 | 37.011 | 36.841 | 36.871 | 36.641 | 37.031 | 36.861 | 37.041 | 37.011 | 37.031 | 37.051 | 37.521 |
| T3-P4 | 36.528 | 36.554 | 36.534 | 36.517 | 36.519 | 36.789 | 36.919 | 36.999 | 36.954 | 36.944 | 36.894 | 36.824 | 36.824 | 36.904 | 36.924 | 36.944 | 36.964 | 36.994 | 36.974 |
| T3-PH6 | 36.943 | 36.938 | 36.935 | 36.968 | 37.19 | 37.288 | 37.233 | 37.268 | 37.213 | 37.043 | 37.093 | 37.003 | 37.283 | 37.113 | 37.253 | 37.243 | 37.273 | 37.313 | 37.313 |
| T3-P5 | 36.798 | 36.888 | 36.958 | 36.973 | 37.17 | 37.223 | 37.198 | 37.273 | 37.198 | 37.058 | 37.113 | 37.028 | 37.198 | 37.128 | 37.228 | 37.198 | 37.228 | 37.198 | 37.218 |
| T3-PH7 | 36.808 | 36.838 | 36.823 | 36.875 | 37.053 | 37.173 | 37.098 | 37.143 | 37.088 | 36.948 | 37.018 | 36.918 | 37.058 | 37.008 | 37.118 | 36.848 | 37.078 | 37.148 | 37.188 |
| T3-P6 | 36.722 | 36.777 | 36.847 | 36.867 | 37.032 | 37.097 | 37.067 | 37.142 | 37.092 | 36.992 | 37.002 | 36.922 | 37.062 | 37.032 | 37.092 | 37.092 | 37.102 | 37.082 | 37.112 |
| T3-PH8 |  | 36.676 | 36.699 | 36.761 | 37.006 | 37.181 | 37.086 | 37.161 | 37.111 | 36.871 | 36.941 | 36.751 | 37.131 | 36.921 | 37.151 | 37.121 | 37.151 | 37.161 | 37.281 |
| T3-PH9 | 36.868 | 36.826 | 36.791 | 36.831 | 37.066 | 37.186 | 37.126 | 37.241 | 37.146 | 36.851 | 36.941 | 36.766 | 37.166 | 36.946 | 37.226 | 37.186 | 37.166 | 37.216 | 37.166 |
| T3-PH10 | 36.31 | 36.268 | 36.278 | 36.298 | 36.473 | 36.603 | 36.523 | 37.008 | 36.888 | 36.698 | 36.738 | 36.578 | 36.918 | 36.758 | 37.218 | 36.898 | 36.948 | 37.018 | 37.328 |
| T3-P7 |  |  |  |  |  | 36.566 |  |  | 36.511 | 36.701 | 36.711 | 37.751 | 36.541 | 37.751 | 36.831 | 36.501 | 36.551 | 36.481 | 36.731 |
| T3-PH11 | 35.989 | 35.904 | 35.934 | 35.974 | 36.124 | 36.219 | 36.179 | 36.554 | 36.189 | 36.029 | 36.049 | 35.929 | 36.459 | 36.069 | 36.799 | 36.269 | 36.259 | 36.329 | 36.939 |
| T3-P8 |  |  |  |  |  | 36.237 |  | 36.587 | 36.212 | 36.322 | 36.322 | 37.372 | 36.462 | 35.992 | 36.822 | 36.322 | 36.302 | 36.322 | 36.922 |
| T3-PH12 | 36.972 | 36.897 | 36.887 | 36.904 | 37.057 | 37.206 | 37.152 | 37.247 | 37.192 | 36.992 | 37.052 | 36.932 | 37.202 | 37.022 | 37.212 | 37.212 | 37.232 | 37.242 | 37.272 |
| T3-PH13 | 37.474 | 37.424 | 37.414 | 37.434 | 37.574 | 37.654 | 37.644 | 37.699 | 37.679 | 37.589 | 37.584 | 37.509 | 37.679 | 37.599 | 37.679 | 37.689 | 37.569 | 37.699 | 37.719 |
| T3-PH14 | 37.487 | 37.44 | 37.43 | 37.44 | 37.61 | 37.71 | 37.7 | 37.73 | 37.705 | 37.635 | 37.65 | 37.535 | 37.695 | 37.615 | 37.675 | 37.665 | 37.705 | 37.715 | 37.725 |
| T3-PH15 | 37.369 | 37.3 | 37.295 | 37.323 | 37.545 | 37.67 | 37.67 | 37.69 | 37.675 | 37.545 | 37.475 | 37.435 | 37.655 | 37.575 | 37.665 | 37.685 | 37.665 | 37.715 | 37.705 |
| T3-PH1 Replaced |  |  |  |  |  |  |  |  |  |  |  |  | 36.37 | 36.170 |  |  |  |  |  |


Blackwater Transect 1
Water level (mOD)
39.50
39.00
38.50
38.00
37.50
37.00
36.50
36.00
35.50
19/07/2018
27/10/2018
04/02/2019
15/05/2019
23/08/2019
01/12/2019
10/03/2020
18/06/2020
T1-PH1A
T1-PH1
T1-P1
T1-PH2
T1-PH3
T1-PH4
T1-P2
T1-PH5
T1-P3
T1-PH6
T1-P4
T1-PH7
T1-PH8
T1-P5
T1-PH9
T1-P6
T1-PH10
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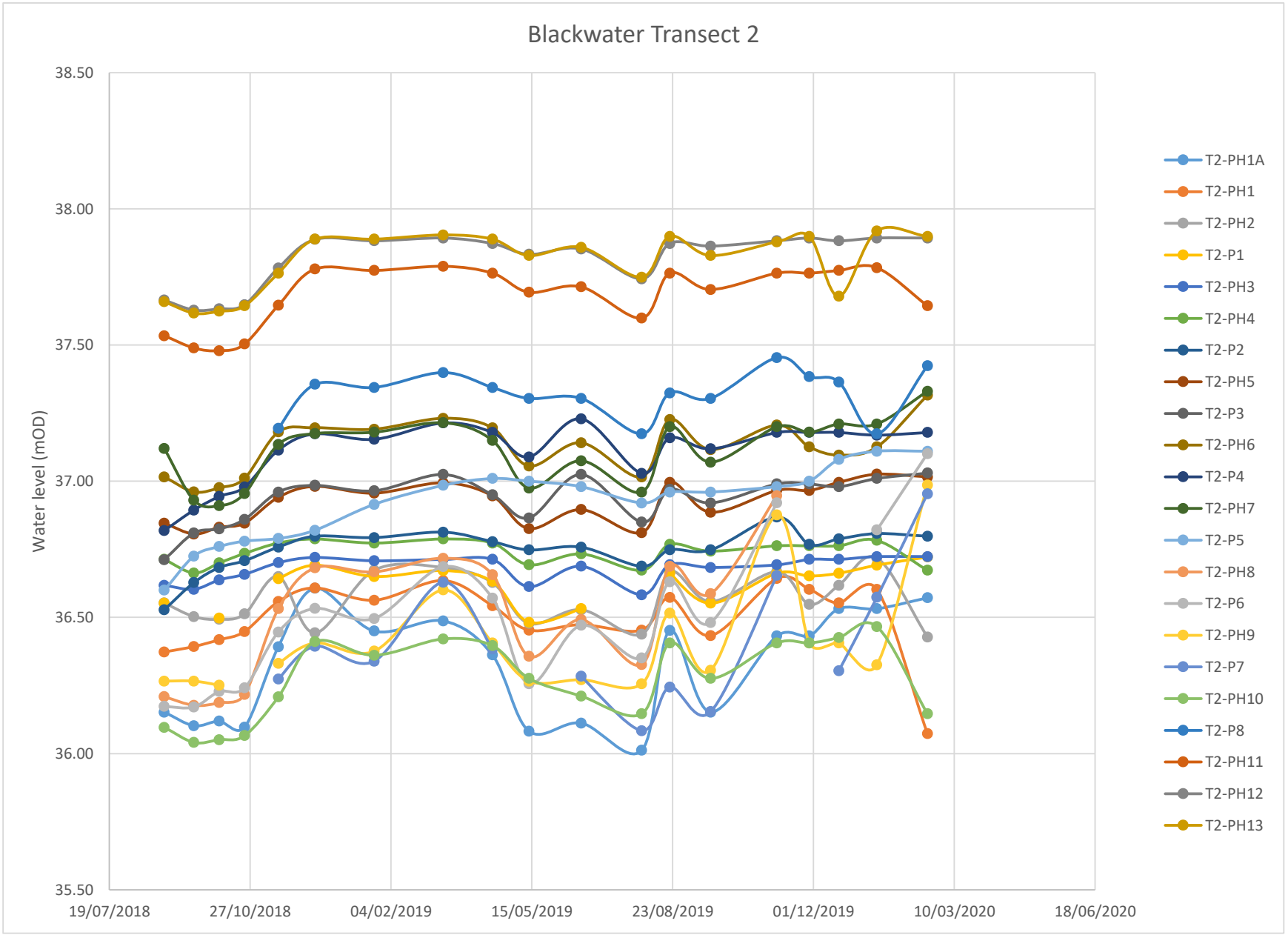
T1-PH11
T1-P8
T1-PH12
T1-P9
T1-PH13
T1-P10
T1-PH1A


Blackwater Transect 2
Water level (mOD)
38.50
38.00
37.50
37.00
36.50
36.00
35.50
19/07/2018
27/10/2018
04/02/2019
15/05/2019
23/08/2019
01/12/2019
10/03/2020
18/06/2020
T2-PH1A
T2-PH1
T2-PH2
T2-P1
T2-PH3
T2-PH4
T2-P2
T2-PH5
T2-P3
T2-PH6
T2-P4
T2-PH7
T2-P5
T2-PH8
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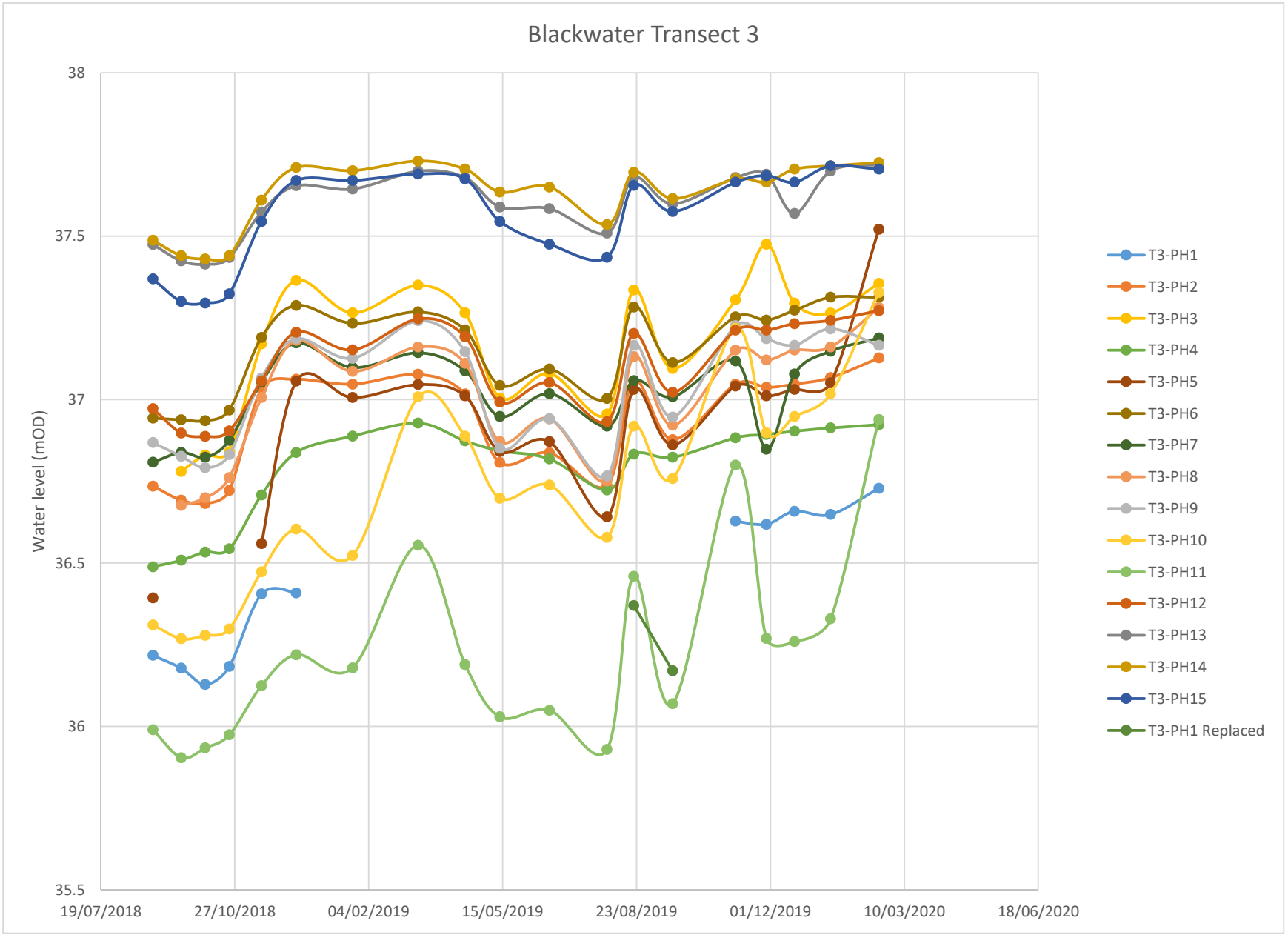
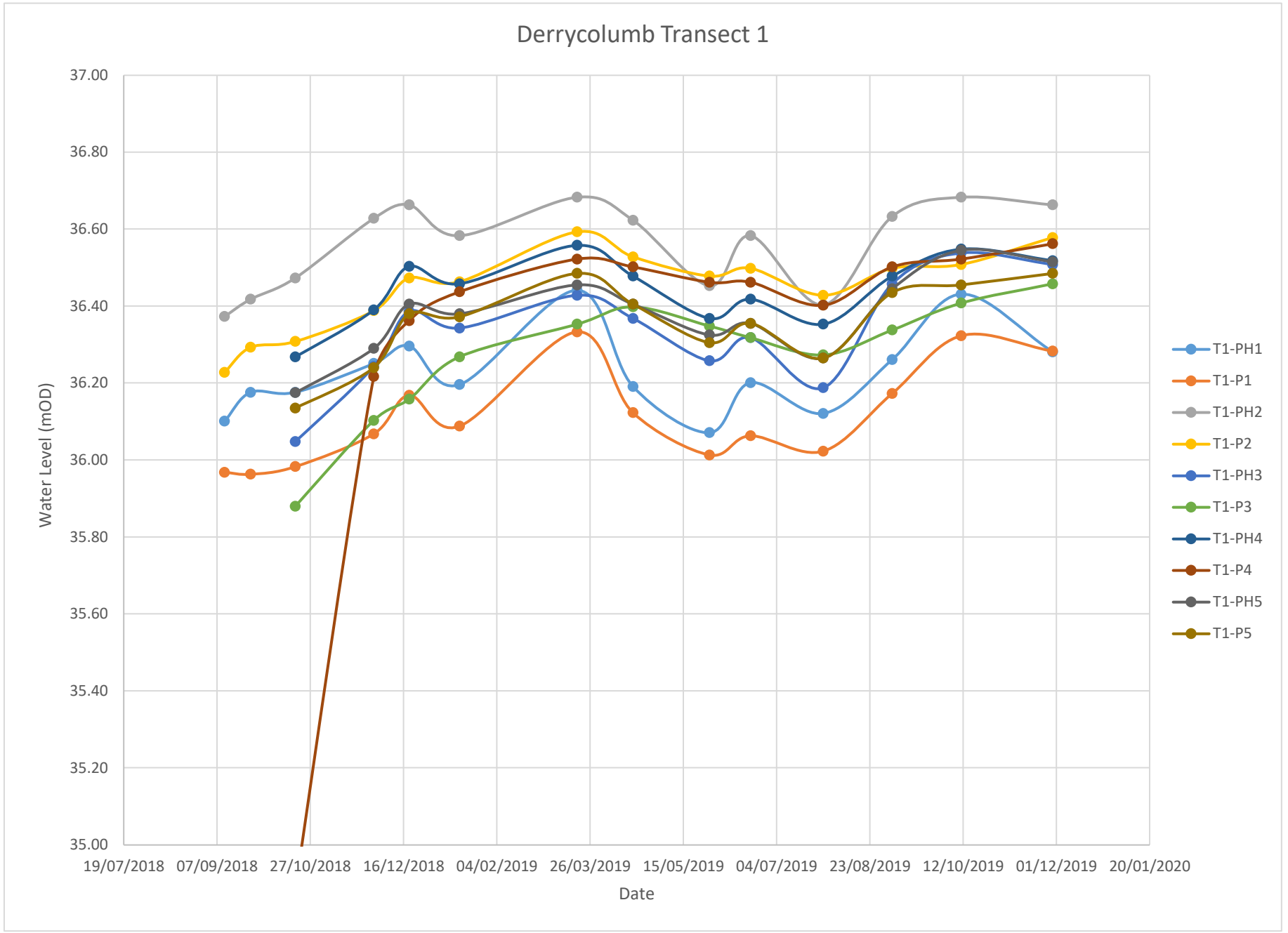
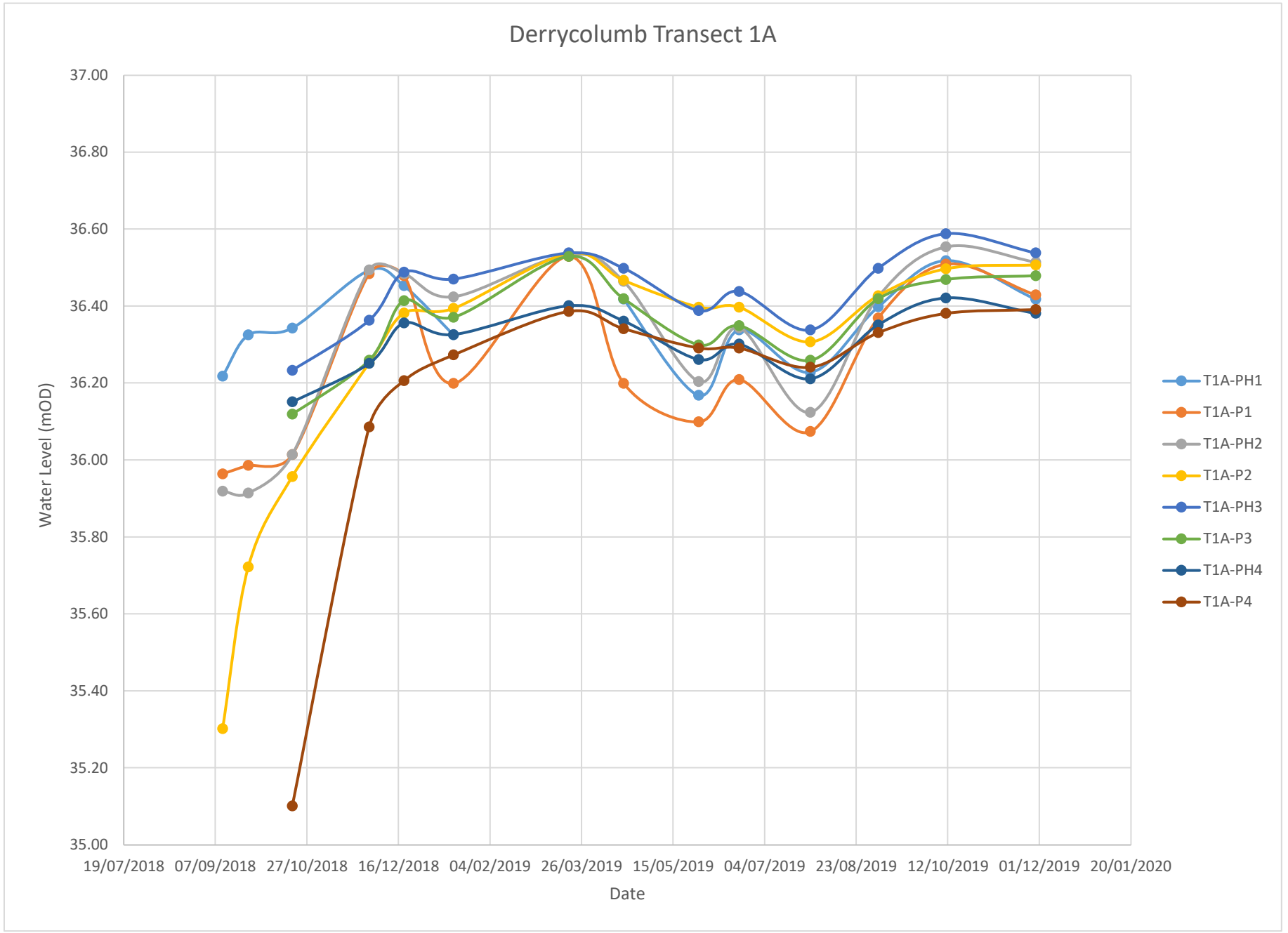
T2-PH9
T2-P7
T2-PH10
T2-P8
T2-PH11
T2-PH12
T2-PH13

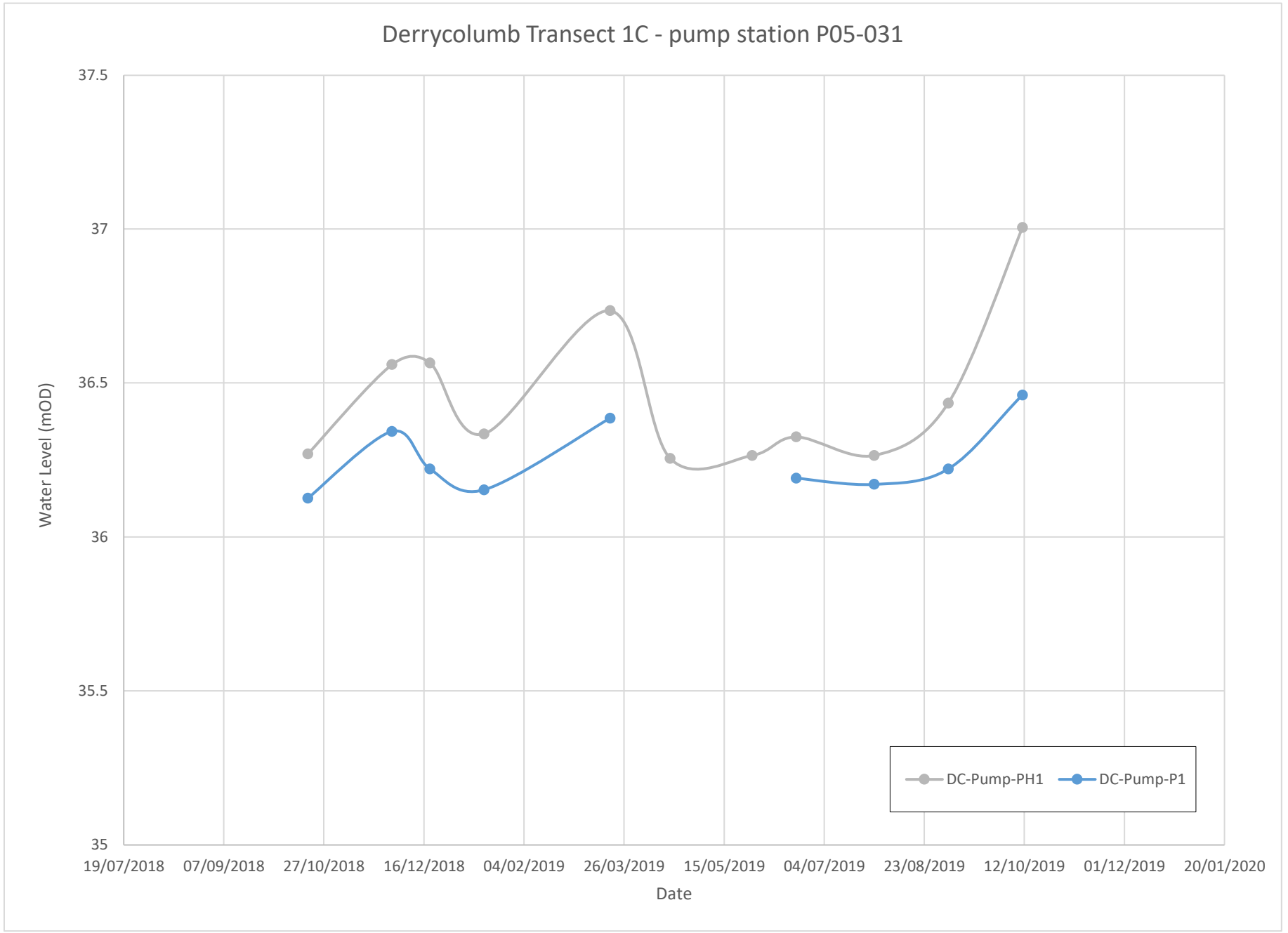

Blackwater Transect 3
Water level (mOD)
38
37.5
37
36.5
36
35.5
19/07/2018
27/10/2018
04/02/2019
15/05/2019
23/08/2019
01/12/2019
10/03/2020
18/06/2020
T3-PH1
T3-PH2
T3-PH3
T3-PH4
T3-PH5
T3-PH6
T3-PH7
T3-PH8
T3-PH9
T3-PH10
T3-PH11
T3-PH12
T3-PH13
T3-PH14
T3-PH15
T3-PH1 Replaced

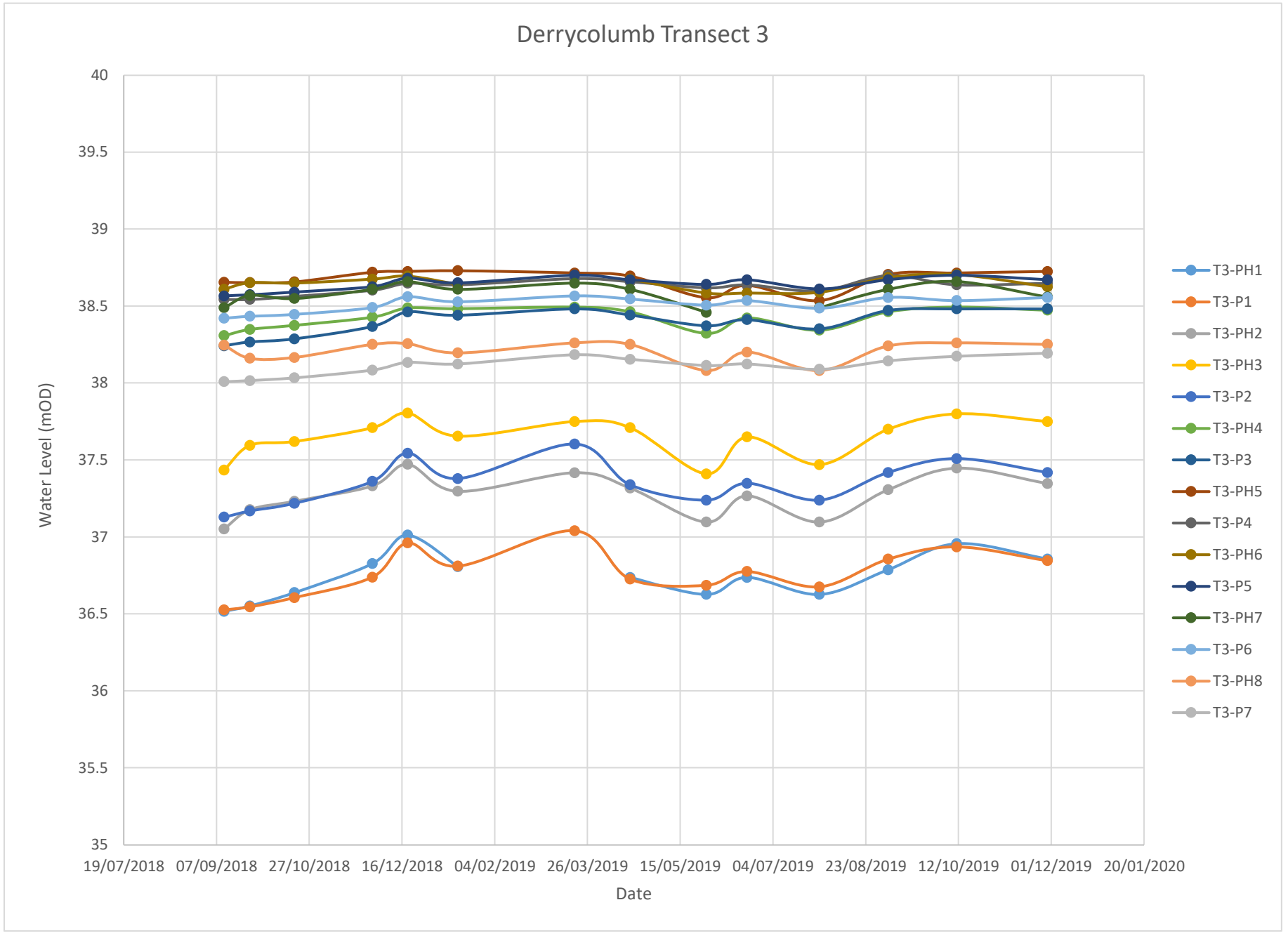
## APPENDIX V: SUMMARY OF BNM WATER LEVEL DATA – DERRYCOLUMB

| Location ID | 11/09/2018 | 25/09/2018 | 19/10/2018 | 30/11/2018 | 19/12/2018 | 15/01/2019 | 19/03/2019 | 18/04/2019 | 29/05/2019 | 20/06/2019 | 29/07/2019 | 04/09/2019 | 11/10/2019 | 29/11/2019 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| T1-PH1 | 36.10 | 36.18 | 36.18 | 36.25 | 36.30 | 36.20 | 36.44 | 36.19 | 36.07 | 36.20 | 36.12 | 36.261 | 36.431 | 36.281 |
| T1-P1 | 35.97 | 35.96 | 35.98 | 36.07 | 36.17 | 36.09 | 36.33 | 36.12 | 36.01 | 36.06 | 36.02 | 36.173 | 36.323 | 36.283 |
| T1-PH2 | 36.37 | 36.42 | 36.47 | 36.63 | 36.66 | 36.58 | 36.68 | 36.62 | 36.45 | 36.58 | 36.40 | 36.633 | 36.683 | 36.663 |
| T1-P2 | 36.23 | 36.29 | 36.31 | 36.39 | 36.47 | 36.46 | 36.59 | 36.53 | 36.48 | 36.50 | 36.43 | 36.498 | 36.508 | 36.578 |
| T1-PH3 | | | 36.05 | 36.24 | 36.39 | 36.34 | 36.43 | 36.37 | 36.26 | 36.32 | 36.19 | 36.458 | 36.538 | 36.508 |
| T1-P3 | | | 35.88 | 36.10 | 36.16 | 36.27 | 36.35 | 36.40 | 36.35 | 36.32 | 36.27 | 36.338 | 36.408 | 36.458 |
| T1-PH4 | | | 36.27 | 36.39 | 36.50 | 36.46 | 36.56 | 36.48 | 36.37 | 36.42 | 36.35 | 36.478 | 36.548 | 36.518 |
| T1-P4 | | | 34.89 | 36.22 | 36.36 | 36.44 | 36.52 | 36.50 | 36.46 | 36.46 | 36.40 | 36.502 | 36.522 | 36.562 |
| T1-PH5 | | | 36.18 | 36.29 | 36.41 | 36.38 | 36.46 | 36.41 | 36.33 | 36.36 | 36.27 | 36.445 | 36.545 | 36.515 |
| T1-P5 | | | 36.14 | 36.24 | 36.38 | 36.37 | 36.49 | 36.41 | 36.31 | 36.36 | 36.27 | 36.435 | 36.455 | 36.485 |
| T1A-PH1 | 36.22 | 36.33 | 36.34 | 36.49 | 36.45 | 36.33 | | 36.42 | 36.17 | 36.34 | 36.23 | 36.398 | 36.518 | 36.418 |
| T1A-P1 | 35.96 | 35.99 | 36.01 | 36.48 | 36.48 | 36.20 | 36.53 | 36.20 | 36.10 | 36.21 | 36.07 | 36.369 | 36.509 | 36.429 |
| T1A-PH2 | 35.92 | 35.91 | 36.01 | 36.49 | 36.48 | 36.42 | 36.53 | 36.46 | 36.20 | 36.34 | 36.12 | 36.424 | 36.554 | 36.514 |
| T1A-P2 | 35.30 | 35.72 | 35.96 | 36.25 | 36.38 | 36.39 | 36.54 | 36.47 | 36.40 | 36.40 | 36.31 | 36.427 | 36.497 | 36.507 |
| T1A-PH3 | | | 36.23 | 36.36 | 36.49 | 36.47 | 36.54 | 36.50 | 36.39 | 36.44 | 36.34 | 36.498 | 36.588 | 36.538 |
| T1A-P3 | | | 36.12 | 36.26 | 36.41 | 36.37 | 36.53 | 36.42 | 36.30 | 36.35 | 36.26 | 36.419 | 36.469 | 36.479 |
| T1A-PH4 | | | 36.15 | 36.25 | 36.36 | 36.33 | 36.40 | 36.36 | 36.26 | 36.30 | 36.21 | 36.351 | 36.421 | 36.381 |
| T1A-P4 | | | 35.10 | 36.09 | 36.21 | 36.27 | 36.39 | 36.34 | 36.29 | 36.29 | 36.24 | 36.331 | 36.381 | 36.391 |
| T3-PH1 | 36.517 | 36.552 | 36.639 | 36.827 | 37.012 | 36.807 | | 36.737 | 36.627 | 36.737 | 36.627 | 36.787 | 36.957 | 36.857 |
| T3-P1 | 36.526 | 36.546 | 36.606 | 36.739 | 36.961 | 36.811 | 37.041 | 36.726 | 36.686 | 36.776 | 36.676 | 36.856 | 36.936 | 36.846 |
| T3-PH2 | 37.052 | 37.177 | 37.232 | 37.332 | 37.472 | 37.297 | 37.417 | 37.317 | 37.097 | 37.267 | 37.097 | 37.307 | 37.447 | 37.347 |
| T3-PH3 | 37.435 | 37.595 | 37.62 | 37.71 | 37.805 | 37.655 | 37.75 | 37.71 | 37.41 | 37.65 | 37.470 | 37.700 | 37.800 | 37.750 |
| T3-P2 | 37.129 | 37.169 | 37.219 | 37.361 | 37.544 | 37.379 | 37.604 | 37.339 | 37.239 | 37.349 | 37.239 | 37.419 | 37.509 | 37.419 |
| T3-PH4 | 38.308 | 38.348 | 38.375 | 38.428 | 38.488 | 38.483 | 38.493 | 38.463 | 38.323 | 38.423 | 38.343 | 38.463 | 38.493 | 38.473 |
| T3-P3 | 38.242 | 38.267 | 38.287 | 38.367 | 38.462 | 38.44 | 38.482 | 38.442 | 38.372 | 38.412 | 38.352 | 38.472 | 38.482 | 38.482 |
| T3-PH5 | 38.655 | 38.653 | 38.657 | 38.72 | 38.725 | 38.73 | 38.715 | 38.695 | 38.555 | 38.635 | 38.535 | 38.705 | 38.715 | 38.725 |
| T3-P4 | 38.543 | 38.543 | 38.563 | 38.603 | 38.648 | 38.638 | 38.678 | 38.658 | 38.618 | 38.638 | 38.598 | 38.698 | 38.638 | 38.648 |
| T3-PH6 | 38.61 | 38.652 | 38.65 | 38.675 | 38.695 | 38.64 | | 38.675 | 38.585 | 38.585 | 38.59 | 38.685 | 38.705 | 38.625 |
| T3-P5 | 38.566 | 38.574 | 38.591 | 38.626 | 38.681 | 38.651 | 38.701 | 38.671 | 38.641 | 38.671 | 38.611 | 38.671 | 38.701 | 38.671 |
| T3-PH7 | 38.489 | 38.569 | 38.549 | 38.609 | 38.659 | 38.609 | 38.649 | 38.609 | 38.459 | | 38.489 | 38.609 | 38.659 | 38.559 |
| T3-P6 | 38.421 | 38.434 | 38.446 | 38.491 | 38.561 | 38.528 | 38.566 | 38.546 | 38.506 | 38.536 | 38.486 | 38.556 | 38.536 | 38.556 |
| T3-PH8 | 38.246 | 38.161 | 38.166 | 38.251 | 38.256 | 38.196 | 38.261 | 38.251 | 38.081 | 38.201 | 38.081 | 38.241 | 38.261 | 38.251 |
| T3-P7 | 38.009 | 38.016 | 38.034 | 38.084 | 38.134 | 38.124 | 38.184 | 38.154 | 38.114 | 38.124 | 38.089 | 38.144 | 38.174 | 38.194 |
| DC-Pump-PH1 | | | 36.27 | 36.56 | 36.565 | 36.335 | 36.735 | 36.255 | 36.265 | 36.325 | 36.265 | 36.435 | 37.005 | |
| DC-Pump-P1 | | | 36.126 | 36.343 | 36.221 | 36.153 | 36.386 | | | 36.191 | 36.171 | 36.221 | 36.461 | |


Derrycolumb Transect 1
37.00
36.80
36.60
36.40
36.20
36.00
35.80
35.60
35.40
35.20
35.00
Water Level (mOD)
19/07/2018
07/09/2018
27/10/2018
16/12/2018
04/02/2019
26/03/2019
15/05/2019
04/07/2019
23/08/2019
12/10/2019
01/12/2019
20/01/2020
Date
T1-PH1
T1-P1
T1-PH2
T1-P2
T1-PH3
T1-P3
T1-PH4
T1-P4
T1-PH5
T1-P5

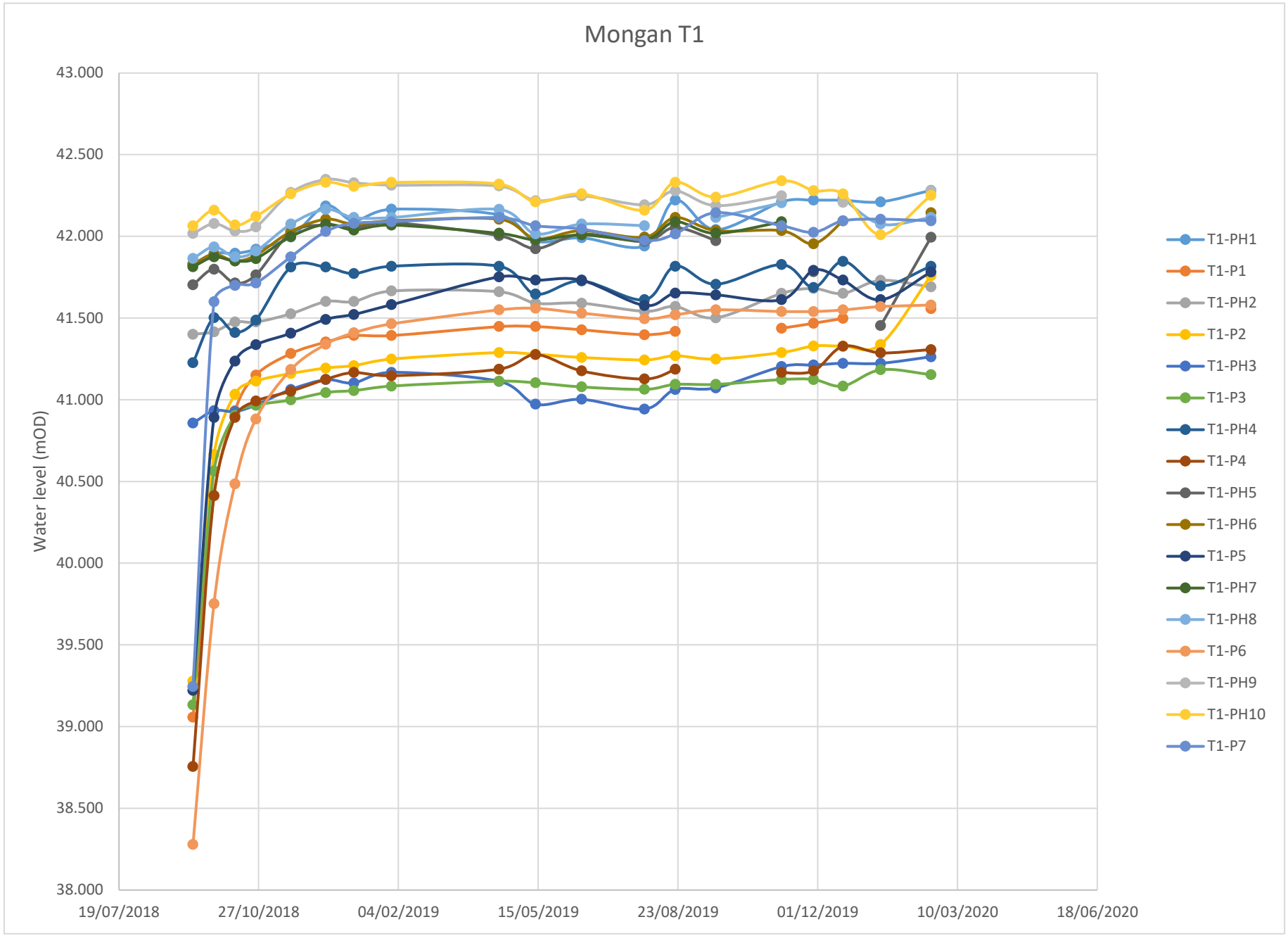

Derrycolumb Transect 1A
Water Level (mOD)
37.00
36.80
36.60
36.40
36.20
36.00
35.80
35.60
35.40
35.20
35.00
19/07/2018
07/09/2018
27/10/2018
16/12/2018
04/02/2019
26/03/2019
15/05/2019
04/07/2019
23/08/2019
12/10/2019
01/12/2019
20/01/2020
Date
T1A-PH1
T1A-P1
T1A-PH2
T1A-P2
T1A-PH3
T1A-P3
T1A-PH4
T1A-P4


Derrycolumb Transect 1C - pump station P05-031
37.5
37
36.5
36
35.5
35
Water Level (mOD)
19/07/2018
07/09/2018
27/10/2018
16/12/2018
04/02/2019
26/03/2019
15/05/2019
04/07/2019
23/08/2019
12/10/2019
01/12/2019
20/01/2020
Date
DC-Pump-PH1
DC-Pump-P1


Derrycolumb Transect 3
Water Level (mOD)
40
39.5
39
38.5
38
37.5
37
36.5
36
35.5
35
19/07/2018
07/09/2018
27/10/2018
16/12/2018
04/02/2019
26/03/2019
15/05/2019
04/07/2019
23/08/2019
12/10/2019
01/12/2019
20/01/2020
Date
T3-PH1
T3-P1
T3-PH2
T3-PH3
T3-P2
T3-PH4
T3-P3
T3-PH5
T3-P4
T3-PH6
T3-P5
T3-PH7
T3-P6
T3-PH8
T3-P7

## APPENDIX VI: SUMMARY OF BNM WATER LEVEL DATA – MONGAN

| Bog | Transect | Piezo type | Location ID | Easting | Northing | Peat depth (m) | peat interval(mbgl) | marl interval (mbgl) | lacustrine clay interval (mbgl) | standpipe screen (mbgl) | piezoemter screen (mbgl) | Ground Level (mOD) | Top pf Pipe (mOD) | upstand (m) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mongan | T1 | phreatic | T1-PH1 | 204305.5 | 230829.3 | 5.5 | 0-5.48 | none | 5.48->5.78 | 0-1.0 | | 42.33 | 43.30 | 1.00 |
| Mongan | T1 | Piezo | T1-P1 | 204305.8 | 230829.5 | | | | | | 4.8-5.1 | 42.31 | 43.59 | 1.29 |
| Mongan | T1 | phreatic | T1-PH2 | 204295.7 | 230857.3 | 5.1 | 0-5.09 | none | 5.09->5.34 | 0.5-1.5 | | 42.00 | 42.49 | 0.50 |
| Mongan | T1 | Piezo | T1-P2 | 204296.0 | 230857.5 | | | | | | 4.7-5.0 | 41.96 | 43.01 | 1.06 |
| Mongan | T1 | phreatic | T1-PH3 | 204293.2 | 230865.6 | 4.4 | 0-4.41 | none | | 0.5-1.5 | | 41.32 | 41.81 | 0.50 |
| Mongan | T1 | Piezo | T1-P3 | 204293.6 | 230865.7 | | | | | | 3.9-4.2 | 41.33 | 42.29 | 0.98 |
| Mongan | T1 | phreatic | T1-PH4 | 204290.0 | 230878.1 | 5.1 | 0-5.10 | none | 5.1->5.35 | 0.5-1.5 | | 41.92 | 42.57 | 0.50 |
| Mongan | T1 | Piezo | T1-P4 | 204289.6 | 230877.9 | | | | | | 4.7-5.0 | 41.91 | 43.34 | 1.43 |
| Mongan | T1 | phreatic | T1-PH5 | 204287.3 | 230885.8 | >5.0 | >5.0 | | | 0-1.0 | | 42.08 | 43.13 | 1.00 |
| Mongan | T1 | phreatic | T1-PH6 | 204284.1 | 230895.1 | 5.3 | 0-5.28 | none | | 0-1.0 | | 42.24 | 43.25 | 1.02 |
| Mongan | T1 | Piezo | T1-P5 | 204284.4 | 230895.2 | | | | | | 4.7-5.0 | 42.07 | 43.48 | 1.43 |
| Mongan | T1 | phreatic | T1-PH7 | 204282.8 | 230898.4 | >5.0 | >5.0 | | | 0-1.0 | | 42.11 | 43.07 | 0.98 |
| Mongan | T1 | phreatic | T1-PH8 | 204281.3 | 230904.5 | 5.4 | 0-5.4 | none | | 0-1.0 | | 42.20 | 42.82 | 0.60 |
| Mongan | T1 | Piezo | T1-P6 | 204280.9 | 230904.5 | | | | | | 5.0-5.3 | 42.30 | 43.42 | 1.09 |
| Mongan | T1 | phreatic | T1-PH9 | 204274.6 | 230923.3 | >5.2 | >5.2 | | | 0-1.0 | | 42.40 | 43.38 | 1.00 |
| Mongan | T1 | phreatic | T1-PH10 | 204268.5 | 230943.2 | 6.5 | 0-6.5 | none | 6.5->6.8 | 0-1.0 | | 42.39 | 43.40 | 1.02 |
| Mongan | T1 | Piezo | T1-P7 | 204268.8 | 230943.1 | | | | | | 4.85-5.15 | 42.37 | 43.65 | 1.27 |
| Mongan | T2 | phreatic | T2-PH1 | 204186.7 | 230760.4 | 4.7 | 0-4.7 | none | 4.7->4.95 | 0.5-1.5 | | 41.893 | 42.41 | 0.5 |
| Mongan | T2 | piezo | T2-P1 | 204187.0 | 230760.7 | | | | | | 3.75-4.05 | 41.908 | 42.846 | 0.96 |
| Mongan | T2 | phreatic | T2-PH2 | 204180.7 | 230765.9 | 4.7 | 0-4.72 | none | 4.7->5.0 | 0.5-1.5 | | 41.892 | 42.36 | 0.48 |
| Mongan | T2 | piezo | T2-P2 | 204180.9 | 230766.2 | | | | | | 4.1-4.4 | 41.902 | 42.878 | 0.98 |
| Mongan | T2 | phreatic | T2-PH3 | 204168.1 | 230777.6 | 4.8 | 0-4.75 | none | | 0.5-1.5 | | 42.002 | 42.494 | 0.5 |
| Mongan | T2 | piezo | T2-P3 | 204168.2 | 230777.8 | | | | | | 4.4-4.7 | 42.002 | 42.677 | 0.68 |
| Mongan | T2 | phreatic | T2-PH4 | 204160.8 | 230784.9 | 5.1 | 0-5.05 | none | 4.05->4.35 | 0-1.0 | | 42.322 | 43.363 | 1 |
| Mongan | T2 | piezo | T2-P4 | 204160.6 | 230784.7 | | | | | | 4.7-5.0 | 42.357 | 43.244 | 0.9 |
| Mongan | T2 | phreatic | T2-PH5 | 204157.6 | 230787.7 | >4.0 | >4.0 | | | 0-1.0 | | 42.413 | 43.384 | 0.95 |
| Mongan | T2 | phreatic | T2-PH6 | 204139.9 | 230804.8 | 5.3 | 0-5.3 | none | 4.3->4.65 | 0-1.0 | | 42.686 | 43.603 | 1 |
| Mongan | T2 | piezo | T2-P5 | 204140.2 | 230805.0 | | | | | | 4.6-4.9 | 42.588 | 43.118 | 0.52 |
| Mongan | T2 | phreatic | T2-PH7 | 204121.9 | 230822.1 | 5.5 | 0-5.45 | none | 5.45->5.68 | 0-1.0 | | 42.802 | 43.81 | 0.98 |
| Mongan | T2 | piezo | T2-P6 | 204122.3 | 230822.2 | | | | | | 5.05-5.35 | 42.784 | 43.873 | 1.05 |
| Mongan | T2 | phreatic | T2-PH8 | 204103.7 | 230839.5 | 5.7 | 0-5.7 | none | 5.7->5.95 | 0-1.0 | | 42.875 | 43.905 | 1.05 |
| Mongan | T2 | piezo | T2-P7 | 204104.2 | 230839.8 | | | | | | 5-5.3 | 42.863 | 43.701 | 0.8 |
| Mongan | T3 | phreatic | T3-PH1 | 204082.1 | 230661.7 | 3.3 | 0-3.3 | none | 3.3->3.65 | 0.5-1.5 | | 41.243 | 42.411 | 1.18 |
| Mongan | T3 | Piezo | T3-P1 | 204082.5 | 230662.0 | | | | | | 2.43-2.73 | 41.256 | 41.921 | 0.67 |
| Mongan | T3 | phreatic | T3-PH2 | 204076.3 | 230666.5 | 3.4 | 0-3.4 | none | 3.4->3.8 | 0.5-1.5 | | 41.118 | 42.138 | 1 |
| Mongan | T3 | Piezo | T3-P2 | 204076.5 | 230666.6 | | | | | | 2.5-2.8 | 41.167 | 41.736 | 0.6 |
| Mongan | T3 | phreatic | T3-PH3 | 204067.3 | 230674.4 | 4.6 | 0-4.62 | none | 4.62>4.9 | 0-1.0 | | 42.117 | 43.274 | 1.2 |
| Mongan | T3 | Piezo | T3-P3 | 204067.4 | 230674.1 | | | | | | 4.05-4.35 | 42.105 | 43.089 | 1 |
| Mongan | T3 | phreatic | T3-PH4 | 204061.4 | 230678.2 | 4.7 | 0-4.7 | none | 4.7->5.0 | 0-1.0 | | 42.381 | 43.367 | 1.01 |
| Mongan | T3 | Piezo | T3-P4 | 204061.5 | 230678.4 | | | | | | 4.25-4.55 | 42.353 | 42.972 | 0.6 |
| Mongan | T3 | phreatic | T3-PH5 | 204056.6 | 230682.6 | 4.9 | 0-4.85 | none | 4.85>5.25 | 0-1.0 | | 42.822 | 43.84 | 1.06 |
| Mongan | T3 | Piezo | T3-P5 | 204056.8 | 230682.7 | | | | | | 4.4-4.7 | 42.813 | 43.428 | 0.7 |
| Mongan | T3 | phreatic | T3-PH6 | 204038.5 | 230699.2 | 5.2 | 0-5.2 | none | 5.2>5.45 | 0-1.0 | | 43.317 | 44.004 | 1 |
| Mongan | T3 | Piezo | T3-P6 | 204038.2 | 230698.9 | | | | | | 4.4-4.7 | 43.319 | 44.317 | 0.7 |
| Mongan | T3 | phreatic | T3-PH7 | 204020.0 | 230716.1 | 5.7 | 0-5.7 | none | 5.7>5.99 | 0-1.0 | | 43.551 | 44.549 | 1 |
| Mongan | T3 | Piezo | T3-P7 | 204020.2 | 230716.4 | | | | | | 5.1-5.4 | 43.595 | 44.577 | 1 |
| Mongan | T3 | phreatic | T3-PH8 | 204001.7 | 230732.7 | 5.8 | 0-5.75 | none | 5.75>6.0 | 0-1.0 | | 43.886 | 44.905 | 1.2 |
| Mongan | T3 | Piezo | T3-P8 | 204001.9 | 230732.9 | | | | | | 4.95-5.25 | 43.87 | 45.039 | 1.16 |
| Mongan | T3 | Piezo | T3-PH3 Replaced | | | | | | | | | 41.947 | 42.962 | 1.16 |
| Mongan | T3 | Piezo | T3-P3 Replaced | | | | | | | | | 41.939 | 42.464 | 1.16 |


Mongan T1
Water level (mOD)
43.000
42.500
42.000
41.500
41.000
40.500
40.000
39.500
39.000
38.500
38.000
19/07/2018
27/10/2018
04/02/2019
15/05/2019
23/08/2019
01/12/2019
10/03/2020
18/06/2020
T1-PH1
T1-P1
T1-PH2
T1-P2
T1-PH3
T1-P3
T1-PH4
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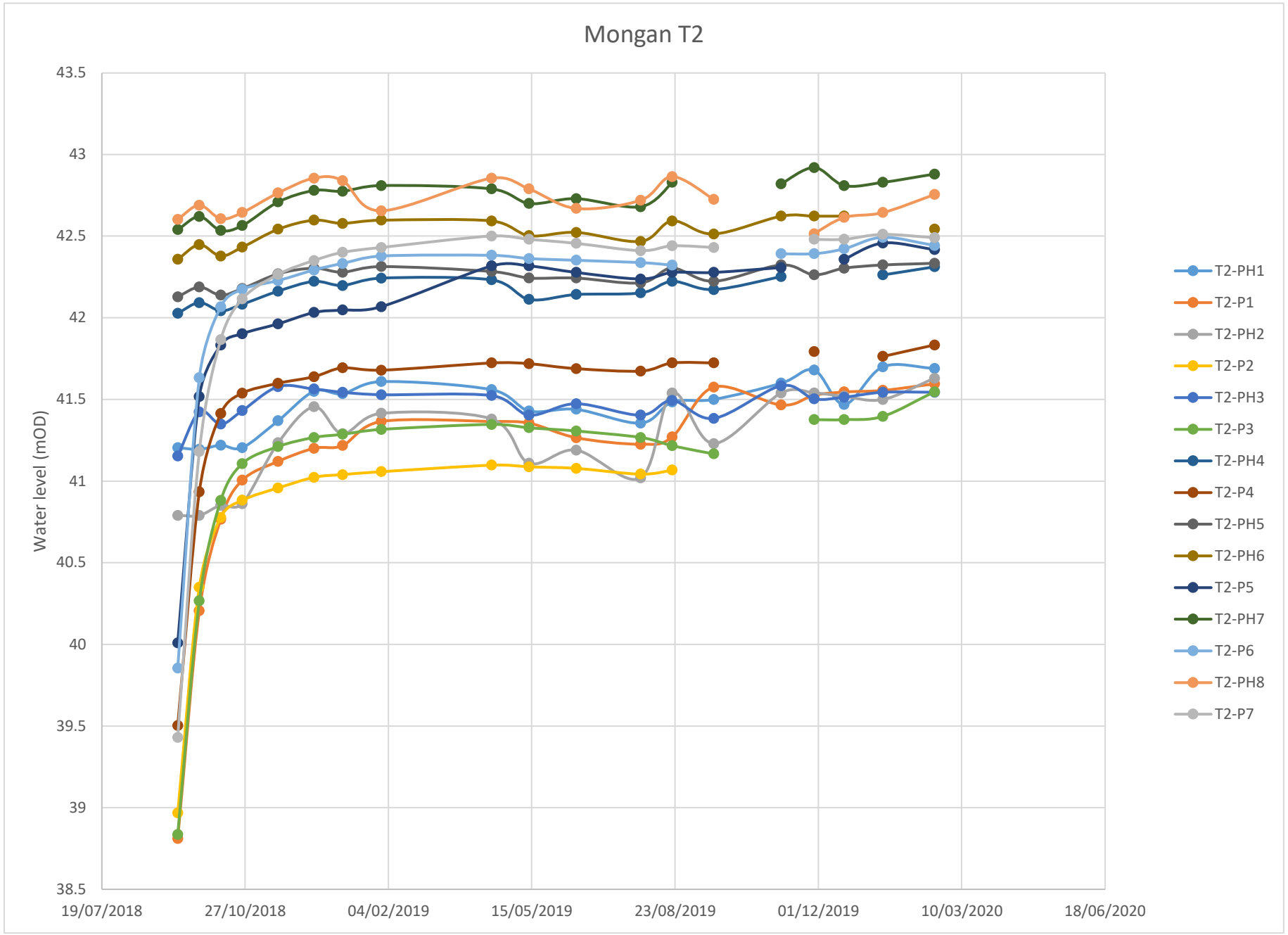
T1-PH10
T1-P7


Mongan T2
Water level (mOD)
43.5
43
42.5
42
41.5
41
40.5
40
39.5
39
38.5
19/07/2018
27/10/2018
04/02/2019
15/05/2019
23/08/2019
01/12/2019
10/03/2020
18/06/2020
T2-PH1
T2-P1
T2-PH2
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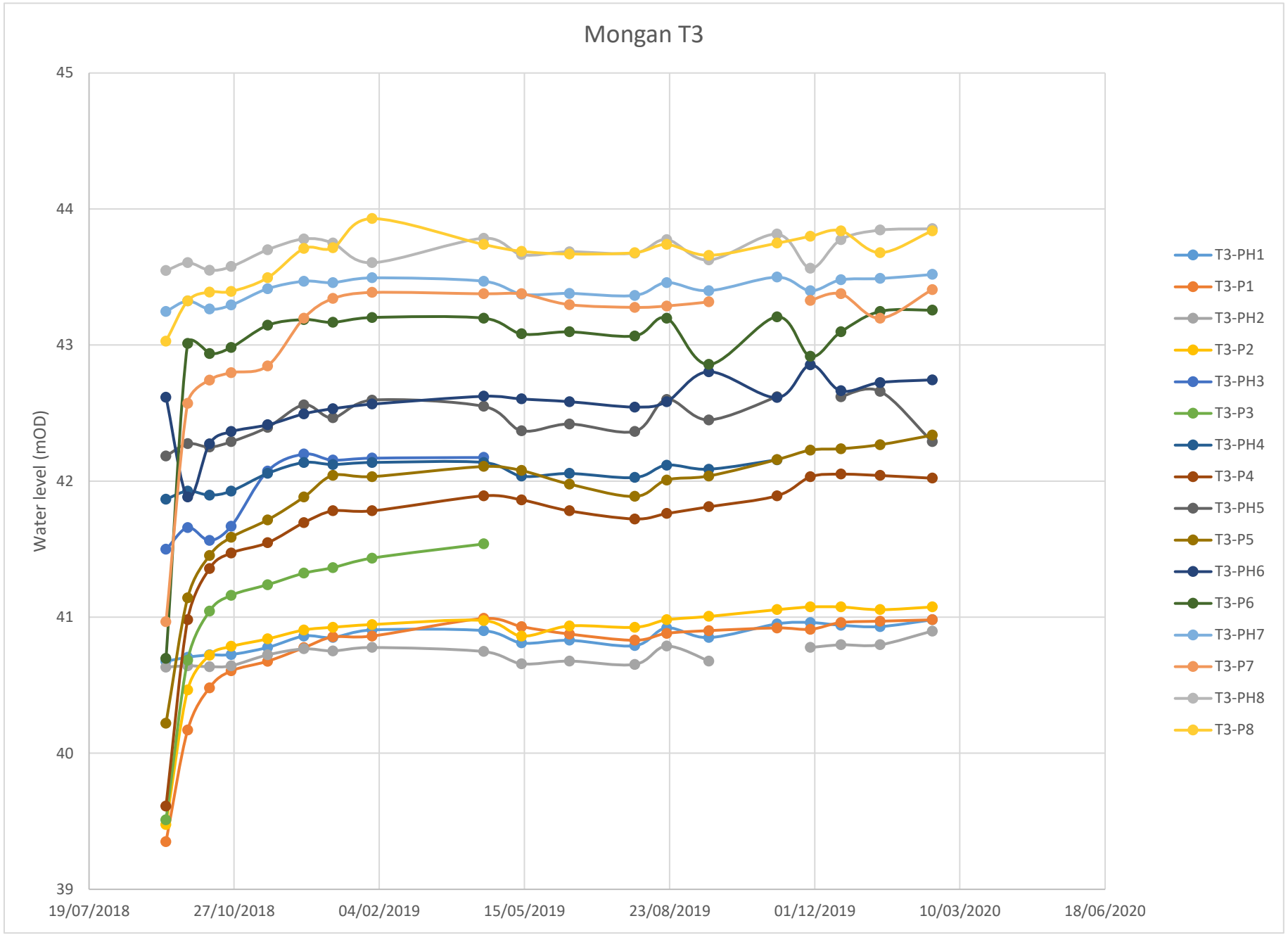
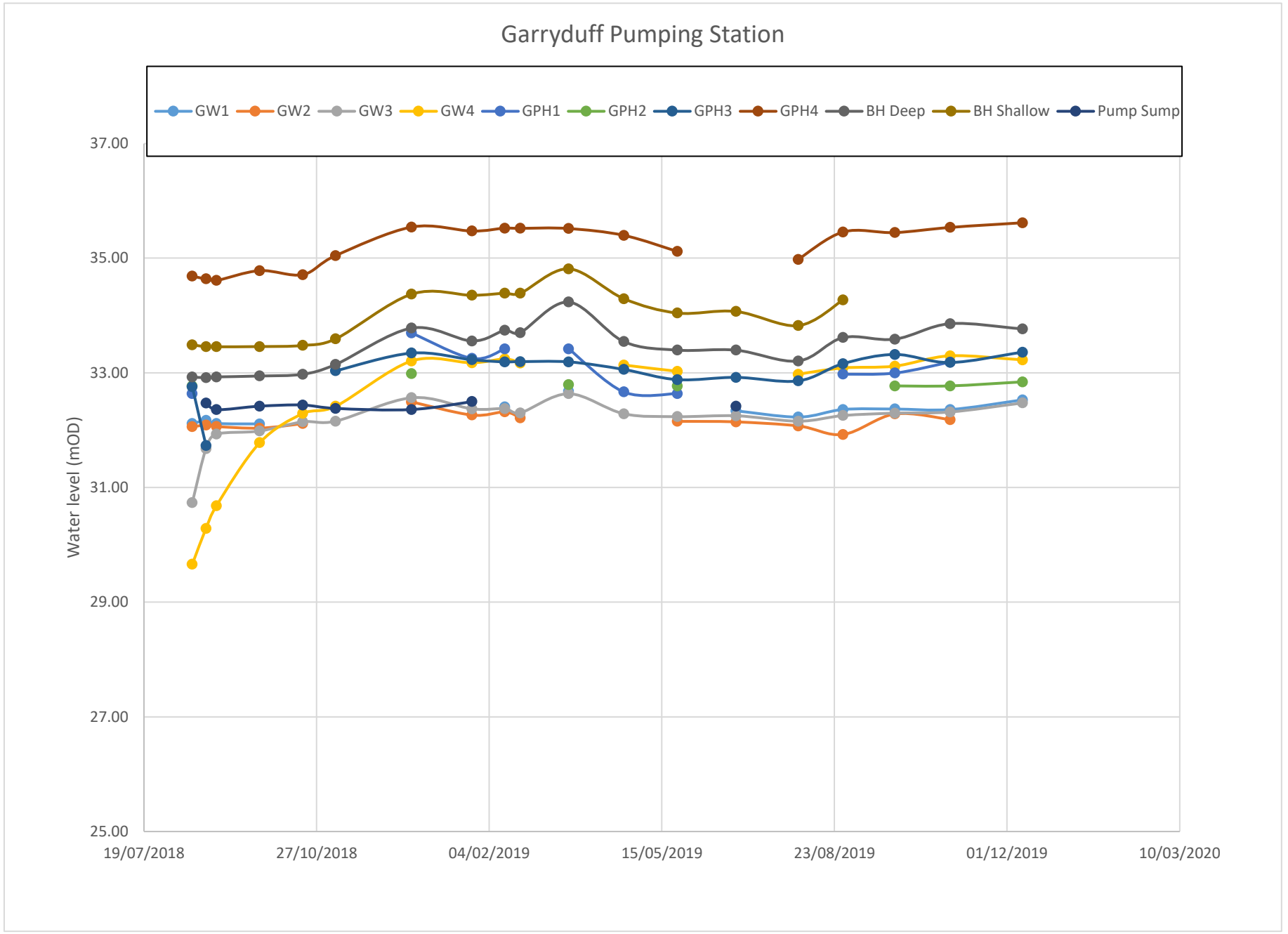
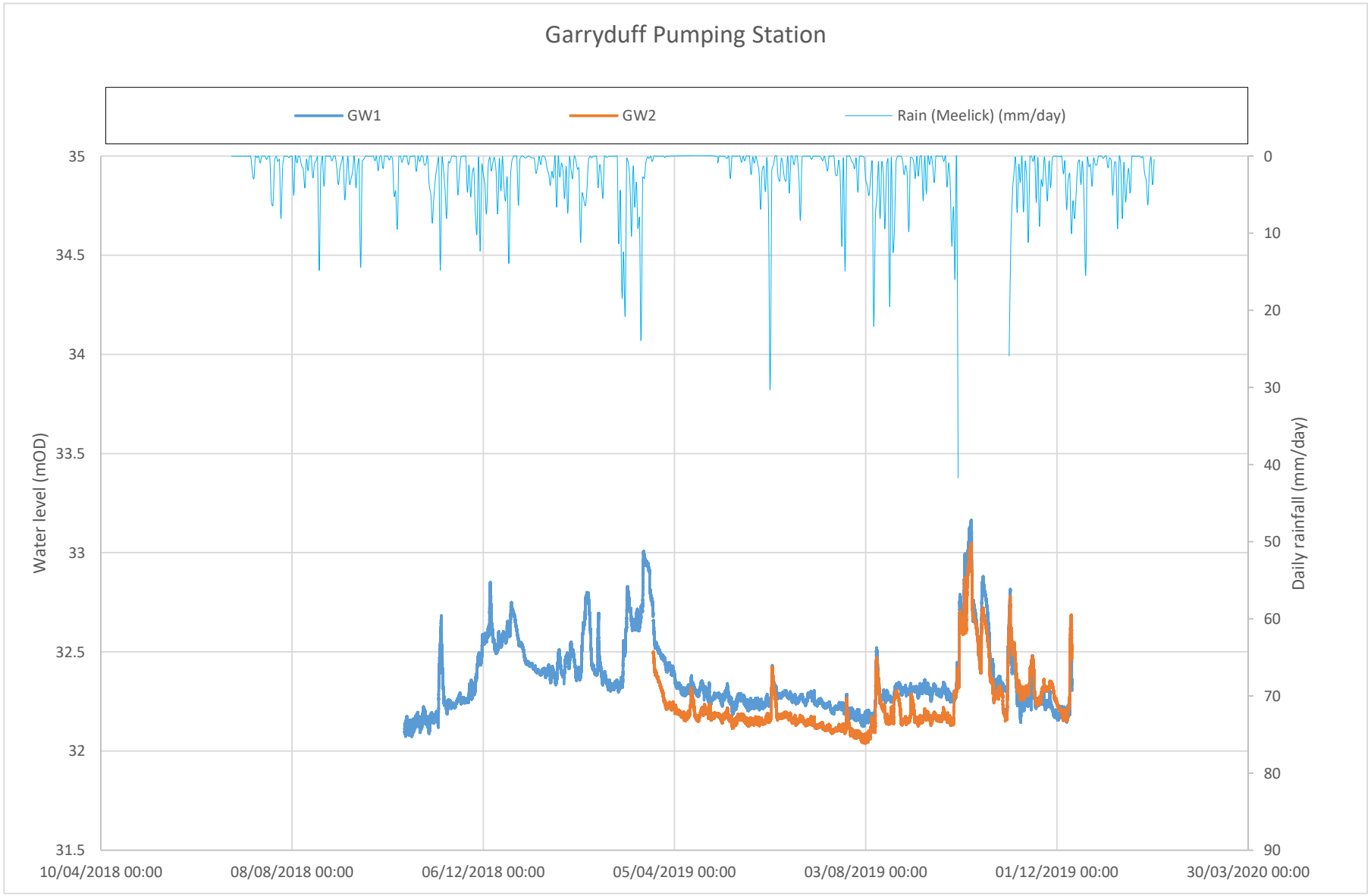
T2-PH8
T2-P7


Mongan T3
Water level (mOD)
45
44
43
42
41
40
39
19/07/2018
27/10/2018
04/02/2019
15/05/2019
23/08/2019
01/12/2019
10/03/2020
18/06/2020
T3-PH1
T3-P1
T3-PH2
T3-P2
T3-PH3
T3-P3
T3-PH4
T3-P4
T3-PH5
T3-P5
T3-PH6
T3-P6
T3-PH7
T3-P7
T3-PH8
T3-P8

## APPENDIX VII: SUMMARY OF BNM WATER LEVEL DATA – GARRYDUFF

| Surveyed Levels Top of Pipes | Surveyed Levels - ground levels | Well ID | 16/08/2018 | 24/08/2018 | 30/08/2018 | 24/09/2018 | 19/10/2018 | 07/11/2018 | 21/12/2018 | 25/01/2019 | 13/02/2019 | 22/02/2019 | 22/03/2019 | 23/04/2019 | 24/05/2019 | 27/06/2019 | 02/08/2019 | 28/08/2019 | 27/09/2019 | 29/10/2019 | 10/12/2019 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 34.28 | 33.884 | GW1 | 32.12 | 32.17 | 32.12 | 32.11 | | | | | 32.41 | | 32.68 | | | 32.34 | 32.23 | 32.36 | 32.37 | 32.36 | 32.53 |
| 34.385 | 33.901 | GW2 | 32.06 | 32.09 | 32.07 | 32.04 | 32.12 | | 32.50 | 32.27 | 32.32 | 32.22 | | | 32.16 | 32.15 | 32.08 | 31.93 | 32.29 | 32.19 | |
| 34.657 | 33.914 | GW3 | 30.74 | 31.68 | 31.93 | 31.99 | 32.15 | 32.16 | 32.57 | 32.37 | 32.38 | 32.30 | 32.64 | 32.29 | 32.24 | 32.25 | 32.16 | 32.26 | 32.30 | 32.32 | 32.48 |
| 35.927 | 35.645 | GW4 | 29.66 | 30.29 | 30.68 | 31.78 | 32.29 | 32.42 | 33.21 | 33.18 | 33.24 | 33.17 | | 33.14 | 33.03 | | 32.98 | 33.09 | 33.12 | 33.30 | 33.23 |
| 34.588 | 33.923 | GPH1 | 32.64 | | | | | | 33.70 | 33.25 | 33.42 | | 33.42 | 32.67 | 32.64 | | | 32.98 | 33.00 | 33.19 | |
| 34.753 | 33.904 | GPH2 | 32.77 | | | | | | 32.99 | | | | 32.79 | | 32.77 | | | | 32.77 | 32.77 | 32.84 |
| 34.711 | 33.942 | GPH3 | 32.76 | 31.73 | | | | 33.04 | 33.35 | 33.23 | 33.19 | 33.20 | 33.19 | 33.06 | 32.88 | 32.92 | 32.86 | 33.16 | 33.32 | 33.18 | 33.36 |
| 36.158 | 35.633 | GPH4 | 34.69 | 34.64 | 34.61 | 34.78 | 34.71 | 35.05 | 35.54 | 35.48 | 35.52 | 35.52 | 35.52 | 35.40 | 35.12 | | 34.98 | 35.46 | 35.45 | 35.54 | 35.62 |
| 35.137 | 35.037 | BH Deep | 32.93 | 32.92 | 32.93 | 32.95 | 32.98 | 33.15 | 33.78 | 33.56 | 33.74 | 33.70 | 34.24 | 33.55 | 33.40 | 33.40 | 33.21 | 33.62 | 33.59 | 33.86 | 33.77 |
| 35.074 | 35.024 | BH Shallow | 33.49 | 33.46 | 33.46 | 33.46 | 33.48 | 33.59 | 34.37 | 34.35 | 34.39 | 34.39 | 34.81 | 34.29 | 34.04 | 34.07 | 33.82 | 34.27 | | | |
| 35.56 | | Pump Sump | | 32.48 | 32.36 | 32.42 | 32.44 | 32.38 | 32.36 | 32.50 | | | | | | 32.42 | | | | | |


Garryduff Pumping Station
GW1
GW2
GW3
GW4
GPH1
GPH2
GPH3
GPH4
BH Deep
BH Shallow
Pump Sump
Water level (mOD)
37.00
35.00
33.00
31.00
29.00
27.00
25.00
19/07/2018
27/10/2018
04/02/2019
15/05/2019
23/08/2019
01/12/2019
10/03/2020


Garryduff Pumping Station
GW1
GW2
Rain (Meelick) (mm/day)
Water level (mOD)
Daily rainfall (mm/day)
35
34.5
34
33.5
33
32.5
32
31.5
0
10
20
30
40
50
60
70
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90
10/04/2018 00:00
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30/03/2020 00:00

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# APPENDIX 8-4

***Water Framework Directive Assessment***

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# WATER FRAMEWORK DIRECTIVE ASSESSMENT
# PEAT EXTRACTION AND REHABILITATION PLAN AT THE BALLIVOR BOG GROUP, CO. MEATH/WESTMEATH

**FINAL REPORT**

Prepared for:

**BORD NA MÓNA PLC**

Prepared by:

**HYDRO-ENVIRONMENTAL SERVICES**

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# 1. INTRODUCTION

## 1.1 BACKGROUND

Hydro-Environmental Services (HES) were requested by MKO Ireland on behalf of Bord na Móna PLC to complete a Water Framework Directive (WFD) Assessment for the effects of peat extraction operations and associated ancillary activities at the Ballivor Bog Group, Co. Meath/Westmeath.

The Application Site comprises 5 no. Bord na Móna bogs, Ballivor, Carranstown, Bracklin, Lisclogher, and Lisclogher West Bogs, situated c. 2.5 km south-southeast of Delvin, c. 3.7 km east of Raharney, and c. 2.2 km west of Ballivor Village in Counties Meath and Westmeath. The total Application Site area is approximately 24.19km$^2$.

The purpose of this WFD assessment is to determine whether any specific components or activities associated with the peat extraction activities at the Application Site have compromised WFD objectives or have resulted in a deterioration of the status of any waterbodies in the vicinity or downstream of the Application Site. In addition, this assessment will determine whether any components or activities associated with the proposed site Cutaway Bog Decommissioning and Rehabilitation Plans and associated activities will compromise WFD objectives or result in a deterioration of the status of any waterbodies in the vicinity or downstream of the Application Site. This assessment will determine the water bodies with the potential to be impacted, describe the control measures and determine if the peat extraction activities have been in compliance with the objectives of the WFD since its transposition into Irish Law in 2003.

This WFD assessment is intended to supplement the remedial EIAR submitted as part of the substitute consent application. For the purposes of this FRA, and consistent with the rEIAR, the various components are described and assessed using the following references: the 'Project', 'Peat Extraction Phase', 'Current Phase' and the 'Remedial Phase'.

## 1.2 STATEMENT OF AUTHORITY

Hydro-Environmental Services (HES) are a specialist hydrological, hydrogeological and environmental practice that delivers a range of water and environmental management consultancy services to the private and public sectors across Ireland and Northern Ireland. HES was established in 2005, and our office is located in Dungarvan, County Waterford. We routinely complete impact assessments for hydrology and hydrogeology for a large variety of project types.

This WFD assessment was prepared by Michael Gill and Conor McGettigan.

Michael Gill (BA, BAI, Dip Geol., MSc, MIEI) is an Environmental Engineer and Hydrogeologist with over 18 years' environmental consultancy experience in Ireland. Michael has completed numerous hydrological and hydrogeological impact assessments for a variety of development types across Ireland. He has substantial experience in surface water drainage design and SUDs design and surface water/groundwater interactions.

Conor McGettigan (BSc, MSc) is a junior Environmental Scientist, holding an M.Sc. in Applied Environmental Science (2020) from University College Dublin. Conor has also completed a B.Sc. in Geology (2016) from University College Dublin. In recent times Conor has assisted in the preparation of hydrological and hydrogeological impact assessments for a variety of developments.

## 1.3 WATER FRAMEWORK DIRECTIVE

The EU Water Framework Directive (2000/60/EC), as amended by Directives 2008/105/EC, 2013/39/EU and 2014/101/EU ("WFD"), was established to ensure the protection of the water environment. The Directive was transposed in Ireland by the European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003).

The WFD requires that all member States protect and improve water quality in all waters, with the aim of achieving good ecological status by 2027 at the latest. Any new development must ensure that this fundamental requirement of the WFD is not compromised.

The WFD is implemented through the River Basin Management Plans (RBMP) which comprises a six-yearly cycle of planning, action and review. RBMPs include identifying river basin districts, water bodies, protected areas and any pressures or risks, monitoring and setting environmental objectives. In Ireland, the first RBMP covered the period from 2010 to 2015 with the second cycle plan covering the period from 2018 to 2021.

The River Basin Management Plan (2018 - 2021) objectives include:

- Ensure full compliance with relevant EU legislation;
- Prevent deterioration and maintain a 'high' status where it already exists;
- Protect, enhance and restore all waters with the aim of achieving at least good status by 2027;
- Ensure waters in protected areas meet requirements; and,
- Implement targeted actions and pilot schemes in focused sub-catchments aimed at (1) targeting water bodies close to meeting their objectives and (2) addressing more complex issues that will build knowledge for the third cycle.

Furthermore, the Department of Housing, Local Government and Heritage are currently reviewing the submissions made on the Draft River Basin Management Plan (2022 - 2027) which was out for public consultation in Q4 of 2021 and Q1 of 2022. As of January 2024, the plan has not been published while the draft plan is available to view at https://www.gov.ie/en/consultation/2bda0-public-consultation-on-the-draft-river-basin-management-plan-for-ireland-2022-2027/.

Our understanding of these objectives is that surface waters, regardless of whether they have 'Poor' or 'High' status, should be treated the same in terms of the level of protection and mitigation measures employed, *i.e.* there should be no negative change in status at all.

# 2. WATERBODY IDENTIFICATION & CLASSIFICATION

## 2.1 INTRODUCTION

This section identifies those surface waterbodies (SWBs), groundwater bodies (GWBs) and protected areas with potential to be affected by the historic peat extraction activities and proposed remedial measures and reviews any available WFD information.

## 2.2 SURFACE WATERBODY IDENTIFICATION

Regionally the Application Site is located in the River Boyne surface water catchment within Hydrometric Area 7 of the Eastern River Basin District (www.epa.ie).

On a more local scale, the majority of the Application Site is located in the River Boyne sub-catchment (Boyne_SC_050) with much of Ballivor Bog and a small section towards the southwest of Bracklin Bog located in the Boyne_040 sub-catchment. Additionally, a small area in the northwest of Bracklin Bog is located in the Deel[Raharney]_010 sub-catchment.

Within the Deel[Raharney]_010 sub-catchment, the Deel River flows to the southeast approximately 1km west of Bracklin Bog. This area of the Application Site (*i.e.* the northwest of Bracklin bog) drains towards the Deel(Raharney)_030 and Deel(Raharney)_040 river waterbodies. The River Deel flows to the southeast entering the Boyne_040 sub-catchment to the south of Raharney village. The River Deel reaches its confluence with the River Boyne approximately 4.5km south of Ballivor village.

Within the Boyne_040 sub-catchment, the Deel River flows to the southeast approximately 1.25km southwest of Ballivor Bog. This area of the Application Site (*i.e.* the southwest of Bracklin Bog and the west of Ballivor Bog) is drained by the Deel(Raharney)_060 river waterbody which discharges into the Boyne_060 river waterbody approximately 3.5km southeast of Ballivor Bog.

As stated above, the majority of the Application Site is located in the Boyne_050 sub-catchment. The Stonyford River flows to the southeast, approximately 700m east of Lisclogher Bog before eventually discharging into the Boyne River approximately 7km east of Ballivor Bog. The north of Lisclogher Bog is drained by the Stonyford_030 river waterbody with the remainder of Lisclogher bog and the majority of Bracklin and Carranstown bogs drained by the Stonyford_040 river waterbody. The south of Carranstown Bog and the east of Ballivor Bog are drained by the Boyne_060 river waterbody.

The Stoneyford River discharges into the Boyne_070 river waterbody approximately 5km southeast of Ballivor village. The River Boyne then flows to the northeast through the towns of Trim and Navan after which it continues eastwards before becoming tidal to the west of my M1 motorway. The Boyne flows through the Boyne Estuary transitional waterbody and discharges into the Boyne Estuary Plume Zone costal waterbody between Haven and Mornington Point.

Error! Reference source not found. below illustrates the surface waterbodies located downstream of the Application Site.

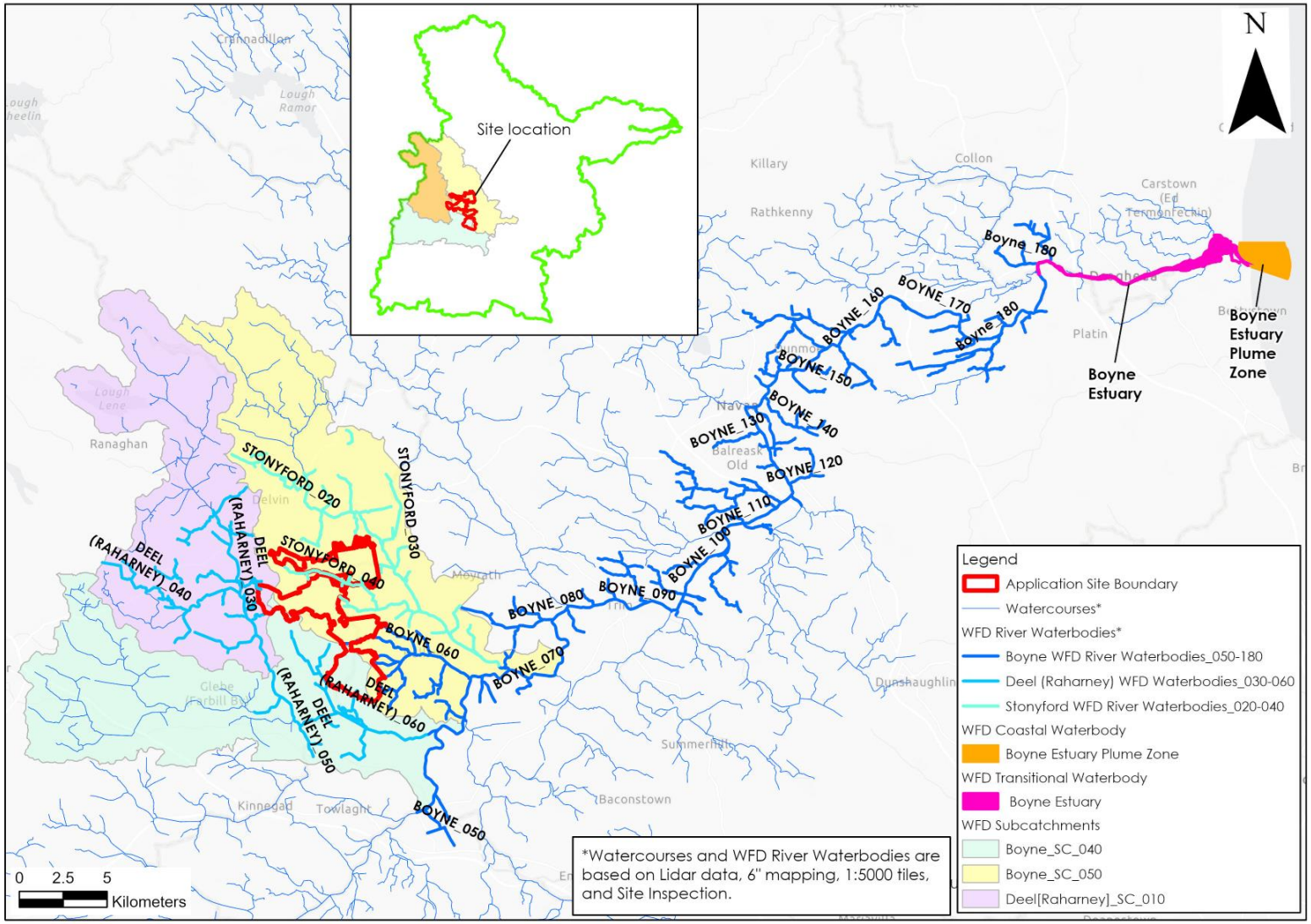


**Figure A: Hydrological Setting and Downstream Surface Water Bodies**

**Table A** presents the catchment area of each waterbody downstream of the Application Site. The Deel(Raharney)_030 river waterbody in the vicinity of the Application Site has the smallest catchment area of 68.54km$^2$. The catchment area increases progressively downstream as more tributaries discharge into the Boyne River, with the final river waterbody *i.e*. Boyne_180, having a total catchment area of 2,524km$^2$. In addition, **Table A** presents the area of the Application Site draining to each waterbody as a percentage of the total catchment area for that waterbody. The percentage decreases progressively downstream of the Application Site. For example, the Application Site is 10.10% of the total catchment area of the Stonyford_040 river waterbody but only 0.96% if the total catchment draining to the Boyne_180 river waterbody. Therefore, those waterbodies which are located in close proximity to the Application Site are more susceptible to water quality impacts as a result of activities within the Application Site.

**Table A: Downstream Catchment Size**

| WFD River Sub-Basin | Total Catchment Area (km$^2$) | Area of Application Site draining to Waterbody (km$^2$) | Application Site as % Area of Catchment |
|---|---|---|---|
| Deel(Raharney)_030 | 68.54 | 0.46 | 0.45 |
| Deel(Raharney)_040 | 103.81 | 0.97 | 0.66 |
| Deel(Raharney)_050 | 118.71 | 0.97 | 0.38 |
| Deel(Raharney)_060 | 153.96 | 6.17 | 2.11 |
| Boyne_050 | 741.64 | 6.17 | 0.83 |
| Boyne_060 | 947.67 | 8.58 | 0.91 |
| Stonyford_030 | 102.83 | 0.49 | 0.48 |
| Stonyford_040 | 154.67 | 15.61 | 10.10 |
| Boyne_070 | 1,147.95 | 24.19 | 2.11 |
| Boyne_080 | 1,343.76 | 24.19 | 1.80 |
| Boyne_090 | 1,354.41 | 24.19 | 1.77 |
| Boyne_100 | 1,471.87 | 24.19 | 1.64 |
| Boyne_110 | 1,563.22 | 24.19 | 1.55 |
| Boyne_120 | 1,666.65 | 24.19 | 1.45 |
| Boyne_130 | 1,680.85 | 24.19 | 1.44 |
| Boyne_140 | 2,397.15 | 24.19 | 1.00 |
| Boyne_150 | 2,411.06 | 24.19 | 1.00 |
| Boyne_160 | 2,468.03 | 24.19 | 0.98 |
| Boyne_170 | 2,477.50 | 24.19 | 0.97 |
| Boyne_180 | 2,524.54 | 24.19 | 0.96 |
| Boyne Estuary | 2,672.86 | 24.19 | 0.91 |

## 2.3 SURFACE WATER BODY CLASSIFICATION

A summary of the WFD status and risk result for Surface Water Bodies (SWBs) downstream of the Application Site are shown in **Table B**. The overall status is based on the ecological, chemical and quantitative status of each SWB.

Local Groundwater Body (GWB) and Surface water Body (SWB) status information is available from (www.catchments.ie).

The western section of Bracklin Bog is drained by the Deel(Raharney)_030 SWB. The status of this SWB has improved from "Moderate" in the 2nd WFD cycle (2013-2018) to "Good" in the latest 3rd WFD cycle (2016-2021). Further downstream the Deel(Raharney)_040 SWB achieved "Good" status in all 3 no. WFD cycles while the Deel(Raharney)_050 SWB was assigned "Moderate" status in all 3 no. WFD cycles. The Deel(Raharney)_060 SWB drains the western section of Ballivor Bog and its status has increased from "Moderate" in the 1st WFD cycle (2010-2015) to "Good" in the 2nd WFD cycle (2013-2018) and has remained at "Good" status in the latest WFD cycle (2016-2021).Further downstream, the Boyne_050 achieved "Good" status in all 3 no. WFD cycles.

The Boyne_060 SWB drains the eastern section of Ballivor and Carranstown bogs. This SWB has experienced an improved status from "Moderate" in 2010-2015 to "Good" in 2013-2018 and 2016-2021. The Stonyford River drains Lisclogher, Lisclogher West and Bracklin bogs. The Stonyford_030 has consistently deteriorated in status throughout each of the WFD cycles, having "Good" status in 2010-2015, to "Moderate" in 2013-2018, to "Poor" in 2016-2021. The Stonyford_040 however, received a deterioration in status from "Good" in 2010-2015 to "Moderate" in 2013-2018 and remained to be of "Moderate" status in 2016-2021.Further downstream the Boyne_070 and Boyne_080 both achieved "Moderate" status in the latest WFD round.

Further downstream the River Boyne (Boyne_090 to Boyne_180) is mostly of "Moderate" status with only it's lower reaches (Boyne_170 and _180) achieving "Good" status in the latest WFD cycle. A greater proportion of waterbodies proximal to the Application Site have achieved "Good" status in comparison to those further downstream.

The majority of the SWBs draining the Application Site or directly downstream have been deemed to be "At risk" of not meeting their WFD objectives. The Boyne Estuary transitional waterbody and the Boyne Estuary Plume Coastal waterbody both achieved "Moderate" status in the latest WFD cycle.

The Draft 3rd Cycle Boyne Catchment Report (HA 07) states that excess nutrients remain the most prevalent issue in the Boyne Catchment. The report states that excessive nutrient loss leading to eutrophication is a major issue for SWBs within the Boyne Catchment. Significant pressures relating to excess nutrients are primarily agriculture but also include the extractive industry and urban wastewater. The poor status of these downstream waterbodies relates to a combination of activities and pressures within the wider catchment.

Agriculture is a significant pressure on 7 no. SWBs downstream of the Application Site. In relation to agriculture, the Draft 3rd Cycle Boyne Catchment Report states that phosphorous loss to surface waters remains an issue. Organic pollution associated with run-off from farmyards has also been identified throughout the catchment. Sediment associated with agricultural activities such as stream crossings and land drainage has also been listed as an issue.

Hydromorphology has been listed as a significant pressure on 7 no. SWBs in the vicinity and downstream of the Application Site. The Draft 3rd Cycle Catchment Report states that channelisation is the dominant hydromorphology subcategory with 34 no. river waterbodies in the Boyne catchment subject to extensive modification mainly due to drainage schemes.

Peat (peat drainage and peat extraction) is listed as significant pressure 13 no. river waterbodies within the Boyne Catchment. However, only 1 no. waterbody downstream of the Application Site (Stonyford_030) is under significant pressure from peat. The Draft 3rd Cycle Catchment Report states that peat pressures have resulted in increased sediment loads in these rivers which alters habitats, morphology and hydrology. The report also states that peat pressures have resulted in fluctuations in ammonia concentrations.

Other pressures listed on river waterbodies downstream of the Application Site include urban wastewater, urban runoff and domestic wastewater.

In terms of transitional and coastal waterbodies, the Boyne Estuary and the Boyne Estuary Plume are both "at risk" of failing to meet their respective WFD objectives. The Boyne Estuary is under significant pressure from agricultural activities in the wider catchment and urban wastewater from the Drogheda agglomeration. Meanwhile the Boyne Estuary Plume is being impacted by urban runoff and unknown anthropogenic activities which are resulting in macroalgae and phytoplankton issues.

SWB status for the 2016-2021 WFD cycle are shown in **Figure B**.

**Table B: Summary WFD Information for Downstream Surface Water Bodies**

| SWB | Overall Status (2010-2015) | Overall Status (2013-2018) | Overall Status (2016-2021) | 3rd Cycle Risk Status | WFD Pressures |
|---|---|---|---|---|---|
| Deel(Raharney)_030 | Good | Moderate | Good | At risk | Agriculture |
| Deel(Raharney)_040 | Good | Good | Good | Not at risk | None |
| Deel(Raharney)_050 | Moderate | Moderate | Moderate | At risk | Hydromorphology |
| Deel(Raharney)_060 | Moderate | Good | Good | Under review | Hydromorphology & agriculture |
| Boyne_050 | Good | Good | Good | Not at risk | None |
| Boyne_060 | Moderate | Good | Good | At risk | Hydromorphology & agriculture |
| Stonyford_030 | Good | Moderate | Poor | At risk | Agriculture & peat |
| Stonyford_040 | Good | Moderate | Moderate | At risk | Agriculture |
| Boyne_070 | Good | Moderate | Moderate | At risk | Agriculture |
| Boyne_080 | Moderate | Moderate | Moderate | At risk | Hydromorphology |
| Boyne_090 | Moderate | Moderate | Moderate | At risk | Hydromorphology & urban run-off |
| Boyne_100 | Moderate | Moderate | Moderate | At risk | Hydromorphology & agriculture |
| Boyne_110 | Unassigned | Good | Moderate | Under review | None |
| Boyne_120 | Moderate | Good | Moderate | Under review | None |
| Boyne_130 | Unassigned | Good | Moderate | Not at risk | None |
| Boyne_140 | Unassigned | Moderate | Moderate | Under review | None |
| Boyne_150 | Moderate | Moderate | Moderate | At risk | Anthropogenic & domestic wastewater |
| Boyne_160 | Moderate | Moderate | Moderate | Under review | Hydromorphology, agriculture, & urban wastewater |
| Boyne_170 | Good | Good | Good | Under review | None |
| Boyne_180 | Good | Good | Good | Not at risk | None |
| Boyne Estuary | Moderate | Moderate | Moderate | At risk | Agriculture & urban wastewater |
| Boyne Estuary Plume | Good | Moderate | Moderate | At risk | Anthropogenic & Urban Runoff |

## 2.4 GROUNDWATER BODY IDENTIFICATION

According to data from the GSI database and bedrock geology series (www.gsi.ie), the majority of the Application Site is underlain by a locally Important Aquifer (LI) with a small area in the north underlain by a Poor Aquifer (PI). These bedrock aquifers comprise of Dinantian Pure Unbedded Limestones and Dinantian Upper Impure Limestones.

The Application Site is underlain by the Athboy Groundwater Body (GWB), characterised by poorly productive bedrock.

## 2.5 GROUNDWATER BODY CLASSIFICATION

The Athboy GWB (IE_EA_G_001) underlies the Application Site. This GWB has been assigned 'Good Status' in all WFD cycles (2010-2015, 2013-2018 and 2016-2021) (**Table C**). This status is defined based on the quantitative status and chemical status of the GWB. The Athboy GWB is deemed to be "At risk" of not meeting its WFD objectives, however, no significant pressures have been identified to be impacting this GWB.

**Table C: Summary WFD Information for Groundwater Bodies**

| GWB | Overall Status (2010-2015) | Overall Status (2013-2018) | Overall Status (2016-2021) | 3rd Cycle Risk Status | WFD Pressures |
|---|---|---|---|---|---|
| Athboy | Good | Good | Good | At risk | None |

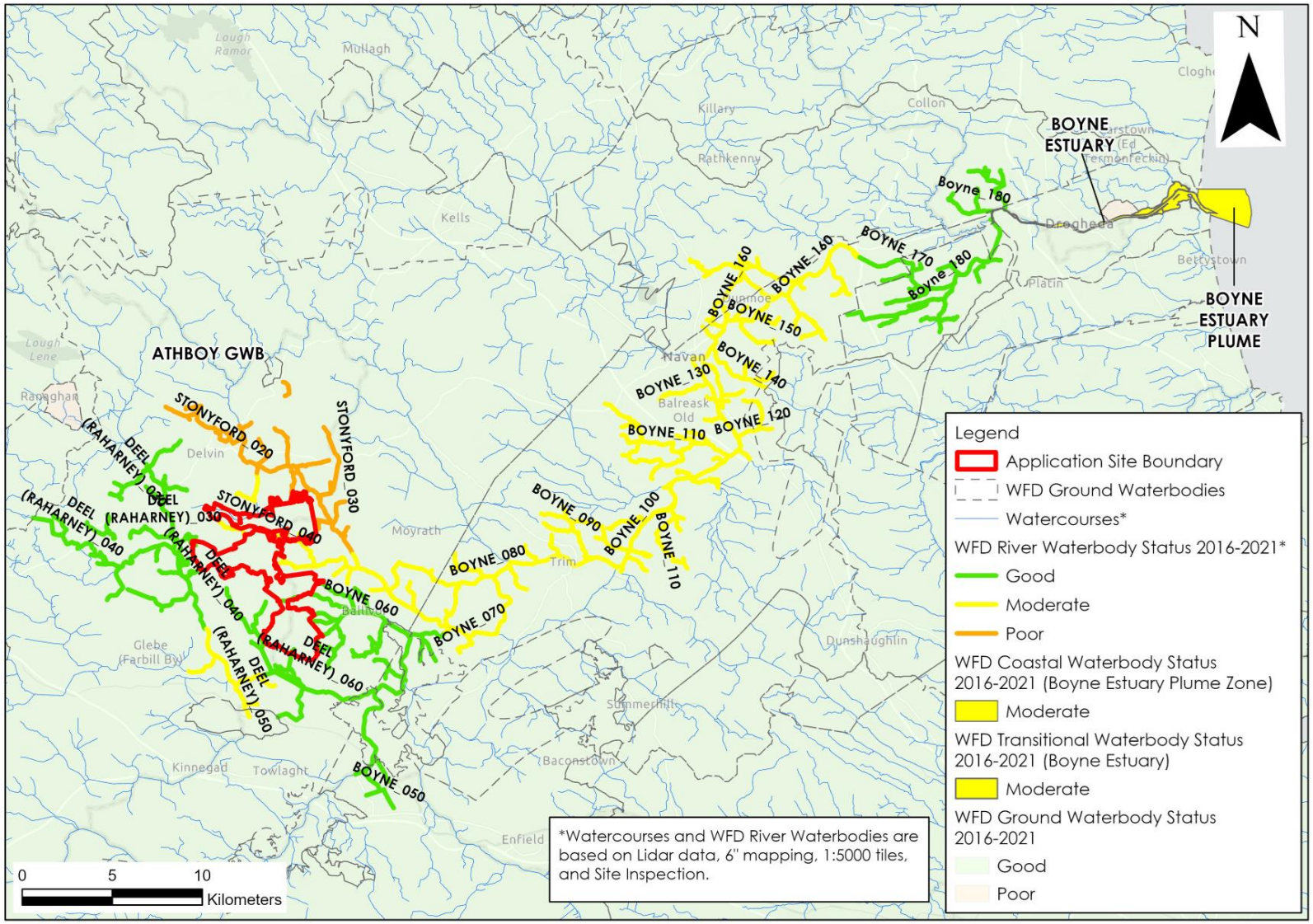


**Figure B: WFD Waterbody Status (2016-2021)**

## 2.6 PROTECTED AREA IDENTIFICATION

The WFD requires that activities are also in compliance with other relevant legislation, as considered below.

The potential effect of the historic peat extraction activities and the proposed remedial measures on nature conservation designated sites, bathing waters, nutrient sensitive areas (NSAs), shellfish areas and drinking water protected area's (DWPAs) are also included as part of the WFD Compliance Assessment.

### 2.6.1 Nature Conservation Designations

Within the Republic of Ireland designated sites include Natural Heritage Areas (NHAs), Proposed Natural Heritage Areas (pNHAs), Special Areas of Conservation (SACs), candidate Special Areas of Conservation (cSAC) and Special Protection Areas (SPAs).

Ramsar sites are wetlands of international importance designated under the Ramsar Convention (adopted in 1971 and came into force in 1975), providing a framework for the conservation and wise use of wetlands and their resources.

The Application Site is not located within a Ramsar site or a designated site of national (Natural Heritage Area (NHA) / Proposed Natural Heritage Area (pNHA)) or European importance (Special Area of Conservation (SAC) / Special Protection Area (SPA).

However, there are downstream hydrological connections with some Natura 2000 sites within the River Boyne surface water catchment. Designated sites that lie downstream of the Application Site include:

- River Boyne and River Blackwater SAC (Site Code: 002299), is hydrologically linked with the Application Site as the Deel (Raharney), Stonyford and Boyne rivers are included within the SAC;
- River Boyne and River Blackwater SPA (Site Code: 004232), is hydrologically linked with the Application Site as the Deel (Raharney), Stonyford and Boyne rivers are included within the SAC;
- Boyne Woods pNHA (Site Code: 001592), 26km northeast of Lisclogher Bog and to the east of Navan Town along the River Boyne;
- Crewbane Marsh pNHA (Site Code: 000553), 35km northeast of Lisclogher Bog along the River Boyne;
- Dowth Wetland pNHA (Site Code: 001861), 40km northeast of Lisclogher Bog;
- Boyne River Islands pNHA (Site Code: 001862), 42km northeast of Lisclogher Bog and to the west of Drogheda; and,
- Boyne Coast and Estuary SAC and pNHA(Site Code: 001957), 48km northeast of the Lisclogher Bog.

Other protected sites located in the vicinity of the Application Site but are not directly linked via surface water pathways include:

- Mount Hevey Bog SAC and Mount Hevey Bog pNHA is located approximately 3.4km west of the Application Site.
- The Royal Canal pNHA is located approximately 1.3km southwest of the Application Site.

### 2.6.2 Bathing Waters

There are no bathing water sites located in the vicinity of the Application Site. The closest protected bathing waters are located at Portrane - Brook Beach (IEEABWC020_0000_0200), ~60km west (as the crow flies) of the Application Site.

### 2.6.3 Nutrient Sensitive Areas

Nutrient Sensitive Areas (NSA) comprise Nitrate Vulnerable Zones and polluted waters designated under the Nitrates Directive (91/676/EEC) and areas designated as sensitive areas under the Urban Wastewater Treatment Directive (UWWTD)(91/271/EEC). Sensitive areas under the UWWTD are water bodies affected by eutrophication associated with elevated nitrate concentrations and act as an indication that action is required to prevent further pollution caused by nutrients.

The Boyne River NSA (IERI_EA_1994_0001) and the Boyne Estuary NSA (IE_EA_010_0100) are mapped downstream of the Application Site. The Boyne River NSA is mapped to begin within the Boyne_100 river sub-basin, approximately 16km downstream of the Application Site. The EPA carried out a review of Nutrient Sensitive Areas (NSAs) downstream of large urban wastewater discharges in 2020. Once the regulations are in place, and nutrient sensitive areas have been identified, additional nutrient removal must be applied (if not already applied) to wastewater treatment plants discharging to the sensitive area. If this treatment was in place the objective was deemed to have been met. According to the Draft 3rd Cycle Boyne Catchment Report (2021, EPA) the NSA objectives are being met for the River Boyne and Boyne Estuary within the catchment.

### 2.6.4 Shellfish Areas

The Shellfish Waters Directive (2006/113/EC) aims to protect or improve shellfish waters in order to support shellfish life and growth.

There are no designated shellfish areas located in the vicinity of the Application Site. The Application Site is ~60km west (as the crow flies) of Balbriggan\Skerries (IE_EA_020_0000), the nearest protected shellfish area.

### 2.6.5 Drinking Water Protected Areas

According to the Draft 3rd Cycle Boyne Catchment Report (EPA, 2021) there are 12 no. surface waterbodies in the catchment identified as Drinking Water Protected Areas (DWPAs).

The Stoneyford_040 (IE_EA_07S020400) SWB mapped within the Application Site is identified as a DWPA. Further downstream the Boyne_100 SWB (IE_EA_07B041500), the Boyne_120 SWB (IE_EA_07B041700) and the Boyne_180 SWB (IE_EA_07B042200) are also recognised as DWPA's.

Meanwhile, all GWBs within the catchment, including the Athboy GWB, are listed as DWPAs.

# 3. WFD SCREENING

As discussed in **Section 2**, there are a total of 22 no. surface water bodies that are located in the vicinity or downstream of the Application Site. In addition, 1 no. groundwater body underlies the Application Site. Furthermore, there are several protected areas within the vicinity and downstream of the Application Site including a number of nature conservation designated sites, NSAs and DWPAs.

## 3.1 SURFACE WATER BODIES

As shown in Error! Reference source not found. above, there are 20 no. river water bodies, 1 no. transitional waterbody and 1 no. coastal waterbody located downstream of the Application Site.

With consideration for the historic peat extraction activities and the Cutaway Bog Decommissioning and Rehabilitation Plans for the Application Site, it is considered that all sections of the Deel(Raharney) and Stonyford Rivers in the vicinity and downstream of the Application Site are carried through into the WFD Assessment (*i.e.* Deel(Raharney)_030, Deel(Raharney)_040, Deel(Raharney)_050, Deel(Raharney)_060, Stonyford_030 and Stonyford_040). Similarly, the sections of the River Boyne to the west of Trim and downstream of the Application Site will be carried through for WFD Assessment (i.e. Boyne_050, Boyne_060, Boyne_070 and Boyne_080).

The River Boyne downstream of Trim has been screened out due to its distant location (>10km) from the Application Site. As outlined above in **Table A**, the area of the Application Site draining to downstream waterbodies as a percentage of the total catchment area for that waterbody decreases progressively downstream. For example, the Application Site is 1.77% of the total catchment area of the Boyne_090 river waterbody. This figure decreases to 0.96% for the Boyne_180 river waterbody upstream of the Boyne Estuary. Therefore, the Application Site comprises a very small percentage of the total catchment area to these surface waterbodies. The WFD also note the emergence of several new pressures on river waterbodies downstream of Trim *i.e*. agriculture, urban runoff and urban wastewater. The status of these waterbodies will not be affected by activities at the Application Site but rather represent pressures associated with wider land-use patterns in their catchments.

In addition, the Boyne Estuary transitional waterbody and the Boyne Estuary Plume coastal waterbody have been screened out due to their distant location, the large volumes of water within these surface waterbodies and the saline nature of these waters. The historic peat extraction activities and the proposed rehabilitation plans have no potential to cause a deterioration in the status of these screened out SWBs and/or jeopardise their attainment of good surface water status.

## 3.2 GROUNDWATER BODIES

With respect to groundwater bodies, the Athboy GWB will be carried through to the WFD Assessment due to its proximal location directly underlying the Application Site.

## 3.3 PROTECTED AREAS

The Application Site is hydrologically connected to the River Boyne and River Blackwater SAC and SPA via several drains and streams which flow from the bog areas into the Deel (Raharney), Stonyford and Boyne rivers. With consideration for the historic peat extraction activities and the proposed Cutaway Decommissioning and Rehabilitation Plans for the Application Site, it is considered that the River Boyne and River Blackwater SAC and SPA are carried through into the WFD Impact Assessment.

Several other designated sites, listed in **Section** Error! Reference source not found., are located further downstream along the River Boyne and are therefore also hydrologically connected with the Application Site. However, these designated sites are located significant distances (>25km) from the Application Site. Therefore, the historic peat extraction activities and the proposed Cutaway Bog Decommissioning and Rehabilitation Plans have no potential to impact any of these designated sites and so have been screened out. Consequently, the River Boyne and River Blackwater SAC/SPA remain the primary sensitive receptors due to their proximity to the Application Site and the direct hydrological linkage.

The Mount Hevey Bog SAC and Mount Hevey Bog pNHA is a raised bog and is located upgradient of any drainage from the Application Site. In addition, the River Deel acts as a hydraulic barrier between the Application Site and Hevey Bog. Therefore, no hydrological or hydrogeological impacts will occur on this designated site as a result of the historic peat extraction activities and the proposed rehabilitation plans.

The Royal Canal pNHA is located approximately 1.3km southwest of the Application Site. The River Deel acts as a hydraulic barrier between the Application Site and this pNHA. Therefore, no hydrological or hydrogeological impacts will occur on this designated site as a result of the historic peat extraction activities and the proposed Cutaway Bog Decommissioning and Rehabilitation Plans.

The Boyne River NSA downstream of the town of Trim has been screened out due to its distant location (>10km) from the Application Site and the increasing volumes of water within the Boyne River. In addition, the Boyne Estuary NSA has been screened out due to its distant location, the large volumes of water within the surface waterbody and the saline nature of these waters. The historic peat extraction activities and the proposed Cutaway Bog Decommissioning and Rehabilitation Plans have no potential to cause a deterioration in the status of these NSAs.

With consideration for the historic peat extraction activities and the proposed rehabilitation plan for the Application Site, it is considered that the Stonyford_040 DWPA is carried through into the WFD Impact Assessment due to its proximal location.

The bathing waters at Portrane, the Brook Beach and Shellfish areas at Balbriggan\Skerries, have been screened out due to their distal location from the Application Site. The historic peat extraction activities and the proposed Cutaway Bog Decommissioning and Rehabilitation Plans have no potential to cause a deterioration to these bathing or shellfish protected areas.

## 3.4 WFD SCREENING SUMMARY

A summary of WFD Screening discussed above is shown in **Table D**.

**Table D: Screening of WFD water bodies**

| Type | WFD Classification | Waterbody Name/ID | Inclusion in Assessment | Justification |
|---|---|---|---|---|
| Surface Water Body | River | Deel(Raharney)_030 | **Yes** | The northwest of Bracklin Bog is located within the catchment of the Deel(Raharney)_030 SWB. An assessment is required to consider the potential impacts that historic peat extraction activities have had on this SWB. Similarly, an assessment is required to consider the potential impacts of the proposed rehabilitation plan on this SWB. |
| | River | Deel(Raharney)_040 | **Yes** | The west of Bracklin Bog is located within the catchment of the Deel(Raharney)_040 SWB. An assessment is required to consider the potential impacts that peat extraction activities have had on this SWB. Similarly, an assessment is required to consider the potential impacts of the proposed rehabilitation plan on this SWB. |
| | River | Deel(Raharney)_050 | **Yes** | The Deel(Raharney)_050 SWB is located directly downstream of the Deel(Raharney)_040 SWB and in close proximity to the Application Site. An assessment is required to consider the potential impacts of the peat extraction activities on this GWB. Similarly, an assessment is required to consider the potential impacts of the proposed rehabilitation plan on this SWB. |
| | River | Deel(Raharney)_060 | **Yes** | The southwest of Bracklin bog and the west of Ballivor bog drain to the Deel(Raharney)_060 SWB. An assessment is required to consider the potential impacts that peat extraction activities have had on this SWB. Similarly, an assessment is required to consider the potential impacts of the proposed rehabilitation plan on this SWB. |
| | River | Boyne_050 | **Yes** | The Boyne_050 SWB is located directly downstream of the Deel(Raharney)_060 SWB and in close proximity to the Application Site. An assessment is required to consider the potential impacts that peat extraction activities have had on this SWB. Similarly, an assessment is required to consider the potential impacts of the proposed rehabilitation plan on this SWB. |
| | River | Stonyford_030 | **Yes** | The north of Lisclogher bog is located within the catchment of the Stonyford_030 SWB. An assessment is required to consider the potential impacts that peat extraction activities have had on this SWB. Similarly, an assessment is required to consider the potential impacts of the proposed rehabilitation plan on this SWB. |
| | River | Stonyford_040 | **Yes** | Lisclogher, Bracklin and Carranstown bogs are located within the catchment of the Stonyford_040 SWB. An assessment is required to consider the potential impacts that peat extraction activities have had on this SWB. Similarly, an assessment is required to consider the potential impacts of the proposed rehabilitation plan on this SWB. |
| | River | Boyne_060 | **Yes** | The south of Carranstown bog and the east of Ballivor bog are located within the catchment of the Boyne_060 SWB. Furthermore, peat related activities are listed as a significant pressure impacting on this SWB. An assessment is required to consider the potential impacts that peat extraction activities have had on this SWB. Similarly, an assessment is required to consider the potential impacts of the proposed rehabilitation plan on this SWB. |

| | | | | |
|---|---|---|---|---|
| | River | Boyne_070 | **Yes** | The Boyne_070 SWB is located directly downstream of the Stonyford_040 and Boyne_060 SWBs and in close proximity to the Application Site (~6.5km). An assessment is required to consider the potential impacts that peat extraction activities have had on this SWB. Similarly, an assessment is required to consider the potential impacts of the proposed rehabilitation plan on this SWB. |
| | River | Boyne_080 | **Yes** | The Boyne_080 SWB is located directly downstream of the Boyne_070 SWB and in close proximity to the Application Site (~10km). An assessment is required to consider the potential impacts that peat extraction activities have had on this SWB. Similarly, an assessment is required to consider the potential impacts of the proposed rehabilitation plan on this SWB. |
| | River | Boyne_090 | No | The Boyne_090 SWB has been screened out due to its distal location from the Application Site (~13km), the increasing volumes of water within the River Boyne and the emergence of new non-peat related pressures (urban runoff) on this SWB. Furthermore, SWBs closer to the Application Site which have peat related activities listed as a significant pressure (Boyne_060) have a higher status than this waterbody. |
| | River | Boyne_100 | No | The Boyne_100 SWB has been screened out due to its distal location from the Application Site (~16km), the increasing volumes of water within the River Boyne and the emergence of new non-peat related pressures (agriculture) on this SWB. Furthermore, SWBs closer to the Application Site which have peat related activities listed as a significant pressure (Boyne_060) have a higher status than this waterbody. |
| | River | Boyne_110 | No | The Boyne_110 has been screened out due to its distal location from the Application Site (~20km), the increasing volumes of water within the River Boyne and the emergence of new non-peat related pressures (agriculture) on this SWB. While this SWB is unassigned with regards status, the historic or proposed activities will not cause this SWB to deteriorate. |
| | River | Boyne_120 | No | The Boyne_120 SWB has been screened out due to its distal location from the Application Site (~23km), the increasing volumes of water within the River Boyne and the listing of non-peat related pressures (agriculture and urban runoff) on the SWB. |
| | River | Boyne_130 | No | The Boyne_130 SWB has been screened out due to its distal location from the Application Site (~23km) and the increasing volumes of water within the River Boyne. While this SWB is unassigned with regards status, the historic or proposed activities will not cause this SWB to deteriorate. |
| | River | Boyne_140 | No | The Boyne_140 SWB has been screened out due to its distal location from the Application Site (~22.5km) and the increasing volumes of water within the River Boyne. While this SWB is unassigned with regards status, the historic or proposed activities will not cause this SWB to deteriorate. |
| | River | Boyne_150 | No | The Boyne_150 SWB has been screened out due to its distal location from the Application Site (~24km) and the increasing volumes of water within the River Boyne. |
| | River | Boyne_160 | No | The Boyne_160 SWB has been screened out due to its distal location from the Application Site (~29km) and the increasing volumes of water within the River Boyne. |

| | | | | |
|---|---|---|---|---|
| | River | Boyne_170 | No | The Boyne_170 SWB has been screened out due to its distal location from the Application Site (~33km) and the increasing volumes of water within the River Boyne. |
| | River | Boyne_180 | No | The Boyne_180 SWB has been screened out due to its distal location from the Application Site (~36km) and the increasing volumes of water within the River Boyne. |
| | Transitional | Boyne Estuary | No | The Boyne Estuary transitional waterbody has been screened out due to its distal location from the Application Site, the large volume of water within the estuary and the saline nature of its water. |
| | Coastal | Boyne Estuary Plume | No | The Boyne Estuary Plume coastal waterbody has been screened out due to its distal location from the Application Site, the large volumes of water within the surface waterbody and the saline nature of its water. |
| Groundwater Body | Groundwater | Athboy | **Yes** | The Application Site overlies the Athboy GWB. An assessment is required to consider the impacts of peat extraction activities on this GWB. Similarly, an assessment is required to consider the potential impacts of the proposed rehabilitation plan on this GWB. |
| Protected Areas | Nature Conservation Designations | River Boyne and River Blackwater SAC & SPA | **Yes** | The Application Site is hydrologically connected to the River Boyne and River Blackwater SAC and SPA via several drains and streams which flow from the bog areas into the Deel (Raharney), Stonyford and Boyne rivers. An assessment is required to consider the potential impacts that historic peat extraction activities have had on this designated site. Similarly, an assessment is required to consider the potential impacts of the proposed rehabilitation plan on this designated site. |
| | | Boyne Woods pNHA | No | The Boyne Woods pNHA has been screened out due to its distal location from the Application Site (>25km). Therefore the historic or proposed activities have no potential to impact the pNHA. |
| | | Crewbane Marsh pNHA | No | Crewbane Marsh pNHA has been screened out due to its distal location from the Application Site (>25km). Therefore the historic or proposed activities have no potential to impact the pNHA. |
| | | Dowth Wetland pNHA | No | Dowth Wetland pNHA has been screened out due to its distal location from the Application Site (>25km). Therefore the historic or proposed activities have no potential to impact the pNHA. |
| | | Boyne River Islands pNHA | No | Boyne River Islands pNHA has been screened out due to its distal location from the Application Site (>25km). Therefore the historic or proposed activities have no potential to impact the pNHA. |
| | | Boyne Coast and Estuary SAC & pNHA | No | Boyne Coast and Estuary SAC & pNHA have been screened out due to its distal location from the Application Site (>25km). Therefore the historic or proposed activities have no potential to impact the SAC & pNHA. |
| | | Mount Hevey Bog SAC & pNHA | No | Mount Hevey Bog SAC & pNHA is located upgradient of the Application Site. In addition, the River Deel acts as a hydraulic barrier between the Application Site and Hevey Bog. Therefore the historic or proposed activities have no potential to impact the SAC & pNHA. |
| | | Royal Canal pNHA | No | The Royal Canal pNHA is located approximately 1.3km southwest of the Application Site. The River Deel acts as a hydraulic barrier between the Application Site and the pNHA. Therefore the historic or proposed activities have no potential to impact the pNHA. |

| | | | | |
|---|---|---|---|---|
| | Bathing Waters | Portrane, the Brook Beach | No | Portrane, the Brook Beach bathing waters have been screened out due to its distal location from the Application Site (>60km). The historic or proposed activities have no potential to impact these Bathing Waters |
| | Nutrient Sensitive Areas | Boyne River NSA | No | The Boyne River NSA has been screened out due to its distal location from the Application Site (~16km) and the increasing volumes of water within the River Boyne. Therefore the historic or proposed activities have no potential to impact the status of this NSA. |
| | | Boyne Estuary NSA | No | The Boyne Estuary NSA has been screened out due to its distal location from the Application Site, the large volume of water within the estuary and the saline nature of its water. Therefore, the historic or proposed activities have no potential to impact the status of this NSA. |
| | Shellfish Areas | Balbriggan\Skerries | No | Balbriggan\Skerries shellfish area has been screened out due to its distal location from the Application Site (>60km). The historic or proposed activities have no potential to impact this Shellfish Area. |
| | Drinking Water Protected Areas. | Stonyford_040 | **Yes** | Lisclogher, Bracklin and Carranstown bogs are located within the catchment of the Stonyford_040 DWPA. An assessment is required to consider the potential impacts of the historic peat extraction activities on this DWPA. Similarly, an assessment is required to consider the potential impacts of the proposed rehabilitation plan on this DWPA. |
| | | Boyne_100 | No | The Boyne_100 DWPA has been screened out due to its distal location from the Application Site (~16km) and the increasing volumes of water within the River Boyne. Therefore the historic or proposed activities have no potential to impact the status of this DWPA. |
| | | Boyne_120 | No | The Boyne_120 DWPA has been screened out due to its distal location from the Application Site (~23km) and the increasing volumes of water within the River Boyne. Therefore the historic or proposed activities have no potential to impact the status of this DWPA. |
| | | Boyne_180 | No | The Boyne_180 DWPA has been screened out due to its distal location from the Application Site (~36km) and the increasing volumes of water within the River Boyne. Therefore the historic or proposed activities have no potential to impact the status of this DWPA. |

# 4. WFD COMPLIANCE ASSESSMENT (ASSESSING THE EFFECT OF PREVIOUS ACTIVITIES)

## 4.1 PEAT EXTRACTION ACTIVITIES (PRE – 2003)

The Application Site has been subject to drainage and peat extraction activities since 1948, *i.e.* for more than 50 years before the WFD existed.

The primary hydrological and hydrogeological changes associated with the peat extraction process occurs during the initial drainage of the bog in advance of peat extraction. Constructed drainage ditches drain the upper surface of the bog by lowering the local peat water table. At this time, ancillary features were also constructed including railway lines, machine passes, canteens, work sites, Welfare facilities, mobile fuel tanks, fixed fuel tanks and peat loading facilities. After the Application Site was drained, vegetation was removed from the bog surface, leaving only bare peat fields between the drains. During the Peat Extraction Phase, only minimal landuse change occurs which predominantly relate to minor annual topographic changes (i.e., lower ground levels) caused by ongoing peat extraction.

The timing of drainage and initiation of peat extraction varies across the Application Site. Ballivor Bog was the first bog to be drained in 1948, with industrial peat extraction commencing in 1953. The installation of drainage began in Lisclogher in 1959 with peat extraction commencing there in 1960. By the mid-1980s Carranstown and Bracklin bogs had all been drained with peat extraction beginning in both Carranstown and Bracklin bogs by1988. Installation of drainage began in Lisclogher West in 1973, though Lisclogher West was never subject to peat extraction.

Prior to 2000, the peat extraction activities were not subject to IPC Licence controls. However, management of silt in discharges was always implemented, and this became formalised in the 1970s with the setting up of the silt committees within Bord na Móna. Also, since 1988, environmental monitoring and control measures in the form of silt ponds have been utilised at the Ballivor Bog Group with the aim of minimising the concentrations of suspended solids entering local watercourses (refer to Section 4.3.5 of rEIAR Chapter 4 for a full description of the measures).

Due to the nature of peat extraction activities being near surface activities, impacts on groundwater are generally negligible. Any groundwater impacts will be contained within the bog basin which is typically isolated from the underlying bedrock groundwater body due to a substantial thickness impermeable lacustrine deposits which underlies the basin peat. Therefore, surface water is the main sensitive receptor. The primary risks to groundwater at the Application Site was from cementitious materials, hydrocarbon spillage and leakages, and wastewater systems installed at welfare facilities across the bogs. The primary risk to surface waters will be entrained suspended sediments (peat and soil particles) in site runoff during peat extraction works along with potential hydrocarbons spillage and leakages.

There is no requirement to assess the peat extraction activities at the Application with respect to the WFD which predate 2003 (i.e. the transposition of the WFD Directive into Irish Law). Similarly, the assessment of peat extraction activities at the Application Site on Nature Conservation Designations and Drinking Water Protected Areas that have been screened in, is ineffectual pre-2003 due to the fact that the River Boyne and River Blackwater was only proposed as a Site of Importance in 2003. In addition, abstractions data collected for DWPAs only commenced in 2004 (and updated in 2009) for the legislation governing the quality of drinking water, set out in the European Communities (Drinking Water) (No. 2) Regulations 2007 (SI no. 278/2007).

However, for completeness and in order to describe the baseline environment we provide a brief discussion on the potential impacts of peat extraction on water quality and water quantity and present the available water quality data for this period.

### 4.1.1 Effects

#### 4.1.1.1 Surface Water Quantity/Quality

Peat in its natural state can act as a sponge providing storage of water after rainfall. However, with the implementation of bog drainage, the water levels in the peat bog were lowered and the capacity of the bog to store water was reduced. The available water storage within the bogs would have provided a small buffer for downstream flooding. However, following drainage, surface runoff rates from the Application Site would have increased slightly causing downstream rivers and streams to become flashier (faster and higher flood peaks). However, drainage from the bogs is regulated by the shallow (low gradient) nature of the drainage, and by routing all bog drainage via field drains, main drains, headland drains, pumps (no longer active) then from silt ponds to outfalls, with final discharge to [surrounding each bog unit] natural watercourses. The bog drainage network likely alters flow volumes entering downstream surface waterbodies due to the increased connectivity of drains to the river network.

In terms of surface water quality, the primary potential negative impact on surface water quality would be the increase in suspended solid entrainment in surface waterbodies. The greatest risk of suspended sediment entrainment occurs during times of major earthworks, such as during the removal of vegetation and the construction of the bog drainage network. During the Peat Extraction Phase, there was an ongoing risk of elevated concentrations of suspended solids making their way into downstream surface watercourses from the erosion and transport of peat sediment via the bog drainage network. This potential pathway would have posed a significant risk to local surface water quality, particularly as the River Boyne and its tributaries are capable of supporting populations of Salmonids which are particularly sensitive to elevated concentrations of sediments. The largest potential negative water quality effect would have occurred in those surface waterbodies directly downstream of the Application Site (i.e. the Ballivor Group of Bogs).

#### 4.1.1.2 Effects from Hydrocarbon Leakages and Spills

Accidental spillage during refuelling of construction plant with petroleum hydrocarbons is a major pollution risk to groundwater and surface water quality. The accumulation of small spills of fuels and lubricants during routine plant use can also be a pollution risk. Hydrocarbon has a high toxicity to humans, and all flora and fauna, including fish, and is persistent in the environment. It is also a nutrient supply for adapted micro-organisms, which can rapidly deplete dissolved oxygen in waters, resulting in the death of aquatic organisms.

Potential accidental wastewater discharges from on-site welfare facilities (tea stations and workshop/office facilities) have the potential to impact on groundwater and surface water quality. Runoff from concrete works can also impact on surface water and groundwater quality.

Furthermore, discharges from wastewater systems (septic tanks) at office buildings, and at welfare facilities and workshops could potentially have caused surface water contamination. Activities and features associated with peat extraction include railway lines, machine passes, canteen structures, work sites, production centres, mobile fuel tanks, fixed fuel tanks, and peat loading facilities. These potential impacts existed for all 5 no. bogs and their associated welfare facilities and workshops.

### 4.1.2 Baseline Water Quality

As the 1st WFD cycle was completed in 2010-2015, no WFD status reports exist for this period. However, the EPA have been completing ecological monitoring on these waterbodies since the 1970s. The Biological Q-Value is a water quality rating system based on both the habitat and the invertebrate community assessment and is divided into status categories[1] (Q-values)

[1] *Referred to hereinafter as 'Q-status' in order to differentiate between the EPA Q-Rating status, which is based solely on ecological parameters, and the WFD status which is a combination of ecological and chemical parameters.*

ranging from 0-1 (Poor) to 4-5 (Good/High) (refer to **Table E**). These historic Q-values guide our estimates of the health of the waterbodies during this period.

Historic Q-values for SWBs directly downstream of the Application Site are summarized in **Table F** and presented graphically in Error! Reference source not found.. The data shows an overall decreasing trend from the early 1970s to the late 1990s. However, improvements in water quality occurred in the early to mid-1980s with many SWBs downstream of the Application Site achieving a Q-value of Q4 (Good Q-status) or Q4-5/Q5 (High Q-status) during this time. By the late 1990s, all SWBs directly downstream of the Application Site achieved a Q-value of Q3.5 (Moderate Q-status) or Q4 (Good Q-status) and were deemed to be either slightly polluted or unpolluted.

Of the 10 no. SWBs screened into the WFD assessment, 9 no. waterbodies achieved a Q-value of Q4-5/Q5 (High Q-status) and were deemed to be of satisfactory condition during this period (1971-2000). Only 1 no. waterbody achieved a Q-value of Q3 or lower. The Boyne_050 was assigned a Q-value of Q3 in 1974 but improved in quality to be of high Q-value in the early 1980s.

However, as shown in **Figure C**: Historic Q Values (1971-2000)**,** river waterbodies upstream of the Application Site (Boyne_040, Stonyford_020 and Deel(Raharney)_010) have experienced a similar trend in Q-values. Therefore, the trend is likely to reflect land-use changes in the wider Boyne catchment rather than any specific peat extraction related activities within the Application Site.

**Table E: EPA Q-Rating System**

| EPA Q-Rating | EPA Q-Status | Pollution Status | Waterbody Condition |
|---|---|---|---|
| Q5/Q4-5 | High Q-Status | Unpolluted | Satisfactory |
| Q4 | Good Q-Status | Unpolluted | Satisfactory |
| Q3-4 | Moderate Q-Status | Slightly Polluted | Unsatisfactory |
| Q3/Q2-3 | Poor Q-Status | Moderately Polluted | Unsatisfactory |
| Q2/Q1-2/Q1 | Bad Q-Status | Seriously Polluted | Unsatisfactory |

**Table F: Summary Historic Q-values during Unmitigated Peat Extraction Phase**

| WFD SWB | Station ID | Available Data | EPA Q-Rating Range |
|---|---|---|---|
| Deel(Raharney)_030 | RS07D010200 | 1971 – 2000 | 3.5 - 5 |
| Deel(Raharney)_040 | RS07D010300 | 1976 – 2000 | 3.5 – 5 |
| Deel(Raharney)_050 | RS07D010400 | 1971 – 2000 | 3.5 – 5 |
| Deel(Raharney)_060 | RS07D010600 | 1971 – 2000 | 3.5 - 5 |
| Boyne_050 | RS07B040800 | 1974 – 2000 | 3 – 4.5 |
| Boyne_060 | RS07B040900 | 1974 – 2000 | 3.5 – 5 |
| Stonyford_030 | RS07S020075<br>RS07S020090<br>RS07S020080 | 1981 – 2000 | 3.5 – 4 |
| Stonyford_040 | RS07S020300 | 1976 – 2000 | 3.5 – 4.5 |
| Boyne_070 | RS07B041000 | 1974 – 2000 | 3.5 – 4 |
| Boyne_080 | RS07B041100 | 1979 – 2000 | 3.5 – 4.5 |

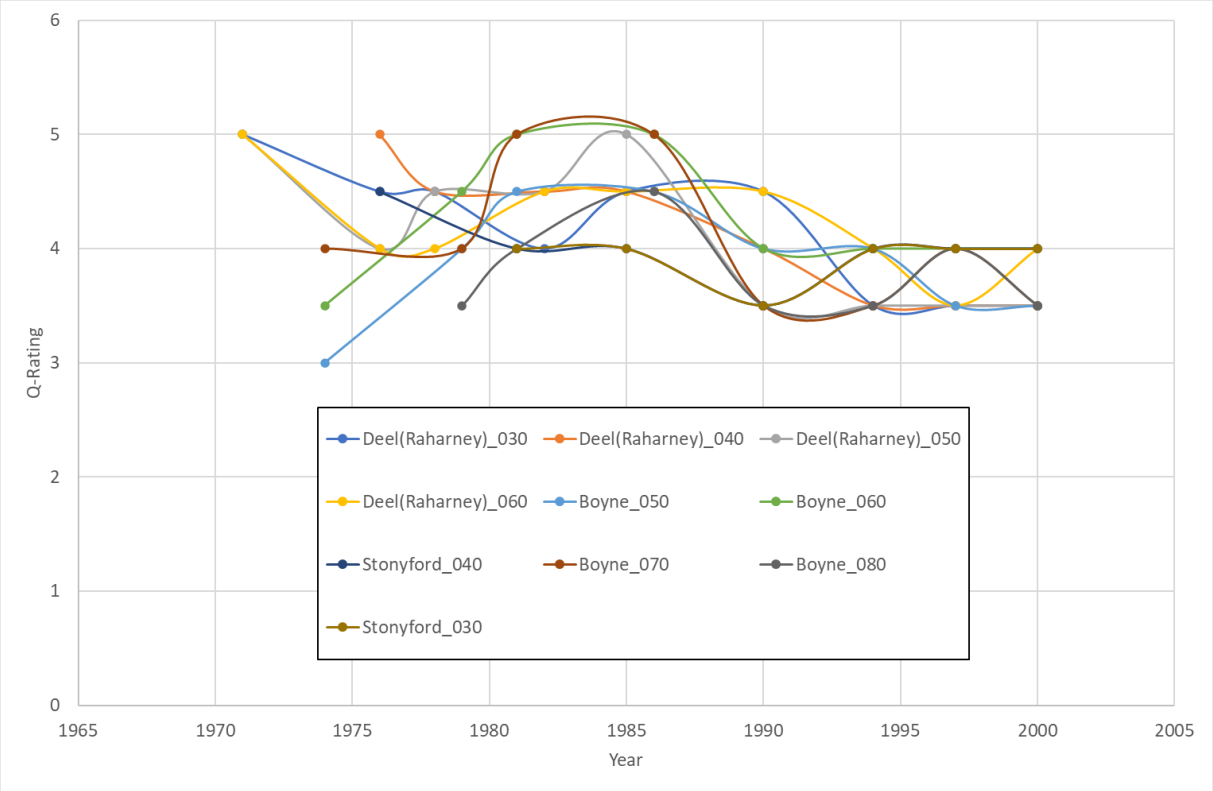


**Figure C: Historic Q Values (1971-2000)**

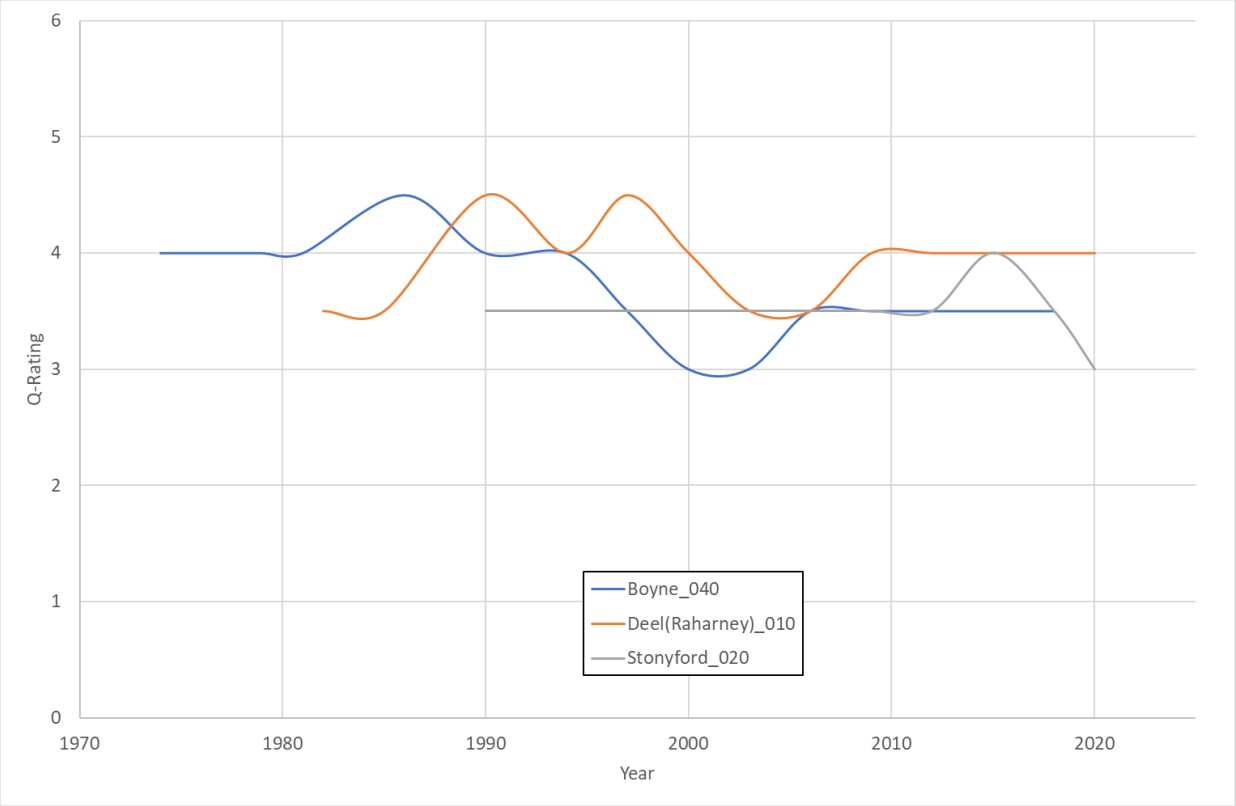


**Figure D: Upstream EPA Q-Ratings (1974-2020)**

## 4.2 PEAT EXTRACTION PHASE (2003 – JUNE 2020)

This phase includes all peat extraction activities from the transposition of the WFD into Irish Law in 2003 to the formal cessation of peat extraction activities in the June 2020. During this time period the peat extraction activities at the Application Site were completed under the conditions set out in IPC Licence No. P0501-01. This IPC Licence came into effect in April 2000 and upgraded and enhanced several pre-existing environmental monitoring and control measures which had been implemented at the Application Site since and pre-1988 (refer to Section 4.3.5 of rEIAR Chapter 4 for a complete description of the measures). These pre-IPC measures largely included the incorporation of silt ponds into the bog drainage system to minimise the concentrations of suspended solids entering local watercourses. Further amendments were made to the IPC Licence conditions in 2003 following the transposition of the WFD into Irish Law. The bogs also have Surface Water Management Plans[2] which define how compliance with the Licences is achieved. Therefore throughout this phase peat extraction activities have been operating under strict conditions designed to protect downstream water quality and quantity.

As the 1st WFD cycle was completed in 2010-2015, no WFD status exists for the first half of this period. However, EPA Q-values are available from 2000 to 2020 for all watercourses downstream of the Application Site and are summarized in **Table G** and presented graphically in

[2] *Current versions: SWMP 0501 Derrygreenagh 31.01.2020.pdf*

Error! Reference source not found.. The data shows a relatively stable trend in Q-values during this period with the majority of watercourses fluctuating between Q3.5 ("Moderate" Q-value) and Q4 ("Good" Q-value), being either slightly polluted or unpolluted. Only 1 no. waterbody achieved a "High" Q-value (Q4.5) during this period (Boyne_050). These EPA Q-values indicate a slight decline in water quality in comparison with the pre-2000 period. However, river waterbodies upstream of the Application Site have experienced a similar trend in Q-values (**Figure C**: Historic Q Values (1971-2000)). Therefore, the trend is likely to reflect land-use changes in the wider Boyne catchment rather than any specific peat extraction related activities within the Application Site. Consequently, changes in water quality during this period cannot be attributed solely to peat extraction activities, which were being scaled back at this time.

We consider that with the implementation of the control measures in accordance with IPC Licence Requirements the status of the SWBs during this phase were comparable to those recorded in the 1st WFD cycle (2010-2015).

**Table G: Summary Historic Q-Values during mitigated Peat Extraction Phase**

| WFD SWB | Station ID | Available Data | EPA Q-Rating Range |
|---|---|---|---|
| Deel(Raharney)_030 | RS07D010200 | 2000 – 2020 | 3.5 – 4 |
| Deel(Raharney)_040 | RS07D010300 | 2000 – 2020 | 3 – 4 |
| Deel(Raharney)_050 | RS07D010400 | 2000 – 2020 | 3.5 – 4 |
| Deel(Raharney)_060 | RS07D010600 | 2000 – 2020 | 3.5 - 4 |
| Boyne_050 | RS07B040800 | 2000 – 2020 | 3.5 – 4.5 |
| Boyne_060 | RS07B040900 | 2000 – 2020 | 3.5 – 4 |
| Stonyford_030 | RS07S020075<br>RS07S020090<br>RS07S020080 | 2000 – 2020 | 3 – 4 |
| Stonyford_040 | RS07S020300 | 2000 – 2020 | 3.5 – 4 |
| Boyne_070 | RS07B041000 | 2000 – 2020 | 3.5 – 4 |
| Boyne_080 | RS07B041100 | 2000 - 2020 | 3.5 – 4 |

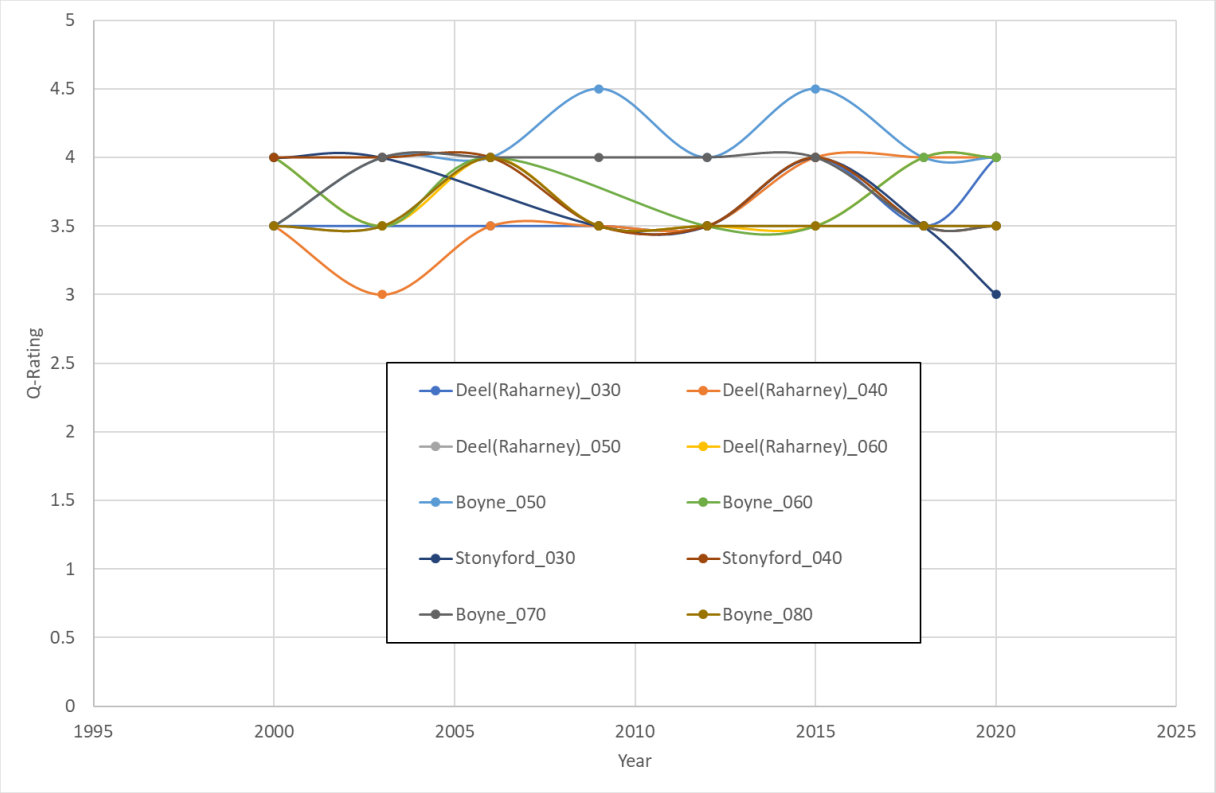


**Figure E: Historic Q-Values (2000-2020)**

#### 4.2.1.1 Surface Water Quality Effects from Bog Drainage

During this period the Application Site operated in accordance with IPC Licence conditions which put in place a series of control measures designed for the protection of surface water quality in the vicinity and downstream of the Application Site. These measures included:

- All process wastewater from the peat extraction areas is to be treated via an appropriately designed silt pond treatment system which has been inspected and maintained in accordance with Condition 6 of the IPC Licence. Treated process wastewater is discharged into nearby surface watercourses, with quarterly grab sampling completed on a select number of discharge outlets;
- Stormwater derived on-site is released into a local waterbody following basic treatment. Where run-off is from a rooftop only, it is directed to a drain. Runoff from other areas such as carparks is passed through hydrocarbon interceptor prior to release.

Bord na Móna have been conducting monitoring of emissions to water from the Application Site with the results summarised in **Table H** below.

We consider that the status of the SWBs at this time was comparable to those recorded during the 1st WFD round. Based on the EPA Q-values, there has been a slight decline in water quality in comparison with the pre-2000 period. However this is likely to be a combination of factors within the overall catchment and cannot be attributed solely to peat extraction activities which were being scaled back during this period. In addition, the monitoring and requirements of the IPC licence would have ensured that peat extraction activities were not adversely impacting water quality in downstream receptors.

A summary of potential status change to SWBs arising from potential surface water quality impacts from peat extraction works during the mitigated Peat Extraction Phase of peat extraction are outlined in **Table I.**

**Table H: Bord na Móna Water Quality Monitoring (2003-2021)**

| Parameter | IPC Licence Limit | No. samples | No. Exceedances | % Compliant |
|---|---|---|---|---|
| COD (mg/l) | 100 | 142 | 31 | 78% |
| pH | 6 – 9 | 142 | 0 | - |
| Ammonia (mg/l) | 2.78 | 142 | 5 | 96% |
| Total Phosphorous (mg/l) | - | 158 | - | - |
| Suspended Solids (mg/l) | 35 | 141 | 2 | 98.5% |

**Table I: Surface Water Quality Impacts during Mitigated Peat Extraction Phase**

| SWB | WFD Code | Assessed Pre-IPC Licence Status (Pre 2000) | Assessed Post IPC Licence Status (2000 – 2010) | WFD Cycle 1 Status (2010-2015) |
|---|---|---|---|---|
| Deel(Raharney)_030 | IE_EA_07D010200 | Moderate/Good | Good | Good |
| Deel(Raharney)_040 | IE_EA_07D010300 | Moderate/Good | Good | Good |
| Deel(Raharney)_050 | IE_EA_07D010400 | Moderate/Good | Moderate | Moderate |
| Deel(Raharney)_060 | IE_EA_07D010600 | Moderate/Good | Moderate | Moderate |
| Boyne_050 | IE_EA_07B040800 | Good | Good | Good |
| Boyne_060 | IE_EA_07B040900 | Moderate/Good | Moderate | Moderate |
| Stonyford_030 | IE_EA_07S020100 | Moderate/Good | Good | Good |
| Stonyford_040 | IE_EA_07S020400 | Moderate/Good | Good | Good |
| Boyne_070 | IE_EA_07B041000 | Good | Good | Good |
| Boyne_080 | IE_EA_07B041200 | Moderate | Moderate | Moderate |

#### 4.2.1.2 Groundwater Quality Effects from Leakages and Spills

The Ballivor Bog Group has been regulated by the EPA under IPC Licence Registration No. P0501-01 since 2000. Compliance with the IPC Licence requires a series of water quality protection controls. The list below outlines control measures conditioned under the IPC licencing regime, as regulated by the EPA:

- Effective spill/leak management of mobile fueling units;
- Replacement (and remediation where necessary) of all underground fuel tanks;
- There shall be no other emissions to water of environmental significance;
- All tank and drum storage areas shall be rendered impervious to the materials stored therein. In addition, tank and drum storage areas shall, as a minimum be bunded;
- Drainage from bunded areas shall be diverted for collection and safe disposal;
- The integrity and water tightness of all the bunding structures and their resistance to penetration by water or other materials stored therein shall be tested and demonstrated by the licensee to the satisfaction of the Agency and shall be reported to the Agency

within eighteen months from the date of grant of this licence and every two years thereafter;
- The loading and unloading of fuel oils shall be carried out in designated areas protected against spillage and leachate run-off;
- While awaiting disposal, all materials shall be collected and stored in designated areas protected against spillage and leachate run-off;
- Except for roof water, all surface water discharges from workshop areas shall be fitted with oil interceptors;
- An inspection for leaks on all flanges and valves on over-ground pipes used to transport materials other than water shall be carried out weekly;
- The licensee (BnM) shall undertake a programme of testing and inspection of underground fuel pipelines to ensure that all underground fuel lines are tested at least every three years; and,
- The licensee shall have in storage an adequate supply of containment booms and/or suitable absorbent material to contain and absorb any spillage.

Due to the local hydrogeological regime and the isolation of the perched water table in the peat from the underlying regional groundwater table, we consider that that the no change in the status of the Athboy GWB would have occurred during the Peat Extraction Phase (refer to **Table J**).

**Table J: Groundwater Quality Impacts during Mitigated Peat Extraction Phase**

| GWB | WFD Code | Assessed Pre-IPC Licence Status (Pre 2000) | Assessed Post IPC Licence Status (2000 – 2010) | WFD Cycle 1 Status (2010-2015 |
|---|---|---|---|---|
| Athboy | IE_EA_G_001 | Good | Good | Good |

#### 4.2.1.3 Surface Water Quality Effects from Leakages and Spills

The Ballivor Bog Group has been regulated by the EPA under IPC Licence Registration No. P0501-01 since 2000. The bogs also have Surface Water Management Plans[3] which define how compliance with the Licences is achieved via various control measures.

As described above in **Section 4.2** the historic Q-values during this period were generally of moderate and good status. If hydrocarbon leakages and spills were occurring during this phase of peat extraction activities such Q-values would not have been achieved. Much lower Q-ratings would be anticipated for waters polluted with hydrocarbon compounds. Therefore, we do not consider that peat extraction activities during this period resulted in a significant deterioration in surface water quality due to leakages and spills.

A summary of potential status change to SWBs arising from leakages and spills during the mitigated Peat Extraction Phase are outlined in **Table K**.

[3] Current versions: SWMP 0501 Derrygreenagh 31.01.2020.pdf

**Table K: Surface Water Quality Effects from Leakages and Spills during Mitigated Peat Extraction Phase**

| SWB | WFD Code | Assessed Pre IPC Licence Status (Pre 2000) | Assessed Post IPC Licence Status (2000 – 2010) | WFD Cycle 1 Status (2010-2015) |
|---|---|---|---|---|
| Deel(Raharney)_030 | IE_EA_07D010200 | Moderate/Good | Good | Good |
| Deel(Raharney)_040 | IE_EA_07D010300 | Moderate/Good | Good | Good |
| Deel(Raharney)_050 | IE_EA_07D010400 | Moderate/Good | Moderate | Moderate |
| Deel(Raharney)_060 | IE_EA_07D010600 | Moderate/Good | Moderate | Moderate |
| Boyne_050 | IE_EA_07B040800 | Good | Good | Good |
| Boyne_060 | IE_EA_07B040900 | Moderate/Good | Moderate | Moderate |
| Stonyford_030 | IE_EA_07S020100 | Moderate/Good | Good | Good |
| Stonyford_040 | IE_EA_07S020400 | Moderate/Good | Good | Good |
| Boyne_070 | IE_EA_07B041000 | Good | Good | Good |
| Boyne_080 | IE_EA_07B041200 | Moderate | Moderate | Moderate |

#### 4.2.1.4 Effects on River Boyne and River Blackwater SAC & SPA

The surface water connections from the Application Site to the Deel, Stonyford and Boyne rivers could potentially have transferred poor quality surface water that may have affected the conservation objectives of the downstream designated sites throughout its Peat Extraction Phase.

The qualifying interests of the SAC, as listed below, have the potential to be affected as these are associated directly with the river system.

- [7230] Alkaline Fens
- [91E0] Alluvial Forests
- [1099] River Lamprey (Lampetra fluviatilis)
- [1106] Atlantic Salmon (Salmo salar)
- [1355] Otter (Lutra lutra)

With regards the SPA, it is noted that even if some material was to enter the local watercourses of the Deel, Stoneyford and Boyne rivers throughout its peat extraction phase, the actual Special Conservation Interests of the SPA, as listed below, would not be affected as the species are not associated with watercourses:

- A229 Kingfisher

However, during this period the Application Site operated in accordance with IPC licence conditions which put in place a series of control measures designed for the protection of surface water quality in the vicinity and downstream of the Application Site. These control measures are outlined above in **Section 4.1.1**. Therefore, it can be concluded that the potential to affect the qualifying interests of the River Boyne and River Blackwater SAC throughout the

Peat Extraction Phase was significantly reduced due to the implementation of control measures throughout this phase.

#### 4.2.1.5 Effects on Stonyford_040 DWPA

Peat extraction activities could potentially have resulted in an increase in the suspended sediment load, resulting in increased turbidity, increased pH and contamination which could have affected the water quality in the Stonyford River, therefore impacting on the Stonyford_040 DWPA.

However, during this period the Application Site operated in accordance with IPC licence conditions which put in place a series of control measures designed for the protection of surface water quality in the vicinity and downstream of the Application Site. These control measures are outlined above in **Section 4.1.1**. Therefore, it can be concluded that the potential to affect the Stonyford_040 DWPA throughout the Peat Extraction Phase of the Ballivor Bog Group was significantly reduced due to the implementation of the control measures throughout this phase.

### 4.3 CURRENT PHASE (JUNE 2020 – PRESENT DAY)

The Current Phase includes all activities carried out at the Application Site from the cessation of peat extraction in June 2020 to the present day.

During this time period the decommissioning activities at the Application Site have been limited to the removal of stockpiled peat with no peat extraction occurring during this phase. From mid-2020 to mid-2021 operations at the Application Site comprised of the removal of stockpiled peat to the Ballivor Works for processing prior to transportation to Kilberry Horticulture Works in Co. Kildare the Edenderry Power Plant and Derrinlough Briquette Factory, both in Co. Offaly. The Ballivor Works ceased operation in mid-2021 and from this date any stockpiled peat removed from the bogs is transported directly to the same above locations. The last stockpiled peat was removed from Ballivor Bog in June 2022 and the last of the stockpiles at Bracklin, Lisclogher and Carranstown bogs were removed by the end of 2023.

Environmental monitoring and drainage and silt maintenance continued during this phase in accordance with IPC licence conditions.

The Peatland Action Scheme (PCAS) is a programme of enhanced peatland rehabilitation measures, which is in addition to the IPC licence requirement (does not form part of this Substitute Consent application) and is being is being applied at specific locations across the Bord na Móna landbank that are identified as suitable for the prescribed enhancement measures. PCAS measures to rewet peat including intensive and targeted drain blocking have commenced in Carranstown East, Lisclogher West and Bracklin West (refer to Section 4.7.2 for further details in relation to PCAS) during this phase.

#### 4.3.1.1 Surface Water Quality Effects from Bog Drainage

With the cessation of peat extraction, there is less potential for disturbance of peat and elevated concentrations of suspended sediments entering surface watercourses. During this period the site drainage still operated under the same drainage systems as during the Peat Extraction Phase *i.e.* field drains, main drains, silt ponds and discharge outlets etc. Therefore, discharge volumes from the Application Site to nearby surface watercourses will be comparable to surface water discharges during the Peat Extraction Phase.

During this period the Application Site also continued to operate under IPC licencing requirements with respect to surface water discharge quality and quantity.

The status of SWBs during the Current Phase is likely to be unchanged from those recorded during the most recent WFD round (2016-2021). A summary of status change to SWBs arising from bog drainage during the Current Phase are outlined in **Table L**.

**Table L: Surface Water Quality Effects from Bog Drainage during the Current Phase**

| SWB | WFD Code | Status (2016-2021) | Assessed Change |
|---|---|---|---|
| Deel(Raharney)_030 | IE_EA_07D010200 | Good | Good |
| Deel(Raharney)_040 | IE_EA_07D010300 | Good | Good |
| Deel(Raharney)_050 | IE_EA_07D010400 | Moderate | Moderate |
| Deel(Raharney)_060 | IE_EA_07D010600 | Good | Good |
| Boyne_050 | IE_EA_07B040800 | Good | Good |
| Boyne_060 | IE_EA_07B040900 | Good | Good |
| Stonyford_030 | IE_EA_07S020100 | Poor | Poor |
| Stonyford_040 | IE_EA_07S020400 | Moderate | Moderate |
| Boyne_070 | IE_EA_07B041000 | Moderate | Moderate |
| Boyne_080 | IE_EA_07B041200 | Moderate | Moderate |

#### 4.3.1.2 Contamination of Groundwater by Leakages and Spills

Despite the cessation of peat extraction at the Application Site, there was still some limited activity at the Application Site involving machinery and plant with which there is always a risk of accidental spillage of hydrocarbons. Similarly, the office buildings at the Bord na Móna depot remained occupied and discharges from wastewater systems (septic tanks) etc. have the potential to cause surface water and groundwater contamination. However, the risks are of a lesser extent due to the lower volumes of plant, machinery and workers operating at the Application Site during the Current Phase.

A summary of potential status change to GWBs arising from potential groundwater quality impacts during the Current Phase are outlined in **Table M.**

**Table M: Groundwater Quality Impacts during the Current Phase**

| GWB | WFD Code | Status (2016-2021) | Assessed Change |
|---|---|---|---|
| Athboy | IE_EA_G_001 | Good | Good |

#### 4.3.1.3 Contamination of Surface Water by Leakages and Spills

Despite the cessation of peat extraction at the Application Site, there is still some limited activity at the Application Site involving machinery and plant with which there is always a risk of accidental spillage of hydrocarbons. Similarly, the office buildings at the Bord na Móna depot remain occupied and discharges from wastewater systems (septic tanks) etc. have the potential to cause surface water and groundwater contamination. These risks of a lesser extent due to the lower volumes of plant, machinery and workers operating at the Application Site during the Current Phase.

A summary of status change to SWBs arising from bog drainage during the Current Phase are outlined in **Table N**.

**Table N: Surface Water Quality Effects from Bog Drainage during the Current Phase**

| SWB | WFD Code | Status (2016-2021) | Assessed Change |
|---|---|---|---|
| Deel(Raharney)_030 | IE_EA_07D010200 | Good | Good |
| Deel(Raharney)_040 | IE_EA_07D010300 | Good | Good |
| Deel(Raharney)_050 | IE_EA_07D010400 | Moderate | Moderate |
| Deel(Raharney)_060 | IE_EA_07D010600 | Good | Good |
| Boyne_050 | IE_EA_07B040800 | Good | Good |
| Boyne_060 | IE_EA_07B040900 | Good | Good |
| Stonyford_030 | IE_EA_07S020100 | Poor | Poor |
| Stonyford_040 | IE_EA_07S020400 | Moderate | Moderate |
| Boyne_070 | IE_EA_07B041000 | Moderate | Moderate |
| Boyne_080 | IE_EA_07B041200 | Moderate | Moderate |

#### 4.3.1.4 Effects on the River Boyne and River Blackwater SAC & SPA

With the cessation of peat extraction, there is less potential for disturbance of peat and elevated concentrations of suspended sediments and contaminants entering surface watercourses and downstream designated sites. During this period the Application Site drainage still operates under the same drainage systems as during the Peat Extraction Phase *i.e.* field drains, main drains, silt ponds and discharge outlets etc. Therefore, discharge volumes from the Application Site to nearby surface watercourses will be comparable to surface water discharges during the Peat Extraction Phase.

During this period the Application Site also continues to operate under IPC licensing requirements with respect to surface water discharge quality and quantity.

Therefore, it can be concluded that the potential to affect the qualifying interests of the River Boyne and River Blackwater SAC & SPA throughout the Current Phase is significantly reduced due to the reduced activity at the Application Site and the continued implementation of mitigation measures.

#### 4.3.1.5 Effects on the Stonyford_040 DWPA

Despite the cessation of peat extraction, there was still some limited activity at the Application Site that could potentially have resulted in an increase in the suspended sediment load, resulting in increased turbidity, increased pH and contamination which could have affected the water quality in the Stonyford River, therefore impacting on the Stonyford_040 DWPA.

However, the risks are of a lesser extent due to the lower volumes of plant, machinery and workers operating at the Application Site during the Current Phase and during this period the Application Site continues to operate in accordance with IPC licence conditions which put in place a series of mitigation measures designed for the protection of surface water quality in the vicinity and downstream of the Application Site. These mitigation measures are discussed above in **Section 4.1.1**. Therefore, it can be concluded that the potential to affect the

Stonyford_040 DWPA throughout the Current Phase is significantly reduced due to the reduced activity at the Application Site and the continued implementation of mitigation measures.

# 5. WFD COMPLIANCE ASSESSMENT (REMEDIAL PHASE)

## 5.1 REMEDIAL MEASURES PHASE

It is currently proposed to implement a Cutaway Bog Decommissioning and Rehabilitation Plan at each of the bogs comprising the Application Site. The plans use bespoke interventions designed to first stabilise the environment and secondly to rehabilitate the Application Site as much as possible by placing the existing peatland environments on a path towards naturally functioning peatlands. Rehabilitation allows a site to naturally colonise with vegetation to stabilise the bare peat extraction fields and minimise water pollution. Whilst the proposed rehabilitation plans have a ~5 year timeframe, in general Bord na Móna peatlands cannot be restored back to the raised bog in a reasonable timeframe as their environmental conditions have been so radically altered from its natural state. Rehabilitation has already commenced on a section of Carranstown and Lisclogher bogs. These Decommissioning and Rehabilitation Plans are required in order to fulfil the requirements of Condition 10.2 of the IPC licence No. P0501-01. These Cutaway Bog Decommissioning and Rehabilitation Plans, attached as Appendix 4-2, will be subject to agreement with the EPA prior to their implementation across the Application Site (Note that the Decommissioning and Rehabilitation Plans for Lisclogher West and Carranstown have been agreed and are no longer in draft).

The proposed rehabilitation plans at the Application Site will be undertaken using standard best practices (refer to Appendix III of the Cutaway Bog Decommissioning and Rehabilitation Plans included as Appendix 4-2). Each individual bog comprising the Ballivor Bog Group has its own unique history of peat extraction activities, therefore the most appropriate rehabilitation approach is bog specific reflecting local ecological and hydrological factors. For example, the rehabilitation of the milled peat extraction area in western Bracklin will be different to that of Lisclogher West, which was never subject to industrial scale peat extraction.

Bord na Móna's rehabilitation plans identify two scenarios present at the Application Site which will determine any additional targeted revegetation or rewetting measures to be implemented. Firstly, in the case that significant acid peat remains at the surface, there will be an assessment of the area to implement an intensive programme of drain-blocking and promote the re-establishment of more typical bog communities. Secondly, where alkaline peat is exposed at the surface the land is likely to revert to more alkaline poor fen/wetland or Birch dominated scrub ecosystems where the development of these communities will depend on the potential to rewet the site.

The greatest hydrological/hydrogeological effects will be experienced in those areas selected for rewetting following ecological surveying. Rewetting would be achieved through measures such as drain blocking. This would raise the local peat water table, establishing a more suitable hydrological/hydrogeological regime, making these areas suitable for colonisation by more typical bog communities. Elsewhere where rewetting is not suitable the drainage regimes will remain relatively unchanged.

The rehabilitation plans comprise of short term planning actions, short term practical actions and long-term actions. The initial short-term planning actions will involve seeking approval of the rehabilitation plans from the EPA. In addition, detailed site plans of how the various rehabilitation measures will be applied will be developed for each bog and a review of all issues and constraints which may impact the proposed rehabilitation plans will be completed. The short-term planning actions will ensure that all activities associated with the rehab plans will be completed in accordance with the requirements of the IPC licence. Several short-term actions will be completed in the first 2 years following EPA approval of the rehabilitation plans. These actions will include intensive drain blocking and monitoring of the rehabilitation measures. Silt ponds will continue to function during this phase of the rehabilitation plans. Longer term actions (>3 years) include the evaluation of the success of the short-term rehabilitation measures and undertake further remediation where necessary. Long-term monitoring, aftercare and

maintenance will be completed until the IPC licence is surrendered. We understand that during this phase of the rehabilitation plans, silt ponds will be decommissioned if necessary.

Much of the work associated with the rehabilitation plans will occur during the initial stages of the plan. Once drain blocking and other measures have been implemented the operational activities will comprise non-intrusive ecological and hydrological monitoring and may also include minimal maintenance and repair works if/as those works are deemed necessary.

The Cutaway Bog Decommissioning and Rehabilitation Plans contain enhanced rehabilitation measures associated with the Peatland Climate Action Scheme (PCAS). The proposed enhanced measures include intensive drain blocking, reprofiling of peat fields, fertilizer application and seeding of vegetation. Note that some of these measures have already been implemented in some areas of the Application Site (eastern portion of Carranstown, Lisclogher West and western Bracklin during the Current Phase).

## 5.2 POTENTIAL EFFECTS (UNMITIGATED)

The Cutaway Bog Decommissioning and Rehabilitation Plans for the Application Site cannot be implemented without mitigation measures. All activities at the Application Site are required to operate in accordance with IPC Licence (P0501-01) until the licence is surrendered. Therefore, an unmitigated scenario is not applicable to the WFD assessment of the Remedial Phase.

## 5.3 POTENTIAL EFFECTS (MITIGATED)

### 5.3.1 Surface Water Quality Effects and Mitigation Measures

Whereas draining the Application Site to facilitate peat extraction has likely had a negative impact on downstream surface watercourses, improvements in flow and water quality can be achieved through bog rehabilitation and rewetting.

International studies have shown a long-term reduction in pollutant concentrations, including nitrate and ammonia, following rewetting in comparison to drained peatlands (Pschenyckyj. C. et al. 2021). Several studies have shown that the magnitude of these positive effects depends on site-specific factors such as the degree of degradation and local peat characteristics. Some studies have shown a short-term increase in phosphorous and suspended solids following restoration linked to initial drain-blocking activities before the hydrogeological regime of the site becomes stabilised (Pschenyckyj. C. et al. 2021). These will be short term impacts and will not impact the overall status of downstream waterbodies.

The greatest improvement in water quality will occur in the receiving waterbodies directly downstream of the Application Site (Deel(Raharney)_030, Deel(Raharney)_040, Deel(Raharney)_060, Boyne_060, Stonyford_030 and Stonyford_040). In the long term, enhanced water quality associated with bog rehabilitation will aid these waterbodies in achieving an improved WFD status. "High" status may be achieved in the Deel(Raharney)_040, Deel(Raharney)_060 and Boyne_060 river waterbodies which are currently of "Good" status. Further downstream the magnitude of the positive impact associated with bog rehabilitation will likely be reduced and these waterbodies (Boyne_050, Boyne_070 and Boyne_080) will not experience a change in WFD status as a direct result of the Remedial Phase, and other existing catchment pressures are likely to continue to dominate future status assignments.

Any works undertaken as part of the Cutaway Bog Decommissioning and Rehabilitation Plans will be completed under licence from the EPA with BnM reporting to the EPA until the IPC Licence is surrendered. The existing drainage systems which have proven effect will continue to operate during this period. Including the operation, maintenance and monitoring of silt ponds to prevent silt-run-off from the Application Site.

The Cutaway Bog Decommissioning and Rehabilitation Plans state that the effects of any management activities will be monitored and assessed.

### 5.3.2 Groundwater Quality Effects from Leakages and Spills

During the Remedial Phase, there will be some activity at the Application Site involving machinery and plant with which there is always a risk of accidental spillage of hydrocarbons. This activity will be greatest during the initial stages of rehabilitation when works associated with rewetting and revegetation such as drain blocking will be completed. Once this work has been completed there will only be very limited activity at the Application Site which will mainly comprise of non-intrusive monitoring and minimal repairs to peat blockages and or additional fertilization to aid the development of successional vegetation communities.

Due to the presence of peat at the Application Site and the bulk low permeability of the underlying mineral soil deposits, groundwater recharge at this site is limited. A shallow perched groundwater table exists in the peat and this is isolated from the underlying regional groundwater system and the Athboy GWB. Therefore, even in an unmitigated scenario any groundwater contamination will occur within the perched water table which discharges to nearby surface watercourses. No deterioration in groundwater quality in the underlying bedrock aquifer or the Athboy GWB will occur.

Mitigation measures will be implemented and adhered to until the IPC Licence for the Application Site is surrendered. These measures significantly decrease the risk of groundwater contamination. No further mitigation measures, beyond those implemented to date, are deemed necessary.

### 5.3.3 Surface Water Quality Effects from Leakages and Spills

As stated in **Section 5.3.2** above, there is a risk of accidental spillage of hydrocarbons during initial rehabilitation works. Due to the local hydrogeological regime and low rates of groundwater recharge, contaminants will enter the bog drainage network and downstream river waterbodies, resulting in a deterioration in surface water quality. This will have a potential negative effect on the WFD status of river waterbodies directly downstream of the Application Site (Deel(Raharney)_030, Deel(Raharney)_040, Deel(Raharney)_060, Boyne_060, Stonyford_030 and Stonyford_040). Due to the persistent nature of hydrocarbons in the environment this adverse effect may extend to downstream watercourses including the Deel(Raharney)_050 and the Boyne_070 SWBs.

Mitigation measures will be implemented and adhered to until the IPC Licence for the Application Site is surrendered.

### 5.3.4 Effects on the River Boyne and River Blackwater SAC and SPA

The surface water connections from the Application Site to the Deel, Stonyford and Boyne rivers that are associated with and mapped within the River Boyne and River Blackwater SAC and SPA may improve in water quality due to improvements in flow and water quality that can be achieved through bog rehabilitation and rewetting.

Any works undertaken as part of the Cutaway Bog Decommissioning and Rehabilitation Plans will be completed under licence from the EPA with BnM reporting to the EPA until the IPC Licence is surrendered. The existing drainage systems which have proven effect will continue to operate during this period. Including the operation, maintenance and monitoring of silt ponds to prevent silt-run-off from the Application Site.

Therefore, it can be concluded that the potential to negatively affect the qualifying interests of the River Boyne and River Blackwater SAC & SPA throughout the Remedial Phase is significantly reduced. On the contrary, the potential for the Cutaway Bog Decommissioning and Rehabilitation Plans to positively affect the qualifying interests of the River Boyne and River

Blackwater SAC & SPA is a more likely outcome as improvements in flow and water quality can be achieved through bog rehabilitation and rewetting, which in turn will positively affect the watercourses and associated qualifying interests of the River Boyne and River Blackwater SAC & SPA.

### 5.3.5 Effects on the Stonyford_040 DWPA

The surface water connections from the Application Site to the Stonyford River may improve in water quality due to improvements in flow and water quality that can be achieved through bog rehabilitation and rewetting.

The greatest improvement in water quality will occur in the receiving waterbodies directly downstream of the Application Site including the Stonyford_040 SWB, therefore impacting on the Stonyford_040 DWPA. In the long term, enhanced water quality associated with bog rehabilitation will aid the improvement of water quality within the Stonyford_040 DWPA.

Any works undertaken as part of the Cutaway Bog Decommissioning and Rehabilitation Plans will be completed under licence from the EPA with BnM reporting to the EPA until the IPC Licence is surrendered. The existing drainage systems which have proven effect will continue to operate during this period. Including the operation, maintenance and monitoring of silt ponds to prevent silt-run-off from the Application Site.

However, as stated in **Section 5.3.2** above, there is a risk of accidental spillage of hydrocarbons during initial rehabilitation works. Due to the local hydrogeological regime and low rates of groundwater recharge, contaminants will enter the bog drainage network and downstream river waterbodies, resulting in a deterioration in surface water quality. This will have a potential negative effect on the river waterbodies directly downstream of the Application Site, including the Stonyford_040, therefore impacting on the Stonyford_040 DWPA.

Mitigation measures will be implemented and adhered to until the IPC Licence for the Application Site is surrendered.

### 5.3.6 Summary Potential Effects of Remedial Phase

In all instances, the mitigation measures described above are sufficient to meet the WFD Objectives. The assessment of WFD elements for the WFD waterbodies for the short-term and long-term is summarised in **Table O** below.

With the implementation of the requirements of the IPC Licence at the Application Site during this period, the site rehabilitation works will have no potential to cause a deterioration in the status of downstream SWBs and/or jeopardise their attainment of good surface water status. The long-term impacts of the Application Site rehabilitation plans may lead to an improvement in the status of those waterbodies directly downstream of the Application Site, however this is dependent on several site-specific factors.

**Table O: Summary of WFD Status for Unmitigated and Mitigated Scenarios**

| WFD Element | WFD Code | Current Status (2016-2021) | Assessed Short-term Status | Assessed Long-term Status |
|---|---|---|---|---|
| Deel(Raharney)_030 | IE_EA_07D010200 | Good | Good | Good/High |
| Deel(Raharney)_040 | IE_EA_07D010300 | Good | Good | Good/High |
| Deel(Raharney)_050 | IE_EA_07D010400 | Moderate | Moderate | Moderate/ Good |
| Deel(Raharney)_060 | IE_EA_07D010600 | Good | Good | Good/High |
| Boyne_050 | IE_EA_07B040800 | Good | Good | Good |
| Boyne_060 | IE_EA_07B040900 | Good | Good | Good/High |
| Stonyford_030 | IE_EA_07S020100 | Poor | Poor | Poor/Moderate |
| Stonyford_040 | IE_EA_07S020400 | Moderate | Moderate | Moderate/ Good |
| Boyne_070 | IE_EA_07B041000 | Moderate | Moderate | Moderate |
| Boyne_080 | IE_EA_07B041200 | Moderate | Moderate | Moderate |

# 6. SUMMARY & CONCLUSION

WFD status for SWBs (Surface Water Bodies) and GWBs (Groundwater Bodies) hydrologically linked to the Application are defined in **Section 2** above.

From a hydrological perspective, the main impacts associated with the peat extraction activities at the Application Site occurred during the initial stages of peat extraction with the installation of the drainage infrastructure to facilitate peat extraction activities. The timing of drainage varied across the site with Ballivor Bog being the first bog subject to drainage in 1948. All remaining bogs were drained by the mid-1980s. Therefore, these activities and their potential effect on the underlying GWB and downstream SWBs pre-date the transposition of the WFD into Irish Law.

The WFD Directive came into effect in Ireland in 2003 and this report assesses the effects of the peat extraction activities at the Application Site from this date until the formal cessation of peat extraction in June 2020. During this time period, all activities at the Application Site were operating under IPC Licence requirements. The IPC Licence (P0501-01) sets out several conditions and emission limits designed to ensure the protection of surface and groundwaters. These measures likely led to an improvement in the status of local surface waterbodies in the vicinity of the Application Site.

Peat extraction ceased at the Application Site in June 2020 and no significant changes to the hydrological and/or hydrogeological environments will have occurred from the termination of peat extraction activities to the present day.

While no WFD status reports are available for the period predating 2010, the EPA have been completing ecological monitoring on downstream waterbodies since the 1970s. The Q-values suggest that the peat extraction activities from 2003 to 2010 did not have a significant negative impact before the first WFD cycle in 2010. Review of the available WFD reports show that many of the downstream SWBs achieved a good or moderate status during the Peat Extraction Phase (2003-2020). Whilst several waterbodies experienced a deterioration in WFD status this is unlikely to be related to peat extraction activities which were being scaled back at this time and operating in accordance with IPC requirements. It is important to note that river waterbodies upstream of the Application Site have experienced a similar trend in Q-values over time. Therefore, the trend is likely to reflect wider land-use changes in the Boyne catchment rather than any specific peat extraction related activities within the Application Site.

The Cutaway Bog Decommissioning and Rehabilitation Plans for the Application Site have also been assessed (Remedial Phase). The plans will generally involve the rewetting and revegetation of the drained bogs. These plans will likely have a positive effect on hydrogeology within the Application Site where groundwater tables in the peat bogs are stabilised and closer to the bog surface. However, the Application Site will never return to the original intact raised bog condition which was present before the commencement of the drainage/peat extraction activities. Studies from elsewhere (*e.g.*, Pschenyckyj. C. et al. 2021) have shown that bog rewetting can also result in improvements in local and downstream surface water quality.

During the Remedial Phase the Application Site will be operated in accordance with IPC Licence requirements. These mitigation measures will ensure the protection of downstream surface waterbodies.

3 no. SWBs (Surface Water Bodies) directly downstream of the Application Site are at risk of failing to meet their respective WFD objectives. Therefore, catchment pressures (on water quality and water quantity/volume) appear to be significant at present. Only 1 no. river waterbody downstream of the Application Site (Stonyford_030) is listed as being under significant pressure from peat related activities. However, the proposed rehabilitation plans for the Application Site will ease local peat extraction related pressures and likely improve the status of these SWBs.

The local hydrogeological regime at the Application Site with low permeability peat and glacial deposits ensure that the perched groundwater table within the bog is isolated from the underlying groundwater body. Therefore, historic peat extraction activities are unlikely to have impacted the qualitative (chemical) or quantitative (volume) status of the groundwater body. Similarly, there will be no change in GWB status associated with the Cutaway Bog Decommissioning and Rehabilitation Plans.

As such, the Cutaway Bog Decommissioning and Rehabilitation Plans will not negatively impact upon any surface or groundwater body as it will not cause a deterioration in the status of the body and/or it will not jeopardise the attainment of good status.

Furthermore, the Cutaway Bog Decommissioning and Rehabilitation Plans will not negatively impact upon any downstream protected areas.

**Table P** presents a summary of the estimated WFD status of downstream SWBs and the underlying GWB as discussed in **Section** Error! Reference source not found., **Section 4.2**, **Section** Error! Reference source not found. and **Section 5.3** above.

**Table P: Summary WFD Status**

| WFD Element | Assessed Pre IPC Licence Status (Pre 2000) | Assessed Post IPC Licence Status (2003-2010) | WFD Status (2010-2015) | WFD Status (2013-2018) | WFD Status (2016-2021) | Current Phase (2020-Present) | Short-term Remedial Phase | Long-term Remedial Phase |
|---|---|---|---|---|---|---|---|---|
| Deel(Raharney)_030 | Moderate/ Good | Good | Good | Moderate | Good | Good | Good | Good/High |
| Deel(Raharney)_040 | Moderate/ Good | Good | Good | Good | Good | Good | Good | Good/High |
| Deel(Raharney)_050 | Moderate/ Good | Moderate | Moderate | Moderate | Moderate | Moderate | Moderate | Moderate/ Good |
| Deel(Raharney)_060 | Moderate/ Good | Moderate | Moderate | Good | Good | Good | Good | Good/High |
| Boyne_050 | Good | Good | Good | Good | Good | Good | Good | Good |
| Boyne_060 | Moderate/ Good | Moderate | Moderate | Good | Good | Good | Good | Good/High |
| Stonyford_030 | Moderate/ Good | Good | Good | Moderate | Poor | Poor | Poor | Poor/Moderate |
| Stonyford_040 | Moderate/ Good | Good | Good | Moderate | Moderate | Moderate | Moderate | Moderate/ Good |
| Boyne_070 | Good | Good | Good | Moderate | Moderate | Moderate | Moderate | Moderate |
| Boyne_080 | Moderate | Moderate | Moderate | Moderate | Moderate | Moderate | Moderate | Moderate |
| Athboy GWB | Good | Good | Good | Good | Good | Good | Good | Good |

### 6.1.1 Conclusion

WFD status for SWBs (Surface Water Bodies) and GWBs (Groundwater Bodies) hydraulically linked to the Application Site are defined in **Section 2** above.

Historic peat extraction activities at the Application Site would have had the potential to impact on the status of downstream SWBs and the underlying GWB. However, since the transposition of the WFD into Irish Law in 2003, all peat extraction activities at the Application Site have been operating in under strict IPC Licence requirements designed for the protection of surface and groundwaters and the protection of the status of these waterbodies.

Therefore, there has been no change in GWB or SWB status in the underlying GWB or downstream SWBs resulting from the historic peat extraction works. The mitigation measures have ensured that there was no change in quantitative (volume) or qualitative (chemical) status, and the underlying GWB, downstream SWBs and downstream protected areas have been protected from any potential deterioration.

As such, the Peat Extraction Phase (2003-2020) and the Current Phase (2020-Present):

- Have not caused a deterioration in the status of all surface and groundwater bodies assessed;
- Have not jeopardised the objectives to achieve 'Good' surface water/groundwater status;
- Have not jeopardised the attainment of 'Good' surface water/groundwater chemical status;
- Have not jeopardised the attainment of 'Good' surface water/groundwater quantity status;
- Have not permanently excluded or compromised the achievement of the objectives of the WFD in other waterbodies within the same river basin district;
- Have been compliant with the requirements of the Water Framework Directive (2000/60/EC); and,
- Have been consistent with other Community Environmental Legislation including the EIA Directive (2014/52/EU), the Habitats Directive (92/43/EEC) and the Birds Directive (2009/147/EC) (Note that a full list of legislation complied with in relation to hydrology and hydrogeology is included in Section 9.1.4 of EIAR Chapter 9).

Furthermore the Cutaway Bog Decommissioning and Rehabilitation Plans for the Application Site will be completed in accordance with IPC Licence conditions and will not impact the status of any waterbody. In addition there will be no potential effects on any downstream protected areas as a result of the Cutaway Bog Decommissioning and Rehabilitation Plans. Indeed, the Cutaway Bog Decommissioning and Rehabilitation Plans will likely have a positive long-term effect to the Water Framework Directive Classification of downstream waterbodies.

As such, the Remedial Phase:

- will not cause a deterioration in the status of all surface and groundwater bodies assessed;
- will not jeopardise the objectives to achieve 'Good' surface water/groundwater status;
- does not jeopardise the attainment of 'Good' surface water/groundwater chemical status;
- does not jeopardise the attainment of 'Good' surface water/groundwater quantity status;
- does not permanently exclude or compromise the achievement of the objectives of the WFD in other waterbodies within the same river basin district;
- is compliant with the requirements of the Water Framework Directive (2000/60/EC); and,
- is consistent with other Community Environmental Legislation including the EIA Directive (2014/52/EU), the Habitats Directive (92/43/EEC) and the Birds Directive (2009/147/EC)

(Note that a full list of legislation complied with in relation to hydrology and hydrogeology is included in Section 9.1.4 of EIAR Chapter 9).

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# APPENDIX 10-1

*Carbon Calculations*

| Total (Tonnes) | Years 1954 - 2020 | Average annual production |
|---|---|---|
| 3,903,076 | 66 | 59,138 |

Specific Volumes

| YEAR | Tonnes | Carbon from extraction tC/yr | Carbon from extraction tCO2/yr | Extraction Area (ha) | Carbon from bare peat surface tC/yr | Carbon from bare peat surface tCO2/yr | Total Length of Drains | Total area of Drains (ha) | Carbon from open drains tCO2/yr | Carbon from Surfacewater run off (POC and DOC) tCO2/yr | Direct CH4 from surface tCO2 eq/yr | N20 Direct from surface tCO2eq/yr | Fuel Usage tCO2eq/yr | **Total tCO2/yr** | **Total tCO2** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1954** | 4,474 | 1,013 | 3,717 | 540 | 948 | 3,478 | 239 | 23.9 | 16.2 | 3,316 | 108 | 205.2 | 38.2 | 10,878 | | |
| 1955 | 15,447 | 3,497 | 12,834 | 540 | 948 | 3,478 | 239 | 23.9 | 16.2 | 3,316 | 108 | 205.2 | 131.8 | 20,088 | | |
| 1956 | 15,447 | 3,497 | 12,834 | 540 | 948 | 3,478 | 239 | 23.9 | 16.2 | 3,316 | 108 | 205.2 | 131.8 | 20,088 | | |
| 1957 | 15,447 | 3,497 | 12,834 | 540 | 948 | 3,478 | 239 | 23.9 | 16.2 | 3,316 | 108 | 205.2 | 131.8 | 20,088 | | |
| 1958 | 15,447 | 3,497 | 12,834 | 540 | 948 | 3,478 | 239 | 23.9 | 16.2 | 3,316 | 108 | 205.2 | 131.8 | 20,088 | | |
| 1959 | 34,280 | 7,760 | 28,480 | 1046 | 1,835 | 6,736 | 462 | 46.2 | 31.4 | 6,422 | 209.2 | 397.5 | 292.4 | 42,570 | | |
| 1960 | 48,052 | 10,878 | 39,922 | 1421 | 2,494 | 9,151 | 628 | 62.8 | 42.7 | 8,725 | 284.2 | 540.0 | 409.9 | 59,075 | | |
| 1961 | 48,052 | 10,878 | 39,922 | 1421 | 2,494 | 9,151 | 628 | 62.8 | 42.7 | 8,725 | 284.2 | 540.0 | 409.9 | 59,075 | | |
| 1962 | 48,052 | 10,878 | 39,922 | 1421 | 2,494 | 9,151 | 628 | 62.8 | 42.7 | 8,725 | 284.2 | 540.0 | 409.9 | 59,075 | | |
| 1963 | 44,934 | 10,172 | 37,332 | 1421 | 2,494 | 9,151 | 628 | 62.8 | 42.7 | 8,725 | 284.2 | 540.0 | 383.3 | 56,458 | | |
| 1964 | 51,973 | 11,766 | 43,180 | 1421 | 2,494 | 9,151 | 628 | 62.8 | 42.7 | 8,725 | 284.2 | 540.0 | 443.3 | 62,366 | | |
| 1965 | 50,018 | 11,323 | 41,556 | 1421 | 2,494 | 9,151 | 628 | 62.8 | 42.7 | 8,725 | 284.2 | 540.0 | 426.7 | 60,725 | | |
| 1966 | 44,414 | 10,054 | 36,900 | 1421 | 2,494 | 9,151 | 628 | 62.8 | 42.7 | 8,725 | 284.2 | 540.0 | 378.9 | 56,022 | | |
| 1967 | 40,907 | 9,261 | 33,986 | 1421 | 2,494 | 9,151 | 628 | 62.8 | 42.7 | 8,725 | 284.2 | 540.0 | 348.9 | 53,078 | | |
| 1968 | 55,157 | 12,486 | 45,825 | 1421 | 2,494 | 9,151 | 628 | 62.8 | 42.7 | 8,725 | 284.2 | 540.0 | 470.5 | 65,039 | | |
| 1969 | 49,370 | 11,176 | 41,017 | 1421 | 2,494 | 9,151 | 628 | 62.8 | 42.7 | 8,725 | 284.2 | 540.0 | 421.1 | 60,182 | | |
| 1970 | 44,416 | 10,055 | 36,901 | 1421 | 2,494 | 9,151 | 628 | 62.8 | 42.7 | 8,725 | 284.2 | 540.0 | 378.9 | 56,023 | | |
| 1971 | 55,685 | 12,606 | 46,264 | 1421 | 2,494 | 9,151 | 628 | 62.8 | 42.7 | 8,725 | 284.2 | 540.0 | 475.0 | 65,482 | | |
| 1972 | 51,933 | 11,757 | 43,147 | 1421 | 2,494 | 9,151 | 628 | 62.8 | 42.7 | 8,725 | 284.2 | 540.0 | 443.0 | 62,333 | | |
| 1973 | 39,763 | 9,002 | 33,036 | 1421 | 2,494 | 9,151 | 628 | 62.8 | 42.7 | 8,725 | 284.2 | 540.0 | 339.2 | 52,118 | | |
| 1974 | 43,116 | 9,761 | 35,821 | 1421 | 2,494 | 9,151 | 628 | 62.8 | 42.7 | 8,725 | 284.2 | 540.0 | 367.8 | 54,932 | | |
| 1975 | 45,869 | 10,384 | 38,109 | 1421 | 2,494 | 9,151 | 628 | 62.8 | 42.7 | 8,725 | 284.2 | 540.0 | 391.3 | 57,243 | | |
| 1976 | 58,293 | 13,196 | 48,431 | 1421 | 2,494 | 9,151 | 628 | 62.8 | 42.7 | 8,725 | 284.2 | 540.0 | 497.2 | 67,671 | | |
| 1977 | 44,980 | 10,183 | 37,370 | 1421 | 2,494 | 9,151 | 628 | 62.8 | 42.7 | 8,725 | 284.2 | 540.0 | 383.7 | 56,497 | | |
| 1978 | 61,526 | 13,928 | 51,117 | 1421 | 2,494 | 9,151 | 628 | 62.8 | 42.7 | 8,725 | 284.2 | 540.0 | 524.8 | 70,385 | | |
| 1979 | 62,698 | 14,194 | 52,090 | 1421 | 2,494 | 9,151 | 628 | 62.8 | 42.7 | 8,725 | 284.2 | 540.0 | 534.8 | 71,368 | | |
| 1980 | 49,815 | 11,277 | 41,387 | 1421 | 2,494 | 9,151 | 628 | 62.8 | 42.7 | 8,725 | 284.2 | 540.0 | 424.9 | 60,555 | | |
| 1981 | 58,898 | 13,333 | 48,933 | 1421 | 2,494 | 9,151 | 628 | 62.8 | 42.7 | 8,725 | 284.2 | 540.0 | 502.4 | 68,179 | | |
| 1982 | 45,855 | 10,381 | 38,097 | 1421 | 2,494 | 9,151 | 628 | 62.8 | 42.7 | 8,725 | 284.2 | 540.0 | 391.1 | 57,231 | | |
| 1983 | 58,496 | 13,242 | 48,599 | 1421 | 2,494 | 9,151 | 628 | 62.8 | 42.7 | 8,725 | 284.2 | 540.0 | 499.0 | 67,841 | | |
| 1984 | 35,044 | 7,933 | 29,115 | 1421 | 2,494 | 9,151 | 628 | 62.8 | 42.7 | 8,725 | 284.2 | 540.0 | 298.9 | 48,157 | | |
| 1985 | 89,356 | 20,228 | 74,238 | 1421 | 2,494 | 9,151 | 628 | 62.8 | 42.7 | 8,725 | 284.2 | 540.0 | 762.2 | 93,744 | | |
| 1986 | 56,585 | 12,810 | 47,012 | 1421 | 2,494 | 9,151 | 628 | 62.8 | 42.7 | 8,725 | 284.2 | 540.0 | 482.7 | 66,237 | | |
| 1987 | 56,585 | 12,810 | 47,012 | 1654 | 2,902 | 10,652 | 731 | 73.1 | 49.7 | 10,156 | 330.8 | 628.5 | 482.7 | 69,311 | **1,870,202** | **1954 to 1987** |
| 1988 | 56,585 | 12,810 | 47,012 | 1654 | 2,902 | 10,652 | 731 | 73.1 | 49.7 | 10,156 | 330.8 | 628.5 | 482.7 | 69,311 | | |
| 1989 | 56,585 | 12,810 | 47,012 | 1654 | 2,902 | 10,652 | 731 | 73.1 | 49.7 | 10,156 | 330.8 | 628.5 | 482.7 | 69,311 | | |
| 1990 | 90,583 | 20,506 | 75,258 | 1654 | 2,902 | 10,652 | 731 | 73.1 | 49.7 | 10,156 | 330.8 | 628.5 | 772.7 | 97,847 | | |
| 1991 | 86,190 | 19,512 | 71,608 | 1654 | 2,902 | 10,652 | 731 | 73.1 | 49.7 | 10,156 | 330.8 | 628.5 | 735.2 | 94,160 | | |
| 1992 | 92,744 | 20,995 | 77,053 | 1654 | 2,902 | 10,652 | 731 | 73.1 | 49.7 | 10,156 | 330.8 | 628.5 | 791.1 | 99,660 | | |
| 1993 | 104,742 | 23,711 | 87,021 | 1654 | 2,902 | 10,652 | 731 | 73.1 | 49.7 | 10,156 | 330.8 | 628.5 | 893.4 | 109,731 | | |
| 1994 | 110,074 | 24,919 | 91,451 | 1654 | 2,902 | 10,652 | 731 | 73.1 | 49.7 | 10,156 | 330.8 | 628.5 | 938.9 | 114,206 | | |
| 1995 | 104,384 | 23,630 | 86,724 | 1654 | 2,902 | 10,652 | 731 | 73.1 | 49.7 | 10,156 | 330.8 | 628.5 | 890.4 | 109,430 | | |
| 1996 | 111,260 | 25,187 | 92,437 | 1654 | 2,902 | 10,652 | 731 | 73.1 | 49.7 | 10,156 | 330.8 | 628.5 | 949.1 | 115,202 | | |
| 1997 | 97,800 | 22,140 | 81,254 | 1654 | 2,902 | 10,652 | 731 | 73.1 | 49.7 | 10,156 | 330.8 | 628.5 | 834.2 | 103,904 | | |
| 1998 | 102,495 | 23,203 | 85,154 | 1654 | 2,902 | 10,652 | 731 | 73.1 | 49.7 | 10,156 | 330.8 | 628.5 | 874.3 | 107,845 | | |
| 1999 | 86,749 | 19,638 | 72,073 | 1654 | 2,902 | 10,652 | 731 | 73.1 | 49.7 | 10,156 | 330.8 | 628.5 | 740.0 | 94,629 | | |
| 2000 | 98,702 | 22,344 | 82,003 | 1654 | 2,902 | 10,652 | 731 | 73.1 | 49.7 | 10,156 | 330.8 | 628.5 | 841.9 | 104,661 | | |
| 2001 | 98,702 | 22,344 | 82,003 | 1654 | 2,902 | 10,652 | 731 | 73.1 | 49.7 | 10,156 | 330.8 | 628.5 | 841.9 | 104,661 | | |
| 2002 | 28,640 | 6,484 | 23,795 | 1654 | 2,902 | 10,652 | 731 | 73.1 | 49.7 | 10,156 | 330.8 | 628.5 | 244.3 | 45,855 | | |
| 2003 | 59,737 | 13,523 | 49,630 | 1654 | 2,902 | 10,652 | 731 | 73.1 | 49.7 | 10,156 | 330.8 | 628.5 | 509.6 | 71,956 | | |
| 2004 | 48,956 | 11,083 | 40,673 | 1654 | 2,902 | 10,652 | 731 | 73.1 | 49.7 | 10,156 | 330.8 | 628.5 | 417.6 | 62,907 | | |
| 2005 | 59,251 | 13,413 | 49,227 | 1654 | 2,902 | 10,652 | 731 | 73.1 | 49.7 | 10,156 | 330.8 | 628.5 | 505.4 | 71,548 | | |
| 2006 | 68,069 | 15,409 | 56,553 | 1654 | 2,902 | 10,652 | 731 | 73.1 | 49.7 | 10,156 | 330.8 | 628.5 | 580.6 | 78,950 | | |
| 2007 | 47,637 | 10,784 | 39,578 | 1654 | 2,902 | 10,652 | 731 | 73.1 | 49.7 | 10,156 | 330.8 | 628.5 | 406.3 | 61,800 | | |
| 2008 | 51,829 | 11,733 | 43,060 | 1654 | 2,902 | 10,652 | 731 | 73.1 | 49.7 | 10,156 | 330.8 | 628.5 | 442.1 | 65,319 | | |
| 2009 | 27,721 | 6,275 | 23,031 | 1654 | 2,902 | 10,652 | 731 | 73.1 | 49.7 | 10,156 | 330.8 | 628.5 | 236.5 | 45,084 | | |
| 2010 | 81,062 | 18,351 | 67,347 | 1654 | 2,902 | 10,652 | 731 | 73.1 | 49.7 | 10,156 | 330.8 | 628.5 | 691.5 | 89,855 | | |
| 2011 | 64,951 | 14,704 | 53,962 | 1654 | 2,902 | 10,652 | 731 | 73.1 | 49.7 | 10,156 | 330.8 | 628.5 | 554.0 | 76,333 | | |
| 2012 | 17,095 | 3,870 | 14,203 | 1654 | 2,902 | 10,652 | 731 | 73.1 | 49.7 | 10,156 | 330.8 | 628.5 | 145.8 | 36,165 | | |
| 2013 | 108,605 | 24,586 | 90,231 | 1654 | 2,902 | 10,652 | 731 | 73.1 | 49.7 | 10,156 | 330.8 | 628.5 | 926.4 | 112,973 | | |
| 2014 | 77,968 | 17,650 | 64,777 | 1654 | 2,902 | 10,652 | 731 | 73.1 | 49.7 | 10,156 | 330.8 | 628.5 | 665.1 | 87,258 | | |
| 2015 | 62,267 | 14,096 | 51,732 | 1654 | 2,902 | 10,652 | 731 | 73.1 | 49.7 | 10,156 | 330.8 | 628.5 | 531.1 | 74,080 | | |
| 2016 | 39,730 | 8,994 | 33,008 | 1654 | 2,902 | 10,652 | 731 | 73.1 | 49.7 | 10,156 | 330.8 | 628.5 | 338.9 | 55,164 | | |
| 2017 | 51,844 | 11,736 | 43,073 | 1654 | 2,902 | 10,652 | 731 | 73.1 | 49.7 | 10,156 | 330.8 | 628.5 | 442.2 | 65,331 | | |
| 2018 | 89,839 | 20,338 | 74,640 | 1654 | 2,902 | 10,652 | 731 | 73.1 | 49.7 | 10,156 | 330.8 | 628.5 | 766.3 | 97,222 | | |
| 2019 | 42,115 | 9,534 | 34,990 | 1654 | 2,902 | 10,652 | 731 | 73.1 | 49.7 | 10,156 | 330.8 | 628.5 | 359.2 | 57,165 | | |
| 2020 | 37,782 | 8,553 | 31,390 | 1654 | 2,902 | 10,652 | 731 | 73.1 | 49.7 | 10,156 | 330.8 | 628.5 | 322.3 | 53,528 | **2,703,053** | **1988 to 2020** |
| Total Carbon | | | 3,242,733 | | | 633,368 | | | 2956.0 | 603,863 | 19,670 | 37,373 | 33,293 | | **4,573,255** | **1954 to 2020** |

Extraction Area estimate

| | |
|---|---|
| Ballivor | 540 Ha |
| Bracklyn | 506 Ha |
| Lisclogher east | 375 Ha |
| Carranstown | 233 Ha |

**Notes:**

1 1954 to 1962 is a pro rata calc based on an estimate of the production area on the three bogs , the year the bog came into production and the average tonnage over the 1962 to 1971 period
2 Average moisture content of 53.8% and carbon content of 49%
3 Assume once brought into production that carbon emits from the surface for the entire period ( i.e even if production ceases and revegaetation occurs)
4 540 km of drains for Ballivor, carranstown and Bracklyn - assume ratio is 0.422km per ha of production area 0.442
5 Assume drains are 1m wide
6 Combining the values for DOC and POC (= 6.14 tCO2-eq ha-1 yr-1) 6.14
7 CH4 from surface eq 0.2 tCO2eq/yr
8 N20 Direct emissions from surface 0.38 tCO2eq/yr
9 Average Production during 2009 to 2020 was 58,415 tonnes. Average fuels usage was 121,701 ag diesel and 64,161 derv - this resulted in an average of 498.8 tCO2/yr Ratio of 0.00853 tCO2/ton of peat

# APPENDIX 11 -1

*Glossary of Acoustic Terminology*

## GLOSSARY OF ACOUSTIC TERMINOLOGY

A variety of acoustic parameters and terminology are used throughout this chapter. Significant definitions are identified at this stage to inform the reader.

| | |
|---|---|
| *A – Weighting* | The "A" suffix denotes the fact that the sound levels have been "A-weighted" in order to account for the non-linear nature of human hearing. |
| *Background Noise* | The noise level rarely fallen below in any given location over any given time period, often classed according to day time, evening or night time periods. The $L_{A90,10min}$ is the parameter that is used to define the background noise level in this instance. $L_{A90}$ is the sound level that is exceeded for 90% of the sample period. It is typically used as a descriptor for background noise. |
| *dB (decibel)* | The unit normally employed to measure the magnitude of sound. It is defined as 20 times the logarithm of the ratio between the RMS pressure of the sound field and the reference pressure of 20 micro-pascals (20 μPa). |
| dB(A) | An 'A-weighted decibel' – a measure of the overall noise level of sound across the audible frequency range (20 Hz – 20 kHz) with A-frequency weighting (i.e. A – Weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies. |
| *Hub Height Wind Speed* | The wind speed at the centre of the turbine rotor. |
| *Hertz (Hz)* | *The unit of sound frequency in cycles per second.* |
| $L_{Aeq,T}$ | *This is the equivalent continuous sound level. It is a type of average and is used to describe a fluctuating noise in terms of a single noise level over the sample period (T). The closer the $L_{Aeq}$ value is to either the LAF10 or LAF90 value indicates the relative impact of the intermittent sources and their contribution. The relative spread between the values determines the impact of intermittent sources such as traffic on the background.* |
| $L_{AF90}$ | *Refers to those A-weighted noise levels in the lower 90 percentile of the sampling interval; it is the level which is exceeded for 90% of the measurement period. It will therefore exclude the intermittent features of traffic and is used to estimate a background level. Measured using the "Fast" time weighting.* |
| $L_{den}$ | *Refers to the $L_{Aeq}$ noise levels over a whole day, but with a penalty of 10 dB(A) for night-time noise (23:00-07:00) and 5 dB(A) for evening noise (19:00-23:00), also known as the day evening night noise indicator.* |

## GLOSSARY OF ACOUSTIC TERMINOLOGY (Continued)

| | |
|---|---|
| *Low Frequency Noise* | *LFN - noise which is dominated by frequency components towards the lower end of the frequency spectrum.* |
| *Noise* | Sound that evokes a feeling of displeasure in the environment in which it is heard, and is therefore unwelcomed by the receiver |
| *Noise Sensitive Location (NSL)* | Any dwelling house, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other facility or other area of high amenity which for its proper enjoyment requires the absence of noise at nuisance levels. |
| *octave band* | *A frequency interval, the upper limit of which is twice that of the lower limit. For example, the 1,000Hz octave band contains acoustical energy between 707Hz and 1,414Hz. The centre frequencies used for the designation of octave bands are defined in ISO and ANSI standards.* |
| *Pascal (Pa)* | Pascal is a unit of pressure and so sound pressures are measured in Pascals. |
| *Sound Power Level ($L_w$)* | The sound power level radiated by a source is defined as:<br>$L_w = 10 \times \log_{10}(W/W_o)$ dB.<br>Where W is the acoustic power of the source in Watts (W) and $W_o$ is a reference sound power chosen in air to be $10^{-12}$W. |
| *Sound Pressure Level ($L_p$)* | The sound pressure level at a point is defined:<br>$L_p = 20 \times \log_{10}(P/P_o)$ dB.<br>Where P is the sound pressure and $P_o$ is a reference pressure for propagation of sound in air and has a value of $2 \times 10^{-5}$Pa. |
| Tonal | Sounds which cover a range of only a few Hz which contains a clearly audible tone i.e. distinguishable, discrete or continuous noise (whine, hiss, screech, or hum etc.) are referred to as being 'tonal'. |
| *10 Minute Average Wind Speed (m/s)* | The wind speed measured by an anemometer at a specified height above ground level, averaged over a 10-minute period. |
| *Wind Shear* | The increase of wind speed with height above ground. |

# APPENDIX 11 -2

***CALIBRATION CERTIFICATES***

MEASUREMENT SYSTEMS

# CERTIFICATE OF CALIBRATION

0653

**Date of Issue: 12 May 2020**

**Certificate Number: UCRT20/1415**

Issued by:
ANV Measurement Systems
Beaufort Court
17 Roebuck Way
Milton Keynes MK5 8HL
Telephone 01908 642846 Fax 01908 642814
E-Mail: info@noise-and-vibration.co.uk
Web: www.noise-and-vibration.co.uk
Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems



Approved Signatory

K. Mistry

| | |
|---|---|
| Customer | AWN Consulting<br>The Tecpro Building<br>IDA Business and Technology Park<br>Clonshaugh<br>Dublin 17 |

| | | | | |
|---|---|---|---|---|
| Order No. | RM/20/Cal019 | | | |
| Description | Sound Level Meter / Pre-amp / Microphone / Associated Calibrator | | | |
| Identification | *Manufacturer* | *Instrument* | *Type* | *Serial No. / Version* |
| | Rion | Sound Level Meter | NL-52 | 00186671 |
| | Rion | Firmware | | 2.0 |
| | Rion | Pre Amplifier | NH-25 | 76821 |
| | Rion | Microphone | UC-59 | 16877 |
| | Brüel & Kjær | Calibrator | 4231 | 2205805 |
| | | Calibrator adaptor type if applicable | | UC 0210 |
| Performance Class | 1 | | | |
| Test Procedure | TP 2.SLM 61672-3 TPS-49 | | | |
| | *Procedures from IEC 61672-3:2006 were used to perform the periodic tests.* | | | |
| Type Approved to IEC 61672-1:2002 | YES | Approval Number | 21.21 / 13.02 | |
| | *If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2003* | | | |
| Date Received | 30 April 2020 | ANV Job No. | UKAS20/04240 | |
| Date Calibrated | 12 May 2020 | | | |

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

| Previous Certificate | *Dated* | *Certificate No.* | *Laboratory* |
|---|---|---|---|
| | 20 April 2018 | UCRT18/1437 | 0653 |

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# CERTIFICATE OF CALIBRATION

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**Date of Issue: 04 May 2020**

**Certificate Number: UCRT20/1386**

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Milton Keynes MK5 8HL
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Web: www.noise-and-vibration.co.uk
Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems



Approved Signatory

K. Mistry

| | |
|---|---|
| Customer | AWN Consulting<br>The Tecpro Building<br>IDA Business and Technology Park<br>Clonshaugh<br>Dublin 17 |
| Order No. | RM/20/Cal019 |
| Description | Sound Level Meter / Pre-amp / Microphone / Associated Calibrator |

Identification

| *Manufacturer* | *Instrument* | *Type* | *Serial No. / Version* |
|---|---|---|---|
| Rion | Sound Level Meter | NL-52 | 00186667 |
| Rion | Firmware | | 2.0 |
| Rion | Pre Amplifier | NH-25 | 76817 |
| Rion | Microphone | UC-59 | 12812 |
| Brüel & Kjær | Calibrator | 4231 | 2205805 |
| | Calibrator adaptor type if applicable | | UC 0210 |

| | |
|---|---|
| Performance Class | 1 |
| Test Procedure | TP 2.SLM 61672-3 TPS-49 |

*Procedures from IEC 61672-3:2006 were used to perform the periodic tests.*

Type Approved to IEC 61672-1:2002 YES Approval Number 21.21 / 13.02

*If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2003*

| | | | |
|---|---|---|---|
| Date Received | 30 April 2020 | ANV Job No. | UKAS20/04240 |
| Date Calibrated | 04 May 2020 | | |

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

| Previous Certificate | *Dated* | *Certificate No.* | *Laboratory* |
|---|---|---|---|
| | 20 April 2018 | UCRT18/1432 | 0653 |

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# CERTIFICATE OF CALIBRATION

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**Date of Issue: 05 May 2020**

**Certificate Number: UCRT20/1392**

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Web: www.noise-and-vibration.co.uk
Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems



Approved Signatory

K. Mistry

| | | | | |
|---|---|---|---|---|
| Customer | AWN Consulting<br>The Tecpro Building<br>IDA Business and Technology Park<br>Clonshaugh<br>Dublin 17 | | | |
| Order No. | RM/20/Cal019 | | | |
| Description | Sound Level Meter / Pre-amp / Microphone / Associated Calibrator | | | |
| Identification | *Manufacturer* | *Instrument* | *Type* | *Serial No. / Version* |
| | Rion | Sound Level Meter | NL-52 | 00186670 |
| | Rion | Firmware | | 2.0 |
| | Rion | Pre Amplifier | NH-25 | 76820 |
| | Rion | Microphone | UC-59 | 12816 |
| | Brüel & Kjær | Calibrator | 4231 | 2205805 |
| | | Calibrator adaptor type if applicable | | UC 0210 |
| Performance Class | 1 | | | |
| Test Procedure | TP 2.SLM 61672-3 TPS-49<br>*Procedures from IEC 61672-3:2006 were used to perform the periodic tests.* | | | |
| Type Approved to IEC 61672-1:2002 | YES | Approval Number | 21.21 / 13.02 | |
| | *If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2003* | | | |
| Date Received | 30 April 2020 | ANV Job No. | UKAS20/04240 | |
| Date Calibrated | 05 May 2020 | | | |

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

| Previous Certificate | *Dated* | *Certificate No.* | *Laboratory* |
|---|---|---|---|
| | 20 April 2018 | UCRT18/1435 | 0653 |

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# CERTIFICATE OF CALIBRATION

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**Date of Issue: 31 July 2019** **Certificate Number: UCRT19/1856**

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Milton Keynes MK5 8HL
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E-Mail: info@noise-and-vibration.co.uk
Web: www.noise-and-vibration.co.uk
Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems



Approved Signatory

K. Mistry

| | |
|---|---|
| Customer | AWN Consulting<br>The Tecpro Building<br>IDA Business and Technology Park<br>Clonshaugh<br>Dublin 17 |

| | | | | |
|---|---|---|---|---|
| Order No. | 1999 | | | |
| Description | Sound Level Meter / Pre-amp / Microphone / Associated Calibrator | | | |
| Identification | *Manufacturer* | *Instrument* | *Type* | *Serial No. / Version* |
| | Rion | Sound Level Meter | NL-52 | 00575785 |
| | Rion | Firmware | | 2.0 |
| | Rion | Pre Amplifier | NH-25 | 65812 |
| | Rion | Microphone | UC-59 | 11406 |
| | Brüel & Kjær | Calibrator | 4231 | 2460007 |
| | | Calibrator adaptor type if applicable | | UC 0210 |
| Performance Class | 1 | | | |
| Test Procedure | TP 2.SLM 61672-3 TPS-49 | | | |
| | *Procedures from IEC 61672-3:2006 were used to perform the periodic tests.* | | | |
| Type Approved to IEC 61672-1:2002 | YES | Approval Number | 21.21 / 13.02 | |
| | *If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2003* | | | |
| Date Received | 30 July 2019 | ANV Job No. | UKAS19/07499 | |
| Date Calibrated | 31 July 2019 | | | |

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

| Previous Certificate | *Dated* | *Certificate No.* | *Laboratory* |
|---|---|---|---|
| | 28 July 2017 | UCRT17/1627 | 0653 |

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# CERTIFICATE OF CALIBRATION

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**Date of Issue: 31 July 2019** **Certificate Number: UCRT19/1857**

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Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems



Approved Signatory

K. Mistry

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|---|---|
| Customer | AWN Consulting<br>The Tecpro Building<br>IDA Business and Technology Park<br>Clonshaugh<br>Dublin 17 |

| | | | | |
|---|---|---|---|---|
| Order No. | 1999 | | | |
| Description | Sound Level Meter / Pre-amp / Microphone / Associated Calibrator | | | |
| Identification | *Manufacturer* | *Instrument* | *Type* | *Serial No. / Version* |
| | Rion | Sound Level Meter | NL-52 | 00575802 |
| | Rion | Firmware | | 2.0 |
| | Rion | Pre Amplifier | NH-25 | 75829 |
| | Rion | Microphone | UC-59 | 11426 |
| | Brüel & Kjær | Calibrator | 4231 | 2460007 |
| | | Calibrator adaptor type if applicable | | UC 0210 |
| Performance Class | 1 | | | |
| Test Procedure | TP 2.SLM 61672-3 TPS-49 | | | |
| | *Procedures from IEC 61672-3:2006 were used to perform the periodic tests.* | | | |
| Type Approved to IEC 61672-1:2002 | YES | Approval Number | 21.21 / 13.02 | |
| | *If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2003* | | | |
| Date Received | 30 July 2019 | ANV Job No. | UKAS19/07499 | |
| Date Calibrated | 31 July 2019 | | | |

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

| Previous Certificate | *Dated* | *Certificate No.* | *Laboratory* |
|---|---|---|---|
| | 28 July 2017 | UCRT17/1624 | 0653 |

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**Date of Issue: 05 May 2020**

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Web: www.noise-and-vibration.co.uk
Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems



Approved Signatory

K. Mistry

| | |
|---|---|
| Customer | AWN Consulting<br>The Tecpro Building<br>IDA Business and Technology Park<br>Clonshaugh<br>Dublin 17 |
| Order No. | RM/20/Cal019 |
| Description | Sound Level Meter / Pre-amp / Microphone / Associated Calibrator |

Identification

| *Manufacturer* | *Instrument* | *Type* | *Serial No. / Version* |
|---|---|---|---|
| Rion | Sound Level Meter | NL-52 | 00164427 |
| Rion | Firmware | | 2.0 |
| Rion | Pre Amplifier | NH-25 | 54560 |
| Rion | Microphone | UC-59 | 09208 |
| Brüel & Kjær | Calibrator | 4231 | 2205805 |
| | Calibrator adaptor type if applicable | | UC 0210 |

| | | | |
|---|---|---|---|
| Performance Class | 1 | | |
| Test Procedure | TP 2.SLM 61672-3 TPS-49 | | |
| | *Procedures from IEC 61672-3:2006 were used to perform the periodic tests.* | | |
| Type Approved to IEC 61672-1:2002 | YES | Approval Number | 21.21 / 13.02 |
| | *If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2003* | | |
| Date Received | 30 April 2020 | ANV Job No. | UKAS20/04240 |
| Date Calibrated | 05 May 2020 | | |

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

| Previous Certificate | *Dated* | *Certificate No.* | *Laboratory* |
|---|---|---|---|
| | 09 April 2018 | TCRT18/1306 | ANV Measurement Systems |

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# CERTIFICATE OF CALIBRATION

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**Date of Issue: 22 January 2020** **Certificate Number: UCRT20/1097**

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Beaufort Court
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Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems



Approved Signatory

K. Mistry

Customer
AWN Consulting
The Tecpro Building
IDA Business and Technology Park
Clonshaugh
Dublin 17

Order No. AWNC281119QTE

Description Sound Level Meter / Pre-amp / Microphone / Associated Calibrator

Identification

| *Manufacturer* | *Instrument* | *Type* | *Serial No. / Version* |
|---|---|---|---|
| Rion | Sound Level Meter | NL-52 | 00998409 |
| Rion | Firmware | | 2.0 |
| Rion | Pre Amplifier | NH-25 | 98623 |
| Rion | Microphone | UC-59 | 15915 |
| Rion | Calibrator | NC-74 | 34536109 |
| | Calibrator adaptor type if applicable | | NC-74-002 |

Performance Class 1

Test Procedure TP 2.SLM 61672-3 TPS-49

*Procedures from IEC 61672-3:2006 were used to perform the periodic tests.*

Type Approved to IEC 61672-1:2002 YES Approval Number 21.21 / 13.02

*If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2003*

Date Received 17 January 2020 ANV Job No. UKAS20/01034

Date Calibrated 22 January 2020

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

| Previous Certificate | *Dated* | *Certificate No.* | *Laboratory* |
|---|---|---|---|
| | Initial Calibration | | |

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# APPENDIX 13-1

***Bord na Móna Archaeology Code of Practise***

# Code of Practice



## Code of Practice between the Department of Arts, Heritage and the Gaeltacht, the National Museum of Ireland and Bord na Móna

Bord na Móna

museum
National Museum of Ireland
Ard-Mhúsaem na hÉireann

An Roinn
Ealaíon, Oidhreachta agus Gaeltachta
Department of
Arts, Heritage and the Gaeltacht

National Monuments Service,
Department of Arts, Heritage and the Gaeltacht
November 2011

Email: nationalmonuments@ahg.gov.ie
www.archaeology.ie



## Minister's Foreword

As Minister with responsibility for Ireland's rich natural and built heritage I am delighted to publish this Code of Practice developed by my Department in co-operation with the National Museum of Ireland and Bord na Móna. This publication brings the existing *Agreed Principles for the Protection of Wetland Archaeology in Bord Na Móna Bogs* into an updated format similar to the Codes of Practice already agreed between my Department and other utility service providers.

In a dryland context organic material such as wood, leather, cloth and human tissue decomposes. In wetlands, however, the most fragile of materials may be preserved by surrounding anaerobic conditions. Peat itself is, in fact, a repository of environmental information which can be used to re-create both the local and the regional environment. Distinct types of monuments, toghers platforms and post rows were built to traverse, access and use the resources of these wetland environments. From prehistoric times many valuable artefacts have been deposited or lost in bogs. During the later prehistoric period ritually sacrificed individuals or 'bog bodies' were placed in boggy pools, only to be rediscovered many centuries later. The archaeological deposits and features recovered from bogs are a key resource of knowledge and learning, giving us information which, with careful handling and interpretation, tells us so much about the past.

My Department's involvement with archaeology in Bord Na Móna raised bogs dates back to the 1980s and the significant excavations at Corlea Bog which identified, and enabled the subsequent conservation of, a section of Iron Age roadway built in 148 B.C. across the boglands of Longford. This oak road is one of the most impressive of its kind to have been uncovered in

Europe and an eighteen-metre stretch of the preserved togher is now on permanent display at the Corlea Visitor Centre in Longford with a further portion of the roadway preserved in-situ in adjacent peatland. Since the excavations at Corlea my Department has continued to fund the identification and survey of wetland monuments in Bord na Móna lands.

The importance of archaeology has long been recognised by Bord na Móna. Both my Department and the National Museum of Ireland have had very positive experiences in working with the Bord over the years and I believe that this Code successfully formalises the co-operation required to manage ongoing peat extraction, while affording our valuable archaeological heritage the care and protection it deserves. I look forward to the practical implementation of the guiding principles set out in this document over the coming years.

*Jimmy Deenihan*

Jimmy Deenihan TD
Minister for Arts, Heritage and the Gaeltacht
November 2011



## A Message from the Director of the National Museum of Ireland

As Director of the National Museum of Ireland I applaud the professional progress embodied in this Code of Practice, and the partnership it formalises between the Minister, the National Museum of Ireland and Bord na Móna. It sets a positive trajectory for the future treatment of Ireland's peatland archaeology.

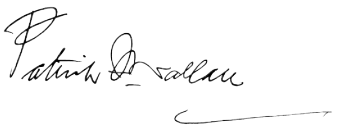
Finds from peatland contexts are amongst the most prized in the national assemblage with one of the first reports of the discovery of trumpets in an Armagh bog dating to 1799. With reports now numbering almost three thousand entries, they show the wealth of archaeological material retrieved from Irish bogs and underline the archaeological potential of Ireland's peatlands. Artefacts preserved in the unique anaerobic conditions offered by peat ecosystems succeed in a tangible fashion in bridging the time gap between the archaeological moment of deposition and the present day student.

Since the foundation of the Museum the archaeological exploration of peatlands and the study of artefacts from peatland contexts have been amongst its core goals. The flood of information that has come from our recent accession of Iron Age bog bodies and the Early Medieval Faddan More Psalter, parallels the well-established involvement of the Museum in the investigation of antiquities from wetlands. The Museum has witnessed changing trends in the numbers of artefacts accessioned from peatlands reflecting adaptations in work practices in the industrial exploitation of Ireland's peatlands and legislative changes which offer greater protection to monuments and artefacts alike. In the period 1945-1985 awareness of the archaeological potential of peatlands increased through museum

fieldwork pioneered by Ellen Prendergast, Etienne Rynne, A. T. Lucas and Michael Ryan's Lough Boora excavation co-funded by Bord na Móna. The contribution of Bord na Móna officials, such as P.J. Ruddy, T.A. Barry and J. Cooke, were most helpful to the Museum. The great part played by the late Barry Raftery and his excavation at Corlea in promoting Irish peatland studies has to be acknowledged. The 1980s saw a dramatic expansion in peat processing which led to National Monuments Service's licensing of excavations initially conducted by UCD's Irish Archaeological Wetland Unit (IAWU) and subsequently by archaeological contractors funded by Bord na Móna.

This Code of Practice endorses the current practice of cooperation between the Minister, The National Museum of Ireland and Bord na Móna in the Archaeology Management Liaison Committee. In this light we must applaud the framework set out in this Code and must strive to stay abreast of diversification in peatland usage and trends in the care of peatland archaeology. Through the auspices of these practices we can progress towards attaining the highest standard of monument and artefact care in the future preservation of our nation's peatland heritage. I look forward to a closer engagement, facilitated by this Code of Practice, between the Minister, Bord na Móna and the National Museum of Ireland and hope that it will further our growing appreciation of the peatlands as a national resource.

Ar aghaidh leis an obair,



Patrick F. Wallace
Director
National Museum of Ireland



## A Message from the Managing Director, Bord na Móna

Bord na Móna is pleased to be associated with this new Code of Practice on peatland archaeology, which outlines the principles to be applied for the protection of Ireland's peatland archaeological heritage. This Code was developed by Bord na Móna in cooperation with the National Monuments Service of the Department of Arts, Heritage and the Gaeltacht and the National Museum of Ireland.

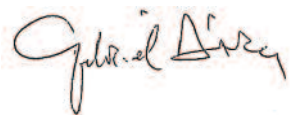
Bord na Móna is Ireland's leading environmentally responsible integrated utility service provider encompassing electricity, heating solutions, resource recovery, water, horticulture and related services. Our Feedstock Business consists of the production and supply of milled peat for power generation and the manufacture of peat briquettes and horticultural grade peat for a range of growing media products.

Peatlands are a very important source of archaeological information in Ireland as objects are preserved in peatlands because of the acidity of peat and the anaerobic environment which exists within peatland deposits. For many years Bord na Móna has played its part as best it could to properly deal with archaeological finds in its bogs and has worked with the relevant authorities and agencies to preserve this unique heritage. The company's recently adopted vision for the future: A New Contract with Nature elevates the good practices of the past onto an entirely new plane of responsibility on which this Code of Practice elegantly sits.

# Code of Practice

The purpose of this Code is to provide a framework within existing legislation, policy and practice to enable Bord na Móna to proceed with our programme of peat extraction within the framework of Government strategy, whilst carrying out appropriate archaeological mitigation having regard to a set of principles and actions agreed by all three parties. The Code also highlights that Bord na Móna is fully committed to ensuring that all its activities are carried out in an environmentally sensitive manner that ensures the safeguarding of the State's archaeological heritage.

Bord na Móna is looking forward to working with the Department of Arts, Heritage and the Gaeltacht and with the National Museum of Ireland, as agreed in this Code, with a view to protecting our archaeological heritage.



Gabriel D'Arcy
Managing Director
Bord na Móna plc



## Code of Practice agreed between the Department of Arts, Heritage and the Gaeltacht, the National Museum of Ireland and Bord na Móna

The purpose of this Code is to provide a framework within existing legislation, policy and practice to enable Bord na Móna to progress with its programme of peat extraction within the framework of Government strategy, whilst carrying out archaeological mitigation having regard to a set of principles and actions agreed by all parties. The Code draws from *Agreed Principles for the Protection of Wetlands Archaeology in Bord na Móna Bogs*, and refers exclusively to the extraction of peat from peatlands where this extraction lies outside the scope of the Planning and Development Acts.

### The Code is guided by the following agreed principles

1. The Minister for Arts, Heritage and the Gaeltacht has a responsibility to protect the archaeological heritage and to exercise powers of preservation, under the National Monuments Acts 1930-2004, taking account of the European Convention on the Protection of the Archaeological Heritage (Valletta).

2. The Minister's statutory responsibilities include the maintenance of the *Record of Monuments and Places*, with the aim of providing protection to all known archaeological monuments including those uncovered in Bord na Móna bogs.

3. The Director of the National Museum of Ireland has a responsibility to enforce state ownership of all archaeological objects and to safeguard the treatment of all archaeological objects before their accession into the State's repository, under National Monuments Acts 1930-2004 and the National Cultural Institutions Act 1997, taking account of the European Convention on the Protection of the Archaeological Heritage (Valletta).

4. Bord na Móna plc is a company with a statutory mandate, under the Turf Development Acts 1946-1998, to develop the national peat resource.

5. The development of peatlands has considerable archaeological implications which must be addressed given that the archaeological heritage is a non-renewable resource.

6. Bord na Móna has a statutory duty under the Turf Development Act 1998 (section 56) to afford appropriate protection for the environment and the archaeological heritage.

7. Bord na Móna will finance a balanced and cost effective approach to archaeological investigation, excavation, post-excavation and mitigation on the basis of the *developer pays* principle and in keeping with the Minister's stated policy in this regard.

8. Bord na Móna will engage a Project Archaeologist to develop archaeological strategy and to oversee the smooth running of the archaeological response to peat extraction in Bord na Móna bogs.



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9. The adoption of a partnership approach between the Minister, the Director and Bord na Móna in pursuit of the delivery of Government policy taking account of the implications for archaeology. To this end the Archaeology Management Liaison Committee has been set up consisting of representatives of the Department of Arts, Heritage and the Gaeltacht, the National Museum of Ireland and Bord na Móna, including the Project Archaeologist and Consultant Archaeologists working on Bord na Móna peatlands. The Committee will meet regularly to agree overall strategies in relation to the mitigation of peat extraction.

10. Appropriate strategies will be developed by the Archaeology Management Liaison Committee to minimise direct impacts on archaeology taking account of Bord na Móna's contractual obligations, annual production plans, design and safety implications, environmental and other impacts and costs.

11. All parties agree that mitigatory planning at the earliest opportunity minimises the impact on the archaeological heritage.

12. Bord na Móna will strive, as far as is reasonably possible, within its statutory remit, to avoid negative impacts on archaeological monuments. In cases where it is not possible to avoid impacting on monuments Bord na Móna, the Minister and the Director will cooperate to ensure, as far as possible, that appropriate archaeological mitigation is carried out in advance of peat extraction.

13. Prospecting for archaeological monuments, archaeological objects and other such remains, other than in circumstances approved by the Minister, in consultation with the Director, is limited to the confines of the area under peat extraction.

14. All parties are committed to dealing with the archaeological implications of peat extraction in a balanced and cost-effective manner consistent with

a. Observing Bord na Móna's requirement to extract peat on an extensive scale
b. Annual production targets in relevant bogs
c. A level of excavation, post-excavation and recording of archaeological monuments and archaeological objects, impacted upon by peat extraction, that is acceptable to the Minister, having consulted with the Director, and preservation in-situ of monuments in those particular circumstances where required by the Minister and which would be reasonable in practice.

15. Each party reserves the right to review decisions.

16. All parties agree that the Archaeology Management Liaison Committee will monitor the operation of this Code of Practice and carry out a formal review within three years of its adoption and at agreed intervals thereafter.



## Agreed Actions

### Bord na Móna will

1. Engage a Project Archaeologist. (The role of the Project Archaeologist is defined in Appendix I. Appendix II sets out the relationship between the Project Archaeologist and the Consultant Archaeologist.)

2. Maintain the network of Archaeological Liaison Officers. (The role of the Archaeological Liaison Officers is defined in Appendix III.)

3. Disseminate a set of Archaeological Protection Procedures (Appendix IV) for employees engaged in peat drainage, extraction and associated activities.

4. Ensure that any monuments or archaeological objects discovered during peat extraction are protected in an appropriate manner by following the Archaeological Protection Procedures.

5. Ensure that any newly discovered monuments on Bord na Móna lands are reported in a timely manner to the National Monuments Service of the Department of Arts, Heritage and the Gaeltacht.

6. Ensure that any archaeological objects discovered on Bord na Móna lands are reported immediately to the Duty Officer of the National Museum of Ireland. (Appendix V)

7. Prioritise monuments for investigation taking account of monument vulnerability, contractual obligations and peat production targets.

8. Prepare tenders for archaeological mitigation of impacts on monuments, to include excavation and recording, in consultation with the Project Archaeologist and the Minister.

9. Engage professional Consultant Archaeologists to carry out mitigation of monuments, including the required palaeo-environmental assessment and post-excavation studies.

10. Provide the necessary finance to fulfil the post-excavation requirements of the Minister and the Director including the conservation of archaeological objects, the provision of scientific analyses and dating, as well as the production of reports on all archaeological work, to a standard which will meet the approval of the Minister.



## The Minister for Arts, Heritage and the Gaeltacht (through the National Monuments Service of the Department) will

1. Be responsible for commissioning archaeological surveys on active production lands owned by Bord na Móna.

2. Ensure that the results or outcomes of such surveys are made available to Bord na Móna.

3. Respond to consultations from the Project Archaeologist and Consultant Archaeologists in a timely manner.

4. Agree with the Project Archaeologist an appropriate final methodology for the preservation in-situ or excavation and recording of archaeological monuments prior to the tender document stage. This to be applied by the Project Archaeologist subject to overall control and monitoring by the Minister.

5. Issue licences for archaeological excavation within 3 weeks of receipt of an application from the Consultant Archaeologist.



6. Agree that a single site director will be sufficient for excavating sites where the subject sites form part of a discrete complex or are in close proximity to each other, having regard to the recommendations of the Project Archaeologist.

7. Specify the format and standard of the reports to be submitted on foot of the licences issued.

8. Assist the National Museum of Ireland in the carrying out of training, on a periodic basis, to ensure that the skills and knowledge of the Archaeological Liaison Officers are kept up to date.



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## The Director of the National Museum of Ireland, or a designated member of his staff, will

1. Be responsible for the care of any archaeological object found on Bord na Móna lands once it has been accepted into the State's repository.

2. Respond to consultations from the Project Archaeologist and Consultant Archaeologists in a timely manner.

3. Agree to be available for consultation with the Project Archaeologist and the Minister, should the need arise, on the appropriate final methodology for the preservation in-situ or excavation and recording of archaeological monuments prior to the tender document stage.

4. Provide comments to the Minister in relation to the issuing of licences for archaeological excavation within 3 weeks of receipt of an application from the Consultant Archaeologist.

5. Agree to process licences to Alter an Archaeological Object and Export an Archaeological Object within 3 weeks of receipt of an application from the Consultant Archaeologist.

6. Agree, subject to consultation with Department of Arts, Heritage and the Gaeltacht, to facilitate the issuing of National Museum of Ireland excavation (E) numbers for the registration of artefacts found during excavations on Bord na Móna lands. The museum will issue guidelines in relation to the application of these numbers and the registration of artefacts under the issued National Museum of Ireland excavation number.

7. Respond, if requested, to consultation from the Minister on the specifications of the format and standard of the reports to be submitted on foot of the licences issued.

8. Carry out training, with assistance from the Department of Arts, Heritage and the Gaeltacht, on a periodic basis to ensure that the skills and knowledge of the Archaeological Liaison Officers are kept up to date.

9. Agree to keep the Project Archaeologist and the Consultant Archaeologists informed of any amendments to the National Museum of Ireland Advice Notes to Excavators or the required Excavation Finds Register Database.

10. Keep an up to date inventory of the archaeological objects found on Bord na Móna's lands and ensure that appropriate finder's rewards are issued within a reasonable time period.



## Appendices

I. Role of the Project Archaeologist

II. Relationship between the Project Archaeologist and the Consultant Archaeologist

III. Role of the Archaeological Liaison Officers

IV. Archaeological Protection Procedures

V. Report of Discovery of Archaeological Objects in Bogs



## Appendix I

## Role of the Project Archaeologist

As part of the Code of Practice, Bord na Móna agrees that all archaeological activities on its peatlands will be carried out under the supervision of a professional archaeologist in consultation with the Department and the National Museum of Ireland. To this end, Bord na Móna agrees to engage the services of a Project Archaeologist with immediate effect.

The Project Archaeologist will

1. Advise Bord na Móna on all aspects of archaeology relating to its estate and assist in the development of a post-survey archaeology strategy for its peatlands.

2. Liaise with the Department in relation to archaeological surveys carried out on Bord na Móna's lands.

3. Agree with Bord na Móna the priority monuments for investigation, taking account of site vulnerability and Bord na Móna's contractual obligations and peat production targets.



4. Agree methodologies with the Department, subject to consultation by the Department with the Director, and prepare tender documents for the excavation and recording of archaeological monuments, by Consultant Archaeologists, on Bord na Móna's peatland areas.

5. Be responsible for ensuring that the applications for excavation licences are in order before they are submitted to the Department and the National Museum of Ireland.

6. Ensure that work is carried out in line with specifications outlined in the tender submission documents, method statements and conditions of excavation licence and within the agreed timescales, without prejudice to the role of the Minister and that of the Director to monitor the work.

7. Oversee the conduct of all archaeological excavations, palaeo-environmental assessment and post-excavation analysis by Consultant Archaeologists, and ensure that all excavation reports are completed to a standard acceptable to the Minister and the Director and submitted in a timely manner.

8. Assist with the certification and validation of all archaeological costs.

9. Assist with the development of a GIS database of archaeological monuments and find spots of archaeological objects on Bord na Móna's lands, which will be updated as surveys and excavations are completed.

10. Advise Bord na Móna on the long term management of monuments that are set aside and preserved in-situ.

## Appendix II

### Relationship between the Project Archaeologist and the Consultant Archaeologist (Licence Holder) in the Conduct of Archaeological Excavations

1. The Project Archaeologist will, in cooperation with the Consultant Archaeologist, draw up method statements for the archaeological excavations required and will ensure that the licence applications are in order before they are submitted to the Department. The method statements will specify the way in which the excavations are to be conducted, as well as the timescales and personnel involved in the recording of the monuments.

2. Both the Project Archaeologist and the Consultant Archaeologist will have the responsibility to ensure that monuments being excavated are recorded to a standard acceptable to the Minister and in a manner consistent with the rescue nature of the excavations. The Project Archaeologist will provide periodic progress reports on the archaeological programme to the Department.

3. The Project Archaeologist will liaise with the Consultant Archaeologist to ensure the appropriate reports are submitted to the Department and the National Museum of Ireland in accordance with the conditions of the licence. Such reports will be submitted to the Department and the National Museum of Ireland via the Project Archaeologist.



## Appendix III

### Role of the Archaeological Liaison Officer

1. To communicate this Code of Practice and the *Archaeological Protection Procedures* (Appendix IV) to all personnel operating on the bog.

2. To ensure that all notices relating to the *Archaeological Protection Procedures* are posted and maintained at appropriate locations on the bog.

3. To report any stray finds, presented to the Liaison Officer from his/her group of bogs, to the Duty Officer of the National Museum of Ireland.

4. To provide for the appropriate protection of the stray find, whether in-situ or removed from the bog, as directed by the Duty Officer of the National Museum of Ireland.



5. To arrange for the delivery or collection of the stray find, as directed by the Duty Officer of the National Museum of Ireland.

6. To complete the Report of Discovery of Archaeological Object(s) in Bogs (Appendix V), as directed by the Duty Officer of the National Museum of Ireland.

7. To maintain a file of all stray finds and associated documentation and provide copies to the Project Archaeologist.

8. To provide assistance, where required, to the Department during archaeological surveys.

9. To provide assistance, where required, to Bord na Móna's Consultant Archaeologists, during investigation and mitigation of monuments.

10. To report to the Bord na Móna members on the Archaeology Management Liaison Committee any planned developments or new activities on cutaway peatland areas within his/her group of bogs.



## Appendix IV

## Archaeological Protection Procedures

### WHAT TO EXPECT

Thousands of archaeological monuments and objects survive within and under our bogs. The most common type of site which will be encountered is the trackway, or togher, which can be made of planks, roundwoods, brushwood, gravel or flagstones. Brushwood platforms, rows of wooden posts and traces of timber huts may also be discovered. Ancient cooking places (fulachta fiadha) are often found close to bog margins, and can be recognised by the presence of large quantities of burnt stone.

Monuments are also found on the mineral soil underneath the peat, particularly under the blanket peats in western regions. These include stone banks, mounds, megalithic tombs, standing stones, and stone circles and rows.

Many objects have either been lost or deposited in our bogs over the centuries. These include tools, implements and weapons made from wood, stone or metal; ornaments made from bronze or even gold; wooden vessels, which sometimes contain bog butter; wooden deer traps and wheels and items of clothing made from leather or textile. Occasionally human bodies, or parts of bodies, as well as animal remains are found preserved in the peat.

**All objects, sites or monuments, no matter how fragmentary, are important elements of our heritage.**

### WHAT TO DO

- Check whether there are any known archaeological monuments in your area.

- Be vigilant at all times - objects or traces of structures can be found on the field surfaces, in the drain faces, on the bog margins or caught within the mechanics of machinery.

# Code of Practice

- If an object is found leave it in place, if it is safe to do so, note its position and immediately contact your Archaeological Liaison Officer who will assess the situation and contact the Duty Officer of the National Museum of Ireland. Resist the temptation to investigate the find spot as this may disturb fragile archaeological deposits.

- If the object is already dislodged or is in imminent danger, remove it carefully, mark its find spot and report it immediately to your Archaeological Liaison Officer.

- Objects made of wood, leather or textile, which are removed from peat should be kept in conditions similar to those in which they are found. This can be done by packing them in peat or, if waterlogged, placing them in a clean basin of water and sealing the container. Resist the temptation to clean or remove peat from the object.

- If timbers or other materials, such as gravel or stones, which could be part of a man-made structure are noted on the bog, mark the location and report it immediately to your Archaeological Liaison Officer. If you suspect the find is of archaeological importance, resist the temptation to expose it any further as this could result in damage to the structure.



- Report anything that looks unnatural in the bog - your Archaeological Liaison Officer will decide whether it should be referred to the appropriate authorities.

**REMEMBER**

Our archaeological heritage is a finite, non-renewable resource. Once a site is destroyed its information is lost forever and we have lost the chance to understand a little more about our past, where we have come from and perhaps the opportunity to learn for the future.

Your Archaeological Liaison Officer is .....



## Appendix V

The Report of Discovery form is to be accompanied by a detailed map illustrating the bog and the drainage patterns, the find spot is to be clearly marked on the map and a grid reference supplied where possible. The form should be returned to the Duty Officer of the National Museum of Ireland, Kildare Street, Dublin 2.

### Report of Discovery of Archaeological Object(s) in Bog

NMI File No: _____

Bord na Móna Works: _____

Archaeological Liaison Officer's name _____

ALO address: _____

_____

Tel. No(s) _____

Finder(s) name(s): _____

Finder(s) address(es): _____

_____

Tel. No(s): _____

Brief description of object(s) with measurements (add rough sketch if possible)

_____

_____

_____

Name of Bog/Area Number: _____

Bord na Móna reference (drain no. etc.): _____

Townland (if different from bog name): _____

Parish: _____ O.S. 6" co-ordinates: _____

Barony: _____ County: _____

Details on how discovered: _____

Depth beneath present surface: _____

Estimated amount of peat removed above present surface (if any): _____

Total depth of peat in vicinity (if known): _____

Nature of peat in immediate vicinity (e.g. sphagnum etc): _____

Are there any monuments in the vicinity? (e.g. trackways, mound, fort): _____

Are there other finds of archaeological objects known from the vicinity?: _____

_____

# APPENDIX 13-2

***Investigation of the Find Spot of Partial Human Remains in Ballivor Bog, County Meath***

*Licence Number: 03E1221*

# Investigation of the Find Spot of Partial Human Remains in Ballivor Bog, County Meath

**By**
Eoin Corcoran

**Client**
Bord na Móna

# Investigation of the Find Spot of Partial Human Remains in Ballivor Bog, County Meath

**Licence Number: 03E1221**

**Director: Eoin Corcoran for ADS Ltd.**

## INTRODUCTION

Partial human remains of a torso, head and upper arms were recovered at Bord na Móna's Ballivor Works on 21st February 2003. The remains were believed to have originated from a production field that is currently in use for the stockpiling of milled peat for later use. The remains were disturbed and later during the stockpile removal process. This process consists of the transferral of the loose peat into rail carriages by a mechanical excavator. The rail carriages then transport the peat into the works where it is tipped into a storage shed. The peat is then moved along a series of conveyor belts that pass below magnets before being run over a screen called a tramp screen. This screen removes any large waste organic matter. The waste material is known as 'tramp material'. The human remains were found in the collecting point of the 'tramp material'. The remainder of the 'tramp material' was retained and isolated for future examination at the request of Dúchas and the National Museum of Ireland (NMI).

The find spot is located in the townland of Clonycavan approximately 1.5km southeast of the Bord na Móna offices at Ballivor Works (Fig 1). It is approximately 250m west of the edge of the production bog. The Bord na Móna Archaeological Liaison Officer Seamus O'Rourke informed ADS Ltd. that he is confident that they have isolated the area from which the remains originated. An area measuring approximately 300m in length had been marked out with posts to prevent machinery driving on the field. The probable find spot is within an area 100m long within the 300m long cordoned off area. It is thought that the bucket of the mechanical digger

may have disturbed the body from the field below, removing it along with the stockpile material.

Jane Whitaker and Moira O'Rourke of ADS Ltd. and Ann Lynch of Dúchas systematically walked the area during a field visit on the 28th February 2003. They found that although the stockpile had been removed, an amount of loose, waste peat covered the entire area and that numerous machine marks were visible across the field where it appeared that the machine had cut into the original field surface.

On the 12th August 2003 a team of one supervisor, one site assistant and two archaeologists under the direction of Eoin Corcoran (licence number 03E1221) investigated the find spot for further archaeological and human remains.

## ARCHAEOLOGICAL INVESTIGATION OF FIND SPOT

The 100m long area was lightly shovel scraped to remove the majority of the loose peat cover. The area was then swept to remove the remaining loose peat. The marks of the machine bucket were clearly visible on the field surface. No archaeological remains were visible following the shovel scrape and the sweeping. The whole 100m long area was then lightly trowelled with special attention being paid to the machine marks given the likelihood that the body had come from the field beneath the stockpile (Plate 1).

The loose peat that was removed from the field surface has been retained and isolated by Bord na Móna with the original 'tramp material' for future examination.
No archaeological remains were recovered from this area.

## CONCLUSION

No remains were found during this thorough investigation of the probable find spot. It is possible that the body may have come from a slightly different area on the bog or that the body was originally deposited in this fragmentary state. Analysis of the remains will help to determine if the remains were damaged by the action of a machine or were damaged in antiquity. The tramp material and the loose peat from the field surface remain to be examined.

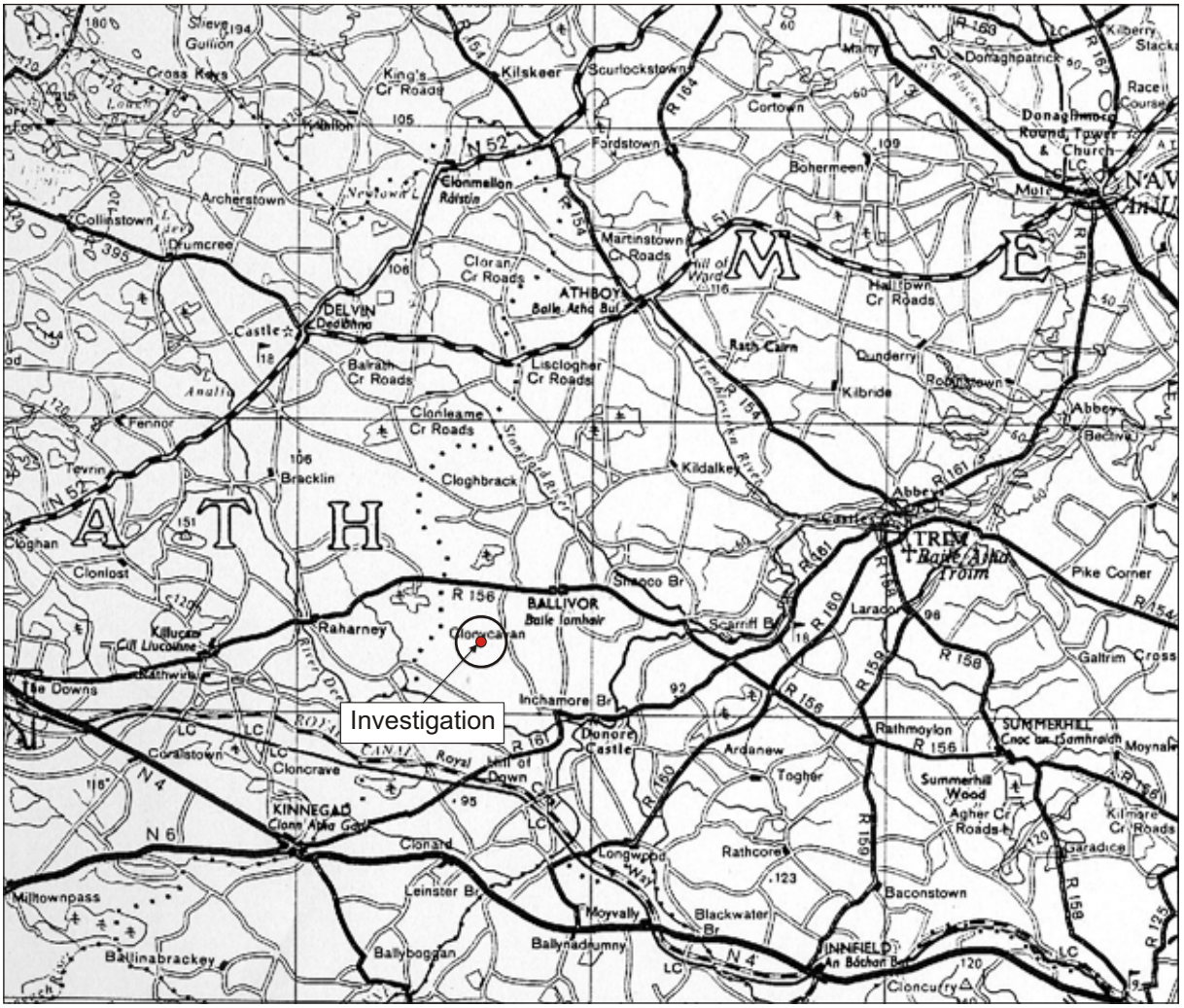


**Fig. 1** General location map.

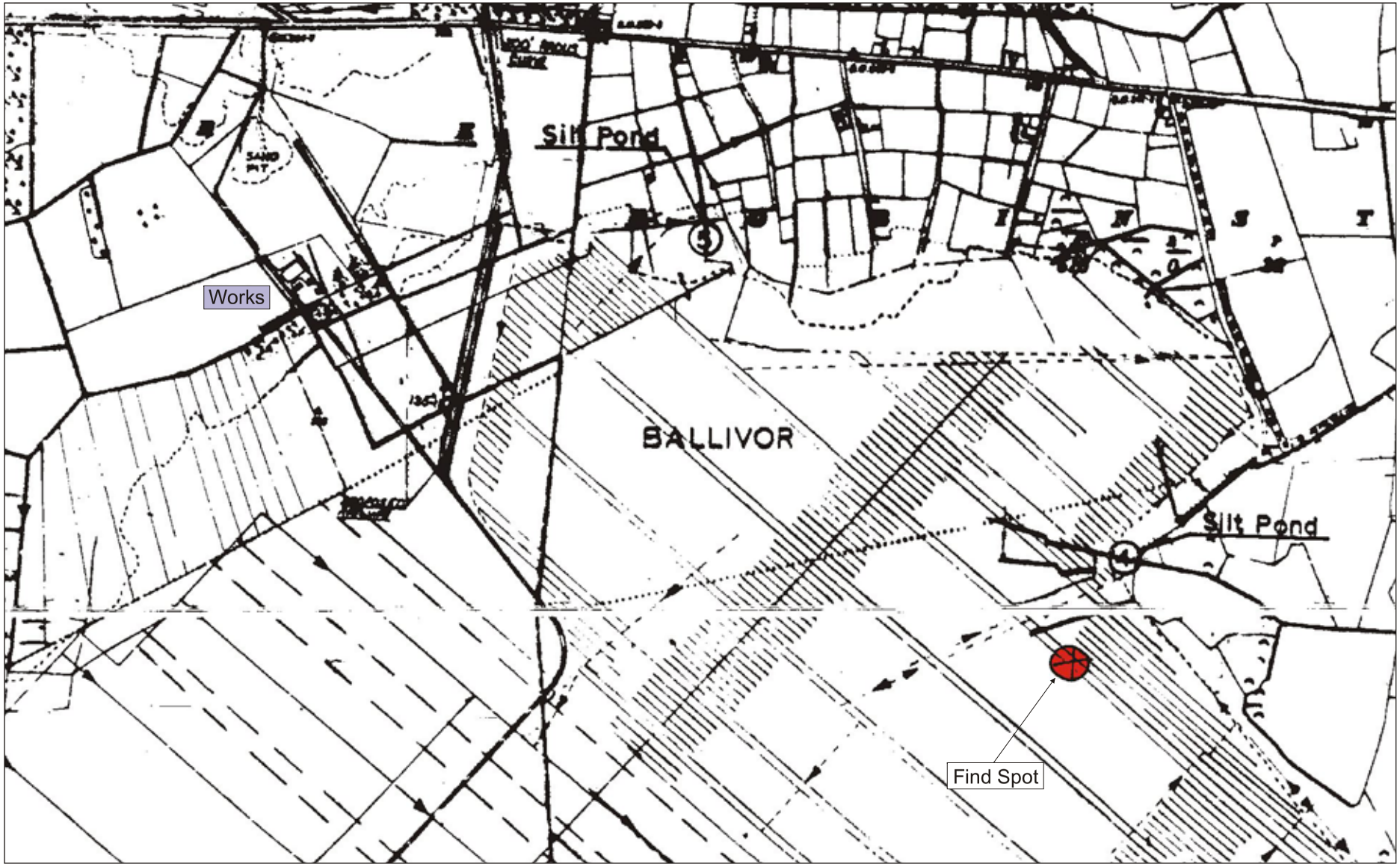


**Fig. 2** Bord Na Mona map of Ballivor Bog with finds spot.



**Plate 1** Investigation of find spot in Ballivor Bog (03E1221).

# APPENDIX 13-3

***Archaeological Peatland Survey 2005***

# Peatland Survey 2005

## Allen, Kilberry & Coolnamóna Bogs

Counties Kildare, Laois, Meath,
Offaly, & Westmeath



**By**

Jane Whitaker MA MIAI

**Client**

DOE, H & LG

**Date of Issue**

March 2006

# Peatland Survey 2005

## Allen, Kilberry & Coolnamóna Bogs

Counties Kildare, Laois, Meath,
Offaly, & Westmeath

**By**

Jane Whitaker MA MIAI

**Client**

DOE, H & LG

**Date of Issue**

March 2006

Archaeological Development Services Ltd
Windsor House, 11 Fairview Strand, Fairview, Dublin 3

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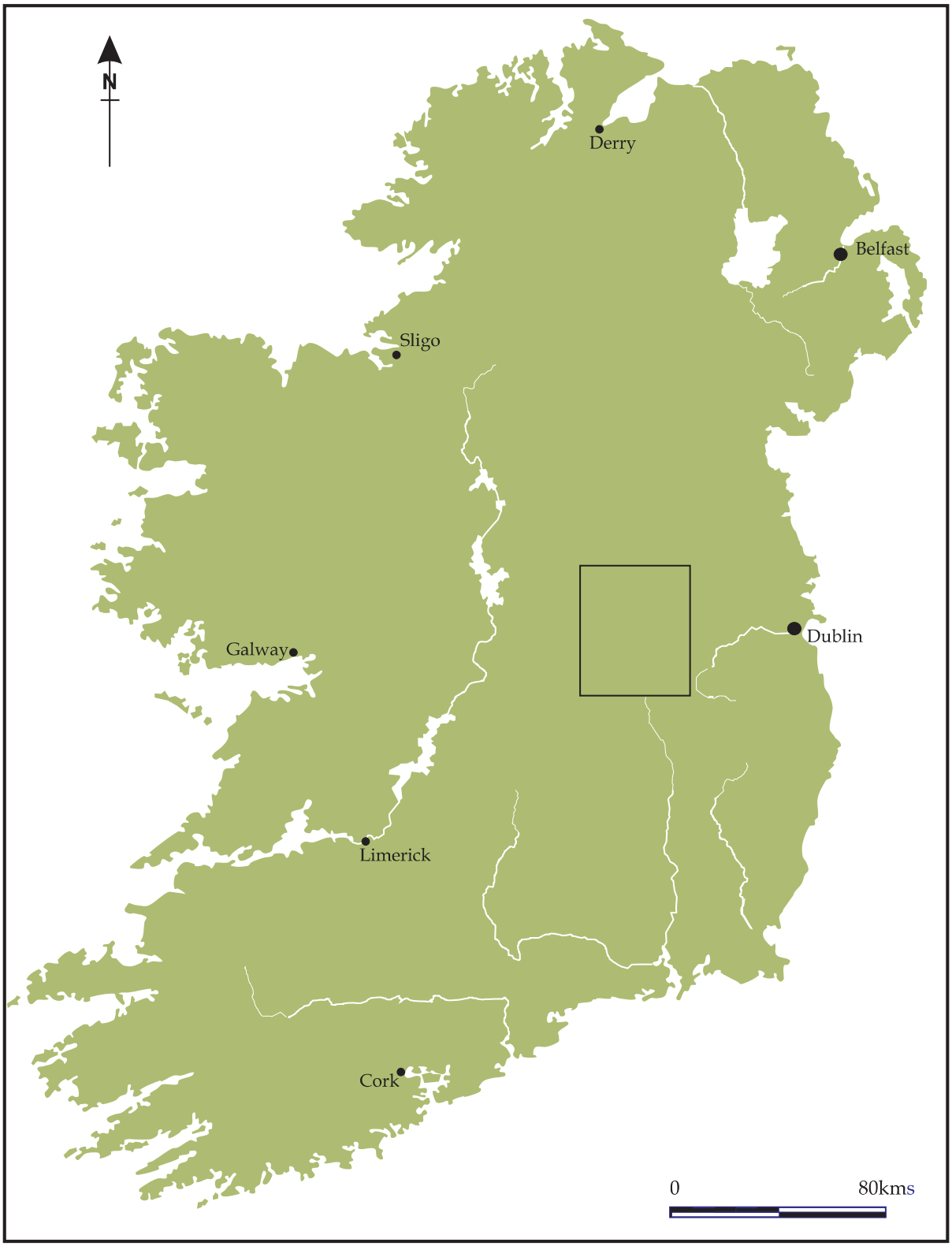


**Fig. 1** Site location map.

# 1. Introduction

ADS Ltd. carried out a fieldwalking survey of the Bord na Móna (BnM) industrial peatlands in part of the Derrygreenagh / Allen Group of bogs in Counties Laois, Meath, Offaly and Westmeath, the Kilberry Group, Co. Kildare and the Coolnamona Group, Co. Laois (Fig. 1 and 2). This work was commissioned by the Department of the Environment, Heritage and Local Government (DOE, H & LG), which is responsible for the Archaeological Survey of Ireland, that is engaged at present in a descriptive survey of the archaeological heritage of the State. A discrete element of this work is the archaeological survey of peatlands with the objective of identifying and evaluating their archaeological potential. The information from this work is used for the updating of the Record of Monuments and Places (RMP) and also informs decisions regarding management of the archaeological resource, in particular, the formulation of strategies to adequately record sites prior to their removal by peat harvesting.

The current focus of the survey is the peatlands under the ownership of BnM, the commercial State body with responsibility for development of the national peat resourse. To date approximately 65% of BnM bogs (which total c.55,000 hectares) have been surveyed, and the Derrygreenagh / Allen Group comprises 21,252 hectares of production bog.

Surveys have been carried out in the Derrygreenagh / Allen Group since 2001, concentrating mainly in the bogs to the west of the group. In 2004 ADS Ltd carried out a survey of the eastern part of this Group and the 2005 work was composed of the remaining bogs in this general area from the Allen, Kilberry and Coolnamona Groups. The total area involved in the 2005 survey was 5,358 hectares, of which 3,416 hectares were in active production at the time of the survey. The remaining 1,942 hectares comprised a mixture of cutaway bog and overgrown bog which was also surveyed. This survey was commissioned in order to record the archaeological potential of the areas concerned.

This report outlines the results of the archaeological fieldwalking survey which recorded the surviving peat depths and topographical characteristics of each of the areas walked. The report contains information on the location and extent of the bogs surveyed as well as information on the historic peat production relevant to those bogs. The archaeological and historical background to the survey area is detailed as well as cartographic and aerial photographic research and information obtained from the Sites and Monuments Records (SMR) of DOE, H & LG and Topographic files of the National Museum of Ireland. The survey results for each of the bogs walked are described by BnM Group and then discussed according to the project specification, on a bog by bog basis, each also having accompanying maps and graphics where relevant.

# 2. Bord na Móna Background

## LOCATION AND EXTENT OF SURVEY

The fifteen bogs selected for archaeological survey in 2005 were located in the remaining parts of the Derrygreenagh / Allen Group near Kinnegad village and south of Tullamore town in the counties of Laois, Meath, Offaly and Westmeath, the Kilberry Group, Co. Kildare north and south of Kildare town and the Coolnamona Group, Co. Laois south of the town of Portlaoise (Fig. 2).

The BnM production bogs were field walked at two drain intervals as requested in the tender documents for the 2005 Peatland Survey. The exception was the cutaway parts of Ballivor, Bracklin and Lisclogher which were walked at roughly 30m intervals as there were no drains to follow owing to the nature of historic peat production in these bogs.

## PRODUCTION AREA

The majority of the bogs, with the exception of the cutaway areas mentioned above, had been in production this season. The production season was still underway as the survey was being carried out. There were areas of considerable overgrowth on some of the bogs surveyed, particularly the cutaway parts of Ballivor and Bracklin. This is due to the fact that these were originally in sod peat or 'bagger' production until the late 1980's early 1990's. These bogs have been out of production for some time, are cutaway in places and are now re-vegetating. For the purpose of this report any relevant production information is contained with the catalogue entries for each bog in Section 5.

## HISTORIC PEAT PRODUCTION

The bogs surveyed in 2005 were all moss peat production bogs. Moss peat is the younger, only slightly decomposed sphagnum peat. Only the bogs where this peat type is well-developed are suitable for the exploitation of moss peat, but when this peat has been harvested the underlying peat can often be developed for milled peat production. Moss peat was first produced commercially about 1850, when it was used as horse stable litter by cavalry and artillery units (Feehan, 1996). It was also frequently used in the eighteenth and nineteenth centuries for improving ground. The three BnM moss peat factories are Ballivor, Coolnamona and Kilberry. It is harvested using the Peco syatem in the same way as milled peat although this was not always the case. The sod peat method was the earliest form of moss peat production. This involved large sods being cut from the bog by machine which were then dried by wind and sun. Walls of the sods were left on the bog over winter to improve the texture. They were turned and dried several times over the spring and following summer and usually collected into ricks between July and September and taken to the factory as required. The sods were then disintegrated, then milled, screened and graded. The best grade is used for gardening while it also has other uses notably in the manufacture of peat pots, for mushroom casing etc. Fibre extracted from the peat also has commercial properties – it can be used for removing odours from gases released during industrial processes or from animal manures and for lagging drainage pipes for example.

Almost a century prior to the establishment of BnM the Irish Peat Company used one of the earliest briquette-making processes, Gwynne's Dry Press, at Kilberry. The briquettes were a success and were as dense as coal, with only 9% water and a charcoal equivalent of 36%. The machinery producing the briquettes was unfortunately never able to operate successfully and the enterprise failed after ten years. Also established at Kilberry by the Irish Peat Company was a peat distillation plant, the first of its kind in the world. The aim was to produce peat gas and tar, along with a range of by-products including calcium acetate, ammonium and sulphate, methyl alchhol, paraffin wax, petroleum and lubricating oil. The peat distillation plant was initially profitable but this changed as the production costs increased over time and the plant too was abandoned in the mid 1800s.

While some of the bogs in the 2005 Peatland Survey were initially in sod peat production the majority have always been in the Peco or milled production. The sod peat bogs for the most part are currently cutaway and have become very overgrown since their production ceased in the last ten years. A brief production history of each of the bogs is described in the catalogue in Section 5 below.

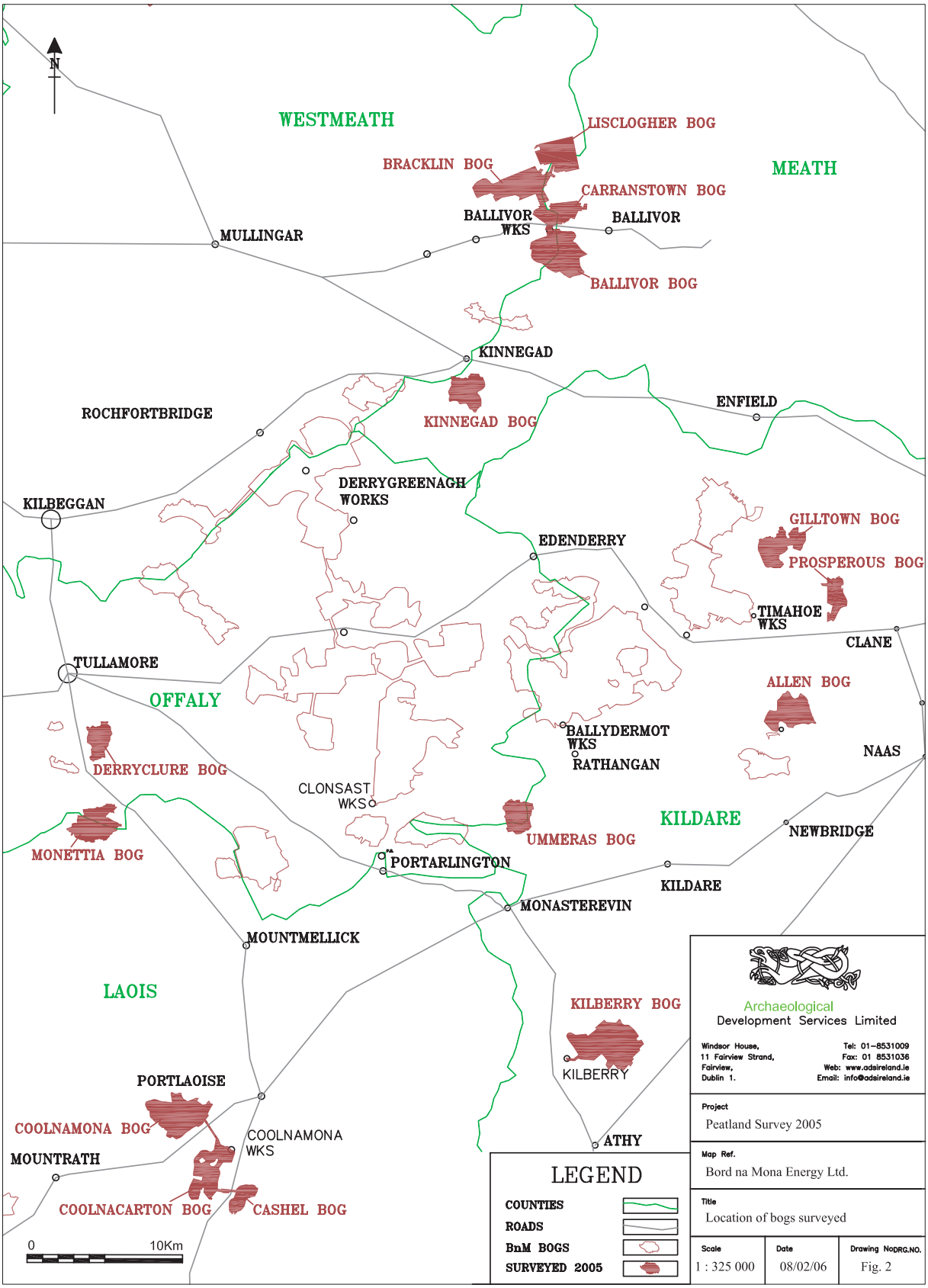


**Fig. 2** 2005 Peatland Survey map.

# 3. Background Research

## CAROTGRAPHIC RESEARCH

**1st edition Ordnance Survey Map, 1838, 6 inch scale**

No archaeological features can be observed in the study area or in the immediate surrounding areas at this time.

**2nd edition Ordnance Survey Map, 1896, 6 inch scale**

There is little or no change indicated on the second edition map. The area remains exactly the same as illustrated on the first edition map. There are more field boundaries and dwellings than on the previous maps.

## AERIAL PHOTOGRAPHIC RESEARCH

BnM provided aerial photographs for consultation. No previously unrecorded sites were noted on these photographs.

## SITES AND MONUMENTS RECORD (SMR)

**Archaeological Survey, DOE, H & LG**

The sites relevant to each of the bogs surveyed are described in the catalogue below, the following is therefore an overview of the archaeological monuments in the landscape of the study areas. There are 2 sites recorded within the BnM production bogs in the SMR record for the survey areas. These are both in the Kilberry Group and are in Allen Bog (KD018-007) and Kilberry Bog (KD030-013). The site in Allen Bog (KD018-007) was a trackway recorded in 1909. No remains of this site were discovered during the survey. The site in Kilberry Bog (KD030-013) in the townland of Cloney is an enclosure site located on the dryland lsland of Derryvullagh.

There are a total of 67 recorded monuments in the areas surrounding the BnM industrial peatlands (Appendix 1).These sites span nearly a range of time periods showing a continuity of settlement tradition in this area.

The sites surrounding the Allen Group of Bogs consist of seven enclosures, fifteen ringforts, a mound, five earthworks, a church site, a cemetery site, a moated site, and four castles.

The dates of most enclosures are uncertain, and indeed there are no dates available for those around the study area. It is thought that they are most likely to be raths or ringforts and therefore are likely to date to the mid to late 1st millennium AD.

The dryland immediately around the bogs in the Allen Group contained the largest number of ringforts of the three areas surveyed with a total of 15 recorded in the dryland surrounding the bogs. Ringforts are the most widely distributed and commonplace mouments on the Irish landscape. The results of research and excavation suggest that the ringfort was largely an Early Christian phenomenon with the majority of them dating to between c.500-c.1200AD. Ecclesiastical remains are represented by a single church site at Killaconnigan, Co. Meath (ME035-010) and a cemetery site at Cartenstown, Co. Westmeath (WM013-064). The function and date of mounds is difficult to ascertain on the basis of available evidence. Some have been destroyed like the one recorded in Derrybeg, Co. Offaly (OF025-001). Some may have been erected to cover burial sites while others may be later landscape features. Earthworks are anomalous features that are usually raised and occurring in a variety of shapes and sizes, the true nature and function of which cannot be determined by their upstanding features or from map evidence alone. Ardnamullan, Co Meath (ME046-005 & ME046-006) are recorded as three circular features on 1st edition map but no visible trace remains. Robinstown, Co. Meath (ME035-012) is a small oval site with associated field banks that could be the result of drainage

Ballynacor, Co. Westmeath (WM013-066) and Craddanstown, Co Westmeath (WM021-001) were both noted on Larkin's antiquities survey map of 1808 but field notes from 1980 state that there is no longer any trace of either site.

The Late Medieval period is represented by the moated site at Tircroghan (ME046-008) and four castles from Martinstown (WM014-017), Ballynacor (WM013-072), Bracklin (WM-14-018), Co. Westmeath and Carranstown Great (ME035-064), Co. Meath.

The dryland sites close to the bogs of the Kilberry Group, Co. Kildare contsisted of four ringforts in the townlands of Curryhills (KD013-011 & KD013-012), Kilmeague (KD018-004) and Grangeclare East (KD018-005). There are eight undated enclosures from the townlands of Coologmartin (KD009-007), Gilltown (KD009-010), Ballynafagh (KD013-006), Coolsickin (KD021-003), Cloney (KD031-013), Skerries North (KD031-021), Rathconnellwood (KD031-004) and Sheean (KD031-019). Ecclesiastical remains are

represented by three church sites all with associated graveyards from Timahoe East (KD009-008), Rathernan (KD018-006) and Oldcourt (KD031-00201). The Later Medieval periods are represented by a tower house site at Kilmeague (KD018-003), a castle site in Timahoe West (KD009-009) and a decoy pond site in Coolsickin (KD021-003).

The dryland sites near the bogs of the Coolnamona Group consisted of five enclosures from the townlands of Clonkeen (LA012-002), Colt (LA018-022), Doon (LA017-015), Oldtown (LA017008), Cashel (LA018-019), a field system (LA017-006) in Oldtown and a possible holy well in Clonkeen (LA017-006).

These sites span the early historic to post medieval periods showing a continuity of settlement tradition in these areas during these times. The Prehistoric period is not represented in the sites and monuments record but there are some stray finds from the bogs that can be attributed a prehistoric date.

## TOPOGRAPHIC FILES

**Irish Antiquities Division, National Museum of Ireland**

The Topographical files for the survey area were searched for references to the townlands within the study area (Appendix 2). No exact find spot is recorded for these stray finds but the NMI finds from bogs database specifies whether they came from the BnM owned bogs or the surrounding bogland. The stray finds are described in the catalogue entries below in relation to the bogs that they were retrieved from. The following is therefore an overview of the finds from the entire study area.

The Prehistoric period is not very well represented in the surviving monuments as noted above. There are, however, several finds from the bogs that are datable to this period showing the presence of human activity in the area at that time.

# 4. Survey Results

## METHODOLOGY

The bogs were all walked at an interval of every second drain. Each site was marked with a four foot bamboo and noted on a field drain map. Once the bog was entirely walked these maps were compiled onto a single base map for the bog and the sites were numbered (Figs. 3-9). The bamboos were numbered and the sites recorded on site record sheets. A digital photograph was taken for each site along with a backup slide photo. Each site was located by GPS and samples were taken where necessary.

## OVERALL RESULTS

A total of 37 sites were recorded during the course of the field survey (Figs. 3-9). Unlike the survey carried out in 2004 where the majority of the sites were occurrences of single worked brushwood or roundwoods the sites recorded in 2005 consisted of more substantial trackways, post rows and platform sites. Only 2 recorded sites, a stray find of a bow in Cashel Bog and a short stretch of trackway in Coolnacartan Bog were discounted as being modern in origin leaving a total of 35. These sites comprised 19 archaeological wood, 2 plank trackways, 8 possible platforms, 3 post rows and 3 toghers. Of these 35 sites 13 are considered to be resolved by the recording process while the remaining 22 may require further investigation. The urgency of further investigation is dependant wholly on the sites' depth below surface, the majority of which are over 0.20m. An overview of the recorded sites is presented in Table 1 below.

A single find was recorded during the course of the survey in Allen Bog (KD-ALN001). This was a wooden bow which was found on the field surface and is thought to date to the 20th century.

Samples from nearly all of the sites (90%) were analysed for species identification and the most prominent species identified was Alder followed by Birch with some occurrences of Willow/Poplar, Hazel Maloideae and a single piece of Ash (see Wood Identification below).

## DATING RESULTS

Of the sixteen samples analysed for radio carbon dating, only a single sample was reported with units 'pMC' (percent modern carbon) rather than BP (LS-CTN002) indicating that the material was living in the last 50 years. Of the remaining fifteen samples the dates are as follows: Neolithic one site: Bronze Age seven sites: the Early Christian five sites and the Medieval two sites.

Apart from a single Early Christian date of AD 430 to 660 from a field surface site in Kinnegad bog (ME-KND004) the remaining six dates from this bog concentrated in the Bronze Age.

Two of the three sites identified in Gilltown Bog were dated. The earliest was KD-GTN005, recorded at eleven sightings varying from 0-1.14m below the field surface and subsequently dated to 1490-1200BC. The second dated site was KD-GTN001 recorded at five locations, mainly on the field surface and was dated to the early Christian period (AD660-890).

Both of the dated sites in Propserous Bog were located on the field surface and were dated to the Medieval Period. Three of the four dates from Cashel Bog were Early Christian while the fourth, a possible platform, was the earliest date from the survey and was 3780-3640BC (LA-CSL004).

## WOOD IDENTIFICATION RESULTS

Wood species identification was carried out by Imogen Poole of ArchaeoScape Ltd (Appendix 3). Seven species of wood were identified from the 44 samples available which represent over 90% of the total recorded sites (Table 2). There was a single occurrence of Ash (Fraxinus excelsior) while Rowan/Hawthorn (Maloideae) was the other lesser represented species. By far the most dominant species was Alder (Alnus) making up 34% of the total sample followed by Willow/Poplar (Populus/Salix) at 15% with Birch (Betula) making up 13%. Hazel (Corylus avellena) and Field Maple (Acer) made up 9% and 7% of the total sample respectively.

## CONCLUSIONS

There were 37 archaeological sites recorded during the 2005 Peatland Survey. These sites differed from those recorded during the 2004 survey in that they were more substantial structures and that the dates returned confirmed that they were archaeological in nature. Twenty two of these sites are considered to require some form of further investigation, while the remainder are considered resolved. As mentioned above the priority of any further investigation depends on the threat to those sites involved based on their depth below the

field surface.

Areas that were completely cutaway, overgrown, and areas of disturbed and redeposited peat were encountered throughout the surveyed area particularly where the sod peat (Bagger) production was originally employed. Based on the results of the 2004 survey it was the author's opinion that any remaining, un-surveyed, bogs in which this method of peat production has been used should have a lower priority than those in milled peat production when deciding on future surveys.

| Sample No. | Conventional Radio Carbon Age | Comment |
|---|---|---|
| ME-KND001B | 3310±70 BP | Cal BC 1750 to 1430 |
| ME-KND004 | 1490±60 BP | Cal AD 430 to 660 |
| ME-KND006 | 3200±60 BP | Cal BC 1610 to 1380 |
| ME-KND010 | 3220±70BP | Cal BC 1650 to 1380 |
| ME-KND011 | 2990±70 BP | Cal BC 1410 to 1000 |
| ME-KND015 | 2880±60 BP | Cal BC 1260 to 900 |
| ME-KND016 | 3120±60 BP | Cal BC 1510 to 1260 |
| KD-GTN001a | 1260±50 BP | Cal AD 660 to 890 |
| KD-GTN005c | 3090±60 BP | Cal BC1490 to 1200 |
| KD-PPS002 | 900±60 BP | Cal AD 1010 to 1260 |
| KD-PPS005 | 550±60 BP | Cal AD 1300 to 1450 |
| LS-CSL004 | 4910±50 BP | Cal BC 3780 to 3640 |
| LS-CSL008c | 1260±50 BP | Cal AD 640 to 780 |
| LS-CSL011 | 1330±50 BP | Cal AD 640 to 780 |
| LS-CSL018 | 1400±70 BP | Cal AD 540 to 770 |
| LS-CTN002 | 137.99±0.8pMC | Material was living in the last 50yrs |

**Table 1** Dating results.

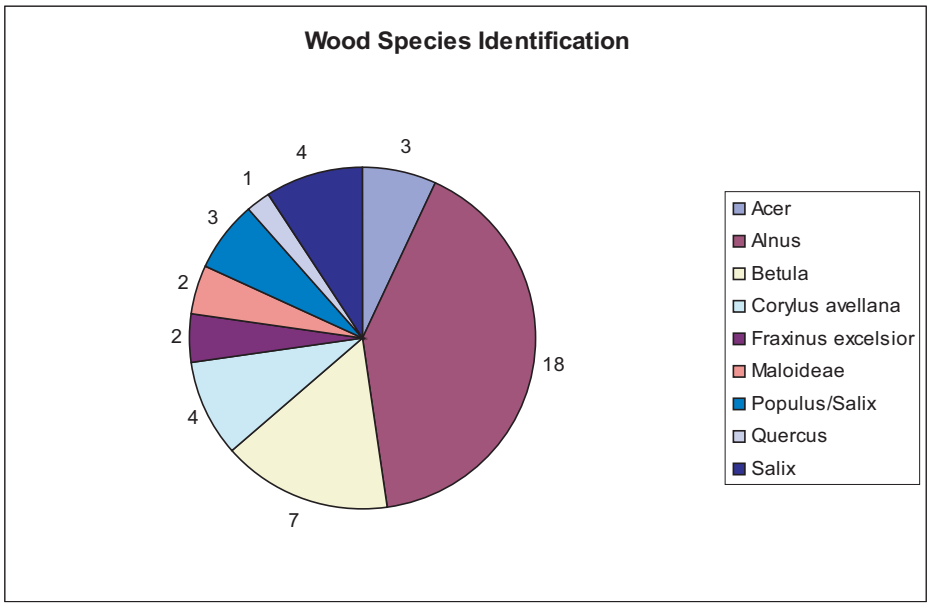


**Table 2** Wood species identification.

| Bog | Site No. | County | Site Type | Depth BS | Easting | North-ing | Wood Ids | Date | Status |
|---|---|---|---|---|---|---|---|---|---|
| Kinnegad | ME-KND001 | Meath | Plank trackway | 0.21-0.76m | 259468 | 242566 | Acer & Alnus | 1750-1430BC | Requires excavation |
| Kinnegad | ME-KND002 | Meath | Plank trackway | 0.12-1m | 260427 | 242563 | Quercus | 1569±9BC | Requires excavation |
| Kinnegad | ME-KND003 | Meath | Togher | 0.20-0.54m | 259454 | 242576 | None | undated | Requires further investigation |
| Kinnegad | ME-KND004 | Meath | Archaeological Wood | 0m | 259439 | 242579 | Quercus | 430-600AD | Resolved |
| Kinnegad | ME-KND005 | Meath | Archaeological Wood | 0.73m | 259463 | 242578 | Populus/Salix | undated | Requires further investigation |
| Kinnegad | ME-KND006 | Meath | Archaeological Wood | 0.69m | 259463 | 242591 | Corylus avellana | 1610-1380BC | Requires further investigation |
| Kinnegad | ME-KND007 | Meath | Possible Platform | 0.56m | 259464 | 242588 | Corylus avellana | undated | Requires further investigation |
| Kinnegad | ME-KND008 | Meath | Possible Platform | 0.44m | 259480 | 242585 | Alnus | undated | Requires further investigation |
| Kinnegad | ME-KND009 | Meath | Archaeological Wood | 0.58m | 259480 | 242579 | None | undated | Requires further investigation |
| Kinnegad | ME-KND010 | Meath | Possible Platform | 0.62m | 259480 | 242578 | Alnus | 1650-1380BC | Requires further investigation |
| Kinnegad | ME-KND011 | Meath | Possible Platform | 0.31m | 259480 | 242584 | Betula | 1410-1000BC | Requires further investigation |
| Kinnegad | ME-KND012 | Meath | Archaeological Wood | 0.08m | 259480 | 242568 | Alnus | undated | Requires further investigation |
| Kinnegad | ME-KND013 | Meath | Archaeological Wood | 0.02m | 259482 | 242570 | Acer | undated | Requires further investigation |
| Kinnegad | ME-KND014 | Meath | Archaeological Wood | 0.23m | 259483 | 242560 | Alnus | undated | Requires further investigation |
| Kinnegad | ME-KND015 | Meath | Possible Platform | 0.35m | 259482 | 242553 | Maloideae | 1260-900BC | Requires further investigation |
| Kinnegad | ME-KND016 | Meath | Possible Platform | 0.65m | 259481 | 242554 | Alnus | 1510-1260BC | Requires further investigation |
| Kinnegad | ME-KND017 | Meath | Archaeological Wood | 0.58m | 259496 | 242576 | Betula | undated | Requires further investigation |
| Kinnegad | ME-KND018 | Meath | Archaeological Wood | 0.40m | 259495 | 242569 | None | undated | Requires further investigation |
| Kinnegad | ME-KND019 | Meath | Possible Platform | 0.93m | 259558 | 242560 | Corylus avellana | undated | Requires further investigation |
| Allen | KD-ALN001 | Kildare | Wooden Bow | 0m | 280651 | 222466 | None | undated | Resolved |
| Allen | KD-ALN002 | Kildare | Archaeological Wood | 0m | 279953 | 221461 | Betula | undated | Resolved |
| Prosperous | KD-PPS001 | Kildare | Archaeological Wood | 0.58m | 283316 | 229258 | Fraxinus | undated | Requires further investigation |
| Prosperous | KD-PPS002 | Kildare | Archaeological Wood | 0m | 283426 | 228842 | Alnus | 1010-1260AD | Resolved |
| Prosperous | KD-PPS003 | Kildare | Archaeological Wood | 0m | 283743 | 229163 | Corylus avellana | undated | Resolved |
| Prosperous | KD-PPS004 | Kildare | Archaeological Wood | 0m | 283743 | 229163 | Alnus | undated | Resolved |
| Prosperous | KD-PPS005 | Kildare | Archaeological Wood | 0m | ? | ? | Alnus | 1300-1450BC | Resolved |
| Gilltown | KD-GTN001 | Kildare | Togher | 0-0.20m | 280345 | 233476 | Alnus & Betula | 660-890AD | Requires excavation |
| Gilltown | KD-GTN005 | Kildare | Togher | 0-1.14m | 279842 | 231848 | Alnus, Betula & Maloideae | undated | Requires further investigation |
| Gilltown | KD-GTN008 | Kildare | Non-archaeological wood | 0m | 279763 | 231757 | Betula | undated | Resolved |
| Coolnacartan | LA-CTN001 | Laois | Archaeological Wood | 0m | 242855 | 192390 | Salix | undated | Resolved |
| Coolnacartan | LA-CTN002 | Laois | Non-archaeological wood | 0m | 244762 | 184468 | Salix | Modern | Resolved |
| Cashel | LA-CSL001 | Laois | Post Row | 0m | 246550 | 192117 | Salix | undated | Resolved |
| Cashel | LA-CSL003 | Laois | Archaeological Wood | 0.70m | 246478 | 191655 | None | undated | Resolved |
| Cashel | LA-CSL004 | Laois | Possible Platform | 0.90m | 246147 | 191524 | Alnus | 3780-3640BC | Requires further investigation |
| Cashel | LA-CSL006 | Laois | Archaeological Wood | 0m | 245972 | 192104 | None | undated | Resolved |
| Cashel | LA-CSL008 | Laois | Post Row | 0m | 246944 | 192440 | Populus/Salix, Alnus x2, Acer & Salix | 640-780AD | Resolved |
| Cashel | LA-CSL009 | Laois | Post Row | 0m | 246838 | 192388 | Alnus | 640-780AD | Resolved |

**Table 3** Summary of results.

# 5 Catalogue of Recorded Sites

INTRODUCTION

This section contains the full catalogue of recorded sites found during the 2005 Peatland Survey. The bogs are described by BnM Group and then discussed according to the project specification, on a bog by bog basis. Each bog has detailed background information and relevant site plots (Figs 3-9). This background information includes the location and extent of the survey, the production area and its history and a summary of the survey results. The site classifications are in keeping with those used most recently by the IAWU except in the case of the modern and suspected modern sites which are recorded as 'Wood Remains'. Each entry contains the townland, catalogue code, bog name, the original site code applied while in the field, national grid references, photographs and any dating information where applicable. In the description each site is described in detail along with the results of wood species analysis.

## ALLEN GROUP, CO. MEATH, COS. LAOIS, MEATH, OFFALY AND WESTMEATH

There are seven bogs in the Allen group that were surveyed during the 2005 Peatland Survey. These bogs were Ballivor, Bracklin, Carranstown, Lisclogher, Kinnegad, Monettia and Derryclure. The latter two bogs were south of Tullamore in Cos Laois and Offaly while the remainder were close to Kinnegad in the Cos. of. Meath and Westmeath. They are described below.

### Ballivor Bog, Co. Meath and Westmeath 05E0796

**Location and Extent of Survey:**

Ballivor Bog is located immediately south of R156 that runs from Raharney to Ballivor, 3km from Ballivor village (Fig. 2). It is surrounded on its eastern, southern and western sides by farmland. There is a small area of forestry in the southwest corner. The main access is from the BnM offices at Ballivor moss peat works in the centre of the northern side of the bog. The bog covers an area of 630 hectares and forms part of the Bord na Móna Allen Group.

**Production Area:**

Just over one third of the bog, to the east, is currently in milled peat production while the remainder is 'cutaway'. Until fairly recently the cutaway part of the bog was in sod peat production. While there are occasional drains this entire area is completely overgrown with heather, sedges and some hazel and birch saplings. The production bog consists of 103 NNW-SSE oriented drains. There is an industrial railway running N-S that turn NE-SW before branching NW-SE around the centre of the bog.

**Archaeological Background:**

There are several sites in the dryland surrounding Ballivor Bog which include three ringforts (ME035-011, ME035-013, WM021-013) in the townlands of Robinstown, Clonygrange and Riverdale, two earthworks (WM021-001, ME035-012) in Craddanstown and Robinstown and a rectilinear enclosure (ME041-002) in the townland of Clonycavan.

There are ten stray finds recorded in the topographical files of the NMI from the general area of Balivor Bog. These finds include the 2003 discovery of a partial bog body from Clonycavan townland. Also from Clonycavan were a brass dish or cauldron (1949:1) and a leather shoe (IA/29/1994). There were two finds from Grange More; a leather shoe (1934) and a stone axehead (W.216;A.537), an ecclesiastical bell of iron dipped in bronze (1928:640), a bronze sword (1963:5) from Clondalee More, a stone axe (1828:17) and a bronze spearhead (1941:349) from Riverdale.

**Survey Results**

No sites were recorded during the fieldwalking survey.

### Bracklin Bog, Cos. Meath and Westmeath 05E0793

**Location and Extent of Survey**

Bracklin Bog is located north of Carranstown Bog between three unclassified roads (Fig. 2). The road from Raharney to Delvin runs along its western extent while two smaller roads that run eastwards from this road define its northern and southern extents. The bog covers an area of 692 hectares and is part of the BnM

Allen Group.

**Production Bog**
Only 25% of this bog is currently in milled peat production. The remainder is overgrown sod peat bog that has become forested in places. The production area is the westernmost part of the bog and measures approximately 200 hectares in size with 89 drains oriented E-W. There is an industrial railway that runs along the eastern side of this bog. All of this part of the bog is in production.

**Archaeological Background:**
There are five sites recorded in the dryland near the northwestern extent of Bracklin bog. These are four ringforts (WM013-103, WM013-104, WM013-105 & WM014-019) from the townlands of Ballynacor and Bracklin, and a castle site (WM013-018) also from Bracklin townland.
Stray finds of bog butter, hair, textile and leather are recorded from Coolronan townland (IA/186/1952) they were found rolled together in a ball at a depth of 7-12ft in a bog.
Bracklin townland spans both Bracklin and Lisclogher bogs, the exact find spot of the four finds attributed to this townland is therefore uncertain. These finds are; a wooden lid (1964:83), a bronze sword blade (1959:31), a Neolithic pottery vessel (1959:09) and a polished stone axehead (1962.243).

**Survey Results:**
No sites were recorded during the fieldwalking survey.

## Caranstown Bog, Cos. Meath and Westmeath 05E0794

**Location and extent of survey**
Caranstown Bog is located immediately north of the R156 that runs from Raharney to Ballivor (Fig. 2). An unclassified road runs northwards along its western extent while the eastern margins are forested. To the north there are some private turbury plots leading to farmland further northwards. The main access is from the level crossing on the R156 where the rail line crosses into Ballivor Bog. The bog is 310 hectares in size and is part of the Bord na Móna Allen Group.

**Production Area**
Caranstown Bog consists of 102 production fields running N-S. The bog was in full production apart from 11 fields along the eastern extent which were partially overgrown. There is a rail line that runs N-S from the level crossing through the centre of the bog.

**Archaeological Background**
There are no archaeological sites in the immediate environs of the bog. There are three sites 1km to the east including an enclosure (ME035-009) and the site of a castle (ME024-008) from the townland of Carranstown Great and a church site (ME024-010) from Killaconnigan townland.
There are no stray finds known from the immediate area of Carranstown bog.

**Survey Results**
No sites were recorded during the fieldwalking survey.

## Lisclogher Bog, Cos. Meath and Westmeath 05E0792

**Location and extent of survey:**
Lisclogher Bog is at the northernmost extent of the Allen Group (Fig. 2). The bog is split into two separate bogs by an unclassified road that runs NE-SW to Ballyhealy crossroads. The eastern part of the bog is currently no longer in production and has a small amount of forestry along the northern and eastern extent of the bog and private turbury along the southern extent. The main access is from the unclassified road that splits the two parts of the bog. The area west of this road has been prepared for production with drainage ditches but no production had taken place at the time of the survey. This part of the bog is surrounded by forestry on its northern and southern extents with farmland at the western extent.

**Production Area:**
The eastern part of the bog is 705 hectares in size and was originally in sod peat production and has not been converted to milled peat production. There are several high face banks with the remainder of the bog at a lower undrained level. Some re-vegetation has taken place since sod production ceased some years ago.
The western part of the bog, as noted above, has been drained for milled peat production, but no production

has taken place to date. The drains are oriented roughly E-W and vary in number across the width of the bog. It is 246 hectares in size and was covered in extensive scrub and overgrowth making visibility poor and field walking very difficult.

**Archaeological Background:**
There are two recorded sites in farmland to the east of the eastern part of Lisclogher bog. These are two ringforts (ME029-025 & ME029-026 in the townland of Woodtown West.
The western extent of Lisclogher Bog has several sites on higher ground to the north overlooking the narrow western extent of the bog. In the townland of Ballynacor, there are five ringforts (WM013-065, WM013-067, WM013-070, WM013-071 & WM013-073) an earthwork (WM013-066) and a castle (WM013-072) while in Cartenstown there is a cemetery site (WM013-064).
A bronze axehead (1954:54) found 10ft deep in the bog and fourteen pieces of wood (IA/104/1982) are recorded from the townland of Lisclogher in the topographical files of the National Museum, it is not certain if these are from the BnM production bog or from private turbury plots.

**Survey Results:**
No sites were recorded during the fieldwalking survey.

## Kinnegad Bog, Co. Meath 05E0795

**Location and extent of survey**
Kinnegad Bog is sometimes referred to by BnM as Rossan Bog and is located 1km south of Kinnegad village in Co. Meath (Figs. 2 and 3). The main access is from the BnM works mid way along the northern extent of the bog. Access was also gained to the southern extent of the bog from a small road that provides access to turbury plots. The production bog covers an area 330 hectares in size and forms part of the Bord na Móna Allen Group of works. There are private turbury plots along the northeastern, southern and southwestern extent of the production bog. The eastern extent has forestry while the western and southern extent is mainly farmland.

**Production Area:**
The bog consists of 110 production fields oriented N-S. An industrial rail line runs across the northern extent of the bog. Most of the bog was in production at the time of the survey apart for five fields immediately south of the works offices which were overgrown to varying degrees and some of which were being excavated to facilitate additional drainage. Midway across the southern extent of the bog is an area of higher ground that is not in production and the production bog to either side of this falls steeply to the south.

**Archaeological Background:**
The closest recorded sites to the production bog, are an enclosure (ME046-011) that is located in farmland to the southeast of the bog in Knockersally townland and an enclosure site in Rossan townland to the north (ME046-004). There are several sites approximately 1km to the east of the bog. These include two enclosure sites in Ardnamullen townland (ME046-005 & ME046-006 and a moated site (ME046-008).
There were no stray finds recorded in the topographical files of the National Museum of Ireland prior to the survey. Immediately after the fieldwalking and site recording was completed BnM workers carrying out drainage works uncovered a partial wooden vessel. They reported the find to ADS Ltd and it was collected by the author and deposited with the National Museum.

**Survey Results:**
Nineteen sites were recorded in the southern extent of the bog (Figs. 3 and 4). These consisted of two plank trackways (ME0KND001 & ME0KND002), one possible trackway and sixteen brushwood and roundwood sites close to one of the plank trackways (ME-KND001). The sites were all located in close proximity in the southern extent of Kinnegad Bog. ME-KND001 and ME-KND003-19 were located west of a wooded area of higher ground that projects into the bog from the surrounding farmland. ME-KND002 was oriented roughly E-W and was located east of the aforementioned wooded area.
It was thought at the time of the survey that ME-KND001 and ME-KND002 were possibly the same site leading up to and away from the wooded higher ground. Unfortunately the sample taken from ME-KND001 for dendrochronological dating didn't have enough rings for analysis so a sample was sent for radiocarbon dating while a dendrochronological date was obtained for ME-KND002. Dating results from these two sites returned dates of 1750 to 1430BC (ME-KND001) and 1569BC±9 (ME-KND002). It is likely from these dates that the sites are one and the same but it is

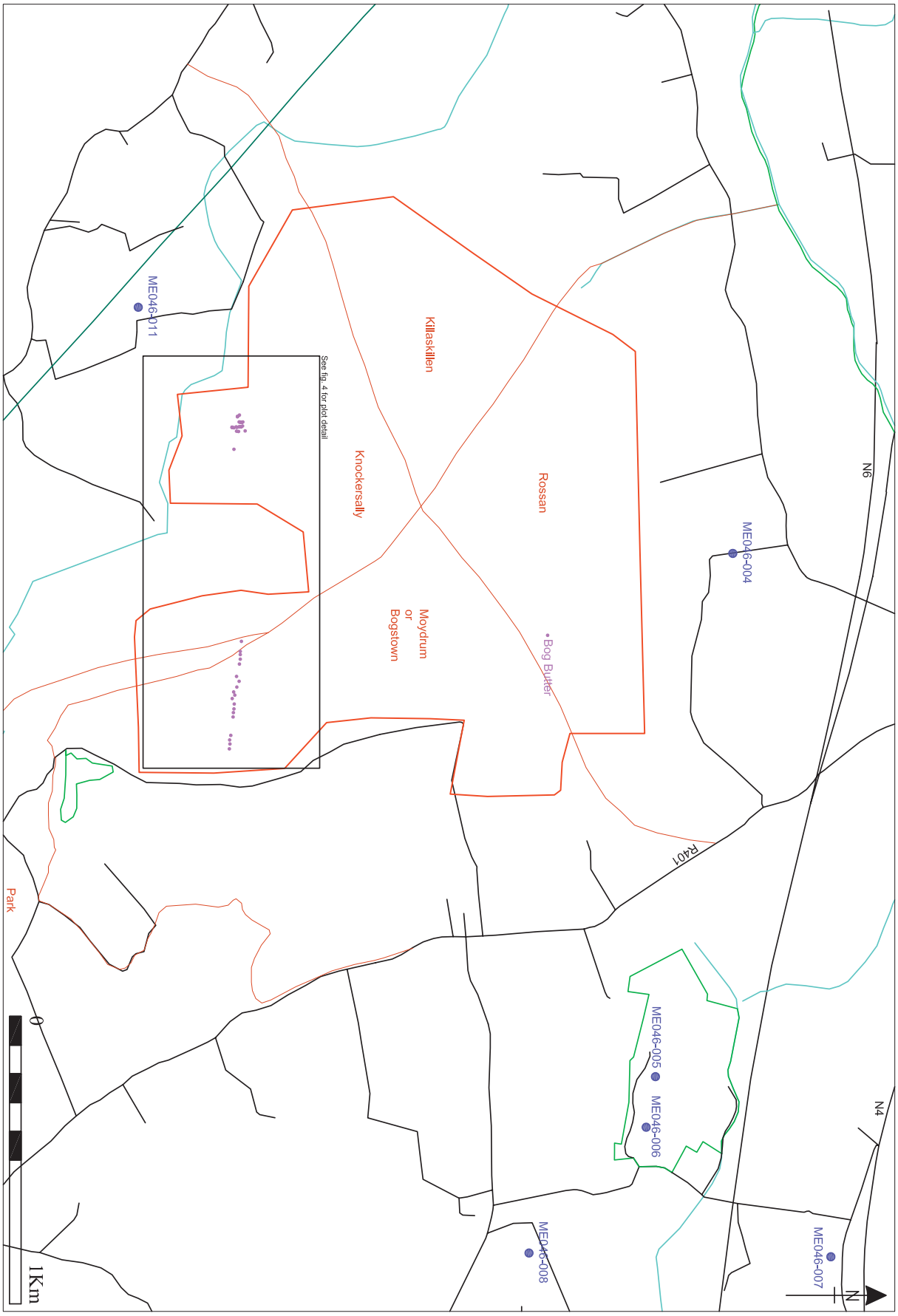


**Fig. 3** Kinnegad Bog. Scale 1:17,000.

recommended that a sample of ME-KND001 be taken during excavation to confirm this.

Eight dates were obtained for the Kinnegad Bog sites, seven of which clustered in the Bronze Age (ME-KND001, 2, 6, 10, 11, 15 & 16) with a single early Christian date from ME-KND004.

All of the sites with the exception of ME-KND004 were drain face exposures and therefore are not under immediate threat from the production process except the re-cutting of drains. ME-KND004 (AD430-660) is considered to be resolved after the survey as it was exposed on the field surface of a higher field and it was possible to trace it further. The sites recorded in Kinnegad bog therefore respresent activity concentrated in the Bronze Age.

**Catalogue of sites:**

Townland: Knockersally
Catalogue Code: ME-KND001a-d
Type: Plank Trackway
Bog: Kinnegad
Site Code: KND001a-d
Date Recorded: 27/07/05
OS Sheet: ME046
NGR: 259443, 242573 – 259494, 242599
Width 0.84-3.75m, Depth 0.30-0.47m, Length 51m
Date: 1750-1430BC

Four sightings of a longitudinal plank trackway were recorded to the west of the area of higher ground described above. This site was surrounded by a cluster of smaller brushwood and roundwood platform sites which were also dated to the Bronze Age. The plank track was composed of a single or double plank upper walking surface supported by transverses and with associated pegs. Owing to the depth of the surrounding drains it was not possible to trace this site further to the west or east.




**Plate 1** ME-KND001a.



**Plate 2** ME-KND001b.

ME-KND001a, 259443, 242573, Width 0.84m, Depth 0.47m

This sighting was exposed in section in the drain face (Plate 1). It was composed of a single longitudinal plank, 0.21m from the field surface, oriented NNE-SSW overlying a plank transverse. The elements were in good condition although dried out where exposed. The upper plank is a squared half split, 0.20m wide and 0.13m thick. The transverse was a radial split and measured 0.32m in width and 0.05-0.10m thick. The overlying peat was poorly humified sphagnum rich with occasional eriophorum inclusions. The underlying peat was better humified and also contains occasional eriophorum inclusions.

ME-KND001b, 259464, 242584, Width 1.86m, Depth 0.34m

This sighting was 15m to the east of ME-KND001a and was also exposed in section in the drain face (Plate 2). Two longitudinal planks, 1.4m apart, were noted in section in the drain face 0.76m from the field surface. There was a deposit of mainly longitudinally oriented



**Plate 3** ME-KND001c.

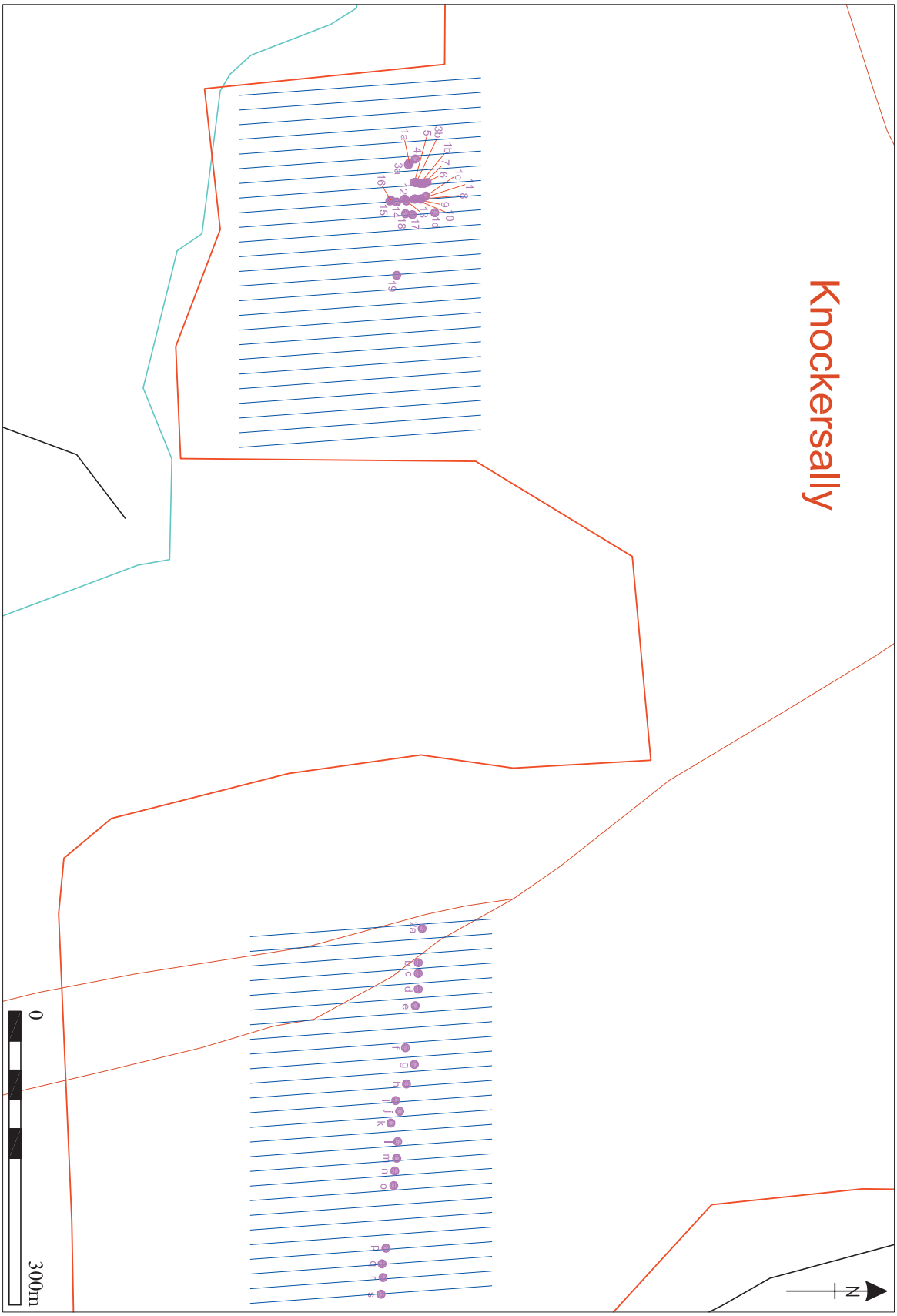


**Fig. 4** Kinnegad Bog plot detail. Scale 1:5,000.



**Plate 4** ME-KND001d.

brushwood running underneath and between the two planks. The planks were both radial splits. The southern one was 0.29m in width and 0.08-0.14m in thickness while the northern plank measured 0.18m in width and 0.05-0.11m in thickness. The peat associated with this site was pasty in texture and had eriophorum and erriceacous inclusions.

ME-KND001c, 259477, 242590, Width 1.98m, Depth 0.36m
This was the most complex of the four sightings (Plate 3). The upper plank had a mortice with an in-situ peg alongside which was a small oak wedge holding it in place. A transverse timber supported the southern half of the plank while a second transverse, a roundwood, overlay the northern half. The northern transverse was in turn supported by a longitudinal roundwood which in turn was supported by a third transverse. At this sighting the site was in moderately decomposed peat with occasional inclusions of eriophorum and erriceacous remains.

ME-KND001d, 259494, 242599, Width 3.75m, Depth 0.30m
This was the final sighting to the east and was composed of a loosely associated set of elements consisiting of a spread of roundwood, brushwood and two planks (Plate 4). The two planks were 0.65m apart further than those in the other sightings and may have been displaced by drain cutting. While some of the roundwood and brushwood is most likely directly associated with the plank track it is possible that the cluster of brushwood to the south was a separate platform site. This can only be clarified by excavation and anything else at this stage is merely speculation.

Townland: Moydrum or Bogstown and Park
Catalogue Code: ME-KND002a-s
Type: Plank Trackway
Bog: Kinnegad
Site Code: KND002a-s
Date Recorded: 27/07/05
OS Sheet: ME046
NGR: 260259, 242582 – 260595, 242545
Width 0.22-3.75m, Depth 0.07-0.67m, Length 250m
Date: 1569BC±9
Nineteen sightings of a Bronze Age plank trackway oriented roughly E-W and running from higher ground to the eastern side of the production bog. The site was exposed in section in the drain faces at varying depths from the field surface ranging from 0.14-1m. The site consists of longitudinal upper planks with transverse supports visible at some sightings.




**Plate 5** ME-KND002a.

ME-KND002a, Width 0.41m, Depth 0.08m
Single longitudinal plank exposed in section in the drain face 0.98m below the field surface (Plate 5). The plank was a thin radial split and measured 0.41m in width and 0.08m in maximum thickness. It was situated in poorly humified sphagnum peat with inclusions of eriophrum and erriceacous remains.

ME-KND002b, Width 0.22m, Depth 0.55m
Single longitudinal plank exposed in section in the drain face 0.33m below the field surface (Plate 6). The plank was a thin radial split 0.55m wide and 0.22m in maximum thickness. It was situated in well humified sphagnum peat with moderate inclusions of eriophorum and ericeacous remains.

ME-KND002c, Width 0.36m, Depth 0.07m
Single longitudinal plank exposed in section in the




**Plate 6** ME-KND002b.

drain face 0.26m below the field surface (Plate 7). The plank was 0.36m in width and 0.07m thick. It was situated in moderately humified sphagnum peat with some eriophorum and occasional ericeacous remains.




**Plate 7** ME-KND002c.

ME-KND002d, Width 3.75m, Depth 0.53m
A single longitudinal plank overlying a transverse plank with mortice at its southern end (Plate 8). The transverse was supported by a plank fragment and a



**Plate 8** ME-KND002d.

brushwood at its southern extent. A peg was noted at the northern part of the exposure. This was running at a 45º angle through a degraded mortice in the upper longitudinal plank. At this sighting the peat was well humified sphagnum rich and contained eriophorum and ericeacous remains.




**Plate 9** ME-KND002e.

ME-KND002e, Width 0.15m, Depth 0.07m
A single, small, longitudinal plank exposed in section in the drain face 0.32m from the bog surface (Plate 9). The plank was 0.15m in width and 0.07m thick. It was situated in well humified sphagnum peat with eriophorum and ericeacous remains.




**Plate 10** ME-KND002f.

ME-KND002f, Width 0.98m, Depth 0.15m
A single longitudinal plank with three associated longitudinal roundwoods along its southern side (Plate 10). The site was 0.48m below the field surface at this sighting. The plank was 0.16m in width and 0.08m thick, while the roundwoods ranged in diameter from 0.08-0.09m. Two of the roundwoods were immediately beside the plank while the third was 0.49m away from

the others. The peat was well humified sphagnum peat with frequent inclusions of eriophorum and ericeacous remains.



**Plate 11** ME-KND002g.

ME-KND002g, Width 2.78m, Depth 0.58m
A longitudinal plank supported by a transverse plank with two associated pegs, 0.29m from the field surface (Plate 11). The elements had all been truncated by the drain cutting. The longitudinal was supported by two roundwoods at its northern extent. The two pegs were visible in the drain face beneath the intersection of the longitudinal and transverse timbers. The peat was well humified sphagnum peat with occasional inclusions of eriophorum and ericeacous remains.




**Plate 12** ME-KND002h.

ME-KND002h, Width 0.32m, Depth 0.67m
A longitudinal roundwood with a light roundwood below it and two associated pegs exposed in section in the drain face 0.18m from the field surface (Plate 12). One of the pegs was in direct contact with the longitudinal roundwood while the other had been truncated by the drain cutting and was 0.29m below the main body of the trackway. They appear to have been either side of the longitudinal holding it in place. The peat was well humified sphagnum peat with frequent inclusions of eriophorum and ericeacous remains.




**Plate 13** ME-KND002i.

ME-KND002i, Width 1.02m, Depth 0.30m
A large longitudinal plank supported by a transverse roundwood with a peg at the northern extent (Plate 13). The site was 0.63m below the field surface at this sighting. The upper plank was 0.29m in width and 0.09m in thickness. The peat was very well humified sphagnum peat with frequent eriophorum and ericeacous remains.




**Plate 14** ME-KND002j.

ME-KND002j, Width 1.53m, Depth 0.35m
A longitudinal plank exposed in section in the drain face 0.99m below the field surface with a peg 1.15m to the north (Plate 14). The plank measured 0.27m in width and 0.09m in thickness, while the peg was 0.06m in diameter. The peat was well humified sphagnum peat with frequent inclusions on eriophorum and ericeacous remains.




**Plate 15** ME-KND002k.

ME-KND002k, Width 0.42m, Depth 0.25m
A longitudinal roundwood with a longitudinal split timber alongside it 0.18m to the south, 0.02m from the field surface (Plate 15). The roundwood measured 0.18m in diameter and the split timber measured 0.10m in width and 0.06m in thickness. The peat was well humified sphagnum peat with occasional eriophorum and ericeacous remains.



**Plate 16** ME-KND002l.

ME-KND002l, Width 3.95m, Depth 0.18m
Single longitudinal roundwood, 0.18m in diameter, exposed in section in the drain face 0.51m below the field surface (Plate 16). The peat was well humified sphagnum peat with frequent eriophorum and ericeacous remains.

ME-KND002m, Width 0.26m, Depth 0.14m
A single longitudinal plank exposed in section in the drain face 0.48m from the field surface (Plate 17). The plank measured 0.26m in width and 0.16m in thickness. The peat was moderately humified sphagnum peat with frequent eriophorum and ericeacous remains.

**Plate 17** ME-KND002m.




ME-KND002n, Width 2m, Depth 0.15m
A single longitudinal plank supported by a large transverse plank exposed in section in the drain face 0.12m from the field surface (Plate 18). The upper plank measured 0.14m in width and was 0.12m thick, while the transverse plank measured 0.30m in width and 0.12m in thickness. The peat was moderately humified sphagnum peat with frequent inclusions of eriophorum and ericeacous remains.



**Plate 18** ME-KND002n.

ME-KND002o, Width 1.92m, Depth 0.19m
Single longitudinal roundwood supported by a transverse plank with a further two roundwoods 1.17m to the north exposed in section in the drain face (Plate 19). This sighting was 0.77m from the field surface. The longitudinal was 0.14m in diameter and the transverse measured 0.57m in width and 0.6m in thickness. The two roundwoods were also longitudinally laid side by side and both measured 0.09m in diameter. The peat was well humified sphagnum peat with frequent inclusions




**Plate 19** ME-KND002o.

if eriophorum and occasional ericeacous remains.

ME-KND002p, Width 0.25m, Depth 0.09m
A single longitudinal plank exposed in section in the drain face 1m below the field surface (Plate 20). The plank measured 0.18m in width and 0.20m in thickness. The peat was well humified sphagnum peat with frequent eriophorum and ericeaous remains.

**Plate 20** ME-KND002p.




ME-KND002q, Width 0.40m, Depth 0.21m
A longitudinal plank overlying two short roundwoods which in turn overlay two longitudinal roundwoods 0.65m below the field surface (Plate 21). The plank measured 0.14m in width and 0.07m in thickness while the roundwoods ranged in diameter from 0.06-0.07m in diameter. The peat was moderately humified sphagnum peat with frequent eriophorum and ericeacous remains.




**Plate 21** ME-KND002q.

ME-KND002r, Width 0.54m, Depth 0.28m
A single, squared longitudinal plank overlying a short squared transverse timber exposed in section in the drain face 0.45m from the field surface (Plate 22). The upper plank measured 0.25m in width and 0.20m in thickness. The peat was sphagnum rich with frequent eriophorum and ericeacous remains.




**Plate 22**
ME-KND002r.

ME-KND002s, Width 0.7m, Depth 0.14m
A single plank longitudinal with an associated roundwood longitudinal alongside exposed in section 0.69m below the field surface (Plate 23). The plank measured 0.22m in width and 0.11m in thickness while the roundwood was 0.06m in diameter. The two elements were 0.25m apart at the drain edge but the roundwood appeared to run towards the plank from the small exposure cleaned. The peat was well humified sphagnum peat with frequent eriophorum and ericeacous remains.




**Plate 23** ME-KND002s.

Townland: Knockersally
Catalogue Code: ME-KND003a-b
Type: Togher
Bog: Kinnegad
Site Code: KND003a-b
Date Recorded: 27/07/05
OS Sheet:
NGR: 259445, 242572 – 259463, 242580
Width 0.54m, Depth 0.40m, Length 15m
Date: Undated
Two sightings of a possible trackway located in two drain faces either side of a production field. The site may represent the remains of a plank trackway oriented NNE-SSW, running parallel to the Bronze Age plank trackway (ME-KND001a-d) which is located 2.8m to the north.




**Plate 24** ME-KND003a.

ME-KND003a, Width 0.54m, Depth 0.40m
A single peg/post with an associated transverse timber exposed in section in the drain face 0.20m from the field surface (Plate 24). The peg measured 0.06m in diameter and 0.40m in length. It was in poor condition from exposure to the elements. The underlying transverse was 0.11m in diameter and its full length is unknown as it was only partially exposed. The peg had a wedge cut end one side of which was damaged the other had two facets both of which were 0.06m in length and 0.07-0.08m in width. The facets were relatively flat in character and had shallow cutting angles.




**Plate 25** ME-KND003b.

ME-KND003b, Width 0.08m, Depth 0.10m
A single longitudinal roundwood exposed in section in the drain face 0.54m from the field surface (Plate 25). The roundwood is oval in shape and measured 0.08-0.10m in diameter.

Townland: Knockersally
Catalogue Code: ME-KND004
Type: Archaeological Wood
Bog: Kinnegad
Site Code: KND004
Date Recorded: 27/07/05
OS Sheet: ME046
NGR: 259439, 242579
Width 0.22m, Depth 0.14m, Length 3.56m
Date: 430-660AD
Three elements oriented NE-SW exposed on the field surface and in poor condition (Plate 26). Two of the elements overlay one another while the third smaller element was placed at their NE end. The larger elements measured 2.33 and 3.06m in length, both were 0.06m in width and 0.08 and 0.05m in thickness. The third element measured 0.57m in length, 0.06m in width and 0.07m in thickness. All of the elements were oak and were located in moderately humified sphagnum peat with frequent inclusions of eriophorum and ericeacous remains. This site may represent the last remains of a longer trackway that survived in this location because

of the higher level of the production field. It was not traced any further during the course of the survey.

**Plate 26**
ME-KND004.




Townland: Knockersally
Catalogue Code: ME-KND005
Type: Archaeological Wood
Bog: Kinnegad
Site Code: KND005
Date Recorded: 27/07/05
OS Sheet:
NGR: 259463, 242578
Width 1.58m, Depth 0.31m
Date: Undated
Three roundwoods exposed in section in the drain face 0.73m below the field surface (Plate 27). These were on average 0.07m in diameter and were oriented E-W. Lying 0.19m below these roundwoods were 13 SW-NE oriented light brushwoods averaging 0.02m in diameter. The peat is moderately decomposed sphagnum peat with frequent eriophorum inclusions. ME-KND003b is 1.8m to the north in the same drain face. A single element was identified for species and was willow/ poplar. The exact function of this site is unclear but it forms part of a complex of sites near the single plank trackway ME-KND001a-d.

Townland: Knockersally
Catalogue Code: ME-KND006
Type: Archaeological Wood
Bog: Kinnegad
Site Code: KND006
Date Recorded: 27/07/05




**Plate 27** ME-KND005.

OS Sheet: ME046
NGR: 259463, 242591
Width 1.58m, Depth 0.31m
Date: 1610-1380BC
A brushwood site exposed in section in the drain face 0.69m from the field surface (Plate 28). The elements at the northern extent of the site were four deep but this thinned out towards the south as the elements became less frequent. The elements ranged in diameter from 15-36mm in diameter. The peat was moderately decomposed sphagnum peat that was pasty in texture with moderate eriophorum inclusions. The function of this site was unclear but as with other sites in the complex of sites surrounding the plank trackway ME-KND001a-d it may have been a small platform. ME-KND001b was 5.3m to the south while ME-KND007 was 1.7m to the north. Two pieces were sampled from this site for dating and identification and they were identified as hazel and alder.




**Plate 28** ME-KND006.

Townland: Knockersally
Catalogue Code: ME-KND007
Type: Possible Platform




**Plate 29** ME-KND007.

Bog: Kinnegad
Site Code: KND007
Date Recorded: 27/07/05
OS Sheet: ME046
NGR: 259464, 242588
Width 0.49m, Depth 0.07m
Date: Undated
Eleven light brushwoods exposed in section in the drain face 0.56m from the field surface (Plate 29). The elements were closely spaced and were also visible in the opposing drain face. The function of this site is unclear but it may represent a short length of a light brushwood trackway or a small platform. A single piece was sampled and was identified as hazel. The peat was moderately humified sphagnum peat with frequent eriophorum inclusions.

Townland: Knockersally
Catalogue Code: ME-KND008
Type: Possible Platform
Bog: Kinnegad
Site Code: KND008
Date Recorded: 27/07/05
OS Sheet: ME046
NGR: 259480, 242585
Width 1.69m, Depth 0.15m
Date: Undated
Transverse and longitudinal arrangement of brushwoods and roundwoods visible in section in the drain face 0.44m below the field surface (Plate 30). The elements were closely spaced and appeared to form part of a small platform. They ranged in size from 0.02-0.06m in diameter. A single element was sampled and identified as alder. The peat was well humified sphagnum peat with frequent eriophorum inclusions.




**Plate 30** ME-KND008.

Townland: Knockersally
Catalogue Code: ME-KND009
Type: Archaeological Wood
Bog: Kinnegad
Site Code: KND009
Date Recorded: 27/07/05
OS Sheet: ME046
NGR: 259480, 242579
Width 0.12m, Depth 0.02m
Date: Undated
A single oak plank exposed in section in the drain face 0.58m below the field surface (Plate 31). It was oriented NE-SW and was in poor condition. It was located 7.2m south of ME-KND008 and 2m north of ME-KND010 in the same drain face. Its function was unclear as no further sightings were traced in either direction. It was located in well humified sphagnum peat with frequent eriophorum and ericeacous remains.




**Plate 31** ME-KND009.

Townland: Knockersally
Catalogue Code: ME-KND010
Type: Possible Platform
Bog: Kinnegad




**Plate 32** ME-KND010.

Site Code: KND010
Date Recorded: 27/07/05
OS Sheet: ME046
NGR: 259480, 242578
Width 1.29m, Depth 0.22m
Date: 1650-1380BC
This site was exposed in section in the drain face 0.62m from the field surface (Plate 32). It was composed of planks, roundwoods and brushwoods most of which were oriented NW-SE. The elements were in fairly poor condition. The site was not traced any further and is thought therefore to be a small platform structure. A single piece was sampled and later identified as alder and dated to 2650-1380BC.

Townland: Knockersally
Catalogue Code: ME-KND011
Type: Possible Platform
Bog: Kinnegad
Site Code: KND011
Date Recorded: 27/07/05
OS Sheet: ME046
NGR: 259480, 242584
Width 1.77m, Depth 0.21m
Date: 1410-1000BC
Tightly packed roundwoods and brushwoods one to two layers deep visible in section (Plate 33) in the drain face 0.31m from the field surface. Most of the elements were quite well preserved apart from the damage caused by drain cutting. The larger elements were mainly at the base of the structure with the lighter elements on top. The site measured 1.77m in width, 0.21m in depth and was not visible in the opposing drain face. A single piece was sampled and was subsequently identified as birch and dated to 1410-1000BC. It was located in moderately decomposed sphagnum peat with frequent inclusions of eriophorum and ericeacous remains.



**Plate 33** ME-KND011.

Townland: Knockersally
Catalogue Code: ME-KND012
Type: Archaeological Wood
Bog: Kinnegad
Site Code: KND012
Date Recorded: 27/07/05
OS Sheet: ME046
NGR: 259480, 242568
Width 0.96m, Depth 0.75m
Date: Undated
A roundwood and associated brushwood and peg exposed in section in the drain face 0.08m below the field surface (Plate 34). The roundwood measured 0.13m in diameter and was oriented E/W. The smaller brushwood elements were located alongside its southern side, were oriented NNE-SSW and were 0.02m in average diameter. The peg was to the south of the




**Plate 34** ME-KND012.

other elements, measured 0.07m in diameter and was 0.7m in length. A single piece was sampled and later identified as alder. The function of this site is unclear but it is one of several small wooden structures near the Bronze Age plank trackway (ME-KND001a-d). The site

was located in well decomposed sphagnum peat with frequent eriophorum and ericeacous remains.



**Plate 35** ME-KND013.

Townland: Knockersally
Catalogue Code: ME-KND013
Type: Archaeological Wood
Bog: Kinnegad
Site Code: KND013
Date Recorded: 27/07/05
OS Sheet: ME046
NGR: 259482, 242570
Width 1.4m, Depth 0.81m, Length 1.2m min
Date: Undated
Brushwood and roundwoods laid side by side and oriented roughly E/W exposed in section in the drain face 0.02m from the field surface (Plate 35). The site was also visible in the opposing drain face and therefore had a minimum length of 1.2m. The elements ranged in diameter from 0.03-0.13m and were a mixture of brushwoods and roundwoods placed closely together to form a packed structure. A single element was sampled from the site and later identified as maple. The function of this site remains unclear but it may represent a short length of trackway or a small platform like the other wooden structures in close proximity to the Bronze Age trackway ME-KND001a-d. ME-KND0012 is located 1m to the north and ME-KND014 is 8.2m to the south. The site was located in moderately decomposed sphagnum peat with frequent inclusions of eriophorum and ericeacous remains.

Townland: Knockersally
Catalogue Code: ME-KND014
Type: Archaeological Wood
Bog: Kinnegad
Site Code: KND014
Date Recorded: 27/07/05
OS Sheet: ME046
NGR: 259483, 242560
Width 2.8m, Depth 0.55m
Date: Undated
Brushwood and roundwoods mostly oriented E-W exposed in section in the drain face 0-0.23m below the field surface (Plate 36). The elements to the south of the structure were smaller brushwoods in a concentrated group with an associated transverse brushwood rod and were hurdle-like in appearance. The remaining elements were larger and more dispersed and also were several elements deep. The site was also expose in the opposing drain face and was therefore a minimum of 1.2m deep. A single piece was sampled and later identified as alder. The function of this site remains unclear but it may represent a short length of trackway or a small platform like the other wooden structures in close proximity to the Bronze Age trackway ME-KND001a-d. ME-KND0013 was 8.2m to the north and ME-KND0015/16 was 1.7m to the east. The site was located in moderately decomposed sphagnum peat with frequent inclusions of eriophorum and ericeacous remains.



**Plate 36** ME-KND014.

Townland: Knockersally
Catalogue Code: ME-KND015
Type: Possible platform
Bog: Kinnegad
Site Code: KND015
Date Recorded: 27/07/05
OS Sheet: ME046
NGR: 259482, 242553
Width 1.08m, Depth 0.15m
Date: 1260-900BC

This possible platform was exposed in section in the drain face 0.35m from the field surface (Plate 37). It was composed mainly of closely placed roundwood elements oriented E-W one to two elements deep. The site measured 1.08m in width and 0.15m in depth. The elements ragned in size from 0.02-0.09m in diameter. It was located 0.15m above ME-KND016 and 2m south of ME-KND014. A single element was sampled and later identified as maloideae (from the apple subfamily) and dated to 1260-900BC. The peat was moderately decomposed with frequent inclusions of eriophorum.




**Plate 37** ME-KND015 & 16.

Townland: Knockersally
Catalogue Code: ME-KND016
Type: Possible platform
Bog: Kinnegad
Site Code: KND016
Date Recorded: 27/07/05
OS Sheet: ME046
NGR: 259481, 242554
Width 1.10m, Depth 0.17m
Date: 1510-1260BC
A possible platform structure exposed in section in the drain face 0.65m from the field surface (Plate 37). It was composed of brushwood and roundwood elements oriented ENE/WSW. The elements were densely packed with the larger roundwoods towards the bottom of the structure with the lighter elements placed above them. The elements ranged in size from 0.02-0.06m in diameter. The site is located 0.15m below ME-KND015 and 2m south of ME-KND014. A single piece was sampled and later identified as alder and dated to 1510-1260BC. The peat was moderately decomposed with occasional inclusions of eriophorum.



**Plate 38** ME-KND017.

Townland: Knockersally
Catalogue Code: ME-KND017
Type: Archaeological Wood
Bog: Kinnegad
Site Code: KND017
Date Recorded: 27/07/05
OS Sheet: ME046
NGR: 259496, 242576
Width 1.88m, Depth 0.45m
Date: Undated
Brushwoods and roundwoods oriented E-W exposed in section in the drain face 0.58m below the field surface (Plate 38). The structure measured 1.88m in width and 0.45m in depth. The wood was in poor condition and there were two distinct areas of denser wood with one placed slightly higher than the other. The elements ranged in diameter from 0.03-0.05m and were 80% brushwood and 20% roundwood. The function of this site remains uncertain but it is possibly a small platform or a short length of trackway. Site number ME-KND018 was located 6.86m to the south and ME-KND001d was 19.8m to the north in the same drain face. A single element was sampled and later identified as birch. The peat was well decomposed, sphagnum rich with frequent inclusions of eriophorum and ericeacous remains.

Townland: Knockersally
Catalogue Code: ME-KND018
Type: Archaeological Wood
Bog: Kinnegad
Site Code: KND018
Date Recorded: 27/07/05
OS Sheet: ME046
NGR: 259495, 242569
Width 0.17m, Depth 0.13m




**Plate 39** ME-KND018.

Date: Undated
A single roundwood exposed in section in the drain face 0.40m from the field surface (Plate 39). The element was oriented E-W and measured 0.17m in diameter. It was located in moderately decomposed sphagnum peat with frequent inclusions of eriophorum and ericeacous remains.




**Plate 40** ME-KND019.

Townland: Knockersally
Catalogue Code: ME-KND019
Type: Possible platform
Bog: Kinnegad
Site Code: KND019
Date Recorded: 27/07/05
OS Sheet: ME046
NGR: 259558, 242560
Width 1.18m, Depth 0.10m
Date: Undated
Several brushwoods oriented N-S exposed in the drain face 0.93m from the field surface (Plate 40). The brushwoods are supported by a small patch of twigs and all are in good condition. The elements exposed measured on average 0.40m in length, 0.03m in diameter and were closely placed. A single element was sampled and was later identified as hazel. The peat in which the site was located was well decomposed sphagnum peat with eriophorum inclusions.

## Monettia Bog, Cos. Laois and Offaly 05E0797

**Location and extent of survey**
Monettia Bog is located 1.4km southwest of Killeigh village in Co. Offaly (Fig. 2). The main access is from the BnM works at the northwestern extent of the bog. The production bog covers an area 728 hectares in size and forms part of the Bord na Móna Allen Group of works. There are private turbury plots along the eastern, southern and southwestern extent of the production bog. The northern extent is mainly farmland.

**Production Area:**
The bog consists of 139 production fields oriented roughly N-S. An industrial rail line runs E-W across the central part of the bog. The entire bog was in production at the time of the survey apart for five fields at the northeastern extent which were overgrown to varying degrees and some of which were being excavated apparently to facilitate additional drainage.

**Archaeological Background:**
A ringfort recorded in the townland of Derrygunnigan (OF-025022) is the site in closest proximity to the production bog. 1km to the east of the Derrygunnigan enclosure site is another enclosure site in the townland of Ballynasragh (OF025-023) while 1.5km to the north there is a further enclosure site in the townland of Ballinvally (OF-025-016) and the archaeological complex of Killeigh (OF-025-017).

There are four finds recorded in the topographical files of the National Museum these are a leather shoe and a bog road from Derrygunnigan townland (IA/61/1954, IA/61/1954 & IA/87/1957) and two bronze spearheads from farmland in Killeenmore (1938:8558-8559). Although there are two references for a bog road they are in fact the same site reported to the NMI on two separate occasions in 1954 and 1957. It was described as being visible only at certain times of year (IA/61/1954) and as 'single oak planks laid end to end, from an island in the bog' (IA/87/1957). This site most likely refers to a site excavated by Ellen OCarroll

on behalf of BnM in 2000 which was an early Christian single plank trackway (O'Carroll, 2000). At that time the site was traced on the field surface across two production fields. No traces of the site remained when the area was investigated in 2005. A second site was reported to ADS Ltd and also excavated in 2000 by the author (Whitaker, 2000). This transversely laid plank, roundwood and gravel site was also no longer extant by the time of the 2005 survey.

**Survey Results:**
A single roundwood was recovered from a drain face in the southwestern part of the bog during the survey but was later discounted as being modern in origin. No further archaeological sites were recorded.

### Derryclure Bog, Co. Offaly 05E0798

**Location and extent of survey**
Derryclure Bog is located 13.5km south of Tullamore town in Co. Offaly (Fig. 2). The main access is into the western extent of the bog from a small lane off the N80 Tullamore to Mountmellick road. The production bog covers an area 200 hectares in size and forms part of the Bord na Móna Allen Group of works.

**Production Area:**
The bog consists of a maximum of 95 production fields in the northern part of the bog oriented roughly N-S. The southern part of the bog has a maximum of 50 production fields. The central part of the bog has several forested areas which were not in production while the remainder of the bog was in production at the time of the survey.

**Archaeological Background:**
The closest site to the production bog is an enclosure site in the townland of Killeenmore (OF025-002) located in farmland to the east of the bog while to the west there is another enclosure site in the townland of Graigue (OF025-008).
There are no stray finds recorded in the topographical files in the National Museum from Derryclure Bog.

Survey Results:
No sites were recorded during the fieldwalking survey.

## KILBERRY GROUP, CO. KILDARE

The five bogs of the Kilberry Group were fieldwalked during the 2005 Peatland Survey. These bogs are Kilberry, Ummeras, Allen, Prosperous and Giltown. They are described below.

### Kilberry Bog 05E0825

**Location and Extent of Survey:**
Kilberry Bog is located 6km north of Athy, west of the R417 (Fig. 2). This large bog is bordered by farmland to east and by forestry to the southwest and northwest. There are areas of private bog on the north, northwestern, northeastern and southern sides of the bog. The western edge of the bog is bordered by the railway line from Athy to Kildare. There is a densely wooded island, Derryvullagh Island, in the central area with a smaller wooded island to the northwest of this. The bog is accessed via the peat works, which are reached via a short road leading from the R417 at Kilberry Village.
The bog covers an area of 978 hectares and forms part of the Bord na Móna Coolnamona Group of works.

**Production Area:**
The bog consists of around 163 fields running SW-NE, with an industrial railway running parallel to the fields from the works to the centre of the bog just northeast of the islands, where it turns to the southwest. The areas in production were located on the southern edge of the bog and on the western side, just north of the islands, the drain faces and field surfaces here being in good condition. There was an area in the southeast corner that was being prepared for production. The drains here had been freshly cut by a mechanical excavator but the field surfaces were heavily encrusted with excavated peat. The rest of the bog consisted either of areas which were out of production and heavily overgrown or worked out areas, with shallow, gravel-bottomed, heavily silted drains and a great deal of natural wood, mostly pine, oak and birch.
The bog has had a long production history, the 1909 Ordnance Survey map showing a peat works in the same location as the current works, with a tramway leading out onto the bog. This works was concerned with the distillation of peat.
There was formerly a farm on Derryvullagh Island and a track is marked on the 1909 map, running south of

the island to the edge of the bog. No traces of this track remain but a Bord na Móna worker recalled that when he began working at Kilberry, some 30 years ago, older workers referred to 'a line of stones' that had existed south of the island.

**Archaeological Background:**
There are four recorded momument sites around the margins of Kilberry Bog with a fifth site, an enclosure (KD031-013) located at Derryvullagh bog island at the centre of the bog. The four sites around the bog margins are: an enclosure and annexe site (KD031-004) from Rathconnellwood to the northeast of the bog, an enclosure site (KD031-021) from Skerries North at the southeast of the bog: a church and graveyard site (KD031-020) from Oldcourt at the south of the bog; and a rectangular enclosure site (KD021-019) from Sheean townland.

There are no finds recorded in the topographical files of the NMI for Kilberry Bog.

**Survey Results:**
No archaeological features were recorded during the survey of this bog.

## Ummeras Bog 05E0827

**Location and Extent of Survey:**
Ummeras Bog is located 3km north of Monasterevin, east of an unclassified road running from Monasterevin to the R419, just east of Bracknagh Village (Fig. 2). It is surrounded by farmland, with some forestry to the south and east and private plots to the south and west. Beyond this, the Slate River runs to the north of the bog, the Black River is to the west and the Grand Canal is to the east. Access to the bog is via the peat works, to the west of the unclassified road. The bog covers an area of 305 hectares and forms part of the Bord na Móna Coolnamona Group of works.

**Production Area:**
The bog consists of 73 fields running N-S, with an industrial railway running along the southern edge of the bog. The bog is in full production and the fields and drains were in good condition, with a large amount of natural wood apparent in the drain faces. Bord na Móna started levelling the bog and cutting drains in 1973, with production of sod moss peat starting in 1980. In 1989 production switched to milled moss peat production.

**Archaeological Background:**
There are three recorded sites in reclaimed farmland immediately south of the production bog. These are a decoy pond site (KD021-002) and an enclosure site (KD021-003) in Coolsickin/Quinnsborough townland and a potential site (KD021-011) identified from aerial photography from Derrylea townland.
There are no stray finds recorded in the topographical files of the NMI from Ummeras Bog.

**Survey Results:**
There were no archaeological sites recorded during the survey.

## Allen Bog 05E0819

**Location and Extent of Survey:**
Allen Bog is located 1km east of the village of Kilmeage, north of an unclassified road connecting the R415, south of Kilmeage, with the R445, west of Naas (Fig. 2 and 5). It is almost entirely surrounded by undeveloped bog and very extensive private turf plots, beyond which is farmland, mostly pasture. The bog is entered via the peat works and accessed by a track leading from the unclassified road. The bog covers an area of 406 hectares and forms part of the Bord na Móna Coolnamona Group of works.

**Production Area:**
The bog consists of 129 fields running E-W, which are divided into eastern and western areas by a N-S industrial railway. The bulk of the eastern part of the bog was out of production and covered in scrub. The western area was in production but at the time of the survey was waterlogged in parts, with field surfaces covered in unharvested peat nuggets. Allen Bog has been in production for some 30 years.

**Archaeological Background:**
There is a single site within the bog in the townland of Rathernan at the SW extent. The togher site (KD018-007) was recorded in 1909 but is no longer extant. There is a potential site identified from aerial photography recorded in Oldtowndonore townland (KD018-031) in farmland along the eastern extent of the bog. Farmland to the west of the bog contains a church and graveyard (KD018-006) in Rathernan townland and the site of a tower house (KD018-003) and a ringfort (KD018-004) in Kilmeague townland.

There are three stray finds recorded in the

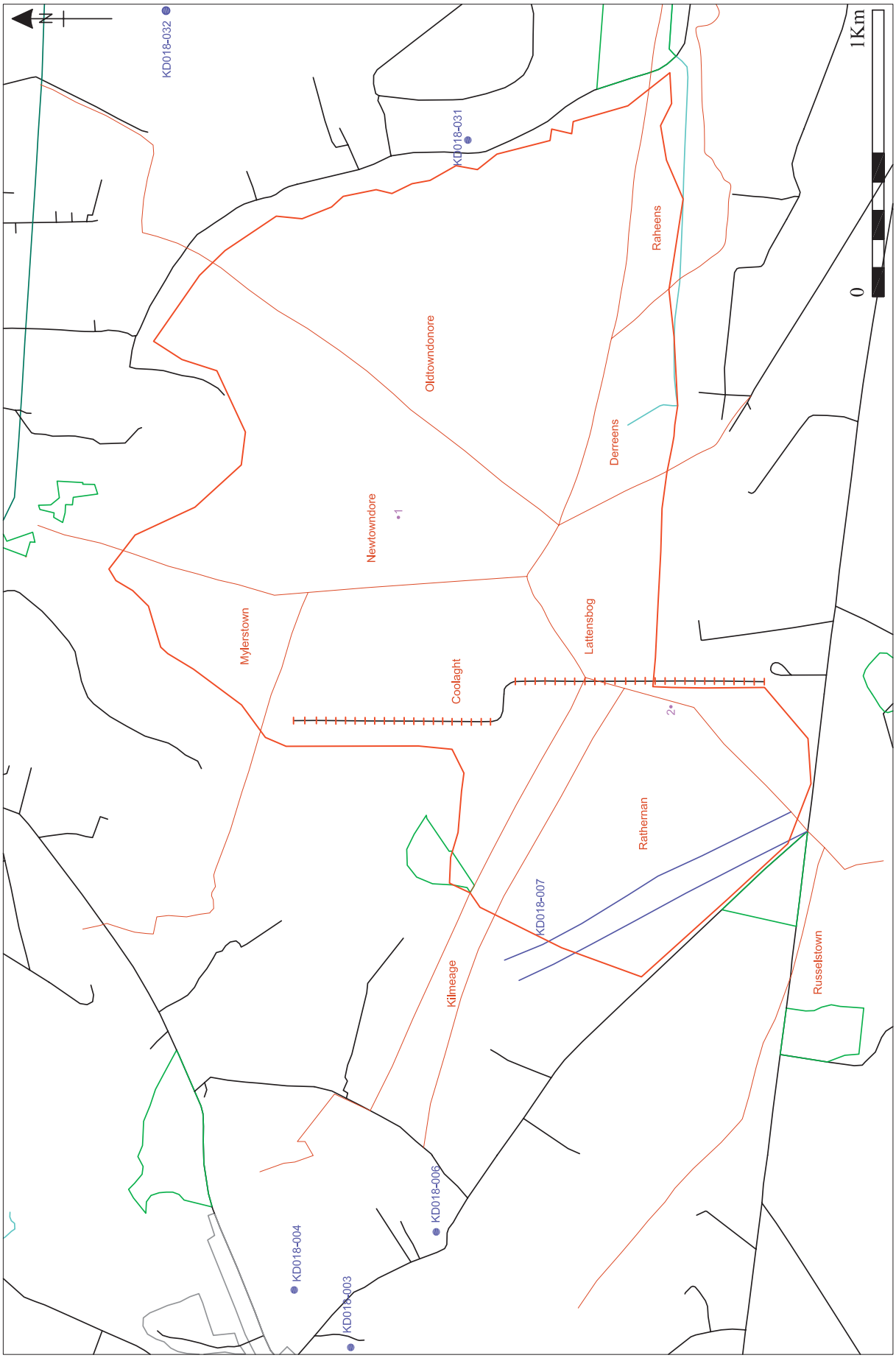


**Fig. 5** Allen Bog. Scale 1:17,000.

topographical files of the NMI for townlands included in the study area. It is uncertain whether these are from the bog or surrounding dryland. These are a flint fragment (1939:508) from Mylerstown townland, a stone axehead (1976:21) from Oldtowndonore and a bronze axehead (1891:12) from Raheens townland.

**Survey Results:**
Two sightings were identified in Allen Bog (Fig. 5), a find spot of a possibly modern wooden bow (KD-ALN001) and a single worked piece of wood (KD-ALN002). Both were found on the field surface.



**Plate 41** KD-ALN001.

**Catalogue of sites:**
Townland: Newtowndonore
Catalogue Code: KD-ALN001
Type: Wooden Bow (possibly modern)
Bog: Allen
Site Code: ALN001
Date Recorded: 05/08/05
OS Sheet: KD018
NGR: 280651, 222466
Diameter 3.2cm max, Surviving Length 1.3m
Date: Modern
A wooden bow found on the field surface in three pieces (Plate 41). The object appears to have tapered along its length from 3.2cm to 2cm in diameter. The largest surviving piece is 0.9m in length and contained a groove carved along it which measured 15mm in width. This piece also had a fresh central break. A second piece measured 0.3m in length while the third and smalled measured 0.45m in length. This piece had a small hole measuring 4mm in diameter 8mm from its end with a groove possibly indicating where a binding had been attached 15mm from the end. The wood is very hard, was not waterlogged and had been machine damaged and its original length is uncertain from the three remaining pieces. It is thought to be relatively modern in origin.

Townland: Rahernan
Catalogue Code: KD-ALN002
Type: Archaeological Wood
Bog: Allen
Site Code: ALN002
Date Recorded: 05/08/05
OS Sheet: KD018
NGR: 279953, 221461
Diameter 0.08m max, Length 0.48m
Date: Undated
A single chisel point roundwood post located on the field surface oriented NW-SE and inserted into the peat at an angle of 40º (Plate 42). The element measured 0.08m in diameter and 0.48m in length and had seven facets on the worked end. The piece had been milled and there was a fresh break along its length. This piece was 100% sampled and was later identified as birch.




**Plate 42** KD-ALN002.

## Prosperous Bog 05E0820

**Location and Extent of Survey:**
This small bog is located just north of Prosperous Village (Plate 2). It is surrounded by farmland with some private bog on the western side and is accessed via an unclassified road running from north from Prosperous. The bog covers an area of 229 hectares and forms part of the Bord na Móna Coolnamona group of works.

**Production Area:**
The bog consists of 59 fields running N-S. The bog is in full production and both drain faces and field surfaces

were in excellent condition. Bord na Móna began preparing the bog in 1978, levelling and cutting drains, although moss peat production began only recently in 2003.

**Archaeological Background:**
There are no recorded sites in the immediate vicinity of Prosperous bog. The sites closest to the bog in surrounding farmland are a ringfort (KD013-011) in Curryhills townland and an enclosure site (KD013-006)in Ballynafagh townland.
Stray finds consist of a single find of a polished stone axehead (1987:152), recovered from a ploughed field recorded in the topographical files of the NMI in the townland of Ballynafagh.

**Survey Results:**
Five sites were recorded in Prosperous Bog (Fig. 6). These were all classified as sightings of Archaeological Wood. The sites varied from asingle roundwood exposed on the field surface to several elements exposed in section in the drain face. Two of the sites were dated (KD-PPS002 and KD-PPS005) and returned dates of 1010 to 1260AD and 1300 to 1450BC respectively.
There are no stray finds recorded from the bog in the topographical files of the NMI.




**Plate 43** KD-PPS001.

**Catalogue:**
Townland: Ballynafagh
Catalogue Code: KD-PPS001
Type: Archaeological Wood
Bog: Prosperous
Site Code: PPS001
Date Recorded: 10/08/05
OS Sheet: KD013
NGR: 283316, 229258
Width 0.55m, Depth 0.20m, Length unknown
Date: Undated
Three brushwood elements recorded in section in the drain face (Fig. 43). All were 0.05m in diameter and were in a good state of preservation. Two elements were located close together with the third 0.2m below. The upper part of the site was located 0.58m from the field surface and the relationship of the elements remains unclear. A single piece was sampled and was later identified as




**Plate 44** KD-PPS002.

Townland: Colt
Catalogue Code: KD-PPS002
Type: Archaeological Wood
Bog: Prosperous
Site Code: PPS002
Date Recorded: 10/08/05
OS Sheet: KD013
NGR: 283426, 228842
Width 0.64m, Depth 0.10m, Length 0.43m
Date: 1010 to 1260AD
A roundwood and brushwood located on the field surface adjacent to the drain edge (Plate 44). The roundwood, measuring 0.06m in diameter and 0.58m in length was oriented NW-SE, while the brushwood, measuring 15mm in diameter and 0.15m in length was oriented N-S. The brushwood ran under the roundwood at an angle of 45º. A single piece was sampled for dating which was later identified as alder and dated to 1010 to 1260AD

Townland: Colt
Catalogue Code: KD-PPS003
Type: Archaeological Wood
Bog: Prosperous
Site Code: PPS003

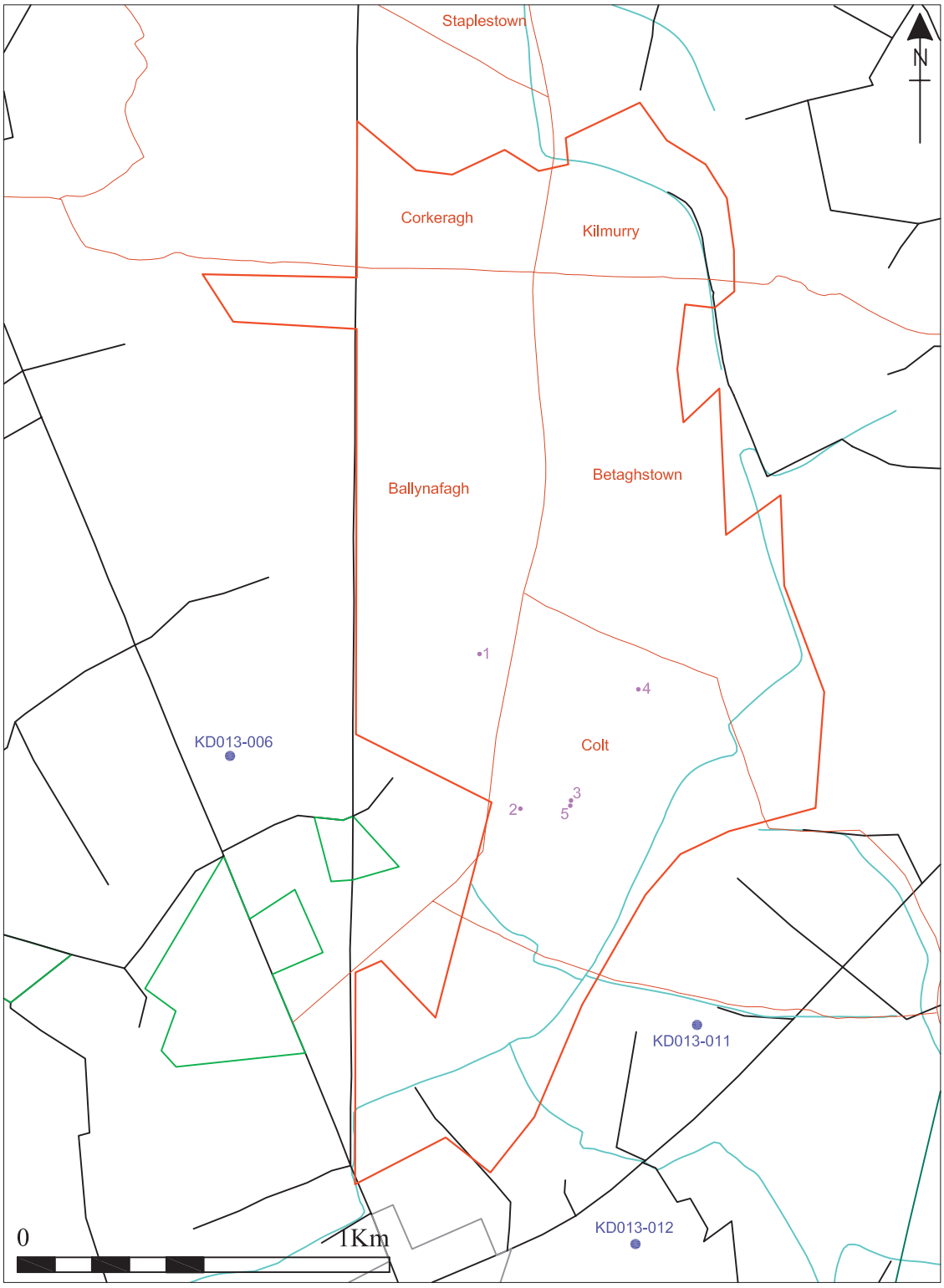


**Fig. 6** Prosperous Bog. Scale 1:17,000.

Date Recorded: 10/08/05
OS Sheet: KD013
NGR: 283562, 228864
Width 0.50m, Depth 0.05m, Length 1.07m
Date: Undated
Three brushwood elements with no clear structural arrangement (Plate 45). One element was oriented N-S while the other two were oriented E-W. They ranged in diameter from 0.01-0.05m in diameter and 0.13-1.07m in length. All were in good condition. A sample was taken and later identified as hazel.

Townland: Colt
Catalogue Code: KD-PPS004

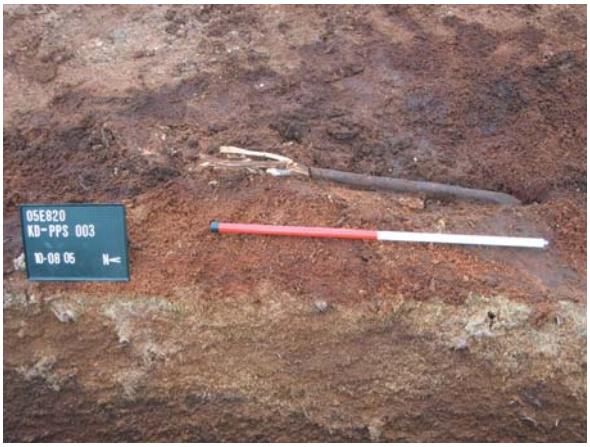


**Plate 45** KD-PPS003.

Type: Archaeological Wood
Bog: Prosperous
Site Code: PPS004
Date Recorded: 10/08/05
OS Sheet: KD013
NGR: 283743, 229163
Diameter 0.03m, Length 0.20m
Date: Undated
A single brushwood exposed on the field surface as the drain edge (Plate 46). It was 0.03m in diameter and 0.20m in length. It was in moderate condition. This piece was sampled and was later identified as alder.




**Plate 46** KD-PPS004.

Townland: Colt
Catalogue Code: KD-PPS005
Type: Archaeological Wood
Bog: Prosperous
Site Code: PPS005
Date Recorded: 10/08/05
OS Sheet: KD013
NGR: 283560, 228850
Width 1m, Depth 0.08m, Length 1.30m
Date: 1300 to 1450AD
Two roundwood elements located on the field surface in poor condition 1m apart (Plate 47). One was oriented E-W while the other was oriented NW-SE. They were both 0.06m in diameter and ranged from 0.25-0.77m in length. One piece had evidence for branch trimming. A piece was sampled and later identified as alder.




**Plate 47** KD-PPS005.

## Gilltown Bog 05E0826

**Location and Extent of Survey:**
Gilltown Bog is situated 2km northwest of Staplestown (Figs. 2 and 7). It is surrounded by farmland, with some private turf plots to the northeast. There are further extensive areas of bog beyond the farmland to the west and northwest. Access to the bog is via the peat works, which are situated to the south of an unclassified road running from Timahoe Crossroads west to Ballagh Crossroads. The bog covers an area of 355 hectares and forms part of the Bord na Móna Coolnamona Group of works.

**Production Area:**
The bog consists of 111 fields running N-S, all of which is in production with the exception of a small area, to the northeast of the bog, which was out of production and overgrown with scrub. The drains faces were in excellent condition, many having been freshly cut, and the field surfaces were in generally good condition, although some were covered in recent drain cleanings. There was a gravel ridge, visible in the base of the drains, running E-W in the central area of the bog, and associated with a number of oak stumps. Gilltown Bog was first developed in the late 1970's, when it was levelled and the drains cut, with peat moss production

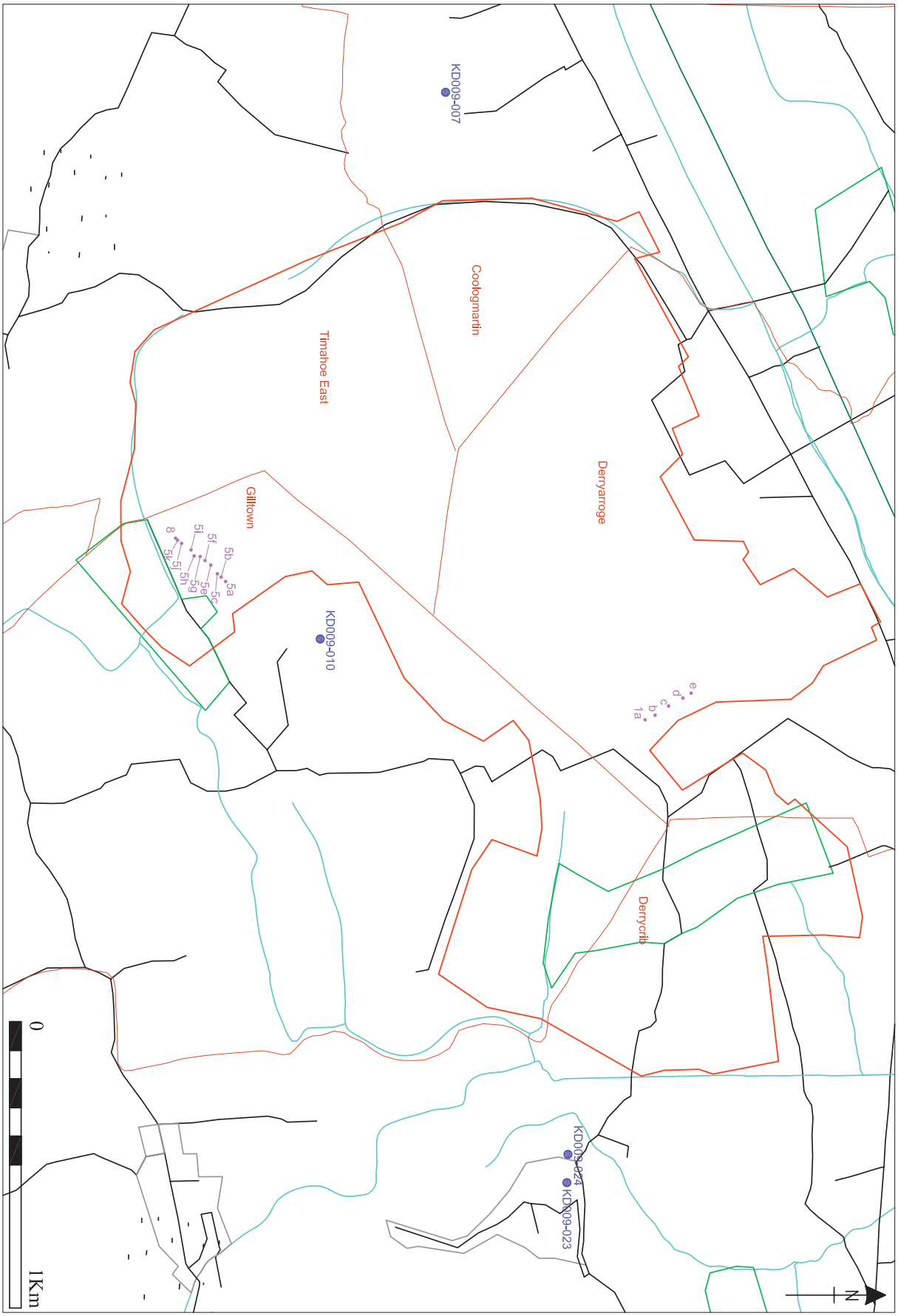


**Fig. 7** Gilltown Bog. Scale 1:17,000.

beginning in the early 1980's. The Bord na Móna workers reported local stories of a mass path running across the bog, although none of them had ever seen it and no traces were found during the survey.

**Archaeological Background:**

There are four recorded monuments in the environs of Gilltown bog, all of which are located in farmland around the bog margins. To the southeast in the townland of Gilltown is an enclosure site (KD009-010), in the townland of Timahoe East is a church and graveyard site (KD009-008), there is a castle site in the adjacent Timahoe West (KD009-009) and there is an enclosure site to the west of the bog in the townland of Coologmartin.

There are five stray finds from the general area, all from the townland of Timahoe East. These are a wooden yoke (1943:131), a perforated timber (1943:130) and part of a block wheel (1943:132), an iron axe (1950:7), a bronze spearhead (1941:1120) and a leather shoe (IA/7/1978). It is uncertain whether these finds came from Gilltown Bog or the nearby Timahoe Bog as the townland spans both bogs.

**Survey Results:**

Three sites were identified in Gilltown Bog during the course of the survey (Fig. 7), one of which was later discounted as non-archaeological (KD-GTN008). The remaining two sites were both toghers dating to 660-890AD (KD-GTN001) and 1490-1200BC (KD-GTN005). Both were substantial toghers oriented NW-SE and recorded at several locations across the bog.

**Catalogue of sites:**

Townland: Derryarroge
Catalogue Code: KD-GTN001a-e
Type: Togher
Bog: Gilltown
Site Code: GTN001a-d, GTN002
Date Recorded: 17/08/05
OS Sheet: KD009
NGR: 280387, 233396 – 280304, 233557
Width 3m average, Depth 0.50m average, Length 180m
Date: 660 to 890AD

A substantial togher recorded at five locations across six production fields. The superstructure was composed mainly of closely placed longitudinal roundwoods and planks with occasional smaller roundwoods and brushwoods packed between and underneath. The trackway is oriented NW-SE and extends from a hill at the northern extent of the bog and runs into privately owned turbury plots to the east of the main BnM production bog. Three pieces were sampled and later identified as alder, brich and rowan/hawthorn and a date of 660 to 890AD was obtained for the site.




**Plate 48** KD-GTN001a.

KD-GTN001a, 280387, 233396, Width 6.6m, Depth 0.50m

Recorded in section in the drain face 0.20m below the field surface (Plate 48). This sighting was composed of longitudinally placed roundwoods and planks exposed in section in the drain face. The elements were closely placed, in good condition and regular in size. There were some small brushwood elements packed between the roundwoods which were two to three deep in some places but in the main were only a single element deep.



**Plate 49** KD-GTN001b.

KD-GTN001b, 280381, 233431, Width 3.18m, Depth 0.60m

Exposed in section on the field surface at the drain edge and consisting of longitudinal roundwoods and occasional planks with some brushwood elements

used as packing between the larger elements (Plate 49). A forked branch like roundwood appeared to be transversely laid across the top of the elements although this may have been disturbed by machine activity. The diameters ranged from 0.07-0.14m and the brushwood packing material ranged from 0.04-0.05m.



**Plate 50** KD-GTN001c.

KD-GTN001c, 279887, 231903, Width 3.4m, Depth 0.05m
Field surface exposure of the trackway, disturbed by machines (Plate 50). Three brushwoods and a roundwood oriented NW-SE in relatively good condition were recorded on the field surface. At the drain edge there also appeared to be a concentration of marl associated with the site.



**Plate 51** KD-GTN001d.

KD-GTN001d, 280321, 233528, Width 1.45m, Depth 0.15m
A machine damaged field surface exposure of the trackway (Plate 51). There were two distinct longitudinal roundwoods oriented NW-SE and an associated deposit of marl and two further associated roundwoods. This sighting was exposed on the field surface for a length of 5.9m and measured 1.45m in width.



**Plate 52** KD-GTN001e.

KD-GTN001e, 280304, 233557, Width 1.33m, Depth 0.15m
Originally identified as a separate site this sighting was the final sighting of this NW-SE trackway at its NW end (Plate 52). As with sightings 'c' and 'd' this was located on the field surface and had been disturbed by machinery. The wooden elements were mainly longitudinally laid with marl and some pegs evident.

Townland: Gilltown
Catalogue Code: KD-GTN005a-k
Type: Togher
Bog: Gilltown
Site Code: GTN005a-k
Date Recorded: 16/08/05
OS Sheet: KD009
NGR: 279914, 231932 – 279770, 231764
Width 1.30-4.10m, Depth 0.20-0.65m, Length 221.7m
Date: 1490 to 1200BC
Substantial roundwood and plank trackway with occasional marl deposits orientated NW-SE across the bog. It was recorded low down in the drain faces at its northest extent and on or close to the field surfaces as it traversed the bog in a southwesterly direction. The site varied in composition along its length from exposures of single planks to several layers of roundwoods, planks, brushwood and gravel. Sightings 'a' to 'e' were multi layered while those from 'f' to 'k' were less dense in composition.

KD-GTN005a, 279914, 231932, Width 1.81m, Depth 0.23m min



**Plate 53** KD-GTN005a.

Several planks and roundwoods exposed in section in the drain face 1.14m below the field surface (Plate 53). Eight planks were longitudinally laid and closely spaced with some longitudinal roundwoods between them. The widest plank measured 0.52m and was 0.14m thick. The planks were two deep in places and it is possible that further material remained below the water level in the drain.



**Plate 54** KD-GTN005b.

KD-GTN005b, 279899, 231916, Width 2.8m, Depth 0.47m

Similar to KD-GTN005a this sighting was located in the drain face 0.80m below the field surface and was composed of mainly NE-SW longitudinally laid planks (Plate 54). There were also some longitudinal brushwood and roundwoods between and underneath the planks. The wooden elements overlay a gravel deposit which continued below the water level in the drain.

KD-GTN005c, 279887, 231903, Width 2.30m, Depth 0.65m

This sighting was composed mainly of large roundwoods



**Plate 55** KD-GTN005c.

with occasional planks (Plate 55). The elements are mainly longitudinally placed with packing of smaller brushwood and gravel deposits between them. The site was located 0.62m below the field surface and was in relatively good condition.



**Plate 56** KD-GTN005d.

KD-GTN005d, 279876, 231893, Width 2.8m, Depth 0.25m

A single longitudinal plank exposed at the base of the drain (Plate 56). The plank was 0.75m in width and was supported by at least one transverse roundwood and had several small brushwood elements beneath and alongside it. Although in relatively good condition the plank had been damaged by a ditcher.

KD-GTN005e, 279857, 231880, Width 2.5m, Depth 0.37m

At this location the site was composed of longitudinal planks and brushwood supported by roundwoods, gravel and further planks which in turn overlay a bed of gravel (Plate 57). Two pegs were also noted. The elements were in good condition and were 0.86m from the field surface.



**Plate 57** KD-GTN005e.



**Plate 58** KD-GTN005f.



**Plate 59** KD-GTN005g.

KD-GTN005f, 279841, 231860, Width 1.3m, Depth 0.20m
Longitudinally laid large roundwoods and planks exposed in section in the drain face 1.1m below the field surface (Plate 58). The elements were closely placed and the trackway was 1.3m in width at this location. There were some smaller transversely laid brushwoods above and below the larger elements.

KD-GTN005g, 279827, 231843, Width 4.10m, Depth 0.60m
Exposed in section in the drain face 0.85m below the field surface (Plate 59). Composed of three longitudinally laid planks on the upper surface with two transverse supporting planks. A roundwood peg and brushwood peg north and south of main structure respectively may have supported the sides of the structure at this location. Traces of gravel were also noted interspersed with brushwood fragments between the larger elements.

KD-GTN005h, 279825, 231822, Width 3.10m, Depth 0.25m
Located just above the water level in the drain face, this sighting was composed of two longitudinally laid planks and a roundwood (Plate 60). Two further longitudinal roundwoods supported the planks which had smaller longitudinal brushwood elements between them. The elements were closely placed and were in relatively good condition.



**Plate 60** KD-GTN005h.

KD-GTN005i, 279825, 231822, Width 1.40m, Depth 0.20m
This sighting was composed of two longitudinal planks one of which was exposed across the base of the drain (Plate 61). There were also some longitudinal brushwood and roundwood elements oriented NE-SW associated with the planks. The elements were located 1.14m from the field surface and had been damaged by the ditch cutting machinery.

KD-GTN005j, 279781, 231778, Width 1.8m, Depth 0.30m
A single NE-SW orientated plank exposed in section in



**Plate 61** KD-GTN005i.

the drain face with some associated brushwood (Plate 62). This sighting is 0.63m below the field surface and was recorded just above the water level in the drain, further elements were visible below the water but were not recordable.

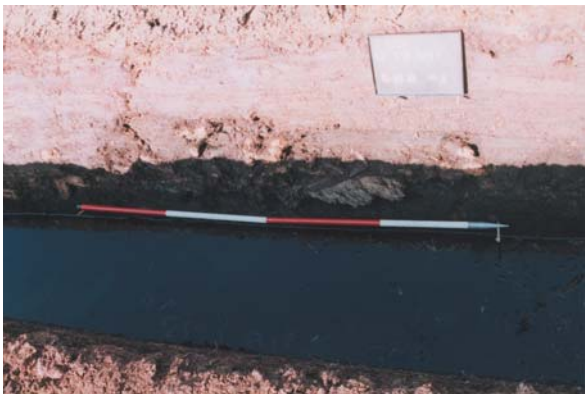

**Plate 62** KD-GTN005j.

KD-GTN005k, 279770, 231764, Width 3.5m, Length 7m
Field surface scattered plank fragments thought to have been displaced by drain cutting (Plate 63). This is the last sighting of the NE-SW trackway at the SW extent.

Townland: Gilltown
Catalogue Code: KD-GTN008
Type: Non-Archaeological Wood
Bog: Gilltown
Site Code: GTN008
Date Recorded: 16/08/05
OS Sheet: KD009
NGR: 279763, 231757
Depth 0.15m, Length 0.61m
Date: Undated
Two toolmarked brushwood pegs recorded on the field surface 0.61m apart (Plate 64). Both elements were at 30º angles and were 0.035mm in diameter. Both had



**Plate 63** KD-GTN005k.

chisel point worked ends but the cuts were very clearly defined and had been cut with a very sharp tool and are thought to be relatively modern in origin.




**Plate 64** KD-GTN008.

## COOLNAMÓNA GROUP

There are three bogs in the Coolnamóna Group, Co. Laois, Coolnamóna, Collnacartan and Cashel. These three bogs were fieldwalked and surveyed as part of the 2005 Peatland Survey. They are described below.

### Coolnamóna Bog 05E0822

**Location and Extent of Survey:**
Coolnamona Bog is situated to the northwest of the N7 motorway, 2 km west of Portlaoise (Fig. 2). To the south it is separated from the motorway by farmland, which also borders the bog on the western and eastern sides. There is forestry to the north, as well as extensive areas of private turf plots. The main access is via the peat works in the southeastern corner of the bog, accessed by a track which links to a small road running parallel to the N7. The bog covers an area of 661 hectares and

forms part of the Bord na Móna Coolnamona Group of works.

**Production Area:**
The bog consists of 95 fields running east-west along its long axis There is an industrial railway in the eastern half of the bog which runs east-west before branching north-south around the centre of the bog. Most of the bog is in production, although there are extensive areas of scrub around the southern, eastern and northeastern fringes.

**Archaeological Background:**
There are two recorded monuments sites close to the bog along the rail line at the SE extent. These are an enclosure (LA012-007) and a possible holy well (LA017-006) in the townland of Clonkeen.
There are four stray finds from Coolnamona Bog recorded in the topographical files of the NMI. These are a perforated hammerhead stone, from Cloncourse townland (1946:329), a leather shoe from Clondacasey townland (1943:115), a stone object from Gorteen townland and a gold dress fastener from Iry townland (1979:87)

**Survey Results:**
A single possible site was recorded during the course of the survey which was later discounted. This was a compact deposit of dried rushes similar in appearance to thatching material. The rushes were 10-15 elements thick and had been laid down over a wet patch of bog to facilitate the passing of a BnM machine.

## Coolnacartan Bog 05E0823

**Location and Extent of Survey:**
Coolnacartan Bog is situated between the N7 and N8 motorways, 2 km southwest of Portlaoise (Figs. 2 and 8). The bog is very irregular in shape with the two main production areas to the northeast and southwest being linked by a narrow waist of bog and extensive private turf cutting around the fringes, especially on the northwestern, southwestern and northeastern sides, having eaten into the main body of the bog. Coolnacartan Bog is surrounded by farmland with areas of forestry on the northeastern, southwestern and eastern sides. The bog covers an area of 529 hectares and forms part of the Bord na Móna Coolnamona Group of works.

**Production Area:**
The bog consists of 225 fields running widthways in a northwest-southeasterly direction, with an industrial railway running along the southeastern edge. Production is concentrated in the central eastern and southwestern area of the bog and was also taking place in the northeastern corner of the bog, the fields here being almost worked out. There were areas of heavy scrub in the southeastern, central western and northwestern parts of the bog, some of which were inaccessible. In some production areas the drain faces were overgrown and in the northeastern corner the field surfaces were also covered with loose peat.

**Archaeological Background:**
On the archaeological constraint maps there are two recorded monuments immediately adjacent to the bog at the NW extent. These are a church site in Clonkeen townland (LA017-007) and a field system site in Oldtown townland (LA017-008). Some distance to the SE in the townland of Colt there is an enclosure site (LA017-022) while to the SW in Ardlea there is a horizontal watermill.

Several finds are reported in the NMI topographical files from Clonaddoran townland which spans Coolnacartan and Cashel bogs. The files do not specify in most cases which bog these were found in. The finds are a slate spearhead (1966:98), leather bag (1973:194), wooden stakes, flint arrowhead with shaft, leather bag with hazelnuts and a leather sandal (IA/148/60), a leather shoe (1943:115), a leather shoe (1960:576) and an animal skin (1986:38). From Colt and Oldtown townlands the finds were a bog butter (IA/254/1990) and a leather shoe (1943:115) respectively.

**Survey Results:**
Two sites were identified in Coolnacartan Bog (Fig. 8) consisting of a small field surface deposit of wood (LS-CTN001) and a site identified as a possible togher recorded on two separate field surfaces (LS-CTN002). The latter was discounted when the dating results were received as it was modern in origin.

Catalogue of sites:
Townland: Coolnacartan
Catalogue Code: LS-CTN001
Type: Archaeological Wood
Bog: Coolnacartan
Site Code: CTN001

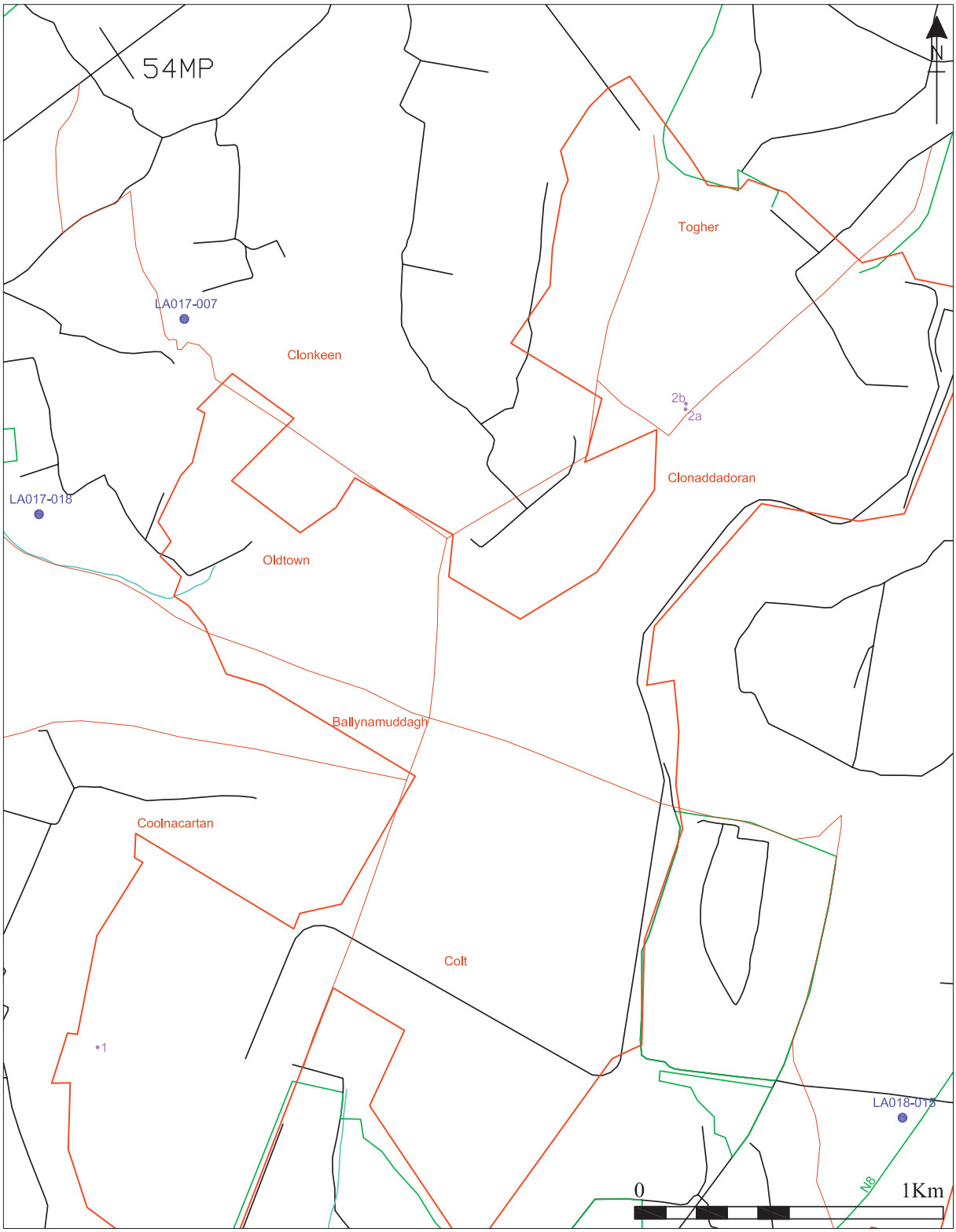


**Fig. 8** Coolnacartan Bog. Scale 1:17,000.

Date Recorded: 22/07/05
OS Sheet: LA017
NGR: 242855, 192390
With 0.72m, Depth 0.12m, Length 1.32m
Date: Undated
A small deposit of archaeological wood mainly oriented E-W on the field surface (Plate 65). The pieces range in size from 1-19mm in diameter and 0.05-0.15m in length. A single worked end was noted along the eastern extent cut to a chisel point with ten facets. The peat was sphagnum rich with occasional eriophorum inclusions. A sample was taken from one of the brushwoods and later identified as willow.

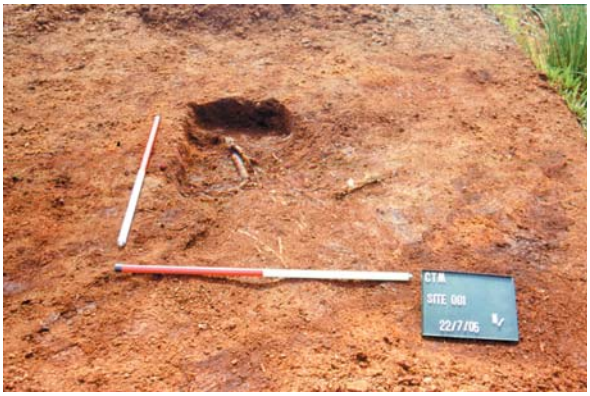


**Plate 65** LS-CTN001.

## Cashel Bog 05E0824

**Location and Extent of Survey:**
Cashel Bog is located to the southeast of the N8 road, 2km south of Portlaoise (Figs. 2 and 9). There is farmland to the northwest and forestry to the west and southeast, with extensive private peat cuttings to the north and, to a lesser extent, to the south. Access to the bog is from a short track connecting with the N8. Cashel Bog covers an area of 242 hectares and forms part of the Bord na Móna Coolnamona Group of works.

**Production Area:**
The bog consists of 106 fields running N-S, with an industrial railway along its northwestern edge. Main body of the bog is in production, with some 40 fields on the eastern side of the bog out of production and covered in scrub. The drain faces in the production areas were clean but, at the time of the survey, the water level in the drains was high following heavy rain and many of the fields were covered in unharvested peat. Some natural wood was visible in the drain faces.

**Archaeological Background:**
There is an enclosure site adjacent to the bog at the southeastern extent in Cashel townland (LA018-019) while approximately 2km to the east there are four sites in the townland of Kilvahan a possible house site (LA-0118-016), a church, enclosure and graveyard (LA018-017) and an architectural fragment in Pass townland (LA018-018).

Several finds are reported in the NMI topographical files from Clonaddoran townland which spans Cashel and Coolnacartan bogs. The files do not specify in most cases which bog these were found in. These are a slate spearhead (1966:98), leather bag (1973:194), wooden stakes, flint arrowhead with shaft, leather bag with hazelnuts and a leather sandal (IA/148/60), a leather shoe (1943:115), a leather shoe (1960:576) and an animal skin (1986:38). From this bog there was a wooden beetle (1984:139) from Ballyruin townland, and two bog butters from Cashel townland (IA/244/1998 & 1971:1007). A third bog butter was discovered this year in Ballyruin townland during ditch cutting after completion of the survey and has been submitted to the museum.

**Survey Results:**
Seven sites were identified in Cashel Bog which consisted of two post rows, a possible platform and three sightings of archaeological wood (Fig. 9). It is thought that one of the post rows (LS-CSL009) may represent the last remains of an Early Christian single plank trackway whose upper surfaces have been removed during the milling process. Two dates were obtained of 660-890AD and 640-780AD respectively. A similar post row site was excavated by ADS Ltd. in 2001 (01E0595) in Curraghmore Bog, Co. Offaly but was later discovered to survive as a single plank trackway in a high face bank. The Curraghmore site was dated to 890AD and survived on the production field surfaces as a series of posts. The occurrence of trackways close to one another and following the same line has also been noted in several ADS ltd. excavations, most notably those in Killaghintober Bog (1999-200), Daingean Bog (2005) and in Ballykean Bog (2004). The reason for two sites so close in date and location has yet to be fully explained. It is possible that one site simply replaced the other as ground conditions became wetter or the trackways became degraded.

The earliest site in the survey was identified at the base of a drain in this bog. LS-CSL004 was dated to 3780 to 3640BC. It was identified in a single location and as a result has been classified as a possible platform. The remaining four sites were sightings of archaeological wood and a post row all of which are considered to be resolved.

**Catalogue of sites:**
Townland: Cashel
Catalogue Code: LS-CSL001
Type: Post Row
Bog: Cashel
Site Code: CSL001
Date Recorded: 27/07/05
OS Sheet: LA018
NGR: 246572, 192112 – 246529-192123
Width 0.20-1.4m, Depth 0.20m, Length 44.1m

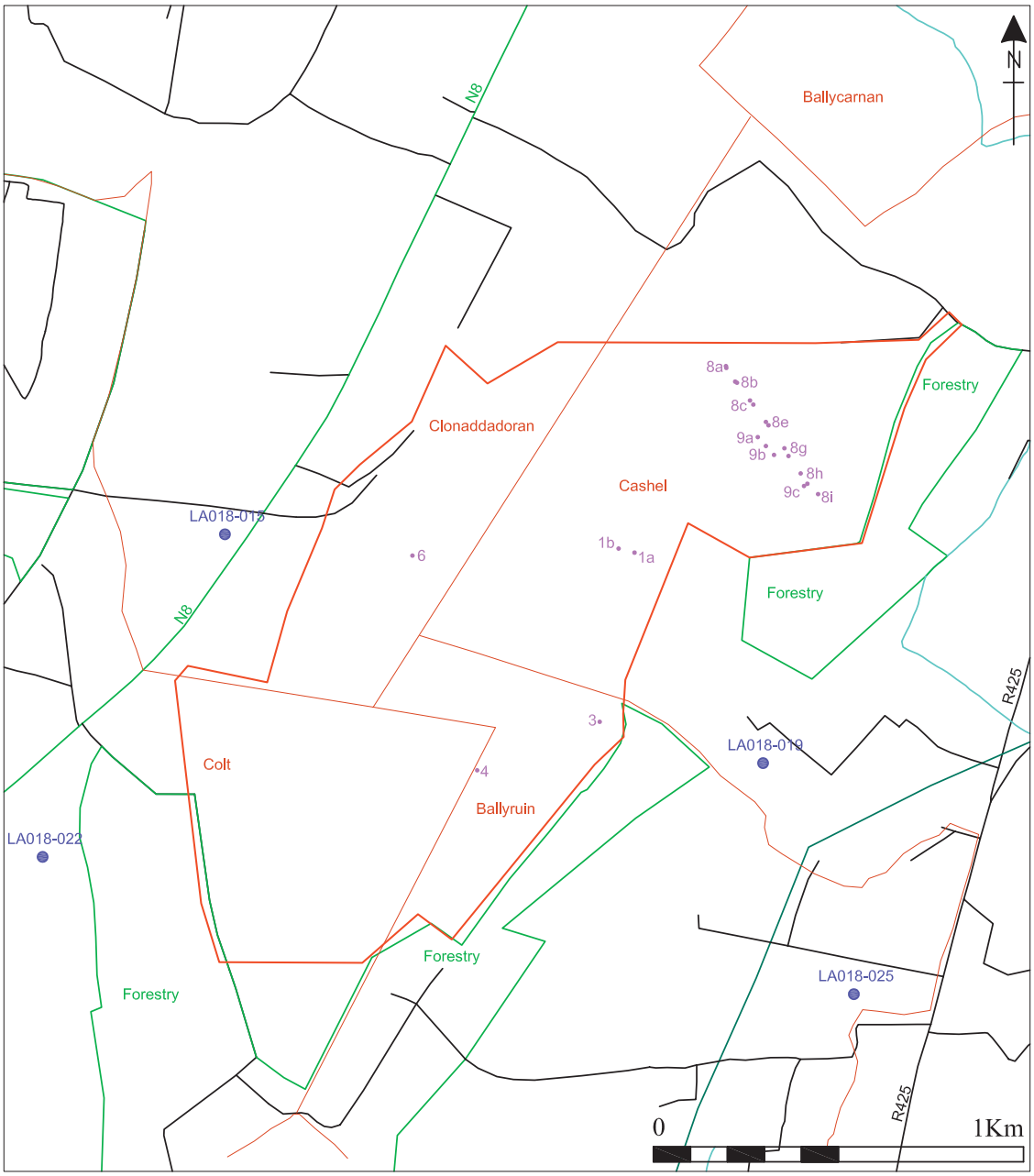


**Fig. 9** Cashel Bog. Scale 1:17,000.

Date: Undated
A post row oriented ESE-WNW and traced for a length of 44.1m across four production fields (Plate 66). It was composed of 51 upright roundwood and brushwood elements with four additional longitudinal roundwood elements on the field surface towards the centre of the post row. The elements varied from 0.02m to 0.14m in diameter. In places there was a double row of pegs 0.20-0.30m apart. In two places there were the remains of horizontal elements lying on the field surface which ranged in length from 0.15-0.45m. The peat was moderately well decomposed with some calluna and eriophorum inclusions.

Townland: Ballyruin
Catalogue Code: LS-CSL003
Type: Archaeological Wood
Bog: Cashel
Site Code: CSL003
Date Recorded: 28/07/05
OS Sheet: LA018
NGR: 246478, 191655
Width 0.08m, Depth 0.92m
Date: Undated
A single roundwood set in the drain face at an angle of 80º (Plate 67). It was 0.70m from the field surface, 0.08m in diameter and measured 0.92m in total length. It had a chisel point at one end with four facets.

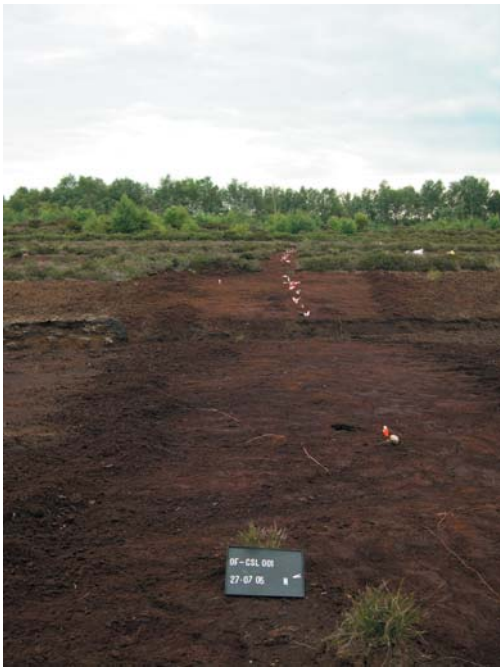

**Plate 66** LS-CSL001.




**Plate 67** LS-CSL003.

Townland: Ballyruin
Catalogue Code: LS-CSL004
Type: Possible platform
Bog: Cashel
Site Code: CSL004
Date Recorded: 28/07/05
OS Sheet: LA018
NGR: 246147, 191524
Width 0.60m, Depth 0.14 min, Length unknown
Date: 3780-3640BC
Four closely placed parallel roundwoods recorded protruding from the drain face in a SE-NW direction (Plate 68). These were only exposed for a maximum of 0.14m into the drain face and were 0.90m from the field surface. They ranged in diameter from 0.07-0.14m. These elements were not located in any of the surrounding drains and may represent a small platform or a short length of togher. A single element was sampled and later identified as alder.



**Plate 68** LS-CSL004.

Townland: Clonaddadoran
Catalogue Code: LD-CSL006
Type: Archaeological Wood
Bog: Cashel
Site Code: CSL006
Date Recorded: 28/07/05
OS Sheet: LA018
NGR: 245972, 192104
Diameter 0.13m, Length 0.80m
Date: Undated
Single large worked roundwood partially exposed on the field surface (Plate 69). It was inserted into the peat at a 30º angle oriented roughly E-W. The roundwood measured 0.13m in diameter and 0.80m in length. This piece was 100% sampled and later identified as alder.



**Plate 69** LS-CSL006.

Townland: Cashel
Catalogue Code: LS-CSL008
Type: Post row
Bog: Cashel
Site Code: CSL008a-i
Date Recorded: 27/07/05
OS Sheet: LA018

NGR: 246820, 192611 – 247068, 192270
Width 0.02 – 0.40m, Length 420m
Date: 660-890AD



**Plate 70** LS-CSL008a.

A post row recorded in eight locations across fifteen production fields and oriented NW-SE. Composed of mainly upright brushwood and roundwood pegs/posts ranging in diameter from 0.02-0.40m in diameter. There were occasional longitudinal elements at some of the sightings which suggest that the site may represent the remains of a planks trackway. The condition of the elements varied from poor to moderate across the length of the site. The pegs/posts were driven into the peat at angles that varied from 45-90º. Five pieces were taken for wood species identification from each sighting and these were identified as willow/poplar, alder (x2), maple and willow.



**Plate 71** LS-CSL008b.

LS-CSL008a, 246819-192616, Width 0.07m max, Length of sighting 2.9m
Nine pegs/posts forming a straight NW-SE oriented line with an additional transverse element on the field surface (Plate 70). The pegs/posts were inserted into the peat at 45-90º angles.



**Plate 72** LS-CSL008c.

LS-CSL008b, 246844, 192574, Width 0.13m, Length of sighting 8.2m
A single line of brushwood pegs/posts with two longitudinal elements (Plate 71). The distances between the pegs/posts varied from 0.24-0.90m and their diameters ranged from 0.04-0.06m. The longitudinal elements abutted the upright pegs.

LS-CSL008c, 246884, 192523, Width 0.10m max, Length of sighting 18.7m
Twenty pegs/posts in a row oriented NW-SE (Plate 72). The elements formed a straight line with an occasional element off line. Their spacing varied from 11 elements in a 3m stretch to having spaces of 1.5m between elements which were inserted into the peat mainly at an angle of 60º.



**Plate 73** LS-CSL008e.

LS-CSL008e, 246934, 192456, Width 0.25m, Length of sighting 12.3m
Three large posts and four smaller pegs exposed on the field surface in a NW-SE line with distances of 1.2-3.8m between them (Plate 73). The diameter of the roundwoods ranged from 0.05-0.20m and they were in moderate condition.




**Plate 74** LS-CSL003.

LS-CSL008f, 247030, 192292, Width 0.08-3m, Length of sighting 30m
Four roundwood posts and associated wood elements exposed on two adjoining field surfaces (Plate 74). The distances between the posts varied from 1.8-3.1m and all were located on a single field surface while there were damaged longitudinal elements on the other field surface.



**Plate 75** LS-CSL003.

LS-CSL008g, 246977, 192394, Width 1.29m, Length 1.9m
Four pegs/posts located on the field surface (Plate 75). Three were in NW-SE oriented line while the fourth was 1.9m to the SE of the northernmost peg/post. Their diameters ranged from 0.04-0.06m in diameter and they were in moderate condition.

LS-CSL008h, 247039, 192298, Width 2m, Length 27.5m
Five pegs/posts located in a line on the field surface and some associated elements scattered across the field surface with a general NW-SE orientation (Plate 76). The pegs/posts were in moderate condition while the remaining elements were in very poor condition from milling.



**Plate 76** LS-CSL008e.

LS-CSL008i, 247068, 192270, Width 0.04-0.l0m, Length 2.40m

Three posts in a NW-SE line across the field surface 2.40m in length (Plate 77). Their diameters ranged from 0.04-0.06m and they were in moderate condition.




**Plate 77** LS-CSL003.

Townland: Cashel
Catalogue Code: LS-CSL009
Type: Post Row
Bog: Cashel
Site Code: CAL008d, CSL011 & CSL018
Date Recorded: 28/07/05
OS Sheet: LA018
NGR: 246905, 192424 - 247030, 192292
Date: 640 to 780AD / 540 to 770AD

A post row recorded in three locations across nine production fields and oriented NW-SE. This site runs almost parallel to LS-CSL008. The northwest sighting LS-CSL009a, was originally thought to form part of LS-CSL008 and was initially recorded as LS-CSL008d. It was later realised to form part of the line of this site which was also made up of two other sightings originally identified as separate sites – LS-CSL011 and LS-CSL018.



**Plate 78** LS-CSL003.

LS-CSL009a (CSL008d), 246905, 192424, Width 0.60m, Length of sighting 0.92m

This sighting had a single peg and an associated, transversely laid, brushwood on the field surface while a third brushwood element was visible in section in the adjacent drain face 0.16m from the field surface (Plate 78). The elements ranged in diameter from 0.02-0.05m and were in poor to moderate condition.




**Plate 79** LS-CSL008e.

LS-CSL009b (LS-CSL011), 246927, 192400 – 246949, 192376, Width 0.07m, Length 33.6m, 640 to 780AD

Six pegs/posts in a line oriented NW-SE and located on the field surface. The elements range in diameter from 0.03-0.07m and were widely spaced across a distance of 33.6m. The closest two elements were 0.9m apart while the furthest were 8.2m apart (Plate 79). The elements




**Plate 80** LS-CSL018.

were in poor to moderate condition. A single element was sampled and later identified as alder and dated to 640-780AD.

LS-CSL009c (LS-CSL018), 247030, 192292, Width 0.07m, Length 0.36m, Date: 540 to 770AD
A single roundwood worked to a chisel point at one end located on the field surface (Plate 80). It was 0.07m in diameter and 0.36m in length. This piece was sampled and later identified as willow/poplar and dated to 540-770AD.

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# 7 APPENDICES

## Appendix 1
## SMR Sites in Peatland Survey Area

SMR No.: ME046-005; 006
Townland: Ardnamullan/Tircroghan
Parish: Clonard
Barony: Upper Moyfenrath
Classification: Earthwork sites
Cartography: Hachured on 1913 OS map (both sites). Three circular features shown on 1st edition OS map.
No trace of these mounds. A native of 76 years said they had been cut twice, the last time being 1939. He remembered them as 'high mounds of turf'. June 1969

SMR No.: OF025-016
Townland: Ballinvally
Parish: Geashill
Barony: Geashill
Classification: Enclosure (site)
Cartography:
Aerial photographs (GSIAP, N 179-80) reveal the cropmark of a large circular enclosure. No visible remains at ground level.

SMR No.: OF025-017
Townland: Ballinvally, Killeigh, Millbrook
Parish: Geashill
Barony: Geashill
Classification: Archaeological Complex
Cartography:
01701 Abbey, Killeigh
01702 Convent, Killeigh (site of)
01703 Priory, Killeigh
01704 Graveyard, Killeigh
01705 Graveslabs x 4, Killeigh
01706 Holy Wells x 7, Killeigh
01707 Rath, Millbrook
01708 Rath, Millbrook
01709 Souterrain (Poss), Millbrook
01710 Iconic Stone Sculpture, Killeigh
01711 Ecclesiastical Enclosure, Millbrook
01712 Cranog, Killeigh and Millbrook
01713 Mill, Killeigh and Millbrook

SMR No.: OF025-023
Townland: Ballynasrah
Parish: Geashill
Barony: Geashill
Classification: Enclosure (site)
Cartography:
The cropmark of a circular enclosure revealed on aerial photographs (GSIAP, N 178-9). No visible remains at ground level.

SMR No.: WM013-103
Townland: Ballynacor
Parish: Killulagh
Barony: Delvin
Classification: Ringfort
Cartography: -
Roughly circular ringfort outlined by remains of low rounded bank of earth and stones set on a low scarp. Slight remains of a shallow fosse from E-S-N-NW. Entrance, probably original, on E side. Modern narrow entrance on W side. Interior is fairly even with a gentle rounded rise towards the centre. Site is overgrown with boxwood and saplings. On a low rise in average pasture.

SMR No.: WM013-104
Townland: Bracklin
Parish: Killulagh
Barony: Delvin
Classification: Ringfort
Cartography: Indicated on OS map of 1837
Circular earthwork outlined by a low bank of earth and stone with a wide shallow fosse outside. Beyond this is a second low wide bank of earth and stone with a shallow fosse outside it. Original entrance may have been ESE-SE-SSE. At this point the bank has been ploughed leaving only a low scarp and the outer bank has been disturbed. There is a poorly defined gap in the inner bank at NNE and another, not quite concentric with it in the outer bank.
1973

SMR No.: WM013-065
Townland: Ballynacor
Parish: Killulagh
Barony: Delvin
Classification: Ringfort

Cartography: Marked on OS Map (*)
Small ringfort. Perimeter has been modified and straightened on S side to form a field bank. Possible entrance at NNE. A number of stones protrude from the ground. Sited on a natural ridge. 1973

SMR No.: WM013-066
Townland: Ballynacor
Parish: Killulagh
Barony: Delvin
Classification: Earthwork
Cartography:
This site is marked on Larkin's Map of 1808, but field notes dated 1980 state that there is no longer any trace of antiquity there now.

SMR No.: WM-13-067
Townland: Ballynacor
Parish: Killulagh
Barony: Delvin
Classification: Ringfort
Cartography:
Roughly circular area outlined by scarp with low bank of earth and stone at upper edge and shallow fosse at foot. There are also some slight remains of a low outer bank. Field wall N-S cuts off a small disturbed portion of the site on the E. There are a small number of disturbance depressions in the surface. Diam. is 43.2m

SMR No.: WM013-070
Townland: Ballynacor
Parish: Killulagh
Barony: Delvin
Classification: Ringfort
Cartography: -
An approximately circular enclosure bounded by a low scarp with remains of an earthen bank on its upper edge and with suggestions of a wide fosse at its foot. The bank is reasonably well preserved from NW-N-E-SE. Elsewhere it is absent. Modern NW-SW fence crosses the site and divides approximately one third of it from the rest. Modern NNE-SSW fence extends outside the foot of the scarp on the NW. Perimeter has small modern gaps. Gap on NNE may possibly represent the entrance. The interior rises appreciably to form an oval platform at the centre. This appears to be due to an outcrop.

SMR No.: WM013-071
Townland: Ballynacor
Parish: Killulagh
Barony: Delvin
Classification: Ringfort
Cartography: Marked on OS map (*)
Bounded NE-E-S by remains of a wide low earthen bank set on a scarp with a fosse at its foot. From S to SW the perimeter is very poorly defined and now very irregular. From SW-W-N the perimeter consists of low earthen bank set on a scarp with a wide shallow fosse at its foot. From N-NE the perimeter is a wide natural slope. The interior has a sub-circular annex-like enclosure about 30m in diameter. The perimeter is poorly defined on the E side. A wide double bank runs through the centre and northern part of the main enclosure. There is a wide flat-bottomed fosse at the foot of both banks. The interior is uneven, and there are no traces of wall footings or buildings.

SMR No.: WM013-072
Townland: Ballynacor
Parish: Killulagh
Barony: Delvin
Classification: Castle
Cartography: -
Marked on the Down Survey Parish Map which shows the castle at the E end of the townland. According to field notes dated May 1983, there is no trace of a castle remaining. It is a good area with numerous rocky outcrops.

SMR No.: WM013-073
Townland: Ballynacor
Parish: Killulagh
Barony: Delvin
Classification: Ringfort
Cartography: Marked on OS map (*)
Large circular ringfort outlined by double bank with fosse in between. Inner bank is set on an embankment on NW-W and S. Fosse and bank are best preserved on N side. On N there is a second fosse outside the outer bank and there is a third bank, broad and low. A silo pit has been built outside the second bank, and there are quarry holes outside the earthwork.

SMR No.: KD013-006
Townland: Ballynafagh
Parish: Ballynafagh
Barony: Clane
Classification: Earthwork site
Cartography: Only indicated on 1837 OS map.
Site under crop at time of visit. No trace of monument.

SMR No.: WM014-018
Townland: Bracklin
Parish: Killulagh
Barony: Delvin
Classification: Castle
Cartography: -
The castle is marked on the Down Survey Parish Map. According to field notes from 1983 there are no visible traces remaining. The is one single storey house over a basement, 5 bays wide with a parapet and single storey wings at each end and a long return bay out the back. All are seemingly 18th/19th Century. The buildings are referred to by the occupants as 'Bracklin Castle'.

SMR No.: WM014-019
Townland: Bracklin
Parish: Killulagh
Barony: Delvin
Classification: Ringfort
Cartography: -
Circular ringfort outlined by a triple bank with two fosses in between. Outer bank and fosse are poorly preserved and absent on S and E. Interior slopes gently from NW-SE. There are stony outcrops in the interior. In coniferous plantation. There is a narrow entrance on the SW and a second entrance on SE. Sited on gently rising ground.
May 1976

SMR No.: ME035-008
Townland: Carranstown Great
Parish: Killaconnigan
Barony: Lune
Classification: Castle
Cartography: Marked with cross-like symbol on OS 1910 edition, and as 'Carronstown Castle' on the 1st edition.
Site of the castle consists of a mound about 1.5m high. Surrounding it are a number of drainage ditches and banks. The ditches are 2-4m wide and 30cm-80cm deep. The bank to the west of the castle is much eroded. The mound is irregularly sloped and has probably been quarried in places. All fields have been reclaimed. 1985

SMR No.: ME035-009
Townland: Carranstown Great
Parish: Killaconnigan
Barony: Lune
Classification: Enclosure
Cartography: -
Situated on a gentle N-facing slope, with slightly higher ground to south. Only one quadrant of the site survives with a scarp and external ditch from S-W. There is a possible entrance and causeway at SW – 3m wide. The rest of the site is destroyed. The quadrant is defined by field fences. Within the enclosure about halfway along the southbound field fence is a bullaun stone. March 1985

SMR No.: LA018-019
Townland: Cashel
Parish: Ballyroan
Barony: Cullenagh
Classification: Enclosure (site)
Cartography: Marked on the 1841 and 1909 eds. OS 6" maps.
A subcircular enclosure (diam. C. 37.8m). A slight rise in the ground level indicates the site.

SMR No.: KD031-013
Townland: Cloney
Parish: Kilberry
Barony: Narragh and Reban West
Classification: Enclosure site
Cartography: -
Description: -

SMR No.: LA018-022
Townland: Colt
Parish: Clonenagh and Clonagheen
Barony: Maryborough West
Classification: Enclosure
Cartography: Hachured from SE-NW on 1909 ed. 1909 ed. OD 6" map.
Portion of low bank (C c. 36.5m S-W) and external fosse survive at S and W. No other visible surface traces.

SMR No.: KD009-007
Townland: Coologmartin
Parish: Timahoe
Barony: Clane
Classification: Ringfort
Cartography: Marked on both 1837 and 1911 OS maps. Marked on latter as Crockberry Hill.
No indication of an earthwork apart from a slight depression to the north of the summit.
July 1972

SMR No.: KD021-002
Townland: Coolsickin / Quinsborough
Parish: Lackagh
Barony: Offaly West
Classification: Decoy pond site
Cartography: Indicated on 1939 OS map.
No visible surface traces.
1986

SMR No.: KD021-003
Townland: Coolsickin / Quinsborough
Parish: Lackagh
Barony: Offaly West
Classification: Enclosure
Cartography: Not indicated on 1837 or 1939 OS maps.
Aerial photograph (CUCAP BGH 71) shows cropmark of circular feature defined by fosse with internal bank. It could be a barrow site or connected with nearby moated site (21.2). A second possible site exists closeby (21.7). No visible surface remains.

SMR No.: KD021-011
Townland: Coolsickin / Quinsborough
Parish: Lackagh
Barony: Offaly West
Classification: Potential site
In open, flat, now drained and improved pastureland. No visible traces remain.
1986

SMR No.: LA017-006
Townland: Clonkeen
Parish: Clonenagh and Clonagheen
Barony: Maryborough West
Classification: Holy Well (possible)
Cartography: Marked on the 1841 and 1906-6 eds. OS 6" maps
Now covered over and incorporated into a pump.

SMR No.: LA012-007
Townland: Clonkeen
Parish: Clonenagh and Clonagheen
Barony: Maryborough West
Classification: Enclosure
Cartography: Not marked on the 1841 ed. OS 6" map
A subcircular area (dims. C. 16m E-W, 10.5m N-S) defined by a scarp (H c. 0.5-1m). No evidence of fosse.

SMR No.: ME041-002
Townland: Clonycavan
Parish: Killaconnigan
Barony: Lune
Classification: Rectilinear enclosure
Cartography: Hachured on OS 1910 map. Marked 'Fort' on 1837 OS map.
Situated on SSE slope of fairly steeply rising ridge. The interior is a long rectangular shape with rounded corners. It is enclosed by a low earthen bank – a wide sprawling one which rises only a small height above the interior. At NNW a large hole has been dug inside the perimeter destroying the bank. Just east of south is a small hole at the perimeter, and another at ENE. Perimeter is much disturbed by trees and ploughing. Possible entrance at the south where there is a very gradual slope from interior to exterior. August 1969

SMR No.: ME035-013
Townland: Clonygrange
Parish: Killaconnigan
Barony: Lune
Classification: Ringfort
Cartography: -
Situated on low ground against the bank of a stream. The stream curtails its banks from SSE-SW. There is some disturbance at the NE, and the external bank is missing from N-ESE. Entrance is at north, about 6m wide. It functions as a modern entrance, and doesn't have a causeway. The interior is cattle-churned, and is not perceptibly higher than the interior.
March 1985

SMR No.: WM021-001
Townland: Craddanstown
Parish: Killucan
Barony: Farbill
Classification: Earthwork
Cartography: -
Marked on Larkin's Map of 1808.

SMR No.: KD013-011
Townland: Curryhills
Parish: Killybegs
Barony: Clane
Classification: Ringfort
Cartography:
Also called 'Scrawtown Fort'. A roughly circular ring-fort on the edge of a high ridge. The site is surrounded by a bank but is impenetrable due to dense overgrowth.

Field boundaries adjoin the site on the southern and western sides. 1972
A handwritten addendum to the above fieldnotes states that the site has been 'destroyed 06/86'.

SMR No.: KD013-012
Townland: Curryhills
Parish: Killybegs
Barony: Clane
Classification: Ringfort
Cartography: Indicated on 1837 and 1911 OS maps
Known as 'Eldons Fort'. Circular platform type ringfort. Site is outlined by a fosse which is very silted-up, and a bank. The interior is raised somewhat over the surrounding area. Interior appears to be flat and has dense overgrowth of nettles. Possible entrances at southeast and northwest. 1972

SMR No.: OF025-001
Townland: Derrybeg
Parish: Geashill
Barony: Geashill
Classification: Mound site
Cartography: Not marked on first two eds.but hachured as a small circular mound on current OS ed.
When visited by Davies (ITA Survey 1942) the mound was already destroyed with just three old hawthorn trees marking its site. No visible remains at ground level.

SMR No.: OF025-022
Townland: Derrygunnigan
Parish: Geashill
Barony: Geashill
Classification: Rath
Cartography: Hachured
Situated on high ground overlooking bogland. A poorly preserved bivallate ringfort comprising a circular platform (diam. 50m E-W) delimited by a low earthen bank (Wth 2m; intn H 1m) and an outer fosse visible at W only where it has been widened to accommodate forestry drainage. Dense overgrowth masks the site and precludes identification of the entrance.

SMR No.: KD031-003
Townland: Derrynine
Parish: Fontstown
Barony: Offaly West
Classification: Earthwork site
Cartography: Marked on 1907-09 OS map as hachured circle.
Very slight rise in low-lying field.
August 1987

SMR No.: LA017-015
Townland: Doon
Parish: Clonenagh and Clonagheen
Barony: Maryborough West
Classification: Enclosure (site)
Cartography: Marked on the 1841 and 1910 eds. OS 6" map
A circular enclosure (max. diam. C. 45m). No visible surface remains.

SMR No.: KD009-010
Townland: Gill Town
Parish: Ballynafagh
Barony: Clane
Classification: Earthwork site
Cartography: Indicated on 1837 and 1911 OS maps. Also marked on Taylor's Map of 1783.

SMR No.: OF025-008
Townland: Graigue
Parish: Geashill
Barony: Geashill
Classification: Enclosure (possible site)
Cartography:
Aerial photographs (GSIAP, N 178-9) reveal the cropmark of a small circular enclosure. No visible remains at ground level.

SMR No.: KD018-005
Townland: Grangeclare East
Parish: Kilmeage
Barony: Connell
Classification: Ringfort
Cartography: Indicated on 1837 and 1907-09 OS maps.
Small roughly circular ringfort delimited by a fosse. Entrance on west side.
1972

SMR No.: KD031-0201/0202
Townland: Oldcourt
Parish: Kilberry
Barony: Narragh and Reban West
Classification: Church and cemetery
Cartography: Indicated on 1837 and 1907 OS maps.
'Killart' is the name of an obliterated churchyard in

the town of Oldcourt. There are superstitious stories attached to the grave yard. The site of the burial ground is now in a hollow with 2-3 aged ash trees nearby. Fitzgerald, Lord W., 1899-1902 JKAS Vol. III

SMR No.: LA017-00801
Townland: Oldtown
Parish: Clonenagh and Clonagheen
Barony: Maryborough West
Classification: Enclosure (site)
Cartography:
An oval enclosure site visible on aerial photographs (GSI, S 226-7). Not visible on the ground. Possible field system to the N and NE (LA017-00802).

SMR No.: LA017-00802
Townland: Oldtown
Parish: Clonenagh and Clonagheen
Barony: Maryborough West
Classification: Field system (site)
Cartography:
Field system visible on aerial photographs (GSI, S 226-7). Not visible on the ground. Enclosure (site), LA017-00802, lies to S.

SMR No.: KD018-031
Townland: Oldtowndonore
Parish: Downings
Barony: Clane
Classification: Potential site
Cartography:
Potential site with aerial photo GSI N389-8 (not included in RMP file).

SMR No.: ME035-010
Townland: Killaconnigan
Parish: Killaconnigan
Barony: Lune
Classification: Church, site of
Cartography: Marked 'Graveyard' on OS 1910 edition, and marked similarly on the 1st edition.
Manuscript ref. NLI 5485 (47) shows a church here. No foundations could be recognised. Burial dates from 1764-1982. Sub-circular/semi-circular with raised interior, surrounded by a stone wall or bank. The stone wall has a heaped up bank inside it.
March 1985

SMR No.: OF025-002
Townland: Killeenmore
Parish: Geashill
Barony: Geashill
Classification: Enclosure (site)
Cartography:
Description:

SMR No.: KD018-003
Townland: Kilmeage
Parish: Kilmeage
Barony: Connell
Classification: Castle
Cartography: Indicated on the 1837 and 1909 OS maps.
O'Grady, in History and Antiquities of the Hill of Allen, 1903-5, mentions that the castle was built on entirely of red sandstone.
No standing parts of the castle remain.
June 1986

SMR No.: KD018-004
Townland: Kilmeage
Parish: Kilmeage
Barony: Connell
Classification: Ringfort
Cartography: Indicated on 1837 and 1907-09 OS maps. Slightly altered shape, two sides flattened, on latter.
Roughly oval shaped ringfort, northern and eastern sides being almost straight. Site is delimited by a bank of earth and stone, and an outer fosse. Entrances on western and southern sides. Interior is flat, sloping slightly from west to east with a slight rise in the centre. Site is enclosed by a hedge making the interior a small field/paddock.

SMR No.: ME046-011
Townland: Knockersally
Parish: Ballyboggan
Barony: Upper Moyfenrath
Classification: Enclosure site
Cartography: -
The only information available on this site was an aerial photograph ref: AP BOV 100.

SMR No.: KD031-00401 and 00402
Townland: Rathconnell wood
Parish: Fontstown
Barony: Offaly West
Classification: Field system site
Cartography: Marked on 1837 OS map as an obvious oval enclosure, and on 1907-09 OS map it has been shaped by field boundaries.

Aerial photographs N223 and N222, especially former, show cropmark of circular enclosure with moon-shaped enclosure attached at northeast.

SMR No.: KD018-006
Townland: Rathernan
Parish: Rathernan
Barony: Connell
Classification: Church
Cartography: Marked as Church on 1837 OS map, and as Church and graveyard on 1907-09 OS map.
Portion of west gable of red mortared sandstone survives. Corner stones of SW corner robbed. Northwest corner missing entirely. Graveyard has few headstones, overgrown and very worn. Some seem to be at least 18th Century in date.
1986

SMR No.: KD018-007
Townland: Rathernay
Parish: Rathernay
Barony: Connell
Classification: Togher site
Cartography: -
JK Millner, 1909, in Miscellanea Bog paths made of wood at Robertstown, Co Kildare, JRSAI vol. 39, mentions a rath on cultivated highland.

SMR No.: WM021-013
Townland: Riverdale
Parish: Killucan
Barony: Farbill
Classification: Earthwork
Cartography:-
Site is levelled. The only surviving feature is a natural rise with low smooth scarp at the edge from N-E.

SMR No.: ME035-011
Townland: Robinstown
Parish: Killaconnigan
Barony: Lune
Classification: Ringfort (2)
Cartography: -
A field fence curtails this site on the N from NNW-NNE. From NNE-ESE the bank consists of a scarp with no evidence of the external ditch. Elsewhere, the bank is about 3m wide, rising 30-40cm above the interior. The ditch is flat-bottomed and wet and 3-4m wide. Running from the perimeter at S to the perimeter at NNW, there is a silted-up drainage ditch which extends towards the stream to the south of the site. The original entrance may have been at the SE 4.5m wise. To the east of the site is a stone with what might be a bullaun. The stone is dissolved elsewhere by rain water. March 1985

SMR No.: ME035-012
Townland: Robinstown
Parish: Killaconnigan
Barony: Lune
Classification: Earthwork
Cartography: Hachured on 1910 OS map. Marked 'Fort' on 1835 OS map.
Small oval site covered with blackthorn bushes in low-lying poor grassland. To the NW of the site is a very large approximately circular enclosure, enclosed by a low bank with outside fosse. To W of latter enclosure is an old serpentine-like field bank. To the ESE and SE of the oval earthwork are other possible earthworks. These could be the result of drainage. To the east of the oval site is a limestone slab with natural depressions, some circular, and some foot-like. There is another curvilinear earthwork in a field to the east. July 1969

SMR No.: ME046-004
Townland: Rossan
Parish: Clonard
Barony: Upper Moyfenrath
Classification: Enclosure site
Cartography: Hachured on 1913 OS map. Marked 'Fort' on 1st edition 1837.
This site was defaced in 1955-59. All that remains is the probable scarped east end of a low prominent, EW ridge of sticky yellow clay. No trace of any features in field to the west of the lane which cuts through the west of the site. June 1969

SMR No.: KD031-019
Townland: Sheean
Parish: Kilberry
Barony: Narragh & Reban West
Classification: Enclosure site
Cartography: -
Aerial photograph (CUAP BDO 43, 1970) shows cropmark of fosse surrounding sub-rectangular area. Possibly an irregular moated site.

SMR No.: KD031-021
Townland: Skerries North
Parish: Narraghmore
Barony: Narragh and Reban West

Classification: Irregular enclosures
Cartography: Indicated on the 1907-09 OS map, as circular hachured enclosure just south of the Skerries crossroads.

SMR No.: KD009-008
Townland: Timahoe East
Parish: Timahoe
Barony: Clane
Classification: Church
Cartography: Indicated on both 1837 and 1911 OS maps.
Overgrown foundation of rectangular structure is visible. Small portion of walls adjacent to southwest corner still stand but are in very poor condition. The graveyard is oval shaped and is slightly smaller than the area enclosed by the modern wall. It is higher than the surrounding field level and contains a large number of headstones, many of 17th Century date.

SMR No.: KD009-009
Townland: Timahoe west
Parish: Timahoe
Barony: Clane
Classification: Castle site
Cartography: Marked on 1837 and 1911 OS maps ('site of').
In open, very slightly undulating pastureland. No visible traces remain.
November 1986

SMR No.: ME046-008
Townland: Tircroghan
Parish: Clonard
Barony: Upper Moyfenrath
Classification: Moated site
Cartography: Marked 'Fort' on the 1st edition OS map. Hachured on 1913 OS map.
In good, slightly undulating, pasture. Some stone in the banks. Possibly stone-walled around the edge of the platform. Slight indications of possible structure within. Shape is more a parallelogram than a rectangle. Very wide fosse. Could it be an earlier predecessor of the 16th Century fort at Tircroghan about 1.2m to ESE of this site? Owner says it was used in St. Finian's time as a defence against wild boar, and that the moat was water filled. March 1965

SMR No.: ME029-025
Townland: Woodtown West
Parish: Kildalkey
Barony: Lune
Classification: Ringfort
Cartography: Hachured 'Denalney's Fort'
Raised subcircular area defined by earthen bank (dims. 67m NNW-SSE, 61m WSW-ENE) with external fosse. Entrance at E.

SMR No.: ME026-026
Townland: Woodtown West
Parish: Kildalkey
Barony: Lune
Classification: Ringfort
Cartography: Hachured
Raised D-shaped area defined by high scarp with bank surviving W-N and E-SSW (dims. 39m NW-SE, 35m NE-SW). Original entrance at SE. No visible fosse.

## Appendix 2
## NMI Topographical Files

Townland: Ballynafagh
Parish: Ballynafagh
Barony: Clane
County: Kildare
Reg. No.: 1987:152
OS Map: 9/13
Description: Polished stone axehead
Long slim axehead of mottled grey-green stone (porphory). Straight with narrow pointed butt, shallow convex cutting edge with recent chipping. Found in a ploughed field. L 24cm, W cutting edge 7.4cm, max T 4.2cm

Townland: Ballyruin
Parish: Ballyroan
Barony: Clane
County: Laois
Reg. No.: 1984:139
OS Map: 18
Description: Wooden beetle
A wooden beetle with evidence of charring at the butt

Townland: Blackwood
Parish: Kilberry
Barony: Narragh and Reban West
County: Kildare
Reg. No.: IA/21/82
OS Map: 31
Description: Shoe
Late medieval (16th/17th century) shoe found in a ploughed field. Strap buckle with single loop and scallop shell designs on bronze buckle. Found in a ploughed field.

Townland: Boherbaun
Parish: Harristown
Barony: Offaly West
County: Kildare
Reg. No.: IA/543/1947
OS Map: 31
Description: Bog butter

Townland: Bracklin
Parish: Killulagh
Barony: Delvin
County: Westmeath
Reg. No.: 1964:83
OS Map: 14/21
Description: Wooden Lid
In very good condition although probably more circular in plan. Originally flat with a narrow handle projecting upward along its centre. Handle slightly wider at the bottom than at the top and has sub triangular depressions roughly cut out of both sides. Found 5ft deep while cutting turf.

Townland: Bracklin
Parish: Killulagh
Barony: Delvin
County: Westmeath
Reg. No.: 1959:31
OS Map: 14/21
Description: Bronze Sword (blade of)
Blade of bronze flange hilted sword. Found while using bagger machine, break is ancient and probably a casting flaw. The point and edges are very sharp, cross section is a narrow pointed oval. L 35.5cm, W (at fractured end) 2.9cm. Dated to 900-500BC.

Townland: Bracklin
Parish: Killulagh
Barony: Delvin
County: Westmeath
Reg. No.: 1959:09
OS Map: 14/21
Description: Neolithic pottery vessel
Mineral grits incorporated into the core. Eternally decorated with oval and round impressions. Found while turf working.

Townland: Bracklin
Parish: Killulagh
Barony: Delvin
County: Westmeath
Reg. No.: 1962:243
OS Map: 14/21
Description: Polished stone axehead
A polished stone axehead with both broad faces convex. Bevelled cutting edge now slightly damaged. The narrow butt has a large abrasion on one broad face. This may be of recent occurrence. L 12.3cm, max W 6.4cm, max T 3.4cm. Found 1ft down while digging.
Townland: Cashel
Parish: Abbeyleix

Barony: Cullenagh
County: Laois
Reg. No.: IA/244/1988
OS Map: 18
Description: Bog butter
Found by BnM worker when hand cutting drain across field

Townland: Cashel
Parish: Abbeyleix
Barony: Cullenagh
County: Laois
Reg. No.: 1971:1007
OS Map: 18
Description: Bog butter
Series of horizontally placed concentric lines indicate butter was originally in a bag/container made of organic material (probably straw) which no longer survives

Townland: Clogorrow
Parish: Kilberry
Barony: Narragh and Reban West
County: Kildare
Reg. No.: IA/543/1947
OS Map: 31/35
Description: Bog butter
Correspondance and acquisition from 1941. Lump weighs 3 stone and according to finder pieces of basket found with it

Townland: Clonadacasey
Parish: Clonenagh/Clonagheen
Barony: Maryborough West
County: Laois
Reg. No.: 1943:115
OS Map: 17/18
Description: Leather shoe
Found 4ft down in a bog ('Clonad' bog) being cut for the first time

Townland: Clonaddoran
Parish: Clonenagh/Clonagheen
Barony: Maryborough West
County: Laois
Reg. No.: 1966:98
OS Map: 18
Description: Slate spearhead
Portion of a slate spearhead. Pointed end missing. Tang, which is damaged on one edge was shaped to a blunt point apparently by cutting the soft stone with a knife. The faces are plain except for longitudinal striations. Edges are sharp. Cross-section a pointed oval. Made of Chloritic slate whose provenance is not local. L (now) 18.05cm max W 4.1cm, max T 9mm. Found 10-12ft deep in bog, 18 inches from the bottom of the bog. Found 10-12ft down in bog

Townland: Clonaddoran
Parish: Clonenagh/Clonagheen
Barony: Maryborough West
County: Laois
Reg. No.: 1973:194
OS Map: 17/18
Description: Leather bag
Four pieces of leather stitched together by leather thongs to form a cone. At narrow end two flaps, each slit to form a button hole shaped perforation. Internal loop formed by double strap attached to seams. Found 6-10ft down in the bog

Townland: Clonaddoran
Parish: Clonenagh/Clonagheen
Barony: Maryborough West
County: Laois
Reg. No.: IA/148/60
OS Map: 17/18
Description: Wooden stakes, flint arrowhead, leather bag, leather sandal
Two pointed wooden stakes, found in an upright position, probably of oak, found with their points about 2ft above gravel bottom of bog. Larger was 1.25m long, 10cm in diameter
Lozenge shaped flint arrowhead about 1½ - 2 inches long attached to an 8inch long wooden shaft found about 10ft deep in bog on or near its bottom.
About 1950 a small leather bag was found about 10ft deep on the gravel bottom of the bog. Made of a single piece of leather and tied at the top with string. Contained a quantity of hazelnuts. 9 inches high and 4 inches in greatest diameter.
About 1950 a leather sandal found 8-10ft down in 'Thogher' bog. Made of a single piece of leather. Composed of a sole, two straps around heel and two straps across instep.

Townland: Clonaddoran
Parish: Clonenagh/Clonagheen
Barony: Maryborough West
County: Laois

Reg. No.: 1960:576
OS Map: 17/18
Description: Leather shoe
Lucas type 4 leather shoe (500-100AD) made from a single piece of leather the heel seem was laced with a leather thong and the toe piece was formed by running a leather thong through a series of slits and pulling it tight to gather the margin of the leather around the foot. Opposing slits in the sides between the heel and the toe piece were for a thong to fasten the shoe across the wearers instep. L 22.5cm. Found during turf cutting operations, 10ft deep in 'Clonad Bog'

Townland: Clonaddoran
Parish: Clonenagh/Clonagheen
Barony: Maryborough West
County: Laois
Reg. No.: 1986:38
OS Map: 17/18
Description: Animal skin
A piece of animal skin rolled into a ball, triangular in shape with straight cut edges. L 53cm found at a depth of between 0.20 and 2.5m in the bog during peat milling

Townland: Cloncourse
Parish: Clonenagh/Clonagheen
Barony: Maryborough West
County: Laois
Reg. No.: 1946:329
OS Map: 12/17
Description: Hammerhead stone
Perforated hammerhead stone, cylindrical in shape with rounded ends, one narrower than the other. L 8.5cm, narrow end 4.9cm, wider end 5.45cm in diameter. The perforation which is vertical sided is 2cm in diameter. No evidence of great use. A perforated hammerhead stone found during turf cutting

Townland: Clondalee More
Parish: Killyan
Barony: Upper Moyfenrath
County: Meath
Reg. No.: 1963:5
OS Map: 41
Description: Bronze Sword Blade (portion)
Portion of a bronze sword blade broken at each end in ancient times. Longitudinal S bend.Cross section is a pointed oval. Portion of surface heavily patinated. L 71.1cm, max W 3.8cm, max T 5.5cm. Found 10ft deep in BnM Ballivor Works at outlet of machine

Townland: Clonkeen
Parish: Clonenagh/Clonagheen
Barony: Maryborough West
County: Laois
Reg. No.: IA/144/1963
OS Map: 12/17
Description: Piece of hoof
Identified as the hoof of an unshod animal – horse, donkey or mule. Found while cutting turf

Townland: Clonycavan
Parish: Killaconnigan
Barony: Lune
County: Meath
Reg. No.: 2003
OS Map: 35
Description: Partial Bog Body
Partial human remains recovered at the tram screen at Ballivor works in Feburary 2003. Find spot examined but no further remains were recovered. Dated to Iron Age

Townland: Clonycavan
Parish: Killaconnigan
Barony: Lune
County: Meath
Reg. No.: 1949:1
OS Map: 35
Description: Brass dish or cauldron
Late medieval brass dish or cauldron hammered from a single sheet of brass. Found in trench 3ft from surface of 'Hill of Down' bog while making a drain

Townland: Clonycavan
Parish: Killaconnigan
Barony: Lune
County: Meath
Reg. No.: IA/29/1994
OS Map: 35
Description: Leather Shoe
Found in milled peat and reported by Terry Bracken, BnM

Townland: Colt
Parish: Clonenagh/Clonagheen
Barony: Maryborough West
County: Laois

Reg. No.: IA/179/86
OS Map: 18
Description: Bog butter

Townland: Colt
Parish: Clonenagh/Clonagheen
Barony: Maryborough West
County: Laois
Reg. No.: IA/254/1990
OS Map: Bog butter

Townland: Colt
Parish: Clonenagh/Clonagheen
Barony: Maryborough West
County: Laois
Reg. No.: 1939:125
OS Map: Copper axehead
Flat copper axehead, found near a low mound on the surface of a meadow while picking off loose stones

Townland: Coolronan
Parish: Killaconnigan
Barony: Lune
County: Meath
Reg. No.: IA/186/1952 1952:10
OS Map: 35
Description: Bog butter, hair, textile and leather
Bog butter, hair, textile and leather found together rolled up in a ball at a depth of 7-12ft in a bog

Townland: Craddanstown
Parish: Killucan
Barony: Farbill
County: Westmeath
Reg. No.: none
OS Map: 21
Description: Giant Irish Deer
Portion of an antler and ends of two long bones revealed situated in a river bank at a point where a land drain runs into the river Deel. The river has been deepened and widened by OPW, the remains were undisturbed by this but were revealed when part of a bank collapsed

Townland: Derryguinnigan
Parish: Geashill
Barony: Geashill
County: Offaly
Reg. No.: IA/61/1954
OS Map: 25
Description: Bog road
Reported by Liam Sheeran, Killeigh. Bog road only seen at certain times when bog is passable (same as IA/87/1957)

Townland: Derryguinnigan
Parish: Geashill
Barony: Geashill
County: Offaly
Reg. No.: IA/87/1957
OS Map: 25
Description: Bog road
Reported by William Mitchell in 1957. Described as 'single oak logs laid end to end, from island in bog (same as IA/61/1954)

Townland: Derryguinnigan
Parish: Geashill
Barony: Geashill
County: Offaly
Reg. No.: IA/61/1954
OS Map: 25
Description: Leather shoe
Mentioned with bog road at same location. Discovered during turf cutting operations by Liam Sheeran, Killeigh

Townland: Gorteen
Parish: Clonenagh/Clonagheen
Barony: Maryborough West
County: Laois
Reg. No.: 1979:87
OS Map: 12
Description: Stone object
A perforated sandstone object, plano convex in section. The convex surface is gound, the flat surface rough and uneven. The object is circular in outline with a central circular perforation. It is wider at the convex face and narrower at the flat face. D 8.8cm, max T 3cm, max D of perforation 2.6cm, min D of perforation 1.5cm. Found 2m deep in BnM Coolnamona works while digging a field drain.

Townland: Grange Mor
Parish: Killucan
Barony: Farbill
County: Westmeath
Reg. No.: 1934
OS Map: 21

Description: Leather Shoe
Found 12ft deep in a bog at Grange More, Co. Westmeath

Townland: Grange Mor
Parish: Killucan
Barony: Farbill
County: Westmeath
Reg. No.: w.216; A537
OS Map: 21
Description: Stone Axehead
A stone axehead found lying on gravel at bottom of bog, 1.8m deep not later than 1861

Townland: Iry
Parish: Clonenagh/Clonagheen
Barony: Maryborough West
County: Laois
Reg. No.: 1984:2
OS Map: 12
Description: Gold fibula
Gold fibula with hollow evenly expanded terminals and solid bow in good condition found while stacking sods of turf. One terminal damaged. Outer surface of each terminal is decorated with a series if three raised ribs (set concentrically inside the rim). Measurements: max W 14.84cm, undamaged terminal max D 5.6x5.4cm, damaged terminal 5.15x5.95cm, max external width of bow8.3cm, max internal W of bow 7.1cm, T of bow at junction of terminal 0.6cm, max T of bow 0.83cmFound while stacking sods with a cutting machine.

Townland: Killeenmore
Parish: Geashill
Barony: Geashill
County: Offaly
Reg. No.: 1938:8558-8559
OS Map: 25
Description: 2 Bronze spearheads
Found during ploughing 20 years apart and about ½ mile apart. Bronze Age leaf shaped spearheads.

Townland: Killeigh
Parish: Geashill
Barony: Geashill
County: Offaly
Reg. No.: 1998:25
OS Map: 25
Description: Wood
Piece of wood, charred at both ends, 32.3cm in length, circular in cross section with max D of 2cm

Townland: Killeigh
Parish: Geashill
Barony: Geashill
County: Offaly
Reg. No.: none
OS Map: 25
Description: Carved stone head
Medieval carved stone head. 7 inches x 5 inches made from limestone. Found in rubble by a local man at the site of a reputed nunnery.

Townland: Lisclogher
Parish: Castletowndelvin
Barony: Delvin
County: Westmeath
Reg. No.: 1965:54
OS Map: 14
Description: Bronze axehead
Bronze axehead with deep side flanges and stop ridge. Flanges and stop ridge coalesce to form a pocket on each side of the central septum. Found 3m deep while cuttings turf in Tigue Estate/Lisclogher Bog

Townland: Lisclogher
Parish: Castletowndelvin
Barony: Delvin
County: Westmeath
Reg. No.: IA/104/1982
OS Map: 14
Description: Wood
Fourteen pieces of wood collected. At least half natural, the others 'worked' to a point but crudely made

Townland: Mylerstown
Parish: Rathernan
Barony: Connell
County: Kildare
Reg. No.: 1939:508
OS Map: 18
Description: Flint fragment

Townland: Newtownbert
Parish: Kilberry
Barony: Narragh & Reban West
County: Kildare
Reg. No.: IA/18/1967
OS Map: 31

Description: Bog butter
Roughly cylindrical lump with portions of wicker-work wrapping 6ft below bog surface

Townland: Oldcourt
Parish: Kilberry
Barony: Narragh & Reban West
County: Kildare
Reg. No.: 1945:178
OS Map: 31
Description: Leather shoe
Leather shoe found at Kilart Bog while cutting turf

Townland: Oldtowndonore
Parish: Downings
Barony: Clane
County: Kildare
Reg. No.: 1976:21
OS Map: 18
Description: Stone Axehead
A long butted polished stone axehead made from fine grained sedimentary rock, grey brown in colour. Found in a ploughed field reclaimed from bog.

Townland: Oldtown
Parish: Clonenagh/Clonagheen
Barony:
County: Laois
Reg. No.: 1986:38
OS Map: 17/18
Description: Animal skin
Rolled into a ball, if spread out, flat triangular in shape with cut edges

Townland: Park
Parish: Ballyboggan/Clonard
Barony: Upper Moyfenrath
County: Meath
Reg. No.: 1974:38-41B
OS Map: 46
Description: Hoard
A hoard found in surface soil consisting of a bronze sword (fragment), a hollow bronze ring, chisel, head and shank of sunflower pin

Townland: Raheens
Parish: Carragh
Barony: Clane
County: Kildare
Reg. No.: 1891:12
OS Map: 18
Description: Bronze Axehead

Townland: Riverdale
Parish: Killucan
Barony: Farbill
County: Westmeath
Reg. No.: 1928:640
OS Map: 21
Description: Iron Bell
Fifth century ecclesiastical bell of iron dipped in bronze. Was found in a bag and has marks from being wrapped in canvas. Found in 1909 in a bog in the townland of Riverdale

Townland: Riverdale
Parish: Killucan
Barony: Farbill
County: Westmeath
Reg. No.: 1828:17
OS Map: 21
Description: Stone Axehead
File not present

Townland: Sheean
Parish: Kilberry
Barony: Narragh & Reban West
County: Kildare
Reg. No.: 1945:371
OS Map: 31
Description: Leather shoe
Found in BnM Kilberry works

Townland: Timahoe East
Parish: Timahoe
Barony: Clane
County: Kildare
Reg. No.: 1943:130-132
OS Map: 9
Description: Timber, yoke & object
130: A wooden yoke found at a depth of 5ft, made from a single piece of fir in perfect condition
131: Part of a solid wooden block wheel
132: A 'deel' timber found at the same depth as yoke. 2½ft long 1¼inch in diameter with a hole at one end., a wooden yoke

Townland: Timahoe East
Parish: Timahoe
Barony: Clane

County: Kildare
Reg. No.: 1950:7
OS Map: 9
Description: Axe
Iron axe, socket (broken) formed by folding tail of the axe over and welding it against one cheek to form a loop. Found during turf cutting operations

Townland: Timahoe East
Parish: Timahoe
Barony: Clane
County: Kildare
Reg. No.: 1941:1120
OS Map: 9
Description: Bronze Spearhead

Townland: Timahoe East
Parish: Timahoe
Barony: Clane
County: Kildare
Reg. No.: IA/7/1978
OS Map: 9
Description: Leather shoe
Lucas type 3 leather shoe. Section of sole missing at toe and piece missing near heel seam. L26cm, max W 10cm found in a bag of turf from Timahoe
Townland: Timahoe East
Parish: Timahoe
Barony: Clane
County: Kildare
Reg. No.: 1938:8560
OS Map: 9
Description: Stone axe (fragment)
Fragment of a large stone exehead fround in a small paddock at Timahoe

Townland: Ummeras Beg
Parish: Lackagh
Barony: Offaly West
County: Kildare
Reg. No.: none
OS Map: 21
Description: Firkin of butter
Wooden vessel found during turf cutting. No top or bottom, no nails or hoops and filled with butter

## Appendix 3

## Wood Species Identification

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INTRODUCTION

Forty four waterlogged samples were sent for identification from waterlogged sites in Co Laoism Meath and Kildare and to assess suitability for C14 dating..

MATERIALS AND METHODS

All wood samples were prepared using standard techniques and examined using transmitted light with magnifications of up to 400x on an Olympus BX41 microscope. Material was identified and compared, when necessary, with samples in the wood slide collection housed in the Utrecht University branch of the National Herbarium of the Netherlands and relevant literature (e.g. Schweingruber 1990). The sections cut were examined for signs of infiltration or infestation, which might affect the results if subject to 14C dating.

RESULTS

The anatomy of the material was consistent with the taxa or groups of taxa given in Table 1. When a genus is represented by a single species in the native British flora it is named as the most likely origin of the wood although it must be noted that wood anatomy alone is often not enough to secure identification to individual species. Anatomical characters of the samples studied are consistent with the following taxa: Alnus sp., Betula sp., Fraxinus excelsior, Corylus avellana, Salix sp., Populus/Salix sp., Acer sp., Maloideae (genera and species cannot be differentiated beyond subfamily on wood characters alone) and Quercus sp.. Classification follows that of Tutin et al (1964-1980).

Table 1. Summary of the identifications of the waterlogged wood

### Gilltown, Co. Kildare

| Sample | Taxonomic affinity | Comments |
|---|---|---|
| KD-GTN001a | Alnus | relatively hard and no evidence of decay or infestation |
| KD-GTN001c | Betula | no evidence of decay or infestation |
| KD-GTN001d | Alnus | wound tissue present but no evidence of decay or infestation |
| KD-GTN002 | Alnus | no evidence of decay or infestation |
| KD-GTN002 | Betula | very soft/wet, no evidence of decay or infestation |
| KD-GTN005c | Betula | wet and soft, no evidence of decay or infestation |
| KD-GTN005e | ?Maloideae | no evidence of decay or infestation |
| KD-GTN005g | Alnus | relatively soft, ?decayed, fungal hyphae present |
| KD-GTN008 | Betula | presence of fungal hyphae |

### Prosperous, Co. Kildare

| Sample | Taxonomic affinity | Comments |
|---|---|---|
| KD-PPS001 | Fraxinus | no evidence of decay or infestation |

| Sample | Taxonomic affinity | Comments |
|---|---|---|
| KD-PPS002 | Alnus | no evidence of decay or infestation |
| KD-PPS003 | Corylus avellana | no evidence of decay or infestation |
| KD-PPS004 | Alnus | relatively hard and no evidence of decay or infestation |
| KD-PPS005 | Alnus | relatively hard and no evidence of decay or infestation |

### Allen, Co. Kildare

| Sample | Taxonomic affinity | Comments |
|---|---|---|
| KN-ALN002 | Betula | presence of fungal hyphae |

### Cashel, Co. Laois

| Sample | Taxonomic affinity | Comments |
|---|---|---|
| LS-CSL001 | Salix | presence of frass |
| LS-CSL003 | Fraxinus excelsior | relatively soft but no evidence of decay or infestation |
| LS-CSL004 | Alnus | very wet, no evidence of decay or infestation |
| LS-CSL008a | ?Populus/Salix | presence of abundant frass and fungal hyphae |
| LS-CSL008c | Alnus | signs of degradation |
| LS-CSL008e | Alnus | relatively hard and no evidence of decay or infestation |
| LS-CSL008e | Acer | relatively hard and no evidence of decay or infestation |
| LS-CSL008h | Salix | presence of frass |
| LS-CSL011 | Alnus | compressed, presence of frass and decay |
| LS-CSL018 | Populus/Salix | presence of fungi |

### Coolnacartan, Co. Laois

| Sample | Taxonomic affinity | Comments |
|---|---|---|
| LS-CTN001 | Salix | fungal hyphae and invertebrates present |
| LS-CTN002 | Salix | very dry, no evidence of decay or infestation |

### Kinnegad, Co. Meath

| Sample | Taxonomic affinity | Comments |
|---|---|---|
| ME-KND001b | Acer | very soft, decay and presence of epidermal cells, palynomorphs and fungal hyphae |
| ME-KND001c | Alnus | no evidence of decay or infestation |
| ME-KND004 | Quercus | relatively soft/wet but no evidence of decay or infestation |
| ME-KND005a | Populus/Salix | no evidence of decay or infestation |
| ME-KND006a | Corylus avellana | no evidence of decay or infestation |
| ME-KND006a (2) | Alnus | relatively hard and no evidence of decay or infestation |
| ME-KND007a | Corylus avellana | relatively hard and no evidence of decay or infestation |
| ME-KND008a | Alnus | no evidence of decay or infestation |
| ME-KND010 | Alnus | presence of f afew fungal hyphae |
| ME-KND011a | Betula | no evidence of decay or infestation |
| ME-KND012a | Alnus | no evidence of decay or infestation |
| ME-KND013a | Acer | relatively soft, fungal hyphae present |
| ME-KND014 | Alnus | no evidence of decay or infestation |
| ME-KND015 | Maloideae | relatively soft but no evidence of decay or infestation |
| ME-KND016 | Alnus | relatively soft but no evidence of decay or infestation |
| MD-KND017a | Betula | no evidence of decay or infestation |
| ME-KND019a | Corylus avellana | no evidence of decay or infestation |

## DISCUSSIONS AND CONCLUSIONS

The size of the wood samples all indicate that the material are from organs less than 100 years old and therefore any error introduced through the 'old wood effect' would be less than the error in the 14C dating (i.e. 50 years). Of the 44 samples studied most were found to be suitable for 14C dating as they showed no evidence of decay or infestation, which could lead to contamination of the 14C signal. However there were several, namely KD-ALN002, KD-GTN005g, LS-CSL001, LS-CSL008a, LS-CSL008c, LS-CSL008h, LS-CSL011, LS-CTN001, ME-KND001b, and possibly LS-CSL018 that are not considered suitable for dating purposes.

Fungi target wood and thus do not introduce fresh carbon into the system, which might otherwise lead to contamination and affect the 14C dating. Moreover within waterlogged material it could be assumed that the wood source is, and has been, that in which the fungi has been found. In principle the fungi would then have a 14C date equivalent to that of the wood but since this is an open system this cannot be guaranteed. Selective digestion by fungi may also result in a changed 13C/12C ratio on which the 14C dates are calculated. Therefore any wood specimen showing the presence of fungi is not considered suitable for dating purposes.

The presence of other organic entities such as palynomorphs, epidermal cells, invertebrates, frass etc (see Table 1) also have the potential to affect the 14C date and therefore material exhibiting the presence of these entities, are also not considered suitable for dating purposes.

Of the material deemed suitable for dating, the subsample to be used should be from (i) relatively dry material and (ii) inner wood, rather than outer wood (especially if the material has been wrapped in clingfilm) to reduce any possible contamination from non-coeval organics in the water infiltrating the material and from the carbon in the plastic bags and/or clingfilm respectively.

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# APPENDIX 13-4

***ANCIENT OBJECTS IN IRISH BOGS AND FARMLANDS 1942***



AN ROINN OIDEAĊAIS

# NEIṪE ÁRSA I BPORTAĊAIḂ NÓ I ḂFEIRMEAĊAIḂ ÉIREANN

## TREÓIR DO LUĊT A ḂFAȘÁLA

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## A GUIDE FOR FINDERS

PREPARED BY
HAROLD G. LEASK, M.R.I.A.I., M.R.I.A.
*Inspector of National Monuments*

1942

(Reprinted 1952)



# neiċe ársa i bportaċaiḃ nó i ḃpeirmeaċaiḃ éireann

Mar a haiṫniġtear iad agus cad ba ċóra a ḋéanamh in a ḋtaoḃ, maille le halt ar ġréiṫre de ċultúr fó-luċta.

## treóir do luċt a ḃfaġála

Foillsiġṫe ag
an Roinn Oideaċais
1942

# ANCIENT OBJECTS IN IRISH BOGS AND FARM LANDS

HOW THEY MAY BE RECOGNIZED AND WHAT TO DO ABOUT THEM, WITH A NOTE ON ARTICLES OF FOLK CULTURE

## A GUIDE FOR FINDERS

PREPARED BY
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AND ISSUED BY
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# neiṫe árṡa i bportaċaiḃ nó i ḃfeirmeaċaiḃ éireann

## A mór-líon agus a táḃaċt, agus cad ba ċóra do luċt a ḃfaġála do ḋéanaṁ

D'fás portaċa móna Éireann trí ċóṁ-oibriú teasa na gréine agus iomadamlaċt na fearṫainne a ṫuiteas in ár ndúṫaiġiḃ. Is iad ár bpríoṁ-adḃar connaiḋ dúṫċasaiġ iad, agus is iongantaċ mar a coimeádaid ó loḃadh gaċ cineál gréiṫre déanta d'adhmad, de leaṫar, de ċnáṁ, de ṁiteal, agus fiú éadaiġe figṫe. Is éaċtaċ iomadaṁail an uiṁir de neiṫiḃ den tsórt san a fuaraṫas ċeana féin i bportaċaiḃ Éireann ; is beag tír san Eóraip d'féadfadh dul in iomadh linn sa cúrsa so. Toisc go bfuil anró agus easba adḃair teine in ár ndúṫaiġiḃ i mbliadhna caiṫfar breis mór móna do ḃaint agus do ṫriomuġadh seaċas mar a deimeadh le linn aon-aġa de stair ár dtíre ; teastuiġeann na milleóin tonna dí, agus caiṫfidh gaċ portaċ a ċion féin do ċur san áireaṁ.

Sa mór-ġearradh móna so a caiṫfear a dhéanaṁ, is ró-dheallraṁṫaċ go bfaiġfear níos mó de neiṫiḃ árṡa i mbliadhna, ná mar a fuaraṫas in aon-bliadain riaṁ ċeana. Is é an Músaem Náisiúnta an Donn-ḋuireaċt Stáit le n-a mbaineann an scéal so, agus tá imṡníoṁ ar an luċt stiúrṫa ar eagla go scaillfidhe nó go loiṫfidhe aon rud luaċṁar. Dhead muinntir Éireann go hiomlán ar an aigne céadna.

Is é an Músaem Náisiúnta an t-ionad ceart ċun neiṫe árṡa do ċoimeád, agus bíonn fonn ar an luċt Stiúrṫa i gcóṁnaidhe, fiaċaḋ le haon rud in a gcuirfidhe suim. Go firmneaċ, cuireann an dliġe sin "Aċt na Séadċomartaí Náisiúnta," 1930, d'fiaċaiḃ ar faġálaidhe rudaí ar a dtugtar "Rud árṡa"—téarma in a dtuigtear gaċ ní in-aistiriġṫe, mar úrlisí, soiṫiġe, airm, cnáṁa a láiṁ-ġreannaḋ, in aon focal, airteaġal sean-déanta ar biṫ—é d'innsint do ḋuine de sna Gárdaíḃ Síoċċána beaḋ ar obair sa ċeanntar, nó do Ċaoṁnaidhe Árs-seóid Éireann, in san Músaem Náisiúnta in Áṫ Cliaṫ. Cuiṁniġtear go bféadfaḋ rud a ṡamhlóċaḋ an faġálaidhe a beiṫ gan táḃaċt, nod áiseaṁail do ṫaḃairt i dtaoḃ gné éigin de béasaiḃ, de nósaiḃ nó de ṡliġtiḃ marṫa ár n-árs-ṡinnsear ; uime sin, níor ċóir aon rud d'á luiġeadh do briseadh ná do ċaiṫeaṁ uaiṫ.

Aċ ní hé gaċ aoinne a ṫuigeann cad ba ċeart a déanaṁ le hearradh árṡa ċun é do ċoimeád iomlán gan máċail, go sroiseann sé an duine cóir. Fairis sin, bíonn iarraidh fé leiṫ ag an Músaem ar earraidiḃ gur eól go beaċt cá bfuaraṫas iad, agus méid an doiṁnis in ar fríṫeadh iad. Is iad na rudaí sin is mó maiṫeas don oibriḋe leiṫilleaċ in san Músaem, agus é ad' iarraidh pictiúra de ṡaoġal an daonnaid



# ANCIENT OBJECTS IN IRISH BOGS AND FARM LANDS

## Their great number and importance and what the finders should do

The turf bogs of Ireland, which we owe to the sun, warmth and too abundant rainfall of the remote past, are not only our main native source of fuel but are quite remarkable for the way in which they preserve all kinds of objects of wood, leather, bone, metal, and even woven materials. Indeed, the number of such things which have been found already in Irish bogs is truly enormous ; few other countries in Europe can match ours in this respect. In this year of stress and shortage of fuel much more turf must be cut and won than at any previous time in the history of the country ; millions of tons are wanted and every bog must yield its quota.

In the very extensive cutting which will have to be done it is very probable that more ancient things will come to light than in any single year before. The National Museum, which is the State institution concerned, is anxious that nothing of value found should be lost or destroyed. With this object all Irish people will agree.

The proper place for ancient objects is the National Museum, which is always ready to receive those it thinks of interest. Indeed, the law, in the National Monuments Act of 1930, requires that the finder of what is called an "archaeological object"—a term which includes all ancient movable things : tools, vessels, weapons, bones engraved by hand, in fact any ancient manufactured article—shall report the find to a member of the Gárda Síochána on duty in the district or to the Keeper of Irish Antiquities in the National Museum in Dublin. Let it be remembered that even an object which seems to the finder to be of little importance may give a useful clue to some aspect of the life, manners, and customs of our remote ancestors ; nothing, therefore, should be needlessly broken or thrown away.

But not everyone knows what to do with an ancient object to keep it whole and undamaged until it reaches the proper hands. Moreover the Museum wants most the objects of which the positions are best known ; that is to say, those of which the exact spot and depth below the surface are exactly known. Finds like these are the most useful to the specialist in the Museum who is trying to piece together a

i dtúis doiléir na Staire, nó sul ar breacaḋ scríḃinní ar biṫ, do ċur le a ċéile. Iarrtar, mar sin, ar luċt bainte móna, ḃeiṫ ag súil go ḃfuiġidís sean-earraiḋe sa ṗortaċ, agus ṫar gaċ ní, an spota cruinn agus an doiṁneas beaċt in a ḃfuaraṫas iad, do ṫaḃairt fé ndeara.

Ná dearṁadtar go gcrapfaiḋ agus go gcnagfaiḋ earraḋ aḋmuid nó leaṫair, má fágtar é ag triomuġaḋ fá an ngréin nó fá an ngaoiṫ, agus go gcaiṫtear é do ċoimeáḋ tais ; gur gnáṫ gur luaiṫre de ċorp daonna a dóġaḋ, agus b'ḟéidir blúirín de úṁa, a ḃíonn istiġ in árṫaċ cré—aċ gur ab ar éigean a ḃíonn ór ċoiḋċe ann—, agus, de ḃríġ gur b'ana-ḟuiris é a ḃriseaḋ, gur cóir é a ġlacaḋ ana-aireaċ, ana-ċáiréiseaċ, agus gan é d'ḟolaṁuġaḋ ar aon ċúinse. Is fíor go ḃfuaraṫas earraiḋe óir i bportaċaiḃ, agus in áiteannaiḃ náċ iad, agus má ḃíonn duine cóṁ háḋṁaraċ san agus go ḃfuiġiḋ sé earraḋ óir, cuiṁniġeaḋ sé, má is earraḋ fíor-ársa é, go ḃfuil aige rud is luaċṁaire i ḃfad ná a ṁeáḋaċaint, don Ṁuseum. Mar ṁaiṫe leis féin agus a ḃfuiġiḋ sé as, ba ċóir dó an faġáltas d'aṫ-ḟriteal gan ṁoill do ḋuine de sna Gárdaíḃ, nó díreaċ don Ṁúseum, nó tríd an maor má ḃíonn a leiṫéid ann.

Seo iad na trí rudaí ba ċeart d'ḟear bainte móna do ḋéanaṁ, má ḟaġann sé earraḋ ársa :—

A haon—má caiṫtear an t-earraḋ d'aistiriú as an áit, i dtreó go raġaḋ an obair ċun cinn, ba ċeart dó é d'aistiriuġaḋ in a iomláine, cóṁ haireaċ agus is féidir é, agus nóta do scríoḃaḋ i dtaoḃ an spota in a ḃfuaraṫas é, agus an ḟaid sliġe do ḃí sé fé ḋromċla na talṁan. Aċ dá mb'ḟéidir é d'ḟáġaint san áit in a ḃfuaraṫas é ar feaḋ cúpla lá, go ḃfaġaḋ oifigeaċ ó'n Ṁúseum caoi ar é d'ḟeicsint ann, do b'é a b'ḟeárr ná a ċéile. Ba ċóir cuid den ṁóin a ḃí in a ṫimċeall d'ḟáġaint timċeall air.

A dó—má is earraḋ aḋmuid, nó leaṫair, nó éadaiġ fiġte é, ba ċeart é do ċoimeáḋ tais le móin ḟliċ nó le caonaċ, in áit a ṡlánata, go gcóiriġiḋ an leiṫleasaiḋe é.

A trí—ba ċeart dó féin nó d'á ṁaor innsint in a ṫaoḃ cóṁ luaṫ agus is féidir, do sna Gárdaíḃ is neasa ḋóiḃ, nó—scríoḃaḋ in a ṫaoḃ go "Caoṁnaiḋe Árs-seóḋ Éireann," an Ṁúseum Náisiúnta, Áṫ Cliaṫ, a ainm agus a ṡeóla do ṫaḃairt dó, agus ainm an Ḃaile Fearainn in a ḃfuaraṫas an t-earraḋ. Ní gáḋ stampa ar an leitir.

Íocann an Ṁúseum Náisiúnta an cúiteaṁ is mó is féidir a hearraiḋiḃ a ṫeastuiġeann uaiḋ, agus féadfaiḋ luċt faġála a ḃeiṫ deiṁin de go ḃfuiġiḋ siad a gceart.



picture of the life and times of the people before written records or the dim, early periods of history. The turf cutter is asked, therefore, not only to keep his eyes open for objects in the bog, but to note just where and at what depth he finds them.

Let him remember that a wooden or leather article will shrink and crack if left to dry in the sun or wind and should be kept moist ; that a pottery vessel is easily broken and most probably contains only some human ashes and perhaps a bit of bronze, but seldom or never gold, and should be treated very tenderly and not emptied. Of course gold objects have been found in bogs and other places and the fortunate finder should remember that they have, if genuinely ancient, a greater value to the Museum than that of their mere weight. He should not delay—for his own sake—in reporting his find at once to the Gárda or the Museum directly or through the supervisor if there be one.

What then should the turf cutter do if he discovers some ancient object during his work? Three things not difficult to remember :—

First, if the object must be removed then and there to allow the work to go on, he should take it out whole as carefully as he can, making a note of where he found it and how far it was below the level of the bog. If he can leave it in its place for a few days, to give the Museum official a chance to see it there, so much the better. Some of the turf mould in which it actually lay should be kept with it.

Second, if the object is of wood, leather, or some woven material he should keep it damp in wet turf or moss in a safe place until it can be treated by the expert.

Third, he or his supervisor should tell the nearest Gardai about the find as soon as he possibly can, or write to the Keeper of Irish Antiquities, National Museum, Dublin, about it, giving his name and address and the name of the townland in which the find was made. The letter need not be stamped.

The National Museum pays the best possible compensation for the objects which it wishes to get and finders may be sure of the fairest treatment.

Aċ cionnus is eól d'fagálaiḋe gur fíor-iarsma sean-aoise an t-earraḋ a geibeann sé? Níl sé oilte ar na neiṫiḃ seo, agus ní féadann sé a ḃeiṫ deimin gur sean-earraḋ é, aċ amáin go moṫuigeann sé gur b'eaḋ. Ċun caḃruiġṫe leis is eaḋ a deimeaḋ na dearaiḋe agus na tuairiscí seo in ár ndiaiḋ. Léiriġeann na pictiúiri a il-oireaḋ d'earraiḋiḃ de gaċ sórt, a toġaḋ a hiomaḋ aċa a fuaraċas san am ċaiṫṫe, agus gur ċóir go gcaḃróċaiḋis leis ċun tuilleaḋ aċa d'aiṫint, cé náċ mbeiḋis go cruinn ar aon-ḋul.

## earraiḋe de miteal luaċmar

Is eól dealraṁ na miteal luaċmar, ór agus geal-airgeaḋ, cóṁ maiṫ san ċeana, ná siltear gur gáḋ iaḋ do léiriuġaḋ sa leaḃairín seo. Cé gur annaṁ a faiġtear iaḋ, do táiniġ a portaċaiḃ Éireann il-iomaḋ earraiḋe óir, mar atá, pláiṫíní tanaiḋe nó for-greanta d'ór ḃuailte, agus iaḋ órnáiḋiġṫe uaireanta ; órnáiḋí tanaiḋe, corrán-ċrotaċa ar a ḋtugtar "luanlaċa," nó "réleaċa" ; muincí bráġaḋ agus failiġe ḋorn de méaḋaiḃ éagsaṁla, go n-aiṫniġtear an fuirm oscailte díoḃ ar an gcuma a leaṫann an ceann saor díoḃ in a śórt cupáin nó cuanóiġe ; púiríní cruaḋa nó folaṁa, nó liaṫróiḋíní ; fáinní cluas, agus a lán aca casta ; fáinní muiníl, cosaṁail le failiġe ḋorn móra, cuṁanga ; fáinní méar, tura, nó le filliḋeaċa nó órnáiḋí, 7c. Is ana-iomaḋaṁail iaḋ na foirmeaċa in a ḃfaiġfiḋe earraiḋe óir.

Baineann dingiliní, pe aca d'ór nó d'airgeaḋ, le ré atá i ḃfaḋ níos déanaiġe ná na hearraiḋe óir a luaḋaḋ, aċ baineann luaċ staireamail leó, agus is mó an luaċ san ná a meáḋaċaint.

Is fánaiġe a geibtear earraiḋe geal-airgid ná earraiḋe óir féin, aċ do noċtaḋ failiġe ḋorn agus deilgne bráġaḋ den miteal so ó am go ham, maille le múnlaí in a mbrúġtí séalaí céaraċ, gíḋ go mbaimtear feiṁ a húṁa ċun na sprice céaḋna. Do geibtear geal-airgeaḋ, uaireanta, in a órnáiḋ in-śniṁte in earraiḋiḃ úṁa agus iaraiṁn.

**Ní ceart earraḋ d'aon tsórt mitil,—ór ná geal-airgeaḋ, copar, uṁa ná iarann—do ġlanaḋ, do ċuimilt, ná do scríoḃaḋ ar aon tsórt sliġe, tar éis duit é a noċtaḋ ; is luaċmaire i ḃfaḋ iaḋ an uair ná baintear leó.**

## focal don feirmeóir

Ní hin sna portaċaiḃ aṁáin a geibtear earraiḋe árda; do fuaraċas a lán aca ó am go ham, ar gnáṫ-ċalaṁ feirme. Ní hag tagairt atáimíd do ċaiṫe eólaiḋeaċta gur riaċtanaċ ceaḋúnas oifigeamail ċuige, agus ná tugtar san aċ do ḋaoiniḃ oilte go mbíonn scill leiṫleaċ aca ; noċttar na hearraiḋe seo le linn gnáṫ-oibre feirmeóireaċta, go



But how can a finder know that the object he finds is a genuine relic of the past? He is not learned in these things and, except for a feeling he has that the thing is an old one he cannot be sure about it. It is to help him that the drawings and descriptions to be found in the following pages have been made and written ; the pictures show a variety of objects of all kinds chosen out of the many which have been found in the past, and should help him to recognize others as well which may not be exactly similar.

## OBJECTS OF PRECIOUS METAL

The precious metals, gold and silver, are so well known in appearance that it has not been thought necessary to illustrate them in this small booklet. Even though such finds are rare there have come from Irish bogs a variety of gold objects :—thin plates and embossed discs of beaten gold, sometimes ornamented ; the thin, crescent, moon-shaped ornaments called lunulae ; gorgets (neck ornaments) and bracelets of different sizes, the open forms of which may be recognized by the way in which their free ends are spread into a sort of cup or navel shape ; solid or hollow beads or even balls ; earrings, often of twisted form ; neck-rings like very large thin bracelets ; finger rings, plain, coiled or ornamented, etc. The forms which gold objects may take are very numerous indeed.

Coins whether of gold or silver, belong to much later times than the gold objets mentioned, but they too have an historical value rather greater than that of their mere weight.

Silver objects are even more rarely found than those of gold, but bracelets and brooches of the metal have come to light from time to time, besides matrices or moulds for impressing wax seals, a purpose for which bronze was also used. Silver is sometimes found inlaid into bronze and iron articles as a decoration.

*No object of metal of any kind, gold, silver, copper, bronze or iron should be cleaned up in any way or filed, when found ; it is of far more value when untouched.*

## A WORD TO THE FARMER

It is not only in the bogs that ancient objects are found ; farm lands have also yielded many such from time to time. Apart from scientific excavations—which can only be carried out under licences granted for the purpose, and these only to specially skilled and trained persons —the ordinary operations of agriculture, particularly tillage and

mór-mór dísearáil agus cuireadóireacht. Do fuaradas ar talamh feirme cóm maith agus a fuaradas ar talamh portaig, formór mór na n-earraide a taisbeántar in sna léaráidib, go háirithe na ceastaí adlactan agus na pot-árthaige—ac gan na cloca creasa garda (leathanach a 11), ná earraide leathair (leath. a 20), ná admuid (leath. a 24), do cur san áireamh. Da ceart don feirmeóir beith ag súil le n-a leithéidib, agus a innsint do sna Gárdaíb nó don Músaem Náisiúnta láithreach, má gheibeann sé ceann.

Is minic a theagmuigeann soc céachta le lic nó le cloic clárda, ó n-a sé go dtí n-a naoi n-órlach fé bárr an talaimh. Tárluigeann, uaireanta, gur clúdaig iad so ar ceastaib adlactan mar uimir a 9 agus a 10 ar leathanach a 19. Ní ceart don treabadóir iad do milleadh, ac dul agus an scéal d'act-fhriteal láithreach, i dtreo go dtiocfad fear oilte ó'n Músaem agus é d'imfiúcad. Is fíor-tábachtach an rud ná brisfide, ná folamhuigtide, ná ná bainfide in aon cor leis an bpota criaid, an soitheach nó an crúiscín a bíonn in sna ceastaíb seo go minic (féach aris ar uimir a 9 agus a 10, leathanach a 19). In aimdeóin an tseana-scéil, **ní bíonn ór in sna prócaíb seo.**

## earraide fó-lucht

Tá earraide eile seachas an cuid árda a caithtear aníos le linn oibre feirme nó gearradh móna, gur mian linn go gcuirfide suim iontu ; iad san a baineann leis an gcultúr Gaedlach is déanmaige, agus ar a dtugtar Earraide fó-lucht. Gnáth-earraide a baineann le cúrsaí an lae, iad so, a hoibrigead in aimsir ár dtuismitheóir agus ár seanathaireacha ; a gcuid áruistí teaglaig, a gcuid éadaig, an trioscán, giúirléadaí feirme de gach sórt, gléas a hoibrigeadh cun snim nó cun figte, cun soillsigte na dtigte nó cun oín a cur suas, cun iascaireacta, cun báidhreacta nó cun fiadaig ; úirlisí i gcómair céirde leathair nó admuid nó iarainn—aon rud a soillsigeann an saoghal ná fuil i bfad imcigte, ac atá ag imeacht as ár gcuimhne go ró-tapaid. Taid na neithe seo uile go fíor-luachmar, i gcómair staire, agus beid átas i gcómnaide ar lucht stiúrtha an Músaem Náisiúnta scéala do clos in a dtaob.

## na sean-aoiseanna

Mar áis don léigteóir, roinnid scoláirí na sean-aoiseanna roimhstarda, agus na daoi-aoiseanna starda a luaidtear cóm minic sin in san leabairín seo, in a réannaib éagsamhla, d'Éirinn, mar leanas, go hachomair :—

| | | |
|---|---|---|
| An Daoi-ré Umha, | ó 1800 go 1400 | Roimh Chríost. |
| An Meán-ré Umha, | ó 1400 go 900 | R.C. |
| An Iar-ré Umha, | ó 900 go 250 | R.C. |
| An Ré Iarainn, | ó 250 R.C. go 500 | A.T. |
| An Daoi-ré Críostaide, | ó 500 A.T. go 1050 | A.T. |



drainage, uncover similar things. Almost all of the objects illustrated —especially burial cists and pottery but excluding those of crudely shaped flint (page 11) leather (page 20), or wood (page 24)—have been found in farm land as well as in the bogs.

The farmer should look out for them and tell the Gárda or the National Museum about them without delay.

It frequently happens that a plough strikes a flattish stone or flag at about six or nine inches below the surface of the ground. Such stones have often proved to be the covers of burial cists like 9 and 10 on page 19. The farmer should not destroy them but should report his find at once in order that the Museum expert should come and make an examination. It is particularly important that the earthenware pot, vessel or urn, which many of the cists contain (see again 9 and 10, page 19) should not be broken or emptied or, indeed, touched at all. Despite the old story *these pots do not contain gold.*

## FOLK OBJECTS

As well as ancient objects which are dug up in agricultural work or turf cutting there are others to which attention is here drawn : the more recent representatives of Irish culture which are called folk objects. These are the everyday things used by our parents and grandparents ; their domestic utensils, their dress, their furniture, farm implements of every kind, gear used in spinning and weaving, for lighting their houses and thatching their roofs, for fishing and boating and hunting, tools used for the crafts of leather, wood and iron working ; in fact, everything which illustrates the life of times not very long past but now rapidly being forgotten. All these things are of value for historical reasons and the National Museum will always be glad to hear about them.

## ANCIENT TIMES

The prehistoric and early historic times mentioned often in these pages are—for convenience—divided by scholars into different Ages or Periods, for Ireland, roughly as follows :—

| | | | |
|---|---|---|---|
| The Early Bronze Age | from | 1800 | to 1400 B.C. |
| Middle ,, | ,, | ,, | 1400 to 900 B.C. |
| Late ,, | ,, | ,, | 900 to about 250 B.C. |
| Iron Age | | ,, | 250 B.C. to 500 A.D. |
| Early Christian Period | | | 500 A.D. to 1050 A.D. |

## earraiḋe cloiċe

## úirlisí agus airm ċreasa

(feic l. a 11)

Tá earraiḋe cloiċe ar na hearraiḋiḃ is aosta ann, iad den ċloiċ ċreasa cruaiḋ, mín, bog-ḃán, buiḋe nó donn, nó de ċarraig éigin eile atá beagnáċ cóṁ cruaiḋ agus cóṁ do-ċaiṫte.

Na trí garḃ-earraiḋe is mó aca so a taisbeántar ṫall, is úirlisí ċloiċ-ċreasa iad de ṡórt fíor-ársa, agus bainid leis an ré cloiċe. Taisbeánann a ngairḃeaċt neaṁ-ionanntas láidir idir iad féin agus iad so atá uiṁiriṫe ó a 1 go a 10, mar bainid seo le réannaiḃ a ḃí níos mó ċun cinn i mineadas,—bainid na trí cinn deiriḋ, go cinnte, leis an Doiċ-ré Uṁa. Táid go léir beag—níl a 8 aċ órlaċ go leiṫ ar ḟaid, aċ tá an ceann is mó, uiṁir a 10, sé hórlaiġ go leiṫ ar ḟaid. Ceann saiġde is eaḋ gaċ ceann aca, aċ uiṁir a 9 agus a 10, agus lann-ḃeara is eaḋ iad san. Earraḋ ana-ṫanaiḋe, ana-ṁín, is eaḋ uiṁir a 10, agus é scealbṫa go fíor-áluinn, Is minic a faiġtear, cóṁ maiṫ, creas-cloċa beaga ċun seiṫí do scríobaḋ, nó ċun poll a ḋéanaṁ.

Aiṫniġtear cloċa creasa ó ċloċaiḃ scáil, a ḃíonn ar ḃáine na cailce agus iad spréaċarnaċ, agus ó'n ċeirt, cineál eile de ċloċaiḃ scáil a ḃíonn duḃ, agus iad spréaċarnaċ cóṁ maiṫ, agus dá ndéantaiḋe úirlisí garḃa, uaireanta.

## STONE OBJECTS

## FLINT TOOLS AND WEAPONS

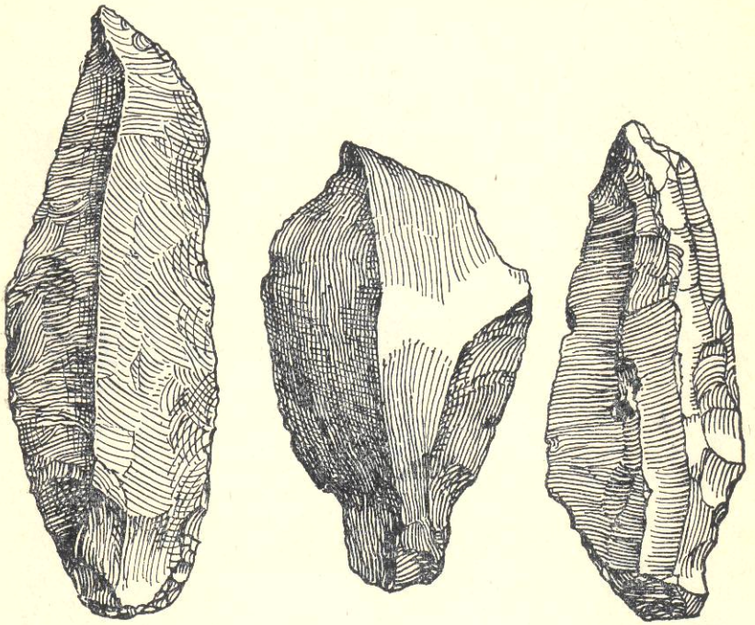
(See p. 11)

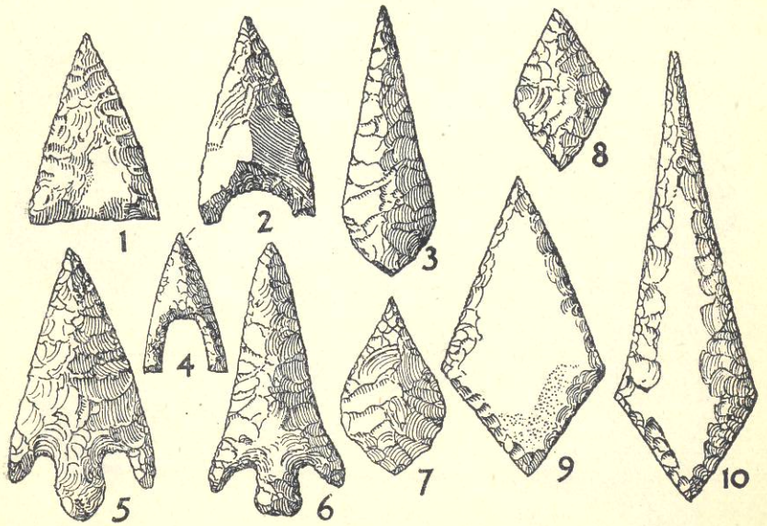
Amongst the most ancient objects are those of stone, either of the hard, smooth, creamy, yellow or brownish material flint or of some other rock nearly as hard and durable.

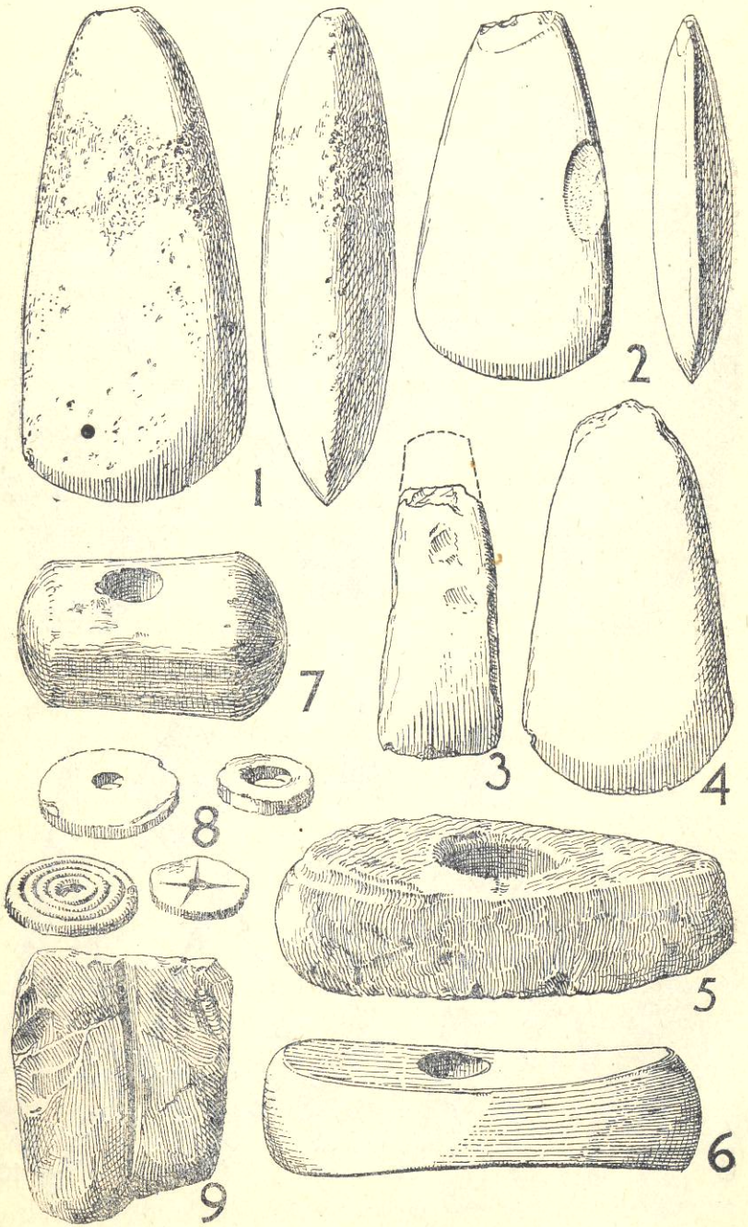
The three larger, roughly shaped objects shown opposite are flint tools of a very ancient kind, belonging to the Stone Age. Their crudity is in strong contrast to those numbered 1 to 10 which belong to more advanced stages in civilization, the last three certainly to the Early Bronze Age. All of them are small ; 8 is but one and a half inches long and 10, the largest, is six and a half inches in length. All, except 9 and 10 which are spear or lance points, are arrow-heads. 10 is a very thin, fine and beautifully chipped object. Little flints made for scraping hides or boring holes are also often found.

Flint should not be confused with quartz which is a chalky white, glistening material or with chert, a black material which also glistens and is sometimes used for crude tools.












## Airm agus giúirléadaí cloċ

(Feic l. a 12)

Maidir le sna samplaíḃ seo ṫall, Cloċ-ṫuaiġte ó'n Ré Cloiċe agus ó'n Ré Uṁa is eaḋ a haon (1) go a ceaṫair (4) ; crot fad-oḃaċ orṫa, iad ag caoluġaḋ go cúl, agus faoḃar géar gearratṫa orṫa. Is é is dóiċiġe gur tuaiġte cogaiḋ ó'n Doiċ-ré Uṁa, uiṁireaċa a cúig (5) agus a 6. Sampla snasta, deaġ-ḋéanta is eaḋ uiṁir a sé. Casúr cloiċe ó'n ré céadna is eaḋ a 7 ; tromáin fearsaide is eaḋ a 8, agus cloċ ḟaoḃair go ḃfuil roc, nó clas, ann, is eaḋ a 9. Ḃaineann a hoċt agus a naoi le ré na Críostaiḋeaċta.

Aċ is minic a geiḃtear giúirléadaí eile cloċ seaċas iad san, mar atá :—cotaí, iad cosaṁail le sna tuaiġtiḃ, aċ gur mó iad, gur leiṫine agus gur clárḋa ; cloċ-lóċrainn, is é sin, cloċa cruinne, agus cuan ionta i gcóṁair íle ; meáḋċaintí agus tumairí i gcóṁair líon agus saiġean ; bróinte cruinne ċun meileatṫa, nó an ḃró " iallaite " a ḃíonn clárḋa, spaid-ċuanta, gur cosaṁail le ḋá aḋairt ċodlaḋta a cloċa cuimilte. Do fuaraṫas failiġe dorn de spaid-ġuail (lignite), sórt gual-ċloiċe gur ab ar éigean a ḃí gual déanta den tsean-aḋmud gur de iad—agus do b'ḟéidir go ḃfaiġfiḋe fós íoṁáiġte a ḃeaḋ snoiḋte go garḃ, símpliḋe.

### Púiríní

Faiġtear púiríní de ġloine daiṫte (ná fuil léaráid díoḃ annso), agus a lán crot éagsaṁla orṫa, agus púiríní de ómar (ómra), aḋḃar luaċṁar a hallṁuiriġeaḋ. Daṫ meala dorċa a ḃíonn air.

## STONE WEAPONS AND IMPLEMENTS

(See p. 12)

Among those shown opposite 1 to 4 are Stone and Bronze Age polished stone axes, of a tapering, long-oval shape brought to a quite sharp cutting edge. 5 and 6 are—probably—battle-axes of the Early Bronze Age, 6 being a well-formed, polished example. 7 is a stone hammer of the same period, while 8 and 9 belong to early Christian times, the former being spindle whorls and the latter a whetstone with a groove.

Besides those shown other stone tools are often found :—choppers like the axes but broader, flatter and bigger ; stone lamps, rather rounded stones with a hollow for oil ; weights and sinkers for nets ; the round hand-mills called querns or the flat but slightly hollowed 'saddle' querns with their bolster-like rubbing stones. Bracelets of lignite, a dark, almost coal-black stone, come to light and carved figures of crude and simple form may yet be found.

### Beads

Coloured glass beads (not illustrated) are found in many forms as also are beads of amber, a precious imported material of the colour of dark honey.

## Tuaiġte ꞁc. d'uṁa agus d'iarann

(Feic l. a 15)

Is minic a geibtear tuaiġte, agus neiṫe d'á sórt, a bain leis an Ré Uṁa nó leis an Ré Iarainn. Déanaṁ clárda, beagnáċ, a bí ar an gcuid ba ṫúisce, mar atá ar a haon (1) annso, aċ, mar a b'ionann agus é sin, ní hi gcóṁnaiḋe a bíonn órnáid orṫa. Saġas ba ḋeireannaiġe is eaḋ uiṁir a 2. Taisbeántar a ṫaob agus a ḟaobar. Tá forḟabra ar a bárr agus ar a bun ċun greama seasaṁaċ d'ḟaġáil ar ḟoirceann ġabalaiġ na sáṁṫaiġe aḋmuid. Feabasuġaḋ air sin is eaḋ uiṁir a 3, mar tá "stop-iomairí" trasna ag a lár, ċun foircinn na gabloíge aḋmuid do ṫeaċt in a gcoinnib. Do ċabruiġ na hiomairí seo ċun na sáṁṫaiġe do ċoimeád gan scolṫaḋ. Saġas is deireannaiġe fós a taisbeántar in uiṁir a 4. Tuaġ cúl-tollṫa é, agus é iomlán, go n-a ṡáṁṫaiġ aḋmuid.

Gnáṫ-arm a bain leis an Doiċ-ré Uṁa do b'eaḋ an t-ulctuaġ, uiṁir a 5. Do fastuiġtí é mar a déanfaiḋe le piocóid, ar ċeann sáṁṫaiġe fada. Scian iarainn is eaḋ uiṁir a 6 ; agus tuaġ iarainn uiṁir a 7.

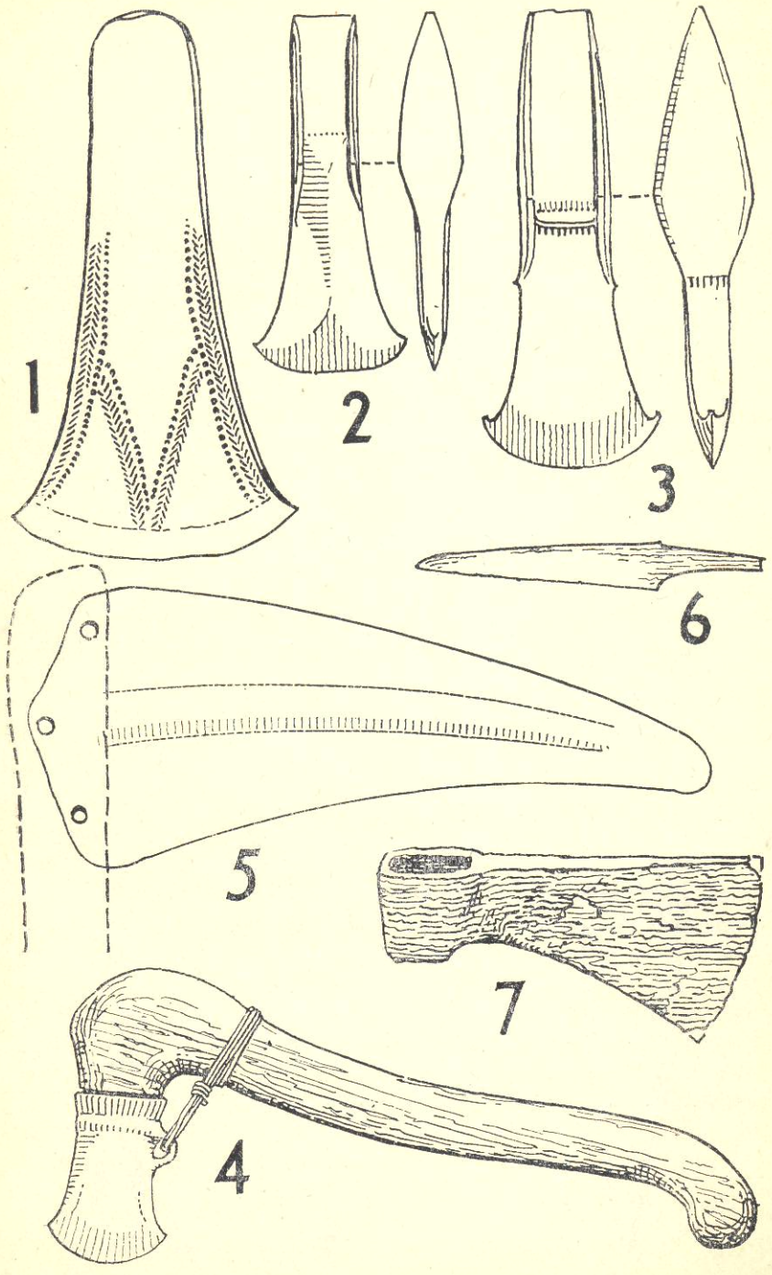
## BRONZE AND IRON AXES, ETC.

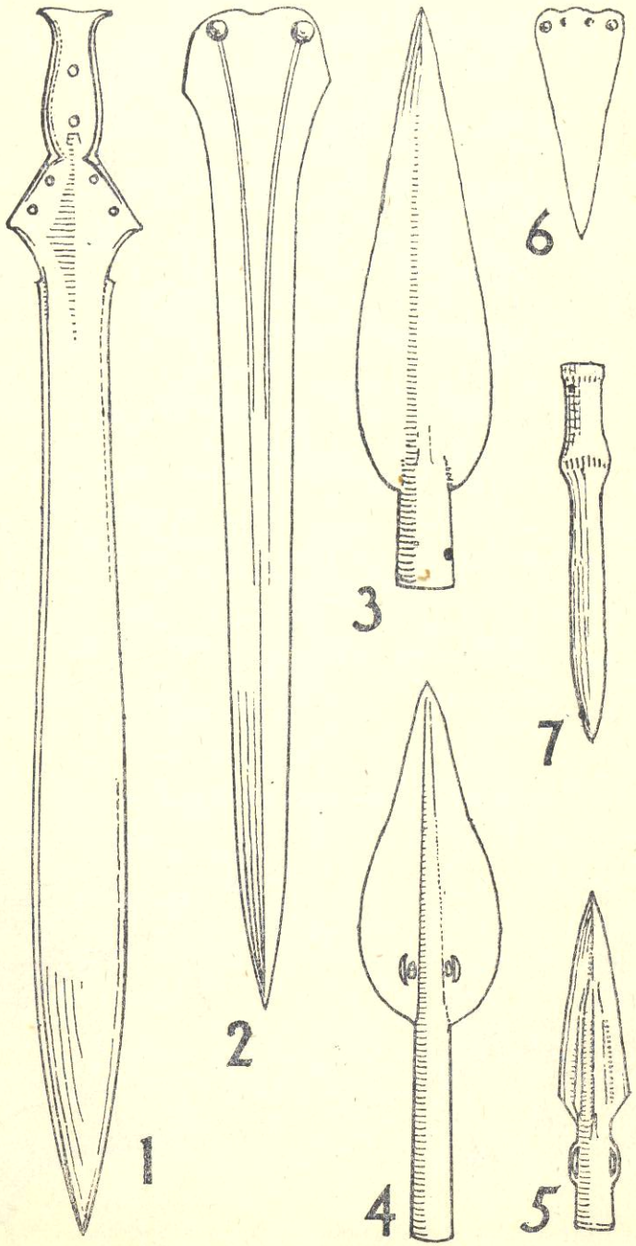
(See p. 15)

Axes and the like of the Bronze and Iron Ages are fairly often found. The earliest, which were first of copper but later of bronze, are of the almost flat form shown at 1 but (unlike it) are not always decorated. At 2 a later type is shown. It has top and bottom flanges intended to grip securely the forked top end of the wooden handle, and 3 is a further improvement, with cross or 'stop' ridges about midway in its length against which came the ends of the wood fork. The ridges thus helped to prevent the handle being split. The still later socketed type of axe is shown at 4, complete with its wooden handle.

A common weapon of the Early Bronze Age was the halbert, 5, which was fixed after the same manner as a pick at the end of a long staff. An iron knife, 6, and an axe of the same material, 7, are also shown.










## Airm d'uimha

(feic l. a 16)

Ar airm na Ré Uimha, is iad na claidhmte, na meadhóga (duirc), agus na bearra craoisighe, is áilne crot. Ceann cineálach is eadh an claidheamh duille-chrotach—uimhir a 1. Sampla de chruit eile is eadh an ropaéir, (claidheamh ropachta), nó an mheadhóg fada, uimh, a 2. Do bí dornchla, d'ár ndóigh, ar gach ceann aca, déanta d'adhmud, de chnámh nó d'adhairc, agus iad fastuighte le seamaidh umha.

Daimeann na bearra craoisighe, a 3, a 4 agus a 5, leis an lar-ré Umha. Tadhair fé ndeara na poill beagha ar lainn a 4, agus na lúb-chuasa ar socaid uimh a 5.

Ceann ársa is eadh an mheadhóg chlárdha chriantánach, uimhir a 6 ; ach daimeann a 7, an meadhóg (nó scian) cúl-tollcha, leis an lar-ré Umha.

## BRONZE WEAPONS

(See p. 16)

Bronze swords, daggers and spear heads are amongst the most beautifully formed weapons of the Bronze Age. The leaf-shaped sword 1, is typical. Another form is the rapier (thrusting sword), or long dagger, 2. Both, of course, had hilts, probably of bone, horn, or wood, fixed to the bronze by rivets.

Spear heads 3, 4, and 5 are of the Late Bronze Age. Note the openings in the blade of 4 and the loops on the socket of 5.

The flat triangular dagger 6 is an early form but the socketed knife, or dagger, 7, belongs to the Late Bronze Age.

## pot-árṫaiġe agus ceastaí adhlactan

(feic t. a 19)

I gcaiṫeamh na Ré Umha—ó 1800 R.Ċ. go 250 R.Ċ. nó mar sin—i bfarraḋ gaċa adhlacan geall leis, do cuirtiḋe isteaċ árṫaiġe nó prócaí de il-iomaḋ crot agus méaḋ. Is féidir go bfuiġfiḋe cuid de sna potaíḃ seo in sna portaċaiḃ, aċ is gnáṫaiġe gur sa talamh fóġanta, nó i bportán gairbéil a geiḃtear iad féin agus na ceastaí cloċ.

Asta so sa léaráid ṫall, " soiṫiġe bíḋ " is eaḋ a 1, a 2, a 3 agus a 4, agus baineann leis an Meán-ré Umha. Cineál mór is eaḋ uimir a 3, agus áisiġtear a leiṫéid ċun cnáma creimṫe (dóiġte) daonna do ċoimeáḋ in adhlacain. Ba ċun na háise céadna uimir a 5. Prócaí adhlactan is eaḋ a 6 agus a 7 cóir maiṫ, aċ baineann leis an lar-ré Umha. Tugtar prócaí " crústuiġte " ar cineál a 6, de bríġ go gceanġaltar an órnáid leis an dtaoḃ amuiġ den pota.

Ceast beag adhlactan de ċloċaiḃ is eaḋ uimir a 8, in a bfuil próca ionntuiġte ós cionn cnáimh dóiġte ; agus ceast iarraċt cosamail leis, aċ gur mó é, is eaḋ uimir a 9, in a bfuil sḃiṫeaḋ bíḋ le hais cnámṫairte nó séaclóir daonna, ar a ċromara. Bí leaca, nó ċloċa clárḋa, ag cúmḋaċ na gceastaí so.

## POTTERY AND BURIAL CISTS

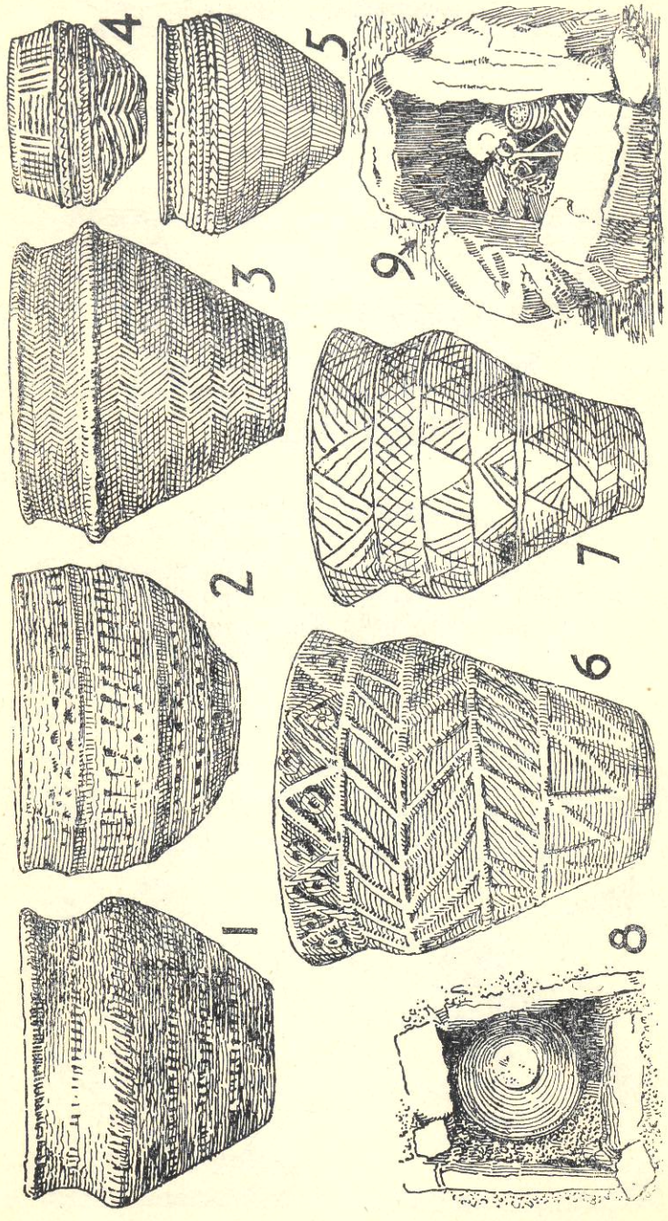
(See p. 19)

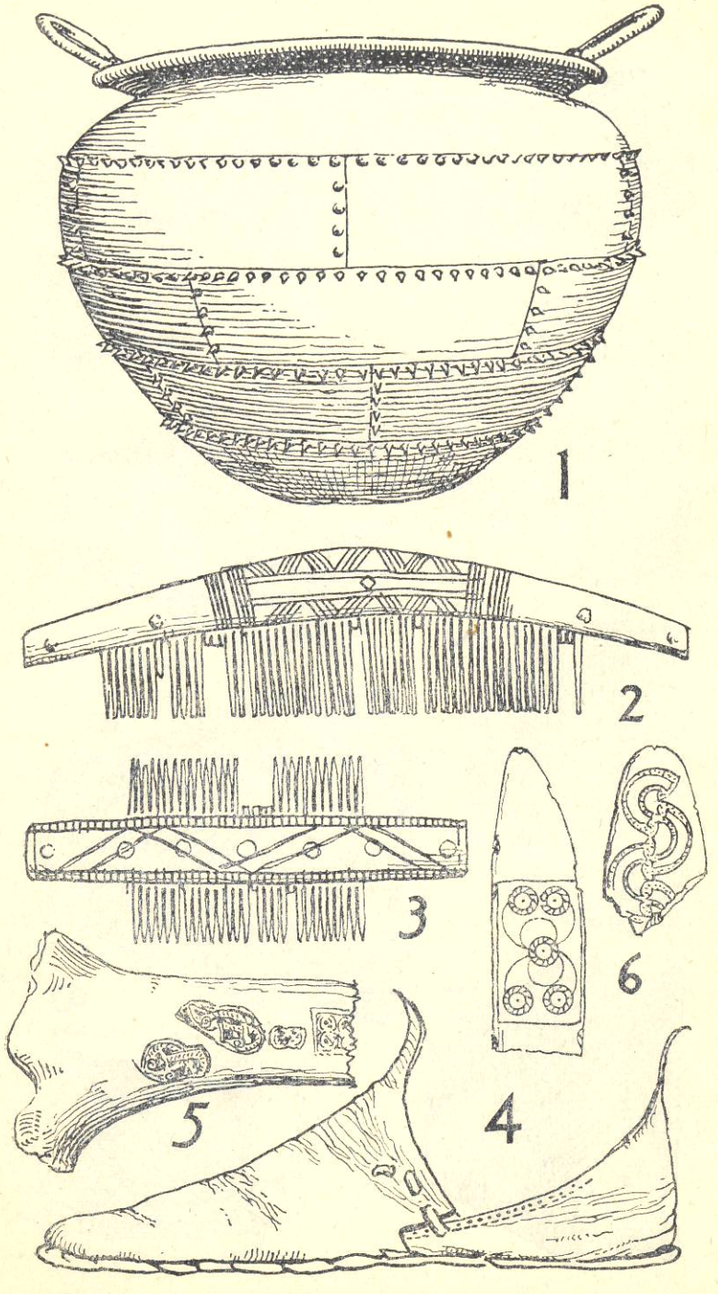
Throughout the Bronze Age—from about 1800 B.C. to about 250 B.C.—most burials are accompanied by pots or urns of various shapes and sizes. Some of these pots may be found in the bogs but they, and the stone cists, are more usually found in better land, or in gravel banks.

Of those illustrated opposite 1, 2, 3, and 4 are what are known as " food-vessels " and belongs to the Middle Bronze Age, 3 being of a large type and used to contain the cremated (burnt) bones of a human burial. 5 served the same purpose. 6 and 7 are also burial urns but of Late Bronze Age date, the former being what is called an " encrusted " urn because the decoration is added to the outside surface of the pot.

A small stone burial cist is shown at 8, containing an urn inverted over burnt bones, while at 9 is a somewhat similar cist, but larger, with a food-vessel beside a crouched human skeleton. These cists had flat stones covering them in.










## earraide d'uma, de chám agus de leathar

(feic l. a 20)

Is minic a fuaratas in sna portacaib, coiri ana-mora, ana-breaghta den Uma, agus iad déanta de straicib a bíonn seamuighte le a céile go dlúth, mar a citear in uimir a 1. Earraide sár-tábhachtach is eadh iad, agus baineann le deire na hIar-ré Uma.

Is féidir go bfuighfidhe earraide chám, cíorta de ghnáth, amail a 2 agus a 3, agus iad déanta de iomad dlúirí a ceanghaltar le a céile le bioránaib, agus an t-iomlán maisighte le hórnáidíb inghearrta. Déantar amlaidh, leis, le dlúiríb chám amail a 5, gur thriail oibridhe mitil a cuid órnáidí ar ghiota de. Agus do tharlóchadh go bfuighfidhe smutaí éadromha chám agus iad maisighte le hórnáideacht den Ré Iarainn, a dearadh le compás, mar uimir a 6. Ar na hearraidib eile den adhbar céadna a táinig a portacaib, atá, spiúnóga, bioráin, siogairlíní,—púiríní, dolaí cruite, agus fiú baill fidhcille agus táiplise.

Comeádtar leathar go hiongnathach slán i bportach, agus is féidir go bfuighfidhe seana-bhróga de sórt uimir a 4. Is fánaighe a faighthear baill éadaigh de seithe, ach cuirtear suim fé leith ionta, agus in éadaighib olna cóm maith, nó in aon tsórt éadaighe fighte.

## BRONZE, BONE AND LEATHER OBJECTS

(See p. 20)

Very fine and often large cauldrons of bronze, made of sheets closely riveted together as in 1, have been found in bogs. They belong to the end of the Late Bronze Age and are very important articles.

Bone objects, of which perhaps the commonest are combs similar to 2 and 3, made up of several pieces pinned together and decorated with incised ornaments, are likely to be found. So also are pieces of bone like 5, a fragment upon which a metal worker has tried out his decorations. The slighter slips of bone decorated with Iron Age ornament, drawn with a compass as in 6, may appear. Other objects of the same material which have come from bogs include spoons, pins, pendants, beads, harp pegs, even chessmen and draughts pieces.

Leather is remarkably well preserved in the bogs, and shoes, of which 4 is one example, will probably be dug up. The rarer garments of skin have been discovered in the past and would be specially interesting, as would those of woollen or other woven materials.

## Bioráin agus deilgne bráġad

(Feic l. a 23)

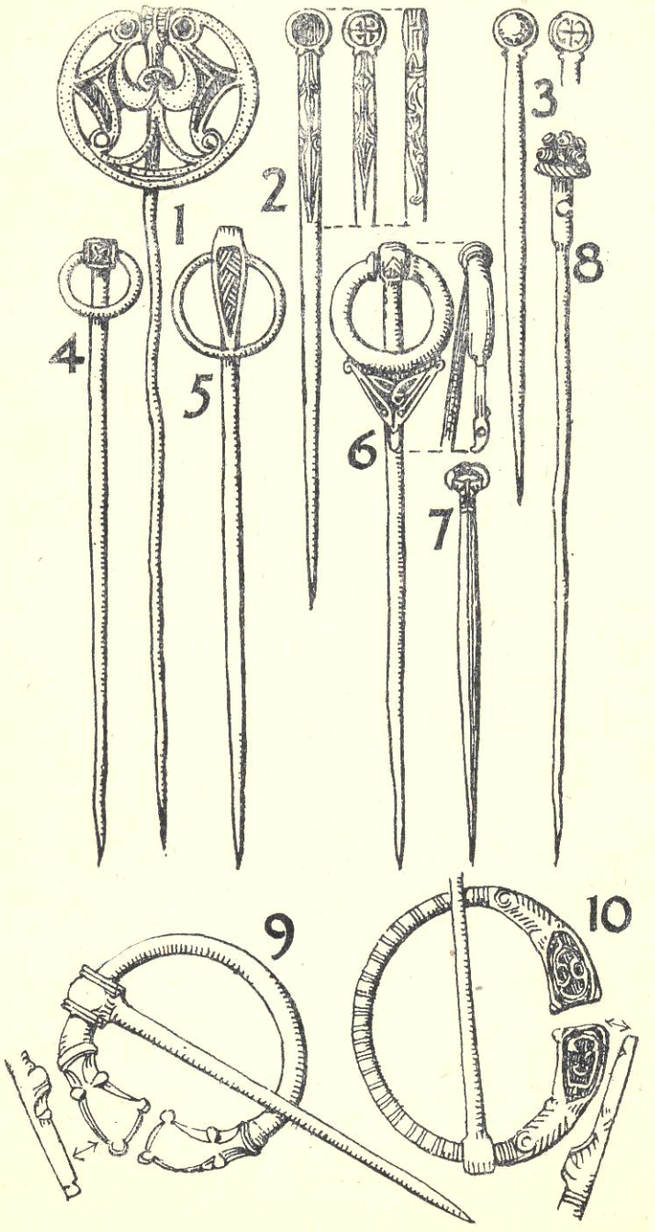
Is den uṁa na bioráin ċeann-fáinneaċa a 1 go a 8, a taisbeántar ṫall, aċ bainid leis an Doiċ-ré Críostaiḋe. Baineann an dá ḋeilg bráġad ceanncruinne, a 9 agus a 10, leis an ré céadna. Samplaí is eaḋ iad de ċineál iomadaṁail in a b̓fuil roinnt atá tur, agus roinnt eile órnáidiġṫe go maiseaṁail, mar atá an Dealg-b̓ráġad Teaṁraċ is so-aiṫnid. Cinn ainiṁiḋṫe aċ iad tur, simpliḋe, is eaḋ forcinn an f̓áinne de uiṁir a 9, aċ táid forcinn uiṁire a 10 maisiġṫe, agus iad tuillte de ċruantaib̓ il-daiṫte.

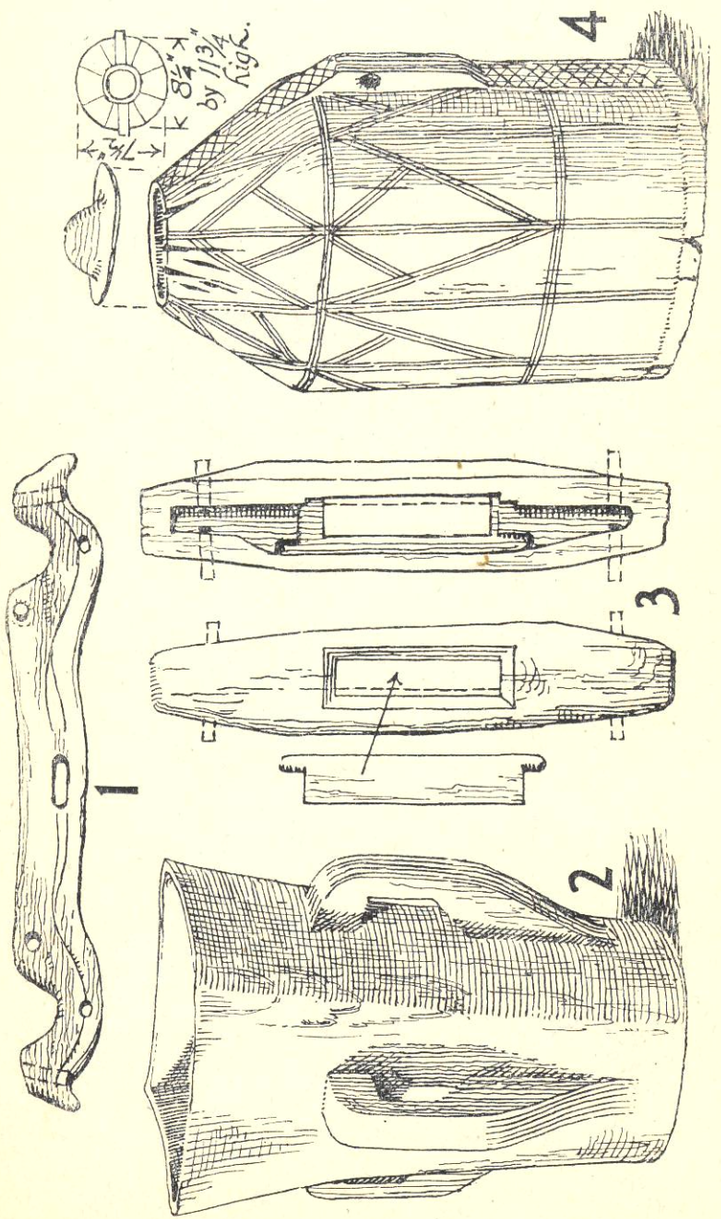
## PINS AND BROOCHES

(See p. 23)

The ring-headed pins, 1 to 8, shown opposite, are of bronze but belong to the Early Christian Period, as do the two penannular brooches, 9 and 10, examples of a large class, which includes some that are quite plain and others as highly ornamented as is the well-known Tara brooch. The ends of the ring of 9 are simplified animal heads, while those of 10 are decorated and were filled with coloured enamels.










## earraide adhmaid

(feic l. a 24)

Aithnigeann gach aonne an dair portaig agus an giúis a fagtar in sna portachaibh ; coimeádtar iad ar chuma iongantach sa mhóin tais. Coimeádtar a lán earraide adhmaid de sean-déantús ar an gcuma gcéadna.

Taisbeántar dam-chuing chall—uimhir a 1—agus i cúmta go slachtmhar chun beit oireamhnach anuas ar mhuineál na ndam. Sampla sár-bhreag den tseana-mhórnán adhmaid is eadh uimhir a 2. Ni fuaratas gaiste fiadh riamh in Éirinn, ach do tárlódh go bhuigfidhe fós. Déadh deallram aige le gaiste do dhor-chun (nó madra uisce), uimhir a 3, a snapann ar chois an aimhirde. Do déanadh é de bloc throm adhmaid atá tollta in a lár le scáine atá oireamhnach don chomhlann bís a hoibrigtear le "hasbruinn" adhmaid.

Árdach bainne is eadh uimhir a 4, agus é déanta a bloc aonair adhmaid, ach amháin an comhla beag, agus an bun do hoireamhnuigeadh dó a bloc eile.

Do b'féidir go bhuigfidhe na hearraide adhmaid seo :—scéithe, spiúnóga, barailli déanta a staibhaitibh, agus boscaí a gearradh a blocaibh adhmaid ; boscaí móra a deineadh de chláracaibh ; cómhraí adhlactan a homnaibh crann, agus iadh, b'féidir, fé charn beag cloch sa portach. Do b'fíor-tábhachtach an fagáltas a leithéid sin. Agus b'féidir go bhuigfidhe uachaisí omna (corrachám), gan trácht ar na maidibh ráma a geobadh leó.

Do nochtadh "tóchar," .i. bóthar portaig de saileannaibh adhmaid, in a lán áit, agus crannóga cóm maith—is é sin, oileán chun cómhuigthe a deineadh i lár portaig, agus beadh sraitheanna de stacaibh bearuigthe fásta fós ann, nó maidí figthe in a gcléithe. Agus b'féidir go bhuigfidhe tóchar cloch. Cia bhfios ? Deirdis sin go léir árd-thábhachtach, agus ba cheart iadh d'ach-fricheal láithreach, i dtreo go bhféadfadh leithleasaidhe an Mhúseum iadh do feicsint sul a gcorruigthi iadh, má caithfear iadh d'aistiriughadh. Ach má is féidir in aon chor é, do b'fhearr gan baint leó go n-infhúchtar go hiomlán iadh.

**Da chóir earraide adhmaid do choimeádh tais go leasuigeadh an leithleasaidhe iadh, mar a dubhartas cheana.**

## WOODEN OBJECTS

(See p. 24)

Everybody is familiar with the bog-oak and pine found in most bogs ; it is preserved in the moist peat in a wonderful way. So also are many wooden objects of ancient manufacture,

An ox-yoke, well shaped to fit over the animals' necks, is shown at 1, page 24. 2 is a specially fine example of the wooden mether or drinking cup. No trap for deer has yet been found in Ireland but it is not unlikely that one will come to light. Such might be similar to 3 which is a sketch of an otter trap, meant to snap on the leg of the animal. It is made of a heavy log of wood pierced in the centre by a long slot into which fits a small flap worked by a 'spring' of wood.

4 is a milk vessel made out of one piece of wood except for the bottom, which is separately fitted in, and a small lid.

Among other wooden things which will probably be found are :— shields, spoons, barrels built up of staves and boxes cut out of blocks of wood. Larger boxes, tree-trunk coffins, covered, perhaps, by a small heap of stones in the bog may yet be found. Such a find would be very important indeed. Dug-outs or canoes, to say nothing of the oars belonging to them will probably appear.

In more than one bog roadways of logs or planks—toghers—have been uncovered, as also have the much larger erections, the Crannógs or artificial island dwellings, marked by rows of pointed stakes or piles and layers of woven brushwood. Flagstone causeways may also be found. All these are very important and should be reported at once, so that the Museum expert may see them before they are removed, if this must be done ; if it is at all possible it would be better to leave them alone altogether until they can be thoroughly examined.

As has been said already, *every effort should be made to keep wooden objects moist until the expert can handle and treat them.*

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# APPENDIX 13-5

***Meath and Westmeath Development Plans- Archaeological and Heritage Policies and Objectives***

# 1. COUNTY DEVELOPMENT PLANS ARCHAEOLOGICAL AND HERITAGE POLICIES AND OBJECTIVES

## 1.1.1 Westmeath County Development Plan 2002-2008

Westmeath County Development Plan 2002-2008 was consulted for all relevant policies and objectives relating to archaeology, built and cultural heritage.

### 2.9.3 Built Heritage Objectives

(i) The Council recognises the contribution the built heritage has made and will make to the County's development and the importance in preserving key elements of the past.

(ii) Under certain circumstances this may be best secured through the "appropriate" productive use of historic buildings. Under certain circumstances this may be best secured through the "appropriate" productive use of historic buildings.

(iii) There will be a presumption against works/developments that have a detrimental effect upon Recorded Protected Structures, Architectural Conservation Areas, ancient monuments and archaeological sites, historic landscapes, historic gardens and designed landscapes or upon the setting of these.

#### 2.9.3.1 Architectural Heritage: Protected Structures

(i) New legislation requires certain obligations from Planning Authorities in regard to Recorded Protected Structures (RPS) and Architectural Conservation Areas (ACA). Proposals concerning these areas will have taken account of guidelines produced by Duchas such as the Architectural Conservation Guidelines for Planning Authorities 2001 and the DOE LG Conservation Guidelines 2001.

(ii) Buildings and Structures of Special interest

A number of buildings and other structures are considered to be of interest for reasons of architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest and are listed in Schedule 4. The Council will operate a general presumption in favour of the preservation of Protected Structures and will only permit demolition under exceptional circumstances.

(iii) Extension or Alteration to a Recorded Protected Structure

The Council will normally only grant consent to proposals for the extension or alteration of a Protected Structure where all the following criteria are met:

- (a)The essential character of the structure and its setting are retained and its features of special interests remain in situ, intact and unimpaired;
- (b)The works proposed make use of traditional and/or sympathetic structure materials and techniques which match or are in keeping with those found on the structure; and
- (c)The architectural details (e.g. doors, gutters, and windows) match or are in keeping with the structure.

(iv) Development affecting the Setting of a Recorded Protected Structure

The Council will not normally permit development, which would adversely affect the setting of a Protected Structure. Development proposals will normally only be considered appropriate where all the following criteria are met:

- (a) The detailed design respects the Protected Structure in terms of scale, height, massing and alignment;
- (b) The works proposed make use of traditional or sympathetic structure materials and techniques which respect those found on the structure; and
- (c) The nature of the use proposed respects the character of the setting of the structure.

(v) Recording & Designation of a Protected Structure:

The Council will endeavour to keep an up-to-date and accurate list of Protected Structures, in the form of a local Record of Protected Structures, and to inform owners/occupiers of the structure's status and their responsibilities. It is the intention of Westmeath County Council to seek to modify the Schedule of Recorded Protected Structures during the period of the Development Plan.

#### 2.9.3.2 Architectural Heritage: Architectural Conservation Areas (ACA's) & Townscape Character

(i) The Council will operate a presumption in favour of preserving the character of ACAs. During the lifetime of the Plan it is intended to develop a programme for the identification and designation of ACAs. The Council may also identify areas of Townscape Character which, while not having the legal definition of ACAs, will be subject to similar control over development.

(ii) Designation:

Under the Local Government (Planning & Development) Act 1999 the Council may, where resources permit, designate selected areas and places of architectural heritage, be they individual streets, whole townscapes and urban centres, groups of structures or the settings of protected structures, after defining their particular 'qualities of interest' and assessing their particular character. A local development plan containing specific objectives will be produced for each designated ACA. These may run contrary to objectives of the County Development Plan.

(iii) New Development in an Architectural Conservation Area:

The Council will normally only permit development proposals for new buildings, alterations, extensions and changes of use in, or which affects the setting of an Architectural Conservation Area where all the following criteria are met:

- (a) The development preserves or enhances the character and appearance of the area;
- (b) The development is in sympathy with the characteristic built form of the area;
- (c) The scale, form, materials and detailing of the development respects the characteristics of adjoining buildings in the area;
- (d) The development does not result in environmental problems such as noise, nuisance or disturbance which would be detrimental to the particular character of the area;
- (e) Important views within, into and out of the area protected;
- (f) Trees and other landscape features contributing to the character or appearance of the area are protected; and
- (g) The development conforms to the guidance set out in Architectural Conservation Area development briefs.

#### 2.9.3.3 Archaeology

(i) Westmeath has a unique archaeological heritage which is worthy of preservation as part of the overall national heritage. This is reflected in the abundance of archaeological sites and monuments found in the County ranging through all historical eras from Neolithic Man, through to the Bronze Age, the Celtic Era and the Christian Period.

The areas around Fore, Kilbixy and the Hill of Uisneach ('the navel of Celtic Ireland') are particularly notable examples of the archaeological richness of the County. (See Schedule 5) Where appropriate the Council will seek designations of Areas of Archaeological Potential from Duchas. Please note, a list of all archaeological monuments in State ownership, guardian sites under preservation orders, registered and all recorded monuments can be consulted at the office of the National Monuments Service.

### (ii) The Protection of Archaeological Remains and their Settings:

There will be a presumption in favour of the physical preservation in situ of archaeological remains of importance and their settings. It is an objective of the Council to strictly control development proposals which may be detrimental to any feature or item of archaeological significance or seriously detract from the interpretation and setting of these sites. Within Zones of Archaeological Potential and in sites on or in the vicinity of Recorded Monuments, development will only be permitted where the Council considers the importance of the proposed development or other material considerations outweigh the value of the remains in question.

### (iii) Archaeological Assessment and Evaluation:

Where the impact of a development proposal on important archaeological remains is unclear, or the relative importance of such remains is uncertain, the Council will normally require developers to provide further information in the form of an archaeological assessment or an archaeological evaluation. Where such information is requested but not made available the Council will normally refuse planning permission.

### (iv)Archaeological Mitigation:

Where it is decided to grant planning permission for development which will affect sites known to contain archaeological remains, the Council will impose conditions to ensure that appropriate measures are taken for the identification and mitigation of the archaeological impacts of the development, including where appropriate the completion of a licensed excavation and recording of remains before development commences.

### (v) Cultural Heritage

Westmeath has a rich cultural heritage with links to many historic figures and events. Cultural bonds help to form a people's identity and imbue a place with unique character. The Táin Trail, Goldsmith Country, the various Monastic sites are just some of the many places with cultural association within the County. The Council will protect the context of such places and will support appropriate development of places of cultural association through its Arts Programme.

### (vi) Historic Parks, Gardens and Demesnes

The Council recognises the contribution which these planned landscapes make to the appearance of the County, and their significance as a source of information about the past, and also that they are often the important setting of a Recorded Protected Structure. The Planning Authority will not normally permit development that would lead to the loss of, or cause harm to, the character, the principal components of, or the setting of parks, gardens and demesnes of special historic interest. Where planning permission is granted this will normally be conditional on the recording, prior to any commencement of development of any features of interest which will be lost. It is intended to carry out a survey to put together a County list of such assets and assess their intactness as well as developing a future strategy for their conservation, restoration and development.

## 1.1.1.2 Westmeath County Development Plan 2014-2020

Westmeath County Development Plan 2014-2021 was consulted for all relevant policies and objectives relating to archaeology, built and cultural heritage.

### 1.1.1.2.1 *Archaeology and Built Heritage Policies and Objectives*

#### Built Heritage Policies & Objectives

**P-BH1** To have regard to the Department of Environment, Heritage and Local Government publication 'Architectural Heritage Protection Guidelines for Planning Authorities' 2004, in the implementation of development objectives and the assessment of planning applications relating to Protected Structures, proposed Protected Structures or buildings within Architectural Conservation Areas.

**P-BH2** To protect and conserve buildings, structures and sites contained in the Record of Protected Structures and to resist the demolition of such structures, in accordance with 'Architectural Heritage Protection Guidelines for Planning Authorities' 2004.

**P-BH3** To ensure that any development, modification, alteration, or extension affecting a Protected Structure and/or its setting is sensitively sited and designed, is compatible with the special character, and is appropriate in terms of the proposed scale, mass, height, density, layout, and materials so that the integrity of the structure and its curtilage is preserved.

**P-BH4** To encourage the sympathetic and appropriate reuse and retention of Protected Structures. In certain cases, the relaxation of site zoning restrictions may be considered in order to secure the preservation and conservation of the Protected Structure, where the use proposed is compatible with the existing structure. This will only be permitted where the development is consistent with conservation policies and the proper planning and sustainable development of the area.

**P-BH5** To have regard to any future advice from the Department of Environment, Community and Local Government regarding energy ratings for Protected Structures and requirements to protect architectural integrity.

**P-BH6** To designate those areas that have particular environmental qualities that derive from their overall layout, design and unity of character as Architectural Conservation Areas (ACAs) and to ensure that the character of such areas is preserved.

**P-BH7** To ensure that any new development or alteration of a building within or adjoining an Architectural Conservation Area positively enhances the character of the area and is appropriate in terms of the plot size, proposed design, including: scale, mass, height, proportions, density, layout, materials, plot ratio, and building lines.

**P-BH8** To protect the character of designated Architectural Conservation Areas including the public realm area associated therewith and to resist inappropriate development that would detract from the heritage value of these areas.

**O-BH1** To continue to administer a prioritised scheme of conservation grants for owners and occupiers of protected structures.

**O-BH2** To continue to review the Record of Protected Structures on an ongoing basis.

**O-BH3** To prepare Statements of Character for each of the identified Architectural Conservations Areas (ACAs) and guidance documents in relation to development in these areas.

**O-BH4** To identify new ACAs and/or the modification of existing ACAs during the lifetime of the Plan.

### 1.1.1.2.2 *Vernacular Buildings and Structures*

In addition to Protected Structures, the county contains a wide variety of older vernacular buildings which are distinctive to the character of the county and contribute in a particular way to the distinctive character of local areas e.g. farm buildings, forges, gate piers, granite kerbs, public houses and many cottages. Vernacular

buildings were built to perform a specific function and were constructed using local materials and designed to reflect local traditions. In the past, the less grand buildings were limited to using only local materials and designed to be functional.

#### Vernacular Buildings & Structures Policies & Objectives

It is a policy of Westmeath County Council:

**P-VB1** To encourage the rehabilitation, renovation and reuse of existing vernacular buildings, where appropriate.

**P-VB2** To retain where feasible, older buildings in towns which make a positive contribution to the character of the area or townscape.

It is an objective of Westmeath County Council

**O-VB1** To carry out an audit of disused vernacular structures in Westmeath during the lifetime of the Development Plan, and promote their adaptation and re-use.

**O-VB2** To ensure that proposed infrastructural and public utility works within the county do not remove historic street furniture such as limestone or granite kerbs, cobblestones, cast-iron post boxes, street lamps etc.

### 1.1.1.2.3 *Historic Parks, Gardens & Demesnes*

**P-PGD1** To require a Design Statement with a planning application for development in a designed landscape, to demonstrate how the historical layout has been considered.

**P-PGD2** To resist development that would lead to the loss of, or cause harm to the character, the principal components of, or the setting of parks, gardens and demesnes of special historic interest. It is an objective of Westmeath County Council

**O-PGD1** To build on the information compiled as part of the National Survey of Historic Gardens & Designed Landscapes, and to carry out a survey to assess the intactness of these assets, including developing a strategy for their conservation, restoration and development.

**O-PGD2** To utilise the designation 'Architectural Conservation Area' where considered appropriate, to preserve the character of a designed landscape.

### 1.1.1.2.4 *Industrial Heritage*

Industrial heritage relates to the physical structures which remain today from the industrial era of the late eighteen century. Although Westmeath would have been predominantly an agricultural county, there are many artefacts and structures remaining connected to the industrialisation period; namely the railways, turnpike and coach roads, canals and their locks, distilleries, mills, hydraulic rams, and the peat and quarry industries which all led to economic and social change in the county.

#### Industrial Heritage Policy & Objective

It is a policy of Westmeath County Council

**P-IH1** To protect buildings, features and the setting of industrial sites and their heritage and to encourage their sensitive restoration, consistent with the Department of Arts, Heritage & the Gaeltacht Guidelines.

It is an objective of Westmeath County Council

**O-IH1** To prepare an inventory, survey and record of the county's industrial heritage during the lifetime of the plan and raise awareness of the value of same through the Heritage Plan.

### 1.1.1.2.5 *Cultural Heritage*

Westmeath has a rich cultural heritage with links to many historic figures and events. Cultural bonds help to form a people's identity and imbue a place with unique character. The Táin Trail, Goldsmith Country, the Hill of Uisneach and various Monastic sites are just some of the many places with cultural association within the county. The Council will protect the context of such places and will support sensitive appropriate development of places of cultural association.

#### Cultural Heritage Policy & Objective

It is a policy of Westmeath County Council

**P-CH1** To protect and conserve the natural, built and cultural heritage features that contribute to the distinctive character and heritage value of County Westmeath.

It is an objective of Westmeath County Council.

**O-CH1** To increase public awareness of the Cultural Heritage of the county.

### 1.1.1.2.6 *Fore Special Heritage Area*

The designation of Fore Village and its hinterland as a Special Heritage Area results from the realisation of its exceptional historical and archaeological importance and the significant contribution which it can make towards the development of tourism within the county. The richness of the archaeological and historical remains of Fore Village, together with the attractive landscape in which they are set mark this area out as one of national importance. In 2010 the Council adopted a Fore Special Heritage Area Management Study to identify key issues for future action in the area and to secure the sustainable conservation and protection of the built and natural heritage of the site.

#### Fore Special Heritage Area Policies & Objective

It is a policy of Westmeath County Council

**P-FSH1** To protect and enhance the Fore Special Heritage Area in accordance with the Management Study adopted in 2010, subject to archaeological and ecological assessment.

**P-FSH2** To maintain the high environmental quality of the Fore Special Heritage Area. Policies relating to the siting and design of new development in High Amenity Areas will apply. New development including restoration and renovation of buildings should not cause direct or indirect damage or interference to the designated areas, archaeological monuments or buildings of artistic, historic or architectural value.

**P-FSH3** To reinforce the nucleated nature of the village of Fore and to protect the setting of the various features of historical and archaeological evidence. In cases where it is deemed the Archaeological Heritage may be impacted upon by a proposed development, the Planning Authority will require an Archaeological Assessment and any site works to be monitored by a licensed Archaeologist in accordance with requirements of the National Monuments Service of the Department of the Arts, Heritage and the Gaeltacht.

It is an objective of Westmeath County Council

**OFSH1** To develop the walks, village conservation and projects identified in the Fore Special Heritage Area Management Study and assist in the promotion of sustainable development and tourism in the area, subject to archaeological and ecological assessment.

### 1.1.1.2.7 Archaeological Heritage Policies & Objectives

It is a policy of Westmeath County Council

**P-AH1** To generally preserve in situ all archaeological remains and sites of importance, such as National Monuments, Recorded Monuments, their setting and context and zones of archaeological potential. Within zones of archaeological potential and in the vicinity of Recorded Monuments, development shall only be permitted where the Council considers the importance of the proposed development or other material considerations outweigh the value of the remains in question, in consultation with the National Monument Service.

**P-AH2** To protect and retain surviving medieval plots and street patterns in towns and villages of the county.

**P-AH3** To ensure that all sites of archaeological potential are protected from development that may injure any potentially important archaeological features or sites, in consultation with the National Monument Service.

**P-AH4** To protect historic burial grounds within the county and encourage their maintenance and public access provision.

**P-AH5** To designate walking routes to important archaeological sites, as public rights of way where possible, in consultation with the National Monuments Service.

It is an objective of Westmeath County Council

**O-AH1** To strictly control development that may be detrimental to any feature or site of archaeological significance or that may seriously detract from the interpretation and setting of these sites.

**O-AH2** To endeavour to ensure that all reports, excavation results and other information relating to archaeological heritage be made available for public viewing in libraries and to create and maintain a database of same.

**O-AH3** To promote pre-planning consultations in relation to proposed developments that may potentially impact upon Archaeological Heritage.

**O-AH4** To provide guidance to developers and landowners in relation to proposals for development that may potentially impact upon Archaeological Heritage, drawing their attention to additional published government guidance available such as 'Framework and Principles for the Protection of the Archaeological Heritage, 1999'.

**O-AH5** To endeavour to improve public access to the Hill of Uisneach, in support of the County Heritage Plan and with the involvement of landowners and relevant Authorities, in consultation with the National Monument Service.

**O-AH6** To seek in consultation with the National Monuments Service of the Department of the Arts, Heritage and the Gaeltacht to designate Fore, Kilbixy, Ardnurcher and the Hill of Uisneach as Archaeological Landscape Areas, in recognition of their numerous archaeological monuments and national heritage significance.

**O-AH7** To require where appropriate, that an Archaeological Assessment be carried out by a suitably qualified person, prior to authorisation or commencement, as appropriate, of any activity that may impact upon Archaeological Heritage.

**O-AH8** To ensure that any development taking place either above or below ground which is within, adjacent to, or might affect sites and features of historical and archaeological interest, shall respect the character of the archaeological site and its setting, and shall be sited and designed so as not to undermine the character of the site and its setting.

**O-AH9** To impose conditions on development that may impact upon sites of archaeological potential and to ensure that appropriate measures are taken for the identification and mitigation of the archaeological impacts, including a licensed excavation and recording of remains, prior to commencement of development, where appropriate.

**O-AH10** To seek funding to carry out archaeological research at the Hill of Uisneach and to facilitate a Management Plan for Uisneach in consultation with landowners, the National Monument Service and the Department of Environment, Community and Local Government.

### 1.1.1.3 Westmeath County Development Plan 2021-2027

Westmeath County Development Plan 2021-2027 was consulted for all relevant policies and objectives relating to archaeology, built and cultural heritage.

#### 1.1.1.3.1 *Cultural Heritage Policy Objectives*

It is a policy objective of Westmeath County Council to:

**CPO 14.1** Improve accessibility to our cultural heritage and maximise its potential as a learning resource.

**CPO 14.2** Promote the understanding of cultural heritage in terms of its inherent and unique character and to recognise what elements should be preserved, conserved or enhanced.

**CPO 14.3** Support the implementation of objectives and actions of the Westmeath County Heritage Plan 2018-2023 and update during the lifetime of the Plan.

**CPO 14.4** Support the growth of cultural tourism in the County, including the potential for niche heritage based tourism products by facilitating the development of heritage events, festivals and infrastructure in a sustainable manner.

#### 1.1.1.3.2 *Archaeology Policy Objectives*

It is a policy of Westmeath County Council to:

**CPO 14.5** Seek to ensure the protection and sympathetic enhancement of archaeological heritage, and in this regard applications will be referred to the National Monuments Service, Department of Culture, Heritage & the Gaeltacht for comment.

**CPO 14.6** Seek to ensure the protection of archaeological sites and monuments and their settings and archaeological objects that are listed in the Record of Monuments and Places, in the ownership/guardianship of the State, or that are the subject of Preservation Orders or have been registered in the Register of Historic Monuments. Seek to ensure the protection and preservation of archaeological sites, which have been identified subsequent to the publication of the Record of Monuments and Places.

**CPO 14.7** Ensure that any development adjacent to an archaeological monument or site shall not be detrimental to the character of the archaeological site, or its setting and shall be sited in a manner which minimises the impact on the monument and its setting. Development which is likely to detract from the setting of such a monument or site will not be permitted.

**CPO 14.8** Seek to ensure the protection and preservation of underwater archaeological sites in riverine or lacustrine locations.

**CPO 14.9** Encourage and promote the appropriate management and maintenance of the County's archaeological heritage, including historical burial grounds, in accordance with conservation principles and best practice guidelines.

**CPO 14.10** Ensure that extensions to archaeologically significant burial grounds will only by permitted, in the event the extension would not constitute a proven risk to archaeological heritage, by means of a direct impact on archaeological features.

**CPO 14.11** Consult with the National Monuments Service in relation to proposed developments adjoining archaeological sites.

**CPO 14.12** Ensure that archaeological excavation is carried out according to best practice as outlined by the National Monuments Service, Department of Culture, Heritage, and the Gaeltacht, The National Museum of Ireland and the Institute of Archaeologists of Ireland.

**CPO 14.13** Prepare conservation plans for the management of archaeological sites and monuments in Council ownership.

**CPO 14.14** Encourage increased awareness of and public access to monuments within Council ownership.

**CPO 14.15** Ensure that all proposed development affecting disturbance to peatlands is subject to archaeological monitoring, in consultation with the Department of Culture, Heritage and the Gaeltacht, unless otherwise agreed with the Planning Authority.

#### 1.1.1.3.3 *Architectural Heritage Policy Objectives*

It is a policy of Westmeath County Council to:

**CPO 14.26** Support initiatives to identify architectural heritage that may be under threat due to climate change or neglect and progress measures and, where possible, support the protection of at risk architectural heritage.

#### 1.1.1.3.4 *Architectural Heritage & Protected Structures Policy Objectives*

It is a policy objective of Westmeath County Council to:

**CPO 14.27** Protect and conserve buildings, structures and sites contained in the Record of Protected Structures and to encourage the sympathetic re-use and long-term viability of such structures without detracting from their special interest and character.

**CPO 14.28** Protect the architectural heritage of Westmeath through the identification of Protected Structures, the designation of Architectural Conservation Areas (ACAs), the safeguarding of designed landscapes and historic gardens, and the recognition of structures and elements that contribute positively to the vernacular and industrial heritage of the County.

**CPO 14.29** Require that applications for modifications, alterations, or extensions to a Protected Structure will be assessed in accordance with the Architectural Heritage Protection Guidelines 2011 and should be sensitively sited and designed, compatible with its special character, and appropriate in terms of the proposed scale, mass, height, density, layout, and materials so that the integrity of the structure and its curtilage is preserved.

**CPO 14.30** Seek that the form and structural integrity of Protected Structures is retained as part of any redevelopment proposal and that the relationship between the Protected Structure and any complex of adjoining buildings, designed landscape features, or designed views or vistas from or to the structure is considered.

**CPO 14.31** Encourage rehabilitation, renovation and re-use of existing Protected Structures for their own economic benefit and that of the area in which they are located.

**CPO 14.32** Carry out an audit and assess the condition of Protected Structures within the Council's ownership and devise a Conservation Management Plan/maintenance regime for these structures.

**CPO 14.33** Carry out an audit of Protected Structures within the Council's ownership to identify any Protected Structures that are under threat directly or indirectly due to climate change.

**CPO 14.34** Integrate climate change adaptation measures into future heritage management plans.

**CPO 14.35** Provide guidance for owners of protected structures or historic buildings on upgrading for energy efficiency and climate resilient measures and promote the principles of sustainable building design in conservation.

**CPO 14.36** Ensure a sustainable future for Protected Structures and buildings sited within ACAs by encouraging and supporting works to upgrade the environmental performance of such structures together with the implementation of measures to address the impacts of climate change. Such works should not adversely affect the special character of the structure including impact on historic fabric, traditional construction, visibility, siting and design. The installation of renewable energy measures and equipment will be acceptable where sited and designed to minimise the visual impact, where it does not result in any significant loss of historic fabric or otherwise affect the significance of the structure.

**CPO 14.37** Incentivise the restoration of Protected Structures in towns and villages.

**CPO 14.38** Facilitate contemporary and innovative designs providing that they are of a sufficient high quality and do not detract from the character of the historic fabric of the Protected Structure.

### 1.1.1.4 Meath County Development Plan 2007-2013

Meath County Development Plan 2007-2013 was consulted for all relevant policies and objectives relating to archaeology, built and cultural heritage.

#### Policies

**HER POL 56** To protect archaeological sites, monuments (including their setting), underwater archaeology and peatlands, and objects within the jurisdiction of Meath County Council, including those that are listed in the Record of Monuments and Places or newly discovered sub-surface archaeological remains.

**HER POL 57** To ensure that full consideration is given to the protection of archaeological heritage when undertaking, approving or authorising development in order to avoid unnecessary conflict between development and the protection of the archaeological heritage.

**HER POL 58** To ensure that all development proposals affecting sites specified in the Record of Monuments and Places or Zones of Archaeological Potential are referred to the Prescribed Bodies (as set out in the Planning and Development Act 2000) and to have regard to the advice and recommendations of the Prescribed Bodies in relation to undertaking, approving or authorising development.

**HER POL 59** To ensure that when an unrecorded archaeological object or site is discovered, any works that threaten the object or site are immediately suspended and that the appropriate Government agency is informed.

**HER POL 60** To protect important archaeological landscapes in co-operation with the appropriate Government agency.

**HER POL 61** To seek the preservation in situ (or at a minimum, preservation by record) of all archaeological sites or objects and their settings.

**HER POL 62** To require the retention of surviving medieval plots and street patterns in the villages and towns of Meath and to record evidence of ancient boundaries, layouts, etc. in the course of development.

**HER POL 63** To protect historical burial grounds within Meath and encourage their maintenance in accordance with conservation principles.

**HER POL 64** To encourage and promote the appropriate management and enhancement of the County's archaeological heritage.

**HER POL 65** To protect the heritage of groups of important national monuments, inclusive oftheir contextual setting and interpretation, in the operation of development management.

**HER POL 66** To employ the full extent of the statutory provisions of the Planning &Development Acts and Regulations and all other relevant legislation including the National Monuments Act to ensure the sustained protection of landscapes of exceptional value and sensitivity and in particular to protect the rural character, setting, amenity and archaeological heritage of Brú na Bóinne and the Hill of Tara, and of the surrounding areas including the area in the vicinity of the proposed M3 Motorway and its related Interchanges.

### Objectives

**Her OBJ 6** To make the Record of Monuments and Places (RMP) available to the public via the Council's website.

**HER OBJ 7** To establish in-house training programmes for Council staff carrying out repair and maintenance works to historic structures and produce a guidance note on this subject for contractors and local community groups.

**HER OBJ 8** To identify appropriate archaeological sites in the County to which public access could be provided, and work to secure public access where appropriate in consultation with the land owner.

**HER OBJ 9** To undertake an inventory of the county's industrial heritage – including canals, mills, railways and bridges.

## 1.1.1.5 Meath County Development Plan 2013 – 2019

Meath County Development Plan 2013-2019 was consulted for all relevant policies and objectives relating to archaeology, built and cultural heritage.

**Archaeological Heritage Policies and Objectives**

**CH POL 6** to promote awareness of, and access to, the archaeological inheritance of County Meath.

**CH POL 7** to ensure that development in the immediate vicinity of a recorded monument is sensitively sited and designed so that it does not significantly detract from the monument. Where upstanding remains exist, a visual impact assessment may be required.

**CH POL 8** to retain surviving medieval plots and street patterns in the villages and towns of Meath, where practicable, and in the course of development to record evidence of ancient boundaries, layouts, etc.

**CH POL 9** To inform and seek guidance from the National Museum of Ireland if an unrecorded archaeological object is discovered, or the National Monuments Service of the DoAHG in the case of the discovery of an unrecorded archaeological site, in accordance with National Monuments legislation

*Development in the UNESCO World Heritage Site of Brú na Bóinne*

**CH POL 1** to work in partnership with the relevant agencies/organisations and the public to promote, understand, conserve and sustainably manage the UNESCO World Heritage Site of Brú na Bóinne.

**CH POL 3** To require that all development within the UNESCO World Heritage Site of Brú na Bóinne shall be subject to the Development Assessment Criteria set out in Volume 1, Chapter 9, Section 9.6.7, and elsewhere in the Development Plan.

**CH POL 4** to refer all planning applications within the UNESCO World Heritage Site of Brú na Bóinne to the Department of Arts, Heritage and the Gaeltacht for comment. These comments will be considered in the making of decisions on all such planning applications.

*World Heritage Tentative List*

Two sites in Meath have been included on the Tentative List as part of larger assemblies of sites:

- The Royal Sites of Ireland (Cashel, Dún Ailinne, Hill of Uisneach, Rathcroghan Complex and Tara Complex);
- Early Medieval Monastic Sites (Clonmacnoise, Durrow, Glendalough, Inis Cealtra, Kells and Monasterboice).

**CH POL 5** To recognise and respect potential World Heritage Sites in Meath on the UNESCO Tentative List – Ireland-2010 and support their nomination to World Heritage status.

*Industrial Heritage*

Industrial heritage consists primarily of sites and structures associated with transportation, communications, manufacturing, public utilities, and materials extraction, but can also refer to archaeological sites and objects which demonstrate early evidence of industry such as metal working, or mining. Meath contains significant stretches of both operational and derelict waterways, railway structures, mills, lime kilns and milestones. Meath County Council commissioned an Industrial Heritage survey of the County in 2008 which may be seen on its website.

**Relevant objectives regarding archaeological heritage**

**CH OBJ 7** To protect archaeological sites and monuments, underwater archaeology, and archaeological objects, which are listed in the Record of Monuments and Places, and to seek their preservation in situ (or at a minimum, preservation by record) through the planning process.

**CH OBJ 8** to seek to protect important archaeological landscapes from inappropriate development.

**CH OBJ 11** To encourage and promote the appropriate management and maintenance of the County's archaeological heritage, including historical burial grounds, in accordance with conservation principles and best practice guidelines.

*Development in the UNESCO World Heritage Site of Brú na Bóinne*

**CH OBJ 1** To protect and enhance the Outstanding Universal Value of the cultural landscape in the UNESCO World Heritage Site of Brú na Bóinne in accordance with the relevant guidelines and national legislation, so that its integrity, authenticity and significance are not adversely affected by cumulative inappropriate change and development, and to enhance views within and adjacent to the site.

**CH OBJ 2** to protect the ridgelines which frame views within and from the UNESCO World Heritage

Site of Brú na Bóinne from inappropriate or visually intrusive development.

**CH OBJ 3** To encourage and facilitate pre-planning consultation with applicants regarding the siting and design of developments affecting the UNESCO World Heritage Site of Brú na Bóinne, and the scope of any necessary impact assessments.

**Architectural Heritage Policies and Objectives**

**CH POL 10** to conserve and protect the architectural heritage of Meath.

Relevant policies regarding protected structures

**CH POL 12** to encourage the retention, sympathetic reuse and rehabilitation of Protected Structures. In certain cases, land use zoning restrictions may be relaxed in order to secure the conservation of the protected structure.

**CH POL 13** to encourage the retention of original windows, doors, renders, roof coverings and other significant features of historic buildings.

**CH POL 14** to continue to develop the Council's advisory/educational role with regard to heritage matters and to promote awareness, understanding, and appreciation of the architectural heritage of Meath.

**CH POL 15** To encourage, where appropriate, the adaptive re-use of existing buildings and sites in a manner compatible with their character and significance.

**Relevant policies regarding Industrial Heritage**

Industrial heritage consists primarily of sites and structures associated with transportation, communications, manufacturing, public utilities, and materials extraction, but can also refer to archaeological sites and objects which demonstrate early evidence of industry such as metal-working, or mining. Meath contains significant stretches of both operational and derelict waterways, railway structures, mills, lime kilns and milestones.

**CH OBJ 17** to work with stakeholders to progress the phased restoration, maintenance and re-use for amenity purposes of the Boyne Navigation, towpath and associated structures within Meath.

**CH OBJ 18** to work with stakeholders to promote the maintenance and re-use for amenity purposes of the Royal Canal and associated structures within Meath.

**CH OBJ 19** to carry out phase two of the Industrial Heritage Survey, which will comprise a more detailed site inventory and assessment of surviving structures and sites.

**Relevant policies regarding vernacular structures**

**CH POL 20** a) To encourage the retention, sympathetic maintenance, and appropriate re-use of the vernacular heritage of Meath, in both the towns and rural areas of the County, including the retention of the original fabric, such as windows, renders, shop fronts, gates, yards, boundary walls and other significant features where possible;

b) To discourage the replacement of good quality vernacular buildings with modern structures;

c) To ensure that new build adjoining, and extensions to, vernacular buildings are of an appropriate

design and do not detract from the building's character.

**Relevant policies regarding Architectural Conservation Areas (ACAs)**

The Town Plans of Navan, Trim and Kells contain details of the ACAs in these towns. For the area of the County Plan the following 18 ACAs are designated: Ardbraccan Demesne, Athboy, Dunboyne, Dunsany Castle Demesne, Headfort Demesne, Julianstown, Kilmessan, Laytown, Longwood, Moynalty, Oldbridge Demesne,

Oldcastle, Slane, Slane Castle Demesne, Slane Mill Complex, Somerville Demesne, Stackallen Demesne, Summerhill.

**CH POL 17** To identify places of special architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest and where appropriate to define them as Architectural Conservation Areas.

**CH POL 18** to require that all development proposals within an ACA should be appropriate to the character of the area, inclusive of its general scale and materials, and are appropriately sited and sensitively designed having regard to the advice given in the Statements of Character for each area.

**Relevant policies regarding Country Houses and Demesnes**

**CH POL19** To encourage the protection, promotion and enhancement of heritage gardens and parks in the county and support public awareness, enjoyment of and access to these sites.

**Relevant objectives regarding Architectural Heritage**

**CH OBJ 13** To protect all structures (or, where appropriate, parts of structures) within the county which are of special architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest and which are included in the RPS.

**CH OBJ 14** to review and update the RPS when new information becomes available and to make additions and deletions as appropriate.

**CH OBJ 15** to identify and retain good examples of historic street furniture e.g. cast-iron post boxes, water pumps, signage, street lighting and kerbing.

**CH OBJ 20** to prohibit the demolition of a structure that positively contributes to the character of an ACA, except in exceptional circumstances. Meath County Council will require such applications to be accompanied by a measured and photographic survey, condition report and architectural heritage assessment of the structure. Where permission for demolition is granted within an ACA, an assessment of the impact of the replacement building on the character of the ACA will be required.

**CH OBJ 21** to ensure that any new development within or contiguous to an ACA is sympathetic to the character of the area and that the design is appropriate in terms of scale, height, plot density, layout, materials and finishes.

**CH OBJ 22** To discourage development that would lead to a loss of, or cause damage to, the character, the principal components of, or the setting of historic parks, gardens and demesnes of heritage significance.

**CH OBJ 23** To require that proposals for development in designed landscapes and demesnes include an appraisal of the landscape, designed views and vistas, and an assessment of significant trees or groups of trees, as appropriate.

**CH OBJ 24** to assist the retention and development of traditional building skills in Meath subject to the availability of resources.

### 1.1.1.6 Meath County Development Plan 2021 – 2027

Meath County Development Plan 2021-2027 was consulted for all relevant policies and objectives relating to archaeology, built and cultural heritage.

#### 1.1.1.6.1 *Archaeology*

## Policies

**HER POL 1** To protect sites, monuments, places, areas or objects of the following categories:

- Sites and monuments included in the Sites and Monuments Record as maintained by the National Monuments Service of the Department of Culture, Heritage and the Gaeltacht;
- Monuments and places included in the Record of Monuments and Places as established under the National Monuments Acts;
- Historic monuments and archaeological areas included in the Register of Historic Monuments as established under the National Monuments Acts;
- National monuments subject to Preservation Orders under the National Monuments Acts and national monuments which are in the ownership or guardianship of the Minister for Culture, Heritage and the Gaeltacht or a local authority;
- Archaeological objects within the meaning of the National Monuments Acts; and Wrecks protected under the National Monuments Acts or otherwise included in the Shipwreck Inventory maintained by the National Monuments Service of the Department of Culture, Heritage and the Gaeltacht.

**HER POL 2** To protect all sites and features of archaeological interest discovered subsequent to the publication of the Record of Monument and Places, in situ (or at a minimum preservation by record) having regard to the advice and recommendations of the National Monuments Service of the Department of Culture, Heritage and the Gaeltacht and The Framework and Principles for the Protection of the Archaeological Heritage (1999).

**HER POL 3** To require, as part of the development management process, archaeological impact assessments, geophysical survey, test excavations or monitoring as appropriate, for development in the vicinity of monuments or in areas of archaeological potential., Where there are upstanding remains, a visual impact assessment may be required.

**HER POL 4** To require, as part of the development management process, archaeological impact assessments, geophysical survey, test excavations or monitoring as appropriate, where development proposals involve ground clearance of more than half a hectare or for linear developments over one kilometre in length; or developments in proximity to areas with a density of known archaeological monuments and history of discovery as identified by a licensed archaeologist.

**HER POL 5** To seek guidance from the National Museum of Ireland where an unrecorded archaeological object is discovered, or the National Monuments Service in the case of an unrecorded archaeological site.

## Objectives

**HER OBJ 1** To implement in partnership with the County Meath Heritage Forum, relevant stakeholders and the community the County Meath Heritage Plan and any revisions thereof.

**HER OBJ 2** To ensure that development in the vicinity of a Recorded Monument or Zone of Archaeological Potential is sited and designed in a sensitive manner with a view to minimal detraction from the monument or its setting.

**HER OBJ 3** To seek to protect important archaeological landscapes from inappropriate development.

**HER OBJ 4** To encourage the management and maintenance of the County's archaeological heritage, including historic burial grounds, in accordance with best conservation practice that considers the impact of climate change.

**HER OBJ 5** To promote awareness of, and encourage the provision of access to, the archaeological resources of the county.

**HER OBJ 6** To work in partnership with key stakeholders to promote County Meath as a centre for cultural heritage education and learning through activities such as community excavation and field/summer schools.

## Bru Na Boinne Policies

Brú na Bóinne, which means the 'palace' or the 'mansion' of the Boyne, refers to the area within the bend of the River Boyne which contains one of the world's most important prehistoric landscapes. It is located close to the east coast of Ireland approximately 40 km north of Dublin city, about 8km west of the medieval town of Drogheda and about 5km east of the village of Slane.

The archaeological landscape within Brú na Bóinne is dominated by the three well-known large passage tombs, Knowth, Newgrange and Dowth, built some 5,000 years ago in the Neolithic or Late Stone Age.

**HER POL 6** To protect the Outstanding Universal Value of the UNESCO World Heritage Site of Brú na Bóinne in accordance with the relevant guidelines and national legislation, so that its integrity, authenticity and significance are not adversely affected by inappropriate development or change.

**HER POL 7** To encourage the retention, conservation, and appropriate re-use of traditional buildings within the UNESCO World Heritage Site of Brú na Bóinne in preference to either their replacement, or the construction of new buildings on green field sites.

**HER POL 8** To ensure that development within the UNESCO World Heritage Site of Brú na Bóinne shall be subject to the Development Assessment Criteria set out in Appendix no. 8 and the Development Management Guidelines in Chapter 11.

**HER POL 9** To consider individual housing within the UNESCO World Heritage Site of Brú na Bóinne, as shown on Map No 8.1, only for those involved locally in full time agriculture and who do not own land outside of the UNESCO World Heritage Site of Brú na Bóinne and subject to compliance with all other relevant provisions contained in this Development Plan.

**HER POL 10** To ensure that residential extensions within the UNESCO World Heritage Site of Brú na Bóinne are in character with the original buildings.

**HER POL 11** To support the Department of Culture, Heritage and the Gaeltacht and all stakeholders in the implementation of the Brú na Bóinne Management Plan, 2017.

## Bru Na Boinne Objectives

**HER OBJ 7** To work in partnership with the community and all other relevant stakeholders to promote, understand, conserve and sustainably manage the UNESCO World Heritage Site of Brú na Bóinne

**HER OBJ 8** To encourage and facilitate preapplication discussions, in conjunction with the Department of Culture, Heritage and the Gaeltacht, regarding the siting and design of developments affecting the UNESCO World Heritage Site of Brú na Bóinne and the scope of any necessary impact assessments.

**HER OBJ 9** To refer all planning applications within the UNESCO World Heritage Site of Brú na Bóinne to the Department of Culture, Heritage and the Gaeltacht for comment. These comments will be considered in the assessment of all such planning applications.

**HER OBJ 10** To actively support and encourage the re-use of vacant and derelict dwellings within the Core and Buffer Zone of the World Heritage Site of Brú na Bóinne by providing assistance and professional advice to owners seeking to re-develop such sites.

**HER OBJ 11** To protect the ridgelines which frame views within and from the UNESCO World Heritage Site of Brú na Bóinne from inappropriate or visually intrusive development

**HER OBJ 12** To prepare and implement a Business Plan for the World Heritage Site in conjunction with relevant stakeholders, subject to funding.

### World Heritage Tentative List

The protection of the world's cultural and natural heritage is of importance for present and future generations and to this end the State is committed to the identification, protection, conservation, presentation and promotion of the World Heritage Site in accordance with Article 4 of the World Heritage Convention. A Tentative List is an inventory of those properties which a country intends to consider for nomination to the World Heritage List. The current Tentative List was approved by the Minister for Arts, Heritage and the Gaeltacht and submitted to UNESCO in March 2010. The nomination of any property from the Tentative List for inscription on the World Heritage List will only take place after consultation with local communities and other relevant stakeholders. Two sites in the County have been included on the Tentative List as part of larger assemblies of sites: • The Tara Complex as part of The Royal Sites of Ireland (Cashel, Dún Ailinne, Hill of Uisneach, Rathcroghan Complex and Tara Complex) Kells, as part of the Early Medieval Monastic Sites (Clonmacnoise, Durrow, Glendalough, Inis Cealtra, Kells and Monasterboice). In January 2019, the Minister for Culture, Heritage and the Gaeltacht invited applications for Ireland's Tentative List of properties for potential future nomination to the World Heritage List 2020-2030.

### Policies & Objectives

**HER POL12** To recognise and respect potential World Heritage Sites in Meath on the UNESCO Tentative List – Ireland.

**HER OBJ 13** To support the State in the nomination process of Tara and Kells to World Heritage status as part of an assemblage of Royal and Monastic Sites in cooperation with the relevant Local Authorities.

## 1.1.1.6.2 *Protected Structures*

### Policies

**HER POL 14** To protect and conserve the architectural heritage of the County and seeks to prevent the demolition or inappropriate alteration of Protected Structures.

**HER POL 15** To encourage the conservation of Protected Structures, and where appropriate, the adaptive re-use of existing buildings and sites in a manner compatible with their character and significance. In certain cases, land use zoning restrictions may be relaxed in order to secure the conservation of the protected structure

**HER POL 16** To protect the setting of protected structures and to refuse permission for development within the curtilage or adjacent to a protected structure which would adversely impact on the character and special interest of the structure, where appropriate.

**HER POL 17** To require that all planning applications relating to Protected Structures contain the appropriate accompanying documentation in accordance with the Architectural Heritage Protection Guidelines for Planning Authorities (2011) or any variation thereof, to enable the proper assessment of the proposed works.

**HER POL 18** To require that in the event of permission being granted for development within the curtilage of a protected structure, any works necessary for the survival of the structure and its re-use should be prioritised in the first phase of development.

### Objectives

**HER OBJ 15** To review and update the Record of Protected Structures on an on-going basis and to make additions and deletions as appropriate.

**HER OBJ 16** To identify and retain good examples of historic street furniture, e.g. cast-iron post boxes, water pumps, light fixtures and signage, as appropriate.

**HER OBJ 17** To promote best conservation practice and encourage the use of appropriately qualified professional advisors, tradesmen and craftsmen, with recognised conservation expertise, for works to protected structures or historic buildings in an Architectural Conservation Area.

**HER OBJ 18** To provide detailed guidance notes and continue to develop the Council's advisory/ educational role with regard to heritage matters and to promote awareness, understanding and appreciation of the architectural heritage of the County.

#### 1.1.1.6.3 *Industrial Heritage*

Industrial heritage consists primarily of structures associated with manufacturing, transportation, communications, public utilities and materials extraction. Examples include canals, railway structures, mills, warehouses, lighthouses, lime kilns and milestones. A desktop survey of the industrial heritage of the County was carried out in 20085.

It is the policy of the Council:

**HER POL 24** To encourage appropriate change of use and reuse of industrial heritage structures provided such a change does not seriously impact on the intrinsic character of the structure and that all works are carried out in accordance with best conservation practice, subject to compliance with normal planning criteria.

**HER POL 25** To protect and enhance the built and natural heritage of the Royal Canal and Boyne Navigation and associated structures and to ensure, in as far as practically possible, that development which may impact on these structures and their setting be sensitively designed with regard to their character and setting. Development of the project will be subject to the outcome of the Appropriate Assessment process.

##### Objectives

**HER OBJ 26** To require an architectural / archaeological assessment, as appropriate, which references the Meath Industrial Heritage Survey and other relevant sources, for all proposed developments on industrial heritage structures or sites.

**HER OBJ 27** To carry out Phase 2 of the Industrial Heritage Survey which will comprise a field survey and assessment of surviving structures and site and consider if appropriate proposing them for addition to the Record of Protected Structure.

#### 1.1.1.6.4 *Designed Landscapes, Gardens and Demesnes*

Historic designed landscapes consist of private gardens, public parks and the gardens and landscapes associated with country house demesnes. In the County, the designed landscapes are largely found in demesne or estate lands and frequently form the setting for protected structures. The National Inventory of Architectural Heritage (NIAH) carried out a desktop survey of Historic Gardens and Demesnes in Ireland, which commenced in 2003 and identified approximately 300 such sites in the County. This survey can be seen on their website www. buildingofireland.ie.

It is the policy of the Council:

**HER POL 26** To encourage the protection and enhancement of heritage gardens and demesne landscapes, and to support, in consultation with the owners, the provision of public access to these sites as appropriate.

##### Objectives

**HER OBJ 28** To discourage development that would adversely affect the character, the principal components of, or the setting of historic parks, gardens and demesnes of heritage significance.

**HER OBJ 29** To require that proposals for development in designated landscapes and demesnes include an appraisal of the landscape, designed views and vistas, including a tree survey, where relevant, in order to inform site appropriate design proposals.

# APPENDIX 13-6

***Archaeological Impact Assessment of Proposed Bog Decommissioning and Rehabilitation at Lisclogher West, Carranstown and Bracklin West Bogs***

# Archaeological Impact Assessment of Proposed Bog Decommissioning and Rehabilitation at Lisclogher West Bog, Co. Westmeath

## Report For

## Bord Na Móna Energy Ltd.

## Author

## Dr. Charles Mount

## Bord Na Móna Project Archaeologist

## Introduction

The EPA (2002) *Guidance on the process of preparing and implementing a bog rehabilitation plan* notes that the licensee should characterise the bog prior to embarking on detailed planning and implementation. This characterisation should detail how the land is classified in terms of statutory protections, e.g. as European sites, world heritage sites, RAMSAR sites, National Heritage Areas, national monuments, archaeological heritage, etc. This archaeological impact assessment report was prepared by Dr. Charles Mount for Bord na Móna Energy Ltd to fulfil this characterisation in relation to archaeological heritage. It represents the results of a desk-based assessment of the impact of proposed bog rehabilitation on c.239 hectares at Lisclogher West Bog, Co. Westmeath on the known archaeological heritage of the bog. The proposed rehabilitation actions will be a combination of measures to create wetlands and re-wet deep peat as outlined in the draft Methodology Paper for the proposed Bord na Móna Decommissioning, Rehabilitation and Restoration Scheme. These enhanced measures for Lisclogher West Bog will include:

- Raised bog restoration measures including intensive drain-blocking (7/100 m);
- Modifying outfalls, and management of water levels with overflow pipes and blocking of internal outfalls;
- Regular drain blocking (3/100) on dry cutaway along with the blocking of outfalls and management of water levels;
- Re-wetting the deep peat in the cutover areas of the bog using berms and peat dams. This enhanced measure seeks to create large (c. 45m x 60m) flat areas or cells of shallow (levels at peat surface +/- 10 cm) water conditions on bare areas and vegetated areas of cutover bog;
- Removal of conifer forestry from the high bog (Forest to Bog restoration). A small part of the high bog was planted with conifer forestry. It is proposed to remove this forestry to support raised bog restoration. Trees will be felled and removed, conifer stumps will be "flipped", the bog surface will be reprofiled (smoothed) and the drains will be blocked to encourage the redevelopment of bog vegetation. This requires engagement and agreement with Coillte and with the Forest Service. This enhanced bog restoration measure is proposed to be carried out as a trial at Lisclogher West to learn new techniques and to inform the feasibility and potential to use these new techniques at other sites to remove conifers (See Appendix XIII).
- Removal of feral self-sown conifer trees from the high bog. Conifers from adjacent plantations have colonised the bog. These trees will be felled to waste to support raise bog restoration.
- Silt control measures will be retained and maintained during the rehabilitation phase. During the monitoring and verification phase silt ponds and silt control measures will be continually inspected and maintained, where appropriate. When it is deemed that silt ponds are not required, as the bog has been successfully stabilised and water quality parameters meet targets the condition of the silt ponds will be reviewed. Silt ponds will either be de-watered (water levels lowered to a level where the silt pond will naturally develop as a small wetland feature), left in situ, or infilled (where discharges do not require silt control).

Lisclogher West Bog is located c.2.6km south of Delvin and there is a minor road running through it for most of its length. The bog rehabilitation area occupies the townlands of Ballyhealy or Ballinure, Bolandstown, Bracklin and Martinstown on OS 6-inch sheet Westmeath No. 14.

## Methodology

This is a desk-based archaeological assessment that includes a collation of existing written and graphic information to identify the likely archaeological potential of Lisclogher West Bog. The extent of the rehabilitation area is indicated in Fig. 1. This area was examined using information from:

- The IAWU Peatland Survey
- The 2005 Peatland Survey
- The Record of Monuments and Places
- The Sites and Monuments Record (SMR) that is maintained by the Dept of Housing, Local Government and Heritage
- The Excavations database
- Previous assessments

An impact assessment has been prepared and recommendations have been made.

## Desktop assessment

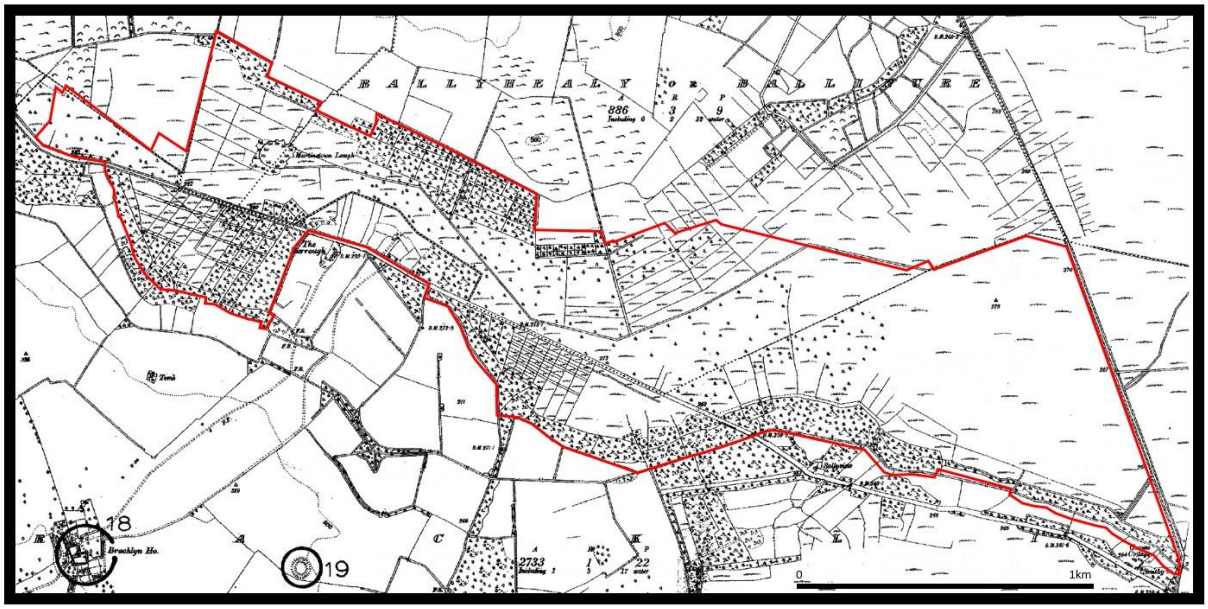


Fig. 1. Lisclogher West Bog, Co. Westmeath, detail of the Record of Monuments and Places map sheets Westmeath No. 14. The proposed rehabilitation area is outlined with the red line.

**Peatland survey**

Lisclogher West Bog was not surveyed by the Irish Archaeological Wetland Unit (IAWU).

**Recorded Monuments**

The Record of Monuments and Places (RMP) for Co. Westmeath which was established under Section 12 of the National Monuments (Amendment) Act, 1994 was examined as part of the assessment (DAHGI 1997). This record was published by the Minister in 1997 and includes sites and monuments that were known in Lisclogher West Bog before that date. This review established that there are no RMPs located in the proposed rehabilitation area (see Fig. 1).

**2005 Archaeological Survey of Ireland Peatland Survey**

Lisclogher West Bog was surveyed by ADS Ltd in 2005 as part of the Archaeological Survey of Ireland Peatland Survey (Licence No. 05E0792). No sightings of archaeological heritage were recorded during the fieldwalking survey (Whitaker 2006, 11-12).

**Archaeological Excavations**

The Excavations Bulletin at excavations.ie was checked for reports of licenced excavations carried out in the rehabilitation area. This indicates that there have been no licenced excavations carried out in the rehabilitation area.

**Sites and Monuments Record**

The Sites and Monuments Record (SMR) which is maintained by the Department of Housing, Local Government and Heritage was examined as part of the assessment on the 8th of May 2023. This review established that there are no SMRs located in the proposed rehabilitation area (see Fig. 2).




Fig. 2. Lisclogher West Bog, Co. Westmeath, detail of the Sites and Monuments Record. The proposed rehabilitation area is outlined with the red line.

**Previous assessments**

Lisclogher West Bog has been the subject of an Environmental Impact Assessment Report (EIAR) carried out by Irish Archaeological Consultancy LTD in 2018 for Bord na Móna Energy Limited in relation to IPC Licence P0500-03. This assessment included a review of the topographical files and finds registers of the National Museum of Ireland intended to identify all archaeological objects from the bog reported to the Museum by that date and these are included below in Table 1 (Pers Comm. Jane Whitaker). The assessment noted that there was a potential for archaeological heritage to be uncovered during the course of any future development works in Lisclogher West Bog.

**Reported finds**

As noted above the EIAR carried out by Irish Archaeological Consultancy LTD in in relation to IPC Licence P0500-03 contains a complete list of known archaeological objects from Lisclogher West Bog reported to the National Museum of Ireland up to 2018 (see Table 1).

| Townland | Museum No./ catalogue No. | Description |
|---|---|---|
| Lisclogher | 1954:54 | Bronze Axehead |
| Lisclogher | IA/104/1982 | 14 pieces of wood |

Table 1. List of archaeological finds from Lisclogher West Bog reported to the National Museum of Ireland.

## Impact assessment

There are no known sightings of archaeological material in the rehabilitation area. There are some archaeological objects known from the bog that have been removed to the National Museum (see Table 1).

## Recommendations

There are no known sightings of archaeological monuments in the rehabilitation area. There are some archaeological objects known from the bog that have been removed to the National Museum (see Table 1). Should any previously unknown archaeological heritage be uncovered during the rehabilitation works, it should also be avoided and reported to the Bord na Móna Archaeological Liaison Officer and the National Museum of Ireland.

## Conclusion

This is a desk-based archaeological assessment and includes a collation of existing written and graphic information to identify the likely archaeological potential of the proposed rehabilitation area. Lisclogher West Bog was surveyed by ADS Ltd in 2005 as part of the Archaeological Survey of Ireland Peatland Survey and no sightings of archaeological heritage were recorded. There are no known sightings of archaeological monuments in the rehabilitation area. There are some archaeological objects known from the bog that have been removed to the national Museum (see Table 1). Should any previously unknown archaeological heritage be uncovered during the rehabilitation works, it should also be avoided and reported to the Bord na Móna Archaeological Liaison Officer and the National Museum of Ireland.

## References

DAHGI 1997. Recorded Monuments Protected under Section 12 of the National Monuments (Amendment) Act, 1994. County Westmeath.

EPA 2020. Guidance on the process of preparing and implementing a bog rehabilitation plan.

Mackin *et al.* 2017. Best practice in raised bog restoration in Ireland. Irish Wildlife Manuals, No. 99. National Parks and Wildlife Service.

Whitaker, J. 2006. Peatland Survey 2005 Allen, Kilberry & Coolnamóna Bogs Counties Kildare, Laois, Meath, Offaly, & Westmeath. Unpublished report for Department of the Environment, Heritage and Local Government.

Dr. Charles Mount
9 May 2023

# Archaeological Impact Assessment of Proposed Bog Decommissioning and Rehabilitation at Carranstown Bog, Cos. Meath and Westmeath

**Draft**

**Report For**

**Bord Na Móna Energy Ltd.**

**Author**

**Dr. Charles Mount**

**Bord Na Móna Project Archaeologist**

## Introduction

The EPA (2020) *Guidance on the process of preparing and implementing a bog rehabilitation plan* notes that the licensee should characterise the bog prior to embarking on detailed planning and implementation. This characterisation should detail how the land is classified in terms of statutory protections, e.g. as European sites, world heritage sites, RAMSAR sites, National Heritage Areas, national monuments, archaeological heritage, etc. This archaeological impact assessment report was prepared by Dr. Charles Mount for Bord na Móna Energy Ltd to fulfil this characterisation in relation to archaeological heritage. It represents the results of a desk-based assessment of the impact of proposed bog rehabilitation of c.305 hectares at Carranstown Bog, Cos. Meath and Westmeath on the known archaeological heritage of the bog. The proposed rehabilitation actions will be a combination of measures to create wetlands and re-wet deep peat as outlined in the draft Methodology Paper for the proposed Bord na Móna Decommissioning, Rehabilitation and Restoration Scheme. These enhanced measures for Carranstown Bog will include:

- Deep Peat measures including field re-profiling, bunding and drain-blocking, resulting in bunded wetlands suitable for Sphagnum inoculation, on deeper peat;
- Intensive drain blocking around shallow peat areas / modelled depressions on little or no peat to create/promote the spread of wetland habitats,
- Modifying outfalls, and management of water levels with overflow pipes and blocking of internal outfalls;
- Regular drain blocking (3/100) on dry cutaway along with the blocking of outfalls and management of water levels;
- Intensive drain blocking (7/100) in areas to develop wetlands in areas of shallow peat. Measures include the blocking of outfalls, management of water levels and transplanting reeds and other rhizomes;
- Berms and field re-profiling (45m x 60m cell) in deep peat areas, along with blocking outfalls and managing overflows with a controlled weir outfall, includes drainage channels for excess water and Sphagnum inoculation;
- Targeted fertiliser applications to accelerate vegetation establishment on areas of bare peat on headlands and high fields, and within certain areas of dry cutaway. Areas where vegetation has established do not need fertiliser application.
- Seeding of vegetation and inoculation of Sphagnum will be undertaken where required.

Carranstown Bog is located c.1.7km northwest of Ballivor, Co. Meath, and north of the R156 road. The overall rehabilitation area occupies the townlands of Grangemore, Co. Westmeath and Carranstown Great and Little and Killaconnigan, Co. Meath on OS 6 inch sheets Meath No. 35 and Westmeath No. 21.

## Methodology

This is a desk-based archaeological assessment that includes a collation of existing written and graphic information to identify the likely archaeological potential of Carranstown Bog. The overall extent of the rehabilitation is indicated in Fig. 1. This area was examined using information from:

- Archaeological Survey of Ireland Peatland 2005
- The Sites and Monuments Record that is maintained by the Dept of Housing, Local Government and Heritage
- The topographical files of the National Museum of Ireland.
- The Excavations database
- Previous assessments

An impact assessment has been prepared and recommendations have been made.

## Desktop assessment

### Recorded Monuments

The Record of Monuments and Places (RMP) for Cos. Meath and Westmeath which was established under Section 12 of the National Monuments (Amendment) Act, 1994 was examined as part of the assessment (DAHGI 1996 and 1997). These records were published by the Minister in 1996 and 1997 and includes sites and monuments that were known in Carranstown Bog before that date. This review established that there are no RMPs located in the proposed rehabilitation area (see Fig. 1).

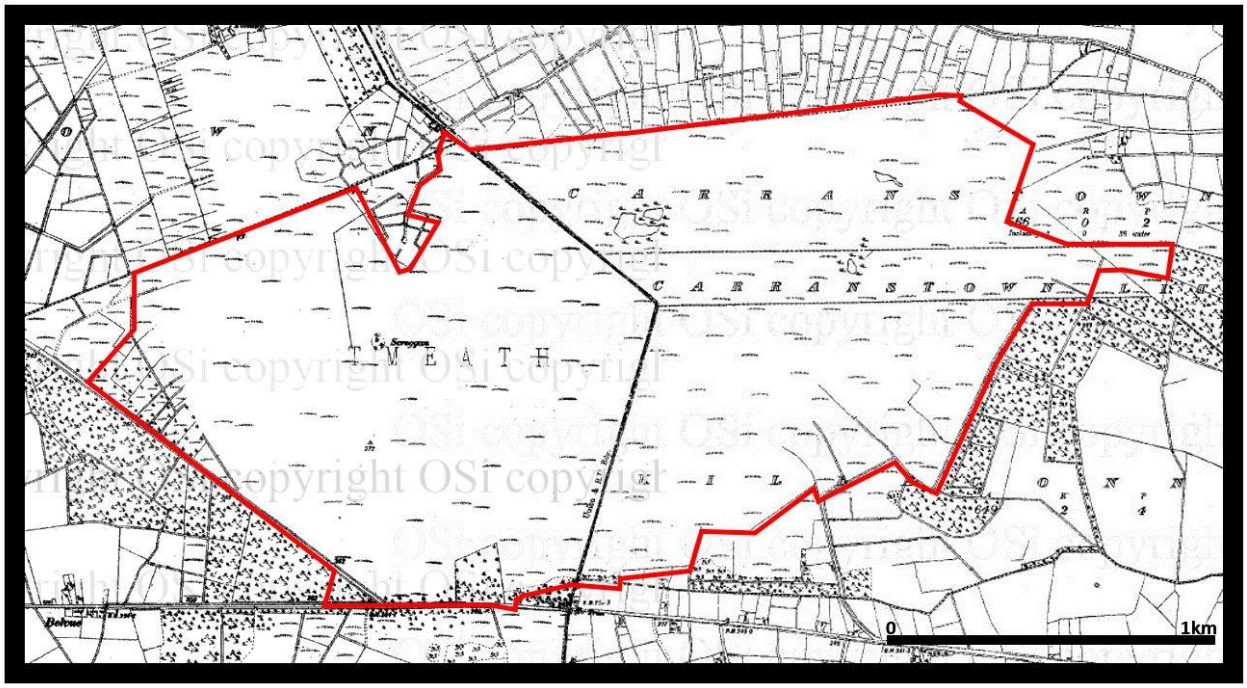


Fig. 1. Carranstown Bog, , detail of the Record of Monuments and Places map sheets Meath No. 35 and Westmeath No. 21. The proposed rehabilitation area is outlined with the red line. There are no Recorded Monuments in the rehabilitation area.

### Archaeological Survey of Ireland Peatland 2005

In 2005 Carranstown Bog was the subject of a peatland survey (Licence No. 05E0794). The bog was field walked by ADS Ltd at two drain intervals with the exception of the overgrown area which was walked at roughly 30m intervals. No archaeological material was recorded during this survey (Whitaker 2005, 12).

### Sites and Monuments Record

The Sites and Monuments Record (SMR) which is maintained by the Department of Housing, Local Government and Heritage was examined as part of the assessment on the 16th of November 2021. The SMR consists of records included in the RMP and sites and monuments notified to the Dept. since the publication of the RMP. This review established that there are no entries in the SMR in the proposed rehabilitation area (see Fig. 2).

**Reported finds**

The topographical files of the National Museum of Ireland were searched for records of finds from the bog in x 2021. There have been no finds reported to the Museum from the rehabilitation area.




Fig. 2. Carranstown Bog, Cos. Meath and Westmeath, detail of the Sites and Monuments Record. The proposed rehabilitation area is outlined with the red line. There are no SMRs in the rehabilitation area.

**Archaeological investigations**

Reports of archaeological excavations and licensed monitoring in the study area listed in the excavations database at excvations.ie were examined as part of the assessment. There are no additional reports of archaeological investigation carried out in the rehabilitation area.

**Previous assessments**

Carranstown Bog has been the subject of an Environmental Impact Assessment Report caried out by Irish Archaeological Consultancy LTD in 2018 for Bord na Móna Energy Limited in relation to IPC Licence P0500-01. The assessment noted that no archaeological material has been identified in Carranstown Bog and noted that there was a potential for archaeological features to be uncovered during the course of any future development works in the bog.

## Impact assessment

There is no known archaeological material in Carranstown Bog.

## Recommendations

There is no known archaeological material in Carranstown Bog. Should any previously unknown archaeological material be uncovered during the rehabilitation works, it should be avoided and reported to the Bord na Móna Archaeological Liaison Officer and the National Museum of Ireland.

## Conclusion

This is a desk-based archaeological assessment and includes a collation of existing written and graphic information to identify the likely archaeological potential of the proposed rehabilitation area. There is no known archaeological material in Carranstown Bog. Should any previously unknown archaeological material be uncovered during the rehabilitation works, it should be avoided and reported to the Bord na Móna Archaeological Liaison Officer and the National Museum of Ireland.

## References

DAHGI 1996. Recorded Monuments Protected under Section 12 of the National Monuments (Amendment) Act, 1994. County Meath.

DAHGI 1997. Recorded Monuments Protected under Section 12 of the National Monuments (Amendment) Act, 1994. County Westmeath.

EPA 2020. Guidance on the process of preparing and implementing a bog rehabilitation plan.

Whitaker, J. 2006. Peatland Survey 2005 Allen, Kilberry & Coolnamóna Bogs Counties Kildare, Laois, Meath, Offaly, & Westmeath. Unpublished report for the Department of the Environment, Heritage and Local Government.

Dr. Charles Mount
18 November 2021

# Archaeological Impact Assessment of Proposed Bog Decommissioning and Rehabilitation at Bracklin West Bog, Co. Westmeath

## Report For

## Bord Na Móna Energy Ltd.

## Author

## Dr. Charles Mount

## Bord Na Móna Project Archaeologist

## Introduction

The EPA (2002) *Guidance on the process of preparing and implementing a bog rehabilitation plan* notes that the licensee should characterise the bog prior to embarking on detailed planning and implementation. This characterisation should detail how the land is classified in terms of statutory protections, e.g. as European sites, world heritage sites, RAMSAR sites, National Heritage Areas, national monuments, archaeological heritage, etc. This archaeological impact assessment report was prepared by Dr. Charles Mount for Bord na Móna Energy Ltd to fulfil this characterisation in relation to archaeological heritage. It represents the results of a desk-based assessment of the impact of proposed bog rehabilitation on c.750 hectares at Bracklin West Bog, Co. Westmeath on the known archaeological heritage of the bog. The proposed rehabilitation actions will be a combination of measures to create wetlands and re-wet deep peat as outlined in the draft Methodology Paper for the proposed Bord na Móna Decommissioning, Rehabilitation and Restoration Scheme. These enhanced measures for Bracklin West Bog will include:

- A widespread drain-blocking programme will be implemented across the cutaway, where possible. This will have to be planned in association with the wind farm infrastructure. In general, field drains will be blocked where possible to re-wet cutaway and re-wet to the optimum water-level. More intensive measures will be targeted towards the bare peat.
- In areas of deeper peat, berms and field reprofiling will be carried out to create 45m x 60m cells. These will be carried out in deep peat areas where water has potential to be retained within the cell. Measures will also entail blocking outfalls, managing overflows, creating drainage channels for excess water and carrying out Sphagnum inoculation.
- Less intensive measures (targeted drain-blocking) will be used in areas where habitats have already established.
- Measures will include drain blocking (3/100 m), modifying outfalls and managing water levels with overflow pipes;
- Wetland measures including blocking outfalls and managing water levels with overflow pipes.

Bracklin West Bog is located c.2.9km north of Raharney and east of the L1504 road. The bog rehabilitation area occupies the townlands of Ballynaskeagh, Bracklin, Craddanstown, Killagh, and Mucklin on OS 6 inch sheets Westmeath Nos. 13, 14, 20 and 21.

## Methodology

This is a desk-based archaeological assessment that includes a collation of existing written and graphic information to identify the likely archaeological potential of Bracklin West Bog. The extent of the rehabilitation area is indicated in Fig. 1. This area was examined using information from:

- The IAWU Peatland Survey
- The 2005 Bord na Móna Survey
- The Record of Monuments and Places
- The Sites and Monuments Record (SMR) that is maintained by the Dept of Housing, Local Government and Heritage
- The Excavations database
- Previous assessments

An impact assessment has been prepared and recommendations have been made.

## Desktop assessment

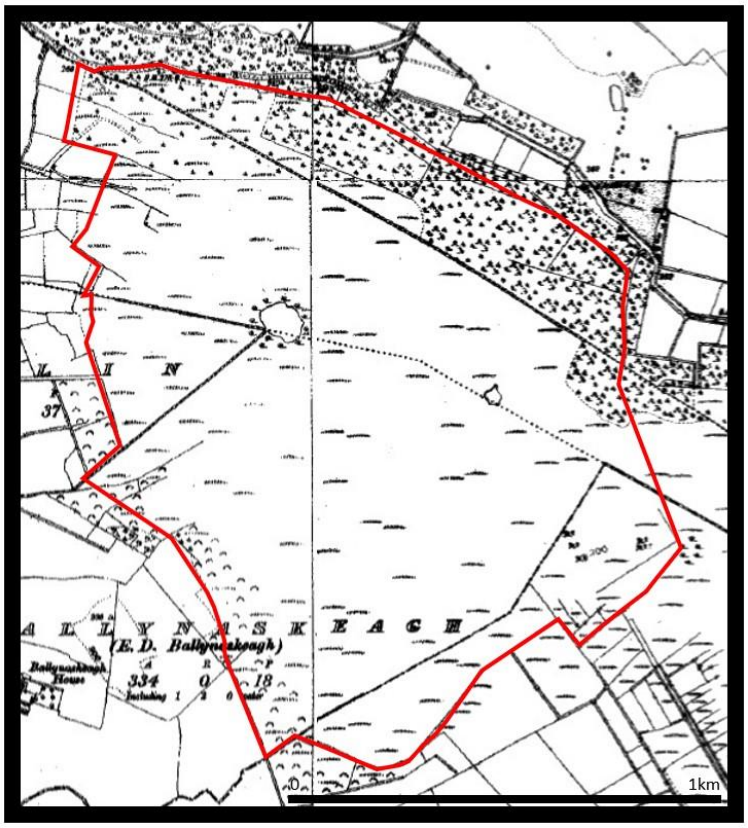


Fig. 1. Bracklin West Bog, Co. Westmeath, detail of the Record of Monuments and Places map sheets Westmeath Nos. 13, 14, 20 and 21. The proposed rehabilitation area is outlined with the red line.

**Peatland survey**
Bracklin West Bog was not surveyed by the Irish Archaeological Wetland Unit (IAWU).

**Recorded Monuments**
The Record of Monuments and Places (RMP) for Co. Westmeath which was established under Section 12 of the National Monuments (Amendment) Act, 1994 was examined as part of the assessment (DAHGI 1997). This record was published by the Minister in 1997 and includes sites and monuments that were known in Bracklin West Bog before that date. This review established that there are no RMPs located in the proposed rehabilitation area (see Fig. 1).

**2005 Archaeological Survey of Ireland Peatland Survey**
Bracklin West Bog was surveyed by ADS Ltd in 2005 as part of the Archaeological Survey of Ireland Peatland Survey (Licence No. 05E0793). No sightings of archaeological material were recorded during the fieldwalking survey (Whitaker 2006, 11-12).

**Archaeological Excavations**
The Excavations Bulletin at excavations.ie was checked for reports of licenced excavations carried out in the rehabilitation area. This indicate that there have been no licenced excavations carried out in the rehabilitation area.

**Sites and Monuments Record**

The Sites and Monuments Record (SMR) which is maintained by the Department of Housing, Local Government and Heritage was examined as part of the assessment on the 1st of February 2023. This review established that there are no SMRs located in the proposed rehabilitation area (see Fig. 2).




Fig. 2. Bracklin West Bog, Co. Westmeath, detail of the Sites and Monuments Record. The proposed rehabilitation area is outlined with the red line.

**Previous assessments**

Bracklin West Bog has been the subject of an Environmental Impact Assessment Report (EIAR) carried out by Irish Archaeological Consultancy LTD in 2018 for Bord na Móna Energy Limited in relation to IPC Licence P0500-03. This assessment included a review of the topographical files and finds registers of the National Museum of Ireland intended to identify all finds from the bog reported to the Museum by that date and these are included below in Table 1 (Pers Comm. Jane Whitaker). The assessment noted that there was a high potential for archaeological features to be uncovered during the course of any future development works in Bracklin West Bog.

**Reported finds**

As noted above the EIAR carried out by Irish Archaeological Consultancy LTD in in relation to IPC Licence P0500-03 contains a complete list of known finds from Bracklin West Bog reported to the National Museum of Ireland up to 2018 (see Table 1).

| Townland | Museum No./ catalogue N0. | Description |
|---|---|---|
| Bracklin | 1964:83 | Wooden lid |

| | | |
|---|---|---|
| Bracklin | 1959:31 | Bronze sword blade |
| Bracklin | 1959:09 | Neolithic pottery vessel |
| Bracklin | 1962:243 | Polished stone axehead |

Table 1. List of archaeological finds from Bracklin Bog reported to the National Museum of Ireland.

## Impact assessment

There are no known sightings of archaeological material in the rehabilitation area. There are some finds known from the bog (see Table 1).

## Recommendations

There are no known sightings of archaeological material in the rehabilitation area. There are some finds known from the bog (see Table 1). Should any previously unknown archaeological material be uncovered during the rehabilitation works, it should also be avoided and reported to the Bord na Móna Archaeological Liaison Officer and the National Museum of Ireland.

## Conclusion

This is a desk-based archaeological assessment and includes a collation of existing written and graphic information to identify the likely archaeological potential of the proposed rehabilitation area. Bracklin West Bog was surveyed by ADS Ltd in 2005 as part of the Archaeological Survey of Ireland Peatland Survey and no sightings of archaeological material were recorded. There are no known sightings of archaeological material in the rehabilitation area. There are some finds known from the bog (see Table 1). Should any previously unknown archaeological material be uncovered during the rehabilitation works, it should also be avoided and reported to the Bord na Móna Archaeological Liaison Officer and the National Museum of Ireland.

## References

DAHGI 1997. Recorded Monuments Protected under Section 12 of the National Monuments (Amendment) Act, 1994. County Westmeath.

EPA 2020. Guidance on the process of preparing and implementing a bog rehabilitation plan.

Mackin *et al.* 2017. Best practice in raised bog restoration in Ireland. Irish Wildlife Manuals, No. 99. National Parks and Wildlife Service.

Whitaker, J. 2006. Peatland Survey 2005 Allen, Kilberry & Coolnamóna Bogs Counties Kildare, Laois, Meath, Offaly, & Westmeath. Unpublished report for Department of the Environment, Heritage and Local Government.

Dr. Charles Mount
1 February 2023

# APPENDIX 14-1

***Ballivor Wind Farm Scoping Responses from IAA, Department of Defence, Telecommunication Operators***

## Shaun Doolin

**From:** Defence Property Management Planning <PropertyManagementPlanning@defence.ie>
**Sent:** Friday 12 February 2021 16:48
**To:** Karen Mulryan
**Cc:** Gareth O'Flaherty (Defence); Sarah Zacharia (Defence)
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Good afternoon Karen,

We wish to acknowledge receipt of your e-mail for a proposed Windfarm Development at Ballivor, Meath/Westmeath.

We will consult with our Military colleagues and revert in due course.

Best regards

Don

**Don Watchorn**

*Property Management Branch*

**An Roinn Cosanta**

*Department of Defence*

**Bóthar an Stáisiúin, An Droichead Nua, Contae Chill Dara, W12 AD93.**

Station Road, Newbridge, Co.Kildare, W12 AD93.

T +353 (0)45 492199
E-mail don.watchorn@defence.ie

---

**From:** Karen Mulryan <kmulryan@mkoireland.ie>
**Sent:** Friday 12 February 2021 15:26
**To:** Raymond Myles (Defence) <Raymond.Myles@defence.ie>; Defence Property Management Planning <PropertyManagementPlanning@defence.ie>
**Cc:** Gareth O'Flaherty (Defence) <Gareth.OFlaherty@defence.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Good afternoon,

I previously contacted you with a proposed wind farm development at Ballivor on the Meath/Westmeath border.
Please see attached the proposed final turbine locations for your records.
If you have any comments, please let us know.

Kind regards,

Karen.

Karen Mulryan
Environmental Scientist

**MKO**
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Ireland, H91 VW84
+353 (0) 91 735611
www.mkoireland.ie

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**From:** Karen Mulryan <kmulryan@mkoireland.ie>
**Sent:** Thursday 7 May 2020 17:43
**To:** Raymond.Myles@defence.ie
**Cc:** Gareth OFlaherty <Gareth.OFlaherty@defence.ie>; eilish.keating@defence.ie
**Subject:** 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Good afternoon,

MKO is preparing an Environmental Impact Assessment Report (EIAR) for a proposed Bórd na Móna Powergen Ltd wind energy development at Ballivor and the surrounding townlands located at the Meath-Westmeath border. The proposed development will be located on 5 bogs and will be referred to as the Ballivor Wind Farm. The site is located approximately 2.2km west of Ballivor Village, Co. Meath, and 3.7km east of Raharney and 2.5km south-southeast of Devlin, which are both located in Co. Westmeath.
The proposed project will likely encompass 25-35 turbines and will have an output of at least 50megawatts. Should the project be of this scale, an application will be made to An Bord Planeála seeking a determination in relation to the SID status, or otherwise, of the proposed wind energy development. If the board determine that the development is indeed SID, the planning application will be submitted directedly to An Bord Planeála, under the provision of the Planning and Development (Strategic Infrastructure) Act 2006. Should the project be of a scale lower than the SID thresholds, an application for planning permission will be made to Meath and Westmeath County Councils.
As part of the EIA process, we would welcome any comments that you may have in relation to the proposed project, including baseline data, survey techniques or potential impacts that should be considered as part of the assessment process and in the preparation of the EIAR. In order to facilitate this, a Scoping Document providing details of the proposed project and the site of the proposed development is attached.

If you could return any comments or suggestions at your earliest convenience it would be much appreciated. If you require any further information, please do not hesitate to contact me.

Kind Regards,

Karen.

## Shaun Doolin

**From:** Defence Property Management Planning <PropertyManagementPlanning@defence.ie>
**Sent:** Friday 19 February 2021 17:06
**To:** Karen Mulryan
**Cc:** Gareth O'Flaherty (Defence); Sarah Zacharia (Defence)
**Subject:** FW: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Good evening Karen,

In response to your e-mail below re. proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Having consulted with our Air Corps colleagues, The Department of Defence would like to make the following observations:

1. All turbines or tall structures, should be illuminated by high intensity obstacle lights that will allow the hazard be identified and avoided by aircraft in flight.

2. Obstruction lights used should be incandescent or of a type visible to Night Vision Equipment. Obstruction lighting fitted to obstacles must emit light at the near Infra-Red (IR) range of the electromagnetic spectrum specifically at or near 850nanometres (nm) of wavelength. Light intensity to be of similar value to that emitted in the visible spectrum of light.

3. Due to the nature of flight operations by the Irish Air Corps the above mentioned are separate to any ICAO and IAA lighting requirements.

Please contact me if you have any queries in this regard.

Best regards

Don

**Don Watchorn**

*Property Management Branch*

**An Roinn Cosanta**

*Department of Defence*

**Bóthar an Stáisiúin, An Droichead Nua, Contae Chill Dara, W12 AD93.**

Station Road, Newbridge, Co.Kildare, W12 AD93.

T +353 (0)45 492199
E-mail don.watchorn@defence.ie

---

**From:** Defence Property Management Planning
**Sent:** Friday 12 February 2021 16:48
**To:** Karen Mulryan <kmulryan@mkoireland.ie>
**Cc:** Gareth O'Flaherty (Defence) <Gareth.OFlaherty@defence.ie>; Sarah Zacharia (Defence) <Sarah.Zacharia@defence.ie>
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Please see attached the proposed final turbine locations for your records.
If you have any comments, please let us know.

Kind regards,

Karen.

Karen Mulryan
Environmental Scientist

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**To:** Raymond.Myles@defence.ie
**Cc:** Gareth OFlaherty <Gareth.OFlaherty@defence.ie>; eilish.keating@defence.ie
**Subject:** 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

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As part of the EIA process, we would welcome any comments that you may have in relation to the proposed project, including baseline data, survey techniques or potential impacts that should be considered as part of the assessment process and in the preparation of the EIAR. In order to facilitate this, a Scoping Document providing details of the proposed project and the site of the proposed development is attached.

If you could return any comments or suggestions at your earliest convenience it would be much appreciated. If you require any further information, please do not hesitate to contact me.

Kind Regards,

Karen.

Karen Mulryan
Environmental Scientist

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## Shaun Doolin

**From:** O'BRIEN Christophe <Christophe.O'BRIEN@IAA.ie>
**Sent:** Monday 15 February 2021 11:11
**To:** Karen Mulryan
**Cc:** Planning
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Good morning Karen,

Thank you for the email and the additional materials.

Based on the information provided and the turbines appear to be positioned in excess of 10km radius from Athboy Aerodrome, the Authority has no specific requirements for integration into the Environmental Impact Assessment Report.

Should this proposal proceed to a formal planning application, the Authority will make the general observations that in the event of planning consent being granted, the applicant should be conditioned to contact the Irish Aviation Authority to: (1) agree an aeronautical obstacle warning light scheme for the wind farm development, (2) provide as-constructed coordinates in WGS84 format together with ground and tip height elevations at each wind turbine location and (3) notify the Authority of intention to commence crane operations with at least 30 days prior notification of their erection.

Best Regards,

Christophe

*Christophe O'Brien*
Aerodromes Inspector
Safety Regulation Division
Irish Aviation Authority
T: + 353 (1) 603 1492
M: + 353 86 33 22022
E: christophe.o'brien@iaa.ie

---

**From:** Karen Mulryan <kmulryan@mkoireland.ie>
**Sent:** Friday 12 February 2021 13:06
**To:** O'BRIEN Christophe <Christophe.O'BRIEN@IAA.ie>
**Cc:** Planning <planning@iaa.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

*** This message originated from outside the Irish Aviation Authority. Please treat hyperlinks, attachments and instructions in this email with caution. ***

Hi Cristophe,

Please see attached. The propose Tip height is 200m.

Kind regards,

Karen.

Karen Mulryan
Environmental Scientist

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**From:** O'BRIEN Christophe <Christophe.O'BRIEN@IAA.ie>
**Sent:** Friday 12 February 2021 11:10
**To:** Karen Mulryan <kmulryan@mkoireland.ie>
**Cc:** Planning <planning@iaa.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Hi Karen,

Thank you for your email, do you have pdf versions of the files that you could forward?

A table with the WGS-84 coordinates, the blade tip height and the elevation of each proposed turbine would also be very useful in terms of reviewing the proposal.

Best Regards,

Christophe

*Christophe O'Brien*
Aerodromes Inspector
Safety Regulation Division
Irish Aviation Authority
T: + 353 (1) 603 1492
M: + 353 86 33 22022
E: christophe.o'brien@iaa.ie

**From:** Karen Mulryan <kmulryan@mkoireland.ie>
**Sent:** Friday 12 February 2021 11:00
**To:** O'BRIEN Christophe <Christophe.O'BRIEN@IAA.ie>

**Cc:** Planning <planning@iaa.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

*** This message originated from outside the Irish Aviation Authority. Please treat hyperlinks, attachments and instructions in this email with caution. ***

Good morning Christophe,

I previously contacted you with a proposed wind farm development at Ballivor on the Meath/Westmeath border. Please see attached the proposed turbine locations for your records.
If you have any comments, please let us know.

Kind regards,

Karen.

Karen Mulryan
Environmental Scientist

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**From:** O'BRIEN Christophe <Christophe.O'BRIEN@IAA.ie>
**Sent:** Friday 8 May 2020 14:48
**To:** Karen Mulryan <kmulryan@mkoireland.ie>
**Cc:** Planning <planning@iaa.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Good afternoon Karen,

Your email was forwarded to me by my colleague Audrey in Corporate Affairs.

I note the centroid coordinate provided in the study, do you have a contour map / WHS-84 coordinates at this stage giving the indicative positions of the turbines?

You are relatively proximate to the licensed aerodrome of Athboy, also known as Ballyboy airfield. We would be particularly keen to understand the likely most North – Westerly positioned turbine on this basis as it may have an impact on aircraft operations at the aerodrome.

Can you please provide further information in this regard?

Best Regards,

Christophe

*Christophe O'Brien*
Aerodromes Inspector
Safety Regulation Division
Irish Aviation Authority
T: + 353 (1) 603 1492
M: + 353 86 33 22022
E: christophe.o'brien@iaa.ie

---

**From:** Karen Mulryan <kmulryan@mkoireland.ie>
**Sent:** 08 May 2020 09:54
**To:** IAA INFORMATION <iaainfo@IAA.ie>; RAFFERTY Audrey <audrey.rafferty@iaa.ie>
**Subject:** 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Good afternoon,

MKO is preparing an Environmental Impact Assessment Report (EIAR) for a proposed Bórd na Móna Powergen Ltd wind energy development at Ballivor and the surrounding townlands located at the Meath-Westmeath border. The proposed development will be located on 5 bogs and will be referred to as the Ballivor Wind Farm. The site is located approximately 2.2km west of Ballivor Village, Co. Meath, and 3.7km east of Raharney and 2.5km south-southeast of Devlin, which are both located in Co. Westmeath.
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As part of the EIA process, we would welcome any comments that you may have in relation to the proposed project, including baseline data, survey techniques or potential impacts that should be considered as part of the assessment process and in the preparation of the EIAR. In order to facilitate this, a Scoping Document providing details of the proposed project and the site of the proposed development is attached.

If you could return any comments or suggestions at your earliest convenience it would be much appreciated. If you require any further information, please do not hesitate to contact me.

Kind Regards,

Karen.

Karen Mulryan
Environmental Scientist

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## Shaun Doolin

**From:** O'BRIEN Christophe <Christophe.O'BRIEN@IAA.ie>
**Sent:** Wednesday 12 May 2021 15:37
**To:** Shaun Doolin
**Cc:** Planning; Karen Mulryan
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Good afternoon Shaun,

Thank you for the email and the updated materials.

Based on the information provided and that the turbines continue to appear to be positioned in excess of 10km radius from Athboy Aerodrome, the Authority has no specific requirements for integration into the Environmental Impact Assessment Report.

Should this proposal proceed to a formal planning application, the Authority will make the general observations that in the event of planning consent being granted, the applicant should be conditioned to contact the Irish Aviation Authority to: (1) agree an aeronautical obstacle warning light scheme for the wind farm development, (2) provide as-constructed coordinates in WGS84 format together with ground and tip height elevations at each wind turbine location and (3) notify the Authority of intention to commence crane operations with at least 30 days prior notification of their erection.

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M: + 353 86 33 22022
E: christophe.o'brien@iaa.ie

**From:** Shaun Doolin <sdoolin@mkoireland.ie>
**Sent:** Friday 7 May 2021 16:01
**To:** O'BRIEN Christophe <Christophe.O'BRIEN@IAA.ie>
**Cc:** Planning <planning@iaa.ie>; Karen Mulryan <kmulryan@mkoireland.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

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Good afternoon,

Since we last contacted you regarding the proposed Ballivor Wind Farm, two turbines have moved slightly in the northeast of the site. Turbine 19 has moved 25m north, while Turbine 20 has move 110m northwest. Please see the attached PDF of the final turbine locations, along with a spreadsheet containing location coordinates in ITM, Irish Grid and WGS84 reference systems. I have highlighted the two repositioned turbines in the spreadsheet and have also attached a KML for convenience.

Please feel free to contact us if you have any comments or queries.

Kind regards,
Shaun

Shaun Doolin
Graduate Environmental Scientist

**MKO**
Tuam Road, Galway
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+353 (0) 91 735611
www.mkoireland.ie

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**From:** O'BRIEN Christophe <Christophe.O'BRIEN@IAA.ie>
**Sent:** Monday 15 February 2021 11:11
**To:** Karen Mulryan <kmulryan@mkoireland.ie>
**Cc:** Planning <planning@iaa.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Good morning Karen,

Thank you for the email and the additional materials.

Based on the information provided and the turbines appear to be positioned in excess of 10km radius from Athboy Aerodrome, the Authority has no specific requirements for integration into the Environmental Impact Assessment Report.

Should this proposal proceed to a formal planning application, the Authority will make the general observations that in the event of planning consent being granted, the applicant should be conditioned to contact the Irish Aviation Authority to: (1) agree an aeronautical obstacle warning light scheme for the wind farm development, (2) provide as-constructed coordinates in WGS84 format together with ground and tip height elevations at each wind turbine location and (3) notify the Authority of intention to commence crane operations with at least 30 days prior notification of their erection.

Best Regards,

Christophe

*Christophe O'Brien*
Aerodromes Inspector
Safety Regulation Division

Irish Aviation Authority
T: + 353 (1) 603 1492
M: + 353 86 33 22022
E: christophe.o'brien@iaa.ie

**From:** Karen Mulryan <kmulryan@mkoireland.ie>
**Sent:** Friday 12 February 2021 13:06
**To:** O'BRIEN Christophe <Christophe.O'BRIEN@IAA.ie>
**Cc:** Planning <planning@iaa.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

*** This message originated from outside the Irish Aviation Authority. Please treat hyperlinks, attachments and instructions in this email with caution. ***

Hi Cristophe,

Please see attached. The propose Tip height is 200m.

Kind regards,

Karen.

Karen Mulryan
Environmental Scientist

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**From:** O'BRIEN Christophe <Christophe.O'BRIEN@IAA.ie>
**Sent:** Friday 12 February 2021 11:10
**To:** Karen Mulryan <kmulryan@mkoireland.ie>
**Cc:** Planning <planning@iaa.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Hi Karen,

Thank you for your email, do you have pdf versions of the files that you could forward?

A table with the WGS-84 coordinates, the blade tip height and the elevation of each proposed turbine would also be very useful in terms of reviewing the proposal.

Best Regards,

Christophe

*Christophe O'Brien*
Aerodromes Inspector
Safety Regulation Division
Irish Aviation Authority
T: + 353 (1) 603 1492
M: + 353 86 33 22022
E: christophe.o'brien@iaa.ie

---

**From:** Karen Mulryan <kmulryan@mkoireland.ie>
**Sent:** Friday 12 February 2021 11:00
**To:** O'BRIEN Christophe <Christophe.O'BRIEN@IAA.ie>
**Cc:** Planning <planning@iaa.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

*** This message originated from outside the Irish Aviation Authority. Please treat hyperlinks, attachments and instructions in this email with caution. ***

Good morning Christophe,

I previously contacted you with a proposed wind farm development at Ballivor on the Meath/Westmeath border. Please see attached the proposed turbine locations for your records.
If you have any comments, please let us know.

Kind regards,

Karen.

Karen Mulryan
Environmental Scientist

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that any attachment hereto is free from computer viruses or other defects. The opinions expressed in this e-mail and any attachments may be those of the author and are not necessarily those of MKO

**From:** O'BRIEN Christophe <Christophe.O'BRIEN@IAA.ie>
**Sent:** Friday 8 May 2020 14:48
**To:** Karen Mulryan <kmulryan@mkoireland.ie>
**Cc:** Planning <planning@iaa.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Good afternoon Karen,

Your email was forwarded to me by my colleague Audrey in Corporate Affairs.

I note the centroid coordinate provided in the study, do you have a contour map / WHS-84 coordinates at this stage giving the indicative positions of the turbines?

You are relatively proximate to the licensed aerodrome of Athboy, also known as Ballyboy airfield. We would be particularly keen to understand the likely most North – Westerly positioned turbine on this basis as it may have an impact on aircraft operations at the aerodrome.

Can you please provide further information in this regard?

Best Regards,

Christophe

*Christophe O'Brien*
Aerodromes Inspector
Safety Regulation Division
Irish Aviation Authority
T: + 353 (1) 603 1492
M: + 353 86 33 22022
E: christophe.o'brien@iaa.ie

**From:** Karen Mulryan <kmulryan@mkoireland.ie>
**Sent:** 08 May 2020 09:54
**To:** IAA INFORMATION <iaainfo@IAA.ie>; RAFFERTY Audrey <audrey.rafferty@iaa.ie>
**Subject:** 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Good afternoon,

MKO is preparing an Environmental Impact Assessment Report (EIAR) for a proposed Bórd na Móna Powergen Ltd wind energy development at Ballivor and the surrounding townlands located at the Meath-Westmeath border. The proposed development will be located on 5 bogs and will be referred to as the Ballivor Wind Farm. The site is located approximately 2.2km west of Ballivor Village, Co. Meath, and 3.7km east of Raharney and 2.5km south-southeast of Devlin, which are both located in Co. Westmeath.
The proposed project will likely encompass 25-35 turbines and will have an output of at least 50megawatts. Should the project be of this scale, an application will be made to An Bord Planeála seeking a determination in relation to the SID status, or otherwise, of the proposed wind energy development. If the board determine that the development is indeed SID, the planning application will be submitted directedly to An Bord Planeála, under the provision of the Planning and Development (Strategic Infrastructure) Act 2006. Should the project be of a scale

lower than the SID thresholds, an application for planning permission will be made to Meath and Westmeath County Councils.
As part of the EIA process, we would welcome any comments that you may have in relation to the proposed project, including baseline data, survey techniques or potential impacts that should be considered as part of the assessment process and in the preparation of the EIAR. In order to facilitate this, a Scoping Document providing details of the proposed project and the site of the proposed development is attached.

If you could return any comments or suggestions at your earliest convenience it would be much appreciated. If you require any further information, please do not hesitate to contact me.

Kind Regards,

Karen.

Karen Mulryan
Environmental Scientist

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==========

## Shaun Doolin

**From:** Marcin Skupski <Marcin.Skupski@viatel.com>
**Sent:** Tuesday 16 February 2021 11:18
**To:** Karen Mulryan; newbuild
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Hi Karen,

Thank you for your email, I have no comments here. Good luck with you development.

Regards,
**Marcin Skupski**
Build and Maintenance Team Leader

T: 086 832 0724
M: marcin.skupski@viatel.com

**www.viatel.com**

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---

**From:** Karen Mulryan <kmulryan@mkoireland.ie>
**Sent:** Friday 12 February 2021 10:52
**To:** Marcin Skupski <Marcin.Skupski@viatel.com>; newbuild <newbuild@viatel.com>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Good morning Marcin,

I previously contacted you with a proposed wind farm development at Ballivor on the Meath/Westmeath border. I do not believe there are any link issues with the site; however, I would like to send you the proposed final turbine locations for your records.
Please see attached. If you have any comments, please let us know.

Kind regards,

Karen.

Karen Mulryan
Environmental Scientist

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**From:** Marcin Skupski <Marcin.Skupski@viatel.com>
**Sent:** Friday 22 May 2020 09:30
**To:** Karen Mulryan <kmulryan@mkoireland.ie>; newbuild <newbuild@viatel.com>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Hi Karen,

Apologies for late reply. This development shouldn't interfere with Viatel's wireless network.

**Marcin Skupski**
Build and Maintenance Team Leader

T: 086 832 0724
M: marcin.skupski@viatel.com

**www.viatel.com**

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**From:** Karen Mulryan <kmulryan@mkoireland.ie>
**Sent:** Friday 8 May 2020 17:05
**To:** newbuild <newbuild@viatel.com>
**Subject:** 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Good afternoon,

MKO is preparing an Environmental Impact Assessment Report (EIAR) for a proposed Bórd na Móna Powergen Ltd wind energy development at Ballivor and the surrounding townlands located at the Meath-Westmeath border. The proposed development will be located on 5 bogs and will be referred to as the Ballivor Wind Farm. The site is located approximately 2.2km west of Ballivor Village, Co. Meath, and 3.7km east of Raharney and 2.5km south-southeast of Devlin, which are both located in Co. Westmeath.
The proposed project will likely encompass 25-35 turbines and will have an output of at least 50megawatts. Should the project be of this scale, an application will be made to An Bord Planeála seeking a determination in relation to the SID status, or otherwise, of the proposed wind energy development. If the board determine that the development is indeed SID, the planning application will be submitted directedly to An Bord Planeála, under the provision of the Planning and Development (Strategic Infrastructure) Act 2006. Should the project be of a scale lower than the SID thresholds, an application for planning permission will be made to Meath and Westmeath County Councils.
As part of the EIA process, we would welcome any comments that you may have in relation to the proposed project, including baseline data, survey techniques or potential impacts that should be considered as part of the assessment

process and in the preparation of the EIAR. In order to facilitate this, a Scoping Document providing details of the proposed project and the site of the proposed development is attached.

If you could return any comments or suggestions at your earliest convenience it would be much appreciated. If you require any further information, please do not hesitate to contact me.

Kind Regards,

Karen.

Karen Mulryan
Environmental Scientist

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## Shaun Doolin

**From:** Roger Woods <rwoods@bai.ie>
**Sent:** Monday 11 May 2020 09:51
**To:** Karen Mulryan
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

**Follow Up Flag:** Follow up
**Flag Status:** Flagged

Hi Karen

The BAI does not perform an in-depth analysis of the effect of wind turbines on FM networks. However, we are not aware of any issues from existing windfarms into existing FM networks. Also, the proposed windfarms are not located close to any existing or planned FM transmission sites.

Regards

Roger

Senior Executive Engineer
Broadcasting Authority of Ireland
2-5 Warrington Place
Dublin D02 XP29

Tel: 01 6441200
Fax: 01 6441299

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---

**From:** Karen Mulryan <kmulryan@mkoireland.ie>
**Sent:** Thursday 7 May 2020 17:21
**To:** Roger Woods <rwoods@bai.ie>
**Subject:** 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Good afternoon,

MKO is preparing an Environmental Impact Assessment Report (EIAR) for a proposed Bórd na Móna Powergen Ltd wind energy development at Ballivor and the surrounding townlands located at the Meath-Westmeath border. The proposed development will be located on 5 bogs and will be referred to as the Ballivor Wind Farm. The site is located approximately 2.2km west of Ballivor Village, Co. Meath, and 3.7km east of Raharney and 2.5km south-southeast of Devlin, which are both located in Co. Westmeath.
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lower than the SID thresholds, an application for planning permission will be made to Meath and Westmeath County Councils.
As part of the EIA process, we would welcome any comments that you may have in relation to the proposed project, including baseline data, survey techniques or potential impacts that should be considered as part of the assessment process and in the preparation of the EIAR. In order to facilitate this, a Scoping Document providing details of the proposed project and the site of the proposed development is attached.

If you could return any comments or suggestions at your earliest convenience it would be much appreciated. If you require any further information, please do not hesitate to contact me.

Kind Regards,

Karen.

Karen Mulryan
Environmental Scientist

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## Shaun Doolin

**From:** John Bagnall <john.bagnall@eir.ie>
**Sent:** Friday 14 May 2021 10:57
**To:** Shaun Doolin
**Cc:** Karen Mulryan; Mobile Networks TXN
**Subject:** Re: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Hi Shaun,

The new turbine positions are fine, best of luck with the development.

Kind regards,

**John Bagnall**
Transmission Design & Engineering

**M:** +353 85 1053746
**E:** john.bagnall@eir.ie
Address: EirCode - D24 HX03

On Fri, 7 May 2021 at 15:57, Shaun Doolin <sdoolin@mkoireland.ie> wrote:

> Good afternoon,
>
> Since we last contacted you regarding the proposed Ballivor Wind Farm, two turbines have moved slightly in the northeast of the site. Turbine 19 has moved 25m north, while Turbine 20 has move 110m northwest. Please see the attached PDF of the final turbine locations, along with a spreadsheet containing location coordinates in ITM, Irish Grid and WGS84 reference systems. I have highlighted the two repositioned turbines in the spreadsheet and have also attached a KML for convenience.
>
> Please feel free to contact us if you have any comments or queries.
>
> Kind regards,
>
> Shaun

## Shaun Doolin

**From:** John Bagnall <john.bagnall@eir.ie>
**Sent:** Friday 12 February 2021 13:39
**To:** Karen Mulryan
**Subject:** Re: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Hi Karen,

The plotted 26 turbines are fine and dont impact the Eir mobile network. Best of luck with your proposal.

Kind regards,

**John Bagnall**
Transmission Design & Engineering

**M:** +353 85 1053746
**E:** john.bagnall@eir.ie
Address: EirCode - D24 HX03

On Fri, 12 Feb 2021 at 10:45, Karen Mulryan <kmulryan@mkoireland.ie> wrote:

> Good morning,
>
> I previously contacted you with a proposed wind farm development at Ballivor on the Meath/Westmeath border. I do not believe there are any ESB issues with the site; however, I would like to send you the proposed final turbine locations for your records.
>
> Please see attached. If you have any comments, please let us know.
>
> Kind regards,
>
> Karen.

## Shaun Doolin

**From:** John Bagnall <john.bagnall@eir.ie>
**Sent:** Friday 15 May 2020 07:20
**To:** Karen Mulryan
**Cc:** Mobile Networks TXN
**Subject:** Re: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

**Follow Up Flag:** Follow up
**Flag Status:** Flagged

Hi Karen,

We have three transmission links within the proposed area that could be at risk, the end points of the transmission link is below, for windfarm developments we would keep a buffer of 100meters radius away from this transmission path as always.

The link endpoints are below if you could incorporate them into your analysis when plotting the turbines locations.

Link 1 – End point 1 - 53°32'32.94"N 6°59'58.28"W , End point 2 – 53°38'33.12"N 7° 7'16.93"W

Link 2 – End point 1 - 53°32'32.94"N 6°59'58.28"W , End point 2 – 53°34'10.92"N 6°53'51.15"W

Link 3 – End point 1 - 53°32'32.94"N 6°59'58.28"W , End point 2 – 53°32'47.03"N 6°47'45.02"W

Please send future windfarm development analysis and large infrastructure project request to MobileNetworksTXN@eir.ie for Eir Mobile (formerly Meteor) network analysis.

Kind regards,

**John Bagnall**
Transmission Design & Engineering

**M:** +353 85 1053746
**E:** john.bagnall@eir.ie
Address: EirCode - D24 HX03

On Thu, 7 May 2020 at 17:50, Karen Mulryan <kmulryan@mkoireland.ie> wrote:

> Good afternoon,
>
> MKO is preparing an Environmental Impact Assessment Report (EIAR) for a proposed Bórd na Móna Powergen Ltd wind energy development at Ballivor and the surrounding townlands located at the Meath-Westmeath border. The proposed development will be located on 5 bogs and will be referred to as the Ballivor Wind Farm. The site is located approximately 2.2km west of Ballivor Village, Co. Meath, and 3.7km east of Raharney and 2.5km south-southeast of Devlin, which are both located in Co. Westmeath.
>
> The proposed project will likely encompass 25-35 turbines and will have an output of at least 50megawatts. Should the project be of this scale, an application will be made to An Bord Planeála seeking a determination in relation to

the SID status, or otherwise, of the proposed wind energy development. If the board determine that the development is indeed SID, the planning application will be submitted directedly to An Bord Planeála, under the provision of the Planning and Development (Strategic Infrastructure) Act 2006. Should the project be of a scale lower than the SID thresholds, an application for planning permission will be made to Meath and Westmeath County Councils.

As part of the EIA process, we would welcome any comments that you may have in relation to the proposed project, including baseline data, survey techniques or potential impacts that should be considered as part of the assessment process and in the preparation of the EIAR. In order to facilitate this, a Scoping Document providing details of the proposed project and the site of the proposed development is attached.

If you could return any comments or suggestions at your earliest convenience it would be much appreciated. If you require any further information, please do not hesitate to contact me.

Kind Regards,

Karen.

Karen Mulryan
Environmental Scientist

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## Shaun Doolin

**From:** Thomas Sheridan <thomas.sheridan@eir.ie>
**Sent:** Thursday 18 February 2021 16:53
**To:** Karen Mulryan
**Subject:** Re: 191137 Proposed Ballivor Wind Farm

**Follow Up Flag:** Follow up
**Flag Status:** Flagged

Hi Karen,

I have checked the proposed wind turbine locations as detailed below and I don't expect them to have any impact on the eircom LTD fixed line microwave radio network.

| X | Y | X | Y | LABEL |
|---|---|---|---|---|
| 265859.5 | 252173.3 | 665796.3 | 752196 | A |
| 265224.6 | 253488.3 | 665161.6 | 753510.8 | B |
| 264038.5 | 253098.9 | 663975.7 | 753121.5 | C |
| 264392.3 | 253696.6 | 664329.5 | 753719 | D |
| 263846 | 252429.3 | 663783.2 | 752452 | E |
| 264564.8 | 252669.3 | 664501.9 | 752691.9 | F |
| 265527.5 | 259828.7 | 665464.4 | 759849.8 | G |
| 264085.8 | 259531.6 | 664023 | 759552.7 | H |
| 264807 | 259706.2 | 664744.1 | 759727.3 | I |
| 265091 | 259150.8 | 665028 | 759172 | J |
| 265946.9 | 258523.3 | 665883.8 | 758544.6 | K |
| 264336.8 | 259032.4 | 664273.9 | 759053.6 | L |
| 265184.5 | 258473.9 | 665121.5 | 758495.3 | M |
| 266046.6 | 252942.2 | 665983.4 | 752964.8 | N |
| 264685.5 | 251983.9 | 664622.5 | 752006.7 | O |
| 265991.2 | 251671 | 665928 | 751693.8 | P |
| 262657.3 | 257783.6 | 662594.8 | 757805.2 | Q |
| 261570.3 | 257032.2 | 661508.1 | 757053.9 | R |
| 262064.4 | 256782.6 | 662002 | 756804.4 | S |
| 263536.6 | 257474.1 | 663474 | 757495.7 | T |
| 262827.4 | 257301.7 | 662764.9 | 757323.3 | U |

Best Regards,
Thomas Sheridan.

On Fri, Feb 12, 2021 at 11:21 AM Karen Mulryan <kmulryan@mkoireland.ie> wrote:

> Hi Thomas,
>
> Please see attached.

Kind regards,

Karen.

Karen Mulryan
Environmental Scientist

**MKO**

Tuam Road, Galway

Ireland, H91 VW84

+353 (0) 91 735611

www.mkoireland.ie

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**From:** Thomas Sheridan <thomas.sheridan@eir.ie>
**Sent:** Friday 12 February 2021 11:16
**To:** Karen Mulryan <kmulryan@mkoireland.ie>
**Subject:** Re: 191137 Proposed Ballivor Wind Farm

Hi Karen,

Can you please send me the wind turbine locations in Irish Grid format.

Best Regards,

Thomas Sheridan

On Fri, Feb 12, 2021 at 10:53 AM Karen Mulryan <kmulryan@mkoireland.ie> wrote:

> Good morning Thomas,
>
> I previously contacted you with a proposed wind farm development at Ballivor on the Meath/Westmeath border. Please see attached the proposed final turbine locations for your records.
>
> If you have any comments, please let us know.
>
> Kind regards,
>
> Karen.


Karen Mulryan
Environmental Scientist

**MKO**

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## Shaun Doolin

**From:** Thomas Sheridan <thomas.sheridan@eir.ie>
**Sent:** Wednesday 30 September 2020 11:48
**To:** Karen Mulryan
**Subject:** Re: 191137 Proposed Ballivor Wind Farm

Hi Karen,

It looks extremely likely that this radio link will be ceased.

Regards,
Thomas

On Tue, Sep 29, 2020 at 1:14 PM Thomas Sheridan <thomas.sheridan@eir.ie> wrote:

> Karen,
>
> I expect the radio to be removed but a definite decision has not been made yet.
>
> Regards,
> Thomas
>
> On Tue, Sep 29, 2020 at 1:02 PM Karen Mulryan <kmulryan@mkoireland.ie> wrote:
>
> > Hi Thomas,
> >
> > Thanks for the below. Can you confirm this link will be removed or its it tentative for now? As the WF application process and time to construction and operation can take a few years, if it this link due to be removed then there is the possibility we wont need to constrain it out.
> >
> > Kind regards,
> >
> > Karen.

Karen Mulryan
Environmental Scientist

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**From:** Thomas Sheridan <thomas.sheridan@eir.ie>
**Sent:** Tuesday 29 September 2020 12:46
**To:** Karen Mulryan <kmulryan@mkoireland.ie>
**Subject:** Re: 191137 Proposed Ballivor Wind Farm

Hi Karen,

It would be ideal to have 100m clearance from the blade tip to the radio path boundary. This is sometimes reduced to 30m after determining precise gps locations of the radio endpoints.

In this case it looks likely that this radio will be removed in the next year or two.

Regards,

Thomas Sheridan

From

On Tue, Sep 29, 2020 at 11:54 AM Karen Mulryan <kmulryan@mkoireland.ie> wrote:

> Hi Thomas,

What set back distance do you require for this link?

Kind regards,

Karen.

Karen Mulryan
Environmental Scientist

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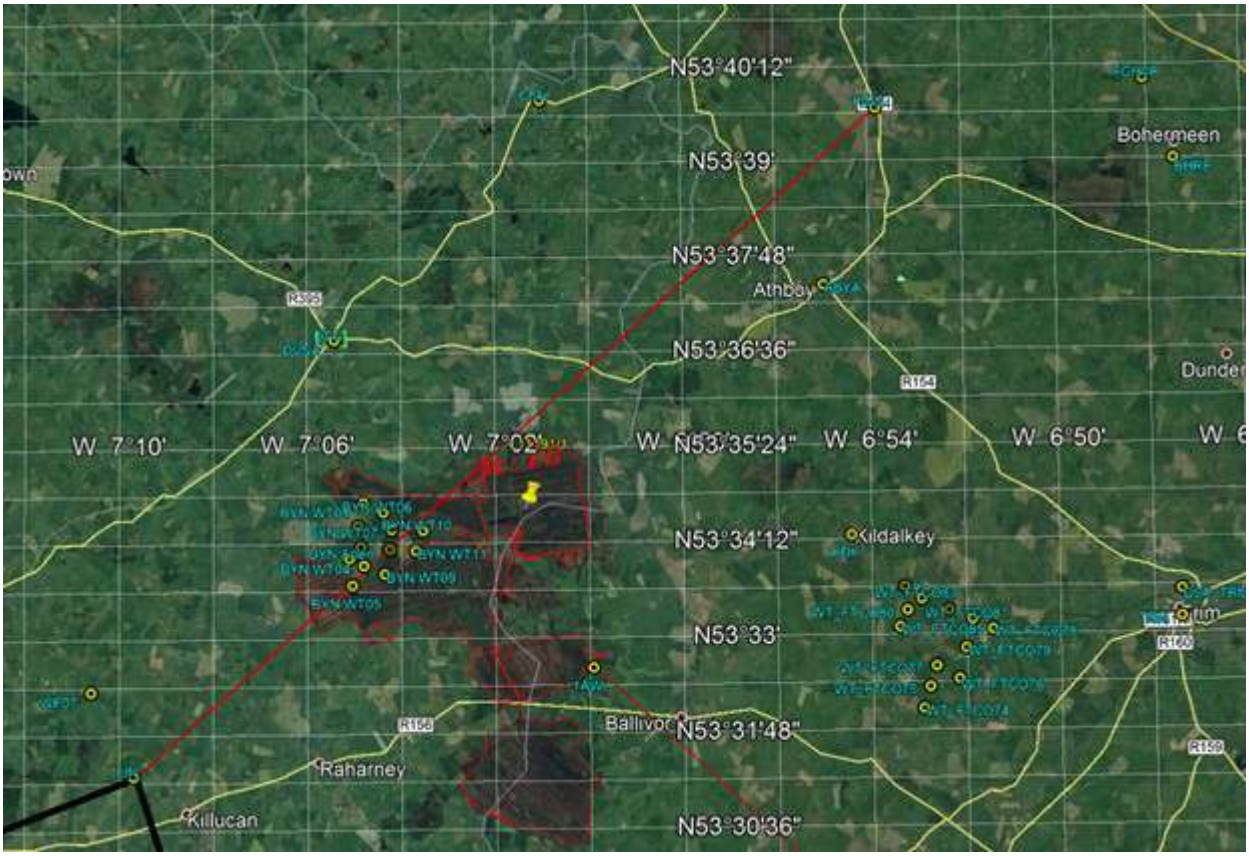
**From:** Thomas Sheridan <thomas.sheridan@eir.ie>
**Sent:** Tuesday 29 September 2020 11:48
**To:** Karen Mulryan <kmulryan@mkoireland.ie>
**Subject:** Re: 191137 Proposed Ballivor Wind Farm

Hi Karen,

The radio link path detailed below passes through the site.

| licence no | | Eastings | Northings | | Eastings | Northings |
|---|---|---|---|---|---|---|
| PP11191/1 | Fordstown | 273000 | 268460 | Killucan | 255700 | 252850 |




Best Regards,

Thomas Sheridan

On Tue, Sep 29, 2020 at 9:22 AM Karen Mulryan <kmulryan@mkoireland.ie> wrote:

> Hi Thomas,
>
> Please see attached.

Thanks,

Karen.

Karen Mulryan
Environmental Scientist

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**From:** Thomas Sheridan <thomas.sheridan@eir.ie>
**Sent:** Monday 28 September 2020 16:57
**To:** Karen Mulryan <kmulryan@mkoireland.ie>
**Subject:** Re: 191137 Proposed Ballivor Wind Farm

Hi Karen,

Can you please send me the site boundary details in kmz format.

Best Regards,

Thomas Sheridan

On Fri, Sep 25, 2020 at 1:36 PM Karen Mulryan <kmulryan@mkoireland.ie> wrote:

> Hi Thomas,
>
> I am hoping you can help me. John Bagnall gave me your contact details. We are looking at the attached site for a proposed wind farm development and would like to know if you have any Openeir links in the area that may be impacted. If you could provide coordinates of any in the area and recommended set back distances from them it would be greatly appreciated.
>
> Kind regards,
>
> Karen.


Karen Mulryan
Environmental Scientist

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## Shaun Doolin

**From:** Matthew Craig <matthew.craig@2rn.ie>
**Sent:** Friday 7 May 2021 16:05
**To:** Shaun Doolin
**Cc:** Johnny Evans; windfarms@rte.ie; Karen Mulryan
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Hi Shaun,

Thanks for the update the turbine that is of most concern for us is T16.
Its location at the moment is OK but I would be concerned should it move any further to the north-east.

Regards


**Matthew Craig**

Project Engineer
Projects and Coverage Planning
2RN
Block B, Cookstown Court, Old Belgard Road, Tallaght, Dublin 24, Ireland D24 WK28
Phone: + 353 (0) 1 2082261 Mobile: + 353 (0) 87 7509955



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**From:** Shaun Doolin <sdoolin@mkoireland.ie>
**Sent:** 07 May 2021 15:47
**To:** Matthew Craig <matthew.craig@2rn.ie>
**Cc:** Johnny Evans <Johnny.Evans@2rn.ie>; windfarms@rte.ie; Karen Mulryan <kmulryan@mkoireland.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Good afternoon,

Since we last contacted you regarding the proposed Ballivor Wind Farm, two turbines have moved slightly in the northeast of the site. Turbine 19 has moved 25m north, while Turbine 20 has move 110m northwest. Please see the attached PDF of the final turbine locations, along with a spreadsheet containing location coordinates in ITM, Irish Grid and WGS84 reference systems. I have highlighted the two repositioned turbines in the spreadsheet and have also attached a KML for convenience.

Please feel free to contact us if you have any comments or queries.

Kind regards,
Shaun


Shaun Doolin
Graduate Environmental Scientist

**MKO**
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Ireland, H91 VW84
+353 (0) 91 735611
www.mkoireland.ie

## Shaun Doolin

**From:** Matthew Craig <matthew.craig@2rn.ie>
**Sent:** Monday 11 May 2020 14:57
**To:** Karen Mulryan; Johnny Evans
**Cc:** windfarms@rte.ie
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Hi Karen,

We request a corridor of 380m for links at this frequency.

Regards

**Matthew Craig**

Project Engineer
Projects and Coverage Planning
2RN
Block B, Cookstown Court, Old Belgard Road, Tallaght, Dublin 24, Ireland
D24 WK28
Phone: + 353 (0) 1 2082261
Mobile: + 353 (0) 87 7509955

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**From:** Karen Mulryan <kmulryan@mkoireland.ie>
**Sent:** 11 May 2020 12:56
**To:** Matthew Craig <matthew.craig@2rn.ie>; Johnny Evans <Johnny.Evans@2rn.ie>
**Cc:** windfarms@rte.ie
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Hi Matthew,

Do you have a set back distance for your links?

Thanks,

Karen.

Karen Mulryan
Environmental Scientist

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**From:** Matthew Craig <matthew.craig@2rn.ie>
**Sent:** 08 May 2020 11:17
**To:** Karen Mulryan <kmulryan@mkoireland.ie>; Johnny Evans <Johnny.Evans@2rn.ie>
**Cc:** windfarms@rte.ie
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Hi Karen,

We have a signal path running between our site at Three Rock and Cairn Hill that passes through the middle of the proposed site.
The details are in the table below:

| Site | Lat | Long | Ant Height(AMSL) | Frequency (MHz) |
|---|---|---|---|---|
| Three Rock | 53.244.455 | -6.238.067 | 577 | 546 |
| Cairn Hill | 53.807.227 | -7.715.351 | 295 | |

I have also attached a KMZ file with the proposed windfarm outline, the path and two 180m tip height turbines at the beginning and end of where the path passes through.

There is also a risk of interference to DTT viewers in the area we suggest that a protocol be signed with the developer should the site go ahead.

Could you please let me know if you have any further information as to the height and location of the turbines we will be able to complete a more detailed assessment.

Regards

**Matthew Craig**

Project Engineer
Projects and Coverage Planning
2RN
Block B, Cookstown Court, Old Belgard Road, Tallaght, Dublin 24, Ireland
D24 WK28
Phone: + 353 (0) 1 2082261
Mobile: + 353 (0) 87 7509955

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**From:** Karen Mulryan <kmulryan@mkoireland.ie>
**Sent:** 07 May 2020 17:09

**To:** Johnny Evans <Johnny.Evans@2rn.ie>
**Cc:** Matthew Craig <matthew.craig@2rn.ie>; windfarms@rte.ie
**Subject:** 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Good afternoon,

MKO is preparing an Environmental Impact Assessment Report (EIAR) for a proposed Bórd na Móna Powergen Ltd wind energy development at Ballivor and the surrounding townlands located at the Meath-Westmeath border. The proposed development will be located on 5 bogs and will be referred to as the Ballivor Wind Farm. The site is located approximately 2.2km west of Ballivor Village, Co. Meath, and 3.7km east of Raharney and 2.5km south-southeast of Devlin, which are both located in Co. Westmeath.
The proposed project will likely encompass 25-35 turbines and will have an output of at least 50megawatts. Should the project be of this scale, an application will be made to An Bord Planeála seeking a determination in relation to the SID status, or otherwise, of the proposed wind energy development. If the board determine that the development is indeed SID, the planning application will be submitted directedly to An Bord Planeála, under the provision of the Planning and Development (Strategic Infrastructure) Act 2006. Should the project be of a scale lower than the SID thresholds, an application for planning permission will be made to Meath and Westmeath County Councils.
As part of the EIA process, we would welcome any comments that you may have in relation to the proposed project, including baseline data, survey techniques or potential impacts that should be considered as part of the assessment process and in the preparation of the EIAR. In order to facilitate this, a Scoping Document providing details of the proposed project and the site of the proposed development is attached.

If you could return any comments or suggestions at your earliest convenience it would be much appreciated. If you require any further information, please do not hesitate to contact me.

Kind Regards,

Karen.

Karen Mulryan
Environmental Scientist

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## Shaun Doolin

**From:** Thomas Barry <Tom.Barry@TETRAIRELAND.IE>
**Sent:** Friday 5 March 2021 07:03
**To:** Karen Mulryan
**Subject:** RE: EXTERNAL MAIL:- RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Karen,

We anticipate no impact from the development as proposed. Can you ensure the proposal is also reviewed by eir.

Regards,
Tom

---

**From:** Karen Mulryan [mailto:kmulryan@mkoireland.ie]
**Sent:** Friday 12 February 2021 10:56
**To:** Thomas Barry
**Subject:** EXTERNAL MAIL:- RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

**CAUTION: This mail is from outside Tetra.**
**Do NOT click suspicious links.**
**Do NOT click or download suspicious attachments.**

Good morning Thomas,

I previously contacted you with a proposed wind farm development at Ballivor on the Meath/Westmeath border.
Please see attached the proposed final turbine locations for your records.
If you have any comments, please let us know.

Kind regards,

Karen

Karen Mulryan
Environmental Scientist

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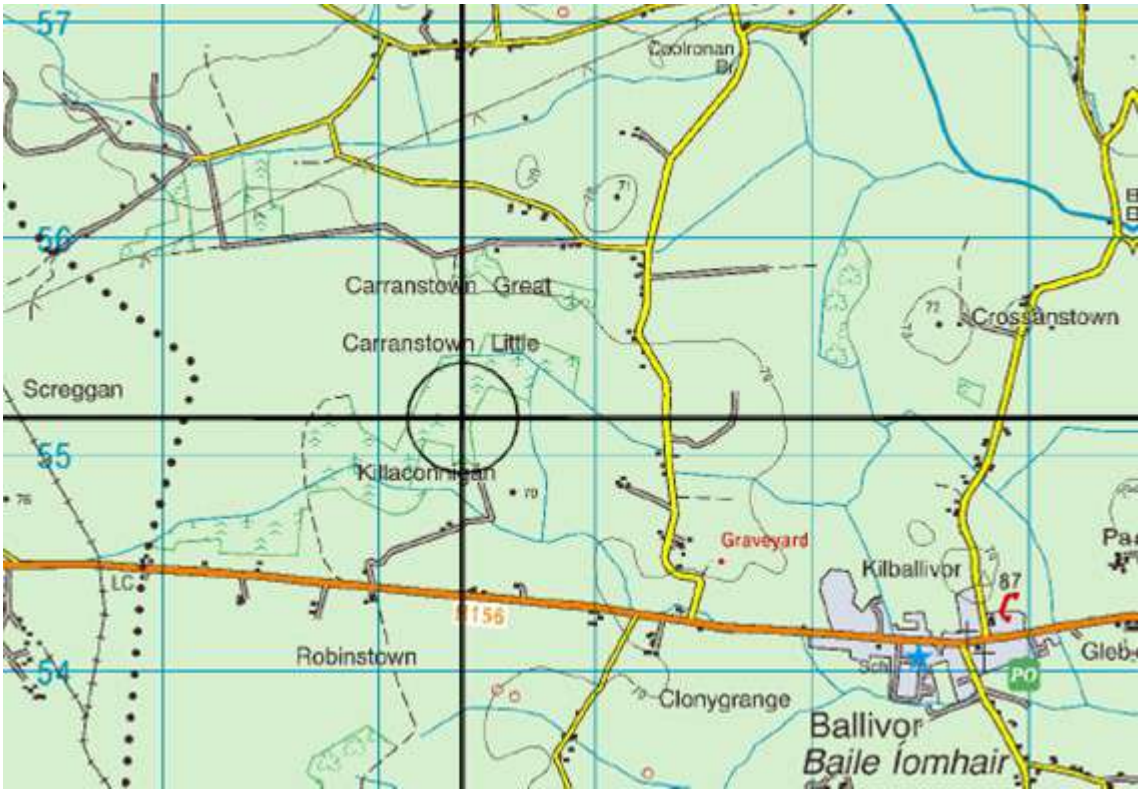
**From:** Thomas Barry <Tom.Barry@TETRAIRELAND.IE>
**Sent:** Friday 15 May 2020 13:40
**To:** Karen Mulryan <kmulryan@mkoireland.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Karen,

We have equipment on a site at E266385 N255170, we specify an exclusion zone of 500m from the location. Can you also ensure the proposal is reviewed by eir.

Regards,
Tom




**From:** Karen Mulryan [mailto:kmulryan@mkoireland.ie]
**Sent:** Friday 8 May 2020 10:26
**To:** Thomas Barry
**Subject:** 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Good morning,

MKO is preparing an Environmental Impact Assessment Report (EIAR) for a proposed Bórd na Móna Powergen Ltd wind energy development at Ballivor and the surrounding townlands located at the Meath-Westmeath border. The proposed development will be located on 5 bogs and will be referred to as the Ballivor Wind Farm. The site is located approximately 2.2km west of Ballivor Village, Co. Meath, and 3.7km east of Raharney and 2.5km south-southeast of Devlin, which are both located in Co. Westmeath.
The proposed project will likely encompass 25-35 turbines and will have an output of at least 50megawatts. Should the project be of this scale, an application will be made to An Bord Planeála seeking a determination in relation to the SID status, or otherwise, of the proposed wind energy development. If the board determine that the development is indeed SID, the planning application will be submitted directedly to An Bord Planeála, under the provision of the Planning and Development (Strategic Infrastructure) Act 2006. Should the project be of a scale

lower than the SID thresholds, an application for planning permission will be made to Meath and Westmeath County Councils.
As part of the EIA process, we would welcome any comments that you may have in relation to the proposed project, including baseline data, survey techniques or potential impacts that should be considered as part of the assessment process and in the preparation of the EIAR. In order to facilitate this, a Scoping Document providing details of the proposed project and the site of the proposed development is attached.

If you could return any comments or suggestions at your earliest convenience it would be much appreciated. If you require any further information, please do not hesitate to contact me.

Kind Regards,

Karen.

Karen Mulryan
Environmental Scientist

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## Shaun Doolin

**From:** Alister Cole <Alister.Cole1@three.ie>
**Sent:** Tuesday 11 May 2021 13:50
**To:** Shaun Doolin
**Cc:** Sean Kelly; DL Estates ROI; Karen Mulryan
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Hi Shaun,

I have reviewed the original/new Turbine locations (26) and 3Ireland have no microwave links that could potentially be affected.

Best regards,

Alister

Alister Cole
Transmission Engineer

**Mobile**: 086 6024556
**Email**: Alister.Cole1@three.ie

---

**From:** Shaun Doolin <sdoolin@mkoireland.ie>
**Sent:** 07 May 2021 15:54
**To:** Alister Cole <Alister.Cole1@three.ie>
**Cc:** Sean Kelly <Sean.Kelly2@three.ie>; DL Estates ROI <Estates@three.ie>; Karen Mulryan <kmulryan@mkoireland.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

**CAUTION!** External Email.

Good afternoon,

Since we last contacted you regarding the proposed Ballivor Wind Farm, two turbines have moved slightly in the northeast of the site. Turbine 19 has moved 25m north, while Turbine 20 has move 110m northwest. Please see the attached PDF of the final turbine locations, along with a spreadsheet containing location coordinates in ITM, Irish Grid and WGS84 reference systems. I have highlighted the two repositioned turbines in the spreadsheet and have also attached a KML for convenience.

Please feel free to contact us if you have any comments or queries.

Kind regards,
Shaun

## Shaun Doolin

**From:** Alister Cole <Alister.Cole1@three.ie>
**Sent:** Friday 12 February 2021 16:47
**To:** Karen Mulryan
**Cc:** Sean Kelly; DL Estates ROI
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Thanks Karen,

Looking at the Turbine locations our links will not be affected.

Thanks and regards,

Alister

Alister Cole
Transmission Engineer

**Mobile**: 086 6024556
**Email**: Alister.Cole1@three.ie

---

**From:** Karen Mulryan <kmulryan@mkoireland.ie>
**Sent:** 12 February 2021 16:32
**To:** Alister Cole <Alister.Cole1@three.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

**CAUTION!** External Email.

Hi Alister,

Its not decided yet, ranging 140m-160m RD.

Kind regards,

Karen.

Karen Mulryan
Environmental Scientist

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**From:** Alister Cole <Alister.Cole1@three.ie>
**Sent:** Friday 12 February 2021 16:30
**To:** Karen Mulryan <kmulryan@mkoireland.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Hi Karen,

Would you also have the rotor diameter please?

Thanks

Alister

Alister Cole
Transmission Engineer

**Mobile**: 086 6024556
**Email**: Alister.Cole1@three.ie

**From:** Alister Cole
**Sent:** 12 February 2021 14:26
**To:** Karen Mulryan <kmulryan@mkoireland.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Perfect, much appreciated,

Thanks

Alister

Alister Cole
Transmission Engineer

**Mobile**: 086 6024556
**Email**: Alister.Cole1@three.ie

**From:** Karen Mulryan <kmulryan@mkoireland.ie>
**Sent:** 12 February 2021 14:04
**To:** Alister Cole <Alister.Cole1@three.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

**CAUTION!** External Email.

Hi Alister,

Please see attached.

Kind regards,

Karen.

Karen Mulryan
Environmental Scientist

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**From:** Alister Cole <Alister.Cole1@three.ie>
**Sent:** Friday 12 February 2021 13:57
**To:** Karen Mulryan <kmulryan@mkoireland.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Hi Karen,

Thank you for sending the location kmz file. Would you also have the turbine location in Irish Grid coordinates?

Thanks and regards,

Alister

Alister Cole
Transmission Engineer

**Mobile**: 086 6024556
**Email**: Alister.Cole1@three.ie

**From:** Alan Hutchinson <alan.hutchinson@three.ie>
**Sent:** 12 February 2021 12:48
**To:** Karen Mulryan <kmulryan@mkoireland.ie>; Alister Cole <Alister.Cole1@three.ie>
**Cc:** DL Estates ROI <Estates@three.ie>
**Subject:** FW: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Hi Alister,

Please see correspondence from Karen on final proposed turbine locations.

Regards,
Alan.

**Alan Hutchinson**
RAN Programme and Commercial Manager

+353(0) 86 814 5316
alan.hutchinson@three.ie

**From:** Karen Mulryan <kmulryan@mkoireland.ie>
**Sent:** 12 February 2021 10:57
**To:** Gerry Callan <Gerry.Callan@three.ie>
**Cc:** Alan Hutchinson <alan.hutchinson@three.ie>; DL Estates ROI <Estates@three.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

**CAUTION!** External Email.

Good morning Gerry,

I previously contacted you with a proposed wind farm development at Ballivor on the Meath/Westmeath border.
Please see attached the proposed final turbine locations for your records.
If you have any comments, please let us know.

Kind regards,

Karen

## Shaun Doolin

**From:** Gerry Callan <Gerry.Callan@three.ie>
**Sent:** Tuesday 12 May 2020 10:45
**To:** Karen Mulryan
**Cc:** Alan Hutchinson; DL Estates ROI
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

**Follow Up Flag:** Follow up
**Flag Status:** Flagged

Hi Karen,

We would normally seek a 100m buffer, however once we have the turbine layout we can look at specific links and turbines more closely.

Hope this helps,

Best wishes,



**Gerry Callan**
Transmission Engineer

086 3884246
gerry.callan@three.ie



**Make it count.**

---

**From:** Karen Mulryan <kmulryan@mkoireland.ie>
**Sent:** 12 May 2020 10:41
**To:** Gerry Callan <Gerry.Callan@three.ie>
**Cc:** Alan Hutchinson <alan.hutchinson@three.ie>; DL Estates ROI <Estates@three.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Hi Gerry,

What set back distance do you need for your links?

Regards,

Karen.

Karen Mulryan
Environmental Scientist

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**From:** Gerry Callan <Gerry.Callan@three.ie>
**Sent:** 12 May 2020 09:36
**To:** Karen Mulryan <kmulryan@mkoireland.ie>
**Cc:** Alan Hutchinson <alan.hutchinson@three.ie>; DL Estates ROI <Estates@three.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Hi Karen,

Thank you for the various files supplied allowing us conduct our analysis of the impact this windfarm development might have on our network.

This is actually an area where we are currently optimising our service as new fibre is being delivered to one of the sites we use. Once it's in place in the next few months, our links in the area will be reconfigured as per the table below.

| Site A | X | Y | Site B | X | Y | Band | Dish Height A | D |
|---|---|---|---|---|---|---|---|---|
| Lisnabin Killucan | 255742 | 252754 | Coillte Cockstown | 264764 | 260496 | 15 | 27.3 | |
| Vodafone Delvin | 259789 | 263451 | Rathcore SDH | 276204 | 244149 | 11 | 30 | |
| Ballivor Coillte | 266371 | 255159 | Delvin Coillte | 259633 | 264651 | 18 | 30 | |
| Kinnegad | 259835 | 247003 | Ballivor Coillte | 266371 | 255159 | 18 | 30 | |
| Vodafone Delvin | 259789 | 263451 | Ballivor Coillte | 266371 | 255159 | TBC | TBC | |
| Vodafone Delvin | 259789 | 263451 | Coillte Cockstown | 264764 | 260496 | TBC | TBC | |
| Vodafone Delvin | 259789 | 263451 | Delvin Coillte | 259633 | 264651 | TBC | TBC | |
| Vodafone Delvin | 259789 | 263451 | Coillte Grange More | 263369 | 253606 | TBC | TBC | |

At present we have 4 links traversing the development area (the first 4 in the table), however 3 of these will be decomissioned in due course.

4 new links will be deployed in the area, 2 of which will not traverse the development area.

So the final layout in the region will be links 4, 5 and 8 (highlighted in amber) above. Those are the links you'll need to factor into your constraints planning for this development.

Once you have a confirmed turbine layout, do please let us know the coordinates (in Irish Grid format) and we'll import them into our planning tool to ensure that there is not impact on our existing network and to ensure future planning takes them into account as well.

Good luck with the development,

Best wishes,

**Gerry Callan**
Transmission Engineer

086 3884246
gerry.callan@three.ie

**Make it count.**

---

**From:** Karen Mulryan <kmulryan@mkoireland.ie>
**Sent:** 11 May 2020 11:11
**To:** Gerry Callan <Gerry.Callan@three.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Good morning Gerry,

Please see attached.

If you need anything else please let me know.

Regards,

Karen.

Karen Mulryan
Environmental Scientist

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---

**From:** Gerry Callan <Gerry.Callan@three.ie>
**Sent:** 08 May 2020 11:19
**To:** Karen Mulryan <kmulryan@mkoireland.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Hi Karen,

To enable us get a quick response back to you on this, would you have any of the following …

1. A MapInfo Shapefile of the outline of the development area.
2. A Google Earth KMZ file of the outline of the development area.

3. An Excel file with Irish Grid coordinates of the extremities of the development area (NW, NE, SW, SE) which will allow us identify the development area on our planning tool.

Thanks in advance,

Best wishes,



**Gerry Callan**
Transmission Engineer

086 3884246
gerry.callan@three.ie



**Make it count.**

---

**From:** Karen Mulryan <kmulryan@mkoireland.ie>
**Sent:** 08 May 2020 10:30
**To:** Gerry Callan <Gerry.Callan@three.ie>
**Subject:** 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Good morning,

MKO is preparing an Environmental Impact Assessment Report (EIAR) for a proposed Bórd na Móna Powergen Ltd wind energy development at Ballivor and the surrounding townlands located at the Meath-Westmeath border. The proposed development will be located on 5 bogs and will be referred to as the Ballivor Wind Farm. The site is located approximately 2.2km west of Ballivor Village, Co. Meath, and 3.7km east of Raharney and 2.5km south-southeast of Devlin, which are both located in Co. Westmeath.
The proposed project will likely encompass 25-35 turbines and will have an output of at least 50megawatts. Should the project be of this scale, an application will be made to An Bord Planeála seeking a determination in relation to the SID status, or otherwise, of the proposed wind energy development. If the board determine that the development is indeed SID, the planning application will be submitted directedly to An Bord Planeála, under the provision of the Planning and Development (Strategic Infrastructure) Act 2006. Should the project be of a scale lower than the SID thresholds, an application for planning permission will be made to Meath and Westmeath County Councils.
As part of the EIA process, we would welcome any comments that you may have in relation to the proposed project, including baseline data, survey techniques or potential impacts that should be considered as part of the assessment process and in the preparation of the EIAR. In order to facilitate this, a Scoping Document providing details of the proposed project and the site of the proposed development is attached.

If you could return any comments or suggestions at your earliest convenience it would be much appreciated. If you require any further information, please do not hesitate to contact me.

Kind Regards,

Karen.

## Shaun Doolin

**From:** Stephenson, Chris, Vodafone Ireland (External) <chris.stephenson2@vodafone.com>
**Sent:** Wednesday 12 May 2021 11:53
**To:** Shaun Doolin
**Cc:** Byrne, Gavin, Vodafone Ireland; Lyons, Sean, Vodafone Ireland (External); Karen Mulryan
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Hi Shaun,
Thanks for the update, that looks fine.

Kind regards
Chris

C2 General

**From:** Shaun Doolin <sdoolin@mkoireland.ie>
**Sent:** Friday 7 May 2021 15:56
**To:** Stephenson, Chris, Vodafone Ireland (External) <chris.stephenson2@vodafone.com>
**Cc:** Byrne, Gavin, Vodafone Ireland <gavin.byrne@vodafone.com>; Lyons, Sean, Vodafone Ireland (External) <sean.lyons@vodafone.com>; Karen Mulryan <kmulryan@mkoireland.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

**CYBER SECURITY WARNING:** This email is from an external source - be careful of attachments and links. Please follow the Cyber Code and report suspicious emails.
Good afternoon,

Since we last contacted you regarding the proposed Ballivor Wind Farm, two turbines have moved slightly in the northeast of the site. Turbine 19 has moved 25m north, while Turbine 20 has move 110m northwest. Please see the attached PDF of the final turbine locations, along with a spreadsheet containing location coordinates in ITM, Irish Grid and WGS84 reference systems. I have highlighted the two repositioned turbines in the spreadsheet and have also attached a KML for convenience.

Please feel free to contact us if you have any comments or queries.

Kind regards,
Shaun

Shaun Doolin
Graduate Environmental Scientist

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Ireland, H91 VW84
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**From:** Stephenson, Chris, Vodafone Ireland (External) <chris.stephenson2@vodafone.com>
**Sent:** Friday 26 February 2021 11:47
**To:** Karen Mulryan <kmulryan@mkoireland.ie>
**Cc:** Byrne, Gavin, Vodafone Ireland <gavin.byrne@vodafone.com>; Lyons, Sean, Vodafone Ireland (External) <sean.lyons@vodafone.com>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Hi Karen,
The proposed positions are fine.

Kind regards
Chris

C2 General

**From:** Lyons, Sean, Vodafone Ireland (External) <sean.lyons@vodafone.com>
**Sent:** Monday 15 February 2021 08:29
**To:** Stephenson, Chris, Vodafone Ireland (External) <chris.stephenson2@vodafone.com>
**Cc:** Byrne, Gavin, Vodafone Ireland <gavin.byrne@vodafone.com>
**Subject:** FW: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Hi Chris,

Could you please complete analysis on this proposed windfarm?

Please send your findings to:
Karen Mulryan <kmulryan@mkoireland.ie>

**Sean Lyons**
Transmission Program Manager
Converged Transmission
Technology- NET
+353877758117
sean.lyons@vodafone.com
Vodafone Ireland Limited, Registered Office: MountainView, Leopardstown, Dublin 18, Registered in Ireland: No. 326967

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C2 General

**From:** Byrne, Gavin, Vodafone Ireland <gavin.byrne@vodafone.com>
**Sent:** Friday 12 February 2021 15:26
**To:** Lyons, Sean, Vodafone Ireland (External) <sean.lyons@vodafone.com>
**Cc:** Neill o', Shane, Vodafone Ireland <shane.oneill2@vodafone.com>
**Subject:** FW: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Hi Sean,

Can you ask one of the team to take a look at this windfarm development please?

**Gavin Byrne**
TX Planning & Design Engineer
Converged Transmission
+353876448159
gavin.byrne@vodafone.com

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**From:** Karen Mulryan <kmulryan@mkoireland.ie>
**Sent:** Friday 12 February 2021 11:22
**To:** Byrne, Gavin, Vodafone Ireland <gavin.byrne@vodafone.com>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

**CYBER SECURITY WARNING:** This email is from an external source - be careful of attachments and links. Please follow the Cyber Code and report suspicious emails.

Good morning Gavin,

I previously contacted you with a proposed wind farm development at Ballivor on the Meath/Westmeath border.
Please see attached the proposed final turbine locations for your records.
If you have any comments, please let us know.

Kind regards,

Karen

Karen Mulryan
Environmental Scientist

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**From:** Byrne, Gavin, Vodafone Ireland <gavin.byrne@vodafone.com>
**Sent:** Monday 11 May 2020 13:34
**To:** Karen Mulryan <kmulryan@mkoireland.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Hi Karen,

Exclusion zones are +30m from the maximum 1st Fresnel zone diameter, (from rotor tip) of each microwave. From the tower, +50m as a general rule, again from rotor tip, but the near field calculation like the Fresnel zone is frequency dependent.

Any turbine that resides within the 30m exclusion zone will need to be assessed by us directly

If you want further clarification, please let me know.

If you want me to analyse specific turbine locations and dimensions, by all means send them to me.

Thanks

Gavin

**From:** Karen Mulryan <kmulryan@mkoireland.ie>
**Sent:** Monday 11 May 2020 12:55
**To:** Byrne, Gavin, Vodafone Ireland <gavin.byrne@vodafone.com>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

**CYBER SECURITY WARNING:** This email is from an external source - be careful of attachments and links. Please follow the Cyber Code and report suspicious emails.
Hi Gavin,

Do you have a set back distance for your links?

Thanks,

Karen.

Karen Mulryan
Environmental Scientist

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**From:** MKO-Admin <info@mkoireland.ie>
**Sent:** 08 May 2020 11:21

**To:** Karen Mulryan <kmulryan@mkoireland.ie>
**Subject:** FW: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

---

**From:** Byrne, Gavin, Vodafone Ireland
**Sent:** Friday 8 May 2020 11:19
**To:** MKO-Admin <info@mkoireland.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

For the attention of Karen Mulryan:

Hi Karen,

Can you please send all future correspondence to this Vodafone email address, the Netshare address is no longer valid and because of the forwarding rules, I was unable to find your email address, hence I have emailed this response to this address.

Please find attached list of potentially impacted microwaves. Of particular importance is the MPLS trunk microwave between WHLIN Kilucan and MH009 Faughan Hill. This is a trunk radio that carries a significant amount of traffic across our MPLS backhaul network.

If you have turbine locations that you want me to assess, please send them on.

**Gavin Byrne**
TX Planning & Design Engineer
Converged Transmission
+353876448159
gavin.byrne@vodafone.com

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MountainView, Leopardstown, Dublin 18, Registered in Ireland: No. 326967

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**From:** Gavin Byrne <gavin.byrne@netshare.ie>
**Sent:** Friday 8 May 2020 10:24
**To:** Byrne, Gavin, Vodafone Ireland <gavin.byrne@vodafone.com>
**Subject:** FW: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

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**U**

**From:** Karen Mulryan
**Sent:** Friday 8 May 2020 10:24:17 (UTC+00:00) Dublin, Edinburgh, Lisbon, London
**To:** Gavin Byrne
**Subject:** 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Good afternoon,

MKO is preparing an Environmental Impact Assessment Report (EIAR) for a proposed Bórd na Móna Powergen Ltd wind energy development at Ballivor and the surrounding townlands located at the Meath-Westmeath border. The proposed development will be located on 5 bogs and will be referred to as the Ballivor Wind Farm. The site is located approximately 2.2km west of Ballivor Village, Co. Meath, and 3.7km east of Raharney and 2.5km south-southeast of Devlin, which are both located in Co. Westmeath.
The proposed project will likely encompass 25-35 turbines and will have an output of at least 50megawatts. Should the project be of this scale, an application will be made to An Bord Planeála seeking a determination in relation to the SID status, or otherwise, of the proposed wind energy development. If the board determine that the development is indeed SID, the planning application will be submitted directedly to An Bord Planeála, under the provision of the Planning and Development (Strategic Infrastructure) Act 2006. Should the project be of a scale lower than the SID thresholds, an application for planning permission will be made to Meath and Westmeath County Councils.
As part of the EIA process, we would welcome any comments that you may have in relation to the proposed project, including baseline data, survey techniques or potential impacts that should be considered as part of the assessment process and in the preparation of the EIAR. In order to facilitate this, a Scoping Document providing details of the proposed project and the site of the proposed development is attached.

If you could return any comments or suggestions at your earliest convenience it would be much appreciated. If you require any further information, please do not hesitate to contact me.

Kind Regards,

Karen.

Karen Mulryan
Environmental Scientist

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## Shaun Doolin

**From:** Peter O`Brien <peter.obrien@enet.ie>
**Sent:** Tuesday 11 May 2021 10:46
**To:** Shaun Doolin
**Cc:** Karen Mulryan
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Hi Shaun,

125m is great, should be no issues for us,

Regards,
Peter

---

**From:** Shaun Doolin <sdoolin@mkoireland.ie>
**Sent:** Tuesday, May 11, 2021 10:33 AM
**To:** Peter O`Brien <peter.obrien@enet.ie>
**Cc:** Karen Mulryan <kmulryan@mkoireland.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

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Hi Peter,

We have placed a minimum setback buffer of 50m either side of your links. However, our turbines are actually placed a minimum of 125m from your links.

Kind regards,
Shaun

Shaun Doolin
Graduate Environmental Scientist

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---

**From:** Peter O`Brien <peter.obrien@enet.ie>
**Sent:** Tuesday 11 May 2021 10:10
**To:** Shaun Doolin <sdoolin@mkoireland.ie>
**Cc:** Karen Mulryan <kmulryan@mkoireland.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Hi Shaun,

What is the setback distance from our links to the turbines?

Regards,
Peter

---

**From:** Shaun Doolin <sdoolin@mkoireland.ie>
**Sent:** Tuesday, May 11, 2021 10:06 AM
**To:** Peter O`Brien <peter.obrien@enet.ie>
**Cc:** Karen Mulryan <kmulryan@mkoireland.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

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Hi Peter,

Thank you for getting back to me on this.

Could you please confirm that your links will not be impacted by our proposed turbine locations?

Kind regards,
Shaun

Shaun Doolin
Graduate Environmental Scientist

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Ireland, H91 VW84
+353 (0) 91 735611
www.mkoireland.ie

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---

**From:** Peter O`Brien <peter.obrien@enet.ie>
**Sent:** Monday 10 May 2021 07:58
**To:** Shaun Doolin <sdoolin@mkoireland.ie>
**Cc:** Karen Mulryan <kmulryan@mkoireland.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Hi Shaun,

We still have just the two links passing through this windfarm:

| Site A Coordinates | Site A Antenna Height | Site B Coordinates | Site B Antenna Height | Link Frequency |
|---|---|---|---|---|
| 53°38'21.08"N 7°16'28.13"W | 15m | 53°24'18.20"N 6°44'45.50"W | 20m | 7GHz |

| | | | | |
|---|---|---|---|---|
| 53°38'21.08"N<br>7°16'28.13"W | 15m | 53°26'39.70"N<br>6°51'41.80"W | 10m | 13GHz |

Regards,
Peter

---

**From:** Shaun Doolin <sdoolin@mkoireland.ie>
**Sent:** Friday, May 7, 2021 4:35 PM
**To:** Peter O`Brien <peter.obrien@enet.ie>
**Cc:** Karen Mulryan <kmulryan@mkoireland.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

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Good afternoon,

Since we last contacted you regarding the proposed Ballivor Wind Farm, two turbines have moved slightly in the northeast of the site. Turbine 19 has moved 25m north, while Turbine 20 has move 110m northwest. Please see the attached PDF of the final turbine locations. I have also attached a KML for convenience.

Please feel free to contact us if you have any comments or queries.

Kind regards,
Shaun

Shaun Doolin
Graduate Environmental Scientist

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---

**From:** Karen Mulryan
**Sent:** Friday 12 February 2021 11:06
**To:** 'Peter O`Brien' <peter.obrien@enet.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Good morning Peter,

I previously contacted you with a proposed wind farm development at Ballivor on the Meath/Westmeath border.
Please see attached the proposed final turbine locations for your records.
If you have any comments, please let us know.

Kind regards,

## Shaun Doolin

**From:** Peter O`Brien <peter.obrien@enet.ie>
**Sent:** Tuesday 23 June 2020 12:41
**To:** Karen Mulryan
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

**Follow Up Flag:** Follow up
**Flag Status:** Flagged

Hi Karen,

Between 100 - 150m,

Thanks,
Peter

---

**From:** Karen Mulryan <kmulryan@mkoireland.ie>
**Sent:** Tuesday, June 23, 2020 12:12 PM
**To:** Peter O`Brien <peter.obrien@enet.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Thanks Peter,

What buffer do you require for your links?

Regards,

Karen.

Karen Mulryan
Environmental Scientist

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---

**From:** Peter O`Brien <peter.obrien@enet.ie>
**Sent:** 23 June 2020 10:46
**To:** Karen Mulryan <kmulryan@mkoireland.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Hi Karen,

We have two links currently that are over this area, details below:

| Site A Coordinates | Site A Antenna Height | Site B Coordinates | Site B Antenna Height | Link Frequency |
|---|---|---|---|---|
| 53°38'21.08"N 7°16'28.13"W | 15m | 53°24'18.20"N 6°44'45.50"W | 20m | 7GHz |
| 53°38'21.08"N 7°16'28.13"W | 15m | 53°26'39.70"N 6°51'41.80"W | 10m | 13GHz |

Best Regards,
Peter

---

**From:** Karen Mulryan <kmulryan@mkoireland.ie>
**Sent:** Monday, June 22, 2020 3:08 PM
**To:** Peter O`Brien <peter.obrien@enet.ie>
**Subject:** 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Good afternoon Peter,

MKO is preparing an Environmental Impact Assessment Report (EIAR) for a proposed Bórd na Móna Powergen Ltd wind energy development at Ballivor and the surrounding townlands located at the Meath-Westmeath border. The proposed development will be located on 5 bogs and will be referred to as the Ballivor Wind Farm. The site is located approximately 2.2km west of Ballivor Village, Co. Meath, and 3.7km east of Raharney and 2.5km south-southeast of Devlin, which are both located in Co. Westmeath.
The proposed project will likely encompass 25-35 turbines and will have an output of at least 50megawatts. Should the project be of this scale, an application will be made to An Bord Planeála seeking a determination in relation to the SID status, or otherwise, of the proposed wind energy development. If the board determine that the development is indeed SID, the planning application will be submitted directedly to An Bord Planeála, under the provision of the Planning and Development (Strategic Infrastructure) Act 2006. Should the project be of a scale lower than the SID thresholds, an application for planning permission will be made to Meath and Westmeath County Councils.
As part of the EIA process, we would welcome any comments that you may have in relation to the proposed project, including baseline data, survey techniques or potential impacts that should be considered as part of the assessment process and in the preparation of the EIAR. In order to facilitate this, a Scoping Document providing details of the proposed project and the site of the proposed development is attached.

If you could return any comments or suggestions at your earliest convenience it would be much appreciated. We would be grateful for any information regarding any telecoms links and buffers you have in the area so we can exclude them from our design. If you require any further information, please do not hesitate to contact me.

Kind Regards,

Karen.

Karen Mulryan
Environmental Scientist

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www.mkoireland.ie

## Shaun Doolin

**From:** Redmond. Myles (ESB Networks) <myles.redmond2@esb.ie>
**Sent:** Friday 14 May 2021 16:50
**To:** Shaun Doolin; McDonagh. Paul (ESB Networks)
**Cc:** Dalikeni. Wilson (ESB Networks); Karen Mulryan
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Hi Shaun,

I have carried out further analysis on this windfarm and I can confirm that there will be no expected impact to our microwave and point to multipoint radio networks.

Regards,

Myles

---

**From:** Shaun Doolin <sdoolin@mkoireland.ie>
**Sent:** Friday 7 May 2021 16:37
**To:** Redmond. Myles (ESB Networks) <myles.redmond2@esb.ie>; McDonagh. Paul (ESB Networks) <paul.mcdonagh@esb.ie>
**Cc:** Dalikeni. Wilson (ESB Networks) <wilson.dalikeni@esb.ie>; Karen Mulryan <kmulryan@mkoireland.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

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Good afternoon,

Since we last contacted you regarding the proposed Ballivor Wind Farm, two turbines have moved slightly in the northeast of the site. Turbine 19 has moved 25m north, while Turbine 20 has move 110m northwest. Please see the attached PDF of the final turbine locations. I have also attached a KML for convenience.

Please feel free to contact us if you have any comments or queries.

Kind regards,
Shaun

Shaun Doolin
Graduate Environmental Scientist

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**From:** Myles Redmond <myles.redmond2@esb.ie>
**Sent:** 10 July 2020 16:00
**To:** Paul McDonagh <paul.mcdonagh@esb.ie>; Karen Mulryan <kmulryan@mkoireland.ie>
**Cc:** Wilson Dalikeni <wilson.dalikeni@esb.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Hi Karen,

I have checked the proposed area for the Scada point to multi point network and I do not envisage the proposed Windfarm development will not impact on any of our current infrastructure.

The nearest site to the development is Delvin 38kV and this is bearing north towards of our hillsites so will not be impacted.




Regards,

Myles

**From:** Karen Mulryan <kmulryan@mkoireland.ie>
**Sent:** Tuesday 7 July 2020 15:02
**To:** McDonagh. Paul (ESB Networks) <paul.mcdonagh@esb.ie>

**Cc:** Dalikeni. Wilson (ESB Networks) <wilson.dalikeni@esb.ie>
**Subject:** 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Hi Paul,

Would you be able to provide any detail on the UHF SCADA point to multi point radio links in the area. We are trying to come up with an interim design so coordinates would be very helpful.

Kind regards,

Karen.

Karen Mulryan
Environmental Scientist
**MKO**
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**From:** Paul McDonagh <paul.mcdonagh@esb.ie>
**Sent:** 13 May 2020 11:58
**To:** Karen Mulryan <kmulryan@mkoireland.ie>
**Cc:** Wilson Dalikeni <wilson.dalikeni@esb.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Hi Karen

Going off the centre of site co-ordinates within the document, we have a couple of UHF SCADA point to multi point radio links in the area. It is OK from a point to point MW radio link perspective.

Would have details on the proposed turbine layout to review further.

Thanks

Paul

**From:** Dalikeni. Wilson (ESB Networks) <wilson.dalikeni@esb.ie>
**Sent:** Monday 11 May 2020 09:29
**To:** McDonagh. Paul (ESB Networks) <paul.mcdonagh@esb.ie>
**Subject:** FW: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Hi Paul,

Can you please review this development and respond to developer.

Regards,

## Shaun Doolin

**From:** Paul McDonagh <paul.mcdonagh@esb.ie>
**Sent:** Wednesday 13 May 2020 11:58
**To:** Karen Mulryan
**Cc:** Wilson Dalikeni
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

**Follow Up Flag:** Follow up
**Flag Status:** Flagged

Hi Karen

Going off the centre of site co-ordinates within the document, we have a couple of UHF SCADA point to multi point radio links in the area. It is OK from a point to point MW radio link perspective.

Would have details on the proposed turbine layout to review further.

Thanks

Paul

---

**From:** Dalikeni. Wilson (ESB Networks) <wilson.dalikeni@esb.ie>
**Sent:** Monday 11 May 2020 09:29
**To:** McDonagh. Paul (ESB Networks) <paul.mcdonagh@esb.ie>
**Subject:** FW: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Hi Paul,

Can you please review this development and respond to developer.

Regards,

**Wilson Dalikeni | WAN Team Manager, Networks Telecoms | ESB Networks | T: +353 1 702 6814 / +353 87 257 9770 | www.esbnetworks.ie**

---

**From:** Karen Mulryan <kmulryan@mkoireland.ie>
**Sent:** Friday 8 May 2020 09:46
**To:** Dalikeni. Wilson (ESB Networks) <wilson.dalikeni@esb.ie>
**Subject:** 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

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Good morning,

MKO is preparing an Environmental Impact Assessment Report (EIAR) for a proposed Bórd na Móna Powergen Ltd wind energy development at Ballivor and the surrounding townlands located at the Meath-Westmeath border. The proposed development will be located on 5 bogs and will be referred to as the Ballivor Wind Farm. The site is located approximately 2.2km west of Ballivor Village, Co. Meath, and 3.7km east of Raharney and 2.5km south-southeast of Devlin, which are both located in Co. Westmeath.

The proposed project will likely encompass 25-35 turbines and will have an output of at least 50megawatts. Should the project be of this scale, an application will be made to An Bord Planeála seeking a determination in relation to the SID status, or otherwise, of the proposed wind energy development. If the board determine that the development is indeed SID, the planning application will be submitted directedly to An Bord Planeála, under the provision of the Planning and Development (Strategic Infrastructure) Act 2006. Should the project be of a scale lower than the SID thresholds, an application for planning permission will be made to Meath and Westmeath County Councils.
As part of the EIA process, we would welcome any comments that you may have in relation to the proposed project, including baseline data, survey techniques or potential impacts that should be considered as part of the assessment process and in the preparation of the EIAR. In order to facilitate this, a Scoping Document providing details of the proposed project and the site of the proposed development is attached.

If you could return any comments or suggestions at your earliest convenience it would be much appreciated. If you require any further information, please do not hesitate to contact me.

Kind Regards,

Karen.

Karen Mulryan
Environmental Scientist

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## Karen Mulryan

**From:** Paul Brunel <Paul.Brunel@imaginegroup.ie>
**Sent:** Thursday 2 September 2021 16:57
**To:** Karen Mulryan; Ronnie O'Neill
**Cc:** Shaun Doolin
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

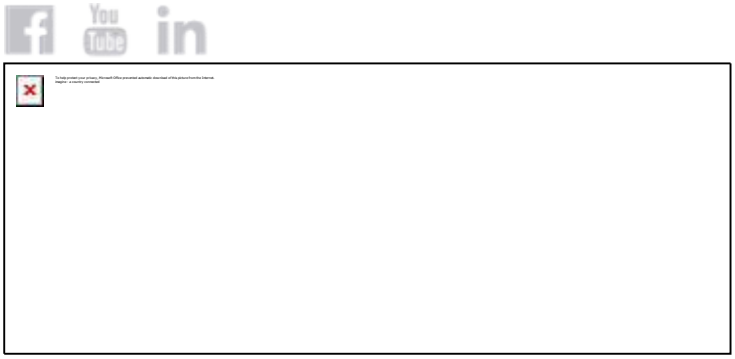
**Follow Up Flag:** Follow up
**Flag Status:** Flagged

Hi Karen,
We have agreed the proposed set back as outlined by Kevin Hayes of AI Bridges on the 1st of July this year.
(Minimum 33m Clearance between blade tip and the 2nd fresnel zone).

Kind Regards,

Paul Brunel.
Transmission Planning.
Ph: 086 388 1962

Imagine Group.
Sandyford Business Centre.
Blackthorn Road, Sandyford, D18 AW89



---

**From:** Karen Mulryan
**Sent:** 02 September 2021 16:06
**To:** Ronnie O'Neill; Paul Brunel
**Cc:** Shaun Doolin
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

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Hi Ronnie,

I am just following up with you to ensure the setbacks AI Bridges provided are agreed. The potential proposed construction period if this project was to get a grant wouldn't be until towards the end of the decade.

Kind regards,

**From:** Karen Mulryan
**Sent:** Tuesday 3 August 2021 16:04
**To:** 'Ronnie O'Neill' <Ronnie.ONeill@imaginegroup.ie>; 'Paul Brunel' <Paul.Brunel@imaginegroup.ie>; Shaun Doolin <sdoolin@mkoireland.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Hi Ronnie,

Just want to confirm you received my email below regarding the potential construction timeframes if this project was to be successful in planning?

Kind regards,

Karen.

Karen Mulryan
Environmental Scientist BA MSc ACIfA IAI

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**From:** Karen Mulryan
**Sent:** Tuesday 27 July 2021 15:02
**To:** Ronnie O'Neill <Ronnie.ONeill@imaginegroup.ie>; Paul Brunel <Paul.Brunel@imaginegroup.ie>; Shaun Doolin <sdoolin@mkoireland.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Hi Ronnie,

We are just in the pre-planning stage at the moment. If we were to get a consent, it is anticipated the project would commence construction in the latter half of the decade.

Kind regards,

Karen.

Karen Mulryan
Environmental Scientist BA MSc ACIfA IAI

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**From:** Ronnie O'Neill <Ronnie.ONeill@imaginegroup.ie>
**Sent:** Friday 23 July 2021 09:06
**To:** Karen Mulryan <kmulryan@mkoireland.ie>; Paul Brunel <Paul.Brunel@imaginegroup.ie>; Shaun Doolin <sdoolin@mkoireland.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Hi Karen ,

We have agreed with AI Bridges that the locations of turbines T20 & T25 should have enough clearance to not cause us an issue but there is always an element of doubt .
I know this , at the moment , is the proposed layout but can you give an estimate of when these works might take place .

We currently have over approx 200x customers connected to our site & if the MW link is interfered with at all , we are in a very bad situation .
We do not have an alternative solution for connection onto our network .

It is something we will have to monitor very carefully as the construction works are progressing .

Rgds,
Ronnie .

**From:** Karen Mulryan <kmulryan@mkoireland.ie>
**Sent:** Wednesday 21 July 2021 10:17
**To:** Paul Brunel <Paul.Brunel@imaginegroup.ie>; Shaun Doolin <sdoolin@mkoireland.ie>
**Cc:** Ronnie O'Neill <Ronnie.ONeill@imaginegroup.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

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Good morning Paul,

Further to our correspondence below, I believe AI Bridges were in touch regarding the setbacks from your links and an set back buffer of 30m from the 2nd Fresnel was agreed?

Can you confirm this is the case and you have no concerns regarding the proposed layout attached?

Kind regards,

Karen.

Karen Mulryan
Environmental Scientist BA MSc ACIfA IAI

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**From:** Paul Brunel <Paul.Brunel@imaginegroup.ie>
**Sent:** Tuesday 18 May 2021 15:58
**To:** Shaun Doolin <sdoolin@mkoireland.ie>
**Cc:** Ronnie O'Neill <Ronnie.ONeill@imaginegroup.ie>; Karen Mulryan <kmulryan@mkoireland.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Hi Shaun,
We need a 50m clearance buffer from the centre if our MW path.
Please let us know the radius of the turbine blades when you have this information.

Kind Regards,

Paul Brunel.
Transmission Planning.
Imagine Group.
Ph: 086 388 1962
imagine

t. +353 1 437 5000
m. +353 863832470
w. imagine.ie
Imagine
Sandyford Business Centre
Blackthorn Road, Sandyford, D18




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**From:** Shaun Doolin [mailto:sdoolin@mkoireland.ie]
**Sent:** 12 May 2021 14:12
**To:** Paul Brunel
**Cc:** Ronnie O'Neill; Karen Mulryan
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

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Hi Paul,

Thank you for getting back to me about this.

There is a 45m clearance buffer placed either side of your MW path.
You are correct in that T20 is approximately 131m from the MW path.
The radius of the turbine blades has not yet been determined for this development, but we do have a turbine tip height of 200m.

Kind regards,
Shaun

Shaun Doolin
Graduate Environmental Scientist

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**From:** Paul Brunel <Paul.Brunel@imaginegroup.ie>
**Sent:** Wednesday 12 May 2021 10:23
**To:** Shaun Doolin <sdoolin@mkoireland.ie>
**Cc:** Ronnie O'Neill <Ronnie.ONeill@imaginegroup.ie>; Karen Mulryan <kmulryan@mkoireland.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Hi Shaun,
Thank you for the mail.
Please confirm that the new location for T20 will still leave a 50m clearance from our MW path.
T20 is now just over 130m from the MW path.
I trust that the Radius of the Turbine Blades will not exceed 80m.

Kind Regards,

Paul Brunel.

This email originated outside of the organisation - please exercise caution when opening attachments or clicking links.

Good afternoon,

Since we last contacted you regarding the proposed Ballivor Wind Farm, two turbines have moved slightly in the northeast of the site. Turbine 19 has moved 25m north, while Turbine 20 has move 110m northwest. Please see the attached PDF of the final turbine locations. I have also attached a KML for convenience.

Please feel free to contact us if you have any comments or queries.

Kind regards,
Shaun

Shaun Doolin
Graduate Environmental Scientist

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**From:** Karen Mulryan
**Sent:** Friday 12 February 2021 11:01
**To:** 'Ronnie O'Neill' <Ronnie.ONeill@imaginegroup.ie>
**Cc:** Lorna Brennan <lorna.brennan@imaginegroup.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Good morning Ronnie,

I previously contacted you with a proposed wind farm development at Ballivor on the Meath/Westmeath border. Please see attached the proposed turbine locations for your records.
If you have any comments, please let us know.

Kind regards,

Karen.

Karen Mulryan
Environmental Scientist

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**From:** Ronnie O'Neill <Ronnie.ONeill@imaginegroup.ie>
**Sent:** Monday 11 May 2020 14:35
**To:** Karen Mulryan <kmulryan@mkoireland.ie>
**Cc:** Lorna Brennan <lorna.brennan@imaginegroup.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Hi Karen ,

We would require 50mtrs either side of the line I showed in the screenshot .

Thanks ,
Ronnie .

**From:** Karen Mulryan <kmulryan@mkoireland.ie>
**Sent:** Monday 11 May 2020 12:55
**To:** Ronnie O'Neill <Ronnie.ONeill@imaginegroup.ie>
**Cc:** Lorna Brennan <lorna.brennan@imaginegroup.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Hi Ronnie,

Do you have a set back distance for your links?

Thanks,

Karen.

Karen Mulryan
Environmental Scientist

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**From:** Ronnie O'Neill <Ronnie.ONeill@imaginegroup.ie>
**Sent:** 11 May 2020 11:50

Imagine have a Microwave Point to Point link that may be affected by this wind farm , depending on the exact locations of the turbines .

We have an installation on an Cellnex owned tower at the north east of the bog you have identified . It's a 36mtr mast known as Cellnex Cockstown ( 53.590497° / -7.022789° )
Our link connects to 3IRL Rathcore ( 53.442111° / -6.853837° ) . The attached screenshot shows the path across which the link works .
Any installation along this path will cause an issue for Imagines' network .

Let us know when you have identified exact locations for the turbines and we can look into this further .

Rgds,
Ronnie .

---

**From:** Karen Mulryan <kmulryan@mkoireland.ie>
**Sent:** Friday 8 May 2020 09:50
**To:** Ronnie O'Neill <Ronnie.ONeill@imaginegroup.ie>
**Subject:** 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Good morning,

MKO is preparing an Environmental Impact Assessment Report (EIAR) for a proposed Bórd na Móna Powergen Ltd wind energy development at Ballivor and the surrounding townlands located at the Meath-Westmeath border. The proposed development will be located on 5 bogs and will be referred to as the Ballivor Wind Farm. The site is located approximately 2.2km west of Ballivor Village, Co. Meath, and 3.7km east of Raharney and 2.5km south-southeast of Devlin, which are both located in Co. Westmeath.
The proposed project will likely encompass 25-35 turbines and will have an output of at least 50megawatts. Should the project be of this scale, an application will be made to An Bord Planeála seeking a determination in relation to the SID status, or otherwise, of the proposed wind energy development. If the board determine that the development is indeed SID, the planning application will be submitted directedly to An Bord Planeála, under the provision of the Planning and Development (Strategic Infrastructure) Act 2006. Should the project be of a scale lower than the SID thresholds, an application for planning permission will be made to Meath and Westmeath County Councils.
As part of the EIA process, we would welcome any comments that you may have in relation to the proposed project, including baseline data, survey techniques or potential impacts that should be considered as part of the assessment process and in the preparation of the EIAR. In order to facilitate this, a Scoping Document providing details of the proposed project and the site of the proposed development is attached.

If you could return any comments or suggestions at your earliest convenience it would be much appreciated. If you require any further information, please do not hesitate to contact me.

Kind Regards,

Karen.

Karen Mulryan
Environmental Scientist

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www.mkoireland.ie

## Shaun Doolin

**From:** Lawler Jamie <Jamie.Lawlor@irishrail.ie>
**Sent:** Wednesday 23 September 2020 14:06
**To:** Karen Mulryan
**Cc:** Quigley Tom
**Subject:** RE: FAO Thomas Quigley: 191137 proposed Ballivor Wind Farm, Meath/Westmeath Border
**Attachments:** Base station locations.png

Hello Karen,

Please find attached the coordinates of base stations on the Sligo line from Enfield to Mullingar. Enfield, Hill of Down and Mullingar have both UHF and GSMR equipment. The remaining sites have GSMR equipment only. Hill of Down additionally has a microwave link to Mt. Oriel (Lat 53N4729 Long 06W3044). I am not aware of any set back distances but will check with supplier.

Thanks,
Jamie

---

**From:** Karen Mulryan <kmulryan@mkoireland.ie>
**Sent:** Wednesday 23 September 2020 11:54
**To:** Lawler Jamie <Jamie.Lawlor@irishrail.ie>
**Subject:** RE: FAO Thomas Quigley: 191137 proposed Ballivor Wind Farm, Meath/Westmeath Border
**Importance:** High

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Hi Jamie,

I would appreciate any list of links and coordinates you may have so we can map and subsequently avoid them. The Hill of Down is c.4km south of the proposed development site boundary.
Do you have set back distances from your base stations and links that we can incorporate into our design?

Kind regards,

Karen.

Karen Mulryan
Environmental Scientist

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**From:** Lawler Jamie <Jamie.Lawlor@irishrail.ie>
**Sent:** Wednesday 23 September 2020 11:20
**To:** Karen Mulryan <kmulryan@mkoireland.ie>
**Subject:** FW: FAO Thomas Quigley: 191137 proposed Ballivor Wind Farm, Meath/Westmeath Border

Hello Karen,

We currently have a UHF train radio system with base stations located along the track. This system provides communication between the signalman and the train driver. From the .kml file the closest base station to the site is Hill of Down. We are also in the process of rolling out a GSM radio system for train communication. I will get a list of sites for this.
We have a microwave radio link from Hill of Down to Mt. Oriel. The line of sight looks to be outside the area on the .kml but may need further investigation.

Regards,
Jamie

**From:** Quigley Tom <Thomas.Quigley@irishrail.ie>
**Sent:** Wednesday 23 September 2020 10:32
**To:** Lawler Jamie <Jamie.Lawlor@irishrail.ie>
**Subject:** FW: FAO Thomas Quigley: 191137 proposed Ballivor Wind Farm, Meath/Westmeath Border

Hi Jamie,

Please see below – can you review & respond.

Regards,

Thomas Quigley,
Telecoms Department

please don't print this e-mail unless you really need to

**From:** PostMaster (CIE Group of Companies) [mailto:Postmaster@cie.ie]
**Sent:** 23 September 2020 10:29
**To:** Quigley Tom <Thomas.Quigley@irishrail.ie>
**Subject:** FW: FAO Thomas Quigley: 191137 proposed Ballivor Wind Farm, Meath/Westmeath Border

**From:** Karen Mulryan <kmulryan@mkoireland.ie>
**Sent:** Monday 21 September 2020 15:00
**To:** PostMaster (CIE Group of Companies) <Postmaster@cie.ie>
**Subject:** FAO Thomas Quigley: 191137 proposed Ballivor Wind Farm, Meath/Westmeath Border

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Mimecast Attachment Protection has deemed this file to be safe, but always exercise caution when opening files.

Good afternoon Thomas,

We are undertaking an environmental impact assessment of a proposed wind farm at the Ballivor Bog Group on the Meath/Westmeath border.
Comreg recommended we contact you to determine if there are any potential telecoms links belonged to Irish Rail in the area.
Would you be able to review the attached and let us know if you have any queries, comments or concerns.

Kind regards,

Karen.

Karen Mulryan
Environmental Scientist

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Iarnrod Eireann Irish Rail, a designated activity company, limited by shares, registered in Ireland at Connolly Station, Dublin 1, No. 119571 VAT No. IE 4812851 O

## Shaun Doolin

**From:** padraig.condon@bt.com
**Sent:** Friday 12 February 2021 12:45
**To:** Karen Mulryan
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Hi Karen,
I can confirm the proposed development will have no impact on the BT Ireland radio network.

**Regards**

**Padraig Condon**
**Core Network Operations**

**Tel: +353014326819**
**Mobile number: +353 86 604 0636**
**BT Meetme: + 353 1 6569053**
**E-mail padraig.condon@bt.com**
**https://www.webjoin.com/**
**Participant: 40342233#**
**Web: www.btireland.com**

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**From:** Karen Mulryan <kmulryan@mkoireland.ie>
**Sent:** 12 February 2021 10:39
**To:** Condon,PG,Padraig,NQE32E R <padraig.condon@bt.com>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Good morning Padraig,

I previously contacted you with a proposed wind farm development at Ballivor on the Meath/Westmeath border. I do not believe there are any ESB issues with the site; however, I would like to send you the proposed final turbine locations for your records.
Please see attached. If you have any comments, please let us know.

Kind regards,

Karen.

Karen Mulryan
Environmental Scientist

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**From:** padraig.condon@bt.com <padraig.condon@bt.com>
**Sent:** Thursday 7 May 2020 18:54
**To:** Karen Mulryan <kmulryan@mkoireland.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Hi Karen,
I can confirm the planned development will have no impact on the BT Ireland microwave network.

**Regards**

**Padraig Condon**
**Core Network Operations**

**Tel: +353014326819**
**Mobile number: +353 86 604 0636**
**BT Meetme: + 353 1 6569053**
**E-mail padraig.condon@bt.com**
**https://www.webjoin.com/**
**Participant: 40342233#**
**Web: www.btireland.com**

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**From:** Karen Mulryan [mailto:kmulryan@mkoireland.ie]
**Sent:** 07 May 2020 17:37
**To:** Condon,PG,Padraig,NQE32E R <padraig.condon@bt.com>
**Subject:** 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Good afternoon,

MKO is preparing an Environmental Impact Assessment Report (EIAR) for a proposed Bórd na Móna Powergen Ltd wind energy development at Ballivor and the surrounding townlands located at the Meath-Westmeath border. The proposed development will be located on 5 bogs and will be referred to as the Ballivor Wind Farm. The site is located approximately 2.2km west of Ballivor Village, Co. Meath, and 3.7km east of Raharney and 2.5km south-southeast of Devlin, which are both located in Co. Westmeath.
The proposed project will likely encompass 25-35 turbines and will have an output of at least 50megawatts. Should the project be of this scale, an application will be made to An Bord Planeála seeking a determination in relation to the SID status, or otherwise, of the proposed wind energy development. If the board determine that the development is indeed SID, the planning application will be submitted directedly to An Bord Planeála, under the provision of the Planning and Development (Strategic Infrastructure) Act 2006. Should the project be of a scale lower than the SID thresholds, an application for planning permission will be made to Meath and Westmeath County Councils.
As part of the EIA process, we would welcome any comments that you may have in relation to the proposed project, including baseline data, survey techniques or potential impacts that should be considered as part of the assessment process and in the preparation of the EIAR. In order to facilitate this, a Scoping Document providing details of the proposed project and the site of the proposed development is attached.

If you could return any comments or suggestions at your earliest convenience it would be much appreciated. If you require any further information, please do not hesitate to contact me.

Kind Regards,

Karen.

Karen Mulryan
Environmental Scientist

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## Shaun Doolin

**From:** Dominic Crudden <dominic.crudden@emrsolutions.ie>
**Sent:** Friday 12 February 2021 12:02
**To:** Karen Mulryan
**Cc:** info
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Thank you Karen.

Regards,

Dominic Crudden
Business Development Manager at EMR Integrated Solutions

https://emr.ie/industries/renewable-energy

---

**From:** Karen Mulryan [mailto:kmulryan@mkoireland.ie]
**Sent:** Friday 12 February 2021 10:48
**To:** Dominic Crudden <dominic.crudden@emrsolutions.ie>
**Cc:** info <info@emrsolutions.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Good morning Dominic,

I previously contacted you with a proposed wind farm development at Ballivor on the Meath/Westmeath border. I do not believe there are any link issues with the site; however, I would like to send you the proposed final turbine locations for your records.
Please see attached. If you have any comments, please let us know.

Kind regards,

Karen.

Karen Mulryan
Environmental Scientist

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**From:** Dominic Crudden <dominic.crudden@emrsolutions.ie>
**Sent:** Friday 15 May 2020 15:50
**To:** Karen Mulryan <kmulryan@mkoireland.ie>
**Cc:** info <info@emrsolutions.ie>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Good afternoon Karen,

EMR Integrated Solutions do not have any radio links which are likely to be impacted by this development.

If you have any queries please let me know.

Regards,

**Dominic Crudden**
**Business Development**

EMR integrated solutions

Mobile: +353 (86) 7712819
DDI: +353 (1) 2552056
Office: +353 (1) 8013131
Fax: +353 (1) 8013166
Email: dominic.crudden@emrsolutions.ie
Website: https://emr.ie/

**EMR Integrated Solutions is a trading name of MP&E Trading Company Limited, a company registered in Ireland under CRO number: 82403. Directors: A.Feenan, D.Glynn, M.Quinn, D.Shanley. WEEE Registration number IE00601.**

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**From:** Karen Mulryan [mailto:kmulryan@mkoireland.ie]
**Sent:** Thursday 7 May 2020 17:52
**To:** Dominic Crudden <dominic.crudden@emrsolutions.ie>
**Cc:** info <info@emrsolutions.ie>
**Subject:** 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Good afternoon,

MKO is preparing an Environmental Impact Assessment Report (EIAR) for a proposed Bórd na Móna Powergen Ltd wind energy development at Ballivor and the surrounding townlands located at the Meath-Westmeath border. The proposed development will be located on 5 bogs and will be referred to as the Ballivor Wind Farm. The site is located approximately 2.2km west of Ballivor Village, Co. Meath, and 3.7km east of Raharney and 2.5km south-southeast of Devlin, which are both located in Co. Westmeath.
The proposed project will likely encompass 25-35 turbines and will have an output of at least 50megawatts. Should the project be of this scale, an application will be made to An Bord Planeála seeking a determination in relation to

the SID status, or otherwise, of the proposed wind energy development. If the board determine that the development is indeed SID, the planning application will be submitted directedly to An Bord Planeála, under the provision of the Planning and Development (Strategic Infrastructure) Act 2006. Should the project be of a scale lower than the SID thresholds, an application for planning permission will be made to Meath and Westmeath County Councils.
As part of the EIA process, we would welcome any comments that you may have in relation to the proposed project, including baseline data, survey techniques or potential impacts that should be considered as part of the assessment process and in the preparation of the EIAR. In order to facilitate this, a Scoping Document providing details of the proposed project and the site of the proposed development is attached.

If you could return any comments or suggestions at your earliest convenience it would be much appreciated. If you require any further information, please do not hesitate to contact me.

Kind Regards,

Karen.

Karen Mulryan
Environmental Scientist

**MKO**
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+353 (0) 91 735611
www.mkoireland.ie

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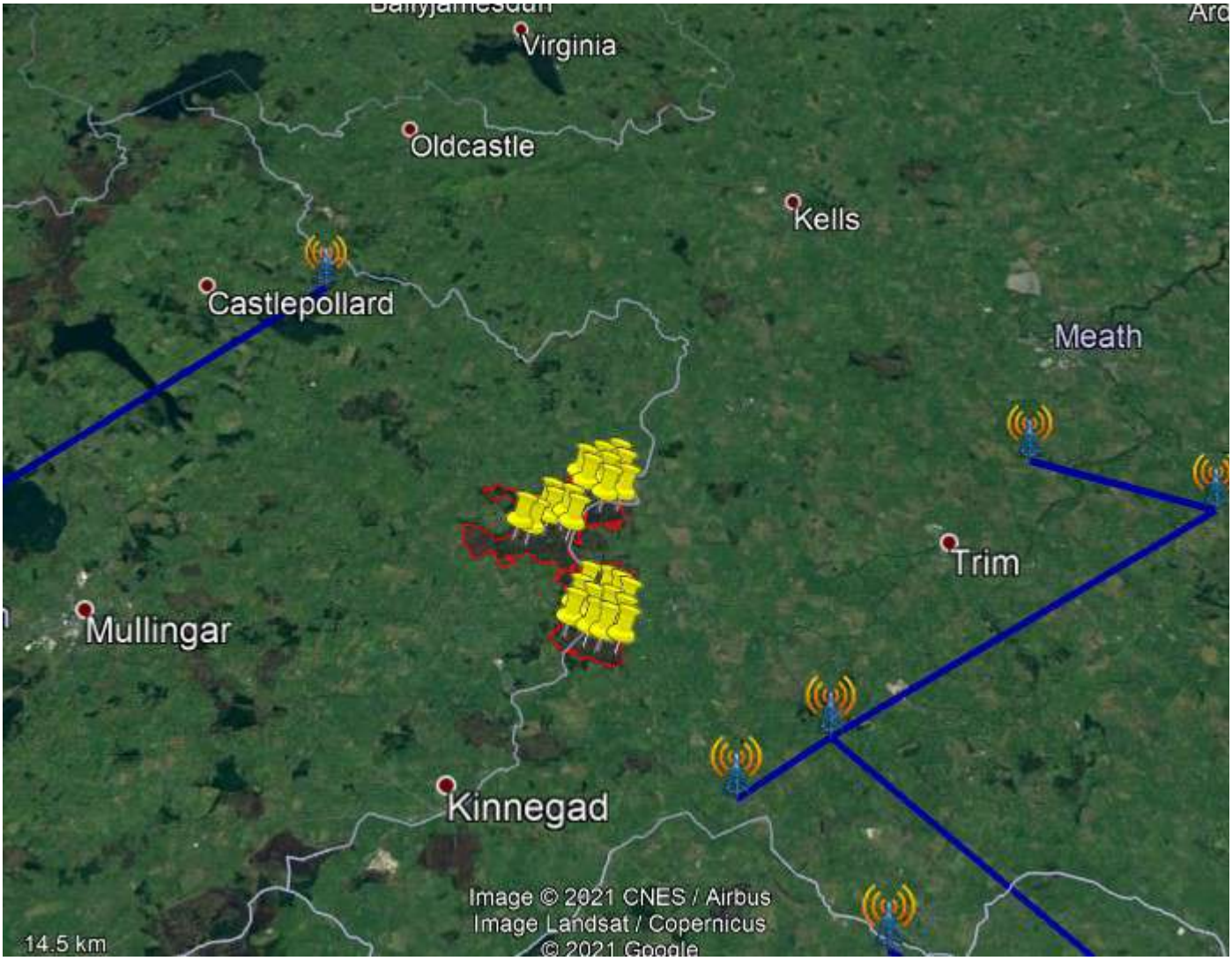
## Shaun Doolin

**From:** Adrian Carroll <adrian.carroll@ripplecom.net>
**Sent:** Friday 12 February 2021 11:27
**To:** Karen Mulryan; Licensing; Ripplecom Support
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Hi Karen,

That shouldn't affect us, see below.




Regards,

**Adrian Carroll** | Network Operations Manager

**T:** 061 571156| **M:** 086 8372264
**E**: adrian.carroll@ripplecom.net | **W:** ripplecom.net
Houston Hall, Raheen Business Park, Limerick, V94 PKF1




**From:** Karen Mulryan <kmulryan@mkoireland.ie>
**Sent:** 12 February 2021 10:50
**To:** Adrian Carroll <adrian.carroll@ripplecom.net>; Licensing <licensing@ripplecom.net>; Ripplecom Support <support@ripplecom.net>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Good morning Adrian,

I previously contacted you with a proposed wind farm development at Ballivor on the Meath/Westmeath border. I do not believe there are any link issues with the site; however, I would like to send you the proposed final turbine locations for your records.
Please see attached. If you have any comments, please let us know.

Kind regards,

Karen

Karen Mulryan
Environmental Scientist

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**From:** Adrian Carroll <adrian.carroll@ripplecom.net>
**Sent:** Thursday 9 July 2020 16:00
**To:** Karen Mulryan <kmulryan@mkoireland.ie>; Licensing <licensing@ripplecom.net>; Ripplecom Support <support@ripplecom.net>
**Subject:** RE: 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Hi Karen,

This will not impact our links.

Regards,

**Adrian Carroll** | Network Operations Manager

**T:** 061 571156| **M:** 086 8372264
**E**: adrian.carroll@ripplecom.net | **W:** ripplecom.net
Houston Hall, Raheen Business Park, Limerick, V94 PKF1




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**From:** Karen Mulryan <kmulryan@mkoireland.ie>
**Sent:** 09 July 2020 15:51
**To:** Licensing <licensing@ripplecom.net>; Ripplecom Support <support@ripplecom.net>
**Subject:** 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Good afternoon,

I previously sent the attached document two months ago Diarmuid O'Briain and Piotr Zurek but I have not a reply. Comreg has asked us to contact you in case there are any potential Ripplecom links or assets that run through the proposed site boundary.

Would you be able to review the attached? Could you let us know of any links you have going through the site and if any, what recommended buffers you would require from the rotor blade tips?

We would appreciate a response at your earliest convenience.

Kind regards,

Karen.

Karen Mulryan
Environmental Scientist

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**From:** Karen Mulryan
**Sent:** 08 May 2020 10:16
**To:** Diarmuid.obriain@ripplecom.net; piotr.zurek@ripplecom.net
**Subject:** 191137 Proposed Bord na Móna Powergen Ltd Wind Farm Development at Ballivor, Meath/Westmeath.

Good morning,

MKO is preparing an Environmental Impact Assessment Report (EIAR) for a proposed Bórd na Móna Powergen Ltd wind energy development at Ballivor and the surrounding townlands located at the Meath-Westmeath border. The proposed development will be located on 5 bogs and will be referred to as the Ballivor Wind Farm. The site is located approximately 2.2km west of Ballivor Village, Co. Meath, and 3.7km east of Raharney and 2.5km south-southeast of Devlin, which are both located in Co. Westmeath.
The proposed project will likely encompass 25-35 turbines and will have an output of at least 50megawatts. Should the project be of this scale, an application will be made to An Bord Planeála seeking a determination in relation to the SID status, or otherwise, of the proposed wind energy development. If the board determine that the development is indeed SID, the planning application will be submitted directedly to An Bord Planeála, under the provision of the Planning and Development (Strategic Infrastructure) Act 2006. Should the project be of a scale lower than the SID thresholds, an application for planning permission will be made to Meath and Westmeath County Councils.
As part of the EIA process, we would welcome any comments that you may have in relation to the proposed project, including baseline data, survey techniques or potential impacts that should be considered as part of the assessment process and in the preparation of the EIAR. In order to facilitate this, a Scoping Document providing details of the proposed project and the site of the proposed development is attached.

If you could return any comments or suggestions at your earliest convenience it would be much appreciated. If you require any further information, please do not hesitate to contact me.

Kind Regards,

Karen.

Karen Mulryan
Environmental Scientist

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