TOBIN

BUILT ON KNOWLEDGE

Bord na Móna

Derryadd, Derryaroge and Lough Bannow Bogs – Application for Substitute Consent

Remedial Environmental Impact Assessment Report

Chapter 9 – Hydrology, Hydrogeology and Water Quality

March 2025

Table of Contents

9.0 HYDROLOGY, HYDROGEOLOGY AND WATER QUALITY 9-1

9.1 Introduction 9-1

9.1.1 Statement of Authority 9-1

9.2 Assessment Methodology 9-1

9.2.1 Background 9-1

9.2.2 Guidance and Legislative Review 9-2

9.2.3 Desk Review 9-4

9.2.4 Consultation 9-5

9.2.5 Field Survey 9-6

9.2.6 Impact Assessment Methodology 9-7

9.3 Baseline Environment 9-9

9.3.1 Historic Landuse Changes 9-9

9.3.2 Topography and Site Description 9-10

9.3.3 Establishing the 1988 Baseline Environment 9-11

9.3.4 Surface Water Quality 9-25

9.3.5 Hydrogeology/Groundwater 9-42

9.4 Assessment of Significant hydrological and hydrogeological effects 9-48

9.4.1 Do-Nothing Scenario 9-49

9.4.2 Peat Extraction Phase (1988 – July 2019) 9-49

9.4.3 Current Phase (July 2019 – Present Day) 9-53

9.4.4 Remedial Phase 9-56

9.5 Control and Monitoring Measures 9-58

9.5.1 Peat Extraction Machinery – Maintenance Programmes and Storage 9-59

9.5.2 Refuelling Facilities 9-60

9.5.3 Bog Hydrogeology and Downstream Surface Water Hydrology 9-60

9.5.4 Designated Sites 9-61

9.5.5 Contamination of Soil/Groundwater by Leakages and Spillages and Alteration of Peat/Subsoil/Bedrock Geochemistry 9-61

9.5.6 Nearby Groundwater/Surface Water Abstractions 9-62

9.5.7 Impact on Water Quality 9-62

9.6 Residual effects 9-62

9.7 Cumulative and Indirect effects 9-63

9.7.1 Projects Considered in Cumulative Assessment 9-63

9.7.2 Peat Extraction Phase 9-64
9.7.3 Current Phase 9-66
9.7.4 Remedial Phase 9-67
9.8 Major Accidents and Disasters 9-69
9.9 References 9-69

9.0 HYDROLOGY, HYDROGEOLOGY AND WATER QUALITY

9.1 INTRODUCTION

This chapter reports the findings of a retrospective assessment of the likely significant effects on Hydrology, Hydrogeology and Water Quality as a result of the Applicants historic peat extraction activities at Derryaroge, Derryadd and Lough Bannow bogs (the ''Application Site'').

A description of the control and mitigation measures which were and will be used to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment and, where appropriate, any mitigation and monitoring arrangements are then discussed. Due to the retrospective nature of the assessment, this chapter will focus on existing or pre-existing measures used in order to mitigate the likely significant effects of historic peat extraction. Any residual effects are also assessed.

In order to align with the temporal scope (Section 2.5, Chapter 2 Methodology), the project description distinguishes between the activities that took place prior to the transposition of the EIA Directive in 1988 and those activities that took place post-1988.

Chapter 4 (Project Description) provides a full description of the Application Site and describes the peat extractions activities that took place from 1988-2019, and the ongoing decommissioning and future rehabilitation (2019-present).

9.1.1 Statement of Authority

John Dillon and Kevin Donlon of TOBIN have completed this chapter. TOBIN Hydrologists and Hydrogeologists are intimately familiar with the site characteristics of Derryaroge, Derryadd and Lough Bannow bogs, having worked on the preparation of a planning application for the wind farm development in the same area, and renewable energy projects including wind farms at Lisheen, Castlebanny and Bruckana set in similar ground and water conditions to Derryaroge, Derryadd and Lough Bannow bogs.

This chapter has been completed by Mr. John Dillon (BSc, MSc, MCIWM, PGeo), TOBIN. John has over 18 years of experience in hydrogeological/hydrological assessment for EIS/EIA. John is a Senior Environmental Consultant in the Environment and Planning section of TOBIN Consulting Engineers. John has an active involvement in the compilation of environmental impact assessment reports, planning applications and wind farm applications.

Kevin Donlon (MIEI) completed the Flood Risk Assessment which is incorporated into the chapter and included in Appendix 9.1.

9.2 ASSESSMENT METHODOLOGY

9.2.1 Background

The main considerations with regard to the assessment of effects on hydrology, hydrogeology and water quality from peat extraction activities relate to alterations to drainage patterns and changes in water quality,

Site context is provided in Chapter 1: Introduction (Section 1.5) of this rEIAR, while further information on sod and milled peat extraction processes are provided in Chapter 4: Project Description (Section 4.4).

The Application Site comprises Derryaroge, Derryadd and Lough Bannow Bogs which form part of a larger bog group, owned and operated by Bord na Móna, known as the Mountdillon Bog Group. The lands encompassed within the Application Site which are the subject of this rEIAR are outlined in red in Figure 1-1 in Chapter 1: Introduction. Section 1.6 of Chapter 1 provides a description of the location of the Derryaroge, Derryadd and Lough Bannow bogs.

The Application Site occupies an area of 2,244 ha, comprising primarily of cutaway bog, partly developed bog, buildings, yards, railway lines and water pumping and treatment infrastructure. The lands within the Application Site represent c. 20% of the Mountdillon Bog Group which has a total area of approx. 11,778 ha. Peat extraction ceased at the Application Site in July 2019 and stockpiled peat deliveries to Lough Ree power station in Lanesborough ceased in December 2020.

Peat extraction activities operate under an Integrated Pollution Control Licence (IPC Reg. No. P0504-01) issued by the Environmental Protection Agency (EPA) in 2000. In accordance with this licence, a bog decommissioning and rehabilitation programme has been developed to enhance rehabilitation of the site.

The methodology used to produce this chapter has drawn on information collected during the desktop study and the site walkovers.

9.2.2 Guidance and Legislative Review

The EU Water Framework Directive (2000/60/EC) (WFD) established a framework for the protection of both surface water and groundwater. Transposing legislation (S.I. No. 792 of 2009, European Communities Environmental Objective (Surface Water) Regulations 2009 as amended) outlines the water protection and water management measures required in Ireland to maintain high or good status of waters where it exists and to prevent any deterioration in existing water status. Water bodies comprise both surface and groundwater bodies, and the achievement of a good status for these depends also on the achievement of 'good' status by dependent ecosystems.

The first cycle of the River Basin Management Plan (RBMP) ran from 2009-2015, where eight separate plans were devised for all of the River Basin Districts (RBDs) with the objective of achieving at least 'good' status for all waters by 2015 (noting that later dates were set for certain waterbodies noted to be under significant pressures). The second cycle of the River Basin Management Plan: 2018-2021, was published by the Department of Housing, Planning and Local Government in April 2018. The third cycle of the River Basin Management Plan: 2022 – 2027, currently in draft status, was published by the Department in 2022.

Article 5 of the WFD stated that characterisation is to be carried out for each river basin district, or for the portion of an international river basin district falling within its territory. There are three separate objectives that are of particular relevance to the characterisation of water quality and hydrology (Article 4.1):

- To prevent deterioration of status of all waterbodies;
- To protect, enhance and restore all waterbodies with the aim of achieving Good Status by 2015, with some limited exceptions, or by the dates set out in the river basin management plans; and
- To reverse any significant and sustained upward trend in the concentration of any pollutant resulting from the impact of human activity on groundwater.

The European Communities Environmental Objectives (Surface Waters) Regulations, 2009 give effect to the criteria and standards to be used for classifying surface waters in accordance with

the ecological objectives approach of the WFD. In accordance with the regulations, waters classified as 'High' or 'Good' must not be allowed to deteriorate. Waters classified as less than good must be restored to at least good status within a prescribed timeframe. In addition, the regulations address certain shortcomings identified by the European Court of Justice in relation to Ireland's implementation of the Dangerous Substances Directive (76/464/EEC), as amended. The regulations set standards for biological quality elements and physico-chemical conditions, supporting biological elements (e.g., temperature, oxygen balance, pH, salinity, nutrient concentrations and specific pollutants), which must be complied with. These parameters establish the 'ecological status' of a water body.

This chapter has been prepared having regard to the policy documents:

- S.I No. 349 of 1989: European Communities (Environmental Impact Assessment) Regulations, and subsequent Amendments (S.I. No. 84 of 1994, S.I. No. 101 of 1996, S.I. No. 351 of 1998, S.I. No. 93 of 1999, S.I. No. 450 of 2000 and S.I. No. 538 of 2001, S.I. 134 of 2013 and the Minerals Development Act 2017), the Planning and Development Act, and S.I. 600 of 2001 Planning and Development Regulations and subsequent Amendments. These instruments implement EU Directive 2011/92/EU and subsequent amendments, on the assessment of the effects of certain public and private projects on the environment;
- Directives 2011/92/EU and 2014/52/EU on the assessment of the effects of certain public and private projects on the environment, including Circular Letter PL 1/2017: Implementation of Directive 2014/52/EU on the effects of certain public and private projects on the environment (EIA Directive);
- Planning and Development Act, 2000, as amended;
- S.I. No. 296 of 2018: European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 which transposes the provisions of Directive 2014/52/EU into Irish law;
- S.I. No. 293 of 1988: European Communities (Quality of Salmonid Waters) Regulations;
- S.I. No. 272 of 2009 (as amended): European Communities Environmental Objectives (Surface Waters) Regulations 2009 (as amended by S.I. No. 296/2009; S.I. No. 386/2015; S.I. No. 327/2012; and S.I. No. 77/2019 and giving effect to Directive 2008/105/EC on environmental quality standards in the field of water policy and Directive 2000/60/EC establishing a framework for Community action in the field of water policy) and S.I. No. 722 of 2003 European Communities (Water Policy) Regulations which implement EU Water Framework Directive (2000/60/EC) establishing a framework for the Community action in the field of water policy and provide for implementation of 'daughter' Groundwater Directive (2006/118/EC) on the protection of groundwater against pollution and deterioration. Since 2000 water management in the EU has been directed by the Water Framework Directive (2000/60/EC) (as amended by Decision No. 2455/2011/EC; Directive 2008/32/EC; Directive 2008/105/EC; Directive 2009/31/EC; Directive 2013/39/EU; Council Directive 2013/64/EU; and Commission Directive 2014/101/EU (WFD). The WFD was given legal effect in Ireland by the European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003);
- S.I. No. 684 of 2007: Waste Water Discharge (Authorisation) Regulations 2017, resulting from EU Directive 80/68/EEC on the protection of groundwater against pollution caused by certain dangerous substances (the Groundwater Directive); S.I. No. 106 of 2007: European Communities (Drinking Water) Regulations 2007 and S.I. No. 122 of 2014: European Communities (Drinking Water) Regulations 2014, arising from EU Directive 98/83/EC on the quality of water intended for human consumption (the Drinking Water Directive) and EU Directive 2000/60/EC;
- S.I. No. 9 of 2010: European Communities Environmental Objectives (Groundwater) Regulations 2010 (as amended by S.I. No. 389/2011; S.I. No. 149/2012; S.I. No.

366/2016; the Radiological Protection (Miscellaneous Provisions) Act 2014; and S.I. No. 366/2016); and
- S.I. No. 296 of 2009: The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009 (as amended by S.I. No. 355 of 2018).

The assessment was carried out in accordance with the guidance documents outlined in Chapter 2 – Methodology, in addition to the following guidelines, and tailored accordingly based on professional judgement and experience:

- Environmental Protection Agency (2022), Guidelines on the Information to be Contained in Environmental Impact Assessment Reports
- Environmental Protection Agency (2006): Environmental Management in the Extractive Industry (Non-Scheduled Minerals);
- Institute of Geologists Ireland (2013) Guidelines for Preparation of Soils, Geology & Hydrogeology Chapters in Environmental Impact Statements; and
- National Roads Authority (NRA) (2008): Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;

9.2.3 Desk Review

- A desk study was undertaken in July 2023 and 2024, in order to collate and review background information of the project during the assessment. The sources of the information obtained to inform this desk study are: Details of hydrological features associated with peat extraction and ancillary activities at the Application Site (e.g. drains, silt ponds, surface water outfalls) provided by Bord na Móna;
- Integrated Pollution Control Licence (IPC) Mountdillon Bog Group (Ref: P0504-01) Environmental Protection Agency, Appendix 4-2;
- Bord na Móna Rehabilitation Plans, Appendix 4-3.;
  - Derryaroge Bog Cutaway Bog Decommissioning and Rehabilitation Plan 2023;
  - Derryadd Bog Draft Cutaway Bog Decommissioning and Rehabilitation Plan 2025;
    Derryaroge Bog Draft Cutaway Bog Decommissioning and Rehabilitation Plan 2025; and
  - Lough Bannow Bog Draft Cutaway Bog Decommissioning and Rehabilitation Plan 2025.
- Annual Environmental Reports 2000 to 2023as shown in Appendix 4-4 (2008 to 2021 are publicly available on the EPA website[1])
- IPC Licence P0504-01 Application (available at EPA Headquarters on request);
- Inspection of extraction records at Mountdillon Works;
- Aerial Maps from 1973 to 2019, Appendix 4-5;
- Bord na Móna databases on peat depth and drainage;
- Bord na Móna LiDAR data;
- National Peatland Strategy (NPWS, 2015);
- Geological Survey of Ireland (GSI) online mapping;
- Environmental Protection Agency database (www.epa.ie);
- Teagasc SIS Map Viewer (www.gis.teagasc.ie/soils/map.php);
- Met Éireann Meteorological Databases (www.met.ie);
- National Parks and Wildlife Services Public Map Viewer (www.npws.ie);
- Water Framework Directives Catchments Map Viewer (www.catchments.ie);

[1] Annual Environmental Reports 2018-2023 available at: https://leap.epa.ie/licence-profile/P0504/compliance

- Bedrock Geology 1:100,000 Scale Map Series, Sheet No. 6; Geological Survey of Ireland (www.gsi.ie);
- Geological Survey of Ireland – Groundwater Body Characterisation Reports (www.gsi.ie);
- OPW Indicative Flood Maps (www.floodmaps.ie);
- Environmental protection Agency - HydroTool Map Viewer (www.watermaps.wfdireland.ie/HydroTool);
- CFRAM Preliminary Flood Risk Assessment (PFRA) maps (www.floodinfo.ie);
- Department of Environment, Community and Local Government on-line mapping viewer (www.myplan.ie); and
- The 2019 Derryadd Windfarm Planning Application. (Ref. No. ABP-303592-19)

9.2.4 Consultation

EIA scoping correspondence was issued to appropriate statutory and non-statutory bodies in August 2022 via post and email, in accordance with Article 28 of the Planning and Development Regulations 2001 (as amended). Consultation letters were issued to the bodies, as set out in Table 2-1 of Chapter 2, to obtain feedback on the content of the rEIAR and the Substitute Consent application. Consultation responses relevant to Hydrology, Hydrogeology and Water Quality are detailed below in Table 9-1.

Table 9-1: List of Consultees and Record of Consultations

Consultee Name	Summary of Comments Received (2022)	Summary of Comments Received (2024)
Longford Co. Co.	The response noted that the peatlands form an integral part of the landscape and heritage and that LCC welcome this exercise. Refers to the LCC County Development Plan and *"supporting the preparation of a holistic plan for the development of industrial peatlands at a regional scale"*.	The response acknowledged receipt of email to the Environment section of LCC.
Minister for Housing, Local Government and Heritage c/o The Manager, Development Applications Unit Department of Housing, Local Government and Heritage	The response received emphasises the need for comprehensive assessments of the pumping regime, water levels, drainage maintenance, and carbon sequestration potential, along with consideration of impacts on biodiversity and compliance with European directives.	Response not relevant to Hydrology, Hydrogeology, or Water Quality
Environmental Protection Agency	No response received	The response confirmed receipt by the EPA. No further response was received.
Inland Fisheries Ireland	No response received	No response received
Geological Survey of Ireland	The response acknowledged receipt of recent consultation, and provided sources for relevant datasets to use throughout the assessment	No response received

9.2.5 Field Survey

Numerous records of site investigations have been carried out in the Application Site over the last 8 years and consisted of trial pits, shell and auger boreholes, dynamic probes, rotary boreholes, geophysical surveying and peat probing. Additionally, the Applicant has been undertaking site monitoring as part of the requirements of their IPC Licence since 2000.

Table 9-2 below presents a breakdown of the site investigations works that were carried out as part of each site investigation.

In support of this rEIAR, TOBIN have carried out several site walkovers and field inspections to review the current hydro(geo)logical conditions on site. These visits are outlined in Table 9-1 below. Information obtained during these site surveys are included in the discussions on the baseline environment in Section 9.3 of this chapter.

Table 9-1: Summary of Site Surveys completed by TOBIN

Date	Types of investigation conducted
January 2017 and March 2018	Field monitoring – Surface water monitoring
April 2019	Water quality sampling at sections of Lough Bannow River, Ballynakill River
September 2022	Site walkover
Nov-Dec 2022	Site walkover, supervision of SI workovers
May 2023	Water quality sampling at sections of Lough Bannow River, Ballynakill River
October 2024	Site walkover

9.2.6 Impact Assessment Methodology

The importance/sensitivity of the geological, hydrogeological and hydrological receptors was assessed on completion of the desk study and baseline assessment. Using the NRA 2008 Guidance presented in Appendix C of the IGI *Guidelines for Preparation of Soils, Geology & Hydrogeology Chapters in Environmental Impact Statements* (2013), an estimation of the importance of the hydrological and hydrogeological environments is set out in Table 9-3 and 9-4.

Table 9-3 : Estimation of Importance of Hydrology Attributes

Importance	Criteria	Typical Example
Extremely High	Attribute has a high quality or value on an international scale.	• River, wetland or surface water body ecosystem protected by EU legislation, e.g., 'European sites' designated under the Habitats Regulations, or 'Salmonid waters' designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988.
Very High	Attribute has a high quality or value on a regional or national scale.	• River, wetland or surface water body ecosystem protected by national legislation – NHA status. • Regionally important potable water source supplying >2500 homes. • Intact Peatlands – with associated GWDTE • Quality Class A (Biotic Index Q4, Q5). • Flood plain protecting more than 50 residential or commercial properties from flooding. • Nationally important amenity site for wide range of leisure activities.
High	Attribute has a high quality or value on a local scale.	• Salmon fishery locally important potable water source supplying >1000 homes. • Quality Class B (Biotic Index Q3-4). • Flood plain protecting between 5 and 50 residential or commercial properties from flooding.
Medium	Attribute has a medium quality or value on a local scale.	• Coarse fishery. • Local potable water source supplying >50 homes Quality Class C (Biotic Index Q3, Q2-3).

Importance	Criteria	Typical Example
		• Flood plain protecting between 1 and 5 residential or commercial properties from flooding.
Low	Attribute has a low quality or value on a local scale.	• Locally important amenity site for small range of leisure activities. • Local potable water source supplying <50 homes. • Quality Class D (Biotic Index Q2, Q1) Flood plain protecting 1 residential or commercial property from flooding. • Amenity site used by small numbers of local people.

Table 9-4: Estimation of Importance of Hydrogeology Attributes

Importance	Criteria	Typical Example
Extremely High	Attribute has a high quality or value on an international scale.	• Groundwater supports river, wetland or surface water body ecosystem protected by EU legislation, e.g., SAC or SPA status.
Very High	Attribute has a high quality or value on a regional or national scale.	• Regionally Important Aquifer with multiple wellfields. • Groundwater supports river, wetland or surface water body ecosystem protected by national legislation - NHA status. • Regionally important potable water source supplying >2500 homes Inner source protection area for regionally important water source.
High	Attribute has a high quality or value on a local scale.	• Regionally Important Aquifer Groundwater provides large proportion of baseflow to local rivers. • Locally important potable water source supplying >1000 homes. • Outer source protection area for regionally • important water source. • Inner source protection area for locally important water source.
Medium	Attribute has a medium quality or value on a local scale.	• Locally Important Aquifer. • Potable water source supplying >50 homes. • Outer source protection area for locally important water source.
Low	Attribute has a low quality or value on a local scale.	• Poor Bedrock Aquifer Potable water source supplying <50 homes.

This assessment involved desktop research supported by a review of water survey data to evaluate whether a fundamental, material or detectable change in water quality might have occurred from past peat extraction within the Application Site.

Overview of Impact Assessment Process

The conventional source-pathway-receptor model (Figure 9-1) for groundwater/surface water protection was applied to access impacts on groundwater and surface water specifically on downstream sensitive ecological receptors and local groundwater supplies.

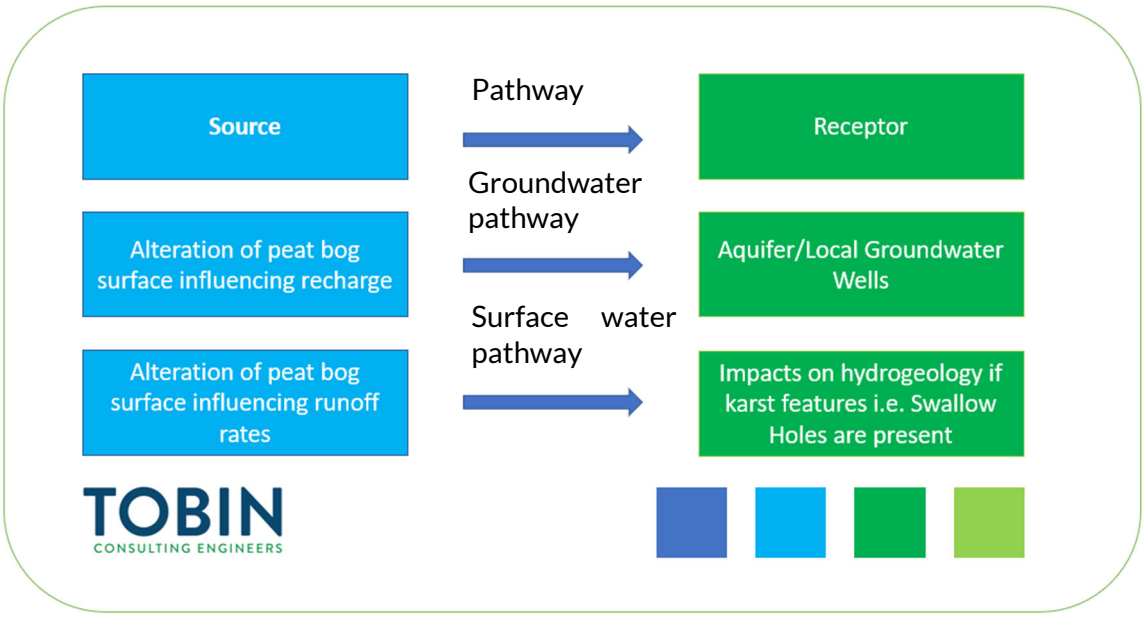


Figure 9-1: Example of a Conceptual Source Pathway Receptor Model

9.3 BASELINE ENVIRONMENT

The baseline hydrological environment of 1988 is described in this section.

9.3.1 Historic Landuse Changes

The primary land-use changes at the Application Site arose with the initial stages of peat extraction. Development began at the Application Site in 1949 with commencement of the drainage of Derryaroge Bog. Sod peat extraction commenced in Derryaroge in 1952. Drainage works on Derryadd and Lough Bannow Bogs commenced in 1960. A summary of the operational history dates for the three bogs within the Application Site is provided in Chapter 4 Table 4-1 and below in Table 9-5.

Table 9-5: Operational History of the Application Site

Bog Unit	First Drained	Extraction Commenced
Derryaroge Bog*	1949	1952
Derryadd Bog	1960	1964
Lough Bannow Bog	1960	1964

** Extraction in Derryaroge Bog initially comprised sod peat extraction, before transitioning to milled peat extraction from 1984*

Available historical aerial images including aerial photos from 1973 until 2019 are included as Appendix 4.5.

By 1988, the landuse at the Application Site was well-established as industrial peat extraction.

During the Peat Extraction PhasePeat Extraction Phase, only minimal landuse change occurred which predominantly related to minor annual topographic changes caused by ongoing peat

extraction activities. While peat extraction was ongoing it was not possible to rehabilitate the underlying peatland.

9.3.2 Topography and Site Description

The topographical levels were highest on the boundaries of mineral islands (drumlins) to the south and centre of the Application Site and tapered towards the surrounding water features. The topography of the Application Site was relatively flat with elevations ranging from 36 to 58 mAOD (Above Ordinance Datum). The general topography varied from approximately 47 to 58 mAOD in the southern end of the Application Site (Lough Bannow Bog) and between 36 and 48 mAOD in the Derryadd and Derryaroge Bogs. Further details are included in Chapter 8 (Land, Soils and Geology).

On a regional scale, the Application Site and its environs are in the Shannon Hydrometric Area and Catchment. The delineation of the catchments and general area of confluence is shown in Figure 9-2. The Application Site is located within the Shannon International River Basin District (SHIRBD). The river waterbody types located within the Application Site are primarily small, low-lying streams/drainage channels which flow to the River Shannon. There are four WFD river water bodies and one WFD artificial waterbody either intersecting or flowing in the vicinity of the Application Site. The hydrological pathway from the Application Site also includes one WFD lake water body – Lough Ree.

At a local scale, the Application Site is located between the Ballynakill River to the east, and the Lough Bannow River to the west. The existing drainage channels within the Application Site store water and transmit it to main drains and ultimately to the settlement ponds. Final settlement occurs in the settlement ponds before discharging to the adjacent drains and streams. As detailed in Table 9-6, eight streams are located within the Application Site boundary. A channelised stream (Derrygeel Stream - EPA Segment code 26D77) is located at the southern end of Derryadd bog and discharges to the Lough Bannow stream.

All surface water from the Application Site ultimately discharges to the River Shannon and Lough Ree. The River Shannon is located 0.25km downgradient of Derryaroge bog.

Table 9-6: Summary of surface waterbodies located near the Application Site

Surface waterbody (EPA Code)	EPA Segment Code	Location within the Application Site	Flow direction and waterbody which it enters
Kilnacarrow (26K64)	26_1494	Northwest boundary of Derryaroge Bog	Flows north into the River Shannon
Ballynakill (26B22)	26_3574, 26_3102	Northeast/ eastern boundary of all bogs	Flows north into the River Shannon
Lough Bannow Stream (26L12)	26_1469	Southwest boundary of Derryaroge bog	Flows north into the River Shannon
Rappareehill (26R40)	26_3871	Northwest boundary of Derryadd Bog	Flows south, then north and west into the Lough Bannow Stream
Derrygeel (26D77)	26_593	Through the southern section of Derryadd Bog	Flows west into the Lough Bannow Stream
Fallan River (26C)	26_3571	Located to the east of the Application Site	Flows north into the River Shannon at Cloondara
Ledwithstown (26L84)	26_3735	Located southeast of the Application Site	Flows south into Lough Ree
Bilberry (26B03)	26_692	Located south of the Application Site	Flows south into Lough Ree

The regional review of hydro(geo)logical features covers a minimum of 2 km from the Application Site boundary as suggested in the Institute of Geologists of Ireland (IGI) guidelines. The maximum extent of the study area is 10 km from the Application Site boundary. The recommended minimum distance of 2 km has been reviewed in the context of the hydrological/hydrogeological environment in addition to the scale of peat extraction activities and increased to reflect the sensitivity of the subsurface, for example where karst systems are present. In the case of the Application Site, there are some karst features within 3 km of the boundary.

9.3.3 Establishing the 1988 Baseline Environment

9.3.3.1 Water Balance

Long term rainfall and evaporation data was available from Met Éireann. The 30-year annual average rainfall recorded at the Mountdillon rainfall station, located at Mountdillon Works are presented in

Table 9-7: Rainfall data along with data from Mullingar synoptic station located 42 km to the southeast.

Table 9-7: Rainfall data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
1980-2010 Average Rainfall (mm)													
Mullingar	91.7	72.0	78.3	62.1	68.7	70.5	61.8	80.8	73.8	102	82.4	97.1	941
Mountdillon	105.0	77.7	88.2	66.6	70.5	74.2	73.1	88.3	79.4	111.8	102.4	109.8	1047.1
mean num. of days with >= 0.2mm Mullingar	19	17	20	15	16	16	16	17	17	19	18	19	209

The long-term average Potential Evaporation (PE) was 491 mm/yr at Mullingar. Long term PE data is not available at Mountdillon. This value is used as the best estimate of the site PE. Actual Evaporation (AE) at the Application Site is estimated as 466 mm/yr (which is 0.95 × PE).

The effective rainfall (ER) represents the water available for runoff and groundwater recharge. The ER for the site was calculated as follows: Effective rainfall (ER) = 1047 mm/yr – 466 mm/yr = 580 mm/yr. Based on groundwater recharge coefficient estimates from the GSI (www.gsi.ie) an estimate of 21 mm/year average annual recharge is given for basin peat in this area (recharge coefficient of <4%). This means that the hydrology of the Application Site was characterised by very high surface water runoff rates and very low groundwater recharge rates. Therefore, annual recharge and runoff rates for the Application Site at the baseline of 1988 are estimated to have been 21 mm/yr and 580 mm/yr respectively.

9.3.3.2 Surface Water Hydrology

The purpose of this section is to describe the surface water environment at the Application Site as of 1988 including the following:

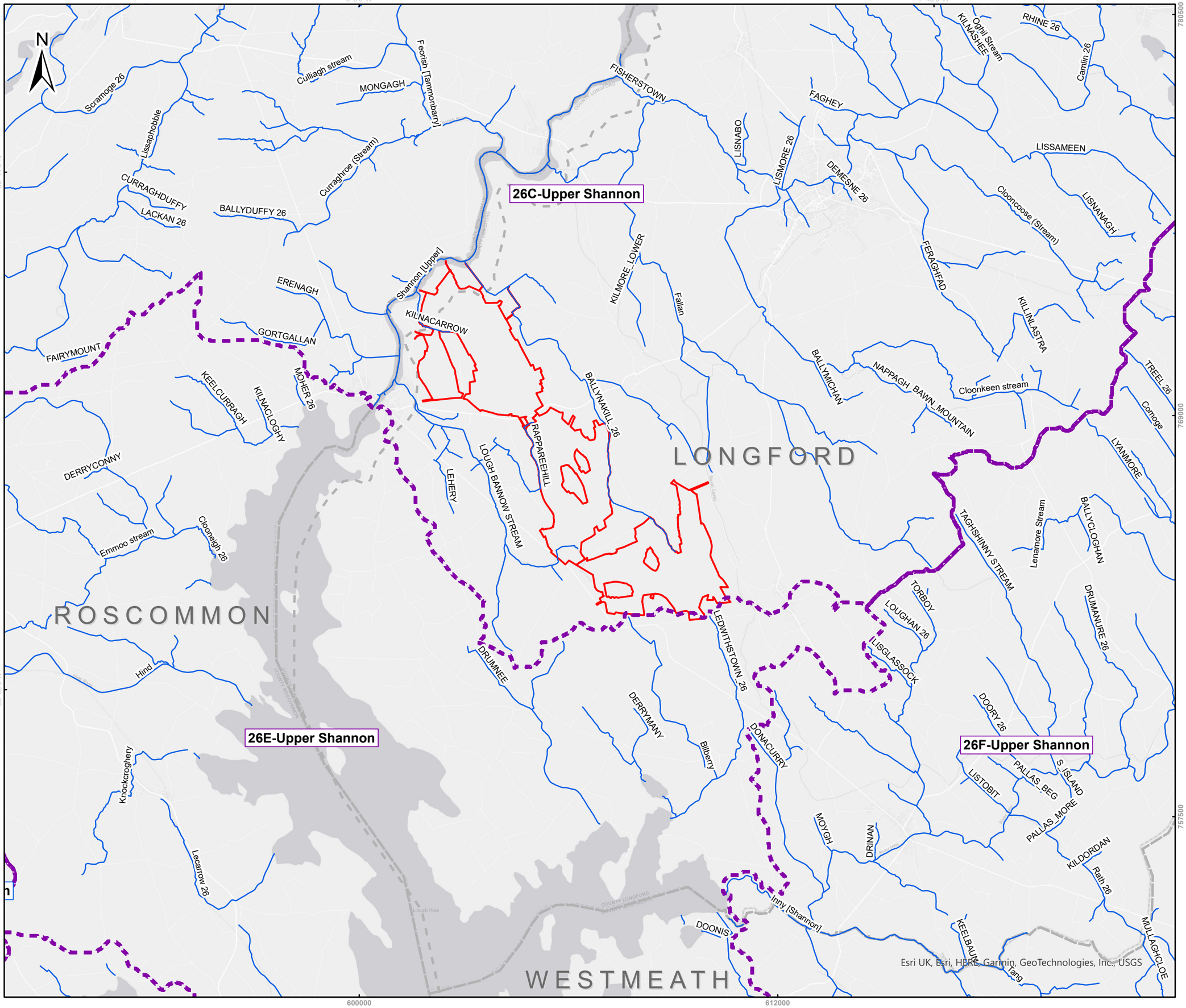
- Surface Water Catchments;
- Site surface water features and drainage;
- Flood Risk Assessment;
- Assessment of hydrometric data;
- Surface water abstractions within the catchment of the site; and
- Surface water quality.

9.3.3.3 Surface Water Catchments

A catchment also referred to as a drainage basin and watershed, is a topographic area that collects and discharges surface streamflow through one outlet or mouth The catchment boundary is the line dividing land where surface drainage flows toward a given stream from land where it drains into a separate stream.

The regional natural surface water drainage pattern, in the environs of the Application Site is shown in Figure 9-2. The Application Site is located within the Shannon Catchment. It should be noted that while catchment names were not defined in 1988, for ease of understanding, current catchment nomenclature, as established since 2007 with the Drinking Water Regulations 2007 have been used.

Surface Water Features/Local Catchment Delineation in relation to Application Site are shown in Figure 9-2 which includes a significant number of unnamed streams although EPA reference numbers have been applied for identification purposes. The Royal Canal, located to the east of the Application Site, is not hydrologically linked to the bogs.



Legend

- Application Site
- Catchments
- Rivers
- County Boundaries

0 2.5 5
Kilometers

NOTES

1. FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING\
2. ALL DRAWINGS TO BE CHECKED BY THE CONTRACTOR ON SITE\
3. ENGINEER TO BE INFORMED OF ANY DISCREPANCIES BEFORE ANY WORK COMMENCES\
4. ALL LEVELS RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD

A	26/02/2025	First issue	S.P	C.N
Rev	Date	Description	By	Chkd.

Client: Bord na Móna

Project: Derryadd, Derryaroge and Lough Bannow Bogs - Application for Substitute Consent

Title: Figure 9-2 - Regional Catchment Delineation

Scale @ A3: 1:100,000

Prepared by:	Checked by:	Date:
S.Pezzetta	C.Naughton	February 2025

TOBIN

Tel: +353-(0)1-8030406
Email: info@tobin.ie
www.tobin.ie

Map Ref: 11400-006-CAs-S.CAs-TOB-A

Draft: A

Catchment Overview

The rivers surrounding the Application Site all discharge to the River Shannon or to Lough Ree. The Upper Shannon Catchment covers an area of 1,500 km² which is characterised by karstified lowland areas, including much of the western half of the catchment and the area underlying the main Shannon channel north of Lough Ree. The upland areas in the catchment are underlain variously by sandstones, limestones and metamorphic rocks. The Application Site is located on a catchment boundary between the catchment of the Upper Shannon Catchment (26C) which covers the majority of the site and the Upper Shannon 26E which forms a small segment to the south. The Ledwithstown River or Bilberry River is the only stream located in the 26E Upper Shannon Catchment. The Lough Bannow Stream and Ballynakill stream are located in the Upper Shannon 26C Catchment.

More locally, three sub catchments are present at the Application Site. The majority of the Application Site is located within the Shannon [Upper] SC_080 Sub Catchment, with a small proportion of the proposed development located within the Bilberry _SC_010 Sub Catchment to the south and the Shannon [Upper]_SC_060 Sub Catchment to the southeast.

The main regional surface water features present within the Application Site include the following:

- The Shannon (Upper) and its tributaries are located to the north and northwest of the site
- The Ballynakill River is located to the north and east of the Derryadd and Derryaroge bogs;
- The Lough Bannow Stream and its tributaries are located to the west of Lough Bannow);
- The Ballynakill River and Lough Bannow Stream discharge to the River Shannon, north of Lanesborough;
- The Fallan River located 1km to the east of the Application Site, discharge to the River Shannon, north of Lanesborough at Cloondara; and
- The Ledwithstown River or Bilberry River rise near the south boundary of Lough Bannow, flows to the southwest and discharges to Lough Ree.

The Application Site comprises approximately 2,244 ha and has several surface water features in the region of the site. A number of natural tributaries that flow into these rivers are located close to the Application Site. The Derrygeel stream (EPA Ref: 26_1494), rises close to the western boundary of the Application Site and continues north joining additional tributaries before its confluence with the Ballynakill River.

Approximately 4 km west of the Bord na Móna landholding, a more karstic flow regime occurs. The landscape between Lough Ree and Lough Bannow Stream comprises a plateau (broad interfluve) which is gently undulating between 43-88 mOD. Few surface water features occur in this plateau however small sinking streams and turloughs occur to the south of the area. Two turloughs, Cordara Turlough and Fortwilliam Turlough occur 2.6 km and 3.9 km to the southwest of Derryadd bog. Cordara Turlough is connected to Fortwilliam Turlough via a losing stream and excavated/man-made drainage ditch. This stream and Cordara Turlough are dry during the summer months with a permanent water body occurring at Fortwilliam. During previous site visits in January 2017 and February 2018, Cordara Turlough was in flood. Water from Cordara Turlough discharges via surface water and groundwater to Fortwilliam Turlough. Discharge from Fortwilliam Turlough is controlled via a sinkhole located on the western lip of the turlough. The Application Site and adjacent lands also include many man-made drains as shown in Figure 9-3 to Figure 9-5.

9.3.3.4 Drainage

Drainage (1988)

Four rivers were identified flowing through the Application Site (see Figure 9-2). The Application Site and adjacent lands also include many man-made drains which flow to the watercourses identified in Figure 9-2 to Figure 9-6 and assist in the drainage of peatland and reclaimed peatland areas, under agricultural land use and forestry. Similar to arterial drainage schemes, the streams surrounding the bog and within the boundary were straightened in the 1950s to 1970s.

The Application Site was in subject to peat extraction from the 1960s. Drainage channels were installed across the Application Site by 1988.

As part of the Third Development Programme in the 1970s (refer to Chapter 4 - Section 4.5 of this rEIAR), Bord na Móna decided in 1974 to install specially designed and constructed silt ponds across it's landbank. The purpose of this was to control surface water emissions, thereby trapping more than 90% of the suspended solids present in the drainage waters[2]. In 1975, experiments were carried out to establish the optimum size, number and location of silt ponds required for a given area. As well as installing silt ponds in all new bogs from this date, Bord na Móna decided to retrofit ponds in all previously developed bogs which at that time was a *"major time-consuming undertaking"* which *"often proved difficult and slow".* In the provision of silt ponds across the bogs, the perimeter drains were now diverted through the ponds prior to discharge into a nearby surface water body. Silts ponds were installed in the early 1970s were reviewed with addition ponds installed in 1978. As detailed in Chapter 4, further Bord na Móna records show that silt pond measures were introduced across all Bord na Móna bogs in the early to mid-1980s in response to the 1977 *Water Pollution Act.* All silt ponds were in place pre-1988. The number of pumps has gradually reduced where falls allowed for gravity drainage to occur. It is assumed that all pumps were in place in 1988 as a worse case assumption.

[2] Clarke, Donal, *Brown Gold: A History of Bord na Móna and the Irish Peat Industry* (2010)

Table 9-8: Bog Drainage Summary pre-1988

Bog	Notes (25 inch map)	Drainage	Silt ponds (1978)	Pumps (1978)
Derryaroge	Historical drainage (25inch map) along the bog boundary and drainage surrounding mineral island. More intensive drainage towards west of site.	All Field and main drains in place in 1973. Boundary drain/streams evident on 1973 maps.	3	9
Derryadd	Historical drainage (25inch map) along the bog boundary and drainage surrounding mineral island. Drainage channels extent to surface water ponds. Mill pond noted to the east of site on the Ballynakill stream. Grid drainage evident to the south of Derryadd bog.	All Field and main drains in place in 1973. Boundary drain/streams evident on 1973 maps.	5	6
Lough Bannow	Historical drainage (25inch map) along the bog boundary and drainage surrounding mineral islands. Drainage evident surrounding Lough Bawn. Drainage channels extent to surface water ponds. A number of streams mark the townland boundaries.	All Field and main drains in place in 1973. Boundary drain/streams evident on 1973 maps.	2	3

Peat Extraction Phase Drainage (1988-2019)

The Application Site was subject to peat extraction pre-1988. Drainage ditches and associated silt ponds were in place prior to 1988. Internal drains were cleaned on a regular basis in suitable weather, mainly prior to and post the peat extraction season (i.e. between October and March). This was necessary to remove sediment from the bottom of milled peat field drains and dispose of it by spreading it on the adjacent peat field.

The main drains store water and direct it to main drains and to the settlement ponds. The storage capacity of run-off water in the drainage network lessens the impact of sediment mobilisation to receiving water, due to the low velocity of the water and the retention time in the drains. Final settlement occurs in the settlement ponds before discharging to the adjacent drains and streams. See the conceptual sketch below in Diagram 9.1.

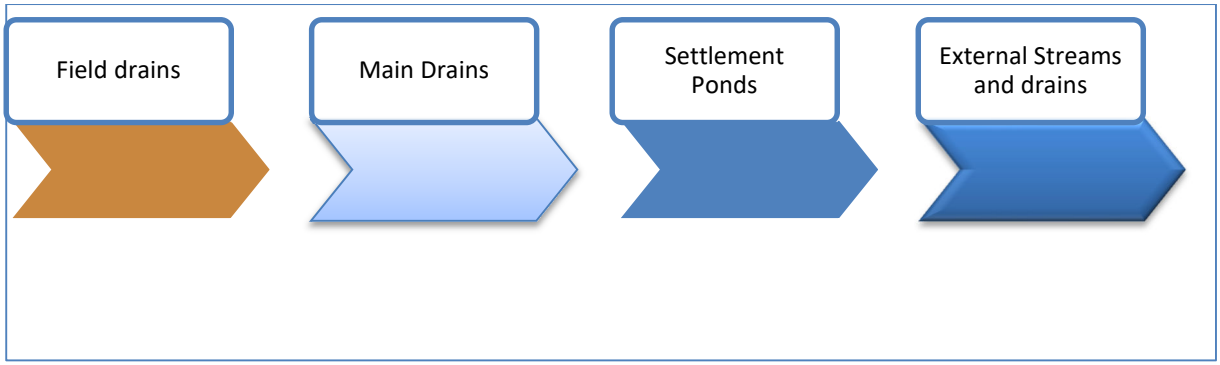


Diagram 9.1 Drainage hierarchy on peatlands.

Drainage channels were maintained and are present throughout the Application Site which has operated under IPC Licence P0504-01 since 2000. All drainage water from the Application Site discharge via an appropriately designed silt pond treatment arrangement. Silt ponds have been sized and maintained in accordance with the existing IPC Licence (P0504-01) which states:

> '*Within three years of date of grant of this licence all existing silt ponds serving operational bogs shall achieve the following minimum performance criteria - Maximum flow velocity < 10 cm/s.*".

Current Phase Drainage (2019-Present Day)

A review of the current drainage was undertaken for the Application Site. Current drainage infrastructure is shown as Figure 9-3 to Figure 9-5 below. This drainage infrastructure was in situ during the Peat-Extraction Phase.

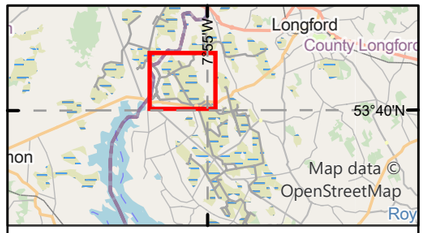
Lands within Derryaroge Bog discharge to the Kilnacarrow stream, River Shannon and Ballynakill River. A number of topographical highs occur in the centre of Derryaroge bog. As a consequence the eastern section of Derryaroge bog discharges through a series of silt ponds to Ballynakill River. The western and northern sections of Derryaroge bog discharge through a series of silt ponds to the Kilnacarrow stream and River Shannon. Sampling points are included in the Cutaway Bog Decommissioning and Rehabilitation Plan for Derryaroge Bog, see Appendix 4-3.

Lands within Derryadd Bog discharge to the Lough Bannow Stream and Ballynakill River. A number of topographical highs occurs to the centre of Derryadd bog. The majority of Derryadd Bog discharges via SW68, SW72 and SW73 outfalls, located in the west of the bog. The Lough Bannow stream discharges to the River Shannon north of Lanesborough.

Lands within Lough Bannow Bog discharge to the Lough Bannow stream, Ballynakill River and Ledwithstown stream. The majority of Lough Bannow Bog discharges to Lough Bannow stream via SW74, located in the northwest of Lough Bannow Bog. The Ledwithstown Stream and Bilberry stream discharges to Lough Ree at Derrynagalliagh.

Table 9-9: Waterbodies and WFD classification within the Application Site

Waterbody Code	Name	Status 2010-2015	Status 2013-2018	Current Status 2016-2021	Application Site within WFD subbasin?
IE_SH_26L120100	Lough Bannow Stream_010	Unassigned	Good	Moderate	Yes
IE_SH_26B220790	Ballynakill_010	Unassigned	Good	Moderate	Yes
IE_SH_26L840850	Ledwithstown_010	Unassigned	Good	Moderate	Yes
IE_SH_26F010200	Fallan 020	Good	Good	Good	Yes
IE_SH_26S021600	Shannon (Upper)_100	Poor	Poor	Poor	Yes
IE_SH_26S021530	Shannon (Upper)_090	Moderate	Moderate	Poor	No
IE_26C_AWB_RCMLW	Royal Canal Main Line (Upper Shannon C)	Good	Good	Good	No
IE_SH_26_750a	Lough Ree	Moderate	Good	Good	Located downgradient



Legend

- Application Site
- Pre-1988 Discharge points
- P05_09 Drain

Pump sites

- 1988 - 1995
- Decommissioned
- Not Known
- pre - 1988

Silt ponds

- 1988 - 1995
- Pre - 1988
- Not Known

Derryadd Enhanced Drainage

- Decommissioned
- Not Known (Post-1995)
- Pre-1988 Upgraded Post-1995
- Pre-1988 Main Drainage Channels (including rehabilitation area)

0 500 1,000
Meters

NOTES

1. FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING\
2. ALL DRAWINGS TO BE CHECKED BY THE CONTRACTOR ON SITE\
3. ENGINEER TO BE INFORMED OF ANY DISCREPANCIES BEFORE ANY WORK COMMENCES\
4. ALL LEVELS RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD

Rev	Date	Description	By	Chkd
A	25/02/2025	First issue	S.P	C.N

Client:

Bord na Móna

Project:

Derryadd, Derryaroge and Lough Bannow Bogs - Application for Substitute Consent

Title:

Figure 9.3
Derryaroge Bog Drainage network
- Page 1 of 3 -

Scale @ A3: 1:16,000

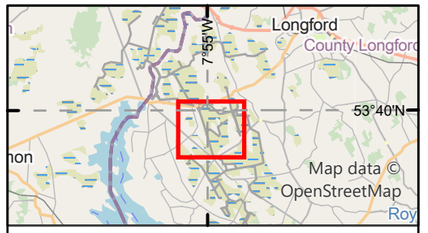
Prepared by:	Checked by:	Date:
S.Pezzetta	C.Naughton	February 2025

TOBIN

Tel: +353-(0)1-8030406
Email: info@tobin.ie
www.tobin.ie

Map Ref: 11400-021-DRAIN-DOGUE-TOB- A

Draft: A



Legend

- Application Site
- Pre-1988 Discharge points
- P05_09 Drain

Pump sites

- Not Known
- pre - 1988

Silt ponds

- 1988 - 1995
- Pre - 1988
- Not Known

Derryadd Enhanced Drainage

- Decommissioned
- Not Known (Post-1995)
- Pre-1988 Upgraded Post-1995
- Pre-1988 Main Drainage Channels (including rehabilitation area)

0 500 1,000
Meters

NOTES

1. FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING\
2. ALL DRAWINGS TO BE CHECKED BY THE CONTRACTOR ON SITE\
3. ENGINEER TO BE INFORMED OF ANY DISCREPANCIES BEFORE ANY WORK COMMENCES\
4. ALL LEVELS RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD

A	25/02/2025	First issue	S.P	C.N
Rev	Date	Description	By	Chkd

Client:

Bord na Móna

Project:

Derryadd, Derryaroge and Lough Bannow Bogs - Application for Substitute Consent

Title:

Figure 9.4
Derryadd Bog Drainage network
- Page 2 of 3 -

Scale @ A3: 1:16,000

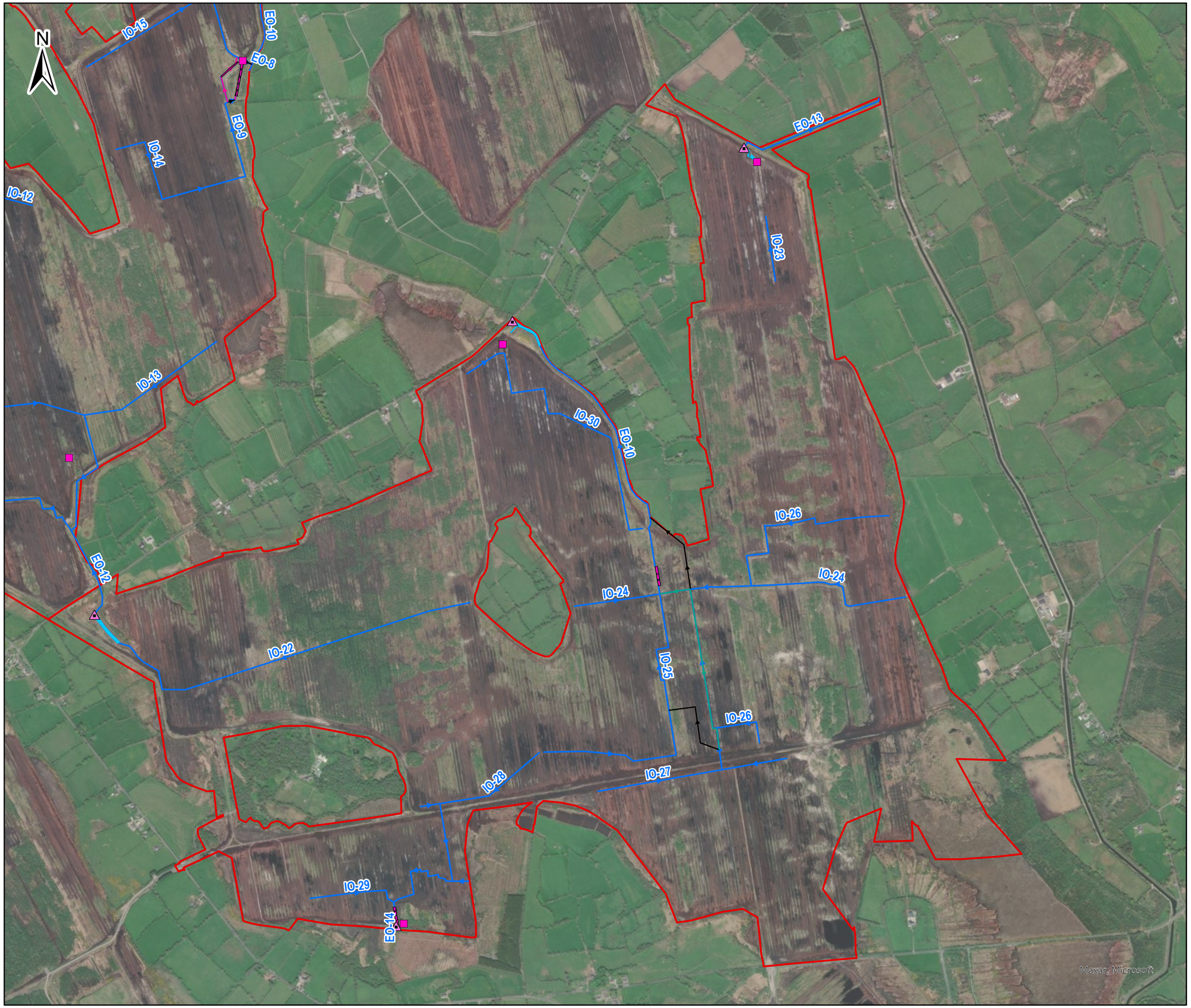
Prepared by:	Checked by:	Date:
S.Pezzetta	C.Naughton	February 2025

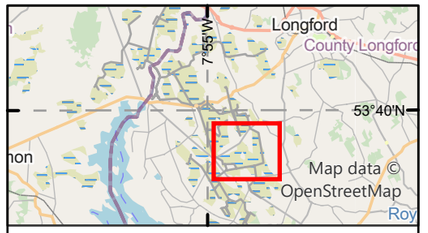
TOBIN

Tel: +353-(0)1-8030406
Email: info@tobin.ie
www.tobin.ie

Map Ref: 11400-021-DRAIN-DADD-TOB- A

Draft: A





Legend

- Application Site
- Pre-1988 Discharge points

Pump sites

- Not Known

Silt ponds

- 1988 - 1995
- Not Known

Derryadd Enhanced Drainage

- Decommissioned
- Not Known (Post-1995)
- Pre-1988 Upgraded Pre-1995
- Pre-1988 Upgraded Post-1995
- Pre-1988 Main Drainage Channels (including rehabilitation area)

0 500 1,000
Meters

NOTES

1. FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING\
2. ALL DRAWINGS TO BE CHECKED BY THE CONTRACTOR ON SITE\
3. ENGINEER TO BE INFORMED OF ANY DISCREPANCIES BEFORE ANY WORK COMMENCES\
4. ALL LEVELS RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD

Rev	Date	Description	By	Chkd
A	25/02/2025	First issue	S.P	C.N

Client: Bord na Móna

Project: Derryadd, Derryaroge and Lough Bannow Bogs - Application for Substitute Consent

Title: Figure 9.5 Lough Bannow Bog Drainage network - Page 3 of 3 -

Scale @ A3: 1:16,000

Prepared by:	Checked by:	Date:
S.Pezzetta	C.Naughton	February 2025

TOBIN
Tel: +353-(0)1-8030406
Email: info@tobin.ie
www.tobin.ie

Map Ref: 11400-021-DRAIN-LB-TOB- A

Draft: A

9.3.3.5 Flood Risk Assessment

The OPW 'Flood Hazard Database' was used to obtain information on historical flooding events within the Application Site. No historical flood events were identified on or within 1km of the Application Site. There are no records of flooding in 1988. The OPW Past Flood Events Maps have no records of recurring or historic flood instances. The closest mapped recurring flood event is situated c. 0.45km west of Derryadd bog on a local road.

The national programme of Catchment Flood Risk Assessment and Management (CFRAM) Studies comprises the execution of three parts:

(1) Preliminary Flood Risk Assessments;

(2) Flood Hazard Mapping; and

(3) The development of Flood Risk Management Plans.

The OPW initially produced a series of maps to assist in the development of the Preliminary Flood Risk Assessment (PFRA) throughout the country. These maps were produced as part of a desktop study of several sources. In July 2011, the Office of Public Works (OPW) published a series of maps showing the estimated 100-year flood plain from the Preliminary Flood Risk Assessment (PFRA) study. This information was used to establish the current baseline conditions. Areas of pluvial flooding were noted on the OPW PFRA mapping. The PFRA study maps (i.e., the MyPlan.ie viewer) were reviewed and the Application Site is not located within a groundwater flood risk zone. There is no evidence of historic groundwater flooding at the site.

Part of the Application Site boundary is located in a flood prone area (Flood Zone A or B) based on the Preliminary Flood Risk Assessment (PFRA) and National Indicative Flood Map (NIFM) maps. This dataset suggests that fluvial flooding potentially occurs at in a number of areas on site. Based on the information available and a site-specific flood risk assessment it is not considered a flood risk – See Appendix 9-1.

Substantial areas of the Application Site and surrounding area have been artificially drained to enable industrial peat extraction. The carefully maintained network of drainage ditches effectively drain the Application Site and surrounding area.

Drainage management works carried out as part of site activities reduce the potential for surface water ponding. Data on historical flooding is limited but records do not indicate that flooding occurs on the downgradient streams. Large areas of pluvial flooding occur within the site where the pump capacity is lower than the rainfall rates. Water management has limited the potential for flooding in the Derryaroge, Derryadd and Lough Bannow bogs. The drainage within the site is controlled in existing drains and in part by mechanical pumping in accordance with the IPC licence.

Pump capacities at pumping stations were designed based on a runoff rate of 1.7 l/s/Ha, which is less than the pre-1988 runoff rates. Runoff rates for the Application Site are greater than 5 l/s/HA therefore surface water accumulates/ponds on site during the winter, providing additional flood storage on site and reducing the potential for flooding off site.

9.3.3.6 Assessment of Hydrometric Data

There were no hydrometric stations located in the immediate environs of the Application Site. Hydrometric stations do exist on watercourses downstream of the development, they include spot

level monitoring on a number of tributaries to the River Shannon (gis.epa.ie/Envision). As such, they are not representative of the actual flows occurring at the site.

The Shannon CFRAMS project published a review report entitled Technical Assessment: River Shannon Level Operation Review (OPW 2012)[3] which examined the controls along the Shannon in detail, including the profile of the river. The main body of the River Shannon, in periods of normal flow, is controlled largely by the operating regulations and procedures of control structures and weirs and sluices along its route. ESB manages the three lakes on the Shannon in accordance with the Regulations and Guidelines for the Control of the River Shannon. These Regulations and Guidelines do not have any Statutory basis but take account of flooding, navigation, low flow management and safety. The minimum flow from Lough Ree is approximately 12m^3/sec determined from water levels and weir discharge calculations when applying the Regulations and Guidelines for the Control of the River Shannon, which is maintained by the sluice gate operation in Athlone when the lake level is lower than 34.79mOD. Actual measured discharges or a reliable low flow stage discharge relationship does not exist at Athlone. The ordinary summer level on the River Shannon at Termonbarry is 40.2m. Tarmonbarry is located 5km gradient of the Application Site.

As outlined previously, the natural surface water drainage pattern in the environs of the Application Site is shown in Figure 9-2. The EPA Naturalised River Flow Duration Percentiles[4] in the adjacent streams are estimated at a number of locations on adjacent streams. The flow estimates represent flows that could be expected in rivers under naturalised conditions and do not take account of artificial influences of any kind such as water supply abstractions or wastewater discharges. The relevant data is summarised below in Table 9-10.

Table 9-10: Flow characteristics

Flow characteristics	Lough Bannow Stream @Lanesbourough village	Derrygeel R. - W of Derryadd	Ballynakill - E Derryadd	Ballynakill -NE of Derryaroge	Rappensmill -NW of Derryad	Ledwithstown – S of Lough Bannow	Bilberry – SW of Lough Bannow	River Shannon (Lanesborough)
SEG_CD	26_588	26_593	26_625	26_3102	26_3871	26_692	26_2679	26_4162
Catchment Area_km2	38.2	5.4	9.95	19.2	5.92	9.57	8.61	2,778
Easting	201630	205700	207180	204340	203980	209780	207980	200538
Northing	269360	265200	268640	272640	268080	258800	258360	269367
Q1 (m³/s)	4.544	0.732	1.189	1.978	0.574	1.137	0.87	195
Q30 (m³/s)	0.943	0.114	0.259	0.485	0.15	0.235	0.212	53
Q50 (m³/s)	0.405	0.056	0.116	0.22	0.069	0.1	0.091	31
Q70 (m³/s)	0.255	0.038	0.073	0.137	0.043	0.064	0.06	17
Q95 (m³/s)	0.117	0.017	0.032	0.06	0.019	0.029	0.027	4.5
Mean Flow (m³/s)	0.897	0.123	0.241	0.435	0.132	0.224	0.192	60
Peat soils % catchment	69.9	82.0	81.5	75.0	83.5	73.8	79.5	35

[3] OPW, (2012) Shannon Catchment-based Flood Risk Assessment and Management (CFRAM) Study Technical Assessment: River Shannon Level Operation Review

[4] https://data.gov.ie/dataset/naturalised-river-flow-duration-percentiles

During low flow periods at the Application Site, little to no flow can occur due to the small catchment areas. This was noted in the EPA sampling locations as detailed in Tables 9-11 to 9-13 Flow volumes increases at the river basin to catchment scale.

Derryaroge Bog

Derryaroge Bog is located within the catchment of two streams: Stream 26_1494 located to the northern west of the Derryaroge site; and Stream 26_3574 form the part of the eastern boundary of the Derryaroge site. The catchment area for each stream was estimated using the EPA's online database (https://gis.epa.ie/EPAMaps) and geographic contours available from OS maps.

Derryadd Bog

Three streams were identified as flowing through or adjacent to Derryadd bog. Stream 26_625 is located to the east; and streams 26_3871 and 26_593 form the western boundary.

The catchment area for each stream was estimated using the EPA's online database (gis.epa.ie/Envision) and geographic contours available from OS maps. It was noted that there were no hydrometric stations located in the immediate environs of the Application Site.

Lough Bannow Bog

Four streams were identified adjacent to Lough Bannow Bog. Stream 26_625 (Trib. Of Ballynakill stream) is located to the northeast and 26_593 is located to the northwest boundary. The Bilberry Stream (26_692) and Ledwithstown Stream (26_3735) are located to the south of Lough Bannow. There are currently no known surface water abstractions from the streams adjacent to the site or from any surface water features <10 km from the Application Site boundary.

9.3.4 Surface Water Quality

9.3.4.1 EPA Biological Q-Value Monitoring

The Environmental Protection Agency (EPA) regularly monitors water bodies in Ireland as part of their remit under the Water Framework Directive (WFD) (2000/60/EC), which requires that rivers are maintained or restored to good/ favourable status. Quality of watercourses are assessed in terms of 4 No. quality classes; 'Unpolluted' (Class A), 'Slightly Polluted' (Class B), 'Moderately Polluted' (Class C) and 'Seriously Polluted' (Class D). These water quality classes, and the water quality monitoring programme are described in the EPA publication 'Water Quality in Ireland, 2022'. The water quality assessments are based on biological surveys. Biological Quality Ratings or Biotic Indices (Q-values) ranging from Q1 to Q5 are defined as part of the biological river quality classification system. The relationship of these indices to the water quality classes defined above, are set out in Table 9-11.

Table 9-11: Relationship between Biotic Indices and Water Quality Classes

Biotic Index (Q-Value)	Quality Status	Quality Class
Q5, 4-5, 4	Unpolluted	Class A
Q3-4	Slightly Polluted	Class B
Q3, 2-3	Moderately Polluted	Class C
Q2, 1-2, 1	Seriously Polluted	Class D

9.3.4.2 Pre-1988 EPA Q-Values

The first national biological and physico-chemical survey of the quality of Irish rivers and streams was carried out by An Foras Forbartha in 1971. No Q-values were available on the River Shannon, Lough Bannow Stream or Ballynakill River pre-1988. There are no EPA or WFD monitoring locations on the streams adjacent to or within the Application Site as shown in Figure 9-6. Historic Q-value data are available for the year 1984 for the River Fallan (Br S of Kilmore Upper), a monitoring station located along the River Fallan, located approximately 4.3 km to the west of Derryadd bog boundary. The result is presented in Table 9-12, with a value of Q4, indicating the river was 'Unpolluted' during this year. No biological Q-Value data are available for other locations due to the fact no EPA monitoring was carried out during this time.

Table 9-12: EPA Q-Value Status (Pre-1988)

Station Name	W of Curry Bridge	Br S of Kilmore Upper	1km downstream of Tarmonbarry	Ballyleague Br Lanesboro
River	**Fallan**	**Fallan**	**Shannon**	**Shannon**
Station Code	**RS26F0100040**	**RS26F010200**	**RS26S021530**	**RS26S021600**
1984	ND[5]	Q4	ND	ND

No Biological Q-Value data are available for 1988 across the monitoring stations due to the fact that no EPA monitoring was completed during this calendar year. It is considered that 1984 is representative of the conditions in 1988.

9.3.4.3 EPA Q-Values during the Peat Extraction Phase (1988 – 2019)

EPA Q-Value monitoring has been completed at several dates and locations on the River Shannon, 1 km downgradient of Lanesborough Power Station, upgradient at Termonbarry Village on the River Shannon and also on the River Fallan, located approximately 4.3km to the west of the Application Site, between 1988 and 2019. Historic Q-values are shown in Table 9-13. No Q values are available on the Lough Bannow or Ballynakill stream.

[5] ND=No Data

Q-Values within the River Fallan have fluctuated between Q3-Q4 'Slightly Polluted' status during the Peat Extraction PhasePeat Extraction Phase, with 'Unpolluted' status Q4, recorded in the River Fallan (Br S of Kilmore Upper), from 1992 to 2017, during the Peat Extraction PhasePeat Extraction Phase. The majority of EPA monitoring points on the River Shannon indicate that the overall water quality in this area was Q3 - 'Moderately Polluted' and that the water quality upstream of the Application Site was Q3-Q4 'Slightly Polluted', during the Peat Extraction Phase.

Table 9-13: EPA Monitoring of Biological Quality of Waters on the River Shannon Upper

Station Name	W of Curry Bridge	Br S of Kilmore Upper	1km downstream of Termonbarry	Ballyleague Br Lanesboro
River	Fallan	Fallan	Shannon	Shannon
Station Code	RS26F0100040	RS26F010200	RS26S021530	RS26S021600
2017	Q3-4	Q4	Q3	ND[6]
2014	Q3-4	Q4	Q3-4	Q3
2011	Q3-4	Q4	Q4	Q3-4
2008	Q3-4	Q4	Q3-4	ND
2005	Q3-4	Q3-4	ND	Q3
2002	Q4	ND	ND	Q3
1999	Q3-4	Q3-4	ND	Q3
1996	Q3-4	Q3-4	ND	ND
1992	ND	Q3-4	ND	ND

9.3.4.4 EPA Q-Values during the Current Phase (July 2019 – Present Day)

EPA Biological Q-Value monitoring data postdates 2019, with Q-Values across the monitoring stations outlined in Table 9-14.

[6] ND=No Data

Table 9-14: Q-Values Current Phase (July 2019- Present Day)

Station Name	W of Curry Bridge	Br S of Kilmore Upper	1km downstream of Tarmonbarry	Ballyleague Br Lanesboro
River	Fallan	Fallan	Shannon	Shannon
Station Code	RS26F0100040	RS26F010200	RS26S021530	RS26S021600
2023	Q4	-	Q3-4	Q3
2020	Q3-4	Q4	Q4	Q3

No significant change in Q-values has occurred in 2020 or 2023 (the Current Phase) in comparison to the Peat Extraction PhasePeat Extraction Phase. Q-Values within the River Fallan vary between Q3-Q4 'Slightly Polluted' status and with 'Unpolluted' status -Q4. The EPA monitoring points on the River Shannon indicate that the overall water quality in this area is Q3-'Moderately Polluted' at Lanesborough and that the water quality upstream of the Application Site is Q3-Q4 'Slightly Polluted'.

9.3.4.5 Site Specific Surface Water Quality and Field Monitoring

Field Based Studies

Site Specific Surface Water Quality (2017-2023):

Field monitoring results by TOBIN January 2017, March 2018 and August 2023 are included in Table 9-16, and Table 9-17. The low conductivity values indicate that the Ballynakill and Lough Bannow River are predominately fed by surface water runoff. Approximately 3km to the west of the Application Site, higher conductivity values on a tributary of the Lough Bannow River (26_280) and Fortwilliam Stream indicate an increasing component of groundwater flow. In terms of suspended solids all monitoring locations had <10 mg/l, with pH values ranging from 6.7-7.3. Slightly acidic pH values of surface waters would be typical of peatland environments due to the decomposition of peat.

Table 9-15: Surface Water Analysis January 2017

ID	Location	Temp °C	Conductivity (µS/cm)	pH (units)	TSS (mg/l)
S1	Lough Bannow stream 26_1150	8.2	390	6.7	<10
S2	Lough Bannow stream 26_872	7.7	391	6.8	<10
S3	Lough Bannow stream 26_280	8.5	460	7	<10
S4	Cordara Turlough	9.5	426	7	<10
S5	Fortwilliam stream inflow	10	597	7.1	<10
S6	St Martins Springs	10.5	590	7	<10
S7	Derryadd outflow to Ballynakill Stream	7.5	335	7.1	<10
S8	Ballynakill Stream upgradient of Derryadd outflow	8.2	399	7	<10
S9	Ballynakill Stream 26_625 at R398 road crossing	8.6	361	7	<10
S10	Ballynakill Stream 26_3102	7.8	359	6.9	<10
S11	Derryaroge outflow to River Shannon	8	389	6.9	<10
S12	Derryaroge bog, within site drainage ditch	8.6	347	6.9	<10
S13	Lough Bannow stream 26_593	8.6	348	6.9	<10

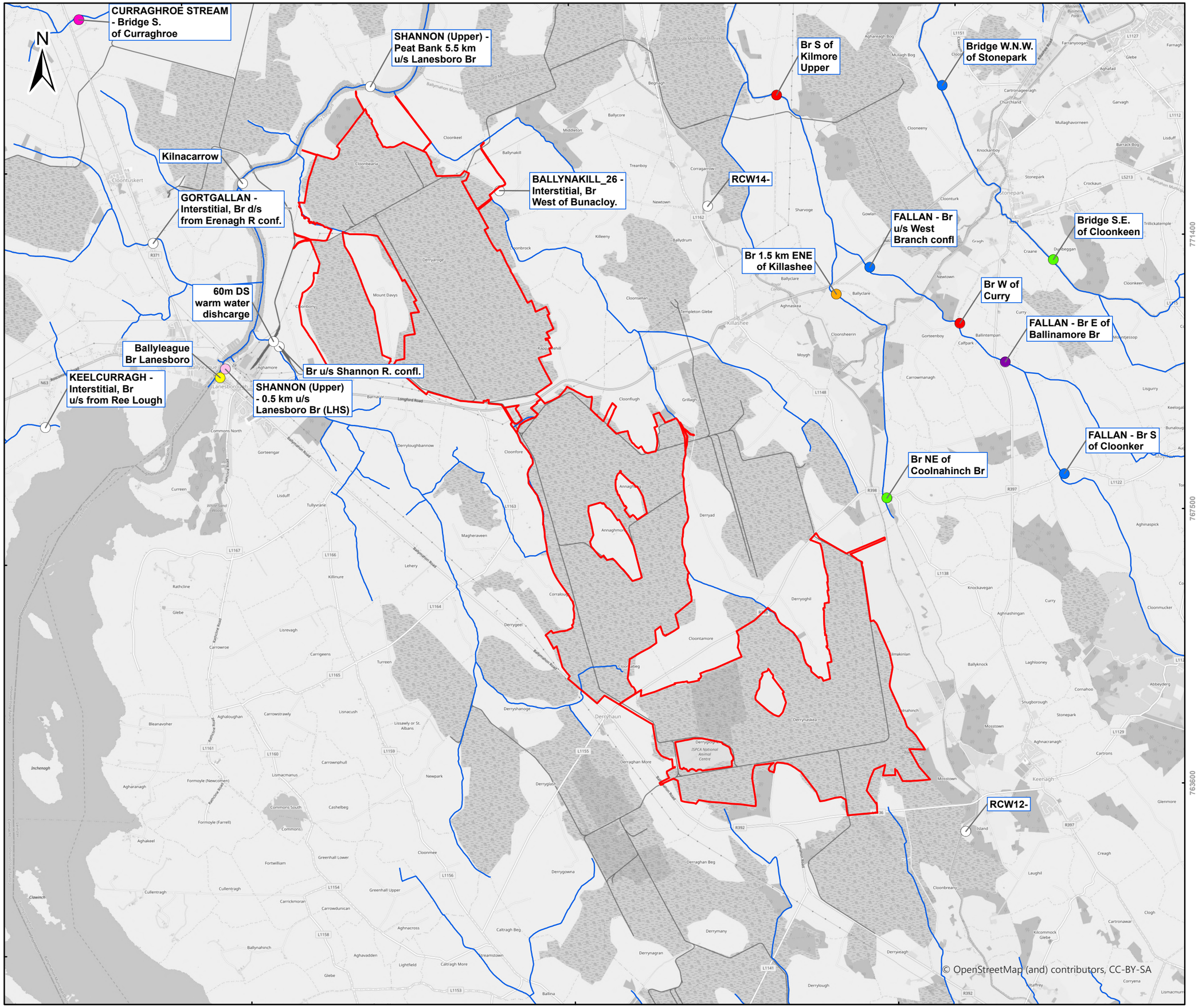
Table 9-16: Surface Water Analysis May 2018

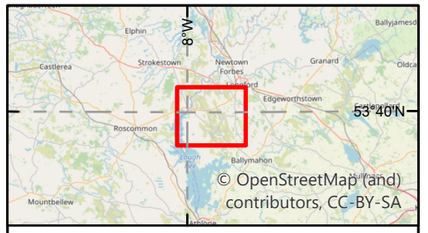
ID	Location	Temp °C	Conductivity (µS/cm)
S1	Lough Bannow stream 26_1150	12.1	399
S2	Lough Bannow stream 26_872	12.7	400
S3	Lough Bannow stream 26_280	12.5	460
S4	Cordara Turlough	DRY	445
S5	Fortwilliam stream inflow	10.7	676
S6	St Martin's Springs	10.8	666
S7	Derryadd outflow to Ballynakill Stream	12.1	337
S8	Ballynakill Stream upgradient of Derryadd outflow	12.5	416
S9	Ballynakill Stream 26_625 at R398 road crossing	12.0	372

ID	Location	Temp °C	Conductivity (µS/cm)
S10	Ballynakill Stream 26_3102	12.4	361
S11	Derryaroge outflow to River Shannon	12.4	405
S12	Derryaroge bog, within site drainage ditch	12.5	355
S13	Lough Bannow stream 26_593	8.6	348

Table 9-17: Surface Water Analysis August 2023

ID	Location	pH	Temp °C	Conductivity (µS/cm)
S1	Lough Bannow stream 26_1150	7.6	13.1	417
S2	Lough Bannow stream 26_872	7.4	13	410
S3	Lough Bannow stream 26_280	7.5	13	470
S5	Fortwilliam stream inflow	7.5	12.6	609
S7	Derryadd outflow to Ballynakill Stream	7.6	13.2	367
S8	Ballynakill Stream upgradient of Derryadd outflow	7.2	13.2	447
S9	Ballynakill Stream 26_625 at R398 road crossing	7.4	13.2	385
S10	Ballynakill Stream 26_3102	7.6	12.7	377
S11	Derryaroge outflow to River Shannon	7.5	12.9	438





Legend

- Application Site

Water Quality Monitoring Stations

- No value
- 1
- 2-3
- 2-3*
- 3
- 3*
- 3-4
- 4
- 4-5
- Rivers

0 1 2
Kilometers

NOTES

1. FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING\
2. ALL DRAWINGS TO BE CHECKED BY THE CONTRACTOR ON SITE\
3. ENGINEER TO BE INFORMED OF ANY DISCREPANCIES BEFORE ANY WORK COMMENCES\
4. ALL LEVELS RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD

Rev	Date	Description	By	Chkd.
A	26/02/2025	First issue	S.P	C.N

Client: Bord na Móna

Project: Derryadd, Derryaroge and Lough Bannow Bogs - Application for Substitute Consent

Title: Figure 9-6 EPA Surface Water Monitoring Locations

Scale @ A3:	1:50,000	
Prepared by:	Checked by:	Date:
S.Pezzetta	C.Naughton	February 2025

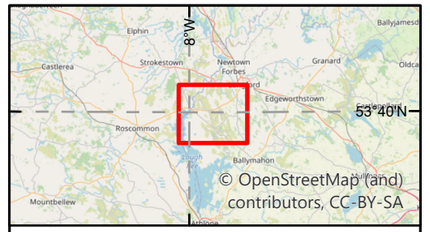
TOBIN

Tel: +353-(0)1-8030406
Email: info@tobin.ie
www.tobin.ie

Map Ref: 11400-010-SW.Q-S.BO-TOB-A

Draft: A

8°0'0"W
7°55'0"W
7°50'0"W
53°42'0"N
53°39'0"N
53°36'0"N
771400
767500
763600
601000
605600
610200



Legend

- Application Site
- Mountdillon Bog Group SW Sample Locations
- Surface Water Monitoring Locations
- Rivers

0 1 2
Kilometers

NOTES

1. FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING\
2. ALL DRAWINGS TO BE CHECKED BY THE CONTRACTOR ON SITE\
3. ENGINEER TO BE INFORMED OF ANY DISCREPANCIES BEFORE ANY WORK COMMENCES\
4. ALL LEVELS RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD

Rev	Date	Description	By	Chkd
A	26/02/2025	First issue	S.P	C.N

Client: Bord na Móna

Project: Derryadd, Derryaroge and Lough Bannow Bogs - Application for Substitute Consent

Title: Figure 9-7 Surface Water Monitoring

Scale @ A3: 1:50,000

Prepared by:	Checked by:	Date:
S.Pezzetta	C.Naughton	February 2025

TOBIN

Tel: +353-(0)1-8030406
Email: info@tobin.ie
www.tobin.ie

Map Ref: 11400-011-SW.M.L-S.BO-TOB-A

Draft: A

Pre-IPC Licence (i.e. pre-2000)

Prior to the implementation of the IPC Licence requirements and associated monitoring discussed in below in Section 0, limited monitoring of surface water quality and emissions was completed at the Application Site by the Applicant.

However, several control measures were designed to protect surface water quality were in place prior the IPC Licence. These measures were related to refuelling of production machines, storage and of tanks and drums and maintenance of machinery, with further information detailed in Section 4.4 Chapter 4 Project Description.

IPC Licence Monitoring (2000 – Present Day)

Surface water monitoring is conducted at the Application Site on a regular basis since 2000 as part of IPC Licence requirements. Data from 2010 to 2024 for Derryaroge, Derryadd, and Lough Bannow bogs are presented from Table**Error! Reference source not found.** 9-18 to 9-20 respectively. Additional IPC Licence data are available for 2001 to 2010 (during the Peat Extraction PhasePeat Extraction Phase) and included in Appendix 4-3, however locations are not directly comparable to the locations shown on below in Figure 9-7.

Emission limit values associated with the IPC Licence are presented in Table 9-18 below. All samples were taken from surface water channels during periods of low flow (i.e. low dilution factor), these results are as expected for the natural background environment in this area (in particular, elevated levels of ammonia and suspended solids would be expected in a peat soil/subsoil environment).

No statistically significant trend (Mann-Kendell trend test) was noted between 2010-2019 and the Current Phase (2019 – present day) of the IPC Licence – See Appendix 9.2.

Table 9-18: IPC Licence Surface Water Monitoring Results (Derryaroge Bog)

Bog	SW Monitoring Point No.	Monitoring Period	pH	Suspended Solids (SS)	Total (dissolved) Solids	Ammonia	TP	COD	Colour
IPC Licence Emission Limit values7			6-9	35	-	1.42	-	100	-
Derryaroge	SW39	Q2 01	7.6	8	246	1	0.47	89	277
Derryaroge	SW39	Q3 01	7.7	5	316	<0.2	<0.05	56	128
Derryaroge	SW39	Q4 01	7.2	15	191	0.5	<0.05	69	180
Derryaroge	SW39	Q1 02	7.8	10	296	0.8	0.05	58	145
Derryaroge	SW39	Q2 02	7.4	<5	268	0.6	0.12	60	136
Derryaroge	SW39	Q3 02	7.9	5	264	0.86	0.2	37	62
Derryaroge		Q4 02	7.3	10	210	0.36	<0.05	96	163
Derryaroge	SW39	Q2 03	7.5	5	-	<0.5	0.2	<100	<200
Derryaroge	SW39	Q3 03	7.4	10	-	<0.5	0.2	<100	225
Derryaroge	SW39	Q4 03	7.4	13	-	<0.5	0.2	<100	<200
Derryaroge	SW-37	Q1 15	7.6	5	304	0.96	0.05	63	155
Derryaroge	SW-38	Q1 15	7.5	5	400	0.27	0.05	45	106
Derryaroge	SW-40	Q2 15	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow
Derryaroge	SW-41	Q2 15	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow
Derryaroge	SDW-41A	Q2 15	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow
Derryaroge	SW-42	Q2 15	7.6	5	240	0.14	0.14	60	100
Derryaroge	SW-43	Q2 15	8	5	387	0.2	0.05	24	95
Derryaroge	SW-47	Q3 15	7.3	5	164	1.3	0.05	63	236
Derryaroge	SW-35	Q3 16	6.7	6	150	0.07	0.46	**115**	301
Derryaroge	SW-36	Q4 16	7.5	12	420	**2.9**	0.01	58	45
Derryaroge	SW-35	Q4 18	7.4	5	398	0.35	0.05	58	281
Derryaroge	SW-36	Q4 18	7.1	5	210	0.39	0.05	77	260
Derryaroge	SW-37	Q4 18	7.2	5	338	0.57	0.05	63	164
Derryaroge	SW-38	Q4 18	7.6	5	490	1.1	0.05	62	96
Derryaroge	SW-39	Q4 18	7.4	5	242	1	0.05	78	241
Derryaroge	SW-40	Q4 18	5.7	5	286	0.77	0.05	54	173
Derryaroge	SDW-41A	Q4 18	-	12	410	**1.5**	0.05	77	157

[7] Bord na Mona Energy Ltd (Mountdillon Group of Bogs) IPC Licence P0504-01

Bog	SW Monitoring Point No.	Monitoring Period	pH	Suspended Solids (SS)	Total (dissolved) Solids	Ammonia	TP	COD	Colour
IPC Licence Emission Limit values7			6-9	35	-	1.42	-	100	-
Derryaroge	SW-42	Q4 18	7.2	5	240	0.11	0.05	91	281
Derryaroge	SW-43	Q4 18	7.6	5	425	0.1	0.05	79	157
Derryaroge	SW-47	Q4 18	No Flow	No flow	No flow	No flow	No flow	No flow	No flow
Derryaroge	SW-41	Q4 18	7	5	364	0.69	0.05	51	107
Derryaroge	SW-35	Q2 21	8	2	310	0.046	0.05	45	135
Derryaroge	SW-36	Q2 21	7.7	11	389	0.766	0.06	53	240
Derryaroge	SW-37	Q2 21	6.6	2	165	0.43	0.05	80	434
Derryaroge	SW-38	Q2 21	7.3	2	164	0.042	0.05	70	322
Derryaroge	SW-39	Q2 21	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow
Derryaroge	SW-40	Q2 21	7.4	2	242	0.025	0.05	64	228
Derryaroge	SW-41	Q2 21	5.7	3	101	0.251	0.05	84	398
Derryaroge	SDW-41A	Q2 21	6.5	2	131	0.592	0.05	72	281
Derryaroge	SW-42	Q2 21	7.4	2	173	0.042	0.05	54	243
Derryaroge	SW-43	Q2 21	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow
Derryaroge	SW-47	Q2 21	7.7	2	279	0.073	0.11	63	240
Derryaroge	SW-35	Q4 23	7.1	2	220	0.287	0.06	99	429
Derryaroge	SW-36	Q4 23	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow
Derryaroge	SW-37	Q4 23	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow
Derryaroge	SW-38	Q4 23	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow
Derryaroge	SW-40	Q4 23	7	4	162	0.175	0.07	101	443
Derryaroge	SW-41	Q4 23	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow
Derryaroge	SDW-41A	Q4 23	6.8	3	97	0.031	0.05	84	426
Derryaroge	SW-42	Q4 23	7.3	3	301	0.089	0.08	59	234
Derryaroge	SW-43	Q4 23	7.2	4	216	0.087	0.13	69	366
Derryaroge	SW-47	Q4 23	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow

Table 9-19: IPC Licence Surface Water Monitoring Results (Derryadd Bog)

Bog	SW Monitoring Point No.	Monitoring Period	pH	Suspended Solids (SS)	Total (dissolved) Solids	Ammonia	TP	COD	Colour
IPC Licence Emission Limit values[8]			6-9	35	-	1.42	-	100	-
Derryadd	SW-68	Q1 13	8	6	282	0.68	0.05	56	108
Derryadd	SW-68	Q1 16	7.8	5	353	0.43	0.07	40	108
Derryadd	SW-70	Q1 16	7.5	5	242	0.16	0.05	50	193
Derryadd	SW-71	Q2 16	7.7	5	350	0.02	0.05	37	159
Derryadd	SW-72	Q1 17	7.8	8	362	0.58	0.05	59	122
Derryadd	SW-73	Q1 17	7.7	12	349	1.1	0.05	52	126
Derryadd	SW-72	Q3 17	7.6	5	256	0.43	0.06	67	177
Derryadd	SW-68	Q1 19	7.3	5	225	0.08	0.05	90	266
Derryadd	SW-70	Q1 19	6.3	5	128	0.58	0.05	56	134
Derryadd	SW-71	Q1 19	7.5	5	252	0.26	0.05	41	189
Derryadd	SW-72	Q1 20	7.6	2	150	0.023	0.05	37	115
Derryadd	SW-68	Q3 21	7.6	3	503	0.494	0.05	64	144
Derryadd	SW-70	Q3 21	7.7	2	402	0.227	0.05	78	221
Derryadd	SW-71	Q3 21	7.8	2	359	0.204	0.05	70	147
Derryadd	SW-73	Q4 21	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow
Derryadd	SW-72	Q 3 22	7.3	13	344	0.135	0.05	55	278
Derryadd	SW-68	Q1 24	7.6	4	217	0.147	0.05	40	168
Derryadd	SW-70	Q1 24	7.3	2	204	0.066	0.06	41	186
Derryadd	SW-71	Q1 24	7.2	2	187	0.044	0.07	64	319
Derryadd	SW-73	Q2 24	8	3	373	0.1	0.05	41	153

[8] Bord na Mona Energy Ltd (Mountdillon Group of Bogs) IPC Licence P0504-01

Table 9-20: IPC Licence Surface Water Monitoring Results (Lough Bannow Bog)

Bog	SW Monitoring Point No.	Monitoring Period	pH	Suspended Solids (SS)	Total (dissolved) Solids	Ammonia	TP	COD	Colour
IPC Licence Emission Limit values9			6-9	35	-	1.42	-	100	-
Lough Bannow	SW78	Q1 04	7.6	5	-	0.6	0.2	<100	<200
Lough Bannow	SW78	Q2 04	7.3	8	-	0.2	0.2	<100	225
Lough Bannow	SW78	Q3 04	7.5	5	-	0.2	0.2	<100	<200
Lough Bannow	SW78	Q4 04	7.4	5	-	0.2	0.2	<100	<200
Lough Bannow	SW-95	Q1 10	7.5	5	193	0.33	0.05	66	258
Lough Bannow	Sw-95	Q2 10	7.8	9	299	0.24	0.05	66	168
Lough Bannow	SW-95	Q3 10	7.5	5	226	0.08	0.05	68	191
Lough Bannow	SW-95	Q4 10	7.4	5	212	0.51	0.05	81	235
Lough Bannow	SW-95	Q1 11	7.4	11	-	0.52	0.05	84	-
Lough Bannow	Sw-95	Q2 11	7.8	13	-	0.81	0.05	52	-
Lough Bannow	SW-95	Q3 11	7.5	19	-	0.35	0.05	98	-
Lough Bannow	SW-95	Q4 11	7.5	5	-	0.52	0.05	72	-
Lough Bannow	SW-95	Q1 12	7.6	5	240	0.5	0.05	49	231
Lough Bannow	SW-95	Q2 12	7.9	5	330	0.44	0.05	32	134
Lough Bannow	SW-95	Q3 12	7.4	10	210	0.21	0.09	79	191
Lough Bannow	SW-95	Q4 12	7.4	15	242	0.94	0.05	92	231
Lough Bannow	SW-76	Q2 16	7.8	5	372	0.34	0.05	31	123
Lough Bannow	SW-77	Q2 16	7.5	34	310	0.06	0.09	54	200
Lough Bannow	SW-78	Q2 16	7.8	5	418	0.02	0.05	37	127
Lough Bannow	SW-74	Q1 17	7.9	7	306	0.29	0.05	52	142
Lough Bannow	SW-78	Q2 17	7.8	5	296	0.3	0.05	23	115
Lough Bannow	SW-77	Q2 17	7.9	14	292	0.11	0.05	41	111
Lough Bannow	SW-75	Q2 19	6.8	5	184	0.25	0.05	25	95
Lough Bannow	SW-76	Q2 19	7.7	5	302	**1.5**	0.05	20	73
Lough Bannow	SW-74	Q2 19	6.7	16	276	0.02	0.12	97	262
Lough Bannow	SW-78	Q4 19	7.5	12	283	1.36	0.05	40	260
Lough Bannow	SW-77	Q4 19	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow
Lough Bannow	SW-76	Q4 21	7.7	2	376	0.1	0.05	84	160

[9] Bord na Mona Energy Ltd (Mountdillon Group of Bogs) IPC Licence P0504-01

Bog	SW Monitoring Point No.	Monitoring Period	pH	Suspended Solids (SS)	Total (dissolved) Solids	Ammonia	TP	COD	Colour
IPC Licence Emission Limit values9			6-9	35	-	1.42	-	100	-
Lough Bannow	SW-75	Q4 21	7.9	2	276	0.144	0.05	69	147
Lough Bannow	SW-74	Q4 21	7.7	3	415	0.085	0.05	74	249
Lough Bannow	SW-78	Q2 22	7.9	2	298	0.118	0.05	46	105
Lough Bannow	SW-77	Q2 22	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow
Lough Bannow	SW-74	Q2 24	7.8	2	380	0.11	0.05	49	175
Lough Bannow	SW-75	Q2 24	7.8	2	352	0.64	0.05	46	97.5
Lough Bannow	SW-76	Q2 24	7.9	12	425	0.189	0.05	49	171

Suspended Solids

The Environmental Protection Agency (EPA) in Ireland introduced trigger values for water quality monitoring as part of its efforts to manage and protect water resources. These values were established to help identify potential pollution issues and guide actions to address water quality concerns. The specific introduction of trigger values in Ireland is closely tied to the implementation of the EU Water Framework Directive (WFD), which was adopted in 2000 and transposed into Irish law through the Water Pollution Acts and subsequent regulations. The trigger values as part of its water quality assessment framework for IPC Licence.

Trigger values are used to indicate when certain parameters (e.g., phosphorus, nitrogen, or other pollutants) exceed acceptable levels, prompting further investigation or remedial action. These values are part of Ireland's broader water quality management system, which aims to achieve "good status" for all water bodies as required by the WFD.

As shown from Table 9-18 to 9-20, there were no exceedances of suspended solids, with all concentrations measured below 35 mg/L in accordance with the IPC Licence.

As shown from Table 9-18 to 9-20, pH ranged from pH6 to pH8 across the period of record (2010-2024).

EPA Monitoring Data

The EU Water Framework Directive was adopted, leading to more systematic and detailed monitoring programs. Since the late 2000s the EPA began to systematically monitor surface water locations including at Ballyleague Bridge in Lanesborough. The data presented below summarises the EPA monitoring data where records are available.

Nutrients and Temperature:

Annual average concentrations on the River Shannon in Lanesborough are below the annual average environmental quality standards (AA-EQS). Based on the EPA monitoring data, there is no significant trend in ammonium concentrations from 2010-2024, as shown graphically in Figure 9-8.

The EPA chemical test for nutrient conditions is "Pass" or "High" on account of good nitrate, ammonium and orthophosphate conditions at Ballyleague Bridge (Station RS26S021590). As stated in the EPA sub-catchment assessment, there are a number of issues within Shannon (Upper)_100 including heavy siltation noted at the biological monitoring station and the presence of Asian clams and zebra mussels. Pressures identified include impoundment (major weir and lock gates upstream of Tarmonbarry), historical channel modification and elevated water temperature. The river system is affected by historical hydromorphological alterations in areas at and downstream of the Application Site.

Ammonium (NH4):

Ammonia is produced when organic compounds are decomposed through microbial action induced by drainage/lowering of the water table.

The reported concentrations as outlined in Table 9-18 to 9-20 of total ammonia represent both unionized ammonia (NH_3, or 'free ammonia') and ionized ammonia (NH_4^+, or ammonium). NH_3 is significantly more toxic to fish. However, at the Application Site NH_4^+ will be the dominant form of ammonia at lower temperatures and near neutral pH (pH 6.5 – 8), therefore the percentage of NH_3 is low. In all cases, the total ammonia concentrations and pH values (based on EPA monitoring and site-specific monitoring data above) result in ammonia (NH_3) concentrations that are significantly lower than the 0.02 mg/L NH_3 threshold for "non-ionized ammonia" that is stipulated in the Quality of Salmonid Water Regulations (S.I. No. 293/1988). Annual average Environmental Quality Standards (AA-EQS) are set out in the Surface Water Regulations (2019) (S.I. No. 77/2019). Since transposition of EU law is the responsibility of Member States, annual average threshold values vary across EU states (EU, 2006)[10].

No statistically significant trend was noted. EPA data is not available pre-2010. EPA data from 2010 to 2024 are included in Table 9-18 to 9-20. Additional data is available for 2001 to 2010 however locations are not directly comparable to the locations shown on Figure 9-8.

[10] Directive 2006/118/EC on the protection of groundwater against pollution and deterioration and Directive 2013/39 EU as regards priority substances in the field of water policy.

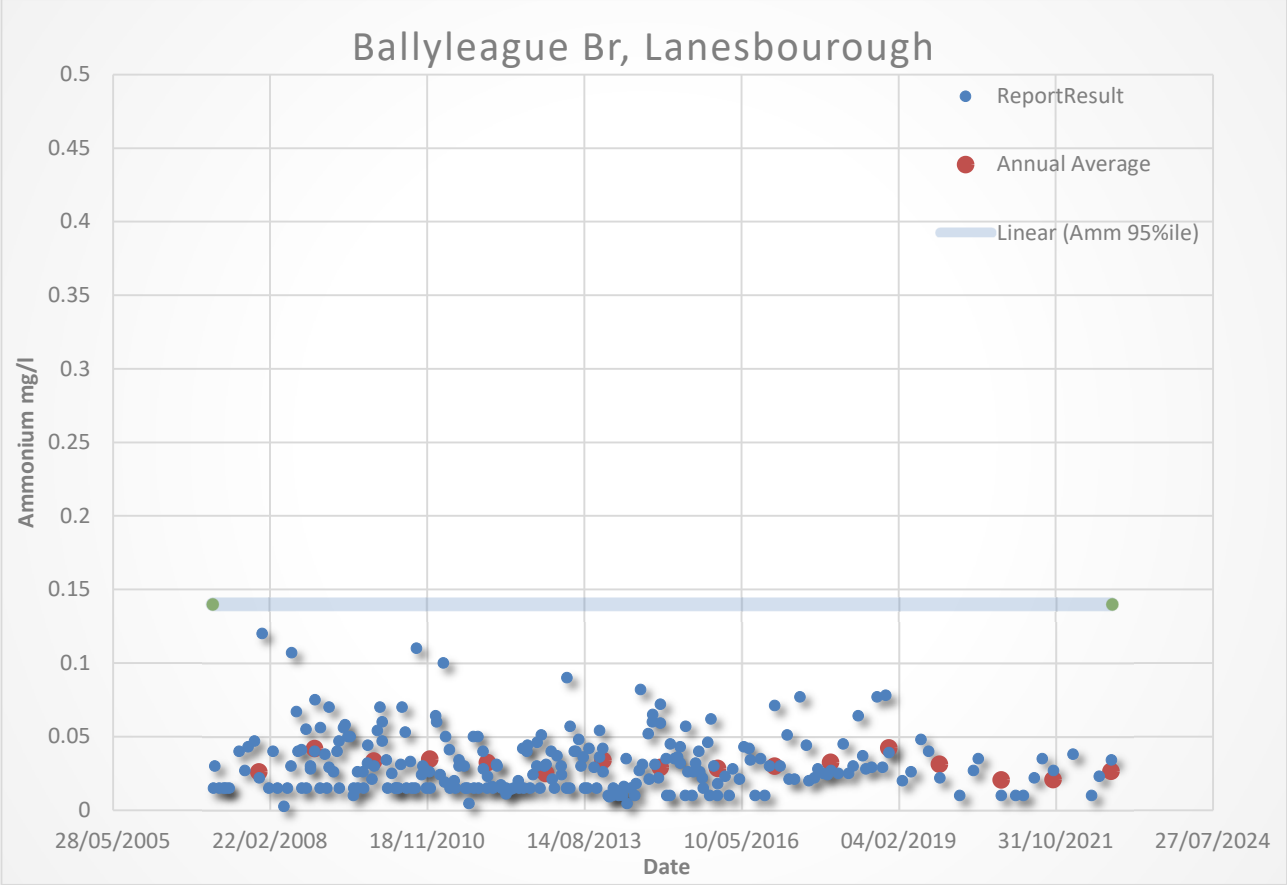


Figure 9-8: Ammonium Concentrations - Ballyleague Br

EPA data for Ballyleague (Station RS26S021590) are available since 2007, with a summary of collated from 2007 to 2023 provided in Table 9-21, indicating no significant overall trend. One annual exceedance for ammonium occurred in 2018 as detailed in Table 9-21. Laboratory Limits of Detection for Ammonium have decreased since 2010.

Table 9-21: Annual Average Ammonium Concentrations (mg/L) - Ballyleague Bridge, Lanesborough

EPA Monitoring Location - Ballyleague Br		
Year	Annual Average Concentration mg/L as NH4	Comply with WFD AA EQS for total ammonia
2007	0.035	Pass
2008	0.056	Pass
2009	0.039	Pass
2010	0.043	Pass
2011	0.041	Pass
2012	0.030	Pass
2013	0.040	Pass
2014	0.034	Pass
2015	0.035	Pass
2016	0.036	Pass
2017	0.033	Pass
2018	0.101	Fail
2019	0.031	Pass
2020	0.031	Pass
2021	0.028	Pass
2022	0.029	Pass
2023	0.023	Pass

The Fallan River, located upgradient of the Application Site (Station RS26F010200), was recorded as satisfactory. The catchment is dominated by agriculture – predominantly intensive pasture.

The Water Framework Directive (WFD) classified all the surface waters as at risk of not achieving good status by 2027 (www.epa.ie). Where waterbodies have been classed as At Risk, significant pressures have been identified. The significant pressure affecting the greatest number of waterbodies is agriculture, followed by hydromorphology, other[11], peat, domestic wastewater, urban wastewater, urban run-off, industry and forestry.

Orthophosphate:

The reported EPA orthophosphate concentrations at Ballyleague Bridge are below AA EQS standards and are included in Appendix 9.2. Typically, orthophosphate concentrations are low in peatland areas that are not developed for agricultural purposes.

Nitrate:

There is no reported exceedance above the EU Drinking Water Directive (2020/2184) maximum admissible concentration of 50 mg/l, or the groundwater threshold value of 37.5 mg/l (Protection of Groundwater Regulations, 1999 (S.I. No. 41/1999)).

[11] *Other – abstractions, aquaculture, atmospheric, anthropogenic pressures, historically polluted sites, waste, water treatment and invasive species have all been grouped into the "Other" pressure category for the purpose of this report

9.3.5 Hydrogeology/Groundwater

The information provided herein relates to the hydrogeology (groundwater) environment. It is provided to give context to the groundwater characteristics and flow patterns within and adjacent to the Application Site. Groundwater is water that has infiltrated into the ground to fill the spaces between sediments and cracks in rock.

9.3.5.1 Existing Groundwater Quality

The EPA Catchment data[12] describes the groundwater quality status of the Application Site in this area as 'Good'. These classifications are based on an assessment of the point and diffuse sources in the area that may affect the groundwater quality. The groundwater in this area is at risk from Diffuse agricultural source pollution (DIF). A WFD compliant assessment is included in Appendix 9-3.

9.3.5.2 Aquifer Potential and Characteristics

Reference to the GSI National Aquifer Map[13], as illustrated in PLACEHOLDER Figure 9-7, indicates that there are two types of Bedrock Aquifer underlying the Application Site. Derryaroge and Derryadd Bogs are underlain by a Regionally Important Aquifer – (Conduit) Karstified (Rkc). Lough Bannow Bog is underlain by a Locally Important Aquifer, which is Moderately Productive in local zones (Ll).

The subsoil deposits overlying the bedrock are not considered to be of sufficient lateral extent or depth to represent an aquifer body and are mainly comprised of peat deposits and low permeability limestone till, and alluvial/lacustrine deposits with occasional lenses of sand and gravel (refer to Chapter 8, Lands, Soil and Geology for further information).

Summarised below in Table 9-22 are the aquifer characteristics of the underlying aquifer and surrounding aquifers at the Application Site.

Table 9-22: Bedrock Aquifer Classification and Characteristics

Aquifer Classification	Permeability/Flow Mechanism	Karst Features
Regionally Important (Rkc)	Regionally Important Aquifer - Karstified (conduit)	Yes
Locally Important (Ll)	Productive only in Local Zones	No

The Application Site is underlain by The Funshinagh GWB, The Inny GWB and The Longford Balinalee GWB. The groundwater body descriptions are available from the GSI website[14] and the 'status' is obtained from the EPA website[15]. The GWBs underlying the Application Site are classified as being at 'Good' status. The Funshinagh WFD GWB is comprised of primarily of high transmissivity karstified

[12] https://www.catchments.ie/water-map/

[13] https://www.gsi.ie/en-ie/data-and-maps/Pages/default.aspx

[14] https://www.gsi.ie/en-ie/programmes-and-projects/groundwater/activities/understanding-ireland-groundwater/Pages/Groundwater-bodies.aspx

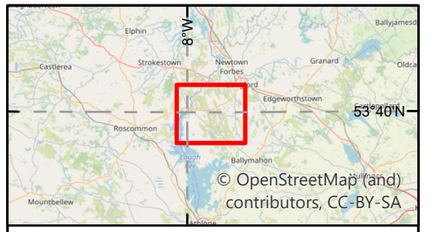
[15] https://gis.epa.ie/EPAMaps/Water

limestone. The Inny and Longford Balinalee GWB is comprised of low transmissivity and storativity rocks, described as Poorly Productive bedrock.

Groundwater flow paths within the aquifer are expected to follow the local surface water catchments. Adjacent to the rivers, water levels will be closer to ground level.

The GSI report that bedrock is close to the surface within 1km of the surrounding area of the Application Site. No significant dissolution features (i.e., karst) were observed from visual appraisal of the Application Site and no karst features are recorded on the GSI Karst Database of Ireland on or within a 1 km radius of the Application Site. Cordara Turlough is located 2.7 km southwest of Derryaroge bog. This is discussed further in Section 9.4.2.

8°0'0"W
7°55'0"W
7°50'0"W
53°42'0"N
53°39'0"N
53°36'0"N
771400
767500
763600
601000
605600
610200
N
Lm
Rkc
Rkd
Lk
PI
LI
© OpenStreetMap (and) contributors, CC-BY-SA



Legend

- Application Site

Aquifer Bedrock

- Rkc - Regionally Important Aquifer - Karstified (conduit)
- Rkd - Regionally Important Aquifer - Karstified (diffuse)
- Lm - Locally Important Aquifer - Bedrock which is Generally Moderately Productive
- Lk - Locally Important Aquifer - Karstified
- LI - Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones
- PI - Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones

0 1 2
Kilometers

NOTES

1. FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING\
2. ALL DRAWINGS TO BE CHECKED BY THE CONTRACTOR ON SITE\
3. ENGINEER TO BE INFORMED OF ANY DISCREPANCIES BEFORE ANY WORK COMMENCES\
4. ALL LEVELS RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD

A	26/02/2025	First issue	S.P	C.N
Rev	Date	Description	By	Chkd

Client: Bord na Móna

Project: Derryadd, Derryaroge and Lough Bannow Bogs - Application for Substitute Consent

Title: Figure 9-9: Aquifer Bedrock

Scale @ A3: 1:50,000

Prepared by:	Checked by:	Date:
S.Pezzetta	C.Naughton	February 2025

TOBIN
Tel: +353-(0)1-8030406
Email: info@tobin.ie
www.tobin.ie

Map Ref: 11400-012-Aq.B-S.BO-TOB-A

Draft: A

9.3.5.3 Groundwater Vulnerability

Groundwater vulnerability represents the intrinsic geological and hydrogeological characteristics that determine how easily groundwater may be contaminated by activities at the surface. Vulnerability depends on the quantity of contaminants that can reach the groundwater, the time taken by water to infiltrate to the water table and the attenuating capacity of the geological deposits through which the water travels. These factors are controlled by the types of subsoils that overlie the groundwater, the way in which the contaminants recharge the geological deposits (whether point or diffuse) and the unsaturated thickness of geological deposits from the point of contaminant discharge. The groundwater Vulnerability Categories are outlined in Table 9-23.

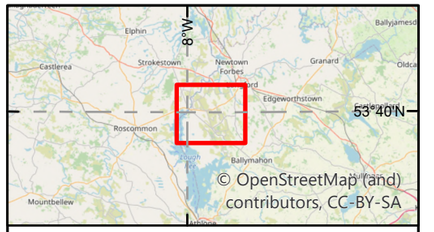
The groundwater vulnerability throughout the Application Site ranges from L (Low) to H (High). Figure 9-8 illustrates the vulnerability classifications for this area. Site investigation and geophysics data would indicate that >3 m subsoil deposits occur across the majority of the Application Site.

Table 9-23: Groundwater Vulnerability Categories

Sensitivity	Hydrogeological Conditions				
	Subsoil Permeability (Type) and Thickness			**Unsaturated Zone**	**Karst Features**
	High Permeability (Sand and Gravel)	**Medium Permeability (Sandy Subsoil)**	**Low Permeability (Clayey Subsoil/ Peat)**	**Sand and Gravel aquifers only**	**<30 radius**
Extreme (E)	0 – 3.0 m	0 – 3.0 m	0 – 3.0 m	0 – 3.0 m	-
High (H)	>3.0 m	3.0 -10.0 m	3.0 – 5.0 m	> 3.0 m	N/A
Moderate (M)	N/A	>10.0 m	5.0-10.0 m	N/A	N/A
Low (L)	N/A	N/A	>10 m	N/A	N/A

Notes: N/A Not Applicable:

8°0'0"W
7°55'0"W
7°50'0"W
53°42'0"N
53°39'0"N
53°36'0"N
771400
767500
763600
601000
605600
610200
N
© OpenStreetMap (and) contributors, CC-BY-SA



Legend

- Application Site

Groundwater Vulnerability

- Rock at or near Surface or Karst
- Extreme
- High
- Moderate
- Low
- Water

0 1 2
Kilometers

NOTES

1. FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING\
2. ALL DRAWINGS TO BE CHECKED BY THE CONTRACTOR ON SITE\
3. ENGINEER TO BE INFORMED OF ANY DISCREPANCIES BEFORE ANY WORK COMMENCES\
4. ALL LEVELS RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD

A	26/02/2025	First issue	S.P	C.N
Rev	Date	Description	By	Chkd

Client: Bord na Móna

Project: Derryadd, Derryaroge and Lough Bannow Bogs - Application for Substitute Consent

Title: Figure 9-10: Groundwater Vulnerability

Scale @ A3: 1:50,000

Prepared by:	Checked by:	Date:
S.Pezzetta	C.Naughton	February 2025

TOBIN
Tel: +353-(0)1-8030406
Email: info@tobin.ie
www.tobin.ie

Map Ref: 11400-013-GRD.V-S.BO-TOB-A

Draft: A

9.3.5.4 Groundwater Usage

A review of the drinking water supplies was undertaken. According to Longford County Council and Uisce Éireann data there are two groundwater schemes used as part of the Lanesborough Public Water Scheme (PWS) which is the nearest drinking water supply to the Application Site.

Lisrevagh borehole, is located 7.3 km to the east of the Application Site and abstracts groundwater for use in the Lanesborough PWS. The Lanesborough PWS is a borehole supply developed on the ESB power station site, which is located 2.5 km to the west of Derryaroge Bog, abstracts groundwater at Lanesborough PWS. Zones of Contribution (ZOCs) were delineated for the EPA in 2011. The ZOC of a groundwater source is effectively a groundwater catchment. They are influenced by the hydrogeology of a given area, and are determined from the considerations of:

- The total outflow at the source;
- The recharge to the associated groundwater flow system;
- Groundwater flow directions and gradients; and
- Subsoil and bedrock permeabilities.

Part of Derryaroge Bog is located within the Lanesborough Public Water Supply ZOCs. These abstraction points and zones of contribution are included in Appendix 9.2.

9.3.5.5 Groundwater Flow

On a regional scale, groundwater flow direction is generally a subdued reflection of surface water drainage. Therefore, with regards to the Application Site, on a regional scale, the groundwater flow is considered to be towards the surrounding tributaries and the rivers located to the east (Ballynakill River), and west (River Lough Bannow and River Derrykeel). Limited recharge to groundwater is likely to occur due to the low permeability peat, marl and till deposits on the Application Site. In Derryaroge bog a 500 m long, 3m deep bedrock exposure of well bedded mid grey fossiliferous limestones and calcareous shales occurs in a drainage ditch. No significant groundwater discharges or karst features occur at this location. No large springs (>100 m^3/day) were recorded on the Application Site based on a review of historical information, GSI mapping or during site walkovers. Local groundwater flow discharges to the local streams and drainage ditches in the Application Site and surrounding area.

Based on the measured groundwater levels in 2017 and 2018, groundwater flow in Derryadd and Lough Bannow is towards the Lough Bannow Stream and internal drainage ditches (40 to 41 mOD). The groundwater levels at the Application Site is below the levels of both Cordara and Fortwilliam Turloughs (43-47 mOD). Therefore, it is not possible for groundwater to discharge to either Cordara or Fortwilliam Turlough. Groundwater at the Application Site discharges to the site's arterial drainage network. Surface water discharge at Derryadd Bog is to Lough Bannow Stream and Ballynakill River. A conceptual site model is included below in Figure 9-9: East-West Conceptual model between bogs and Fortwilliam turlough. Based on SI data, groundwater flow in Derryaroge is towards the north east and north west.

Further to the west of the Application Site (>2.5 km), a karstic groundwater system has developed on a limestone plateau area, overlain by shallow soils and bare rock. Where soils are thin or absent the epikarst layer (i.e. the upper or shallow part of a karst system, in which water is stored before it percolates to underlying aquifers) is well developed. Most groundwater flows occur in an epikarstic layer a couple of metres thick[16]. Conversely where deep soils occur, the karstification is typically limited. Deeper groundwater flow can occur in areas associated with faults or dolomitisation.

[16] GSI GWB description
https://gsi.geodata.gov.ie/downloads/Groundwater/Reports/GWB/FunshinaghGWB.pdf

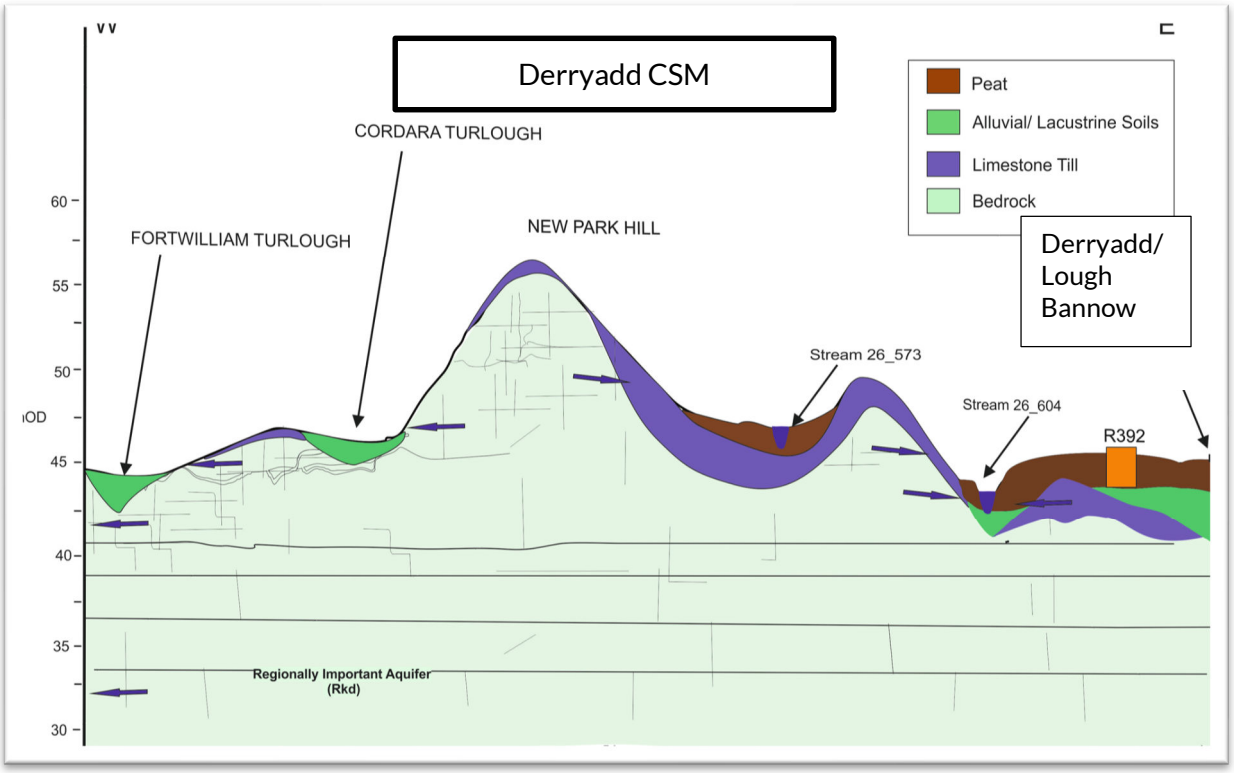


Figure 9-9: East-West Conceptual model between bogs and Fortwilliam turlough

Part of Lough Bannow bog is located on Dinantian Sandstones, Shales and Limestones of the Keel Inlier, which is part of the Inny GWB. This inlier is bounded to the southeast by a zone of normal step faults, downthrowing to the southeast. Groundwater in this area discharges to the site's arterial drains and to the Ballynakill stream. As outlined previously due to distance, aquifer type and groundwater flow directions there is also no complete source- pathway – receptor connectivity.

The Application Site covers an area of approximately 2,244 hectares, which is predominantly cutaway bog, divided by local and access roads.

9.4 ASSESSMENT OF SIGNIFICANT HYDROLOGICAL AND HYDROGEOLOGICAL EFFECTS

This section presents an assessment of remedial impacts on the hydrological and hydrogeological environment.

As detailed in Section 1.5. of this rEIAR, there is no legal requirement for EIA or screening for EIA in respect of any project prior to the latest dates for transposition of the EIA Directive (Directive 85/337/EEC). Accordingly, this application for substitute consent is confined to the development which took place after those dates. The baseline against which the environmental effects of the development required to be assessed has therefore, been identified as being the position as of July 1988.

However, as development commenced many years prior to those dates, in order to facilitate as complete an assessment as is possible of the development since July 1988, a description of the project

and of its environmental effects since commencement (1940s – 1988) is included in Chapter 4 Section 4.5.

9.4.1 Do-Nothing Scenario

A description on the approach to the 'Do-Nothing Scenario' in this rEIAR is presented in Section 2.11 of Chapter 2 (rEIA Methodology). Overall, considering the 'Do-Nothing Scenario' as it relates to hydrology and hydrogeology, had peat extraction activities not taken place at the Application Site after 1988, pre-existing drainage features would still be in place. Depending on the risk of flooding to the adjoining lands, some pump control or additional drainage channel may have remained. Pump capacities at pumping stations are designed based on a runoff rate of 1.7 L/s/Hectare (L/s/ha), which is less than the calculated predevelopment runoff rates. Runoff rates for the bare peatlands are greater than 5 L/s/ha therefore surface water tends to accumulate on site during the winter providing additional flood storage on site and reducing the potential for flooding off site.

In terms of water, the cessation of peat extraction and ancillary activities in 1988 in the Do-Nothing Scenario is unlikely to have resulted in a significant improvement in water emissions from the Application Site. In the Do Nothing scenario, natural revegetation of the bare peat would likely occur, which in turn reduces emissions of suspended solids and contaminants into surface water.

Under the do-nothing scenario, as there was no IPC Licence in place, the Cutaway Bog Decommissioning and Rehabilitation Plans associated with Condition 10 of same would not likely have been written. The EPA was established post 1988, following the enactment of the S.I. 7 of 1992 *Environmental Protection Agency Act 1992*. Other land uses may have occurred under the do-nothing scenario as a result of the cessation of peat extraction, including increased areas of commercial forestry and agricultural lands.

All types of pollution cause physico-chemical and biological changes in receiving waters and so the assessment of water quality and of water pollution may be approached from the physico-chemical or the biological aspect. Several studies including the followings have shown consistency between variations of biotic indices and fluctuations in physicochemical characteristics of water including McGarrigle et al. 1992. Q-Values show a particularly good relationship with annual median phosphate values in Irish rivers. Without a reduction in the use of phosphate from WWTPs, agriculture or improvement to hydromorphology, the lowland streams in the Shannon catchment were not likely to achieve good status in the short term. Phosphate concentration from cutover peatlands are generally low except where agriculture is developed on peatlands. There is no proposal for the conversion of peat extraction areas to agriculture.

9.4.2 Peat Extraction Phase (1988 – July 2019)

The overall area of the Application Site is approximately 2,244 hectares, of which approximately 2,000 hectares were used for the extraction of milled peat. A detailed review of the extraction areas is presented in Chapter 4 of this rEIAR which presents the areas under peat extraction at various stages of development between 1988 and 2019. Peat extraction was ongoing on the site prior to the baseline assessment year of 1988 with all areas within the Application Site subject to peat extraction.

Drainage for milled peat extraction was in place pre-1988 and there were limited changes to the drainage design since this time, as detailed in Chapter 4 of this rEIAR. Annual maintenance occurred on the peat drainage channels and silt ponds.

Potential associated effects are assessed in the following subsections.

9.4.2.1 Effects of Drainage on Bog Hydrogeology and Downstream Surface Water Hydrology

As mentioned, drainage measures at the Application Site were introduced several decades prior to the baseline assessment year of 1988. The volumes of peat extracted, and the depths of peat removed has been estimated using bulk quantities (tonnes) of extracted peat by Bord na Móna. The depth of peat before extensive extraction are estimated to have been in the region of 1 to 4 m. At present day however, only a small number of areas have deep peat cover, with between approximately 1m and 2.5m of peat. Areas within the more elevated areas of the Application Site have been stripped to the subsoil layer resulting from peat extraction operations. Recolonisation with scrub is occurring in these areas.

The effects on drainage (hydrology) and bog hydrogeology between 1988 and 2019 are characterised by small annual changes in topography (ground levels reducing) as peat was extracted, with minimal additional changes in baseline hydrology or hydrogeology. The concentration of suspended sediments increased but was within the IPC Licence emission limit values and accepted limits for aquatic organisms. Drainage results in an increase in specific conductivity of surface water and increases in mineral N (Ammonium & Nitrate). At the EPA Ballyleague Bridge monitoring station, concentrations of ammonium, nitrate and orthophosphate were below the respective SW regulations values.

Drainage from the Application Site was regulated by limiting discharges via drainage design, and specifically by routing all drainage via field drains, main drains, headland drains, then to silt ponds to outfalls, with final discharge to natural watercourses. In some areas, pumps assist with the discharge of surface water in this hierarchy.

The impact on the various receptors (i.e., receiving environment) are listed in Table 9-24 below. Overall, the maintenance of bog drainage between 1988 and 2019 would have had a **slight negative impact** on the hydrological and slight effect on the hydrogeological environment. The streams adjacent to the Application Site have a low to moderate sensitivity and low magnitude of effect. On this basis, there is a slight direct/indirect effect on the local streams and groundwater environment. As detailed in section 9.3.2, there is no significant effect on the River Shannon or groundwater supplies in terms of groundwater/surface water quality.

Table 9-24: Effects of Drainage on Receptors at the Application Site 1988-2019

Receptor	Impact on Receptor
Hydrogeology	Negative, slight, and indirect impact on local hydrogeology, long term
Hydrology	Negative, slight, reversible, long term and direct/indirect impact on surface water flows, in terms of quality and quantity of flow.

Bord na Móna's Cutaway Bog Decommissioning and Rehabilitation Plans include the targeted blocking of drains to allow re-wetting of areas, where suitable (see section 9.5.4 below).

9.4.2.2 Effects on Designated Sites

The groundwater within the Application Site discharges to surface water bodies situated around the Application Site. The designated sites in close proximity to the Application Site are listed in Chapter 7 Biodiversity. Because of the catchments in which the relevant designated sites are located, they are considered to be connected to the environment of the Application Site both hydrologically (surface water) and hydrogeologically (groundwater).

The following designated sites are located downgradient of the Application site:

- Lough Ree SAC [Site code: 000440]
- Lough Ree SPA [Site code: 004064]
- Lough Bawn pNHA [Site code: 001819]
- Lough Bannow pNHA [Site code: 000449]
- Lough Ree pNHA [Site code: 000440]
- Derry Lough pNHA [Site code: 001444]

The Royal Canal, located to the east of the Application Site is not hydrologically/hydrogeological linked to the site.

Two turloughs, Cordara Turlough pNHA and Fortwilliam Turlough SAC occur 2.6km and 3.9km to the southwest of Derryadd bog. Cordara Turlough is connected to Fortwilliam Turlough via a losing stream and excavated/man-made drainage ditch. As previously identified at Fortwilliam Turlough SAC, there is no conceptual link between the Application Site and Fortwilliam Turlough SAC, and the Application Site and Cordara Turlough pNHA. There is no hydrological/hydrogeological connection to Lough Slawn, 6 km to the south west.

The regional surface water drainage pattern is shown on Figure 9-2. The Application Site is located within the upper River Shannon catchment and upstream of the Lough Ree Special Area of Conservation (SAC) (Site Code 00440).

Figure 9-2 depicts Surface Water Features/Local Catchment Delineation in relation to site area' which includes a significant number of unnamed streams although EPA reference numbers have been applied for identification purposes. The Application Site is not located in a delineated area for action as set out in the 2018-2021 National River Basin Management Plan. While peat extraction occurred until 2019, the areas of peat extraction gradually reduced towards the latter portion of the Peat Extraction Phase.

No significant changes occurred near Lough Bawn pNHA. The drainage channels surrounding the Application Site remained in place throughout the Peat Extraction Phase. Rehabilitation within the Application Site was undertaken within the Bord na Mona site to the west of Lough Bawn pNHA boundary in 2017. Rehabilitation including drain blocking (5-7 drain blocks per 100m) on the western boundary of Lough Bawn pNHA was carried out by Bord na Móna. Separately to the drain blocking by Bord na Móna, commercial forestry was removed by Coillte who own land to the east of Lough Bawn.

The Application Site is located in the catchment area for Lough Ree SAC. As a result, changes to the hydrological/hydrogeological environment at the Application Site would most likely have had an indirect impact on the hydrological/hydrogeological environment of the SAC. It must be noted, however, that no Natura sites, including Lough Ree SAC, were designated at the commencement of Peat Extraction Phase (further information is provided in the Natura Impact Statement). The potential impact on Lough Ree SAC during the Peat Extraction Phase was not significant, negative and medium term.

9.4.2.3 Effects on Nearby Groundwater/Surface Water Abstractions

Two groundwater abstraction sites were active during the Peat Extraction Phase, i.e., the Lanesborough PWS (ESB borehole) abstraction and the Lisrevagh borehole. There were no known significant effects on the surface water or groundwater abstractions. There are no known groundwater abstraction wells within the Application Site. Effects under this heading would have been typically analysed/reviewed in terms of water quality and quantity. As mentioned previously, the EPA has recorded that surface water quality downgradient of the Application Site boundary is moderate and similar to the areas in the surrounding environment. The peat extraction and ancillary activities at the Application Site would not have had a significant effect on the water quality of the waterbodies since 1988.

As reported by the EPA and the GSI, groundwater sources, particularly public, group scheme and industrial supplies, are of critical importance in many regions. Consequently, the objective of Source Protection Zones is to provide protection by placing tighter controls on activities within all or part of the zone of contribution (ZOC) of the source. According to the GSI Source Protection Zone Maps[17] there is one Source Protection Zones within the Application Site or in the surrounding region. Due to the low permeability of the soils and subsoils and limited potential groundwater recharge, there is no known source pathway receptor and therefore peat extraction and ancillary activities would not have a significant effect. The potential impact on surface water/groundwater abstractions was not significant and long term.

9.4.2.4 Effects on Local Groundwater Wells/Supplies

Potential effects on local groundwater wells include effects on groundwater quantity, where the volume of water recharging into a particular aquifer has been altered by historic changes in bog recharge and drainage.

As per previous hydrogeology/hydrology sections, effects on groundwater from the perspective of quantity would have also been characterised by the groundwater vulnerability and recharge coefficients of the bog. Areas of 'Low' to 'Moderate' groundwater vulnerability would be less susceptible to major effects compared to areas of 'High' and 'Extreme' groundwater vulnerability. Areas where there is a low recharge coefficient (approximately 4%) also limit the impact. The Application Site is mostly characterised by these limiting environments, in the sense that, groundwater vulnerability is mostly 'Moderate', and the recharge coefficient is often low. Some dry soils around the Application Site have much higher recharge coefficients (between 20 % and 42.5 %).

Historically, the majority of recharge to the bedrock aquifers was from surrounding grassland and forestry areas. In terms of groundwater quality, the potential effects included contamination of groundwater via sources and pathways like pore space in peat, subsoil and bedrock. Any spillage of petrol/hydrocarbons on the Application Site or at workshop areas which infiltrated to groundwater, was likely to discharge to surrounding surface watercourses rather than reaching the underlying bedrock aquifer. This again was linked to low recharge and moderate groundwater vulnerability across much of the Application Site. The potential impact on local groundwater supplies was not significant and long term.

9.4.2.5 Effects on Water Quality

Due to the fact that drainage of the peatland occurred between the 1940s and 1960s and peat extraction commenced across all areas by 1964, the main effects of draining the Application Site occurred 25-40 years prior to 1988.

The Application Site has been moderate in terms of water quality since regular monitoring commenced. The waters of the catchment area are of moderate quality with Q-values being consistently between Q3 and Q3-4 throughout the years. As discussed previously, the water quality of the Ballynakill River is between Q3 and Q4. No increase in water quality was recorded in 2019-2023, following the cessation of peat extraction. All monitoring results for Lough Ree and River Shannon are below AA-EQS limits for ammonium.

The effects of drainage may also have accelerated peat decomposition and reduced dissolved and particulate organic carbon retention within the peat. Carbon effects are addressed in Chapter 15 Climate.

[17] https://www.gsi.ie/en-ie/programmes-and-projects/groundwater/Pages/Data-and-Maps.aspx

Peat extraction activities can result in an increase in levels of sediment and nutrient runoff and therefore impact on the aquatic ecology of the receiving waters in the catchments draining the area. Water quality, as indicated by Q-values, were moderate over an extended period between 1988s and the present day. Given that there has not been any significant deterioration or changes in water quality since 1988 and that the overall water quality of the region is moderate, it is concluded that peat extraction activities did not have a long-term impact on the overall water quality in the area.

Given that there have not been any broad changes in water quality over the course of the EPA monitoring timeframe and that the overall water quality of the region is moderate, it is concluded that peat extraction activities did not have a significant effect on the overall water quality in the area.

9.4.2.6 Site Services

Water consumption across the Application Site would have primarily been at the Mountdillon Works for the workshop. The water supply since 1988 is from the Lanesborough Public Water Scheme (PWS) which was supplied from two groundwater boreholes; one located at Lisreevagh to the west, and one located to the northwest next to the former Lanesborough Power Station (LPS).

Wastewater from the welfare facilities at the Mountdillon Works was, discharged to an on-site septic tank with the effluent discharged to a percolation system through peat before penetrating to ground. The septic tank was inspected and desludge annually by a licenced waste permit holder to ensure the treatment system was working optimally. The tank was installed since pre-1988. No issues with the existing septic tank were noted during the site visits.

It is concluded that activities did not have a significant effect on the overall water environment

9.4.3 Current Phase (July 2019 – Present Day)

The Current Phase includes the period of time between the cessation of peat extraction at the Application Site in 2019 to the present day.

The Current Phase of the Project includes all activities carried out at the Application Site from the cessation of peat extraction in July 2019 to the present day.

Decommissioning of the peat extraction activities is currently underway across the Application Site in accordance with Condition No. 10 of the IPC Licence which states the following:

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

Condition 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 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 IE 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 at the Application Site to enable peat extraction. This list is then refined to identify any items that would be deemed as possibly resulting in environmental pollution, should they not be removed. Decommissioning activities are detailed for each of the three bogs within the Application Site in Appendix 4.3.

As required by the Licence, waste items are and will continue to be removed for recycling or disposal, using external contractors with the required waste collection permits, approved under Condition 7.2, and waste records are and will continue to be maintained as required under Condition 7.3. The validation of the success of compliance with Condition 10.1 of the IPC Licence is carried out through an Independent Closure Audit (ICA) which is followed by an EPA Exit Audit (EA) and the eventual partial or full surrender of the licence.

9.4.3.1 Effects of Drainage on Bog Hydrogeology and Downstream Surface Water Hydrology

In compliance with Condition 10.1 of the IPC Licence, it is a requirement of the licensee to decommission the Application Site by removing/disposing/recovering buildings, equipment, waste etc. from the Application Site. The main criteria pertaining to successfully complying with this condition is ensuring that the Application Site is not causing or likely to cause environmental pollution and the site of the activity is in a satisfactory state such that licenced lands can be deemed suitable for surrender of the IPC 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 extraction operation at the Application 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.

Ongoing decommissioning at the Application Site included removal of peat stockpiles which was completed in November 2022, as well as decommissioning of other infrastructure, which is to follow at a later date, outlined in Table 9-25. As outlined in Chapter 4, approximately 37km of permanent rail track was located within the Application Site boundary. To date 1km of permanent rail has been decommissioned and removed in the south of Lough Bannow Bog. The remaining 36km of rail track will be decommissioned as part of the overall decommissioning programme for the IPC Licence. Decommissioning activities are detailed for each of the three bogs within the Application Site in Appendix 4.3.

Table 9-25: Future decommissioning items for Application Site

Item	Description	Application Site Decommissioning Plan
1	Clean-up of remaining or unconsolidated waste or materials located in Bogs, Yards, Buildings and Offices	Relevant to All Bogs
2	Clean silt ponds	Relevant to All Bogs
3	Decommission peat stockpiles	Completed November 2022
4	Decommission or remove buildings and compounds	Relevant to All Bogs
5	Decommission fuel tanks and associated facilities	Relevant to Derryadd Bog
6	Decommission and removal of septic tanks	Relevant to Derryadd Bog
7	Decommissioning and removal of a number of existing bog pumps where suitable/necessary	Relevant to All Bogs

The Peatland Climate Action Scheme (PCAS) is a programme of enhanced peatland rehabilitation measures with the primary aim of optimising climate action benefits of rewetting former industrial peat extraction areas by creating soggy peatland conditions that will allow compatible peatland habitats to redevelop.

This scheme is in addition to the IPC Licence requirements and therefore does not form part of this substitute consent application and is being applied at specific locations across the Bord na Móna landbank that are identified as suitable for the prescribed enhancement measures.

The scope of the rehabilitation measures for the sections of Derryaroge (north and west) that are currently active under the PCAS Programme include the following, which are directly taken from Section 8 of the Derryaroge Cutaway Bog and Decommissioning and Rehabilitation Plan 2023 (included in Appendix 4-3, which is also publicly accessible on the Bord na Móna PCAS website[18]):

Derryaroge North and West:

- *Re-assessment of the pumping regime and removing pumps if this desired and has no significant external impact. A significant part of the site has already developed a mosaic of wetland habitats with deeper water. Hydrological modelling will look to optimise water levels. Hydrological management will look to optimise summer water levels to maximise the development of wetland vegetation (by looking to set water depths at < 0.5 m, where possible. It is inevitable that some sections will naturally have deeper water due to the topography at this site). Water-levels will be adjusted at outfalls and by adjusting piped drainage. More sustainable permanent gravity drainage solutions will be examined. Some targeted bunding may be required. It is expected that a natural seasonal flooding regime will develop, with water levels fluctuating in association with levels in the adjacent River Shannon Less intensive measures (targeted drain-blocking) will be used in areas where habitats have already established.*
- *Intensive drain blocking and construction of berms in shallow peat areas/modelled depressions to create/promote the spread of wetland habitats*
- *Regular drain blocking (3/100) on dry cutaway along with the blocking of outfalls and management of water levels,*
- *Re-alignment of piped drainage*
- *Deep Peat measures including field re-profiling, resulting in bunded areas suitable for Sphagnum inoculation, on deeper peat*
- *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*
- *Initial hydrological modelling indicates that a small part of the site will develop a mosaic of wetland habitats with the potential for some deeper water. Hydrological management will look to optimise summer water levels to maximise the development of wetland vegetation by looking to set water depths at < 0.5 m, where possible. It is inevitable that some small sections will naturally have deeper water due to the topography at this site). Water-levels will be adjusted at outfalls and by adjusting piped drainage.*

These rehabilitation measures are ongoing on the relevant lands within Derryaroge Bog.

Discharge volumes from the Application Site to nearby surface watercourses are comparable to surface water discharges during the Peat Extraction Phase. No additional mitigation measures are deemed necessary as the conditions, emission limit values set out in the IPC licence are designed in accordance with the relevant legislation to ensure ongoing protection of groundwaters and surface waters. There are no significant effects of drainage on bog hydrogeology and downstream surface water hydrology as a result of the Current Phase of the Application Site.

9.4.3.2 Effects on Designated Sites

There is no hydrogeological connection to Fortwilliam Turlough SAC or Cordara Turlough pNHA as detailed in Section 9.5.2. The Application Site is hydrologically linked with the Lough Ree SAC and SPA. The potential effects on receiving waters (in terms of water quantity and water quality) are similar to but less as those outlined in Section 9.5.2 due to the reduced site activity. As the Application Site

[18] https://www.bnmpcas.ie/wp-content/uploads/sites/18/2023/06/Derryarogue-Final-Rehab-Plan-2023-v12.pdf

contributes less than 0.5% of the catchment area to Lough Ree the potential for significant effects is low. Lough Bawn pNHA is located on the boundary of Lough Bannow bog. There are no discharges to the Lough Bawn pNHA. Based on the site walkover, the mire is saturated and there are no significant effects as a result of Application site activities.

9.4.3.3 Effects on Nearby Groundwater/Surface Water Abstractions

No significant effect on local groundwater abstractions will have occurred between the cessation of peat extraction in July 2019 to present day. Drainage and hydrogeology of the Application Site are not significantly changed during this period.

9.4.3.4 Effect on Water Quality

During the Current Phase some limited activity at the Application Site is required to comply with the IPC licence requirement. This involves the use of machinery and plant with which there is a risk of accidental spillage of hydrocarbons. The Mountdillon Works remained occupied and discharges from wastewater systems (septic tanks) etc. have the potential to cause surface water and groundwater contamination. These effects are the same as those outlined in Section 9.4.2 but with lower site activity due to the lower volumes of plant, machinery and workers operating at the site during the Current Phase.

9.4.3.5 Site Services

Water consumption across the Application Site would have primarily been at the Mountdillon Works for the workshop. The water supply since the 1988 is from the Lanesborough Public Water Scheme (PWS) which is supplied from two groundwater boreholes; one located at Lisreevagh to the west, and one located to the northwest next to the former Lanesborough Power Station (LPS).

Wastewater from the welfare facilities at the Mountdillon Works was, and currently is, discharged to an on-site septic tank with the effluent discharged to a percolation system through peat before penetrating to ground. The septic tank is inspected and desludge annually by a licenced waste permit holder to ensure the treatment system is working optimally. The tank is in place since pre-1988. No issues with the existing septic tank were noted during the site visits.

It is concluded that activities have and will not have a significant effect on the overall water environment.

9.4.4 Remedial Phase

9.4.4.1 Effects of Drainage on Bog Hydrogeology and Downstream Surface Water Hydrology

During the Remedial Phase the Application Site will operate in accordance with IPC Licence requirements until such a time as the licence is surrendered. Silt ponds will be maintained as required. The Cutaway Bog Decommissioning and Rehabilitation Plans aim to rehabilitate the bogs of the Application Site. The Application Site cannot be restored back to raised bog, as the majority of peat has been removed and the environmental conditions have been modified. However other natural habitats have started to develop, such as poor fen, heath, wetlands/reedbeds and birch woodland on shallower peat. In time areas of *Sphagnum* rich embryonic bog communities (on deeper peat) and areas or naturalised peatland can be developed.

The River Basin Management Plan (RBMP) is the key national plan for Ireland to achieve the objectives of the Water Framework Directive (WFD). The current RBMP plan is the Water Action Plan 2024. In broad terms, the objectives of the WFD are to prevent the deterioration of water bodies and to

protect, enhance and restore them with the aim of achieving at least good status and to achieve compliance with the requirements for designated protected areas. Peatland rehabilitation of Bord na Móna cutaway was part of the RBMP (2018-2021) programme of measures. The RBMP 2018-2021 took 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 and will look to implement best-available measures to further reduce water quality impacts caused by peat extraction while the phasing-out process is taking place. This RBMP 2018-2021 rehabilitation target was accelerated by Bord na Móna's' de-carbonisation programme and the Peatland Climate Action Scheme (PCAS). These measures are included in the Water Action Plan 2024.

The Cutaway Bog Decommissioning and Rehabilitation Plans, PCAS and the delivery of peatland rehabilitation by the Applicant is expected to have a positive impact on water quality and will help the deliver its objectives in relation to the Water Framework Directive and is one of the five key actions. Rehabilitation works will result in improvements in water quality, although depending on site-specific factors. While research is limited on the long-term restoration of peatlands, ammonium and DOC concentrations are likely to be reduce over time. Ammonium concentrations at rehabilitated peatlands are typically higher than intact raised bogs.

Discharge volumes from the Application Site to nearby surface watercourses will be comparable to surface water discharges during the Peat Extraction Phase. The flow rates in internal drains will decrease when the sides of the drain are changed from bare peat to vegetation due to increased surface friction. The vegetated area also increase filtration of water, oxygenates the water and absorbs nutrients such as nitrogen and phosphorus. The exact impact will depend on factors like the type of grass, the density of the vegetation, and the overall maintenance of the drain.

No additional control measures are deemed necessary as the conditions and emission limits set out in the IPC Licence are designed in accordance with the relevant legislation to ensure ongoing protection of groundwaters and surface waters.

9.4.4.2 Effects on Designated Sites

There is no hydrogeological connection to Fortwilliam Turlough SAC or Cordara Turlough pNHA as detailed in Section 9.5.2. The Application Site is hydrologically linked with the Lough Ree SAC and SPA. The potential effects on receiving waters (in terms of water quantity and water quality) are similar to but less as those outlined in Section 9.5.2 and 9.5.3 due to the reduced site activity. As the site contributes less than 0.5% of the flow to Lough Ree, there are no likely significant effects. There are no significant effects on Lough Bawn as a result of the Remedial Phase.

9.4.4.3 Effects on Nearby Groundwater/Surface Water Abstractions

No effect on local groundwater abstractions are likely to occur from the rehabilitation of the site. There is limited infiltration of rainwater to ground on the Application Site. cessation of peat extraction activities in July 2019 to the present day. Drainage and hydrogeology of the Application Site are unchanged during this period.

9.4.4.4 Impact on Water Quality

Decommissioning of the peat extraction activities associated with the IPC Licence is currently underway across the Application Site. Monitoring data show that downstream water quality is not significantly altered since the cessation of peat extraction. This is potential due to other activities in the catchment (agriculture on peat/poorly drained soils, forestry and wastewater) affecting water quality and remained largely unchanged during the Peat Extraction Phase. The impact on downstream

surface water quantity is unlikely to be significant, as drainage systems were designed to limit runoff to greenfield rates.

Following the implementation of the PCAS and proposed Decommissioning and Rehabilitation Plans, the bogs will become wetter, retain more water, and gradually recolonize with vegetation. Over time, they will develop into a wetland mosaic with a reduced silt and nutrient outputs. As a result, the residual effects of these plans are expected to have a moderate, positive, indirect, and long-term impact on downstream surface water hydrology and water quality.

The validation of the success of compliance with Condition 10.1 of the IPC Licence is carried out through an Independent Closure Audit (ICA) which is followed by an EPA Exit Audit (EA) and the eventual partial or full surrender of the licence.

9.4.4.5 Site Services

Water consumption across the Application Site will occur at the Mountdillon Works. The water supply will be supplied from the Lanesborough Public Water Scheme (PWS) .

Wastewater from the welfare facilities at the Mountdillon Works will be discharged to an on-site septic tank with the effluent discharged to a percolation system through peat before penetrating to ground. The septic tank will be inspected and desludged annually by a licenced waste permit holder to ensure the treatment system is working optimally.

Given that there have not been any broad changes in water quality over the course of the EPA monitoring timeframe and that the overall water quality of the region is moderate, it is concluded that decommissioning activities will not have a significant effect on the overall water quality in the area.

9.5 CONTROL AND MONITORING MEASURES

With the exception of silt control (which from 1974 was subject to a formal management program as discussed in Chapter 4), formal documentation outlining dedicated measures referred to as control measures practised on site from 1948 - July 1988 are not available. However, based on personal communication with a retired Bord na Móna manager, the following measures below were enacted at the Application Site as part of daily, monthly, and annual bog management and operations and were outlined in the IPC Licence application submitted to the EPA in 1999.

Emissions to Water

The IPC Licence, granted in 2000, sets out specific conditions in relation to emissions to water.

An emission limit value (ELV) for suspended solids of 35mg/l is set out in Schedule 1(i) of the IPC Licence. A schedule for surface water monitoring of emissions is set out in Schedule 1(ii) of the Licence and detailed in Condition 6.2. This condition required the preparation of a surface water monitoring programme at discharge locations, which was established and implemented across the licensed area, including the Application Site. This monitoring programme had regard to the status of each bogland, sensitivity of the receiving watercourse and status of silt pond measures. The Licence also required the preparation of an operational procedure for de-silting of the silt ponds and a roster for visual inspections. The Licence required an upgrade of the sedimentation pond treatment system. Existing silt ponds serving operational bogs during this time were required to achieve the following criteria:

- Maximum flow velocity <10cm/s; and
- Silt design capacity of lagoons, minimum 50 m^3 per nett hectare of bog serviced.

All licence requirements were implemented and continue to be implemented across the licensed areas.

In respect of silt control, the control measures and procedures implemented across the bogs were required to ensure that:

- Drainage manholes were protected from excessive peat, and new manholes and outfalls were set well back from turning grounds;
- Headlands were kept clean and free from loose peat;
- Silt run-off, while piping or ditching, was minimised;
- Drains were ditched in dry weather;
- Field drains were cleaned regularly, particularly after stockpile loading;
- All fields that were milled were ridged at the end of production season; and
- All fields liable to winter flooding were cleared of milled pilled or re-compacted at the end of the extraction season.

Further to emission control, surface water and groundwater protection measures were required at the workshop and depots. This included the following typical control measures:

- Bunded storage areas were used for tanks and drums and the integrity of bunded area were maintained on a continuous basis to ensure water tightness;
- Loading and unloading of fuel tanks were carried out in designated areas to protect against spillage;
- There were no discharges to off-site surface waters, off site storm drains or groundwaters;
- Monitoring and analyses of surface water discharges was carried out in accordance with *Schedule 3 Monitoring of Workshop/Depot Surface Water Run-off* of the licence;
- Measures were implemented in the event of contamination of surface waters, including;
    - Immediate investigations to identify and isolate the source of the contamination;
    - Put measures in place to prevent further contamination and to minimise the effects of any contamination on the environment; and
    - Notify the Agency as soon as practicable.
- Oil interceptors were fitted in areas of run-off and maintenance and cleaning logs were maintained on a continuous basis of same;
- Bi-annual inspections were made of septic tank;
- Washing down and servicing areas of plant and machinery were carried out in designated areas with suitable systems for collection, containment and if necessary, treatment; and
- Records of inspections and any damage or leaks in rolling stock that could result in accidental spillage were maintained on a continuous basis.

Bord na Móna's *Environmental and Operational Procedures for the Protection of Surface Water* is provided in Appendix 4.13 and details the procedures established following the introduction of the IPC Licences. Ammonia levels fluctuate across all years, with the exception of 2022, where it was below the threshold. Total suspended solids were below the IPC limits across all years.

9.5.1 Peat Extraction Machinery – Maintenance Programmes and Storage

- All peat extraction machinery listed in Section 4.4.4 were stored either at the Mountdillon Works, or at machine storage locations in Derryaroge, Derryadd, or Lough Bannow bogs at the end of the workday;
- All machinery was regularly inspected, serviced and maintained;
- All machinery was regularly cleaned via power steam wash system at a wash bay which drained into a fuel/oil interceptor unit and associated gravel soak pit. The interceptor unit facilitated the removal of any oil/grease components. This was done to minimise dust and particle release; and,
- A self-contained machine parts washer was located in the workshop at the Mountdillon Works.

9.5.2 Refuelling Facilities

Refuelling and maintenance of all vehicles were undertaken at the Mountdillon Works, or at machine storage locations in Derryaroge, Derryadd, or Lough Bannow bogs. When machinery required refuelling on the Application Site, it was carried out by a mobile (rail or tractor-transported) fuelling unit which travelled out from the Mountdillon Works to the bogs where the machinery was located. Refuelling procedures were upgraded to standard bunding specifications to comply with IPC Licence requirements in 2000 (refer to Section 4.4.5.4 for details).

The following emergency action procedure was implemented at the Application Site prior to IPC Licencing (i.e., pre-2000):

1. When a spill occurred, the General Manager was immediately informed of the incident;
2. The spill was required to be assessed by the General Manager for potential risk to the health and safety of employees and the potential environmental consequences;
3. If there was a risk of explosion, all personnel were required to be evacuated from the area;
4. The spill was sourced, isolated and contained with polystyrene booms or dry peat (moisture content of 10%);
5. All efforts were made to prevent the spill from entering a storm drain or nearest outfall;
6. Once the spill had been contained, a suitable absorbent (e.g., dry peat) was to be used to soak the spillage;
7. All possible ignition sources such as electoral equipment, naked lights, machinery were removed from the area. Any combustibles in the spill area were removed;
8. Follow up action measures taken includes the implementation of appropriate remedial work to prevent such a spillage recurring in the future; and,
9. In the event of a significant spillage, the General Manager was required to notify the local authority.

9.5.3 Bog Hydrogeology and Downstream Surface Water Hydrology

Derryaroge, Derryadd and Lough Bannow bogs were regulated by the EPA under IPC Licence (Reg. No. P0504-01) since early 2000. No additional control measures, other than compliance with the control measures, regulated by the EPA, are considered necessary in terms of protecting groundwater quality. The list below outlines the relevant control measures conditioned under the IPC Licence, as regulated by the EPA:

- Effective spill/leak management of mobile fuelling 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;
- With the exception of 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 (Bord na Móna) 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.

In terms of groundwater quantity and hydrology (surface water runoff), or volumetric flows to surface water impacted by groundwater drainage of the bogs, control measures that were in place included:

- Field drains with low gradients;
- Silt ponds, as well as being a control measure for sediment from the bog, also acted as attenuation measures for higher flows during peak rainfall events. Each metre length of silt pond provides approximately 12m3 of water storage, which aided in slowing down the discharge from the bog;
- Silt ponds were cleaned at least twice a year to maintain adequate storage and treatment (sedimentation/settlement) capacity; and
- Pump capacities at pumping stations were designed based on a runoff rate of 1.7 l/s/Ha, which is less than the greenfield runoff rates. Runoff rates for the peatlands are greater than 5 l/s/HA therefore surface water tends to accumulate on site during the winter providing additional flood storage on site and reducing the potential for flooding off site.

9.5.4 Designated Sites

No additional measures are required for designated sites. Measures in place for designated sites are the same as above for Section 9.4.2.1.

9.5.5 Contamination of Soil/Groundwater by Leakages and Spillages and Alteration of Peat/Subsoil/Bedrock Geochemistry

Measures that mitigated against contamination of peat, subsoil and bedrock are presented below:

- Effective spill/leak management of mobile fuelling 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;
- With the exception of 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; and
- Inspections and monitoring of wastewater systems and associated discharges.

9.5.6 Nearby Groundwater/Surface Water Abstractions

Potential effects on GWS/PWS have been assessed for the Application Site. Part of Derryaroge Bog is located in the ZOC for Lanesborough however no effects were identified. Derryaroge Bog is underlain by deep subsoils and no spills or contaminated were noted in the area by TOBIN during the site walkovers. The control measures that have protected these water sources are the same as those outlined in Chapter 4 and Section 9.4.3 relating to spills/leakages on the bog units. The implementation of these measures has protected groundwater quality and eliminated any effects on water quality in the underlying aquifer and at downstream water supply source locations.

The control measures that have protected these local groundwater wells/supplies are the same as those outlined in Section 9.5, relating to spills/leakages on the bog units. The implementation of those measures has protected groundwater quality and eliminated any effects on water quality in the underlying aquifer and at downstream local groundwater wells/supplies.

9.5.7 Impact on Water Quality

During this period the Application Site will continue to operate under IPC licensing requirements with respect to surface water discharge quality and quantity.

Any works undertaken for the Decommissioning and Rehabilitation Plans will be completed under licence from the EPA with the Applicant reporting to the EPA until the IPC Licence is surrendered. PCAS measures will be undertaken as per the submitted PCAS plans.

As required by the Licence, waste items are and will continue to be removed for recycling or disposal, using external contractors with the required waste collection permits, approved under Condition 7.2, and waste records are and will continue to be maintained as required under Condition 7.3. The validation of the success of compliance with Condition 10.1 of the IPC Licence is carried out through an Independent Closure Audit (ICA) which is followed by an EPA Exit Audit (EA) and the eventual partial or full surrender of the licence.

Measures that mitigated against contamination of waters are outlined in Section 9.5 and will be being adhered to at the Application Site.

9.6 RESIDUAL EFFECTS

Between 1988 and 2019, hydrological and hydrogeological changes at the Application Site are limited. The main effects were the ongoing discharge of surface water runoff which was controlled by a series of pumps and silt ponds. All effects and risks associated with the peat extraction works were suitably mitigated and controlled in order to prevent and/or minimise the significance of any potential impact. Overall, the hydrological and water quality impact for the period of 1988 to 2019 was slight, direct negative and reversible. The hydrogeological impact for the period of 1988 to 2019 was slight, indirect negative and reversible.

The Current Phase involves stabilising the remaining peat deposit and setting it on a path to rehabilitation. This process is continuously improving the conditions of the bogs which will continue to reduce the effect of residual effects. Where shallow depths of water occur, rapid colonisation by wetland species is occurring. The Current Phase impact on hydrology, hydrogeology and water quality is slight, direct, medium term and positive.

The Remedial Phase of the bogs life cycles will further stabilise the remaining peat deposit and set it on a path to rehabilitation. Based on the PCAS and Decommissioning and Rehabilitation Plans, this process will improve the conditions of the bogs and continue to reduce the effect of residual effects on

hydrology and hydrogeology. The Remedial Phase impact on hydrology, hydrogeology and water quality is slight to moderate, direct, long term and positive.

9.7 CUMULATIVE AND INDIRECT EFFECTS

Cumulative effects of this project with other developments in the region, relate to the effects on Hydrology, Hydrogeology and Water Quality. These developments include other existing or planned developments in the environs of the Application Site and/or developments with the potential to interface with the bog in terms of environmental effects.

A cumulative impact assessment of the subject peat extraction and all ancillary works and other relevant development was undertaken with the purpose of identifying what influence the subject development has had, or potentially could have, on the surrounding environment when considered cumulatively and in combination with relevant permitted, proposed and constructed projects and other land-uses in the vicinity of the site. Cumulative impacts are defined as '*impacts that result from incremental changes caused by other past, present or reasonably foreseeable actions together with the project*[19]'.

Assessment material for this cumulative impact assessment was compiled on the relevant developments within the vicinity of the Application Site with reference to Guidance contained in Section 3.7 of the Guidelines on the information to be contained in Environmental Impact Assessment Reports (EPA, 2022) and Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions (EC, 1999). The material was gathered through a search of relevant online Planning Registers (e.g. Longford County Council's and ABP's online planning portals), reviews of relevant EIAR documents, planning application details and planning drawings in order to identify past and future projects, their activities and their environmental impacts.

The types of relevant developments considered for cumulative assessment within this study area and considered in this rEIAR include, but are not limited to those associated with:

- Extractive industries,
- Industrial developments,
- Agriculture,
- Forestry,
- Renewable energy.

9.7.1 Projects Considered in Cumulative Assessment

As outlined in Section 2.9.2 the projects considered in relation to the potential for cumulative effects, and for which all relevant data was reviewed, include existing and historical large-scale developments in operation surrounding the Application Site. This included developments which were constructed prior to 1988 but were operational between 1988 and the present day at the same time as the peat extraction works, as well as developments which were built after 1988 and operational at the same time as the peat extraction works.

The developments identified are listed in Table 2-3 to 2-5 and the main projects with potential cumulative effect on the land use, soils and geological environment are described in the subsequent sections. To account for the potential effects which may occur from the ongoing current of the peat extraction works at the Application Site and the future rehabilitation of the lands in accordance with

[19] Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions, European Commission, 1999

the IPC Licence requirements, consideration was also given to the planned future uses of the lands within the Application Site, namely for renewable energy development as well as enhanced rehabilitation under the Peatlands Climate Action Scheme (PCAS).

The various projects are detailed in Chapter 2, Section 2.9 of this EIAR. An assessment of the relevant cumulative effects is discussed below.

9.7.2 Peat Extraction Phase

Lanesborough Power Station

Lanesborough Power Station (LPS) was constructed in 1958, 30 years before the baseline assessment time period year of 1988 and prior to commencement of formal planning legislation in Ireland. Therefore, only the operation of the plant since 1988 until it was decommissioned in 2004 and demolished in 2007 is relevant for the cumulative impact assessment. Peat extracted from the bogs at the Application Site was transferred to the power station by a dedicated rail line.

Based on the 2018 ground investigation undertaken by ESB at the existing LPS, no discernible cumulative contamination of groundwater was found. The existing Landsborough Public Water Supply on the LPS site was in operation throughout the before, during and after the operational period for the Application Site. Based on the available EPA water quality data, there was no deterioration in surface water quality during the operational or post operational period. Q values at Lanesborough Ballyleague Br were similar during operation and post operation, i.e. Q3 in 2020 and 2023.

Lough Ree Power Station (2004 – 2019) and Derraghan Ash Disposal Facility (ADF)

Lough Ree Power Station (LRPS) was commissioned in 2004. The 100 MW generating station replaced the nearby 85 MW Lanesborough Power Station. Lough Ree Power had a 15-year contract to burn peat supplied by Bord Na Móna and closed at the end of 2019. The existing Lanesborough Public Water Supply on the LRPS site was in operation throughout the operational period. Based on a review of the EPA water chemistry data and Q values for Lanesborough there was no significant change in water quality since the closure of the cessation of peat harvesting activities or power station, the development did not give rise to any significant cumulative impacts with regards to hydrology, hydrogeology, and water quality. Q values at Lanesborough Ballyleague Br were similar during operation and post operation, i.e. Q3 in 2020 and 2023.

The Derraghan Ash Disposal Facility (ADF) was constructed in 2004 to manage ash produced from the Lough Ree Power Station. Consent for the facility was provided for as part of the power station. The ADF is located 0.5km west of Lough Bannow Bog. The site occupies an area of approximately 33 ha within the Derraghan Bog, which is also part of the Mountdillon Bog Group. The ADF was designed to exclusively accept peat ash from the power station.

The ADF was operated in accordance with an Industrial Emissions (IE) Licence (Reg. No. P0610-02) issued by the EPA. This Licence covers both generation and ash disposal facility activities. The facility is maintained by the ESB with ongoing aftercare and maintenance.

Ash was transported from the Lough Ree Power Station exclusively by Bord na Móna rail line, which traversed the Application Site bogs between the power station and ADF, crossing under the R392 Regional Road, at the entrance to the facility in Derraghan Bog, and continuing south to the ADF.

The 2022 Annual Environmental Report (AER) for the facility states that no waste was accepted at the facility in 2022 as the power plant had ceased operations in 2020.

A 2017 ground investigation was undertaken by ESB at the existing Ash Disposal site and no discernible contamination of the soils or groundwater at the site was found. The presence of low permeability overburden, and bunding protect the locally important groundwater resource present in the bedrock beneath the ADF.

The rivers surrounding the ADF are located in a separate river subbasin. There is no direct hydrological link to the Application Site. There is no significant hydrological linkage to the rEIAR site and therefore there is no significant adverse cumulative effects on the water environment in combination with other relevant developments.

Sliabh Bawn Wind Farm

Sliabh Bawn is an operational windfarm located to the northwest of Lanesborough to the west of the River Shannon. Construction of Slieve Bawn has been completed and the project is in the operational phase. The planning permission granted by An Bord Pleanála (ABP) in 2012. Sliabh Bawn Wind Farm was constructed and operates in accordance with a number of planning conditions. The windfarm is not located in the same river basin as the Application Site.

The principal risks associated with hydrology, hydrogeology and water quality at the site are the generation of silty waters due to runoff from construction areas, and the loss of construction and operational materials (concrete, fuel and oil) to water.

Sliabh Bawn is not hydrologically connected to the rEIAR site. A review of the submitted application and surface water monitoring during the construction period the wind farm development did not give rise to any significant cumulative impacts with regards to hydrology, hydrogeology, and water quality.

Material Disposal Sites (Ref. 0673 and 0688)

Permission was applied for two material disposal areas outside of the Application Site, which included for inert materials, soils and subsoils. The sites are located 1km east of Derryadd Bog, at Cloonfiugh, Killashee, Co. Longford.

Based on a review of the relevant information there is no potential for significant cumulative effects during the Peat Extraction Phase.

Other commercially harvested bogs operated by Bord na Móna and private operators

Consideration has been given to other commercially extracted bogs located in close proximity to the Application Site. These primarily consist of other bogs owned and operated by Bord na Móna which are also part of the Mountdillon Bog Group, however it also includes privately owned and operated commercially harvested bogs. Commercial peat extraction on all Bord na Móna bogs ceased in January 2021, although many of the Bord na Móna bogs ceased extraction much earlier than this, similar to the Application Site which ceased in July 2019.

Third party peat cutting (turbary plots) is generally a much smaller area of bog compared to the Bord na Móna (BnM) extraction areas.

Bogs in the Mountdillon Bog group were in active production between 1988 and the cessation of peat harvesting on all Bord na Móna bogs. As with the Application Site, areas within the peatlands were removed from production on a phased basis. The Derryshanoge Bog (located to the east of Lough Bannow Bog) is within the Lough Bannow Stream catchment while the Killashee Bogs discharges to the River Ballynakill. Further to the east the Begnagh and Clooneany Bogs are within the Fallan Catchment. The activities carried out on the other bogs would have been similar to those carried out

at the Application Site. The principal risks associated with hydrology, hydrogeology and water quality at the site are the generation of silty waters due to runoff to water. These risks were mitigated through the adoption of existing Bord na Mona control measures.

Ammonium concentrations were within the surface water regulations at Lanesborough for all available years except 2018. Ammonium concentrations may reduce in the medium term however concentrations were below the relevant Annual Average EQS limits. There is no statistically significant effects on the sub catchment as a result of peat extraction works.

Potential effects were mitigated through the adoption of operational good practice and IPC licence procedures and hence, it is unlikely that the development give rise to any significant cumulative effects with regards to hydrology, hydrogeology and water quality.

9.7.3 Current Phase

Renewable energy projects and grid upgrade works (See Table 2-4, Chapter 2)

There are renewable energy projects including solar farms, battery energy storage systems, substations, grid uprate works applied for during the Current Phase. The location of these projects are outside the Application Site and therefore do not result in potential for significant cumulative effects during the Current Phase.

Harmony Solar

Permission has been granted for an underground electrical cable and transformer compound to connect permitted solar farms to the national grid at Lough Ree Power Station (22275). Construction is currently underway on this cable which crosses sections of the Derryaroge Bog. There is a potential for a slight adverse cumulative effect during the construction of the cable route within the Application Site due to the temporary stripping of soils and excavations needed for cable trenching.

Material Disposal Site (20215)

Permission was applied for an inert material site at Carrowmanagh, Killashee, Co Longford, 3km outside of the Application Site. Based on a review of the application information and due to the location outside of the Application Site boundary, there is no potential for significant cumulative effects during the Current Phase.

Active travel network (2460132)

Permission was granted for a network of walking and cycling trails on lands to the west of the Application Site. These trails will be outside of the Application Site and thus their construction and operation during the Current and Remedial Phases will not result in significant cumulative effects.

Other industrially harvested bogs operated by Bord na Móna and private operators (Peat Extraction and Current Phase)

Consideration has been given to other industrially harvested bogs located in close proximity to the Application Site. These primarily consist of other bogs owned and operated by Bord na Móna which are also part of the Mountdillon Bog Group, however it also includes privately owned and operated commercially harvested bogs. Industrial peat extraction on all Bord na Móna bogs ceased by January 2021, although many of the Bord na Móna bogs ceased extraction much earlier than this, similar to the Application Site which ceased in July 2019.

Third party peat cutting (turbary plots) are much smaller areas of bog compared to the Bord na Móna (BnM) extraction areas.

Bogs in the Mountdillon Bog group were subject to peat extraction between 1988 and the cessation of peat extraction on all Bord na Móna bogs in 2021. The Derryshanoge Bog (located to the east of Lough Bannow Bog) and the Killashee Bogs are located to the east of Derryaroge Bog. The activities carried out on the other bogs would have been similar to those carried out at the Application Site with a gradual reduction in the extent of the areas subject to peat extraction. A number of bogs have completed PCAS programmes including Derryaroge North and West, Corlea and Derryshannoge.

Potential effects were mitigated through the adoption of the PCAS operational procedures and ongoing IPC licence procedures and hence, it is unlikely that the development give rise to any significant cumulative effects.

9.7.4 Remedial Phase

Potential benefits of peatland rehabilitation include carbon sequestration, restored biodiversity, and improved hydrological functions. The Mountdillon Bog Group, and in particular the Application Site, is an important natural asset and has the potential to play a strategic role in meeting national climate action targets, which have become all the more significant in light of the Climate Action and Low Carbon Development (Amendment) Act 2021, the Climate Action Plan 2024, the Climate Change Performance Index 2024, and the Change Advisory Council's Annual Report 2023. These reports provide an updated assessment of both global climate change and climate change in the context of Ireland and identify the increasingly discernible impacts climate change is having on both the environment and society. In line with the Applicant's vision to assist in achieving a climate neutral Ireland by 2050, it is intended to utilise the Application Site for both peatland rehabilitation and wind energy infrastructure and to facilitate environmental stabilisation of the Application Site and the optimisation of climate action benefits.

The overall permanent footprint of the proposed wind farm will be less than 4% of the total area of the Application Site and therefore does not impact or change the overall goals and outcomes of the proposed rehabilitation plans. As such, it is the intention of the Applicant to integrate the peatland remedial measures with the proposed future wind farm. The key objectives of environmental stabilisation and re-wetting of the cutaway areas will occur between and surrounding the proposed windfarm infrastructure. The EIAR for the proposed Derryadd Wind Farm development will detail issues related to peat management during wind farm 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 naturally re-vegetate. This has proven successful during construction of Mountlucas and Cloncreen Wind Farms. In the event that natural re-vegetation was unsuccessful, additional measures such as re-seeding would be considered.

The draft Cutaway Bog Decommissioning and Rehabilitation Plans which accompany the wind farm application detail how the site will be rehabilitated along with the construction and operation of the proposed windfarm; on the assumption the wind farm will be granted. Further details of this proposed windfarm development can be obtained at the project website (https://www.derryaddwindfarm.ie/). A separate planning application for the proposed Derryadd Wind Farm will be submitted directly to An Bord Pleanála through the Strategic Infrastructure Development planning process. As mentioned, the wind farm footprint comprises approximately 4% of the Wind Farm Application Site and the wind farm application includes proposals to rehabilitation the site to support wetland habitats. This would offset any potential loss of cutover and revegetating peatland.

Both the rehabilitation measures and the proposed Derryadd Wind Farm are cumulatively assessed with the future remedial measures that will be carried out at the Application Site. The proposals for

future land uses have been accounted for, to the extent that information is available, in the preparation of the Draft and final Cutaway Decommissioning and Rehabilitation Plans for the bogs which are included in Appendix 4.3 of this rEIAR.

The Cutaway Bog Decommissioning and Rehabilitation plans were developed in compliance with Condition 10 of the IPC licence, provided in Appendix 4.3. The scope of the plans was to address issues of concern as identified by Bord na Móna and consultees.

The primary rehabilitation goal is environmental stabilisation of the site and optimising climate action benefits. This will be achieved via wetland creation/management and residual peat re-wetting. This is defined as:

- Carrying out rehabilitation with the application rehabilitation measures to re-wet peat and slow water movement across the site;
- Where appropriate, optimising hydrological conditions for the further development of wetland, Reed swamp, wet woodland and fen habitats on shallow cutaway peats, along with management of existing wetlands;
- Stabilisation or improvement in water quality parameters (e.g., suspended solids).
- Environmental stabilisation;
- Rehabilitation will support the National Policies on Climate Action and Green House Gas 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 Application Site will have reduced emissions (reduced source) as it develops naturally functioning wetland, scrub, woodland and peatland habitats. Approximately 30% of the Application Site will comprise wetlands. It will also support Ireland's commitments towards Water Framework Directive and the National River Basin Management Plan 2018-2021.

Colonisation of the cutaway generally begins within the first year of the field being taken out of extraction. Vegetation quickly establishes in drains and slows water flow and improves water quality. Rehabilitation will allow for the stabilisation of the site in its entirety. In order to achieve this, the drainage channels in the peat extraction areas were blocked to reduce water level fluctuations in the peatlands. The rehabilitation plan slowed the movement of water through the peat extraction areas through blocking of field drains and developing replacement siltation areas for terminal silt ponds. Each of these aspects are undertaken on a phased basis.

The Cutaway Bog Decommissioning and Rehabilitation plan also entailed the aftercare management of a number of siltation ponds. A programme of works will be devised in consultation with the EPA. Soft rush and other pioneer vegetation quickly establish in drains and then spreads across the peat fields. Once the soft rush establishes, other species begin to colonise the peatlands. The vegetation in the drains, helps to retain suspended solids and reduce the velocity of runoff.

Monitoring of the areas taken out of operations showed a steady recovery of the site through natural colonisation and stabilisation of the soils and overall high quality of water draining the site and entering streams. The rehabilitation was successful in slowing the movement of water on site and containing any peat within the bog area. A number of pools and shallow waterbodies have been created and these help to mitigate against peat run-off by extending the area for peat settlement before entering existing silt ponds.

In conclusion, the PCAS, Decommissioning and rehabilitation is and will have mostly positive effects on the water environment of the Application Site. Rehabilitation works will include the blocking of drainage channels may have had slight short-term negative effects, as the environment was altered but, in this case, this was done in order to assist and speed up the recovery process of the bog and result in long-term positive effects.

The bog rehabilitation by the Applicant will have restored the regime closer to that expected for a wetland on peat soils and is a beneficial impact of the rehabilitation following cessation of peat harvesting activities. It is considered that there will be a long-term slight positive effect on water quality arising from the cumulative effects of the rehabilitation of the bogs and the future development of the subject lands. The future proposals are also expected to slight beneficial and long term on hydrology, hydrogeology and water quality.

9.8 MAJOR ACCIDENTS AND DISASTERS

Major Accidents and Disasters assessment considers the potentially significant effects of a development on the environment as a result of its vulnerability to, or introduction of, risks of major accidents and/or disasters. It is clear from the EIA directive that a major accident and/or natural disaster assessment should be mainly applied to Control of Major Accident Hazards (COMAH) sites, SEVESO sites or nuclear installations. The Application Site is not a COMAH or nuclear installation, however the assessment is included for completeness. The starting point for the scope and methodology of this assessment is that the application site was operated in line with best international current practice (IPC Licence) and as such, major accidents were and will be extremely unlikely. The potential for a significant spillage of hydrocarbons is limited on site. No significant spillage occurred on the Application Site.

It can be concluded that the risk of accidents associated with this development were low and did not cause unusual, significant, or adverse effects on the water environment since 1988.

9.9 REFERENCES

- Environmental Protection Agency (May 2022): Guidelines on the Information to be contained in Environmental Impact Assessment Reports;
- Environmental Protection Agency (September 2015): Draft - Advice Notes on Current Practice (in the preparation of Environmental Impact Statements);
- Environmental Protection Agency (September 2015): Draft – Revised Guidelines on the Information to be contained in Environmental Impact Statements;
- Environmental Protection Agency (2003): Advice Notes on Current Practice (in the preparation of Environmental Impact Statements);
- CIRIA 2006: Control of Water Pollution from Construction Sites - Guidance for Consultants and Contractors. CIRIA C532. London, 2006; and,
- Environmental Protection Agency (2006): Environmental Management in the Extractive Industry (Non-Scheduled Minerals);
- Institute of Geologists Ireland (IGI) Guidelines for Preparation of Soils, Geology & Hydrogeology Chapters in Environmental Impact Statements;
- National Roads Authority (2008): Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;
- Mott MacDonald (2020): Remedial Environmental Impact Assessment Report for Bord na Móna Peat Extraction Substitute Consent Application
- Slieve Bawn (2013): Slieve Bawn Wind Farm Environmental Impact Statement

www.tobin.ie

TOBIN Consulting Engineers

@tobinengineers

Galway
Fairgreen House,
Fairgreen Road,
Galway,
H91 AXK8,
Ireland.
Tel: +353 (0)91 565 211

Dublin
Block 10-4,
Blanchardstown Corporate Park,
Dublin 15,
D15 X98N,
Ireland.
Tel: +353 (0)1 803 0406

Castlebar
Market Square,
Castlebar,
Mayo,
F23 Y427,
Ireland.
Tel: +353 (0)94 902 1401

Limerick
Unit 4, Crescent Court,
St Nessan's Road, Dooradoyle,
Limerick
V94V298
Ireland
Tel: +353 (0)61 976 262

Sligo
First Floor,
Carroll House,
15/16 Stephen Street
Co Sligo
Tel: +353 (0)71 9318 844