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Bord na Móna

Derryadd Wind Farm – Application

Revised Stage 1 Appropriate Assessment Screening and Stage 2 Appropriate Assessment Natura Impact Statement

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1.0 INTRODUCTION

Bord na Móna Powergen Limited (hereafter 'the Applicant') submitted a planning application for the proposed Derryadd Wind Farm (hereafter referred to as 'the development') to An Bord Pleanála (ABP) (now An Coimisiún Pleanála [ACP]) on 9 May 2025.

The development comprises 22 wind turbines and associated infrastructure, including turbine foundations, access roads, crane hardstandings, underground cabling, an on-site electrical substation and grid connection works. The windfarm site is located on the cutaway peatlands of Derryadd, Derryaroge and Lough Bannow Bogs in County Longford (see Figure 1.1), collectively forming part of the Mountdillon Bog Group. The proposed wind farm site extends to approximately 1,900 hectares and is situated adjacent to the communities of Derraghan, Keenagh, Killashee and Lanesborough. A summary description of the development is included in Section 3.0 while further detail is presented Appendix A.

The May 2025 submission included a combined Appropriate Assessment Screening Report (and Natura Impact Statement (AASR-NIS), prepared by TOBIN on behalf of the Applicant, which assessed the potential for likely significant effects arising from the proposed Derryadd Wind Farm on European sites, specifically Special Areas of Conservation (SACs) and Special Protection Areas (SPAs). Where such effects cannot be ruled out, the report further evaluates whether the proposed development would result in adverse effects on the integrity of those sites. The assessment covers all phases of the proposed development, including construction, operation, and decommissioning.

Following its review of the application documentation, ACP issued a request for Further Information (FI) dated 30 March 2026 seeking additional information in relation to the assessment of potential effects on European sites to inform the Appropriate Assessment of the proposed development to be carried out by ACP.

The specific matters raised by ACP in relation to the assessment of potential effects on European sites are summarised in Sections 1.1 while the full response to FI is presented in Appendix B below. In response to the FI the original AASR-NIS was reviewed and revised, with additional assessments, analyses, clarifications and supporting information incorporated where necessary.

1.1 AN COIMISIÚN PLEANÁLA REQUEST FOR FURTHER INFORMATION

ACP has requested that the Applicant provide updated assessments to assess the implications of the proposed development in light of the new Site-Specific Conservation Objectives (SSCOs) for Lough Ree SPA (Site Code: 004064), dated April 2025 and issued following lodgement of the planning application. Accordingly, the assessments presented in the original AASR-NIS have been updated to consider these SSCOs, and to inform ACP's Appropriate Assessment.

Specifically, ACP requires:

- A detailed reassessment of the proposed development against the site-specific conservation objectives, attributes and targets for all Special Conservation Interest (SCI) bird species of the SPA.

- Particular consideration of impacts on Whooper Swan, for which the conservation objective is to restore favourable conservation condition.
- Assessment of impacts on ecologically important areas outside the SPA boundary, including areas that may form part of the functional ecological habitat of qualifying species now and in the future in view of bog rehabilitation plans.
- Assessment of all potential impacts against the relevant attributes and targets for the listed bird species and, where the conservation objective is to restore favourable conservation condition, demonstration of how the proposed development, alone or in combination with other plans and projects, will not delay or prevent the achievement of that objective for the SPA.
- Clarification of the bird population figures used within the Collision Risk Model (CRM) and mortality calculations, particularly where wider regional populations were used rather than the SPA population identified in the conservation objectives.
- Provision of revised mortality threshold and collision risk calculations using the qualifying populations for Lough Ree SPA as identified in the Site-Specific Conservation Objective.

This document comprises a revision to the previously submitted combined AASR-NIS. It has been prepared in response to the FI issued by ACP and incorporates an assessment of the proposed development against the SSCOs for Lough Ree SPA (004064), together with the additional analyses, clarifications and supporting information required to address the matters raised by ACP in relation to the assessment of potential effects on European sites.

This document has been prepared in compliance with Part XAB of the Planning and Development Act 2000 (as amended), the Planning and Development Regulations 2001 (as amended), relevant jurisprudence of the European and Irish Courts, Article 6(3) of the Habitats Directive (92/43/EEC), the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011), as amended, and relevant guidance relating to the assessment of potential effects on European sites.

1.2 STATEMENT OF AUTHORITY

The original AASR–NIS report submitted for the Substitute Consent application in May 2025 was authored by TOBIN Senior Ecologist Joao Martins (B.E (Hons), M.Sc) and senior reviewed by Áine Sands (B.E. (Hons), MCIEEM) and Dr. James Forde (B.Sc. (Hons), M.Sc., Ph.D., MCIEEM).

To address the ACP FI, the original AASR–NIS report was updated by Senior Ecologist /Ornithologist John Sherry (B.Sc. (Hons)) with input from Dr Tom Gittings (B.Sc. (Hons), Ph.D., MCIEEM), with input and review provided by Dr James Forde.

Joao Martins (B.E. (Hons) M.Sc.)

Joao Martins is Senior Ecologist in TOBIN's Environment & Planning (E&P) division in TOBIN. He has over 15 years' experience in freshwater ecology, associated with monitoring for the EU Water Framework Directive (e.g., macroinvertebrates, habitat/hydromorphology) and projects of scientific nature, in Germany, Portugal and Ireland. He has worked for over 7 years in environmental consultancy, developing his expertise in Appropriate Assessment, Ecological Impact Assessments (EcIA) and EIAR. Joao has also conducted and coordinated bird surveys (e.g.

I-WeBS, Vantage Point (VP), Countryside Bird Survey (CBS), Woodcock), botanical and habitat surveys, mammal surveys (bats and non-volant) and inland fisheries (electrofishing).

Áine Sands (B.E. (Hons), MCIEEM)

Áine Sands is a Principal Ecologist and part of the E&P division in TOBIN. Áine has over eleven years post-graduate experience in ecology and environmental consultancy and has predominantly been involved in large renewable energy projects such as wind farms, solar farms and hydrogen production plants. Within her role, Áine has carried out numerous Screenings for Appropriate Assessments, NIS and EcIA reporting for a variety of projects. Áine also has a strong understanding of National and European legislation associated with biodiversity and is cognisant of relevant rulings by the Court of Justice of the European Union (CJEU). Lastly, Áine has experience with undertaking ecological surveys for protected habitats and species and is able to collect robust data from these surveys.

Dr. James Forde (B.Sc. (Hons), M.Sc., Ph.D., MCIEEM)

James is Senior Ecologist and Technical Director of the TOBIN E&P division. James holds a B.Sc. (hons) and M.Sc. degrees in marine ecology, and a Ph.D. in ecology. James is also a full member of the Chartered Institute of Ecology and Environmental Management (CIEEM). James has almost 20 years' academic and environmental consultancy experience. He has an extensive understanding of ecology and appreciation of the objectives and mechanisms of national and international environmental legislation and policy. He has significant experience in preparing and reviewing ecological reports including Screenings for Appropriate Assessment, NIS and EcIA reporting, and Environmental Impact Assessment Reports (EIAR). James has provided strategic technical and environmental advice for developments across a wide range of sectors, including onshore and offshore renewables, telecommunications, flood relief schemes, port and harbour developments, energy generation and transmission.

John Sherry (B.Sc. [Hons])

John is a Senior Ecologist with TOBIN, with over 8 years' experience in environmental consulting, primarily engaged in the preparation of impact assessments for the renewable energy sector. He has extensive experience preparing AA Screening, NIS, EcIA, EIAR and Ecological Management Plans. His expertise is primarily in ornithology, with significant experience undertaking and reporting on breeding and wintering bird surveys. He also has experience in habitat, non-volant mammal and bat surveys. John has provided technical ecological input for a wide range of renewable energy and infrastructure projects, supporting ecological constraints assessments, impact assessments and planning applications.

Dr Tom Gittings (B.Sc. (Hons), Ph.D., MCIEEM

Tom Gittings has a BSc in Ecology, a PhD in Zoology and is a member of the Chartered Institute of Ecology and Environmental Management. He has over 30 years’ experience in professional ecological consultancy work and research. He has specific expertise in ornithological assessments for wind energy projects and has been involved in numerous wind energy projects. His input to these projects has variously included survey work, collision risk modelling, writing the ornithological sections of EIS, EIAR and NIS reports, expert witness services at oral hearings, and provision of scoping advice and peer review services.

TOBIN ecologists responsible for undertaking the surveys used to inform this the Appropriate Assessment reporting for the proposed development were:

- Úna Butler (B.A. (Hons), MSc.) - multidisciplinary walkover surveys
- Ria Aherne (BSc) - multidisciplinary walkover surveys
- Sinead O'Reilly (BSc (Hon), MSc.) - river habitat survey
- John Sherry (B.Sc. (Hons)) - breeding and wintering bird surveys

Specialist survey and assessments were provided by:

- Dr. Tina Aughney (B.Sc. (Hons), Ph.D) (Bat Eco Services) - bat surveys and assessment
- Adam Mantell (Arctia Ecology) - Whorl Snail survey
- Alexis FitzGerald (FitzGerald Ecology) - habitat survey
- John Browne (Stillwaters Consultancy) - electrofishing and macroinvertebrate surveys
- Dr Tom Gittings – Ornithology Collision Risk Modelling

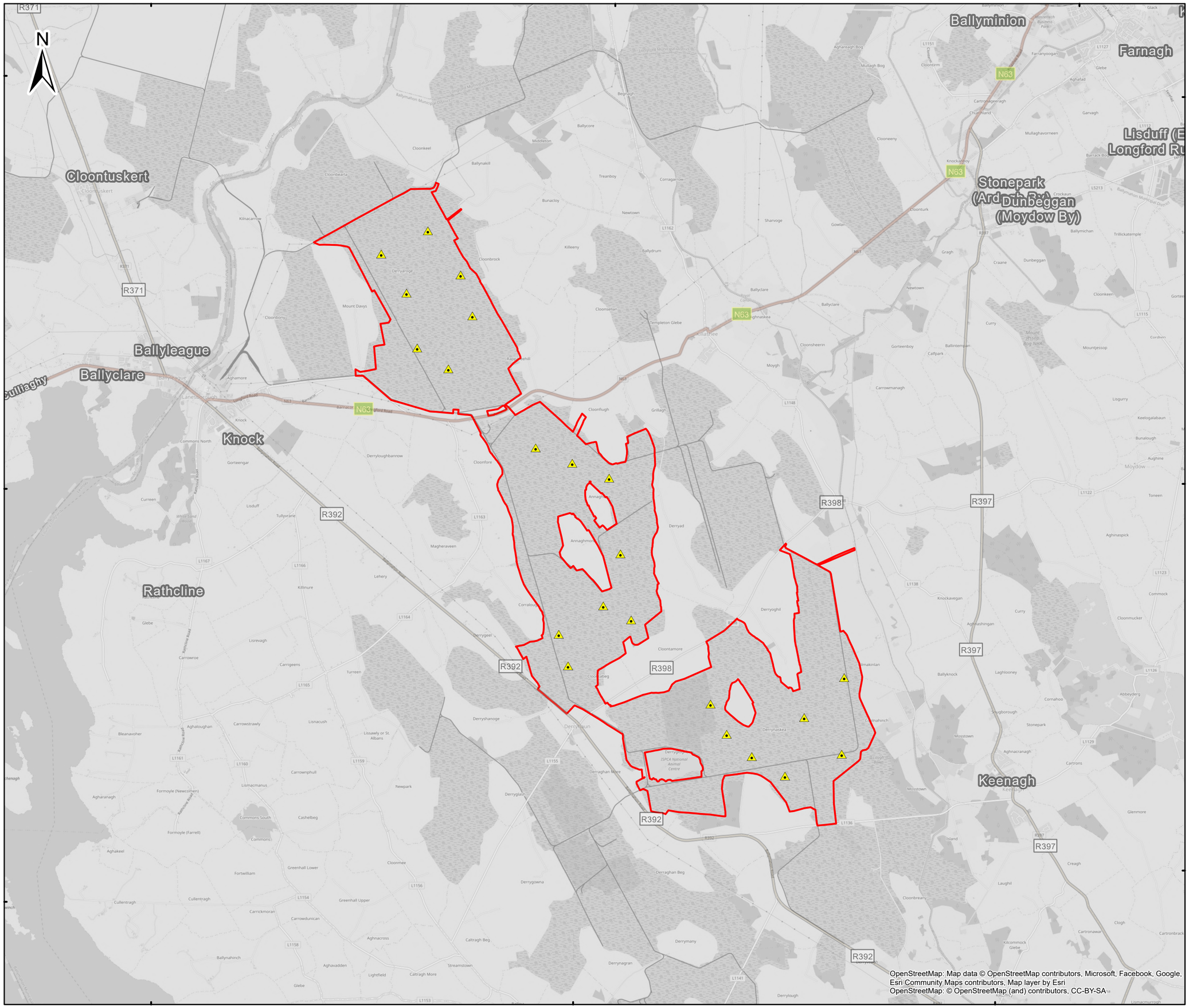
1.3 COMMONLY USED TERMS

Some terms commonly used in this report are provided in Table 1.1 below.

Table 1.1: Terms and definitions

Term	Definition
Proposed Wind Farm Site	The lands at Derryaroge, Derryadd, and Lough Bannow bogs encompassing the wind farm and associated infrastructure.
Turbine Delivery Route (TDR)	The designated transportation route, including any lands required along the route for modification/ upgrade of the route.
Points of Interest (POIs)	Locations along the TDR where modification/ upgrade works are proposed.
Proposed Development	All works at the proposed wind farm site and at POIs.
EU Habitats Directive (Directive 92/43/EEC)	European Union legislation, adopted in 1992, aimed at the conservation of natural habitats and wildlife species across Europe. Its primary objective is to protect Europe's most valuable and threatened species and habitats, particularly those identified as being of European importance
Special Area of Conservation (SAC)	Refers to a site designated under the EU Habitats Directive (Directive 92/43/EEC) for the protection of natural habitats and species (excluding birds) that are considered of European interest. SACs also form a key part of the Natura 2000 is a network of protected areas.
Qualifying Interests (QIs)	Refers to the habitat types and non-bird species for which a SAC has been designated under the EU Habitats Directive (Directive 92/43/EEC). These interests include Annex I habitat types (e.g., Degraded raised bogs still capable of natural regeneration [Habitat code: [1355]) and Annex II species (e.g., Otter (*Lutra lutra*) [Species code [1335]).
EU Birds Directive (Directive 2009/147/EC)	European Union legislation, originally adopted in 1979 and later amended in 2009, that aims to protect wild birds and their habitats across Europe. It focuses on the conservation of bird species that are particularly vulnerable or endangered, as well as the habitats that are crucial for their survival, including those used for breeding, feeding, and migration.

Term	Definition
Special Protection Areas (SPAs)	Site designated under the EU Birds Directive (Directive 2009/147/EC) to protect wild bird species and their habitats. SPAs are designated specifically for the conservation of birds, particularly those that are rare, threatened, or migratory. These sites form part of the Natura 2000 network, which is a network of protected areas across Europe designed to safeguard biodiversity.
Special Conservation Interests (SCIs)	SCIs are the bird species that are considered of European importance. These species must be listed on the Birds Directive (Directive 2009/147/EC) Annex I, which includes species that are threatened or migratory and whose conservation requires the designation of protected areas. The protection extends to the species themselves and their habitats. The habitats themselves, such as wetlands, bogs, or heathlands, are not classified as SCIs. Instead, they are part of the site that is protected due to their importance in supporting the SCIs (i.e., the species). These habitats are vital for the survival and breeding of the birds listed as SCIs. For ease of reference in this report, where SCI species and Wetland and Waterbirds [A999] are listed as features of a SPA, the term SCI is used herein to collectively refer to the relevant bird species in conjunction with their designation under SPA A999.
European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477/2011)	This is the main legal instrument that gives effect to both the Birds and Habitats Directives in Ireland. It allows for the designation, protection, and management of SACs and SPAs.
European sites	In Ireland under these Birds and Natural Habitats Regulations, SACs and SPAs are collectively referred to as *European sites*. This terminology is used throughout Irish planning and environmental legislation when applying site protections and assessment requirements under the Natura 2000 framework.
Zone of Influence (ZoI)	Refers to the zone within which potential effects to habitats and species of European sites may occur. The ZoI varies depending on the ecological sensitivities and behavioural characteristics of the QIs or SCIs of the relevant European sites. These variations may include species' foraging ranges, disturbance thresholds, or hydrological dependencies. The ZoI was determined in accordance with the best available guidance and ecological data and was defined using a precautionary approach to ensure that all potential direct, indirect, and cumulative effects are appropriately considered.





Legend

- Proposed wind farm site boundary
- Final Turbine Layout BnM 20230124

0 1 2
Kilometres

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	06/05/2025	First issue	S.P	I.H
Rev	Date	Description	By	Chkd.

Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Figure 1.1: Proposed Derryadd Wind Farm Site

Scale @ A3: 1:50,000

Prepared by:	Checked by:	Date:
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Map Ref: 11399-043-WF.Site-OSM-TOB-A

Draft: A

2.0 APPROPRIATE ASSESSMENT PROCESS

The following section provides a brief overview of the Appropriate Assessment process, including Appropriate Assessment Screening (see Section 2.1) and the preparation of NIS (see Section 2.2) reporting, outlining the steps involved in evaluating potential effects on protected European sites and ensuring compliance with the Habitats Directive.

2.1 STAGE 1 SCREENING FOR APPROPRIATE ASSESSMENT

Screening is a fundamental process used to determine whether an Appropriate Assessment is required for a particular plan or project. According to Part XAB of the Planning and Development Act 2000, as amended, the screening process must be carried out by the Competent Authority. In line with Section 177U of the Act, it states:

- *'A screening for appropriate assessment shall be carried out by the competent authority to assess, based on the best available scientific knowledge, whether the land use plan or proposed development, either alone or in combination with other plans or projects, is likely to have a significant effect on a European site'.*

The screening process is critical in ensuring that any potential **likely significant effects** on European sites are adequately considered before progressing with any development activities.

The Competent Authority's decision to determine if an Appropriate Assessment is necessary must be based on objective, reliable, and verifiable information, and it should be properly recorded for transparency. If needed, the Competent Authority has the right to request further information from the project proponent or consultant to facilitate the screening process and ensure that a thorough assessment is undertaken.

The EC's '*Assessment of Plans and Projects in Relation to Natura 2000 Sites - Methodological Guidance on Article 6(3) and (4) of the Habitats Directive 92/43/EEC'* (EC, 2021) provides a clear and structured approach to Stage 1 Screening, which consists of the following four main steps:

1. **Ascertain if the plan or project is directly connected to, or necessary for, the management of a European site.**
   This step seeks to determine whether the proposed plan or project is specifically linked to the management or conservation efforts of the European site, and whether it is an essential part of maintaining the site's conservation objectives.
   European sites comprise SACs and SPAs, designated under the EU Habitats Directive and EU Birds Directive respectively.
2. **Provide a detailed description of the plan or project and its potential impact factors.**
   This step involves provision of a clear and comprehensive description of the proposed plan or project, including its scope, activities, and potential effects. This will help in identifying possible interactions between the development and European sites, and how these could influence the conservation values of the sites.
3. **Identify which European site may be impacted by the plan or project.**
   This step involves identifying all the European sites that could potentially be affected by the proposed plan or project. This includes evaluating the geographical proximity and the nature of any potential effects on the European sites.

4. **Assess whether likely significant effects can be ruled out in light of the conservation objectives set for the European sites.**
   The final step evaluates whether the proposed plan or project is likely to have significant effects on European sites, considering their specific conservation objectives. If no likely significant effects to the European sites are identified, the Competent Authority may determine that an Appropriate Assessment is not required.

2.2 STAGE 2 APPROPRIATE ASSESSMENT

Where it cannot be excluded beyond reasonable scientific doubt at the Screening stage, that a plan or project, individually or in combination with other plans and projects, would have a significant effect on the conservation objectives of a European site, an Appropriate Assessment is required, or in this case an Appropriate Assessment.

Where an Appropriate Assessment is required, the Competent Authority may require the applicant to prepare a NIS. An NIS, as defined in Section 177T of the Planning and Development Act, 2000 as amended, is a statement for the purposes of Article 6(3) of the Habitats Directive of the implications of a proposed development, on its own and in combination with other plans and projects, for a European site in view of its conservation objectives. Stage 2 Appropriate Assessment considers potential **adverse effects** and the **integrity** of the site.

The NIS, where required, should be underpinned by the best scientific knowledge, objective information and analysis necessary to reach a definitive determination as to:

1. the implications of the plan or project, alone or in combination with other plans and projects, for a European site in view of its conservation objectives, and
2. whether there will be **adverse effects on the integrity** of a European site.

3.0 DESCRIPTION OF THE PROPOSED DEVELOPMENT

This section presents a summary of the proposed Derryadd Wind Farm. The principal components of the proposed development and the key activities associated with its construction, operation and decommissioning are summarised in Table 3.1 below, with further details provided in Appendix A.

The proposed development comprises a 22-turbine wind farm and associated infrastructure located on the cutaway peatlands of Derryadd, Derryaroge and Lough Bannow Bogs, within the Mountdillon Bog Group in County Longford. The development has been designed to minimise the potential environmental effects of the proposed wind farm site, while at the same time maximising the energy yield of the wind resource passing over the site. The proposed wind farm site extends across approximately 1,900 ha of former industrial peatlands. The overall layout of the Development, including turbine locations and associated infrastructure, is illustrated in Figure 1.1.

The wind turbines will have a top of foundation to blade tip height of 190m. The blade rotor diameter will be 165m with a corresponding hub height of 107.5m. The overall layout of the proposed development includes the wind turbines, hardstanding areas, passing bays, electrical substation, borrow pits, meteorological masts, temporary construction compounds, internal site roads layout, the main site entrances, proposed amenity tracks, and associated car parks.

Turbine components for the wind farm development will be delivered to either Galway Port or Foynes Port, depending on logistical and scheduling considerations. Both ports are capable of accommodating the large vessels typically used for transporting wind turbine components and possess the necessary infrastructure to handle oversized and heavy cargo. From the selected port, components will be transported along via a designated turbine delivery route (TDR) to the wind farm site (see Figure 3.1). While the initial parts of the TDRs differ depending on the port of origin, the later stages converge and utilise a common section of the road network. Along this shared portion, modification/ upgrade works are required at specific locations. The locations along the later stages of the TDR where works are proposed, referred to herein as points of interest (POIs), are shown in Figure 3.1. The proposed works at the POIs includes the removal of road signs, trees, lighting columns, and utility posts, and some vegetation clearance. Traffic splitter islands at POIs will be adapted with load-bearing surfaces, and the ground levels lowered. Locations along the TDR where works are proposed, POIs, are shown in Figure 3.1.

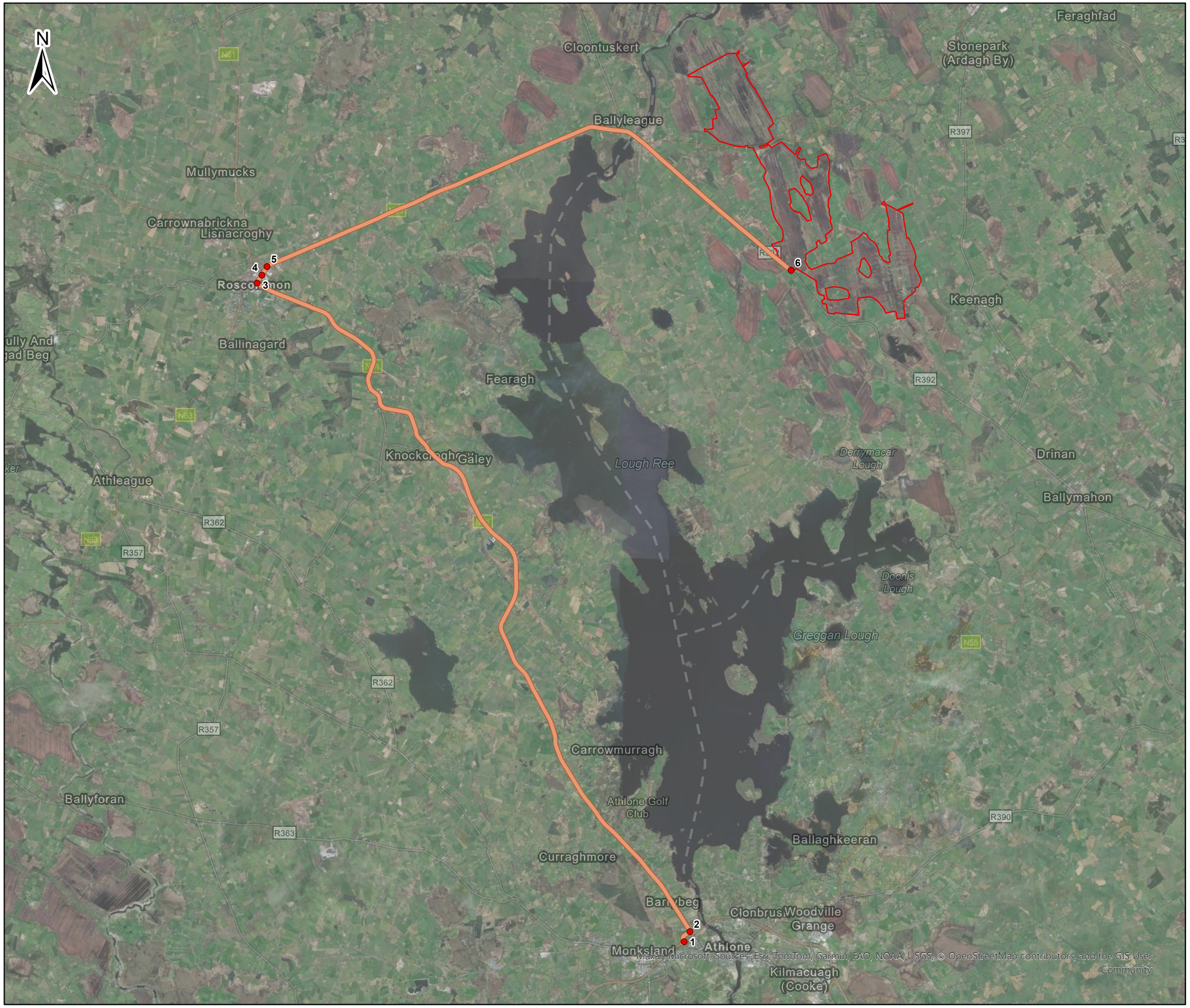
The proposed development comprises:

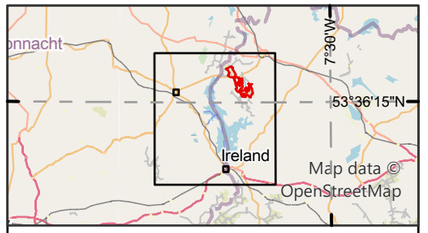
- 22 no. wind turbines with a blade tip height of 190 m, blade rotor diameter of 165 m, hub height of 107.5 m and the associated infrastructure including tower sections, nacelle, hub, and rotor blades and all associated foundations and hard-standing areas in respect of each turbine;
- New internal site access roads, approximately 27,500 m in length including passing bays and associated drainage;
- 2 no. permanent Meteorological Masts, both of which will be 120 m in height, and associated hardstanding areas for both masts, as well as the decommissioning and removal of an existing 100 m Meteorological Mast on site in Lough Bannow Bog;
- 4 no. Borrow pits in Derryadd Bog; All works associated with the opening, gravel and spoil extraction, and decommissioning of the borrow pits;
- 4 no. temporary construction compounds, including material storage, site welfare facilities, and site offices;
- 4 no. temporary security cabins at the main construction site entrances as well as at a number of access points around the proposed wind farm site;
- 1 no. 110 kV electrical substation compound in Derryaroge Bog. The substation will consist of 2 no. control buildings, a 36 m high telecommunications tower, associated electrical plant and equipment, ground water well, wastewater holding tank and welfare facilities.
- All associated underground electrical and communications cabling connecting the turbines and masts to the proposed electrical substation, including road crossing at N63 and associated grid connection via a 110 kV loop-in connection to the existing Lanesborough-Richmond 110 kV overhead line which traverses the proposed wind farm site;
- 1 no. 16 MW battery storage facility;
- 2 no. Peat Deposition Areas, one to the north of the proposed substation compound in Derryaroge Bog and one in Derryadd Bog;
- New site access entrances, temporary improvements and modifications to existing public road infrastructure to facilitate delivery of abnormal loads including locations on N6 Eastbound Slip Road, N6/N61 Roundabout at Athlone, N61/N63

Roundabout at Roscommon, N63 Roscommon Arts Centre Roundabout and N61/N63 Roundabout, Northeast of Roscommon.

- Hinge 3 No. permanent lighting fixtures in Folio RN40465F in Roscommon town to facilitate the delivery of abnormal loads (i.e. turbine blades);
- Approximately 7,500 m of dedicated amenity access tracks to provide linkages between the proposed wind farm site roads, royal canal greenway (to the east), the Corlea Visitor Centre amenity areas (to the south) and the Midlands Trail Networks project (to the north).;
- 3 no. permanent amenity carparks, one of which is situated in Derryaroge Bog (19 no. car parking spaces in total) and two carparks in Derryadd Bog (19 no. car parking spaces in each carpark);
- All associated site work and ancillary works including new drainage and updating existing drainage, access road, earthworks, site reinstatement and erosion control, which will be aligned with the existing and future site rehabilitation plans; and,

A 10-year planning permission is being sought with a 30-year operational life from the date of commissioning of the entire wind farm.





Legend

- Proposed wind farm site
- Turbine Delivery Route POI
- Turbine Delivery Route

0 2,000 4,000
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	06/05/2025	First issue	S.P	I.H

Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Figure 1.2: POIs for the Proposed TDR

Scale @ A3: 1:120,000

Prepared by:	Checked by:	Date:
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Map Ref: 11399-038-POIs-P.APP.BO-TOB-A

Draft: A

Table 3.1: Summary of Relevant Activities Associated with the proposed development (for further deatil see Appendix A)

Phase	Element	Area		Summary of Key Activities
Construction	Wind Turbines	• Foundations	531m^2 per turbine	• Excavation (foundation and crane standing area) • Replacement of access tracks soil/peat by granular fill • Pile/gravity foundation (i.e. 15-18m deep) • Reinforced steel placement • Concrete pouring
		• Hardstands	2,660m^2 per turbine (plus 3m^2 working area per hardstand)	• Levelling compacted hardcore • Working area of 2-3m to be excavated • Excavated peat to be side cast, profiled and bermed
	• Internal Site Access Roads	167,581m^2 (max. 6.0m wide)		• Drain placement upslope • Excavation (excavated peat to be stored or side-cast alongside excavation) • Application of granular fill • Geogrid/geotextile application • Application of quarry dust (50mm) at amenity roads
	• Permanent Floating Roads	(max 6.0m wide)		• Geogrid/geotextile application • Application of granular fill (max. of 700mm)
	• Temporary Floating Roads	(max 6.0m wide)		• Geogrid/geotextile application • Application of granular fill (max. of 700mm) • Drainage features
	• Amenity tracks	22,500m^2 (3m wide x 7,500m long)		• Amenity tracks of 3m wide and gravel/crushed stone finish surface
	• Borrow Pits	4 borrow pits: 223,149m^2 in total		• Removal of top soil (to be stored) • Designation of refuelling areas (inside or outside the pit; concrete slab upon which the fuel bowser will sit)

Phase	Element	Area		Summary of Key Activities
				• Mechanical excavation (no blasting)
				• Large material (e.g. boulders and cobbles) processing
				• Stockpiling of processed material
				• Material loading into lorries
				• Extraction to take place above and below water table
				• Drainage feature (interceptor)
				• Upon completion of Construction Phase, reprofiling of the area
				• Topsoil replacement and reseeding
				• Removal of extraction plant and vehicles
				• Total volume of material to be extracted estimated to be approximately 648,379m^3
	• Peat Deposition Areas (Chapter 3, Section 3.2)	Permanent – Approximately 48,500m^2 Temporary- Approximately 93,800m^2		• Prepare the sites by clearing any remaining vegetation and levelling the ground as necessary
				• Construct the containment bunds, install geotextiles, and set up drainage systems.
				• Transport the surplus peat from excavation areas to the designated deposition areas (both permanent and temporary)
	Battery Storage	5,000m^2	Total of 20,250m^2	• 20 standardised shipping containers (each with 2MW capacity)
				• Will be crane lifted and placed into final position
				• To be mounted on concrete foundations
	Electricity Substation	15,250m^2		• Stripping of soil and overburden (to be stored/sent to borrow pit)
				• Excavation for foundations
				• Laying of shuttered reinforced concrete

Phase	Element	Area		Summary of Key Activities
				• Block laying scaffolding
				• Telescopic load handler/mobile crane will position timber roof trusses
				• telecommunication mast (36m) to be installed
				• Erection of perimeter fencing
				• To include TSO building (450m^2) and IPP building (228m^2)
				• It will include welfare facilities (wastewater to be tankered off-site)
	• Underground cabling	28km x 0.5m wide = 14,000m^2		• trenches of 1.2m deep to be excavated
	• Grid Connection	460m		• Horizontal Directional Drilling (at the crossing point with N63) at 2m depth
				• Underground cabling (trenches of 0.6m wide and 1.2m deep to be excavated) to connect the masts to the substation
		Masts foundations	Total of 128m^2	• Construction of 2 new Line Cable Interface Masts (LCIM) (20m high)
				• Excavation for legs foundation (material to be stored nearby to be used on site roads)
				• Foundation for each leg (3m deep)
				• Concrete will be poured into each excavation
				• Backfilling of foundations (300mm above ground) with stored excavation material)
				• Geogrid material to be laid on the ground surface

Phase	Element	Area	Summary of Key Activities
		Hardstand for crane	• Overlaying with aggregate
	• Meteorological Masts (2 no.)	1,400m^2	• 120m heigh
			• To be constructed on a hardstanding area
	• Construction Compound	4 units: total of 21,750m^2	• Four temporary compound areas
			• Stripping of peat/topsoil
			• Construction of hardstands (>0.5 m above existing ground level)
			• Use of 22,400m^3 of borrow pit stone
			• Office space
			• Welfare facilities
			• Storage of construction material
			• Storage of hazardous material
	• Security Cabins	4 units: total of 800m^2	• Pre-fabricated structures
			• Will be removed at the end of Construction Phase
	• Car Parks	1,045m^2 (three car parks)	• Two are to be located within construction compounds, and will remain upon end of Construction Phase
			• 19 vehicle overall capacity
	• Existing Meteorological Masts		• Removal of instruments
			• Remove mast support and let it fall
			• Mast anchors and base excavation
			• Mast dismantling
			• Removal from site

Phase	Element	Area	Summary of Key Activities
Turbine Delivery Route	• POI1	1,150m^2	• Nine road signs to be removed • One tree to be removed • Provide over-run surfaces
	• POI2	690m^2	• Ten road signs to be removed • Two lighting columns and two posts to be removed • The splitter island to be provided with an oversail surface • The splitter island to be provided with an overrunning surface
	• POI3	900m^2	• One lighting column to be removed • Four utility posts/bollard to be removed • Fiver road signs to be removed • Provision of a load bearing surfaces • Removal of trees on the central island
	• POI4	130m^2	• Five road signs to be removed • Two trees to be removed
	• POI5	300m^2	• Seven signs to be removed • One tree to be removed • Load bearing surface provided at the splitter island • The ground level to be lowered • Tree canopy to be trimmed
	• POI6	5,950m^2	• Trees to be removed • Vegetation to be cleared • Utility posts to be removed • Load bearing surface to be laid

Phase	Element	Area	Summary of Key Activities
Operation	• Maintenance	-	Traffic (four-wheel drive vehicles or vans); Visit checks Changing consumables (e.g. oil changes)
	• Ancillary functions	-	Routine maintenance programme involving a number of turbines checks and changing of consumables, including oil changes. The electricity substations components and site tracks will also require periodic maintenance in accordance with appropriate operation maintenance plans, procedures and health and safety plans.
Decommissioning	• Wind Turbines		Disassembling and parts sent offsite
	• Turbine foundations		Covered with earth/reseeded
	• Site roadways		Leave in situ for further use
	• Substation		Retained as permanent structure (managed by EirGrid/ESB)

4.0 INFORMATION USED TO INFORM THE REVISED AASR-NIS

The following sections provide an overview of the methodologies employed and sources used to gather information on the baseline conditions on the proposed wind farm site, the POIs of the TDR, and the surrounding areas including relevant European sites.

4.1 DESKTOP STUDY

The desk study for this assessment included a comprehensive review of available data on the proposed wind farm site, the TDR, and the surrounding areas including relevant European sites. This review was essential in gathering relevant information on environmentally sensitive receptors including those QI and SCI of European sites, developing a clear understanding of the site's ecological context, and identifying areas where targeted surveys were required, including at specific POIs along the TDR. The desk study included a review of the following:

- Bord na Móna Cutaway Bog Decommissioning and Rehabilitation Plans (included in Appendix E)
    - Derryaroge Bog – Draft Cutaway Bog Decommissioning and Rehabilitation Plan 2025
    - Derryadd Bog - Draft Cutaway Bog Decommissioning and Rehabilitation Plan 2025
    - Lough Bannow Bog - Draft Cutaway Bog Decommissioning and Rehabilitation Plan 2025.
- Review of the National Parks and Wildlife Service (NPWS) site synopsis, Natura 2000 data forms and Conservation Objectives for European sites within the proposed development ZoI[1];
- NPWS datasets on Annex I habitats and Annex II species[2];
- National Biodiversity Data Centre (NBDC) records[3];
- Ireland Geospatial Data Hub[4];
- Inland Fisheries Ireland (IFI) research data[5];
- Water Framework Directive (WFD) monitoring information[6];
- Geological Survey Ireland Spatial Resources[7];
- Environmental Protection Agency (EPA) Mapping database[8];
- Recommended Bird Survey Methods To Inform Impact Assessment Of Onshore Wind Farms (Scottish Natural Heritage - SNH, 2017);
- Using a collision risk model to assess bird collision risks for onshore wind farms (Band, 2024);

[1] Available at https://www.npws.ie/protected-sites. Accessed in July 2026.
[2] Available at https://www.npws.ie/maps-and-data (accessed in October 2023,) and from a *Data Request* form was filled and submitted with the National Parks and Wildlife Service on all rare and/or protected species records in December 2024 - response was obtained in January 2025
[3] Available at https://maps.biodiversityireland.ie/. Accessed in July 2026.
[4] Available at https://www.geohive.ie/. Accessed in July 2026.
[5] Available at https://www.fisheriesireland.ie/. Accessed in July 2026.
[6] Available at https://www.catchments.ie/. Accessed in July 2026.
[7] Available at https://www.gsi.ie/en-ie/Pages/default.aspx. Accessed in July 2026.
[8] Available at https://gis.epa.ie/EPAMaps/. Accessed in July 2026.

- Guidance on using an updated collision risk model to assess bird collision risk at onshore wind farms (NatureScot, 2024);
- Avoidance Rates for the onshore SNH Wind Farm Collision Risk Model (SNH, 2018c);
- Assessing Significance of Impacts from Onshore Wind Farms Outwith Designated Areas (SNH, 2018a);
- Assessing the Cumulative Impacts of Onshore Wind Farms on Birds (SNH, 2018b);
- Assessing Connectivity with Special Protection Areas (SPAs) (SNH, 2016);
- Monitoring the Impact of Onshore Wind Farms on Birds (SNH, 2009);
- Bird Sensitivity Mapping for Wind Energy Developments and Associated Infrastructure in the Republic of Ireland (Mc Guinness *et al.*, 2015);
- BirdWatch Ireland Irish Wetland Bird Survey (I-WeBS)[9];
- Bird Atlas 2007-2011: The breeding and wintering birds of Britain and Ireland (Balmer, *et al.*, 2013), and European Breeding Bird Atlas 2 (Keller *et al.*, 2020);
- Information on statutory and non-statutory designated sites of ornithological importance - e.g. Special Protection Areas (SPAs);
- Review of previous ecological assessments undertaken within the area (e.g. TOBIN Consulting Engineers, 2019a).
- Review of relevant of publicly available Plans, including the:
    - Ireland's 4th National Biodiversity Action Plan 2023-2030 [10].
    - Longford County Development Plan 2021–2027[11]
    - Roscommon county Development Plan 2022-2028

The desk study has been informed by surveys and reports on the proposed wind farm site, as well as additional sources, including:

- The EIAR and NIS prepared for the Derryadd Wind Farm Planning Application in 2019 (ABP Case reference: PA14.303592; TOBIN Consulting Engineers, 2019).
- Derryadd Wind Farm Flood Risk Assessment

4.2 SCOPING AND CONSULTATION

TOBIN undertook a scoping and consultation exercise during preparation of environmental assessments undertaken for the application for consent for the proposed development to identify key ecological receptors, engage relevant stakeholders, and ensure full compliance with regulations. Although not all consultees responded to the consultation request, any responses and recommendations received were used to inform survey design and scope the contents of the AASR-NIS. Table 4.1 below summaries the scoping and consultation responses relevant to the AASR-NIS. The table also highlights how the responses have been taken into account in the design of the field surveys and the assessment of the potential impact of the proposed development.

[9] Data were supplied by the Irish Wetland Bird Survey (I-WeBS), a scheme coordinated by BirdWatch Ireland under contract to the National Parks and Wildlife Service of the Department of Housing, Local Government and Heritage

[10] Available at: https://assets.gov.ie/233057/f1a92f68-e668-498d-a56c-df777a19b549.pdf. Accessed July 2026.

[11] Available at: https://www.longfordcoco.ie/services/planning/longford-county-development-plan-2021-2027/volume-1-compressed.pdf. Accessed July 2026

Table 4.1: Key Points of Scoping and Consultation Reponses

Consultee	Key Point of Response	Consideration of Stakeholder Responses in Survey Design and Impact Assessment
Development Applications Unit - Department of Housing, Local Government and Heritage	Ecological assessment is a data-driven scientific process, with surveys designed to answer key questions.	The assessment has been designed to ensure it addresses key questions relevant to the biodiversity and potential effects of the proposed development. It incorporates scientifically rigorous methods and data collection to support assessment and conclusions of potential impact and the design of mitigation measures.
	Ornithological surveys should not solely rely on SNH guidelines but be tailored to inform decisions on potential impacts to European sites, biodiversity, and the wider environment. Additional survey methods and technologies may be needed beyond SNH guidance.	The ornithological surveys have been adapted beyond SNH guidelines to ensure they are specific to the local context and designed to provide a clear understanding of potential effects on European sites and local biodiversity.
	The assessment should evaluate the connection between birds using the site and nearby European sites, such as Lough Ree SPA, distinguishing between behaviours like breeding, roosting, and foraging.	The assessment considers connectivity of bird populations between the site and adjacent European sites, distinguishing different behavioural patterns such as breeding, roosting, and foraging, as these activities may have different levels of vulnerability to development effects. The assessment includes: Surveys were designed to capture these behavioural patterns across relevant time periods, including breeding and non-breeding seasons. The data gathered has informed an understanding of the spatial and temporal use of the site by protected species and allowed for an assessment of whether these activities are linked to SCIs of European sites. The potential for effects such as disturbance, habitat loss, displacement, and collision risk has been assessed in relation to each relevant SCI. Where connectivity to European sites is identified, the assessment considers whether any of the activities conducted by the birds at the site are critical to the achievement of the conservation objectives of those designated sites. Based on the findings, appropriate mitigation measures have been proposed where necessary to avoid or reduce effects on species exhibiting these behaviours. The conclusions drawn reflect both the ecological sensitivity of the species involved and the importance of their behaviours in maintaining the integrity of the relevant European sites.

Consultee	Key Point of Response	Consideration of Stakeholder Responses in Survey Design and Impact Assessment
	Advanced techniques like mark-recapture and telemetry tracking should be used to assess bird movement, dependency, and connectivity.	While advanced techniques such as mark-recapture and telemetry tracking were not employed as part of this assessment, the movement, site usage, and potential connectivity of key bird species to adjacent European sites have been robustly addressed through a comprehensive suite of standardised ornithological survey methods, carried out over multiple seasons. These include detailed vantage VP surveys, flight activity mapping, behavioural observations, and transect survey and targeted species-specific surveys conducted during critical periods (e.g. breeding and overwintering). The survey effort was designed to capture temporal and spatial patterns in bird activity, allowing for the identification of potential functional links between the proposed development site and designated European sites. Behavioural patterns (e.g. foraging, roosting, and breeding) were also recorded, providing evidence of how species interact with the proposed wind farm site and the surrounding landscape. While telemetry or tagging would have provided additional fine-scale movement data, the combination of expert interpretation of long-term field data collected over seven seasons between the breeding season of 2021 and the breeding season 2024, and analysis of bird distribution patterns has provided sufficient evidence to assess likely significant effects and inform appropriate mitigation where required. As such, the assessment is considered proportionate and adequate for the purpose of evaluating potential effects under Article 6(3) of the Habitats Directive.
	Bird numbers and site use should be compared with data from adjacent European sites and international populations.	The assessment approach followed standard methodologies aligned with current national guidance and was considered proportionate to the scale and nature of the development. The data collected provided a robust basis for identifying potential linkages to European sites for assessing likely significant effects in accordance with Article 6(3) of the Habitats Directive. Where relevant published information on nearby designated sites was available, it was reviewed to provide context for the site-specific findings.
	Survey data should be presented on maps, with raw data in linked tables, including visibility conditions and weather records.	Survey data is be mapped and raw data provided. This brings transparency and context. In all cases weather conditions during survey visibility conditions and relevant weather records are included that could influence bird behaviour.
	Surveys should cover a range of times, seasons, and species-specific periods, such as migration and breeding.	The surveys have been designed to cover a variety of times, seasons, and periods specific to key species, including migration, breeding and non-breeding seasons, to ensure comprehensive understanding of the potential effects across different timeframes.

Consultee	Key Point of Response	Consideration of Stakeholder Responses in Survey Design and Impact Assessment
Irish Wildlife Trust (IWT)	The biodiversity impact should assess the connectivity of the lands to surrounding areas, especially the River Shannon and Lough Ree SAC.	The biodiversity impact assessment included an evaluation of the connectivity of the proposed development site with surrounding areas to understand the potential ecological corridors and effects.
	The assessment should examine future trends, including: • Potential colonisation of the area by white-tailed eagles. • Changes in the number and distribution of whooper swans. • Potential recovery of breeding waders, such as curlew and redshank. • These trends should be evaluated across a variety of time frames.	The biodiversity impact assessment included a thorough evaluation of the ecological connectivity between the proposed development site and the surrounding landscape, with particular attention to potential linkages to nearby designated sites and important habitats. This included an assessment of ecological corridors such as hedgerows, watercourses, and wetland areas that facilitate species movement, foraging, and seasonal migration. The assessment considers white-tailed eagle and breeding wader species including curlew and redshank.

5.0 IDENTIFICATION OF RELEVANT EUROPEAN SITES WITHIN THE LIKELY ZONE OF INFLUENCE

The following sections describe the Source-Pathway-Receptor (SPR) model used in the AASR-NIS to identify relevant European sites within the likely Zone of Influence (ZoI) of the proposed development.

This SPR model systematically evaluates how effects from the development could affect ecological features both within and outside the European site boundaries, providing a clear framework for assessing potential effects on designated habitats and species.

5.1 EFFECTS AND ZONE OF INFLUENCE

This section provides a general overview to the identification of the ZoI for projects. The section highlights how ecological, hydrological, and biological linkages can influence both in-situ and ex-situ effects on QIs and SCIs of European site and thereby affect the ZoI.

As outlined in the *Appropriate Assessment of Plans and Projects in Ireland* (DoEHLG, 2010), a 15 km buffer is often used as an initial starting point for identifying potentially affected European sites. This broad preliminary review ensures that no relevant sites are overlooked. However, the actual ZoI is refined based on the specific characteristics of a project, such as type, scale, and location, along with the ecological sensitivities of nearby receptors and the potential for in-combination effects. In many cases, a more focused assessment may be necessary, considering sites much closer than 15 km (sometimes within just 100 meters), to accurately assess the likelihood and significance of any potential effects. A preliminary assessment of European sites with 15km for the proposed wind farm site and the TDR is presented in Section 6.3.

Mobile QI or SCI species are referred to here as those species that have a range beyond the European site for which it is designated. The range of mobile QI or SCI species varies considerably, from only a few meters (e.g. in the case of the Narrow-mouthed Whorl Snail (*Vertigo angustior*) [Species code: 1013] and Geyer's Whorl Snail (*Vertigo geyeri*) [Species code: 1014]), to extensive distances. For example, migratory wetland birds may travel hundreds of kilometres between breeding (summer) sites, staging (stopover) locations), and non-breeding (wintering) sites, while the European Otter may move across large river systems, lakes, and coastal areas as part of its natural range.

In contrast, to mobile QIs and SCIs, relatively sedentary QI species and QI habitats typically have ZoIs within close proximity to a proposed project. However, they can still be significantly affected at much greater distances from the source of the impact.

Consequently, a project may have an effect on a QI or SCI either within the boundaries of the European site (**in-situ effects**) or outside the boundaries (**ex situ effects**) for which it is designated. However, the extent and nature of any effect will be site-specific, depending on the receptor and the nature of the impact source. The ecological, hydrological, hydrogeological, physical, and biological linkages between the project and the European site also play a crucial role in determining how these effects are transferred. These linkages can influence whether effects occur directly within the European site or are transmitted to connected European site areas, potentially affecting species and habitats both inside and outside the site boundaries

For example, ecological, hydrological, hydrogeological, physical, and biological linkages between a project and a European site can result in in-situ effects to a QI or SCI, where pollutants, changes in habitat structure, or other disturbances are transferred directly into the designated site. This can potentially impact the structure or function of qualifying habitats or species populations within the site boundaries, disrupting their ecological integrity and compromising their conservation status.

Similarly, linkages between a project and a European site can result in ex-situ effects to a QI or SCI, where pollutants or disturbances are transferred from the project to areas outside the designated site boundaries. These areas may be used by qualifying species for activities like foraging, migration, or shelter. As a result, these effects can affect the species or habitat indirectly, altering their behaviour, health, or overall function within their broader range, potentially compromising their ability to maintain their natural processes and survival.

5.2 IDENTIFICATION OF THE LIKELY ZONE OF INFLUENCE OF THE PROPOSED DEVELOPMENT

To inform the AASR-NIS, a range of Geographic Information System (GIS) spatial datasets and mapping tools were utilised to identify potential interactions between the proposed development and European sites. The key steps undertaken in this assessment are outlined below.

The methodology, based on relevant guidance as outlined in Section 4, ensures a structured stepwise approach that systematically evaluates all potential interactions between the proposed development and European sites, in accordance with the requirements of the Habitats Directive and relevant national legislation.

Spatial Data Collection and Mapping: The most up-to-date GIS spatial datasets for European sites, as well as Water Framework Directive (WFD) Surface Water Bodies (SWBs) (i.e. River Water Bodies (RWB) and Lake Water Bodies (LWB)) and Ground Water Bodies (GWB), are sourced from the NPWS website and the EPA website.

These datasets were integrated into the assessment process to establish spatial relationships between the proposed development and European sites, enabling an informed evaluation of potential impact pathways.

Identification of European Sites Using a Source-Pathway-Receptor Model: A Source-Pathway-Receptor model was applied to systematically identify all European sites that could potentially be affected by activities at the proposed development.

European sites located at greater distances from the proposed development were also examined to assess potential connectivity. However, for these more remote sites, no complete source-pathway-receptor chain was identified, and therefore, they were not considered further in the impact assessment.

Assessment of Connectivity with SACs: To assess potential hydrological and hydrogeological connectivity between the SACs and the wind farm site and at POIs along the TDR was assessed by mapping the WFD SWBs (i.e., RWBs and LWBs) and GWBs to determine if waterborne pathways existed.

The assessment of connectivity also considered ecological pathways, such as the movement of species and habitats, as well as riparian corridors that might facilitate biological connectivity across the landscape.

Assessment of Connectivity with SPAs: In the absence of specific European or Irish guidance on assessing connectivity between projects and SPAs, the NatureScot (formally Scottish Natural Heritage [SNH]) document *Assessing Connectivity with Special Protection Areas* (SPA) (SNH, 2016) was consulted.

The document establishes a framework for assessing connectivity between a project and designated SPAs by considering the typical dispersal and foraging ranges of bird species protected under the Birds Directive. It accounts for the distance species may travel beyond SPA boundaries and provides insights into their movement patterns.

The assessment applied species-specific knowledge to evaluate whether qualifying bird species associated with SPAs could be affected by the proposed development. The dispersal and foraging ranges of SCIs of SPAs are taken into account when assessing impact during the assessment of potential effects on SPA species.

Likely Zone of Influence of the Proposed Development

Since the proposed development is not located within any European sites, **no direct effects** anticipated. However, **indirect in-situ and ex-situ effects remain a possibility.**

Section 6.3 below establishes the Likely Zone of Influence of the proposed development based on an evaluation of how species from nearby European sites could be impacted, especially if they use the proposed development site and POIs for activities such as foraging, breeding, or migration.

5.3 SOURCE-PATHWAY-RECEPTOR (SPR) MODEL

In the AASR-NIS, the Source-Pathway-Receptor model is employed to identify the likely Zone of Influence (ZoI) of the proposed development and assess the potential for significant effects on the QIs and SCIs of European sites. This model helps systematically evaluate how effects from the development could affect ecological features both within and outside the European site boundaries. The SPR model is a well-established framework used in environmental impact assessments including Appropriate Assessment. The framework is effective in identifying potential for significant effects on the environment:

- Ensures a logical and traceable assessment of whether a source of impact exists, whether a pathway for transmission is present, and whether a sensitive receptor may be affected.
- Is widely accepted in guidance documents including the European Commission's Appropriate Assessment guidance (EC, 2001; 2018) and national guidance in Ireland (DoEHLG, 2010).

The SPR model aligns with the principles of ecological risk assessment and is suited to receptor types where both direct (e.g. habitat loss) and indirect effects (e.g., hydrological change or habitat degradation) are pathways of impact.

The SPR model is shown graphically below. The existence of a pathway is a crucial element in the screening process. If no pathway can be identified between the 'source' and the 'receptor',

then no effect can be anticipated on the receptor (OPR, 2021). General descriptions of the elements of the SPR model are described below:

Source:

The source refers to the origin of the potential effect, here activities associated with the proposed development. This comprises the construction and operation of a wind farm, the release of pollutants, noise disturbance, habitat destruction, or changes in hydrology due to land use changes. The source is where the environmental stressor or threat originates, and it is essential to define clearly what activities could lead to effects.

Pathway:

The pathway represents the route or mechanism through which the potential impact travels from the source to the receptor. This could include physical, chemical, or biological means. In the case of the proposed development, the pathway could involve direct physical disturbance to species or habitats (e.g., bird collisions with turbines), changes in water flow affecting aquatic ecosystems, or the dispersion of pollutants or noise across the landscape. Pathways are crucial in understanding how the impact could reach sensitive areas and whether mitigation measures could interrupt or alter the path.

Receptor:

The receptor refers to the specific environmental feature or component that is vulnerable to the identified impact, in this case QI and SCI species and habitats of European sites. For the proposed development, receptors include designated QI species such as non-volant mammals, and SCI bird species that are sensitive to disturbance, or the key habitats that are used by species including wetlands, watercourses etc. The receptor's sensitivity to the impact is assessed to understand the degree of risk posed by the development.

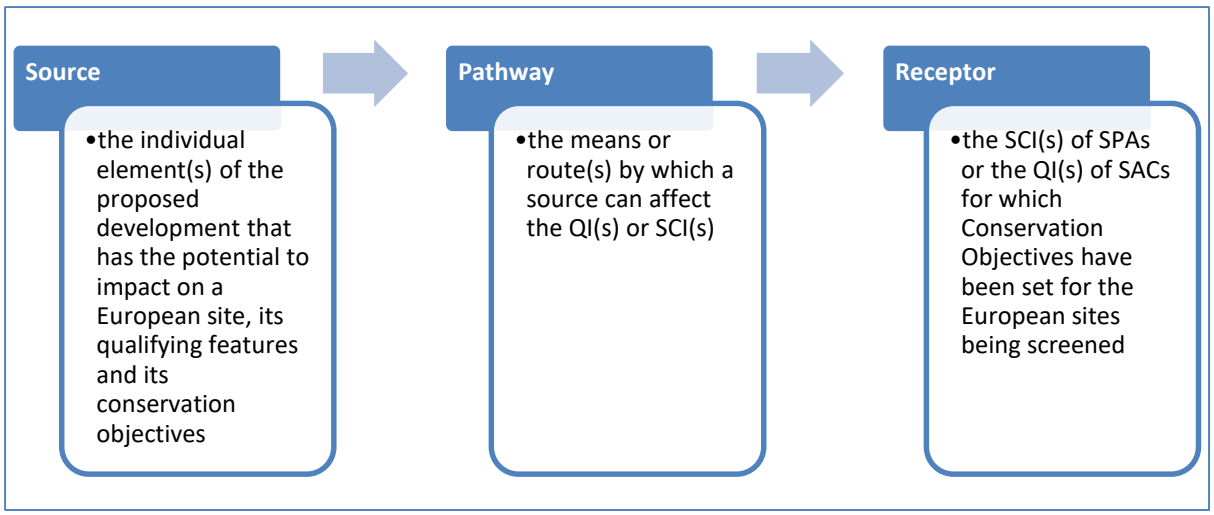


Figure 5.1: Source-Pathway-Receptor Model for the Proposed Development

5.4 IMPACT ASSESSMENT FRAMEWORK

In the AASR-NIS, a combination of assessment approaches was applied to evaluate potential effects on the QIs of SACs and the SCIs of SPAs. An overview of the assessment approach for terrestrial and aquatic ecology is provided in Section 5.5, while the evaluation of potential

effects on bird species, which follows the methodology proposed by Percival (2003), is detailed in Section 5.6.

The use of multiple assessment methods is both appropriate and necessary, given the differing nature and pathways of potential effects arising from the construction, operation, and decommissioning phases of the proposed development. By applying the most suitable methodology to each ecological receptor, this AASR-NIS provides a robust, evidence-based, and ecologically meaningful evaluation of potential impacts.

5.5 TERRESTRIAL AND AQUATIC ECOLOGY ASSESSMENT

5.5.1 Overview

The following sections provide a brief overview of the evaluation of the potential ecological effects of the proposed wind farm development on both terrestrial and aquatic species and environments. The assessment specifically addresses the QIs and SCIs of European sites, considering both in-situ and ex-situ effects. It examines the potential effects on habitats and species both within the designated European site boundaries (in-situ effects) and in surrounding areas (ex-situ effects). The assessment takes into account the construction, operational and decommissioning phases of the development, addressing how these phases may affect habitats, species populations, and ecological linkages both inside and outside of the European sites.

5.5.2 Construction Phase Effects

The construction phase of the proposed wind farm involves the installation of 22 turbines, 2 met masts, turbine foundations, access roads, substations, Battery Energy Storage System (BESS), amenity access tracks and cabling infrastructure. This phase is anticipated to generate potentially temporary environmental effects, particularly related to hydrology, fauna disturbance, and potential contamination. These potential effects are outlined below.

5.5.2.1 Siltation Effects

Construction activities such as excavation, vehicle movement, and earthworks may dislodge soil and sediment, increasing suspended solids in nearby watercourses. If sediment control measures are insufficient, this could result in siltation in receiving aquatic ecosystems, adversely impacting water quality and aquatic organisms.

Sediment runoff could be carried into nearby water bodies, where it may settle and cause turbidity, smothering aquatic habitats. Increased sedimentation can impair water quality by reducing light penetration, which negatively effects aquatic plant life. This disruption can also hinder the feeding, breeding, and movement of fish and invertebrates. Prolonged siltation may lead to habitat degradation, which could reduce biodiversity and compromise the functionality of local aquatic ecosystems.

5.5.2.2 Dust Effects

Construction activities such as excavation, earthworks, vehicle movement, and the development of access and amenity tracks can generate quantities of airborne dust, especially during dry weather conditions. The creation and use of these tracks, including the movement of

construction machinery and increased human activity, may disturb surface soils and result in dust dispersion beyond the immediate work areas.

If unmanaged, this dust can settle on surrounding vegetation, soil surfaces, and water bodies, leading to localised contamination. Sensitive habitats such as bogs, heathlands, wetlands, and semi-natural grasslands are particularly vulnerable to dust deposition, which can inhibit photosynthesis, clog plant stomata, and alter plant and soil chemistry.

Dust deposition in aquatic systems may contribute to turbidity or nutrient enrichment, affecting water quality and potentially disrupting the feeding, breeding, and movement of aquatic organisms. Furthermore, elevated dust levels can degrade habitat quality for ground-nesting birds, invertebrates, and small mammals, particularly with the installation of amenity tracks.

5.5.2.3 Contamination Effects

Construction activities will involve significant handling of fuels, oils, hazardous materials, bentonite used in HDD drilling, and materials from concrete washout. These activities pose a risk of spills or leaks, particularly in areas without proper secondary containment or during adverse weather conditions. The potential for hydrocarbons, bentonite, and concrete washout materials to enter nearby watercourses through runoff or spills may result in ecological harm.

Hydrocarbons are highly toxic to aquatic life, especially to species like fish and invertebrates. These substances persist in the environment, accumulate in sediments, and disrupt the food chain. While bentonite is non-toxic, large amounts introduced into watercourses can lead to sedimentation or alter water chemistry, negatively affecting water quality. Additionally, materials from concrete washout can raise the pH levels of water, significantly degrading water quality and harming aquatic organisms and habitats.

The contamination of water by these substances can cause long-term damage to water quality and aquatic ecosystems, impairing their ability to support diverse species and leading to significant ecological harm.

5.5.2.4 Disturbance and Displacement Effects on Fauna

Construction activities will generate visual, noise, and physical disturbances from:

- Heavy machinery operations
- Groundworks and excavation
- Increased human presence

Disturbance from construction activities could cause QI species to temporarily move away from certain areas, especially during active machinery operations. While otters are generally adaptable, the noise and human presence may cause stress, particularly if construction activities occur near known otter habitats or resting sites. In such cases, the construction activities could disrupt their behaviour, potentially leading to temporary displacement.

5.5.2.5 Direct Mortality Effects

Increased traffic from construction vehicles poses a risk of mortality, particularly for otters. The increased vehicle movement during the construction phase could exacerbate this risk. This

could lead to local otter mortality, contributing to a decline in the species' population within the area.

5.5.2.6 Spread of Invasive Alien Plant Species (IAPS)

The presence of Rhododendron near the construction compound raises risk about its potential spread. Invasive alien species, like Rhododendron, may spread through construction activities, either via wind dispersal of seed or when construction vehicles unintentionally transport seeds on machinery or equipment. The spread of invasive species can outcompete native vegetation, leading to a reduction in plant biodiversity. In turn, this could alter local ecosystems, reducing habitat availability for native fauna and potentially displacing native species.

5.5.3 Operation Phase Effects

After the construction phase, the proposed wind farm will enter its operational phase. The primary ecological concern during this phase is the potential for ongoing disturbance or displacement of fauna due to the physical presence and motion of wind turbines.

5.5.3.1 Disturbance/Displacement Effects on Fauna

QI species are unlikely to be significantly disturbed by the operational turbines. For instance, Otter are highly adaptable to human presence and have been observed to thrive in urbanised environments. Given this species' tolerance for human activity, it is expected that the turbines and their maintenance will not significantly disrupt their behaviour or movement patterns.

5.5.4 Decommissioning Effects

Sources of effect are identified for the construction, operation, and decommissioning phases of the proposed development, each posing varying degrees of risk to species and their habitats. These include direct habitat loss, disturbance, displacement, and collision risk, all assessed in terms of their likelihood, magnitude, and the sensitivity of the receptors involved. The nature of impacts during decommissioning is generally similar to those during construction, though typically of lower extent and shorter duration.

5.6 ORNITHOLOGICAL ASSESSMENT (PERCIVAL 2003)

5.6.1 Overview

The Percival (2003) methodology, as applied here, is specifically designed to evaluate potential effects of wind energy developments on bird populations. It is widely used in ornithological impact assessments. SNH (2017) references and builds upon the approach developed by Percival (2003), particularly in relation to assessing bird sensitivity and magnitude of effects from wind farm developments.

The use of the Percival (2003) framework here is effective methodology as:

- Birds, unlike many other ecological receptors, are highly mobile and capable of long-distance movements across landscapes and jurisdictions.
- Bird species can exhibit natural seasonal and geographical variability.

- The Percival method introduces species-specific sensitivity and magnitude criteria to evaluate risk, which are essential in determining the significance of effects on SCIs of SPAs.
- It incorporates survey data and spatial behaviour (e.g., flight paths, foraging range), which are central to evaluating risks such as displacement or collision.

The main effects of sources of impact associated with wind farms are identified by SNH (2017) as:

1) Collision Risks: Wind turbines can pose direct threats to birds through collisions, especially in areas with high bird densities or migratory routes.
2) Disturbance and Displacement: The presence of wind farms can disturb birds, leading to displacement from critical habitats such as feeding or nesting areas.
3) Habitat Alteration: Construction and operation of wind farms may alter habitats, affecting the availability of resources for birds.
4) Cumulative Effects: The combined effects of multiple wind farms in a region can exacerbate these issues, potentially leading to significant ecological consequences.

Percival (2003) framework for assessing the potential effects of wind farms on bird populations consider the following three key criteria:

1) Sensitivity of the receptor
2) Magnitude of the effect
3) Significance of the effect

Descriptions of the criteria are provided in the following sections.

5.6.2 Sensitivity of Ornithological Receptors

The 'sensitivity' of each bird species or population relates to the conservation importance the species or population assumes at a local, regional, national and international level. Each avian species is associated with a classification for its 'sensitivity', which is defined as its ecological importance (Percival, 2003), determined by the criteria in Table 5.1

Table 5.1: Determination of Sensitivity (table copied from Percival, 2003)

Sensitivity	Determining Factor
Very High	Species that form the cited interest of SPAs and other statutorily protected nature conservation areas. Cited means mentioned in the citation text for the site as a species for which the site is designated.
High	Species that contribute to the integrity of a SPA but which are not cited as species for which the site is designated. Ecologically sensitive species including the following: divers, common scoter, hen harrier, golden eagle, red- necked phalarope, roseate tern and chough. Species present in nationally important numbers (>1% Irish population).
Medium	Species listed in the Annex 1 of the Birds Directive Species present in regionally important numbers (>1% regional (county) population)Other species on BirdWatch Ireland's red list of Birds of Conservation Concern (Gilbert *et al.*, 2021).
Low	Any other species of conservation interest, including species on BirdWatch Ireland's amber list of Birds of Conservation Concern not covered above.

In the context of Appropriate Assessment, only the appraisal of effects on species of 'Very High' *Sensitivity* (i.e. SCIs of European sites) is relevant.

5.6.3 Magnitude of Potential Effects

Each type of general effect is associated with an extent in which that effect could be assessed as significant, i.e. the area affected by the loss of potential to support current bird populations - *Magnitude* of an effect (see Table 5.2), as defined by Percival (2003).

Table 5.2: Determination of Magnitude of Effects (table copied from Percival, 2003)

Magnitude	Determining Factor
Very High	Total loss or very major alteration to key elements/ features of the baseline conditions such that the post development character/composition attributes will be fundamentally changed and may be lost from the site altogether. *Guide: < 20% of population/habitat remains*
High	Major loss or major alteration to key elements/features of the baseline (pre-development) conditions such that post development character/composition/attributes will be fundamentally changed. *Guide: 20-80% of population/habitat lost*
Medium	Loss or alteration to one or more key elements/features of the baseline conditions such that post development character/composition/attributes of baseline will be partially changed *Guide: 5-20% of population/habitat lost*
Low	Minor shift away from baseline conditions. Change arising from the loss/alteration will be discernible but underlying character/composition/attributes of baseline condition will be similar to pre-development circumstances/patterns. *Guide: 1-5% of population/habitat lost*
Negligible	Very slight change from baseline condition. Change barely distinguishable, approximating to the "no change" situation *Guide: < 1% population/habitat lost*

Because one of the parameters for the determination of the *Magnitude* of an effect on avian resources is the loss of suitable/preferred habitat, baseline habitat data is used for its determination (Section 5.7.1). However, since the proposed wind farm site is not an isolated landscape feature to birds, landcover data of the wider environment (within 5km from the proposed wind farm site - Percival, 2003), adapted from the Corine Land Cover 2018 dataset[12], is also used to conclude about the local distinctiveness of the habitats in the proposed wind farm site within the wider context, with respect to their ornithological importance. The relative combination of the two datasets is then used with the criteria for the determination of *Magnitude* of effects.

5.6.4 Significance of Potential Effects

The determination if a specific risk/effect from a wind farm development is acceptable or unacceptable in terms of an effect assessment is informed by the combination of the

[12] **Creative Commons Attribution 4.0 License** available at https://data.gov.ie/dataset/corine-landcover-2018/resource/eead42c4-9eb2-40bc-8c91-a9f3e503d0e8?inner_span=True (Accessed in September 2024; Minimum Mapping Unit of 25 hectares and a Minimum Mapping Width of 100 m)

classification of the individual parameters *Sensitivity* and *Magnitude*, described in the Sections above. The combined result would indicate the *Significance* of an impact, and should be interpreted as (Percival, 2003):

- *Very low* and *Low* – should not be of concern, under regular circumstances, although consideration on the design should be exercised for impact minimisation;
- *Medium* – could potentially be a significant impact, requiring individual assessment. Appropriate mitigation and/or design revision may suffice to reduce this impact significance; and
- *High* and *Very high* – represents a highly significant impact on avian resources, which would warrant a planning application refusal.

Table 5.3: Significance Matrix: Combining Magnitude and Sensitivity to Assess Significance (Percival, 2003)

SIGNIFICANCE		Sensitivity			
		Very high	High	Medium	Low
MAGNITUDE	VERY HIGH	Very high	Very high	High	Medium
	HIGH	Very high	Very high	Medium	Low
	MEDIUM	Very high	High	Low	Very low
	LOW	Medium	Low	Low	Very low
	NEGLIGIBLE	Low	Very low	Very low	Very low

5.6.5 Collision Risk Assessment

Collision Risk Modelling (CRM) is a widely applied method used to estimate the potential for bird-turbine collisions in wind energy developments. As noted in Percival (2003), CRM plays an important role in the assessment of effects on bird populations sensitive to collision risk, such as large raptors and migratory waterbirds. The model provides a structured, quantitative approach to evaluating the likelihood of bird collisions based on site-specific flight activity and turbine parameters and plays a critical role in Environmental Impact Assessments (EIAs) and Appropriate Assessments for wind energy developments—particularly where sensitive or protected bird species may be impacted.

Percival (2003) highlights that, while CRM is a useful tool, it is subject to limitations, particularly around the accuracy of bird flight height data, assumptions about avoidance behaviour, and the need for robust baseline survey data. The report emphasises that CRM should not be used in isolation, but rather as part of a broader ornithological assessment framework that also considers displacement, habitat loss, and cumulative effects. CRM outputs should therefore be interpreted in the context of species ecology, population estimates, mortality thresholds, site connectivity and the precautionary assumptions applied within the assessment.

For the proposed wind farm, a CRM was applied in accordance with NatureScot (2024) and Band (2024) guidance to estimate the potential number of bird collisions with wind turbine blades. Specifically, the objectives of the CRM were to:

- Quantify the likelihood of bird collisions with turbines,
- Support compliance with the EU Birds Directive and Habitats Directive, and
- Inform mitigation measures and wind farm design to reduce the potential effects on avian populations.

Key Inputs

CRM requires the following data:

- Flight activity data: Recorded using vantage point surveys, measuring bird flight height, direction, and frequency.
- Turbine specifications: Blade length, rotation speed, hub height, number of turbines, etc.
- Bird biometrics: Wingspan, flight speed, avoidance rates.
- Avoidance rate: A critical assumption representing the proportion of birds that actively avoid collision.

The CRM model for the proposed wind farm (presented in full in Appendix L) is based on data collected over seven seasons, using Vantage Point (VP) surveys conducted from the 2021 breeding season through to the 2024 breeding season. The CRM results were subsequently considered in the context of species-specific reference populations and associated mortality thresholds to determine the potential significance of predicted collision mortality. This assessment recognised that the modelling incorporates a number of precautionary assumptions and sources of uncertainty, including assumptions relating to avoidance behaviour, background mortality rates and population size.

CRM Stages

Guidance from NatureScot (2024) and Band (2024), outline a framework for estimating the risk of bird collisions with wind turbine blades. The is framework comprises the following five key stages:

- Estimation of bird flight activity within the rotor-swept height at the development site, based on data collected through vantage point (VP) surveys;
- Calculation of the proportion of birds at risk, taking into account flight heights, flight behaviour, and turbine specifications;
- Assessment of bird avoidance rates, applying species-specific avoidance factors that reflect behavioural tendencies to avoid turbines;
- Determination of collision probability, calculated using the geometric and behavioural assumptions presented in the Band CRM model[13];
- Final estimation of annual collision mortality, which incorporates the number of turbines, operational hours, and the level of bird flight activity at the site

[13] The Band Collision Risk Model uses geometric factors, including rotor-swept area, bird flight paths, and turbine dimensions, to estimate collision risk. It accounts for species-specific flight behaviours and turbine motion to accurately assess bird-turbine interactions

Outputs

CRM provides:

- Estimated number of potential bird collisions per year.
- Species-specific risk assessments.
- Input for population viability analysis if required.

5.6.6 Linkage Between the Percival (2003) Methodology and Appropriate Assessment Requirements

The use of the Percival (2003) methodology in this AASR-NIS aligns with the legal and methodological requirements of Appropriate Assessment as set out in Article 6(3) of the Habitats Directive (92/43/EEC) and interpreted by national and EU-level guidance.

1. **Focus on Conservation Objectives**

Appropriate Assessment requires that any plan or project be assessed for its potential to affect the integrity of European sites, with particular regard to their conservation objectives.

The Percival methodology directly supports this by focusing on SCIs of SPAs, the approach allows for a detailed evaluation of potential effects (e.g. displacement, habitat loss, and collision risk) that could compromise the conservation status of SCI populations.

2. **Assessment of Significance**

The Appropriate Assessment process hinges on the assessment of whether an impact is likely to be significant, either alone or in combination with other plans or projects.

Percival (2003) offers a structured and transparent method for determining significance, based on key variables: sensitivity of the receptor (i.e. conservation value of the species) and magnitude of the potential effect. This aligns with the "precautionary principle" underpinning Appropriate Assessment, by ensuring that all potentially significant risks to qualifying bird species are systematically evaluated.

3. **Use of Best Scientific Knowledge**

Under Article 6(3), assessments must be carried out using the best scientific knowledge in the field. The Percival methodology, widely referenced in guidance by bodies such as SNH and previously used in ornithological assessments (e.g. Percival 1999), represents best practice for ornithological impact assessment in the context of wind farm developments. Its application is consistent with the scientific standards expected in the Appropriate Assessment process, ensuring that the conclusions drawn are both robust and legally defensible.

4. **Receptor-Specific Methodologies**

Appropriate Assessment requires consideration of the specific ecological characteristics of qualifying features. Birds are susceptibility to collision risk. The SPR model, while appropriate for the majority terrestrial-based or hydrological receptors, is insufficient to capture the behavioural and population-level responses of bird species. The Percival framework is designed precisely for this purpose, enabling a receptor-specific assessment that is ecologically meaningful and compliant with Appropriate Assessment standards.

5.7 FIELD STUDY

5.7.1 Multidisciplinary Walkover Survey

A multidisciplinary walkover survey was carried out at the proposed wind farm site in August 2022, followed by a supplementary survey in July 2023. The area surveyed is hereafter referred to as the 'study area. Representative and significant habitats within the proposed wind farm site were surveyed and mapped, in good weather conditions and unconstrained, although particular focus was dedicated to the areas where the infrastructure associated with the proposed wind farm is to be located. Some marginal habitats were not surveyed (Section 5.7.6.1) but were also mapped, based on historic survey effort at the study area (TOBIN Consulting Engineers, 2019a). Habitats surveyed within the study area were classified upon the qualitative consideration of the plant species abundance, diversity, and protection status; vegetation structure; topography; drainage conditions; and evidence for disturbance and/or management. For specific habitat types, such as petrifying springs, specialised survey guidelines were followed, as Denyer *et al.* (2023), respectively (further information in Section 6.2.1.1.2). In all cases, the predominant plant species were identified and named according to Parnell & Curtis (2012) and Stace (2010) for higher plans; Atherton *et al.* (2010) for bryophytes; and Fitter and Fitter (1984) for grasses, sedges and rushes.

Habitats were classified according to Fossitt (2000), while satellite imagery assisted with habitat delineation and interpretation, following Smith *et al.* (2011). The survey included the identification of plant species protected under the Flora Protection Order (S.I. No. 235/2022), listed in Irish Red List Series (King *et al.*, 2011; Lockhart *et al.*, 2012; Wyse Jackson *et al.*, 2016), and habitat/species that could afford its classification as those designated under the Annex I of the Habitats Directive (Council Directive 92/43/EEC).

Also, a search for Invasive Alien Species listed under the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477 of 2011, as amended) was also conducted throughout the study area. Although direct sighting are reported in this report of animals listed in Part 2 of the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011, because it is not considered that any of the proposed development phases carry the risk of contributing for their propagation, particular attention was paid instead to Invasive Alien Plant Species (IAPS) listed in Part 1 of the mentioned Statutory Instrument, which could spread as a consequence of the proposed development.

While surveying the study area for habitats and flora, the multidisciplinary walkover survey also included the search for evidence for the presence of other protected species, described in Section 6.2.1.3.

5.7.2 Aquatic Survey

The local aquatic ecology was determined using a set of surveys to assess fish and macroinvertebrate communities, along with the observation of relevant habitat features and appraisal of the overall ecological quality of 12 sampling sites. Still Waters Consultancy (Appendix I.3) surveyed 12 representative locations (sampling sites) within and downstream the proposed wind farm site (Figure 5.2) between the 16th and 18th of September 2022, where the following surveys were carried out:

- River habitat survey (adapted from Environment Agency, 2003; and Toland and Murphy, 2013);
- Kick-sampling (adapted from Toner *et al.*, 2005); and
- Electrofishing (O'Grady, 2006; Matson *et al.*, 2018).

Also, the river habitat at the sampling sites was also classified for its suitability to support protected aquatic species of conservation concern (e.g. White-clawed Crayfish, *Austropotamobius pallipes*; River Lamprey, *Lampetra fluviatilis*; Brook Lamprey, *Lampetra planeri*; and Atlantic Salmon, *Salmo salar*).

The 12 sampling sites have been previously visited by TOBIN ecologists on the 29th and 30th of June 2022. However, because the water levels were too high, it was only possible to carry out the River Habitat Survey on that occasion.

5.7.2.1 River Habitat Survey

At each sampling site, a reach of approximately 50m of river length was selected as representative of the local aquatic and riparian habitat conditions. Relevant aquatic/riparian habitat and hydromorphological features were recorded for these reaches during the site visits in June 2022 (Appendix I.1), such as:

- Bank characteristics: bank height; width; habitat classification (Fossitt, 2000); riparian vegetation; land use;
- Aquatic habitat: wetted width; depth; water level (qualitative); flow velocity (qualitative); flow typology; substrate composition; instream vegetation (macrophyte; filamentous algae); and
- Local pressures.

These features were used to assess the physical suitability of each channel for supporting salmonids, lampreys and other fish, a macroinvertebrate assemblage typical of equivalent *Good* WFD water quality status streams, and to ascertain an ecological evaluation at the sampling sites.

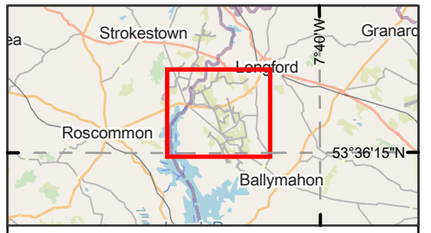
Although the results of this survey are mostly from the sites' visit in June 2022, in September 2022, when the sites have been re-visited to carry out the other surveys, the results were either confirmed or complemented with new observations.

5.7.2.2 Kick-sampling

The macroinvertebrate communities at each sampling site were surveyed with the use of a 'D' shaped net (250mm width; 500µm mesh size), which was submerged on the riverbed with its opening facing upstream. The kick-sampling method involves disturbing the river substrate immediately upstream the net for two minutes, to dislodge the invertebrates, which will be caught in the net. The survey started at riffle areas of the reach (if available), moving along other flow types and aquatic habitats (including vegetation sweeping), finalising with one minute of stone/cobble washing. This semi-quantitative sampling methodology ensures the final sample is representative of the macroinvertebrate assemblage of the reach, and suitable for a qualitative water quality classification (Letovsky *et al.*, 2012).

8°2'0"W
7°55'35"W
7°49'10"W
53°42'40"N
53°40'15"N
53°37'50"N
773500
768000
762500
600000
606000
612000





Legend

- Proposed wind farm site
- Aquatic Sampling Sites
- EPA - Streams hydrological pathway
- EPA - Lakes

0 1 2
Kilometres

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	06/05/2025	First issue	S.P	I.H

Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Figure 5.2: Aquatic Survey Locations

Scale @ A3: 1:50,000

Prepared by:	Checked by:	Date:
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Map Ref: 11399-027-Aq.S-EPA-TOB-A

Draft: A

5.7.2.3 Water Quality Assessment

The water quality for each sampling site was assessed using the EPA scheme of Biotic Indices or Quality (Q) Value (Toner *et al.*, 2005), which uses benthic macroinvertebrates as indicators since it is a community that produces well documented responses to a wide range of water quality characteristics and pollutants (Feeley *et al.*, 2020).

The Q Value system divides the benthic invertebrates into five 'Macroinvertebrate Faunal Groups' according to their tolerance to pollution (mostly related with deoxygenation and eutrophication), ranging from most sensitive species (Group A), to the most tolerant (Group E). Based on the relative taxa abundance within the sample, a Q Value is attributed, from Q1 to Q5, with intermediate values denoting transitional conditions (Toner *et al.*, 2005) - Table 5.4.

Table 5.4: Q Value Ranking and WFD Water Quality Status

Q Value	WFD Water Quality Status	EPA Quality Status
Q5	High	Unpolluted
Q4-5		
Q4	Good	
Q3-4	Moderate	Slightly Polluted
Q3	Poor	Moderately Polluted
Q2-3		
Q2	Bad	Seriously Polluted
Q1-2		
Q1		

The Quality Rating System or Q-value has been successfully intercalibrated with a wide range of other European macroinvertebrate index systems (McGarrigle and Lucey, 2009) and, although its classification has suffered a small adjustment (Table 5.4), is still used by the EPA in its surface water monitoring programmes (EPA, 2021b).

5.7.2.4 Electrofishing Survey

Electrofishing (Bohlin *et al.*, 1989; CEN, 2003) was carried out on the selected sampling sites (see Section 5.7.6.2) under authorisation from the Department of Communication, Energy and Natural Resources, Section 14 of the Fisheries Act (1980) to determine freshwater fish species present, age class and hence provide an up-to-date baseline (2022) of fish present in receiving waters. The qualitative timed (ten minute) electrofishing methodology (Matson *et al.*, 2018) was used, and fish were collected while wading each sampling site reach in a 'zigzag' manner, allowing the electrical field to cover the entire width of the river, as much as possible, in an upstream direction, carrying one portable Smith-Root® LR-24 electro-fisher backpack (40Hz, 250V, with 18% duty cycle). Captured fish were to be removed quickly using the anode net, or dip net (carried by an assistant operator), and placed into a container of water, located on the bank. After sampling site was surveyed, all captured fish were measured (fork length - for age group estimation), transferred to a container of river water (to recover), before being released alive, and spread evenly over the sampled reach. All fish recovered quickly, and no mortalities were observed.

5.7.2.4.1 Biosecurity

Strict biosecurity measures were carried out during aquatic surveys. All equipment and used PPE were inspected and disinfected with 1% Virkon® solution prior to, and post-survey completion.

5.7.3 Protected Species Surveys

5.7.3.1 Otter

During the Multidisciplinary Walkover Surveys (Section 5.7.1), searches for evidence of Otter (*Lutra lutra*) presence were carried out, following methodologies outlined by NRA (2009). The surveys were undertaken along suitable habitats (i.e. streams, rivers and drainages ditches) within the proposed wind farm site (plus a 150m buffer to account for disturbance effects), to determine the presence or absence of the species. Searched evidence of Otter activity included holts (breeding and temporary), couches, slides, spraints, feeding remains and tracks.

5.7.4 Birds

A robust field study of the avian activity within the proposed wind farm site and defined survey buffer areas were from April 2021 to September 2024, inclusive (Table 5.5), and cover the information highlighted in the consultation responses (Section 4.2). Despite some survey techniques recommended in the consultation responses (e.g. 'mark-recapture'/tracking – Tale 4.1) were not adopted, the survey design assures compliance with recommended standard methodologies (e.g. BirdWatch Ireland, 2008; Gilbert *et al.*, 2011; CBS, 2012; Hardey *et al.*, 2013; SNH, 2017) and allow for a comprehensive assessment of likely significant effects from the proposed development on birds.

Appendix K includes reports, survey results and survey locations for all surveys in Table 5.5.

Table 5.5: Ornithological Survey Design for the Characterisation of the Proposed Wind Farm Site Baseline

Season	Survey	Period	Appendix
Breeding 2021	Vantage Point (VP)	April 2021 – September 2021	(Appendix K.1)*
	Breeding Waders	May 2021 - September 2021	
	Raptors		
	Transect Surveys	May and June 2021	
	Barn Owl	April 2021 – September 2021	
Non-breeding 2021/2022	VP	October 2021 – March 2022	(Appendix K.2)*
	I-WeBS	September 2021 – March 2022	
	Raptors		
	Transect Surveys	March 2022	
Breeding 2022	VP	April 2022 – September 2022	(Appendix K)*
	Breeding Waders		
	Breeding Raptors		
	Transect Surveys		

Season	Survey	Period	Appendix
	Breeding Woodcock	May and June 2022	
Non-breeding 2022/2023	VP	October 2022 – March 2023	
	I-WeBS		
	Hen Harrier Roost Watch/Raptors		
	Transects		
Breeding 2023	VP	April 2023 – September 2023	
	Breeding Waders		
	Breeding Raptors		
	Transect Surveys		
	Breeding Woodcock	May and June 2023	
Non-breeding 2023/2024	VP	October 2023 – March 2024	
	I-WeBS		
	Hen Harrier Roost Watch/Raptors		
	Transects		
Breeding 2024	VP	April 2024 – September 2024	
	Breeding Waders		
	Breeding Raptors		
	Transect Surveys		
	Breeding Woodcock	May and June 2024	

* Appendix K.1 and Appendix K.2 include individual reports for Breeding Season 2021 and Non-breeding Season 2021/22, respectively. Appendix K.3 includes the combined survey results from both Fehily Timoney and TOBIN, i.e. from Breeding Season 2021 until Breeding Season 2024.

5.7.4.1 Classification of Target Species

A combination of consultation responses (Section 4.1), and the results of the desk study (informed the identification and classification of relevant key target species for this assessment, i.e. bird species designated as SCIs of relevant European sites. The initial field survey design was then geared towards the study of a list of key target species (Table 5.6), maintaining flexibility as to incorporate any updates from the survey results.

Table 5.6: Key Target Species and Corresponding Criteria, following SNH(2017)

Code	Common Name	Scientific Name	European Site
A004	Little Grebe	*Tachybaptus ruficollis*	Lough Ree SPA (NPWS, 2025a))
A038	Whooper Swan	*Cygnus cygnus*	
A050	Wigeon	*Anas Penelope*	
A052	Teal	*Anas crecca*	
A053	Mallard	*Anas platyrhynchos*	
A056	Shoveler	*Anas clypeata*	
A061	Tufted Duck	*Aythya fuligula*	

Code	Common Name	Scientific Name	European Site
A065	Common Scoter	*Melanitta nigra*	
A067	Goldeneye	*Bucephala clangula*	
A125	Coot	*Fulica atra*	
A140	Golden Plover	*Pluvialis apricaria*	
A142	Lapwing	*Vanellus vanellus*	
A193	Common Tern	*Sterna hirundo*	
A395	Greenland White-fronted Goose	*Anser albifrons flavirostris*	Ballykenny-Fisherstown Bog SPA (NPWS 2025b)

5.7.4.2 Guidance

The proposed development's potential to give rise to effects on ornithological resources was assessed taking into consideration the characterisation of the effects and the receiving environment. Considering the deficient availability of national guidelines for ornithological survey methods and design, the following main guidance documents informed the present assessment:

- Raptors: A Field Guide for Surveys and Monitoring (Hardey *et al.*, 2013);
- Bird Census Techniques (Bibby *et al.*, 2000);
- Bird Monitoring Methods: A Manual of Techniques for Key UK Species (Gilbert *et al.*, 2011);
- I-WeBS Counter Manual: Guidelines for Irish Wetland Bird Survey counters (BirdWatch Ireland, 2008);
- CBS Manual: Guidelines for Countryside Bird Survey Participants (CBS, 2012);
- Birds of Conservation Concern in Ireland (BoCCI): 2020–2026 (Gilbert *et al.*, 2021);
- Birds and Wind Farms in Ireland: a Review of Potential Issues and Impact Assessment (Percival, 2003); and
- Chartered Institute of Ecology and Environmental Management (CIEEM, 2018) - Guidelines for Ecological Impact Assessment in the UK and Ireland - Terrestrial, Freshwater, Coastal and Marine.

5.7.4.3 Species Nomenclature

To assure consistency throughout and to promote scientific accuracy, bird species nomenclature in this Chapter follows the International Ornithological Congress version 14.1 of the *Birds of the World* list (Gill *et al.*, 2024). However, in some instances, the 'Common Names' were used as they reflect the terminology more widely used for the species in Ireland (e.g. 'Red Grouse' vs 'Willow Ptarmigan' for the *Lagopus lagopus* species; 'Goosander' vs 'Common Merganser' for the *Mergus merganser* species).

5.7.4.4 Vantage Point Survey

As defined by the SNH (2017), a Vantage Point (VP) survey is used to quantify the flight activity and distribution over an area. Its results are used for the Collision Risk Model, which estimates the birds' collision risk with the turbines and consequent mortality. Vantage point surveys were carried out from April 2021 to September 2024, covering three Non-breeding Seasons and four Breeding Seasons (Table 5.5).

The VP surveys were conducted by two separate survey teams: Fehily Timoney between April 2021 and March 2022 (see Appendix K), and TOBIN between April 2022 and September 2024. Together, these surveys covered seven seasons in total—four breeding seasons and three non-breeding seasons. A standardised effort of 36 hours per vantage point was completed during each survey period, across all VP locations. To define the best locations of the VPs, viewshed analyses were carried out to inform the VP surveys in the Breeding Season 2021 and Non-breeding Season 2021/22 and repeated in 2022 to inform the surveys for the Breeding Season 2022, Non-breeding Season 2022/23, Breeding Season 2023, Non-breeding Season 2023/24, and Breeding Season 2024.

Although both survey teams used eleven VPs, their locations (and corresponding viewsheds - i.e. visible areas) were relatively different. These viewsheds were analysed within the collision risk model report (Appendix L), which verified that the viewsheds used in the VP survey design for the Breeding Season 2021 and Non-breeding Season 2021/22 covered 15 of the 22 turbine locations, and 80% of the 500 m buffer around the turbine locations. The viewsheds that informed the VP surveys from the Breeding Season 2022 until the Breeding Season 2024 covered 18 of the 22 turbine locations, and 82% of the 500 m buffer around the turbine locations. Despite this theoretical incomplete coverage of the turbine locations and the 500 m buffer around the turbine locations, the analysis in Appendix L concludes that the modelled gaps in coverage are small, and the differences in areas covered were not significant, and did not affect the reliability of the collision risk model results. It should also be noted that the viewshed analysis informing these surveys was based on a model (Digital Surface Model – DSM) that accounts for ground elevation, and natural (e.g. tree cover) and built (e.g. buildings), with a resolution of 25cm. Although this high resolution provides a much higher accuracy in estimating the visibility from a given VP location, it also means that areas with projected hindered visibility from the viewshed analysis could be observed in the field with a small adjustment in the VP positioning (as small as 25cm in either direction). These adjustments were made in the field, through ground-truthing the positions of the VPs to allow full visibility of the 22 turbines and of each of the 500m buffers around each turbine.

As mentioned, although from different locations in each period, eleven VPs were selected as to provide full coverage of all the landscape under consideration, as well as following viewshed analysis[14] and compliance with SNH (2017) guidance, i.e. the viewshed of a given VP should not extend beyond a distance of 2 km, with an arc of maximum 180 degrees. Each VP was surveyed

[14] For viewshed analysis, the SNH (2017) highlights that "*where the key purpose is to estimate the risk of collision with turbines, it is the visibility of the airspace to be occupied by the turbine rotors (the collision risk volume) that is of prime importance. Therefore, it is recommended that visibility be calculated using the least visible part of this airspace, i.e. an imaginary layer suspended at the lowermost height passed through by the rotor blade tips*".

for six hours per month (72 hours per VP per Season), in which the following parameters were recorded for each observation (Appendix K):

- Vantage Point;
- Date of watch;
- Watch period;
- Weather conditions (e.g. visibility, wind-force, wind direction, precipitation);
- Time of sighting;
- Sex, if applicable;
- Approximate height of flight (in meters);
- Habitat type over which bird was flying;
- Bird activity;
- The duration of the flight/activity; and
- Any relevant notes.

During the Breeding seasons, the observations on birds breeding activity on-site was classified as per Table 5.7. This classification followed the British Trust for Ornithology (BTO) methods on breeding evidence for the Bird Atlas 2007-11[15], which, although using different a survey methodology than used in this field study (i.e. it involved surveying 2x2km grid squares), was used herein to identify and group relevant breeding activity. Also, the number of pairs associated with 'Probable' and/or 'Confirmed' behaviour was counted/estimated in the field, where possible.

Table 5.7: BTO Breeding Evidence Codes

Breeding Status	Activity	Code
Non-breeding	Flying over	F
	Species observed but suspected to be still on migration	M
	Species observed but suspected to be summering non-breeder	U
Possible breeder	Species observed in breeding season in suitable nesting habitat	H
	Singing male present (or breeding calls heard) in breeding season in suitable breeding habitat	S
Probable breeding	Pair observed in suitable nesting habitat in breeding season	P
	Permanent territory presumed through registration of territorial behaviour (song etc) on at least two different days a week or more part at the same place or many individuals on one day	T
	Courtship and display (judged to be in or near potential breeding habitat; be cautious with wildfowl)	D
	Visiting probable nest site	N
	Agitated behaviour or anxiety calls from adults, suggesting probable presence of nest or young nearby	A
	Brood patch on adult examined in the hand, suggesting incubation	I
	Nest building or excavating nest-hole	B
Confirmed breeding	Distraction-display or injury feigning	DD
	Used nest or eggshells found (occupied or laid within period of survey)	UN

[15] Available at https://www.bto.org/our-science/projects/birdatlas/methods. Accessed in January 2025

Breeding Status	Activity	Code
	Recently fledged young (nidicolous species) or downy young (nidifugous species). Careful consideration should be given to the likely provenance of any fledged juvenile capable of significant geographical movement. Evidence of dependency on adults (e.g. feeding) is helpful.	FL
	Adults entering or leaving nest-site in circumstances indicating occupied nest (including high nests or nest holes, the contents of which cannot be seen) or adults seen incubating	ON
	Adult carrying faecal sac or food for young	FF
	Nest containing eggs	NE
	Nest with young seen or heard	NY

5.7.4.5 Waterbirds

5.7.4.5.1 Breeding Waders

During the Breeding Season 2021, the breeding wader population using the proposed wind farm site was characterised with specific breeding waders' surveys using transects. Methods were adapted from published literature, including Bibby *et al.* (2000), Gilbert *et al.* (2011), O'Brien and Wilson (2011), and SNH (2017), to estimate the number of breeding individuals of target species. The methodologies were combined into two categories, geared towards the habitat requirements of each group (pre-defined matrixes for target species and associated suitable breeding habitats (recorded during May and June 2021) are included in Appendix K.1): 1) those methods for breeding Northern Lapwing (*Vanellus vanellus*); and 2) those methods for other species, such as Eurasian Curlew (*Numenius arquata*), Common Snipe (*Gallinago gallinago*), Common Redshank (*Tringa tetanus*), Eurasian Woodcock (*Scolopax rusticola*), Common Sandpiper (*Actitis hypoleucos*), and Common Ringed Plover (*Charadrius hiaticula*). The survey was conducted in two visits, in May and June 2021, where all species encountered (seen or heard) were recorded and their abundance, behaviour, sex/age and breeding status noted. The complete methodology is described in Appendix K.1.

For the Breeding Season 2022, 2023, and 2024, the survey for breeding wader species was adapted from Gilbert *et al.* (2011), whereas, instead of two (as suggested by Brown and Shepherd, 1993), or three visits (as suggested by O'Brien and Smith, 1992), monthly counts over the whole respective season were carried out during visits to breeding waders preferred habitats (e.g. damp grassland, peatland, floodplains) at the proposed wind farm site and within a 2 km buffer (Figure 5.4).

5.7.4.5.2 Irish Wetland Bird Survey (I-WeBS)

To characterise the local non-breeding waterbird community using the proposed wind farm site and wider environs, monthly counts of waterbirds were made at wetlands within 10km from the proposed wind farm site (Figure 5.4). Waterbird counts followed an adapted methodology based on BirdWatch Ireland (2008), but not restricted to the Irish Wetland Bird Survey (I-WeBS) sites, delineated by the I-WeBS office, but included all wetlands (permanent and temporary) within 10 km of the proposed wind farm site. These wetlands were visited monthly, and each location was surveyed for the duration necessary to identify and obtain a count for all waterbirds, target species, birds of prey, and other supplementary species of relevance.

5.7.4.6 Breeding /Winter Transect Survey

During the Breeding Season 2021, general breeding birds at the proposed wind farm site were surveyed with a methodology based on BTO (2018) and Bibby *et al.* (2000), where 21 transects, representative of the existing habitats, were delineated across the site (Figure 5.5). These transects were walked and birds were counted over two visits: the first one coinciding with the beginning of the breeding season (12th-14th of May 2021); and the second covering its later part (11th-13th of June 2021). Full description of the methods employed for surveying general breeding birds during the Breeding Season 2021 is included in Appendix K.1. During the Winter Season 2021/2022, the 21 transects were also surveyed for the characterisation of general birds using the proposed wind farm site. The transects were walked and birds were counted over two visits: from the 3rd to the 15th of February 2022; from the 3rd to the 12th of March 2022 (Appendix K.2).

As described above in Section 5.7.4, the survey design was slightly adjusted from the Breeding Season 2022. Thus, the same transects were surveyed based on and adapted from CBS (2012) but, instead of two visits per season as it was done during the Breeding Season 2021 and Wintering Season 2021/2022, the transects were walked and any birds seen or heard were identified, and counted (irrespective of distances from the transect), over monthly visits (April to September), from 2022 to 2024, inclusive. Also, during this period, birds' breeding behaviour was noted as part of the survey, following the BTO classification outlined in Table 5.7.

5.7.4.7 Hinterland (Raptors) Survey/Hen Harrier Roost Watch

The local breeding activity by raptor species was surveyed having regard to general habitat requirements of these species during the Breeding Seasons 2022, 2023 and 2024. Thus, the locations used for the Hen Harrier roost watches were used when habitat conditions were assessed as being suitable for breeding raptors. However, considering the dynamic intra-annual habitat profile at the proposed wind farm site, the area formed by proposed wind farm site plus a 2 km buffer was searched for favoured habitats for locally representative raptor species, following Hardey *et al.* (2013) and Gilbert *et al.* (2011) guidelines, such as:

- Hen Harrier, Merlin (*Falco columbarius*): primarily, dry areas with rank vegetation (~0.5m high), preferably heather. The hedges of young woodlands, even of young conifers, with near-by open hunting habitats were also surveyed;
- Peregrine Falcon (*Falco peregrinus*), Common Kestrel (*Falco tinnunculus*), Merlin, Common Buzzard (*Buteo buteo*): with the absence of cliffs or steep slopes in the local area, trees (with old corvid nests) and tall man-made structures (e.g. bridges, towers, pylons) were surveyed. Of particular interest were the tall structures at the Lough Ree Power Station, where the species has been observed (local testimony);
- Western Barn Owl (*Tyto alba*): derelict buildings and structures (within 2km of the proposed wind farm).

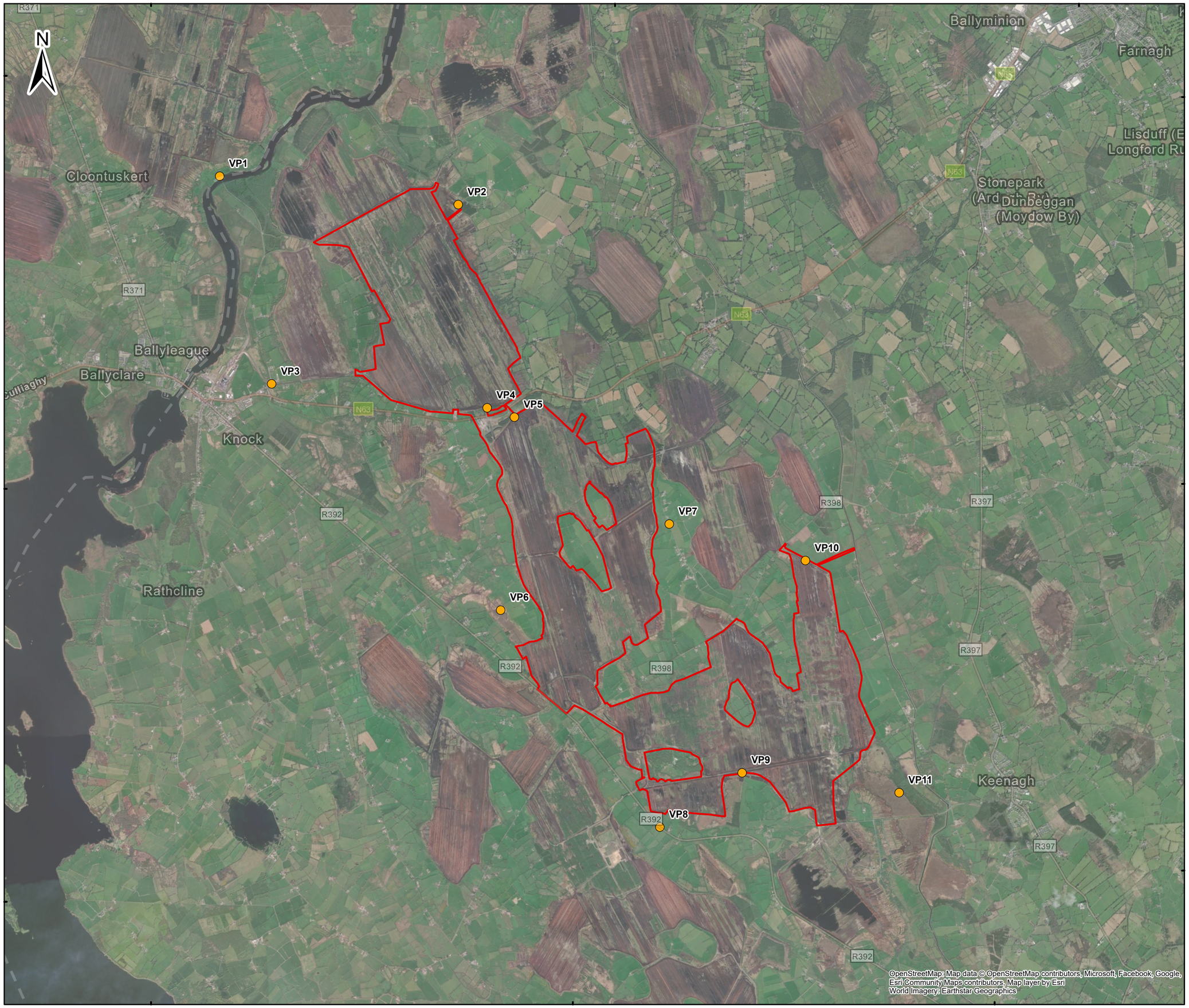
5.7.4.8 Breeding Raptors Survey

The local breeding activity by raptor species was surveyed having regard to general habitat requirements of these species. Thus, the area formed by the proposed wind farm site plus a 2 km buffer was searched for favoured habitats for locally representative raptor species (from results in Section 6.1.1.2), following Hardey *et al.* (2013) and Gilbert *et al.* (2011). The breeding raptors

activity in the proposed wind fam site and hinterland was interpreted following the breeding classification of 'Probable' and/or 'Confirmed' breeding status (Table 5.7).

The suitable areas have been surveyed monthly during the Breeding Seasons 2022, 2023 and 2024.

8°0'0"W
7°54'0"W
7°48'0"W
53°42'50"N
53°39'40"N
53°36'30"N
773500
768000
762500
600000
606000
612000





Legend

- Proposed wind farm site boundary
- Vantage Points

0 1 2
Kilometres

NOTES

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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	06/05/2025	First issue	S.P	J.M

Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Figure 5.3: VP locations for Breeding Season 2022 and Non-breeding Season 2022/2023

Scale @ A3: 1:50,000

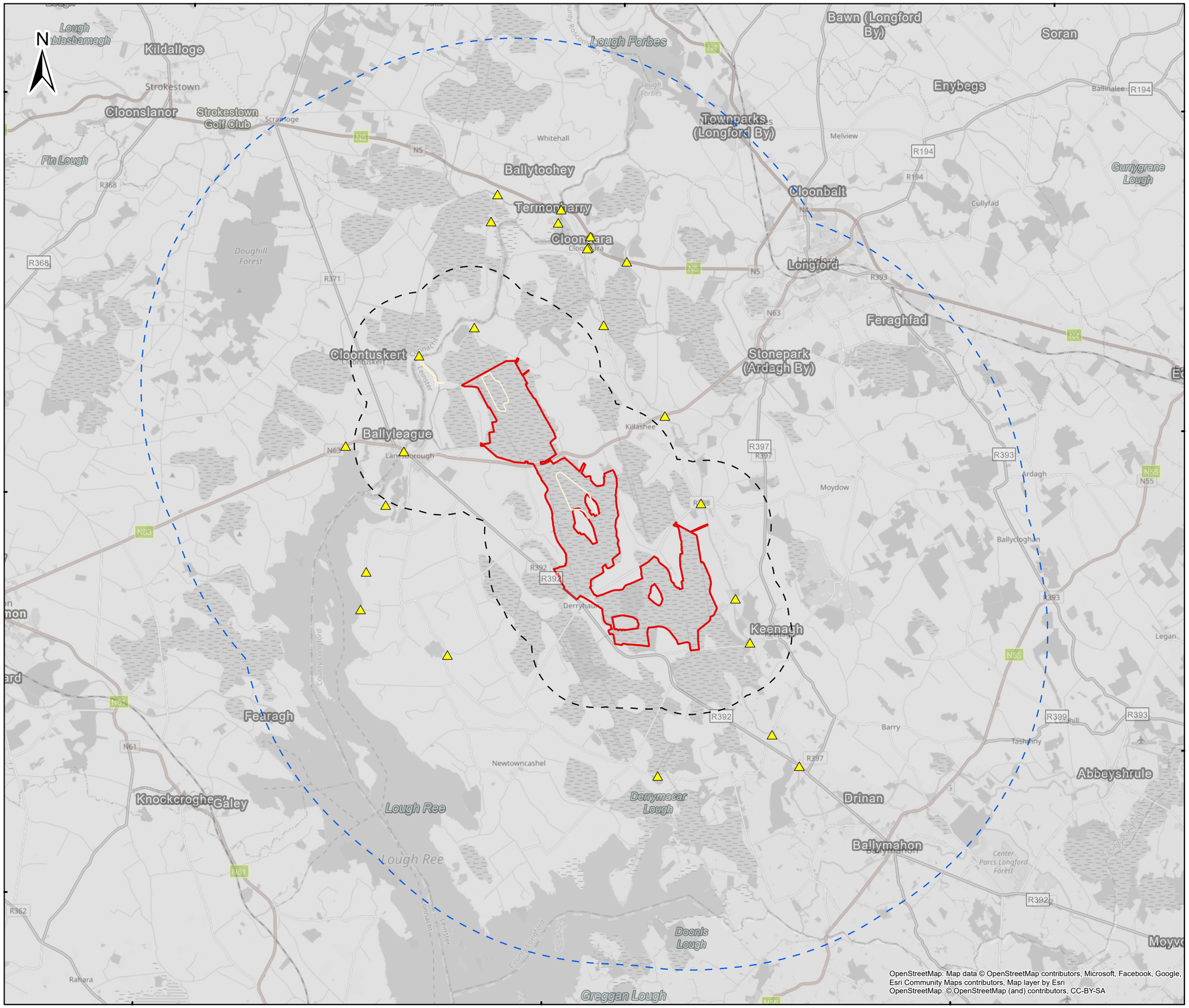
Prepared by:	Checked by:	Date:
S.Pezzetta	J.Martins	May 2025

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Map Ref: 11399-044-VP-BS.2022..nBS..22.23-TOB-A

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Legend

- Proposed wind farm site boundary
- 10km buffer from the proposed wind farm site boundary
- 2km buffer from the proposed wind farm site boundary
- Surveyed wetlands

0 2.5 5
Kilometres

NOTES

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Rev	Date	Description	By	Chkd.

Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Figure 5.4: Study Areas for Waterbirds Surveys

Scale @ A3: 1:110,000

Prepared by:	Checked by:	Date:
S.Pezzetta	J.Martins	May 2025

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Draft: A

8°0'0"W
7°54'0"W
7°48'0"W
53°42'50"N
53°39'40"N
53°36'30"N
773500
768000
762500
600000
606000
612000
N
T1
T2
T3
T4
T5
T6
T7
T8
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T16
T17
T18
T19
T20
T21
World Imagery: Maxar, Microsoft
OpenStreetMap: Map data © OpenStreetMap contributors, Microsoft, Facebook, Google, Esri Community Maps contributors, Map layer by Esri



Legend

- Proposed wind farm site boundary
- Transects

0 1 2
Kilometres

NOTES

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Rev	Date	Description	By	Chkd
A	06/05/2025	First issue	S.P	J.M

Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Figure 5.5: Representative Transects for General Birds Characterisation

Scale @ A3: 1:50,000

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S.Pezzetta	J.Martins	May 2025

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Map Ref: 11399-046-TR-WF.Site-TOB-A

Draft: A

8°0'0"W
7°54'0"W
7°48'0"W
53°42'50"N
53°39'40"N
53°36'30"N
773500
768000
762500
600000
606000
612000
N
HHVP5
HHVP6
HHVP4
HHVP3
HHVP1
HHVP2
OpenStreetMap, Map data © OpenStreetMap contributors, Microsoft, Facebook, Google, Esri Community Maps contributors, Map layer by Esri
World Imagery: Earthstar Geographics



Legend

- Proposed wind farm site boundary
- Hen harrier VPs
- 2km buffer from the proposed wind farm site boundary

0 1 2
Kilometres

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Rev	Date	Description	By	Chkd
A	06/05/2025	First issue	S.P	J.M

Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Figure 5.6: Specific VPs and Study Area for Raptor Surveys

Scale @ A3: 1:60,000

Prepared by:	Checked by:	Date:
S.Pezzetta	J.Martins	May 2025

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Map Ref: 11399-047-RA..VPs-RA..SUR-TOB-A

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5.7.5 Proposed Turbine Delivery Route

5.7.5.1 Multidisciplinary Walkover Survey

Similarly to the methodology employed for surveying the proposed wind farm site (Section 5.7.1), a Multidisciplinary Walkover Survey was conducted at the locations of the proposed TDR where works are proposed. The habitats within these six locations (POI 1 to 6 - Appendix F) were visited on the 12th of July 2023, and were classified (according to Fossitt, 2000) upon the qualitative consideration of the plant species abundance, diversity, and protection status; vegetation structure; topography; drainage conditions; and evidence for disturbance and/or management. Also, a search for Invasive Alien Species listed under the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477 of 2011, as amended) was also conducted throughout the study area.

5.7.6 Field Survey Constraints

5.7.6.1 Multidisciplinary Walkover Survey

Access was granted to the whole study area ahead of the multidisciplinary walkover survey. However, some zones of the study area could not be fully surveyed on foot due to dense vegetation or unsafe conditions (i.e. flooded areas; deep drainage ditches). In accordance with best practice guidelines (CIEEM, 2018), these zones were instead surveyed and visually assessed from adjacent lands and/or from public roads using binoculars, where possible, and were supported by information obtained from a review of aerial photography and desk study data (TOBIN Consulting Engineers, 2019a). Despite the limitation, it is considered that a robust survey was undertaken to fully inform this assessment.

5.7.6.2 Electrofishing

There are a number of limitations inherent to field-based surveying, in particular with regards to suitable weather/water flow conditions, which can restrict access to sampling sites, or integrate a bias in the field survey assessments. Beyond the constraint described in Section 5.7.2, and although careful consideration and planning was put in assuring optimal weather conditions during field surveys, the sampling sites 1, 6, 7, 8, 9, 11 and 12 (Figure 5.2) did not carry enough water to allow the use of the electrofishing methodology described in Section 5.7.2.4. Nevertheless, every effort was made to carry out the surveys, including the adaptation of the methodologies described in Sections 5.7.2.2 and 5.7.2.4 to suit the observed conditions (i.e. using 'spot-electrofishing', which, instead of electrofishing a river reach, the survey technique is employed at discrete locations containing enough water depth). These adaptations will be described on the description of the surveys' results (Section 6.2.1.2 and Appendix I.3) and the necessary ponderation is taken for their analysis and interpretation.

5.7.6.3 Avifauna Surveys

There are a number of limitations inherent to field-based surveying, in particular for bird surveys. These may relate to the availability of suitable weather conditions for completing surveys, with good visibility and limited wind or rain conditions of paramount importance. As such, when undertaking and completing fieldwork, careful consideration and planning was made to ensure optimal weather conditions during survey periods.

Due to unforeseen circumstances, some surveys during the 2021 breeding season, could not commence until the month of May and there is potential that some early signs of breeding bird activity may have been excluded. However, in the following months detailed breeding bird data was collected and following the 2021 season, the full 2022, 2023 2024 season were robustly surveyed and there were no significant constraints and the survey data presented herein provides accurate detail on the baseline ornithology on the site and environs.

6.0 EXISTING ENVIRONMENT

6.1 DESK STUDY

6.1.1 Proposed Wind Farm

6.1.1.1 Biodiversity Records

A review of the NPWS Protected Species Database[2] and the Biodiversity Ireland website[3] for the N06, N07 and N16 10x10 km Irish Grid Squares, in which the proposed wind farm is located, retrieved records of several designated species (Table 6.1). The list of records does not include species classified as invasive mammals as it is not likely the proposed wind farm would affect their spread.

Table 6.1: Relevant Biodiversity Records from Irish Grid Squares N06, N07 and N16

Grid Square	Common Name	Scientific Name	Last Record	Designation
Birds				
N06, N07	Common Coot	*Fulica atra*	26/02/2023	Amber List
N06	Common Goldeneye	*Bucephala clangula*	31/12/2011	Red List
N06, N07	Common Tern	*Sterna hirundo*	31/07/1991	EU Birds Directive - Annex I; Amber List
N06, N07, N16	Eurasian Teal	*Anas crecca*	22/08/2016	Amber List
N06, N07	Eurasian Wigeon	*Anas penelope*	09/01/2023	Amber List
N06, N07, N16	European Golden Plover	*Pluvialis apricaria*	31/12/2011	EU Birds Directive - Annex I; Red List
N06	Gadwall	*Anas strepera*	31/12/2011	Amber List
N07	Greater White-fronted Goose	*Anser albifrons*	29/02/1984	EU Birds Directive - Annex I; Amber List
N06, N07, N16	Mallard	*Anas platyrhynchos*	13/04/2023	Amber List
N06, N07, N16	Northern Lapwing	*Vanellus vanellus*	26/04/2023	Red List
N06	Northern Pintail	*Anas acuta*	31/12/2001	Amber List
N06	Northern Shoveler	*Anas clypeata*	15/02/2023	Red List
N06, N07	Tufted Duck	*Aythya fuligula*	31/12/2011	Amber List
N06, N07, N16	Whooper Swan	*Cygnus cygnus*	17/04/2023	EU Birds Directive -

Grid Square	Common Name	Scientific Name	Last Record	Designation
				Annex I; Amber List
Non-Volant Mammals				
N06, N07, N16	European Otter	*Lutra lutra*	23/09/2014	EU Habitats Directive - Annex II, Annex IV; Wildlife Acts
Invasive Alien Plant Species				
N06, N07	Canadian Waterweed	*Elodea canadensis*	17/07/2017	Regulation S.I. 477/2011
N06, N08	Japanese Knotweed	*Fallopia japonica*	03/11/2021	Regulation S.I. 477/2011
N06, N09	Rhododendron	*Rhododendron ponticum*	29/06/2022	Regulation S.I. 477/2011

6.1.1.2 Avifauna

6.1.1.2.1 Breeding Birds Distribution – NPWS

Under Article 12 of the Birds Directive, every three years (every six years, since 2013), all Member States shall prepare a report on the implementation of the respective national provisions, including specific reporting on status and trends of bird species. Two datasets, corresponding to the periods 2008 to 2012, and 2013 to 2018, have been accessed[16] and filtered as to illustrate the presence of protected species listed in Annex I of the Birds Directive, and as SCI for the European sites considered (Section 6.3) within the N06, N07 and N16 10 km Irish Grid Squares, where the proposed wind farm site is located[17] - Table 6.2. It is relevant to note that the reviewed datasets refer to breeding bird species, which may underrepresent the importance of the proposed wind farm site for migratory species.

It is possible to confirm that N07 and N16 present similar reported diversity of breeding birds of conservation interest in each of the two periods (i.e. 28 and 30 species in 2008-2012 and 2013-2018, respectively). The Irish Grid Square N06, located at closer to the Lough Ree than N07 and N16, harboured significantly higher diversity, accounting for 30 breeding bird species of conservation interest in 2008-2012, and 39 in 2013-2018.

6.1.1.2.2 Bird Atlas Records

Data from BirdWatch Ireland, Bird Atlas 2007-2011[18] recorded within the N06, N07 and N16 10 km Irish Grid Squares was assessed for the presence of species of conservation interest, similarly to Section 6.1.1.2.1 above. As the dataset informing the Bird Atlas 2007-2011 covers

[16] Available at https://www.npws.ie/maps-and-data/habitat-and-species-data/article-12-data. Accessed in November 2024
[17] Proposed wind farm site is located within the following 2 km Irish Grid Squares: N06J, N07F, N07G, N06M, N06N, N06P, N07K, N07L, N06R, N06S, N06T, N06U, N06W, N06X, N06Y, N16B, N16C, and N16D
[18] Available at https://maps.biodiversityireland.ie/Dataset/220. Accessed in November 2024

four summers and four winters, the presence of migratory species is also included, as opposed to the NPWS dataset described above. Table 6.3 includes the resulting list of species, as well as the corresponding 2 km Irish Grid Square(s) for instances where breeding is classified as '*Confirmed*' in the dataset, when the information is available.

Thus, it is possible to confirm that there were three relevant species with '*Confirmed*' breeding in the dataset, mostly located within Grid Squares N06, and N07. Eurasian Coot (*Fulica atra*), Little Grebe (*Tachybaptus ruficollis*) and Mallard (*Anas platyrhynchos*) were the only species recorded as confirmed breeders within the three searched 10 km Irish Grid Squares. The Lough Ree SPA is designated for Eurasian Coot and Mallard (NPWS, 2025a). It is also important to note that none of the '*Confirmed*' breeding records in Table 6.3 is associated with the proposed wind farm site[17].

During the four winters between 2007 and 2011, the most significant Bird Atlas records were Eurasian Coot, European Golden Plover (*Pluvialis apricaria*), Common Goldeneye (*Bucephala clangula*), Northern Lapwing (*Vanellus vanellus*), Little Grebe, Mallard, Northern Shoveler (*Spatula clypeata*), Eurasian Teal (*Anas crecca*), Tufted Duck (*Aythya fuligula*), and Whooper Swan (*Cygnus cygnus*), due to their similar legislative protection (i.e. SCI of the Lough Ree SPA, i.e. waterbirds).

6.1.1.2.3 BirdWatch Ireland I-WeBS Data Set

Results from the data request to BirdWatch Ireland for the Lough Ree I-WeBS site were analysed having in consideration the relatively short distance between this I-WeBS site and the proposed wind farm site (approximately 2.5km). The data summarised in Table 6.4 comprises species identified during monthly counts at 34 subsites within the Lough Ree I-WeBS site during for the winter 2018/19, 2019/20, 2020/2021, and 2022/23, relevant for the representation of the local occurrence of migratory waterbird populations.

European Golden Plover was the most abundant waterbird species of conservation interest recorded in Lough Ree, with a peak record of 1,000 individuals, which is slightly above the 1% threshold of the national population (i.e. 930 individuals - Burke *et al.*, 2018). Lough Ree is also nationally important for Mallard, (1% of the national population is 280 individuals), Northern Shoveler, and Little Grebe (1% of the national populations of each of these two species is 20 individuals - Burke *et al.*, 2018).

6.1.1.2.4 Bird Sensitivity to Wind Energy Development

With the objective of providing a spatial indication for locations where protected bird species are likely to be sensitive to wind energy, BirdWatch Ireland developed a mapping tool that gathered the characteristics of 22 of the most-sensitive bird species with regards to wind energy effects on habitat loss, disturbance and obstruction, beyond the more common collision risk effect. The tool[3] calculates a *Species Sensitivity Score*, aggregates the scores of each 1x1 km square, and classifies it into four simple labels of: "No data" (0 to 14.7), "Low" (14.8 to 23.4), "Medium" (23.5 to 45.4), "High" (45.5 to 62.8) and "Highest" (62.9 to 116.9; Mc Guinness *et al.*, 2015).

The proposed wind farm site is mostly located within an area with *No Data*, for which the tool is not valid. However, a small portion to the southwest of the Derryadd bog is classified as "Low", due to the presence of Black-headed Gull (*Chroicocephalus ridibundus*), with a Species

Sensitivity Score of 16.9[3]. Outside of the proposed wind farm site, there is one relevant area with data available: south of the site, classified as “Low” for the presence of Whooper Swan (Species Sensitivity Score of 19.8).

Table 6.2: Article 12 Birds Directive Reports 2008 to 2012, and 2013 to 2018 Spatial Data on Breeding Distributions and Ranges[17] of Relevant Species

Common name	Scientific name	Grid Squares						Conservation Status
		N06		N07		N16		
		2008-2012	2013-2018	2008-2012	2013-2018	2008-2012	2013-2018	
Common Scoter	*Melanitta nigra*		✓					▪ SCI – Lough Ree SPA ▪ Red List*
Common Tern	*Sterna hirundo*		✓					▪ SCI – Lough Ree SPA ▪ Amber List*
Eurasian Coot	*Fulica atra*	✓	✓	✓	✓	✓	✓	▪ SCI – Lough Ree SPA ▪ Amber List*
Gadwall	*Mareca strepera*		✓			✓	✓	▪ Amber List*
Northern Lapwing	*Vanellus vanellus*	✓	✓	✓	✓	✓	✓	▪ SCI – Lough Ree SPA ▪ Red List*
Little Grebe	*Tachybaptus ruficollis*		✓		✓		✓	SCI – Lough Ree SPA
Mallard	*Anas platyrhynchos*	✓	✓	✓	✓	✓	✓	▪ SCI – Lough Ree SPA ▪ Amber List*
Northern Shoveler	*Spatula clypeata*	✓	✓			✓	✓	▪ SCI – Lough Ree SPA ▪ Red List*
Eurasian Teal	*Anas crecca*		✓					▪ SCI – Lough Ree SPA ▪ Amber List*
Tufted Duck	*Aythya fuligula*	✓	✓	✓	✓	✓	✓	▪ SCI – Lough Ree SPA ▪ Amber List*

* BoCCI (Gilbert *et al.*, 2021)

Table 6.3: Bird Atlas 2007-2011 Dataset of Relevant Species for N06, N07 and N16 10 km Irish Grid Squares[1]

Common name	Scientific name	Grid Squares								Conservation Status
		N06			N07			N16		
		Breeding	(2km)	Winter	Breeding	(2km)	Winter	Breeding	(2km)	Winter	
Eurasian Coot	*Fulica atra*	**Confirmed**	N06E N06Z	Present	Probable						▪ SCI – Lough Ree SPA ▪ Amber List*
Northern Lapwing	*Vanellus vanellus*	Probable		Present	Possible		Present				▪ SCI – Lough Ree SPA ▪ Red List*
Little Grebe	*Tachybaptus ruficollis*	**Confirmed**		Present	**Confirmed**	N07R					▪ SCI – Lough Ree SPA
Mallard	*Anas platyrhynchos*	**Confirmed**		Present	**Confirmed**	N07H	Present	Probable			▪ SCI – Lough Ree SPA ▪ Amber List*
Northern Shoveler	*Spatula clypeata*	Possible		Present							▪ SCI – Lough Ree SPA ▪ Red List*
Eurasian Teal	*Anas crecca*			Present			Present				▪ SCI – Lough Ree SPA ▪ Amber List*
Tufted Duck	*Aythya fuligula*	Probable		Present							▪ SCI – Lough Ree SPA ▪ Amber List*

* BoCCI (Gilbert *et al.*, 2021)

Table 6.4: Summary of I-WeBS data on Relevant Species for Lough Ree (0F002) in Winters 2018/19, 2019/20, 2020/21, 2022/23, 2023/2024[9]

Common Name	Scientific Name	Peak	Conservation Status
European Golden Plover	*Pluvialis apricaria*	1,000	▪ SCI – Lough Ree SPA ▪ Red List*
Northern Lapwing	*Vanellus vanellus*	402	▪ SCI – Lough Ree SPA ▪ Red List*
Eurasian Wigeon	*Mareca penelope*	358	▪ SCI – Lough Ree SPA ▪ Amber List*
Mallard	*Anas platyrhynchos*	337	▪ SCI – Lough Ree SPA ▪ Amber List*
Tufted Duck	*Aythya fuligula*	285	▪ SCI – Lough Ree SPA ▪ Amber List*
Eurasian Teal	*Anas crecca*	206	▪ SCI – Lough Ree SPA ▪ Amber List*
Eurasian Coot	*Fulica atra*	195	▪ SCI – Lough Ree SPA ▪ Amber List*
Northern Shoveler	*Spatula clypeata*	192	▪ SCI – Lough Ree SPA ▪ Red List*
Whooper Swan	*Cygnus cygnus*	126	▪ Annex I Birds Directive ▪ SCI – Lough Ree SPA ▪ Amber List*
Common Goldeneye	*Bucephala clangula*	44	▪ SCI – Lough Ree SPA ▪ Red List*
Little Grebe	*Tachybaptus ruficollis*	43	▪ SCI – Lough Ree SPA
Gadwall	*Mareca strepera*	14	▪ Amber List*
Common Scoter	*Melanitta nigra*	1	▪ SCI – Lough Ree SPA ▪ Red List*

* BoCCI (Gilbert *et al.*, 2021)

6.1.1.3 Aquatic Environment

The proposed wind farm site is located predominantly within the Upper Shannon Catchment (26C), with a small segment to the south located within the Upper Shannon Catchment (26E) and upstream of the Lough Ree Special Area of Conservation (SAC) (Site Code: 000440).

Three sub catchments are present at the proposed wind farm site, the majority of the proposed wind farm site is located within the Shannon [Upper] SC_080 Sub Catchment, with a small proportion of the proposed wind farm site located within the Bilberry _SC_010 Sub Catchment to the south and the Shannon [Upper]_SC_060 Sub Catchment to the southeast.

The naming of the streams varies between the historical maps, OSI maps and the EPA catchment maps.

6.1.1.3.1 River Water Bodies

The proposed wind farm site drains into four WFD river water bodies. Table 6.5 provides monitoring results for the river water bodies and indicates an apparent longitudinal WFD water quality status decreasing trend, from *Moderate*, for the river water bodies in the vicinity of the proposed wind farm, to *Poor* further downstream. There are no records of fisheries survey data available for any of the four WFD river water bodies.

6.1.1.3.2 Lake Water Bodies

The river water bodies receiving surface water from the proposed Wind Farm site drain into the Ree WFD lake water body (IE_SH_26_750a) (Figure 6.2), which, although classified with *Moderate* status for the *Hydromorphological Conditions* monitoring element[6], has been classified as *Good* WFD water quality status. Nevertheless, this lentic water body display a similar rising trend for the nutrient concentrations to the WFD river water bodies, described in Section 6.1.1.3.1, although the Chlorophyll concentrations have decreased over the same period[6].

Also, the Ree WFD lake water body has been surveyed in 2013 as part of the Water Framework Directive surveillance monitoring programme (Kelly *et al.*, 2014). A total of six fish species and one type of hybrid were recorded: Perch (*Perca fluviatilis*) was the most abundant fish species recorded, followed by Roach (*Rutilus rutilus*) and Roach x Bream hybrids (*Rutilus rutilus* × *Abramis brama*). Brown trout (*Salmo trutta*) and Eel (*Anguilla anguilla*) were also captured, along with small numbers of Pike (*Esox lucius*) and Stone Loach (*Barbatula barbatula*). Previously, in 2010 (IFI, 2010), beyond the species captured in 2013 (in similar abundances), Tench (*Tinca tinca*) was also included with occasional presence at the Ree WFD lake water body.

Surface water bodies located downstream of the Ree WFD lake water body are not considered for the assessment of significant effects from the proposed development. It is considered that the nature of the proposed wind farm (Section 3.0) and the lentic nature and size of this water body would preclude the significance of any potential effects further downstream.

6.1.1.3.3 Groundwater Bodies

The proposed wind farm site lies on three WFD groundwater bodies:

- Funshinagh (IE_SH_G_091)
- Inny (IE_SH_G_110)

- Longford Ballinalee (IE_SH_G_149)

These groundwater bodies have all been classified with *Good* WFD water quality status for the period 2016-2021 (see Table 6.5.

The part of the Inny WFD groundwater body intersected by the proposed wind farm site, and the Funshinagh WFD groundwater body are mostly formed by a karstic aquifer, where groundwater flows through conduits, mostly discharging to large springs or, in winter, to the abundant turloughs in the area, and/or streams and rivers crossing the respective groundwater body. Overall groundwater flow is towards Lough Ree, but the highly karstified nature of the bedrock means that locally groundwater flow directions can be highly variable, with path lengths reaching up to several kilometres[19, 20].

The eastern part of the proposed wind farm site also intersects the Longford Ballinalee WFD groundwater body (Figure 6.2). It lies on an aquifer with a limited and relatively poorly connected network of fractures, fissures and joints, which permeability tends to decrease with depth (GSI, 2017). Thus, the groundwater paths are generally short, with groundwater discharging to small springs, or to the streams and rivers that traverse the aquifer. Water level data suggest that the water table is generally within 5m of the surface[21].

Table 6.5: WFD Water Quality Status (EPA, 2021b) *of Water Bodies Draining the Proposed Wind Farm Site*

Unassigned | Bad | Poor | Moderate | Good | High

WFD classification*	Water Body Name	WFD Reference	WFD Water Quality Status	Limiting Element[6]
RWB	Ledwithstown_010	IE_SH_26L840850	Md**	-
	Lough Bannow Stream_010	IE_SH_26L120100	Md**	-
	Ballynakill_010	IE_SH_26B220790	Md**	-
	Shannon (Upper)_100	IE_SH_26S021600	M**	Invertebrate Status or Potential
LWB	Ree	IE_SH_26_750a	M**	Hydromorphological conditions
GWB	Funshinagh	IE_SH_G_091	-	-
	Inny	IE_SH_G_110	-	-
	Longford Ballinalee	IE_SH_G_149	-	-

* RWB – River Water Body; AWB – Artificial Water Body; LWB – Lake Water Body – GWB – Groundwater Body
** M – Monitoring; Md – Modelling

[19] Available at https://gsi.geodata.gov.ie/downloads/Groundwater/Reports/GWB/InnyGWB.pdf. Accessed in February 2025.
[20] Available at https://gsi.geodata.gov.ie/downloads/Groundwater/Reports/GWB/FunshinaghGWB.pdf. Accessed in February 2025.
[21] Available at https://gsi.geodata.gov.ie/downloads/Groundwater/Reports/GWB/LongfordGWB.pdf. Accessed in February 2025.

6.1.1.3.3.1 Groundwater Flow Study

Based on the measured groundwater levels at the proposed wind farm site in 2017, 2018 and 2023 (Appendix C), groundwater flow in Derryadd Bog is towards the Lough Bannow Stream_010 WFD river water body and internal drainage ditches (38 to 41 mOD). The groundwater levels at Derryadd Bog (42 to 44 mOD) are below the levels at the neighbouring turloughs (e.g. Cordara and Fortwilliam, which are at 45-47 mOD). Therefore, groundwater onsite discharges to the proposed wind farm site's arterial drainage network. A conceptual site model is included below in Figure 6.1.

Lough Bannow is not underlain by a karstic aquifer. But further to the west of the proposed wind farm site (>3.5km), 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 (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. Conversely, where deep soils occur the karstification is typically limited. Deeper groundwater flow can occur in areas associated with faults or dolomitisation.

Turbines T16-T21 are located on Dinantian Sandstones, Shales and Limestones of the Keel Inlier, which is part of the Inny WFD groundwater body. This inlier is bounded to the southeast by a zone of normal step faults, down throwing to the southeast. Given the non-karstic geology underlying these turbines, there is no connectivity with the turloughs located >7km to the east of the proposed wind farm site. Groundwater in this area discharges to the proposed wind farm site's arterial drains and the Ballynakill_010 WFD river water body.

To the north of the proposed wind farm site, at Derryaroge, a 500m 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 (>100m^3/day) occur on the three bog sites, and local groundwater flow discharges to the local streams and drainage ditches in the area.

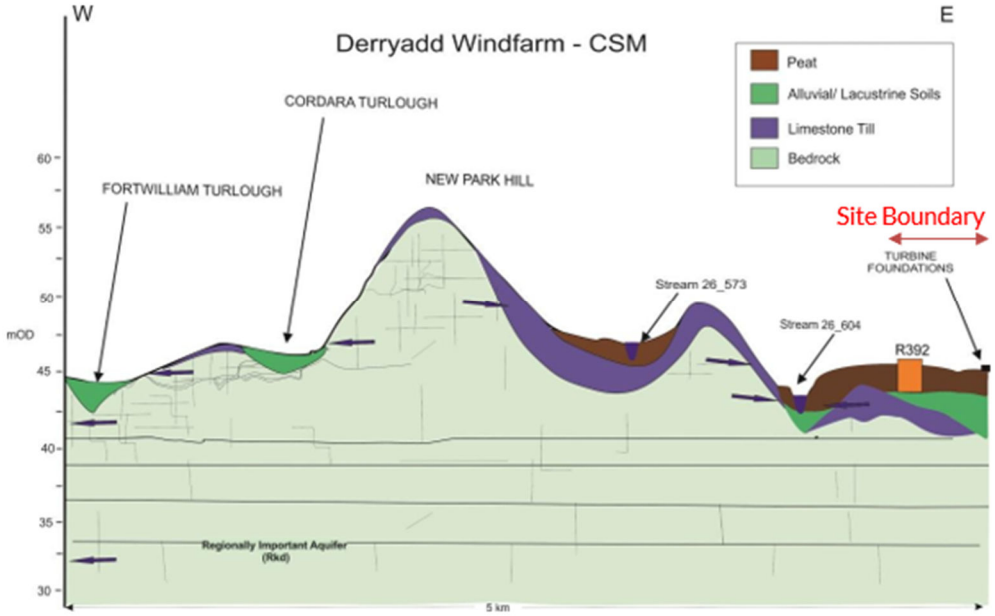
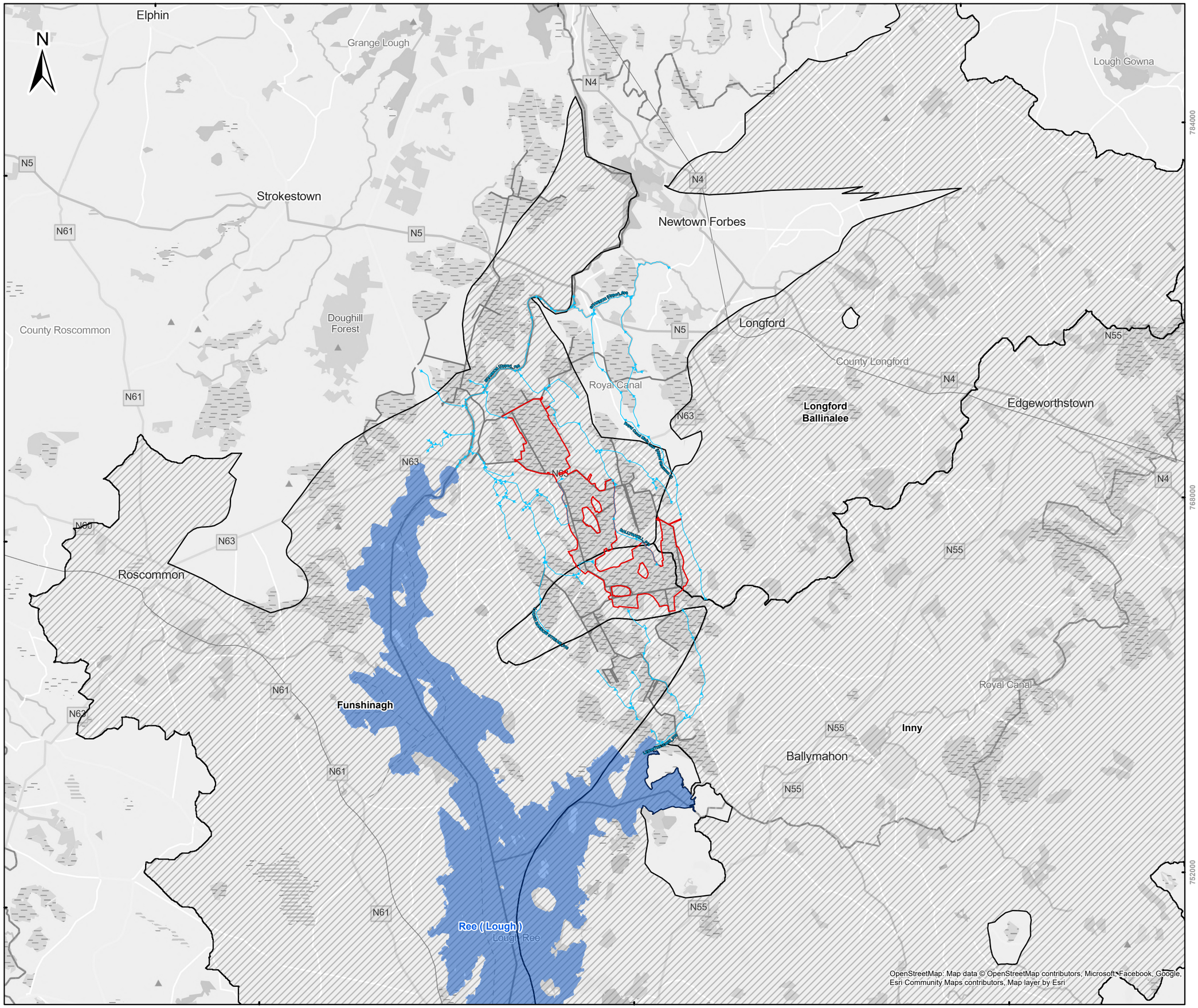
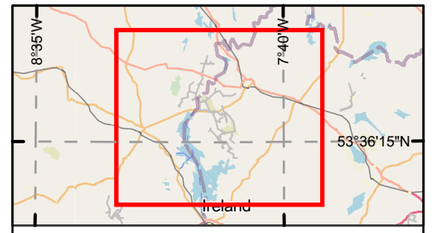


Figure 6.1: East-West Conceptual Model Between Turbine T17 and Fortwilliam Turlough





Legend

- Proposed wind farm site
- WFD - River Water bodies
- WFD - Lake Water bodies
- WFD - Groundwater bodies

0 2.5 5
Kilometres

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	06/05/2025	First issue	S.P	I.H

Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Figure 6.2: Hydrological and Hydrogeological Pathways from the Proposed Wind Farm

Scale @ A3: 1:150,000

Prepared by:	Checked by:	Date:
S.Pezzetta	I.Heanue	May 2025

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Map Ref: 11399-030-WFD-P.APP.BO-TOB-A

Draft: A

6.1.1.3.4 IPC P0504-01

Since 2000, the entirety of the Mountdillon Bog Group, a group of bogs under Bord na Móna management, which includes the proposed wind farm site, is licenced by the EPA under an Integrated Pollution Control (IPC) Licence regime (Reg. No. P0504-01) under Part IV of the EPA Act 1992.

The IPC Licence required the licensee (i.e. Bord na Móna Energy Limited) to establish and maintain an Environmental Management Programme (EMP), which would form part of the Annual Environmental Report[22] (AER) and includes the following objectives:

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

(ii) Waste Reduction/Raw Material usage efficiency (i.e., continue to implement, and where possible, improve on waste streamlining and recycling).

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

- *Effective spill/leak management of mobile fuelling units. Increased bund capacity will be provided where required. Bund integrity testing will be carried out where required.*
- *Collection, storage and reuse of polythyene covering.*

(iv) Continue with implementation process of the Energy Standard 50001.

- *Groundwater protection measure including upgrade to existing septic tank systems where required.*

It is relevant to note that, during the 12-year period of available monitoring data, there were no exceedances to the Suspended Solids (SS) Emission Limit Value (ELV) set for emissions to water –35mg/l – from the Derryaroge, Derryadd and Lough Bannow Bogs.

Although with a broader range than solely the aquatic environment, the Condition 10 of the IPC Licence P0504-01 requires Bord na Móna Energy Limited to prepare and implement, to the satisfaction of the EPA, a Cutaway Bog Decommissioning and Rehabilitation Plan.

The EPA set out these conditions in the Licence "*to make provision for the proper closure of the activity* [peat extraction] *ensuring protection of the environment*".

In 2025 Bord na Móna produced updated draft Cutaway Bog Decommissioning and Rehabilitation Plans for the Mountdillon Bog Group, including the three bogs within which the proposed wind farm site is located (i.e. Derryaroge Bog, Derryadd Bog, and Lough Bannow Bog).

6.1.1.3.4.1 Rehabilitation Plans

In fulfilment of Condition 10, Bord na Móna has prepared Draft Cutaway Bog Decommissioning and Rehabilitation Plans for the Derryadd, Derryaroge, and Lough Bannow bogs. These documents, collectively referred to here as the Draft Rehabilitation Plans, are included in Appendix E. The primary objectives of these plans are to stabilise the hydrological function of the bogs, support the natural recolonisation of native peatland vegetation, and improve

[22] Available at https://leap.epa.ie/licence-profile/P0504/compliance. Accessed in November 2024

biodiversity at the bogs. The plans also address the need to remove, repurpose, or manage any residual infrastructure in a manner that complements the overall rehabilitation goals.

The proposed rehabilitation measures outlined in these draft Rehabilitation Plans are both technical and ecological in nature. Key interventions include the blocking of internal drainage systems to raise water levels, rewetting of the peat surfaces to reduce oxidation and carbon emissions, and the creation of conditions suitable for the re-establishment of flora and fauna. These actions may not only contribute to the ecological enhancement of the rehabilitated of the sites but also support broader climate action objectives by aiding in the transition from carbon-emitting land use to carbon-sequestering habitat restoration.

While ongoing natural regeneration has resulted in some limited ecological improvement at the application site, no targeted rehabilitation measures have been implemented within the proposed wind farm site to date. No material change in habitat extent or condition is anticipated prior to the Construction Phase, currently expected to commence in 2031, other than the gradual successional changes associated with natural regeneration. Given the slow rate of habitat succession of habitat development across cutaway peatlands, across the site is gradual, with many of the existing pioneer cutaway habitats, including areas of bare peat and open habitats, are likely to persist during the intervening period before construction. As such, the ecological baseline at the commencement of construction is expected to remain broadly similar to current site conditions.

During the Operational Phase and the implementation of rehabilitation measures habitats across the site are anticipated to evolve progressively, with increases in scrub, wet woodland, reedbed and other wetland habitats occurring over time. Habitat development is expected to vary across the site depending on residual peat depth, topography and hydrological conditions, with wetter habitats generally developing more rapidly than habitats associated with deeper residual peat. These changes may influence habitat availability and suitability for certain species, while open water, wetland and transitional habitats are expected to remain present within the rehabilitated landscape. In drier and more elevated areas of the site, the implementation of dry cutaway rehabilitation measures, including vegetation establishment and, where required, soil amendments, is expected to support the development of grassland, scrub and, over time, woodland habitats. Wetter areas are anticipated to support the continued development of wetland habitats, including reedbed, marsh and wet woodland communities.

Following implementation of the proposed rehabilitation measures, habitats across the site are expected to undergo progressive change during the Operational Phase. While early benefits will arise from targeted rehabilitation measures undertaken to support IPC licence compliance, habitat development and ecological succession will continue over the longer term. This will result in the gradual transition of some areas currently characterised by bare peat, open water and sparsely vegetated habitats to more structurally diverse habitats, including reedbed, marsh, scrub and wet woodland communities. Habitat development will vary across the site in response to local hydrological conditions, residual peat depth and topography. In wetter areas, mosaics of open water, reedbed and other wetland habitats are expected to persist, while drier and more elevated areas are anticipated to support increasing scrub and woodland cover over time, with birch woodland representing a likely long-term habitat type in suitable locations. These changes

will influence habitat availability and suitability for some species, while maintaining a diverse range of wetland and transitional habitats across the rehabilitated landscape.

6.1.1.3.5 Drainage Design, Pumping Stations and Flood Risk Assessment

Nicholas O'Dwyer Ltd were appointed by Bord na Móna in February 2021 to carry out a drainage design, pumping station reviews and flood risk assessment for the proposed wind farm site (see Appendix F). It included walkover surveys from January to March 2021, which verified the existence of a series of open field drains. An overview of the drainage design for Derryaroge, Derryadd, and Lough Bannow Bogs is presented in Table 6.6.

The surface of the cutover bog is drained by a network of parallel northwest-southeast generally orientated field drains that are typically spaced every 15 – 20 m. The field drains are approximately 0.5 - 1.5 m deep and in most areas, they intercept the mineral subsoil underlying the peat. These field drains mostly feed into larger surface water drains which drain the main catchments across the three bogs. The surface water drains are primarily in a northwest-southeast orientation but there are a number of shorter cross drains which intersect the small field drains. There are also a number of pump stations located at low points in the larger drains to direct the surface water to the outfall locations and boundary drains. There are various outfalls on the bog boundaries which comprise mainly pumped outfalls but also some areas of gravity drainage. Surface water draining/pumped from the site is routed via existing IPC settlement/slit ponds (in accordance with the IPC licence requirements) prior to discharge into off-site drainage channels, streams and rivers which ultimately flow into the River Shannon and Lough Ree.

Derryaroge Bog has several smaller field drains that conveys water to deep collector drains, connected through pipes at lower points. Water pumps are used to lift water from the central collector drains to peripheral collector drains (PO9 & PO9), and from the peripheral collector drains to the receiving surface water bodies (P05, P06 & P08) at unknown flow rates. Drainage at the Derryadd Bog has smaller field drains, which are connected by pipes, and discharge externally with the aid of 6 water pumps P10-P15 (although pump P13 is decommissioned, and discharge is via gravity outfall north of the pump station site) with unknown flow rates. The Lough Bog drainage is regulated by 3 water pumps, P16-P18, with unknown flow rates.

In terms of flood risk, it is reported that despite the proposed wind farm being located with areas classified at risk of fluvial/pluvial flooding, and refers the National Indicative Flood Mapping (NIFM) as indicating 2 areas with an Annual Exceedance Probability (AEP) of 0.1% (return period of 1000 years – low probability), and one area of 1% (return period of 100 years – medium probability), all within the proposed wind farm site, it concludes that the high vulnerability uses for the proposed wind farm (e.g. energy infrastructure – turbines, substation) are all located above the 1,000-year flood levels, while also considering the revegetation process taking place at the proposed wind farm site will "(…) *slow the runoff from the existing bog and will also increase evapotranspiration from the bog, further reducing the speed of runoff from the site*".

Table 6.6: Summary Description of Drainage Design at the Derryaroge, Derryadd and Lough Bannow Bogs (Appendix F)

Bog	Drains	Spacing between	Water Pumps

		consecutive drains	
Derryaroge	▪ Deep collector drains;	300m	9 water pumps (4 located outside the Proposed Wind Farm)
	▪ Smaller field drains	15m	
	▪ Central collector drains	-	
	▪ Peripheral collector drains	-	
Derryadd	▪ Small field drains (shorter than Derryaroge)	15m	5 water pumps (one of which is decommissioned)
Lough Bannow	-	-	3 water pumps

6.1.2 Proposed Turbine Delivery Route

6.1.2.1 Biodiversity Records

Considering the nature and magnitude of the works for the proposed TDR (Appendix F), a review of the NPWS Protected Species Database[2] and the Biodiversity Ireland website[3] was carried out for the following 1x1 km Irish Grid Squares, where the POIs are located: N0241 (POI 1); N0242 (POI 2); M8764 (POI 3 and 4); M8864 (POI 5); and N0564 (POI 6). The review included a search for protected species and/or IAPS (Table 6.7). The list of records does not include species classified as invasive mammals as it is not likely the works for the proposed TDR would affect their spread.

Table 6.7: Biodiversity Records from Irish Grid Squares N0241, N0242, M8764, M8864 and N0564

POI	Grid Square	Common Name	Scientific Name	Last Record	Designation
Birds					
2	N0242	Great Crested Grebe	*Podiceps cristatus*	11/07/2017	BoCCI* - Amber List
Non-Volant Mammals					
3, 4	M8764	European Otter	*Lutra lutra*	22/01/1980	EU Habitats Directive – Annex II, Annex IV; Wildlife Acts
	Invasive Alien Plant Species				
1	N0241	Japanese Knotweed	*Fallopia japonica*	03/11/2017	Regulation S.I. 477/2011

* listed in the Birds of Conservation Concern in Ireland (BoCCI) 2020-2026 (Gilbert *et al.*, 2021)

6.1.2.2 Aquatic Environment

The POIs for the proposed TDR spread through three WFD Subcatchments: POIs 1 and 2 are located within the Shannon [Upper]_SC_100 (26G_2); POIs 3, 4 and 5 are within the Hind_SC_010 (26E_5); and POI 6 is located within the Shannon [Upper]_SC_080 (26C_1) (Appendix F). These separate geographic locations entail three potential hydrological pathways, whose extent will be considered until the pathway reached a lentic water body, i.e. the Ree WFD

lake water body (IE_SH_26_750a) for POIs 3,4, 5, and 6; and the Derg TN WFD lake water body (IE_SH_25_191a) for POIs 1 and 2 (Table 6.8; Appendix G).

6.1.2.2.1 River Water Bodies

The hydrological pathways from the POIs for the proposed TDR include eleven WFD river water bodies (Table 6.8). Only one of the WFD river water bodies achieved the WFD objectives during the monitoring period 2016-2021 (the Hind_020), with *the Invertebrate Status or Potential* being the most common limiting element. The failure of the Shannon (Upper)_120 in passing the *Chemical Surface Water Status* due to the concentrations of Benzo(a)pyrene and Mercury, two highly pollutant elements, is also highly relevant.

6.1.2.2.2 Lake Water Bodies

As mentioned above, there are two WFD lake water bodies acting as receptors of the three hydrological pathways from the POI for the proposed TDR (Table 6.8). The Ree WFD lake water body (IE_SH_26_750a) also forms part of the hydrological pathway of the proposed wind farm site and was described in Section 6.1.1.3.2. With regards to the Derg TN WFD lake water body, which WFD water quality status did not reach the WFD objectives for the 2016-2021 period, seems to be influenced by the inflowing Shannon (Upper)_120 contaminant inputs, as it exceeds the concentration limits of the same pollutants (i.e. Benzo(a)pyrene, and Mercury), failing to pass its *Chemical Surface Water Status* (Table 6.8).

6.1.2.2.3 Groundwater Bodies

The POIs for the proposed TDR overlay three WFD groundwater bodies: POI 1 and 2 are located on the Athlone West (IE_SH_G_014); POI 3, 4 and 5 over the Funshinagh (IE_SH_G_091); and POI 6 over the Inny (IE_SH_G_110) - Table 6.8. The proposed wind farm site is located over the two latter WFD groundwater bodies, and these have been described in Section 6.1.1.3.3. With regards to the Athlone West WFD groundwater body, it lies within a limestone aquifer, with an average effective bedrock thickness of 15m, and, although unlikely to hold karstic features, it holds several faults, which enhance the bedrock permeability/transmissivity. Groundwater flow within this groundwater body would be of local nature, with discharges to local springs, streams and/or rivers that intersect it[23].

[23] Available at https://gsi.geodata.gov.ie/downloads/Groundwater/Reports/GWB/AthloneWestGWB.pdf. Accessed in November 2024

Table 6.8: WFD Water Quality Status (EPA, 2021b) *of Water Bodies in Proximity of the Proposed TDR POIs*

Unassigned | Bad | Poor | Moderate | Good | High

WFD classification*	POIs	Water Body Name	WFD Reference	WFD Water Quality Status	Limiting Element[6]
RWB	1, 2	Shannon (Lower)_010	IE_SH_25S012000	Md**	-
		Shannon (Lower)_020	IE_SH_25S012060	M**	Invertebrate Status or Potential
		Shannon (Lower)_030	IE_SH_25S012350	Md**	-
		Shannon (Upper)_120	IE_SH_26S021800	M**	Chemical Surface Water Status (Benzo(a)pyrene, and Mercury)
		Shannon (Upper)_130	IE_SH_26S021920	Md**	-
	3, 4, 5	Jiggy (Hind)_010	IE_SH_26J010090	M**	Invertebrate Status or Potential
		Hind_010	IE_SH_26H010300	M**	Invertebrate Status or Potential
		Hind_020	IE_SH_26H010400	M**	-
		Hind_030	IE_SH_26H010500	M**	Invertebrate Status or Potential
	6	Lough Bannow Stream_010	IE_SH_26L120100	Md**	-
		Shannon (Upper)_100	IE_SH_26S021600	M**	Invertebrate Status or Potential
LWB	3, 4, 5, 6	Ree	IE_SH_26_750a	M**	Hydromorphological conditions
	1, 2	Derg TN	IE_SH_25_191a	M**	Chemical Surface Water Status (Benzo(a)pyrene, and Mercury)
GWB	1, 2	Athlone West	IE_SH_G_014	-	-
	3, 4, 5	Funshinagh	IE_SH_G_091	-	-
	6	Inny	IE_SH_G_110	-	-

* RWB – River Water Body; AWB – Artificial Water Body; LWB – Lake Water Body – GWB – Groundwater Body
** M – Monitoring; Md – Modelling

6.2 FIELD STUDY

6.2.1 Proposed Wind Farm Site

6.2.1.1 Habitat Survey

6.2.1.1.1 Multidisciplinary Walkover Survey

The habitats found in the 2022 survey reflect the historic use of the site for peat extraction, as well as the first signs of habitat transition. Overall, the area surveyed occupies a total extent of

approximately 1,900ha, encompassing a total of 29 Fossitt (2000) habitat types (see Table 6.9)(excluding the Derryaroge Mineral Island described below). As no targeted rehabilitation measures have been implemented within the proposed wind farm site since completion of the surveys, habitat change since 2022 is expected to have been limited to gradual natural regeneration. As a result, no material change in habitat extent or condition is likely to have occurred and, accordingly, the 2022 habitat baseline remains broadly representative of the current (2026) receiving environment.

While gradual habitat change is expected to continue through ongoing natural regeneration, the rate of change is anticipated to remain relatively limited prior to the commencement of the Construction Phase, currently anticipated in 2031. Accordingly, the Likely Future Receiving Environment (LFRE) at the commencement of the Construction Phase is expected to remain broadly comparable to that recorded during the 2022 habitat surveys. Consequently, the assessment of effects based on the 2022 habitat baseline remains valid for the LFRE. The anticipated habitat trajectories from the 2022 baseline to the commencement of the Construction Phase are summarised in Table 6.9. The habitats identified during the 2022 and 2023 multidisciplinary walkover surveys are shown in Figure 6.3 through Figure 6.5. Each habitat has been assessed based on its classification, extent, and ecological significance. The survey recorded the habitat type and its spatial coverage, measured either in hectares or meters, to understand its distribution within the site. The percentage of the total site occupied by each habitat was calculated to provide a clearer picture of its relative dominance. An ecological valuation was assigned to each habitat, reflecting its conservation importance and contribution to biodiversity. This valuation was supported by a rationale, which considered habitat quality, ecological function, and potential sensitivity to change.

Over 90% of the surveyed area (approximately 1,700ha) is occupied by five habitat types (Table 6.9) namely:

- Cutover bog (PB4)
- Bog woodland (WN7)
- Other artificial lakes and ponds (FL8)
- Raised bog (PB1)
- Conifer plantation (WD4)

Beyond this habitat homogeneity, habitats at the proposed wind farm site generally exhibit relatively low structural and species diversity, being occupied by a large quantity of graminoids, with limited ecological value, perhaps reflecting the longevity and intensity of the historical industrial activity operating at the proposed wind farm site. Nevertheless, the occurrence of some characteristic species of peatland habitats (e.g. Round-leaved Sundew, *Drosera rotundifolia*; Common Cottongrass, *Eriophorum angustifolium*) confer some degree of rehabilitation potential to this large peatland area.

It is also evident that the majority of the remaining area surveyed—comprising approximately 157 hectares (8% of the total area)—is made up of a combination of semi-natural habitats and habitats with relevant vegetation cover. Within this, around 44.4 hectares (2.43%) consist of managed habitats of limited ecological value, such as conifer plantations (classified as WD4). The rest, approximately 112 hectares (6%), includes several ecologically valuable habitats.

These are notable for their species diversity and their potential to support the expansion and colonisation of adjacent lower-quality habitats. These higher-value habitats are dispersed throughout the surveyed area in relatively limited patches.

With respect to linear habitats, four distinct types frequently intersect the habitat areas described above: Depositing/lowland rivers (FW2), Drainage ditches (FW4), Hedgerows (WL1), and Treelines (WL2). Due to their widespread presence, these linear features occur in a regular pattern, often aligned in rows along drainage ditches which are spaced approximately 5 to 10 meters apart. This habitat connects hydrologically the area surveyed with neighbouring surface water bodies, also establishing important ecological corridors that, although holding water seemingly of poor quality, present the highest plant species diversity within the whole area surveyed.

Hedgerows (WL1) and Treelines (WL2) habitats occurred sparsely in the area surveyed, with the few examples displaying a good structure, but limited diversity. One hedgerow included an IAPS but, otherwise, these habitats are important features in the current landscape

The proposed wind farm site (study area) includes three bogs (i.e. Derryaroge Bog; Derryadd Bog and Lough Bannow Bog) that have been intensively harvested for peat until 2019. The habitats found in the 2022 survey seem to reflect this historic land-use, as well as the first signs of habitat transition. Overall, the study area occupies a total extent of approximately 1,900ha, encompassing a total of 29 Fossitt (2000) habitat types (excluding the subsite described below in Section 6.2.1.1.2. However, 91% of this area (approximately 1,700ha) is occupied by solely 5 habitats (Table 6.9): Cutover bog (PB4); Bog woodland (WN7); Other artificial lakes and ponds (FL8); Raised bog (PB1); and Conifer plantation (WD4). Beyond this habitat homogeneity, these habitats do not seem to show great intrinsic diversity, being occupied by a large quantity of graminoids, with limited ecological value, perhaps reflecting the longevity and intensity of the historical industrial activity operating at the proposed wind farm site (Bog woodland habitat - WN7). Nevertheless, the occurrence of some characteristic species of peatland habitats (e.g. Round-leaved Sundew, *Drosera rotundifolia*; Common Cottongrass, *Eriophorum angustifolium*) might indicate some degree of rehabilitation potential to this large peatland area.

It is also evident that the majority of the remainder portion of the study area occupied by semi-natural and significantly vegetated habitats (i.e. approximately 157ha/8% of the study area) is occupied by a managed habitat with limited ecological value (approximately 2.4%/44.4ha - Conifer plantation, WD4; Table 6.9), and several ecologically valuable habitats due to their species diversity, and potential for expansion and colonisation of other habitats of lower quality in the study area. These latter habitats occur scattered around the study area, in restricted extents (approximately 112ha/6% of the study area - Table 6.9; Figure 6.5).

With regards to linear habitats, four habitat types regularly intersect the habitat areas described above: Depositing/ lowland rivers (FW2); Drainage ditches (FW4); Hedgerows (WL1); and Treelines (WL2) (Figure 6.5). Drainage ditches (FW4), although not depicted in Figure 6.5 due to its abundant occurrence, regularly occurred throughout the cutover bog habitat in vertical lines, spaced approximately 5-10m apart. This habitat connects hydrologically the study area with neighbouring surface water bodies, also establishing important ecological corridors that, although holding water seemingly of poor quality, it presented the highest plant species diversity within the whole study area (Appendix H).

Hedgerows (WL1) and Treelines (WL2) habitats sparsely occurred in the study area, with the few examples displaying a good structure, but limited diversity. One hedgerow included an IAPS (Section 6.2.1.5) but, otherwise, these habitats are important features in the current landscape (Table 6.9).

During the Operational Phase, the implementation of rehabilitation measures and continued natural succession are expected to result in a progressive transition from the existing cutaway peatland habitats towards a more diverse mosaic of wetland, scrub, woodland, heathland and peatland habitats. These changes are anticipated to occur gradually over the operational lifetime of the proposed development and will vary according to residual peat depth, hydrology and topography.

While open habitats and areas of bare peat are expected to persist locally, particularly during the earlier stages of habitat development, the overall habitat trajectory is expected to result in increased habitat diversity and structural complexity relative to the current baseline. Habitat development is expected to occur progressively over time, with wetter habitats generally developing more rapidly than habitats associated with deeper residual peat.

The Operational Phase LFRE therefore reflects a longer-term ecological trajectory than that presented in Table 6.9. Unlike the current baseline and the pre-construction LFRE, which can be described in terms of trends affecting individual Fossitt habitat types, the Operational Phase LFRE is expected to comprise broader habitat mosaics resulting from the implementation of rehabilitation measures and ongoing ecological succession.

Accordingly, Table 6.9 is intended to describe the habitat baseline and anticipated habitat trends prior to the commencement of the Construction Phase only. The habitat categories identified during the 2022 surveys are expected to remain broadly recognisable during this intervening period and can therefore be meaningfully described using Fossitt habitat classifications and trend-based changes in extent and condition. By contrast, the Operational Phase LFRE reflects a longer-term habitat trajectory, where individual habitat types are expected to evolve into broader habitat mosaics and transitional communities following rehabilitation and natural succession. As such, the Operational Phase LFRE is not appropriately represented through changes to individual Fossitt habitat types and is therefore not presented within Table 6.9.

Table 6.9: Summary of Habitats (Fossitt, 2000) within the Proposed Wind Farm Site/Study Area

Code	Habitat Name	Area (ha)/ Length (m)	Percentage of Proposed Wind Farm Site	LFRE Trend Prior to Construction
PB4	Cutover bog	1,120.8ha	59.67%	Moderate decrease due to ongoing natural regeneration and establishment of scrub and grassland habitats.
WN7	Bog woodland	413.5ha	22.37%	No material increase. Woodland establishment is expected to remain limited prior to construction and any increase is likely to be small and localised (<0.5 ha).
FL8	Other artificial lakes and ponds	76.5ha	4.14%	No material change. No significant increase is anticipated prior to construction as rehabilitation measures and re-wetting are not expected to occur during this period.
WD4	Conifer plantation	44.3ha	2.40%	No material change. Existing plantation areas are expected to remain largely unchanged prior to construction.
FS1	Reed and large sedge swamps	33.7ha	1.83%	No material change. Habitat extent is expected to remain broadly consistent with the baseline in the absence of rehabilitation measures.

Code	Habitat Name	Area (ha)/ Length (m)	Percentage of Proposed Wind Farm Site	LFRE Trend Prior to Construction
WS1	Scrub	30.6ha	1.65%	Moderate increase due to ongoing natural regeneration and colonisation of previously open habitats.
PB1	Raised bog	30.5ha	1.65%	No material change. No transition to Annex I active raised bog habitat is anticipated prior to construction.
BL3	Buildings and artificial surfaces	17.9ha	0.97%	Unchanged.
WS2	Immature woodland	15.7ha	0.85%	Moderate increase through natural establishment and succession of scrub and woodland species.
ED2	Spoil and bare ground	12.2ha	0.66%	Moderate decrease due to progressive vegetation colonisation and habitat succession.
GS4	Wet grassland	6.7ha	0.36%	Moderate increase through natural regeneration and vegetation establishment.
PF2	Poor fen and flush	4.90ha	0.27%	No material change. Habitat extent and condition are expected to remain broadly consistent with the baseline prior to construction.
HD1	Dense bracken	3.4ha	0.18%	No material change.

Code	Habitat Name	Area (ha)/ Length (m)	Percentage of Proposed Wind Farm Site	LFRE Trend Prior to Construction
GS3	Dry humid acid grassland	3.1ha	0.17%	Moderate increase through natural regeneration of previously disturbed areas.
ED3	Recolonising bare ground	2.00ha	0.11%	Moderate decrease as vegetation succession continues.
WD1	(Mixed) broadleaved woodland	1.6ha	0.09%	No material change. Existing woodland areas are expected to remain broadly stable prior to construction.
HH1	Dry siliceous heath	1.2	0.06%	No material change.
WN6	Wet willow-alder-ash woodland	1.2ha	0.06%	Moderate increase due to the establishment and growth of willow-dominated communities
WD3	(Mixed) conifer woodland	1.0ha	0.05%	No material change.
GS2	Dry meadows and grassy verges	0.6ha	0.03%	Moderate increase through ongoing natural regeneration and grassland development.
BL2	Earth banks	0.6ha	0.03%	Unchanged.
WD2	Mixed broadleaved/conifer woodland	0.5ha	0.03%	No material change.
GA2	Amenity grassland (improved)	0.3ha	0.02%	No material change.
ED1	Exposed sand, gravel or till	0.1ha	0.01%	Moderate decrease due to encroachment of grassland and scrub vegetation.

Code	Habitat Name	Area (ha)/ Length (m)	Percentage of Proposed Wind Farm Site	LFRE Trend Prior to Construction
FW2	Depositing/ lowland rivers	931m	-	Unchanged. Extent and condition expected to remain stable prior to construction.
FW4	Drainage ditches	~1,230,000	-	Unchanged. Extent and condition expected to remain stable under the ongoing drainage regime.
WL1	Hedgerows	521m	-	Unchanged. No increase or decrease anticipated prior to construction.
WL2	Treelines	1,596m	-	Unchanged. No increase or decrease anticipated prior to construction.

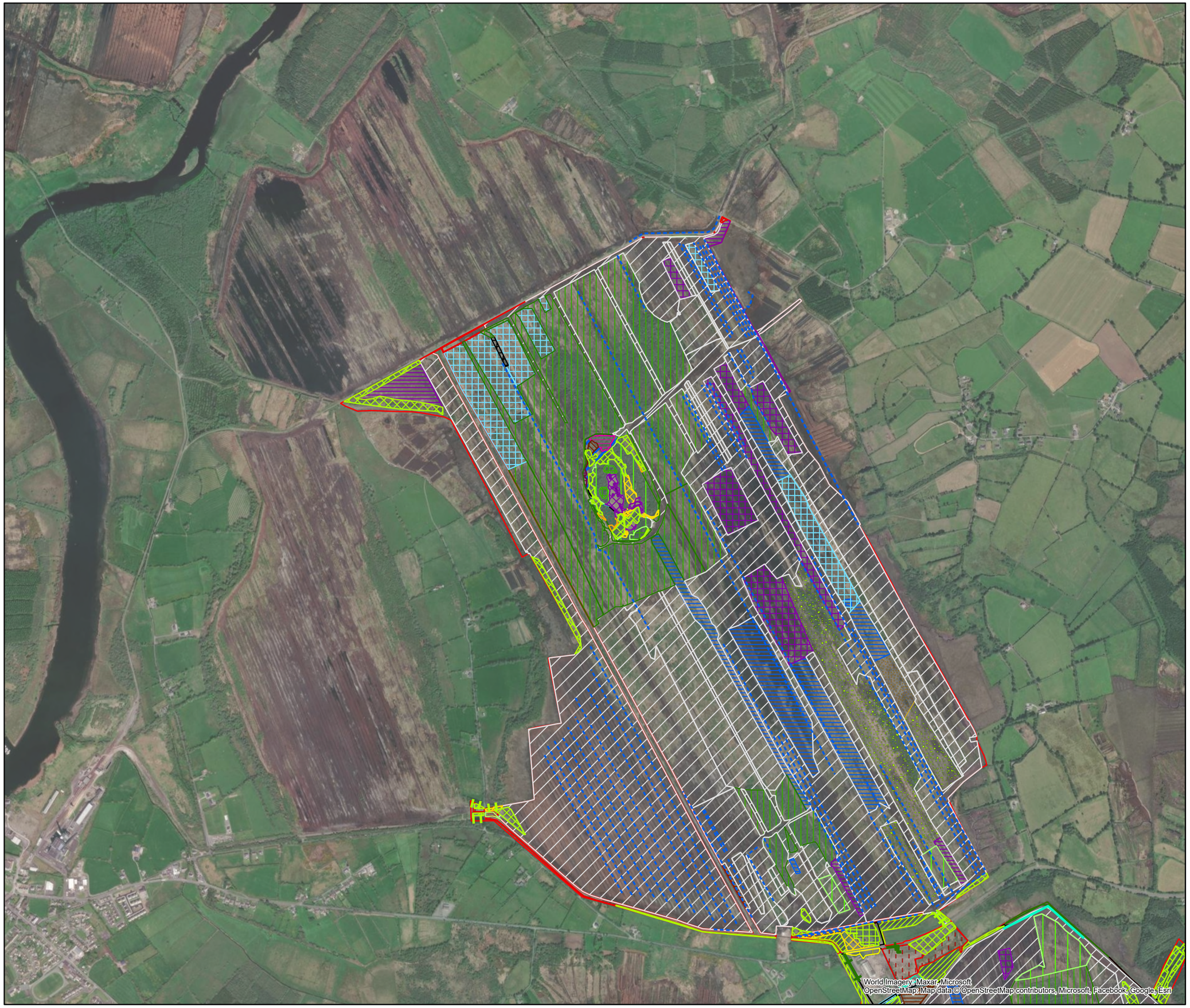
6.2.1.1.2 Subsite (Derryaroge Mineral Island) Habitat Survey

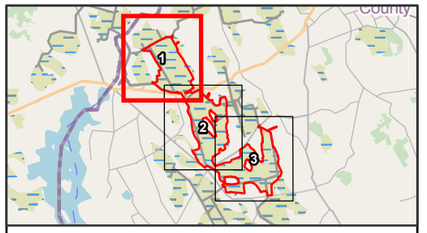
The subsite in Derryaroge Bog subject to a detailed survey (Appendix J) displayed 12 habitat types (Fossitt, 2000), and/or their mosaics. Moreover, the detailed analysis of the species composition and habitat features allowed the identification of three habitats listed in the Annex I of the Habitats Directive, including one designated as priority habitat - Table 6.10.

Table 6.10: Classification of Habitats within the Derryaroge Subsite (adapted from Appendix J)

Habitat	Code (Fossitt, 2000)	Area (ha)	Annex I Habitat (92/43/EEC)	Code	Area (ha)
Other artificial lakes and ponds	FL8	0.02			
Dry calcareous and neutral grassland	GS1	0.13			
Scrub	WS1	3.20			
Wet grassland	GS4	1.51			
Dense bracken	HD1	0.17			
Oak-ash-hazel woodland	WN2	0.58			
Dry siliceous heath	HH1	0.13	European dry heaths	4030	0.13
Immature woodland	WS2	0.01			
Buildings and artificial surfaces	BL3	4.48			
Rich fen and flush	PF1	1.07	Alkaline fens	7230	1.07
Calcareous springs	FP1	0.16	Petrifying springs with tufa formation (*Cratoneurion*)*	7220	0.16
Total		**11.46**			**1.36**

*priority habitat under the Habitats Directive





Legend

- Proposed wind farm site

Habitats

- FW4 - Drainage ditches
- WL1 - Hedgerows
- WL2 - Treelines
- WS1 - Scrub
- BC1 - Arable crops
- BL2/FS1
- BL2/WS1
- BL3 - Buildings and artifical surfaces
- ED1 - Exposed sand, gravel or till
- ED2 - Spoil and bare ground
- ED3 - Recolonising bare ground
- FL8 - Other artificial lakes and ponds
- FL8/PF2
- FP1 - Calcareous springs
- FS1 - Reed and large sedge swamps
- FW4 - Drainage ditches
- GA2/GS2
- GS1 - Dry calcareous
- GS4 - Wet grassland
- GS4/WS1
- GS4/WS1
- HD1 - Dense bracken
- HH1 - Dry siliceous heath
- HH1/WS1
- PB1 - Raised bog
- PB4 - Cutover bog
- PB4/WS1
- PF1 - Rich fen and flush
- PF2 - Poor fen and flush
- WD2 - Mixed broadleaved/ conifer woodland
- WD3 - (Mixed) conifer woodland
- WD4 - Conifer plantation
- WN2 - Oak-ash-hazel woodland
- WN7 - Bog woodland
- WN7/PB4
- WS1 - Scrub
- WS1/GS4
- WS1/WS2
- WS2 - Immature Woodland

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	06/05/2025	First issue	S.P	I.H
Rev	Date	Description	By	Chkd.

Client:

Bord na Móna

Project:

Derryadd Wind Farm

Title:

Figure 6.3:
Proposed Wind farm Site Habitat map
- Page 1 of 3 -

Scale @ A3: 1:16,000

Prepared by:	Checked by:	Date:
S.Pezzetta	I.Heanue	May 2025

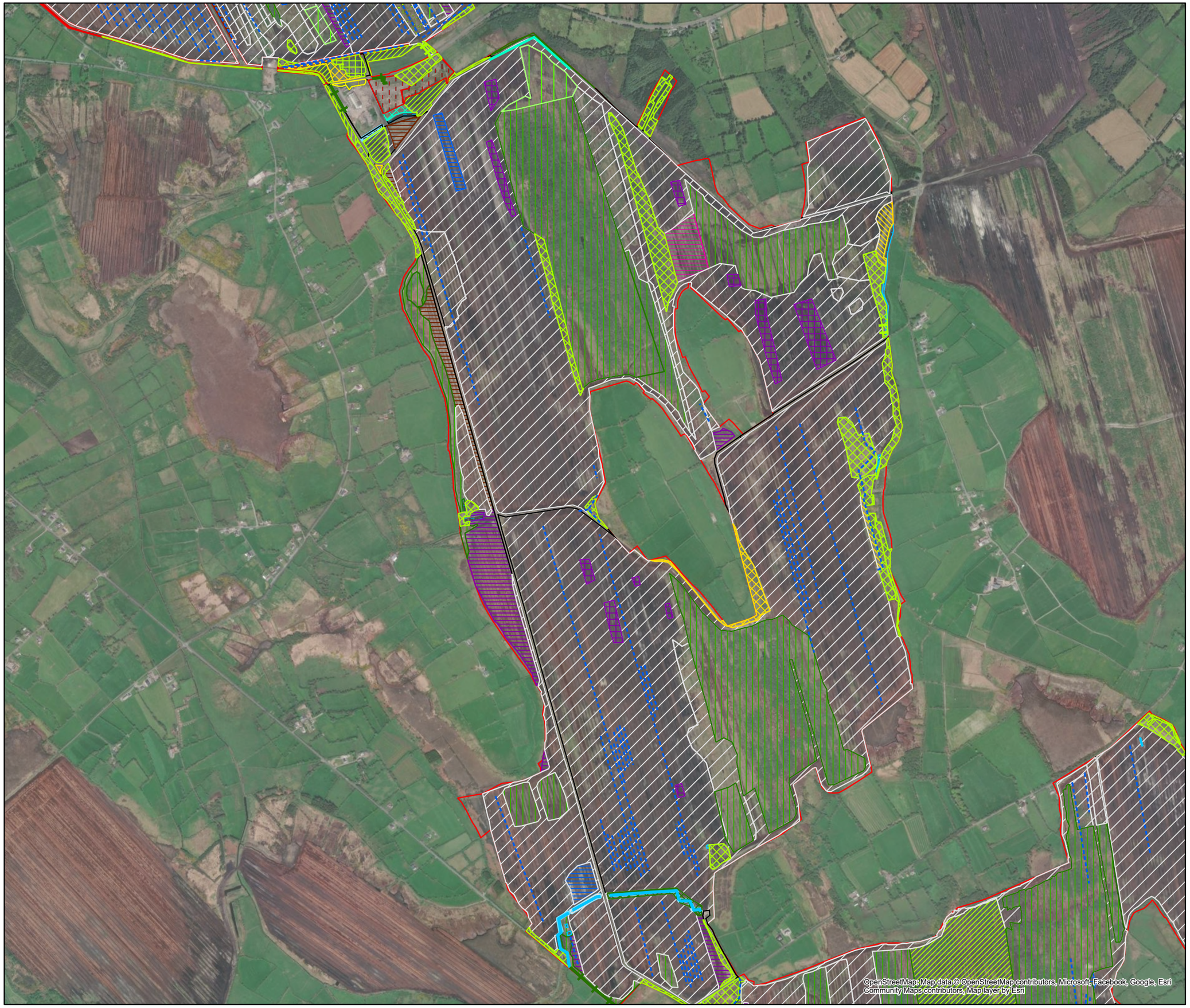
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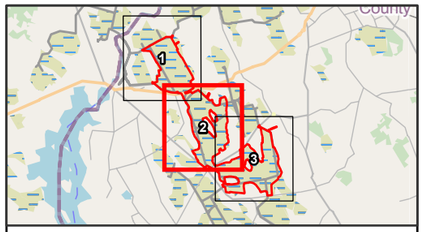
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Map Ref: 11399-033-HAB-P.APP.BO-TOB-A

Draft: A





Legend

- Proposed wind farm site

Habitats

- FW2 - Depositing/ lowaland rivers
- FW4 - Drainage ditches
- WL1 - Hedgerows
- WL2 - Treelines
- WS1 - Scrub
- BL2 - Earth banks
- BL2/WS1
- BL3 - Buildings and artifical surfaces
- ED2 - Spoil and bare ground
- ED3 - Recolonising bare ground
- FL8 - Other artificial lakes and ponds
- FS1 - Reed and large sedge swamps
- FW4 - Drainage ditches
- GA2/GS2
- GS3 - Dry-humid acid grassland
- GS4 - Wet grassland
- GS4/WN7
- HH1 - Dry siliceous heath
- PB1 - Raised bog
- PB4 - Cutover bog
- PB4/GS4
- PF2 - Poor fen and flush
- WD1 - (Mixed) broadleaved woodland
- WD2 - Mixed broadleaved/ conifer woodland
- WD3 - (Mixed) conifer woodland
- WD4 - Conifer plantation
- WN5 - Riparian woodland
- WN6 - Wet willow-alder-ash woodland
- WN7 - Bog woodland
- WN7/PB4
- WS1 - Scrub
- WS2 - Immature Woodland

0 500 1,000
Meters

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Rev	Date	Description	By	Chkd.
A	06/05/2025	First issue	S.P	I.H

Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Figure 6.4: Proposed Wind farm Site Habitat map - Page 2 of 3 -

Scale @ A3: 1:16,000

Prepared by:	Checked by:	Date:
S.Pezzetta	I.Heanue	May 2025

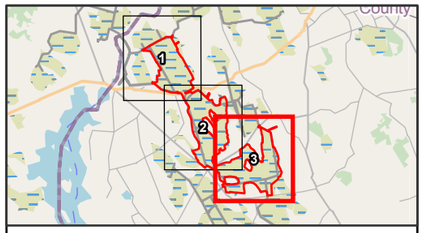
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Legend

- Proposed wind farm site

Habitats

- FW2 - Depositing/ lowaland rivers
- FW4 - Drainage ditches
- WL2 - Treelines
- BL2 - Earth banks
- BL3 - Buildings and artifical surfaces
- FL8 - Other artificial lakes and ponds
- FL8/PF2
- FS1 - Reed and large sedge swamps
- FW4 - Drainage ditches
- GS2 - Dry meadows and grassy verges
- GS3 - Dry-humid acid grassland
- GS4 - Wet grassland
- PB1 - Raised bog
- PB4 - Cutover bog
- PB4/GS4
- PB4/WS1
- PF2 - Poor fen and flush
- WD1 - (Mixed) broadleaved woodland
- WD4 - Conifer plantation
- WD4/WN7
- WN5 - Riparian woodland
- WN6 - Wet willow-alder-ash woodland
- WN7 - Bog woodland
- WS1 - Scrub

0 500 1,000
Meters

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Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Figure 6.5: Proposed Wind farm Site Habitat map - Page 3 of 3 -

Scale @ A3: 1:16,000

Prepared by:	Checked by:	Date:
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6.2.1.2 Aquatic Survey

Considering the survey constraints described in Section 5.7.6.2, the baseline aquatic environment was appraised with results of a set of surveys (described in Section 5.7.2) carried out on 12 sampling sites (Figure 6.2), in eight EPA streams, part of five WFD river water bodies (Table 6.11).

As outlined in Section 6.2.1.1, no targeted rehabilitation measures have been implemented within the proposed wind farm site since completion of the aquatic surveys and, accordingly, the receiving environment associated with the surveyed watercourses is considered broadly representative of current conditions. While some gradual habitat change is anticipated through ongoing natural regeneration prior to the commencement of the Construction Phase, currently anticipated in 2031, no material change in the extent or condition of watercourses, drainage features or associated aquatic habitats is anticipated during this period. Consequently, the baseline aquatic survey data remains valid for consideration of the pre-construction LFRE.

During the Operational Phase, the implementation of rehabilitation measures and associated hydrological changes may influence the condition of aquatic and riparian habitats over time, particularly through improvements in vegetation cover, reduced sediment inputs and enhanced habitat diversity. Accordingly, the baseline aquatic surveys presented herein provide the basis for assessment of aquatic receptors, while the implications of longer-term habitat development are considered separately within the relevant Operational Phase impact assessment.

Table 6.11: Survey Design and Corresponding EPA Streams and WFD River Water Bodies

Unassigned | Bad | Poor | Moderate | Good | High

Sampling Site	EPA Name	EPA Code	WFD Name	WFD Code	WFD Water Quality Status[6]
3	Ballynakill_26	26B22	Ballynakill_010	IE_SH_26B220790	
4					
10					
11					
2	Lough Bannow Stream	26L12	Lough Bannow Stream_010	IE_SH_26L120100	
7					
6	Derrygeel	26D77			
8	Rappareehill	26R40			
1	Bilberry	26B03	Ledwithstown_010	IE_SH_26L840850	
12	Ledwithstown_26	26L84			
5	Trib Fallan West	26F52	Fallan_020	IE_SH_26F010200	
9	Kilnacarrow	26K64	Shannon (Upper)_100	IE_SH_26S021600	

6.2.1.2.1 River Habitat Survey

The analysis of the full dataset of the results of the River Habitat Survey carried out in June 2022 (Appendix I.1) seems to reflect the local historical land-use, where peat extraction activities were carried out for decades. Thus, the majority of these watercourses show signs of having been regulated (i.e. the river channel shows signs of being man-made, or having been straightened/excavated in the past), noticeable by the presence of high banks (an average bank height across all the sampling sites of almost 3m), and a limited extent between the water edge and respective bank, reflective of the existing restricted riparian gallery lateral extent (average of 1m, as the difference between the average bank width and average wetted width, across all sampling sites – i.e. 0.5m on each margin) - Table 6.12.

Table 6.12: Summary of Hydromorphology Features Surveyed in 2022

EPA Name	Sampling Site	Average Bank Height (m)	Average Bank Width (m)	Average Wet Width (m)
Ballynakill_26	**3**	2.50	6.00	5.00
	4	3.50	7.00	5.50
	10	1.50	6.00	5.00
	11	8.00	6.00	5.00
Lough Bannow Stream	**2**	1.50	7.00	6.00
	7	0.75	7.00	5.00
Derrygeel	**6**	2.50	4.00	3.50
Rappareehill	**8**	2.50	7.00	5.00
Bilberry	**1**	4.00	2.50	2.00
Ledwithstown_26	**12**	4.00	3.50	1.50
Trib Fallan West	**5**	1.00	5.00	5.00
Kilnacarrow	**9**	3.00	6.00	5.50
Average		**2.9**	**5.58**	**4.50**

6.2.1.2.2 Water Quality Assessment

Kick-sampling results carried out at the Sampling Sites in September 2022 (Appendix I.3) generally confirmed the local pressures to the aquatic environment, as well as the failure of the majority of the WFD river water bodies in the vicinity of the proposed wind farm site to achieve the WFD objectives (Table 6.5). Thus, the Q-Value of the sampling sites was typically Q3, while none of the 12 sites met the objectives of the WFD and Surface Water Regulations (S.I. No. 77/2019) (as amended) - i.e. (i.e. ≥Q4; EQR good ≥0.75. The macroinvertebrate assemblages were dominated by Group C taxa, whereas only two sampling sites had Group A individuals in

their samples (Sampling Site 2 and 3 - Appendix I.3). The aquatic habitats at the sampling sites were generally unsuitable for supporting the White-clawed Crayfish, with the exception of Sampling Site 4, White-clawed Crayfish require moderate to good water quality, similar to that needed by brown trout, with conditions such as oxygen saturation above 50% and BOD below 3ppm (Reynolds, 1998; Demers *et al.*, 2003). This protected species also needs relatively hard water, with a pH of 7 or above, and calcium concentrations of at least 5mg/l, as sufficient calcium is necessary to harden their exoskeletons after moulting (Gallagher *et al.*, 2006). Additionally, firm substrates and moderate productivity levels are important for crayfish habitats (Reynolds, 1998). The watercourses on the wind farm site were deemed unsuitable to sustainable populations of White-clawed Crayfish due to inappropriate geology, low channel energy, and lack of suitable habitat, particularly the absence of gravels required for crayfish hatchlings (Reynolds, 1998; Reynolds *et al.*, 2010). Larger crayfish need stones to hide under or earthen banks for burrowing (Demers *et al.*, 2003), while hatchlings typically shelter in vegetation, gravel, and fine tree roots, and smaller crayfish are often found among weeds and debris in shallow water. Larger juveniles are more commonly found among cobbles and detritus, such as leaf litter (Reynolds and O'Keeffe, 2005).

6.2.1.2.3 Electrofishing Survey

More than half of the sampling sites (i.e. 55%, having in consideration the survey constraints described in Section 5.7.6.2) retrieved null results for the electrofishing survey. The remainder of the Sampling Sites displayed limited diversity, with Brown Trout (*Salmo trutta*) accounting for 90% of all the sampled fish. Furthermore, overall, these sites had limited value as salmonid habitat due to the absence of enough holding pools, oxygenated riffle habitat, slow to moderate flow, boulders, spawning gravels, combined with the presence of heavy siltation and low energy nature of the watercourses.

Salmonid populations across Ireland have been negatively impacted by various land management practices, particularly affecting the survival of juvenile fish. While many rivers still provide suitable spawning habitats capable of producing large numbers of fry, the quality of nursery habitats is often inadequate. These nursery areas, essential for the growth and development of juvenile salmonids, often lack necessary structural features such as pools and riffles. As a result, the survival of salmonids, including brown trout and Atlantic salmon, through to the smolt stage is limited. The impact of land management practices on river health further exacerbates these challenges. Farming runoff, including fertilisers and soil, enters rivers, causing nutrient pollution that smothers vital habitats. Forestry activities such as tree felling and drainage disrupt the natural landscape, leading to increased sedimentation and the loss of important habitats. River drainage practices, such as straightening or deepening river channels, reduce habitat diversity, making these areas less suitable for fish. Similarly, livestock access to watercourses causes erosion of riverbanks and the introduction of pollutants, further degrading water quality. In many Irish rivers, particularly those in drained catchments with a channel gradient of less than 1%, insufficient water energy prevents the natural movement of bed materials, hindering the formation of key in-stream features like riffles and pools. This limits the availability of mobile gravels and cobbles needed for healthy, functional habitats. Urban development, with its roads and buildings, increases surface runoff and obstructs the natural movement of fish, while peat extraction alters water flow, raises acidity levels, and contributes to sediment build-up. Finally, the spread of invasive plant species weakens riverbanks, reducing

essential shading and cover for aquatic life. Together, these land practices negatively affect water quality and habitat availability for salmonids in many of Ireland's rivers.

Access for salmonids from downstream rivers into the proposed wind farm site would be challenging due to the modified nature of the watercourses within the area. The presence of dense, encroaching in-stream vegetation, coupled with culverts, low gradients, and heavy siltation, further complicates their movement. These factors limit the availability of suitable habitats and impede the natural flow dynamics that salmonids rely on for migration and survival.

Peat based catchments, such as the one in which the proposed wind farm site is located, are commonly less productive than those flowing over other geologies (O'Grady, 2006), with reduced primary productivity, macroinvertebrate diversity and lower fish biomass (Richardson, 1993). In addition, the low local gradient might contribute to the lower fish abundance and diversity in the sampled reaches as it is one of the principal determinants of juvenile salmonid production, with medium gradients being the most optimal in terms of successful recruitment and population persistence (Amiro, 1993; Kennedy and Strange, 2006; O'Grady, 2006; Wood and Budy, 2009). Due to the historic modification of these watercourses, channel gradient is very low and not optimal for salmonids.

Overall, the survey sites were not considered suitable for lamprey species, despite the occasional occurrence of small areas of suitable habitat. Suitable spawning habitat consists of finer, unbedded gravels that was absent from all sampling sites, with the exception of sampling site 5. Electrofishing at sampling site 5 contained one ammocete, while there was light to moderate siltation present at the culvert on this section of river providing good localised ammocoete habitat (burial areas in silt and nearby fine gravels for spawning) and creating overall moderate habitat for lampreys.

Three of the sites surveyed contained high levels of mud and wooden debris, mud, and lacked the deposition of fine, organic rich sediment, which are favoured by larval lamprey (Goodwin *et al.*, 2009; Aronsuu and Virkkala, 2014).

Table 6.13: Summary of Survey Findings in September 2022 (Appendix I.3)

Sampling Site	Summary of Findings (see Appendix I.3)	Q-Value
3	• Dominated by glide habitat with very localised riffle upstream of a culvert; • Riparian vegetation comprised of Hawthorn (*Crataegus monogyna*), Blackthorn (*Prunus spinosa*), Grey Willow (*Salix cinerea*), Bramble (*Rubus fruticosus* agg.), Bracken (*Pteridium aquilinum*), Field Bindweed (*Convolvulus arvensis*), Bittersweet (*Solanum dulcamara*) and Reed Sweet-grass (*Glyceria maxima*); • Instream vegetation included Branched Bur-reed (*Sparganium erectum*), Yellow Water Lily (*Nuphar lutea*) and Common Duckweed (*Lemna minor*); • Stagnant flow downstream of the culvert crossing, containing dark coloured, peat-stained, water;	Q3-4

Sampling Site	Summary of Findings (see Appendix I.3)	Q-Value
	• Spawning and nursery value is low given the low percentage of riffle zones and heavy siltation; • No fish were recorded during electrofishing; • The channel was not considered of value to Crayfish given the observed heavy siltation; • Macroinvertebrate sample dominated by Group C, but also containing Group A, B and D taxa; • No sign of Otters was recorded at the sampling site.	

4	• Substrate containing gravels, but with heavy silt content;
	  • The riparian vegetation included comprised of Grey Willow, Blackthorn, Field Bindweed, Great Willowherb (*Epilobium hirsutum*), and Bramble;
	  • Instream vegetation included Branched Bur-reed, Common Water-starwort (*Callitriche stagnalis*) and patches of Small Pondweed (*Potamogeton berchtoldii*);
	• Electrofishing retrieved 15 individuals of two fish species: Three-spined Stickleback (*Gasterosteus aculeatus*) (n=2); and Brown Trout (*Salmo trutta*) (n=13);
	• The sample did not include any Lamprey species, despite the presence of some soft sediment;
	• The electrofishing sample also included one White-clawed Crayfish (*Austropotamobius pallipes*) (n=1), while several individuals were incidentally observed in the water;
	• Remains of Crayfish were evident in regular Otter spraints in the culvert. Here both Otter latrine sites in mud and spraint sites on concrete ledges were observed;
	• Macroinvertebrate sample was dominated by Group C, while also containing Group A, B and D taxa.
		Q3

10	• Instream vegetation contained dense growths of Common Reed (*Phragmites australis*); • The riparian vegetation included dense Bramble, Bracken, Nettle (*Urtica dioica*), and Grey Willow scrub; • The reach was unsuitable for electrofishing as it comprised a series of small pools with minimum flow through the dense reed growth. • There was no suitable spawning or nursery habitat present for salmonids. The reach would not support Lamprey habitat; • Invertebrate sample was dominated by Group C and D species; • There was good foraging value for Otter, but no evidence of the species was recorded.	Q3
11	• Substrate comprised of coarse gravel and fibrous peat material. It also included boulder, cobble and gravel, bedded with heavy siltation;	Q3

Sampling Site	Summary of Findings (see Appendix I.3)	Q-Value
	• Instream vegetation contained Fool's-water-cress (*Apium nodiflorum*); • The riparian vegetation included dense Bramble and Willow scrub. • Fished sample included 3 fish species, in a total of 14 individuals: Brown Trout (n=11); Gudgeon (*Gobio gobio*) (n=2); and Roach (*Rutilus rutilus*) (n=1); • There was limited, or no salmonid value given the depth, peat-substrate and the lack of flow but the site may have some holding value for coarse fish at times. It was not suitable for Crayfish or Lamprey; • The channel had moderately suitable for Crayfish, but none were observed; • There were some small pockets of gravel and silt suitable for Lamprey, but no individuals were recorded; • It was deemed that the sampling site may have some value as a foraging and commuting habitat for Otter albeit no signs were recorded; • Macroinvertebrate sample was dominated by Group C species.	
2	• Substrate was gravel and soft silt; • Instream vegetation included a dense cover of Fool's-water-cress (*Apium nodiflorum*), Shining pondweed (*Potamogeton lucens*) and Common Water-starwort. Ivy-leaved Duckweed (*Lemna trisulca*) and Common Duckweed were also present; • The riparian vegetation steep banks included Bramble, Great Willowherb, Wild Angelica (*Angelica sylvestris*), rank grasses and Willow (*Salix* spp.); • A single Pike (*Esox lucius*) (29.5cm in length) was recorded during the electrofishing survey. This stretch of river did not hold fisheries value for salmonids, but was considered of value for coarse fish due to its deep channel and slow gradient; • Poor bank and river quality for Otter and no visible signs found; • Invertebrate sample was dominated by Group C and D taxa.	**Q3-4***
7	• Substrate consisted of soft peat with gravels, at places; • Instream vegetation included Water Mint, Fool's-water-cress and Water-cress (*Nasturtium officinale*); • Riparian vegetation included dense Bramble, Bracken and Grey Willow scrub; • The electrofishing sample contained one specimen - a Tench (*Tinca tinca*); • The reach contained holding area value for coarse fish; • The samples did not include any Crayfish; • The channel had some foraging value and as a commuting route for Oter albeit no signs were recorded.	**Q2-3***

Sampling Site	Summary of Findings (see Appendix I.3)	Q-Value
	• The invertebrate sample was dominated by Group C species, but also included Group B and D taxa.	
6	• The stream substrate had a gravel and peat base; • The riparian vegetation contained Bramble, Bracken, Field Bindweed and Willow scrub; • Instream vegetation included Branched Bur-reed, Common Water-starwort, Water-plantain (*Alisma plantago-aquatica*) and Small Pondweed; • No fish were sampled during the electrofishing. However, two Three-spined Stickleback (*Gasterosteus aculeatus*) were caught within the kick sample for macroinvertebrates; • The reach did not contain suitable spawning or nursery habitat for salmonids; • The channel has some foraging value for Otter as a single spraint was observed at the downstream area of the site; • Invertebrate sample was dominated by Group C, but also included significant abundance of Group D taxa.	**Upstream:** **Q2-3** **Downstream:** **Q3**
8	• Substrate composed of mixed gravels and soft silt; • The riparian vegetation included Bramble, Gorse (*Ulex europaeus*), Nettle, Hedge Bindweed (*Calystegia sepium*), Grey Willow, Osier (*Salix viminalis*) and Ash (*Fraxinus excelsior*); • Instream vegetation was abundant and included Water Horsetail (*Equisetum fluviatilis*), Yellow Water Lily, Water Mint and Common Reed; • The channel was not of value to salmonid species, considering the slow flows, extensive instream vegetation and heavy siltation; • Heavy siltation reduced the potential for salmonid spawning or nursery habitat to be present; • No fish were recorded during the electrofishing survey. One Stone Loach (*Barbatula barbatula*), measuring 4cm, was recorded in the macroinvertebrate sample; • The channel had some foraging value and as a commuting route for Otter albeit no signs were recorded; • Invertebrate sample dominated by Groups C and D.	**Q2-3***
1	• The substrate comprised of gravels with heavy peat sedimentation; • The channel was heavily overgrown with instream macrophytes, including Branched Bur-reed, Bulrush, and Water Mint. • The riparian vegetation comprised of dense Gorse, Field Bindweed, Great Willowherb and Grey Willow, bordering cutover lowland blanket bog; • No fish were recorded during the electrofishing survey;	**Q3**

Sampling Site	Summary of Findings (see Appendix I.3)	Q-Value
	• The channel had limited value to fish or Crayfish due to heavy sedimentation, limited flows and dense vegetation growth. • No evidence of Otter was recorded; • The macroinvertebrate sample was dominated by Group C and D indicators.	
12	• Instream vegetation contained Spiked Watermilfoil (*Myriophyllum spicatum*), Floating Sweet-grass (*Glyceria fluitans*) and Water-plantain (*Alisma plantago-aquatica*); • Riparian vegetation contained Grey Willow, Downy Birch (*Betula pubescens*), Ash, Bramble, Hogweed (*Heracleum sphondylium*) and Great Willowherb. • This sampling site was not electrofished (Appendix 7-5c); • There was limited, or no salmonid holding value, due to the reach's depth, peat-substrate and absence of flow. It does not have any spawning or nursery value for salmonids; • The reach did not hold potential (or suitability) for Crayfish or Lamprey species; • Invertebrate sample was dominated by Group C, and occasional Group D species. • No evidence of otters but activity unlikely due to lack of prey.	Q3
5	• The substrate included a mix of coarse gravels, with silt accumulations in the margins; • The riparian vegetation comprised of Great Willowherb, Bramble, Wild Angelica, along with rank grasses; • Instream vegetation included Fool's-water-cress, Branched Bur-reed, and frequent Common Duckweed; • Electrofishing sample retrieved 66 individuals of two species: Brown Trout (n=65) and Lamprey (n=1); • The sampling site presented light to moderate siltation, with most silt accumulations occurring the box culvert, providing moderate lamprey habitat (burial areas in silt and nearby fine gravels for spawning); • Channel was deemed suitable for Crayfish albeit none were recorded; • The channel offered good foraging value for otter given the river was a good salmonid nursery, but no Otter signs were recorded. • Invertebrate sample was dominated by Group C. However, the presence of Group B species and absence of Group A, were contributing factors for the Q-Value valuation.	Q3
9	• The substrate was mostly compacted peat;	-

Sampling Site	Summary of Findings (see Appendix I.3)	Q-Value
	• Instream vegetation included Broad-Leaved Pondweed (*Potamogeton natans*), Fool's-water-cress and occasional Water Mint; • The riparian vegetation included Grey Willow, Alder, Ash and Bramble; • No fish were recorded in electrofishing sample; • Due to the limited flow of water, this sampling site did not hold fisheries value. Also, beyond not supporting suitable salmonid spawning or nursery habitat, the sampling site did not present suitable lamprey habitat; • Considering the water flow conditions, the sampling site was not suitable for Crayfish, nor any were captured in the electrofishing sample; • There was low foraging value for Otter and no signs were recorded during the survey; • No invertebrate sample was collected at this sampling site.	
* Adjusted Q-Value from the classification attributed in Appendix I.3		

6.2.1.3 Protected Species

The protected species baseline presented in this section is informed by field surveys undertaken between 2021 and 2024 and reflects the current (2026) receiving environment. As no targeted rehabilitation measures have been implemented within the proposed wind farm site since completion of these surveys, and habitat change has been limited to gradual natural regeneration, it is considered unlikely that the distribution or availability of habitats supporting protected species has changed materially since the surveys were undertaken. Accordingly, the baseline data remain appropriate for consideration of the current receiving environment and the LFRE prior to commencement of the Construction Phase.

During the Operational Phase, the implementation of rehabilitation measures and continued ecological succession are expected to influence habitat availability and suitability for certain protected species. In particular, the development of wetland, scrub and woodland habitat mosaics may increase habitat suitability for species such as Otter and other fauna associated with these habitats. These longer-term changes represent the Operational Phase LFRE and are considered separately within the impact assessment. The baseline survey results presented herein remain the primary basis for characterising the existing receiving environment and assessing potential effects on protected species.

6.2.1.3.1 Non-Volant Mammals

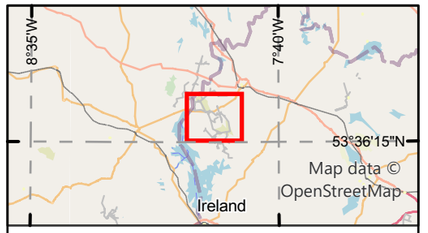
6.2.1.3.1.1 Otter (*Lutra lutra*)

Otter and its breeding/resting sites (holts, couches) are protected under the Wildlife Act 1976 (as amended) and listed on the Annex II and Annex IV of the Habitats Directive (Council Directive 92/43/EEC). The Desk Study indicated an abundant local presence of Otter (Table

6.1), and it was also confirmed during the Multidisciplinary Walkover Survey, where several Otter tracks were identified across the study area. Although no Otter holts or couches have been recorded, Otter tracks were observed near the northern boundary of Lough Bannow Bog (Figure 6.6).

8°0'0"W
7°54'0"W
53°39'40"N
53°36'30"N
600000
606000
612000
768000
762500





Legend

- Proposed wind farm site
- Turbine Layout

Relevant findings

- Rhododendron
- Badger Activity
- American Mink
- Common Blue
- Common Frog
- Deer
- Eurasian Badger
- Irish Hare
- Large White
- Meadow Brown
- Pine Marten
- Raft Spider
- Red Fox
- Small Tortoiseshell

0 1 2
Kilometres

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Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Figure 6.6: Relevant Observations Within the Study Area During the Multidisciplinary Walkover Survey

Scale @ A3:	1:40,000	
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6.2.1.4 Birds

Upon the initial identification of key target species (Section 5.7.4.1), field observations and a subsequent review of the desk study (Section 6.1) led to an update of the species listed in Table 5.6. Although some of the species listed above were recorded during field surveys of the proposed wind farm site, likely significant effects arising from the proposed development could be reasonably excluded at an early stage of the assessment. This conclusion was based on the limited nature, frequency and distribution of the records, the low level of site utilisation observed, and the availability of more suitable habitat within the wider receiving environment (Table 6.14).

Table 6.14: Bird Species Excluded from Detailed Assessment

Family	Common Name	Scientific Name	Rationale
Anatidae	Great White-fronted Goose	*Anser albifrons flavirostris*	▪ No non-flight records, either onsite or in the wider environment; ▪ Only one flying record (Non-breeding Season 2022/23).
	Tufted Duck	*Aythya fuligula*	▪ One non-flying record onsite (27 ind.) in 7 seasons; ▪ One flight record (3 ind.) offsite.
	Common Goldeneye	*Bucephala clangula*	▪ Absent from the site, flying and non-flying; ▪ Sporadic presence within the wider environment.
	Gadwall	*Mareca strepera*	
Laridae	Common Tern	*Sterna hirundo*	▪ Irregular presence only in the wider environment.
Rallidae	Eurasian Coot	*Fulica atra*	▪ Despite being a SCI of Lough Ree SPA, its use of the proposed wind farm site was limited, with records occurring primarily within the wider receiving environment. Site utilisation within the proposed wind farm site was infrequent and no flight activity was recorded during the survey period

Following the prescriptions of Percival (2003) and the SNH (2017), 18 target species were identified as requiring detailed assessment, based on their conservation status, frequency of occurrence, utilisation of the proposed wind farm site, and the potential for interaction with the proposed development. These species constitute the relevant species for the assessment of ornithological effects from the proposed wind farm on European sites (Table 6.14). The dataset used to inform this appraisal is included in Appendix K.

The following Sections describe the field study results, grouping the KARs relevant for Appropriate Assessment according to their taxonomic family, and summarising the combined data in Table 6.19. It is important to note that the summarised data in Table 6.19 reflects the sum of individuals recorded within the proposed wind farm site and wider environment (i.e. within 2km from the proposed wind farm site, the areas covered by the surveys), the respective peak numbers, and the sum of the total duration of flight activity during the respective season.

The ornithological assessment presented herein is based on surveys undertaken between 2021 and 2024. As no targeted peatland rehabilitation measures have been implemented within the proposed wind farm site since completion of those surveys, and habitat change since that time

is expected to have been limited to gradual natural regeneration, the survey findings are considered broadly representative of the current (2026) receiving environment. Accordingly, it is considered unlikely that the extent and condition of habitats utilised by the assessed species have changed materially since completion of the surveys, and the baseline data remains valid for the purposes of this assessment.

As outlined in Section 6.2.1.1, while some gradual habitat change is anticipated to occur through ongoing natural regeneration prior to the commencement of the Construction Phase, currently anticipated in 2031, the rate of change is expected to remain relatively limited in the absence of targeted rehabilitation measures. In particular, moderate increases in scrub, wet willow-alder-ash woodland and grassland habitats are anticipated, together with a corresponding moderate reduction in open cutover bog habitats, while wetland habitats, bog woodland, raised bog, drainage features, hedgerows and treelines are expected to remain broadly consistent with the current baseline. These changes may influence habitat suitability and site utilisation for some bird species; however, they are not expected to materially alter the availability of habitats utilised by the Key Avian Receptors (KARs) recorded during the surveys. Accordingly, the survey data remain an appropriate basis for consideration of both the current receiving environment and the LFRE at the commencement of the Construction Phase, and no material change in habitat availability, site utilisation or ornithological conditions is anticipated that would alter the findings, conclusions or significance of effects identified in the impact assessment presented herein. As outlined in Table 6.15, while some gradual habitat change is anticipated prior to the commencement of the Construction Phase, these changes are not expected to materially alter the availability, distribution or functionality of habitats utilised by the KARs identified in this assessment. The survey results are therefore considered representative of the LFRE.

Table 6.15: Anticipated Habitat Change Prior to the Construction Phase LFRE (2031) and Implications for Key Avian Receptors

Habitat Type	Anticipated Trend to 2031	Relevant KARs	Potential Implications for KARs
PB4 Cutover Bog	Moderate decrease through ongoing natural succession	Whooper Swan, Mallard, Eurasian Wigeon, Eurasian Teal, Northern Shoveler, European Golden Plover, Northern Lapwing, Little Grebe	Remains the dominant habitat within the proposed wind farm site and wider receiving environment; no material reduction in habitat availability anticipated for species utilising cutover bog habitats.
GS4 Wet Grassland	Moderate increase	Northern Lapwing, Whooper Swan	Habitat availability maintained or enhanced for species frequently utilising wet grassland habitats, including Northern Lapwing.
WS1 Scrub	Moderate increase	Limited relevance to assessed KARs	Increased availability of scrub habitat; no significant implications for assessed KARs anticipated.
Wet Willow-Alder-Ash Woodland	Moderate increase	Limited relevance to assessed KARs	Local increase in woodland habitat availability. no significant implications for assessed KARs anticipated.
FL8 Other Artificial Lakes and Ponds	No material change	Whooper Swan, Mallard, Eurasian Wigeon, Eurasian Teal, Northern Shoveler, Little Grebe	Continued availability of aquatic habitats used by waterfowl and grebes.
Raised Bog	Generally stable	European Golden Plover	No material change in habitat availability anticipated.

Bog Woodland	Generally stable	Limited relevance to assessed KARs	No material change in habitat availability anticipated.
Drainage Features	Generally stable	Mallard, Eurasian Teal, Little Grebe, Northern Lapwing and other wetland-associated species	Continued availability of associated wetland habitat resources.

During the Operational Phase, following the implementation of rehabilitation measures and continued natural succession, more substantial habitat change is anticipated across the proposed wind farm site. Habitat development is expected to result in an increase in wetland, scrub, grassland and woodland habitat mosaics, together with a corresponding reduction in the extent of open cutaway habitats. While these longer-term habitat changes may influence habitat suitability and patterns of site utilisation for certain bird species, they are expected to occur progressively over the operational life of the proposed development and do not affect the interpretation of the survey data presented herein. Accordingly, the field survey results continue to provide the baseline against which potential effects on ornithological receptors are assessed. While more substantial habitat change is anticipated during the Operational Phase following the implementation of targeted rehabilitation measures and continued ecological succession, these longer-term changes do not affect the interpretation of the survey data presented herein and do not alter the findings, conclusions or significance of effects identified in the impact assessment.

6.2.1.4.1 Anatidae - Ducks, Geese, and Waterfowl

Over the seven seasons the field study was carried out, birds from the family Anatidae (i.e. Whooper Swan, Mallard, Eurasian Wigeon, Eurasian Teal, and Northern Shoveler - Table 6.19) were the most abundant at the proposed wind farm site, as well as in the wider environment. This dominance has been clearly evident during the non-breeding seasons (as most of the species within this family are migratory), with Whooper Swan being the most observed of these species at the proposed wind farm site, while Eurasian Wigeon and Whooper Swan were the two most observed within the wider environment, with relatively similar recorded abundances.

In terms of flight activity, Whooper Swan was the most observed, with a combined flight duration (observed from the VPs) over the three non-breeding seasons of approximately seven hours (Table 6.19).

During the breeding seasons this family, although not being the most common species recorded at the proposed wind farm site or the wider environment (in terms of total number of individuals), was still recorded in relatively high abundance. The species Mallard, and Eurasian Teal were recorded during the breeding season surveys. Northern Shoveler and Whooper Swan were also recorded during this period, these observations are considered to reflect migratory or transient movements rather than breeding activity within the proposed wind farm site. 'Confirmed' and 'Probable' breeding activity was only recorded only for Mallard (Table 6.16).

The results of the field study include five Anatidae that are listed as SCIs of the Lough Ree SPA.

Table 6.16: Anatidae Habitat Use and Breeding Activity Proposed Wind Farm Site ('Confirmed' and 'Probable') - Appendix K

Species	Breeding Activity	Recorded Habitat Use Onsite (% if recorded of individuals in each habitat)
Whooper Swan	-	FL8 – Other Artificial lakes and ponds (36%) PB4 – Cutover Bog (57%) GS4 – Wet Grassland (6%) WS1 – Scrub (1%)
Mallard	Confirmed – 1 record (Female with ducklings) Probable – 5 pairs	FL8 – Other Artificial lakes and ponds (4%) PB4 – Cutover Bog (96%)
Eurasian Wigeon	-	FL8 – Other Artificial lakes and ponds (57%) PB4 – Cutover Bog (43%)
Eurasian Teal	-	FL8 – Other Artificial lakes and ponds (2%) PB4 – Cutover Bog (98%)
Northern Shoveler	-	FL8 – Other Artificial lakes and ponds (80%) PB4 – Cutover Bog (20%)

6.2.1.4.2 Charadriidae - Plovers and Lapwings

The family Charadriidae, represented by Northern Lapwing, and European Golden Plover was also abundantly recorded at the proposed wind farm site over the study period. These two species have been observed in larger numbers during the non-breeding seasons, both onsite and within the wider environment, with European Golden Plover occurring onsite in significantly higher abundances, while Northern Lapwing was observed in significantly higher numbers in the wider environment (Table 6.18).

The records of European Golden Plover at the proposed wind farm site are consistent with the recorded flight activity, where flight activity of this species was greater than Northern Lapwing during the non-breeding seasons (Table 6.18). It is relevant to note that the records of European Golden Plover onsite, wider environment, or in flight over the breeding seasons were from either the months of March or September, reflective of birds in migration (Appendix K). The absence of records of breeding European Golden Plover Bird Atlas 2007-2011 dataset (Table 6.3) also supports this conclusion.

During the breeding seasons, Northern Lapwing was observed breeding at the proposed wind farm site as reflected by the numbers of 'Confirmed' and 'Probable' breeding occurrences recorded (Table 6.16).

Table 6.17: Charadriidae Habitat Use and Breeding Activity ('Confirmed' and 'Probable') Proposed Wind Farm Site - Appendix K

Species	Breeding Activity	Recorded Habitat Use Onsite (% if recorded of individuals in each habitat)
European Golden Plover	-	PB4 – Cutover Bog (100%)
Northern Lapwing	Confirmed – 87 individuals (Adults and fledglings); Probable – 144 individuals	PB4 – Cutover Bog (1%) GS4 – Wet Grassland (99%)

6.2.1.4.3 Podicipedidae – *Grebes*

Little Grebe is the only representative of the Family Podicipedidae for the present assessment. The species was regularly recorded within both the proposed wind farm site and the wider receiving environment and was therefore considered relevant to the assessment. The species was a regular presence at the proposed wind farm site during both breeding and non-breeding seasons, with particularly frequent records during the breeding seasons. A similar pattern was observable within the wider environment, where the number of individuals recorded during the breeding seasons was approximately double the number recorded during the non-breeding seasons (Table 6.17).

It was rarely recorded flying during the VP surveys, with only two records during the Breeding Season 2024. Little Grebe was recorded as a confirmed breeder within the proposed wind farm site (Table 6.17).

Table 6.18: Podicipedidae Habitat Use and Breeding Activity ('Confirmed' and 'Probable') Proposed Wind Farm Site - Appendix K

Species	Breeding Activity	Recorded Habitat Use Onsite (% if recorded of individuals in each habitat)
Little Grebe	Confirmed – 4 individuals Probable – 7 individuals	FL8 – Other Artificial lakes and ponds (7%) PB4 – Cutover Bog (93%)

Table 6.19: Summary of Field Study Observations of Relevant Species

Family	Species	Designation	Activity[24]	Season													
				Breeding 2021		Non-breeding 2021/22		Breeding 2022		Non-breeding 2022/23		Breeding 2023		Non-breeding 2023/24		Breeding 2024	
				Sum	Peak	Sum	Peak	Sum	Peak	Sum	Peak	Sum	Peak	Sum	Peak	Sum	Peak
Anatidae - Ducks, Geese, and Waterfowl	Whooper Swan	Amber List Annex I Lough Ree SPA	Site (ind)	-		-		-		1,313	180	-		646	128	3	3
			Wider Environ (ind)	-		53	32	1	1	2,141	253	9	7	2,144	209	-	-
			Flight (sec)	-		17,200s		-		1,360s		-		1,102s		-	
	Mallard	Amber List Lough Ree SPA	Site (ind)	21	4	-	-	113	23	192	42	141	15	156	16	171	15
			Wider Environ (ind)	398	44	130	16	399	135	596	44	324	31	659	88	267	12
			Flight (sec)	2,407		5,206		576		479		231		218		353	
	Eurasian Wigeon	Amber List Lough Ree SPA	Site (ind)	-		-		-		254	70	-		85	25	-	-
			Wider Environ (ind)	6	2	476	210	5	3	2,698	320	9	7	1,544	106	-	-
			Flight (sec)	17		3,983		-		24		-		19		-	
	Eurasian Teal	Amber List Lough Ree SPA	Site (ind)	-		-		29	18	32	17	14	6	51	15	77	18
			Wider Environ (ind)	7	6	173	48	73	22	579	150	52	15	582	60	14	6
			Flight (sec)	142		3,935		25		31		-		43		40	
	Northern Shoveler	Red List Lough Ree SPA	Site (ind)	-		-		-		58	28	4	4	8	6	-	
			Wider Environ (ind)	-		18	18	14	8	442	140	3	1	251	59	-	
			Flight (sec)	-		10		-		4		-		-		-	

[24] Site (ind) –total number of individuals recorded during the respective season; Wider Environ (ind) –total number of individuals recorded in surveys covering areas beyond the proposed wind farm site; Flight (sec) – total duration of flight activity recorded during VP surveys (irrespective of number of birds, number of observations, etc)

Family	Species	Designation	Activity[24]	Season													
				Breeding 2021		Non-breeding 2021/22		Breeding 2022		Non-breeding 2022/23		Breeding 2023		Non-breeding 2023/24		Breeding 2024	
				Sum	Peak	Sum	Peak	Sum	Peak	Sum	Peak	Sum	Peak	Sum	Peak	Sum	Peak
Charadriidae - Plovers and Lapwings	European Golden Plover	Red List Annex I Lough Ree SPA	Site (ind)	-	-	-	-	-	-	894	310	217	205	658	180	76	58
			Wider Environ (ind)	-	-	2	2	-	-	1,002	350	30	30	267	75	5	5
			Flight (sec)	-		2,659		395		1,740		1,360		4,692		-	
	Northern Lapwing	Red List Lough Ree SPA	Site (ind)	110	14	-	-	192	48	156	55	90	16	113	48	78	20
			Wider Environ (ind)	153	44	476	260	90	25	1,989	210	83	21	648	165	129	22
			Flight (sec)	1,654		2,124		204		1,058		450		348		795	
Podicipedidae – Grebes	Little Grebe	Lough Ree SPA	Site (ind)	-	-	-	-	34	7	14	5	28	4	23	3	38	4
			Wider Environ (ind)	50	12	21	12	70	14	25	5	55	7	56	15	71	6
			Flight (sec)	-		-		-		-		-		-		75	

6.2.1.5 Invasive Alien Species Plant Species

Multiple shrubs of Rhododendron (*Rhododendron ponticum*), an IAPS listed on the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477 of 2011, as amended), were recorded within a hedgerow (WL2) adjacent to the N63 (Figure 6.6), most likely planted in the past, as they are growing in a linear alignment. No suckers (i.e. smaller plant emerging from the roots of the parent plant) were present, which suggests that there is no current likelihood of this species spreading aggressively throughout the surrounding area.

6.2.2 Proposed Turbine Delivery Route

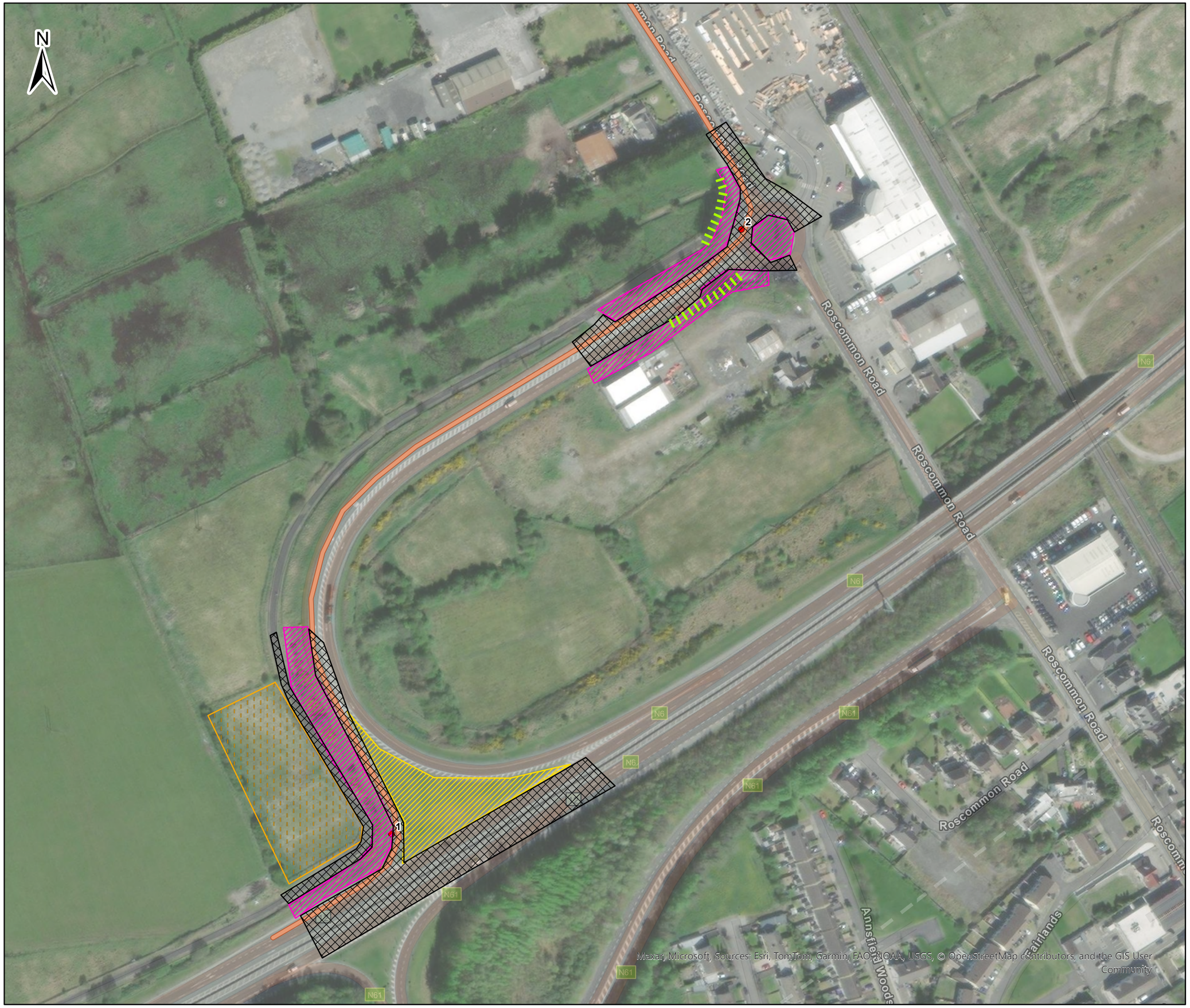
6.2.2.1 Habitat Survey

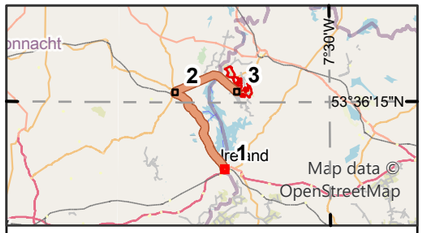
Turbine components will be delivered from either Galway Port or Foynes Port and transported to the wind farm site via a designated TDR. The location of POIs along the TDR where modifications/ upgrades are proposed, are shown in Figure 3.1. Out of the six POIs, the areas associated with the works for the proposed TDR, only one is located within the proposed wind farm site (POI 6 - Figure 3.1). The works for the other five POIs are located along roadways (and their vicinities), separated from the proposed wind farm site, over an extent of approximately 51km (Figure 6.7 and Figure 6.8).

As expected from vegetated habitats in the vicinity of built structures/surfaces, and/or within urban environments, the habitats affected by the proposed TDR works outside the proposed wind farm site showed signs of being highly managed and largely occupied by ruderal, graminoid species, without significant diversity. No primary evidence of the presence of designated animal species was found in these areas and their vicinities.

As for the habitats around POI 6, the proposed works for this POI are located near the margins of, otherwise, ecologically valuable habitats (PB4 and WN7). However, the limited extent of the works for the proposed TDR at POI 6 (total of approximately 0.28ha), along with the geographical setting (i.e. immediately adjacent to a roadway), limits their ecological relevance in the local context. With regards to the linear habitat within POI 6 - Hedgerows (WL1) – considering how infrequent this habitat type is in the local context, the high species diversity it avails for local designated species, and this habitat connectivity nature, it assumes an ecological role of higher importance.

Also of relevance is that none of the surface water bodies identified in Section 6.1.2.2 was observed during the multidisciplinary walkover survey of the proposed TDR POIs. The apparent absence of surface water features around these locations is indicative of local drainage management, which is likely to have culverted surface water bodies around these locations, as it is common in urban settings, which restricts connectivity with the surrounding environment.





Legend

- Proposed wind farm site
- Turbine Delivery Route POI
- Turbine Delivery Route

Habitats

- GS2 - Dry meadows and grassy verges
- GS2/WS1
- GS4/WS1
- BL3 - Buildings and artifical surfaces
- WL2 - Treelines

0 40 80
Meters

NOTES

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4. ALL LEVELS RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD

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Bord na Móna

Project:

Derryadd Wind Farm

Title:

Figure 6.7:
POIs for the Proposed TDR
and Associated Habitats
- Page 1 of 3 -

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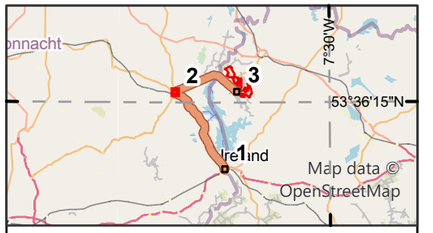
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Legend

- Proposed wind farm site
- Turbine Delivery Route POI
- Turbine Delivery Route

Habitats

- GS2 - Dry meadows and grassy verges
- GS2/BL3
- GS2/WS3
- WS3/GS2
- BL3 - Buildings and artifical surfaces

0 60 120
Meters

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Title: Figure 6.8: POIs for the Proposed TDR and Associated Habitats - Page 2 of 3 -

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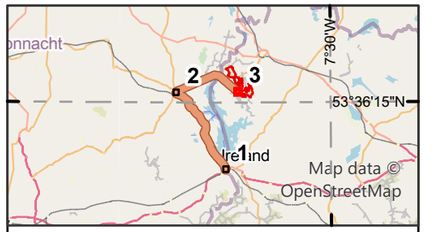
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Legend

- Proposed wind farm site
- Turbine Delivery Route POI
- Turbine Delivery Route

Habitats

- FW2 - Depositing/ lowaland rivers
- FW4 - Drainage ditches
- WL1 - Hedgerows
- BL3 - Buildings and artifical surfaces
- FL8 - Other artificial lakes and ponds
- FW4 - Drainage ditches
- PB1 - Raised bog
- PB4 - Cutover bog
- WD1 - (Mixed) broadleaved woodland
- WN7 - Bog woodland
- WS1 - Scrub

0 40 80
Meters

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Project: Derryadd Wind Farm

Title: Figure 6.9: POIs for the Proposed TDR and Associated Habitats - Page 3 of 3 -

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6.3 PRELIMINARY ASSESSMENT OF EUROPEAN SITES WITHIN 15KM FOR THE PROPOSED DEVELOPMENT

6.3.1 Proposed Wind Farm Site

To provide spatial context for the assessment, European sites surrounding the proposed wind farm site are mapped in Figure 6.9.

Table 6.19 addresses the proposed wind farm site connectivity with European sites, describing potential pathways (e.g. hydrological, hydrogeological, terrestrial/ecological) between the proposed wind farm site and these European sites as a first step for the appraisal for potential likely significant effects.

A preliminary assessment was undertaken of connectivity to European sites within 15km for the proposed wind farm site and the TDR. Of the nine European sites within a 15km buffer (seven SACs, and two SPAs) the proposed wind farm site is appraised to be connected with three European sites, either hydrologically and/or terrestrially/ecologically. European sites located at greater distances from the proposed development were also examined to assess potential connectivity. However, given the separation distance between the Application Site and the SPAs, together with the absence of any identified hydrological, ecological or functional connectivity that could establish a complete source-pathway-receptor relationship for SPA qualifying interests or other SPA-associated bird populations, it is reasonable to conclude that no pathway exists through which the proposed development could result in likely significant effects on these sites. For these remote sites, no complete source-pathway-receptor chain was identified, and therefore, they were not considered further in the impact assessment.

In contrast, the European sites potentially connected to the proposed development are:

- Lough Ree SAC [IE0000440]; and
- Lough Ree SPA [IE0004064];

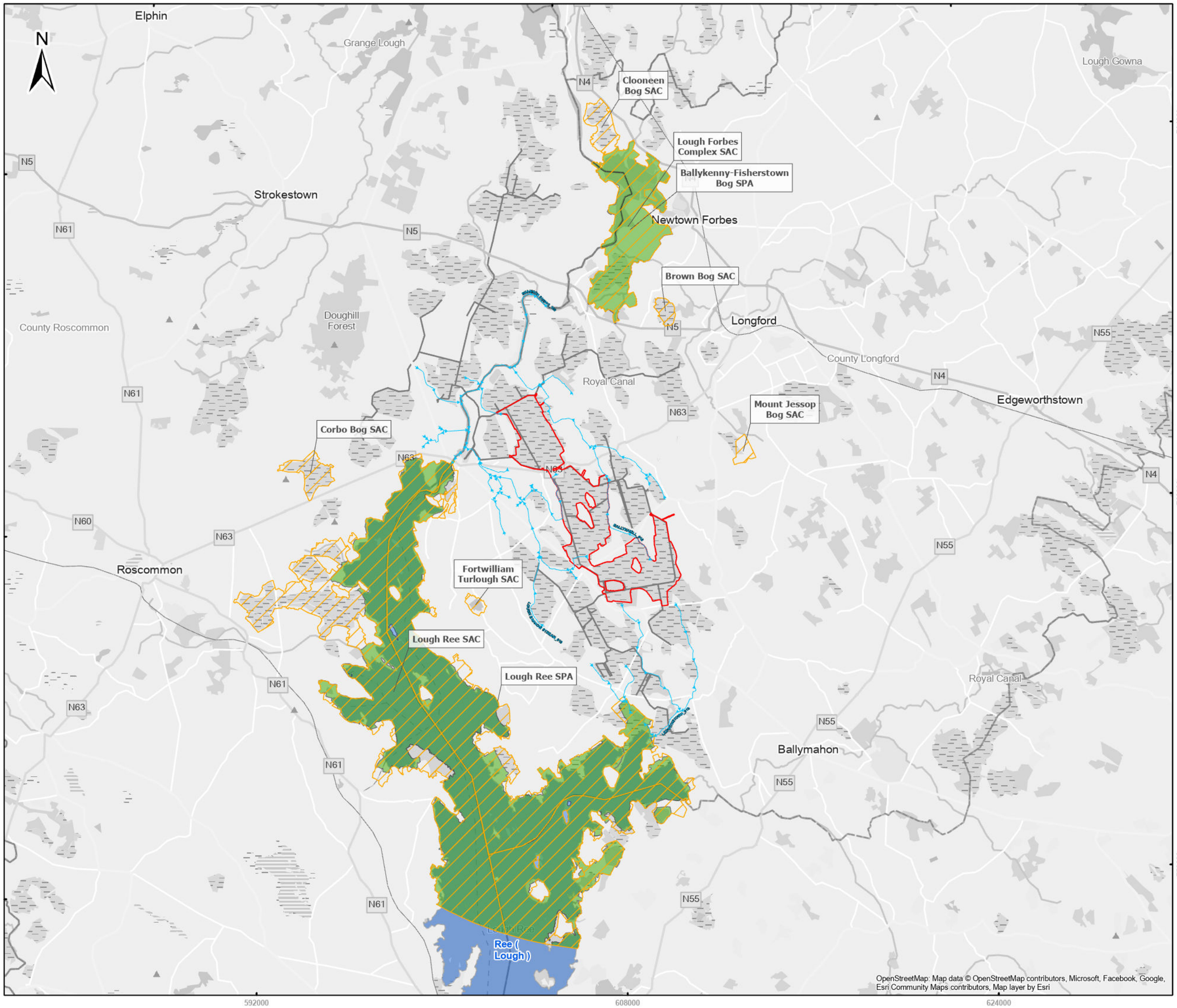
Potential effects to the above sites are comprehensively evaluated in Section 7.0. The evaluation comprises a detailed examination of all potential effects from the proposed development on the identified European sites to determine whether these effects could have a likely significant effect on the QIs and SCIs of the European sites.

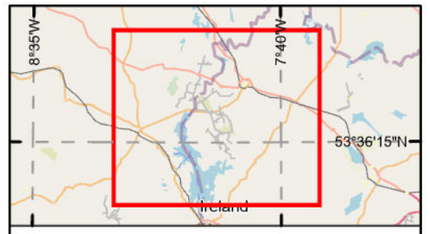
The assessment that considers both direct and indirect effects, including in-situ and ex-situ effects, and involves evaluating a range of potential pathways through which the development could affect the ecological features of the sites, such as habitat disturbance, waterborne pollution, noise, or disruption to species migration patterns.

In addition, in-combination effects, which result from the combined effects of the proposed development and other existing or planned plans or projects in the area on the European sites, are also considered to ensure that all relevant factors are accounted for.

The outcome of the screening process will determine if there is a likelihood of significant effects on the European sites. If significant effects are identified, the European sites are then brought forward to Stage 2: Appropriate Assessment (Section 8.0), which involves a more in-depth analysis of the effects and the development of mitigation measures to avoid, reduce, or compensate for any adverse effects.

By identifying and evaluating potential effects early in the process, the screening for appropriate assessment ensures that any necessary mitigation measures can be developed and implemented before the project proceeds, helping to protect the integrity of the European sites and ensure compliance with relevant environmental legislation.





Legend

- Proposed wind farm site
- Special Areas of Conservation (SACs)
- Special Protection Areas (SPAs)
- WFD - River Water bodies
- WFD - Lake Water bodies

0 2.5 5
Kilometres

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	24/09/2026	First issue	S.P	I.H

Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Figure 6-10: European sites in the wider area of the proposed wind farm site

Scale @ A3:	1:150,000	
Prepared by:	Checked by:	Date:
S.Pezzetta	I.Heanue	September 2026

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Map Ref: 11399-028-EU.S-WFD-TOB-A

Draft: A

Table 6.20: European Sites Within 15km of the Proposed Wind Farm

Site Name [Code]	Conservation Objectives; Statutory Instrument	Approximate Distance from Proposed Wind Farm	Qualifying Interests/Special Conservation Interests	Connectivity with Proposed Wind Farm
Lough Ree SAC [000440]	(NPWS, 2026a) ; S.I. No. 466 of 2023	2.3km	Otter *Lutra lutra* [1355]	**Yes**. The Lough Ree SAC is hydrologically connected with the proposed wind farm, through all the river water bodies listed in Table 6.5. Furthermore, the proposed wind farm site may hold favourable habitat for foraging, resting and breeding Otter [1355].
			Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* - type vegetation [3150]	
			Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) [6210]	
			Active raised bogs* [7110]	
			Degraded raised bogs still capable of natural regeneration [7120]	
			Alkaline fens [7230]	
			Limestone pavements* [8240]	
			Bog woodland* [91D0]	
			Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)*	
Lough Ree SPA [004064]	(NPWS, 2025a); S.I. No. 456 of 2012	2.4km	Little Grebe *Tachybaptus ruficollis* [A004]	**Yes.** Beyond being hydrologically connected with Lough Ree SPA (the SPA is located within the Ree WFD lake water body, into which the river water bodies listed in Table 6.5 ultimately drain), the proposed wind farm site supports habitats that are
			Whooper Swan *Cygnus cygnus* [A038]	
			Wigeon *Anas Penelope* [A050]	
			Teal *Anas crecca* [A052]	

Site Name [Code]	Conservation Objectives; Statutory Instrument	Approximate Distance from Proposed Wind Farm	Qualifying Interests/Special Conservation Interests	Connectivity with Proposed Wind Farm
			Mallard *Anas platyrhynchos* [A053]	utilised by a number of the SPA's SCI species. Survey data confirm that the site and wider receiving environment are used by certain SCI species for activities including foraging, feeding, commuting, roosting and, in some cases, breeding. Accordingly, the proposed wind farm site is considered to constitute functionally linked habitat for a subset of the SCI species associated with Lough Ree SPA, and has therefore been considered within the assessment of potential effects on those species.
			Shoveler *Anas clypeata* [A056]	
			Tufted Duck *Aythya fuligula* [A061]	
			Common Scoter *Melanitta nigra* [A065]	
			Goldeneye *Bucephala clangula* [A067]	
			Coot *Fulica atra* [A125]	
			Golden Plover *Pluvialis apricaria* [A140]	
			Lapwing *Vanellus vanellus* [A142]	
			Common Tern *Sterna hirundo* [A193]	
			Wetlands and Waterbirds [A999]	
Mount Jessop Bog SAC [002202]	NPWS, 2023a; S.I. No. 733 of 2022	3.4km	Degraded raised bogs still capable of natural regeneration [7120]	No. The Mount Jessop Bog SAC is located away from the proposed wind farm for both surface and groundwater flow. Moreover, the QI habitats are separated enough from the proposed wind farm site to preclude any terrestrial connectivity of relevant likelihood o and/or significance.
			Bog woodland* [91D0]	
Fortwilliam Turlough SAC [000448]	NPWS, 2018a; S.I. No. 505 of 2017	4.1km	Turloughs* [3180]	No. Although the Fortwilliam Turlough SAC is located within the Funshinagh WFD

Site Name [Code]	Conservation Objectives; Statutory Instrument	Approximate Distance from Proposed Wind Farm	Qualifying Interests/Special Conservation Interests	Connectivity with Proposed Wind Farm
				groundwater body, potentially hydrogeologically connected with the proposed wind farm, as demonstrated in the groundwater flow study described in Section 6.1.1.3.3.1, the groundwater levels at the proposed wind farm site are below the levels at the Fortwilliam Turlough SAC, which withdraws any potential groundwater flow from the proposed wind farm site towards the Fortwilliam Turlough SAC.
Ballykenny-Fisherstown Bog SPA [004101]	NPWS, 2025b	4.5km	Greenland White-fronted Goose *Anser albifrons flavirostris* [A395]	No. The Ballykenny-Fisherstown Bog SPA is located upstream of any potential hydrological and/or hydrogeological influence from the proposed wind farm. Furthermore, while Greenland White-fronted Goose (*Anser albifrons flavirostris*) has historically been associated with raised bog habitats during the non-breeding season (Norriss and Wilson, 1993), the cutaway peatland habitats present within and surrounding the proposed wind farm site do not represent key wintering habitat for this species. This is supported by the results of the ornithological field study, during which only a single flight record was recorded over seven survey seasons and no evidence of regular site utilisation was identified. Consistent with the screening

Site Name [Code]	Conservation Objectives; Statutory Instrument	Approximate Distance from Proposed Wind Farm	Qualifying Interests/Special Conservation Interests	Connectivity with Proposed Wind Farm
				rationale applied to other infrequently recorded species (see Table 6.14), the proposed wind farm site is not considered to support functionally important habitat for the SCI population of Ballykenny-Fisherstown Bog SPA. Accordingly, the proposed wind farm site is not considered to comprise functionally important habitat for the SCI population of Ballykenny-Fisherstown Bog SPA, and no ecological connectivity between the proposed wind farm site and this SCI is identified.
Lough Forbes Complex SAC [001818]	NPWS, 2016a; S.I. No. 452 of 2017	4.5km	Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition*-type vegetation [3150] Active raised bogs* [7110] Degraded raised bogs still capable of natural regeneration [7120] Depressions on peat substrates of the *Rhynchosporion* [7150] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)* [91E0]	No. The Lough Forbes Complex SAC is located away from any hydrological and/or hydrogeological influence from the proposed wind farm.

Site Name [Code]	Conservation Objectives; Statutory Instrument	Approximate Distance from Proposed Wind Farm	Qualifying Interests/Special Conservation Interests	Connectivity with Proposed Wind Farm
Brown Bog SAC [002346]	NPWS, 2016b; S.I. No. 288 of 2018	6.1km	Active raised bogs* [7110] Degraded raised bogs still capable of natural regeneration [7120] Depressions on peat substrates of the *Rhynchosporion* [7150]	No The SAC is located away from any potential hydrological and/or hydrogeological influence from the proposed wind farm, and at a sufficient distance to exclude terrestrial connectivity.
Corbo Bog SAC [002349]	NPWS, 2015a; S.I. No. 766 of 2021	7.3km	Active raised bogs* [7110] Degraded raised bogs still capable of natural regeneration [7120] Depressions on peat substrates of the *Rhynchosporion* [7150]	No The Corbo Bog SAC is located within the Clooneigh_SC_010 (26E_3) WFD Subcatchment, not connected with the proposed wind farm either hydrologically or hydrogeologically.
Clooneen Bog SAC [002348]	NPWS, 2024a; S.I. No. 562 of 2022	10.7km	Degraded raised bogs still capable of natural regeneration [7120] Depressions on peat substrates of the *Rhynchosporion* [7150] Bog woodland* [91D0]	No The Clooneen Bog SAC is located away from any potential hydrological and/or hydrogeological influence from the proposed wind farm, and at a sufficient distance to exclude terrestrial connectivity.

* *indicates a priority habitat under the Habitats Directive*

6.3.2 Proposed Turbine Delivery Route

There is a total of thirty European sites within a 15km buffer from the proposed TDR (i.e. 22 SAC; eight SPA - Figure 6.11), with Lough Ree SPA [004064] and SAC [000440] being the nearest, separated by approximately 350m and 366m, respectively (see Figure 6.11).

Table 6.21 assesses the connectivity between the TDR POIs and European sites, describing its potential pathways (e.g. hydrological, hydrogeological, terrestrial) as a first step for the appraisal for potential likely significant effects. Lough Ree SAC [000440] is the nearest European site from the proposed wind farm, separated by approximately 2.4km at its closest point.

The proposed TDR is appraised to be connected with QIs and/or SCIs of eight European sites. The sites are

- Lough Ree SPA [004064];
- Lough Ree SAC [000440];
- Middle Shannon Callows SPA [004096];
- River Shannon Callows SAC [000216];
- Fortwilliam Turlough SAC [000448];
- River Suck Callows SPA [004097];
- Lough Derg, North-east Shore SAC [002241]; and
- Lough Derg (Shannon) SPA [004058].

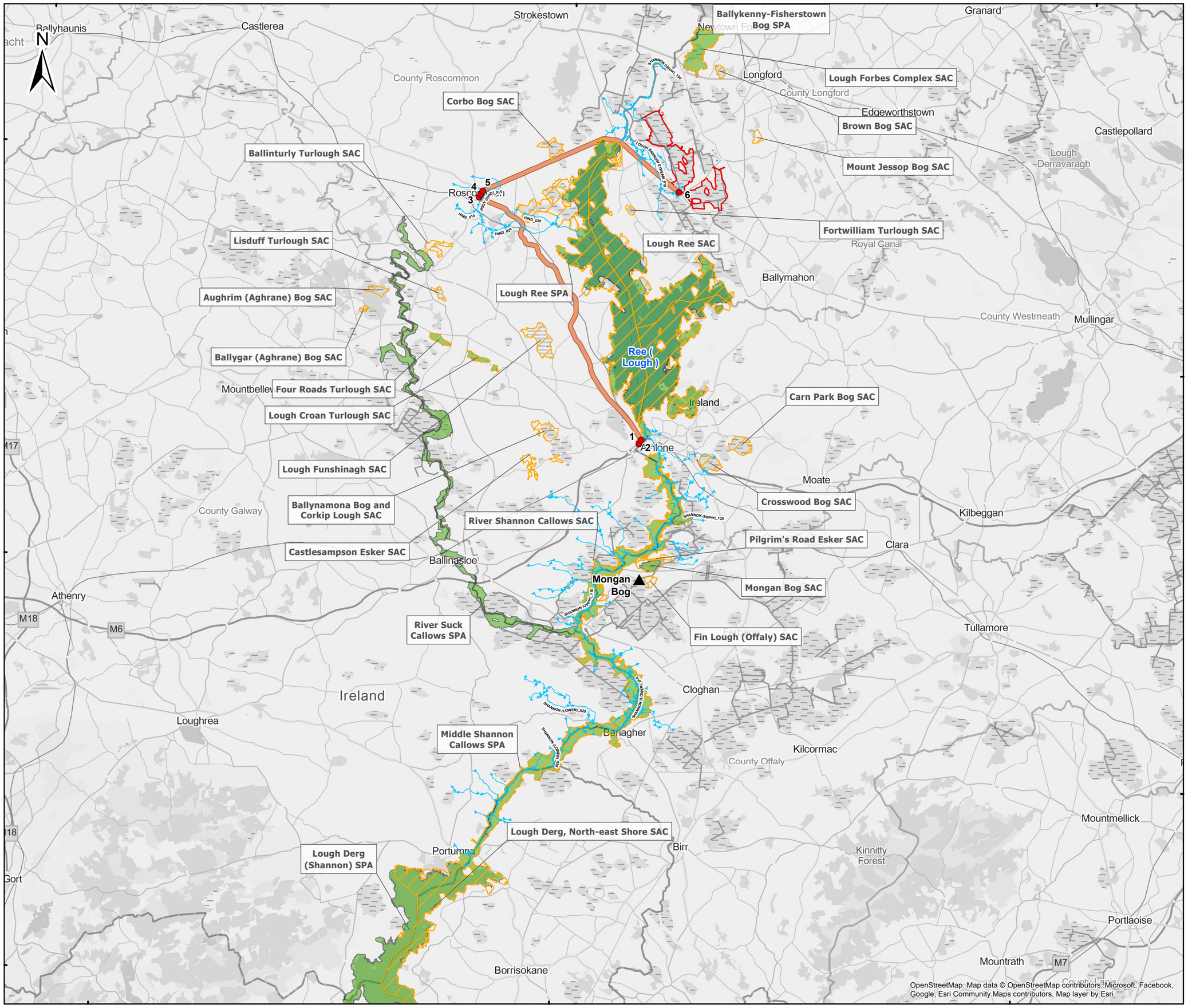
As outlined above for European sites connect to the proposed wind farm site, the eight European sites identified above as being connected to TDR POIs will be brought forward in the assessment process. A comprehensive assessment of potential effects on these European sites is provided in Section 7.0. This includes an evaluation of direct, indirect, in-situ, and ex-situ effects, as well as cumulative effects. The screening determines whether significant effects are likely. If so, the sites are brought forward to Stage 2: Appropriate Assessment (Section 8.0) for further detailed analysis and mitigation planning, ensuring the protection of site integrity.

8°46'20"W 8°3'10"W 7°20'0"W

53°40'25"N 53°20'8"N 52°59'51"N

748000 710000

552000 594000 636000





Legend

- Proposed wind farm site
- Turbine Delivery Route
- Turbine Delivery Route POI
- Ramsar Sites
- Special Areas of Conservation (SACs)
- Special Protection Areas (SPAs)
- WFD - River Water bodies

0 7.5 15
Kilometres

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A	06/05/2025	First issue	S.P	I.H
Rev	Date	Description	By	Chkd.

Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Figure 6.11: European Sites Surrounding the Proposed TDR

Scale @ A3: 1:320,000

Prepared by:	Checked by:	Date:
S.Pezzetta	I.Heanue	May 2025

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Map Ref: 11399-031-EU.S-TDR-TOB-A

Draft: A

Table 6.21: European Sites Within 15km of the TDR.

Site Name [Code]	Conservation Objectives; Statutory Instrument	Approximate Distance from Proposed Wind Farm	Qualifying Interests/Special Conservation Interests	Connectivity with TDR POIs
Lough Ree SPA [004064]	NPWS, 2025a; S.I. No. 456 of 2012	350m	See Table 6.19	No. The road works proposed to accommodate the transport of the turbines for the proposed development are not located in the vicinity of any surface water bodies to warrant hydrological connectivity.
Lough Ree SAC [000440]	NPWS, 2026; S.I. No. 466 of 2023	366m	See Table 6.19	No. The road works proposed to accommodate the transport of the turbines for the proposed development are not located in the vicinity of any surface water bodies to warrant hydrological connectivity.
Middle Shannon Callows SPA [004096]	NPWS, 2022a; S.I. No. 41 of 2012	1.40km	Whooper Swan *Cygnus cygnus* [A038]	No. The road works proposed to accommodate the transport of the turbines for the proposed development are not located in the vicinity of any surface water bodies to warrant hydrological connectivity.
			Wigeon *Anas penelope* [A050]	
			Corncrake *Crex crex* [A122]	
			Golden Plover *Pluvialis apricaria* [A140]	
			Lapwing *Vanellus vanellus* [A142]	
			Black-tailed Godwit *Limosa limosa* [A156]	
			Black-headed Gull *Chroicocephalus ridibundus* [A179]	

Site Name [Code]	Conservation Objectives; Statutory Instrument	Approximate Distance from Proposed Wind Farm	Qualifying Interests/Special Conservation Interests	Connectivity with TDR POIs
			Wetlands [A999]	
River Shannon Callows SAC [000216]	NPWS, 2022b; S.I. No. 473 of 2021	1.41km	Otter *Lutra lutra* [1355]	No. The road works proposed to accommodate the transport of the turbines for the proposed development are not located in the vicinity of any surface water bodies to warrant hydrological connectivity.
			Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410]	
			Lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*) [6510]	
			Alkaline fens [7230]	
			Limestone pavements* [8240]	
			Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)* [91E0]	
Fortwilliam Turlough SAC [000448]	NPWS, 2018a; S.I. No. 505 of 2017	4.25km	See Table 6.19	No. The road works proposed to accommodate the transport of the turbines for the proposed development are not located in the vicinity of any surface water bodies to warrant hydrological connectivity.

Site Name [Code]	Conservation Objectives; Statutory Instrument	Approximate Distance from Proposed Wind Farm	Qualifying Interests/Special Conservation Interests	Connectivity with TDR POIs
Ballinturly Turlough SAC [000588]	NPWS, 2018b; S.I. No. 529 of 2016	4.84km	Turloughs* [3180]	No. All the POIs for the proposed TDR are located downstream from the Ballinturly Turlough SAC with regards to either surface or groundwater flow. Furthermore, the road works proposed to accommodate the transport of the turbines for the proposed development are not located in the vicinity of any surface water bodies to warrant hydrological connectivity.
Crosswood Bog SAC [002337]	NPWS, 2016c; S.I. No. 767 of 2021	5.59km	Active raised bogs* [7110] Degraded raised bogs still capable of natural regeneration [7120]	No. Despite the Crosswood Bog SAC being located within the Inny WFD groundwater body, it is also located within a short distance to the upstream reaches of the Shannon (Upper)_120, downstream of the POIs for the proposed TDR, to which the Inny WFD groundwater body discharges to at this area[19]. Furthermore, the road works proposed to accommodate the transport of the turbines for the proposed development are not located in the vicinity of any surface water bodies to warrant hydrological connectivity.

Site Name [Code]	Conservation Objectives; Statutory Instrument	Approximate Distance from Proposed Wind Farm	Qualifying Interests/Special Conservation Interests	Connectivity with TDR POIs
Corbo Bog SAC [002349]	NPWS, 2015a; S.I. No. 766 of 2021	6.36km	See Table 6.19	No. While none of the POIs for the proposed TDR are hydrologically connected with the Corbo Bog SAC, this European site is located upstream from any potential hydrogeological influence from the proposed TDR (Section 6.1.2.2.3), and the road works proposed to accommodate the transport of the turbines for the proposed development are not located in the vicinity of any surface water bodies.
River Suck Callows SPA [004097]	NPWS, 2022c; S.I. No. 397 of 2012	6.94km	Whooper Swan *Cygnus cygnus* [A038]	No. The road works proposed to accommodate the transport of the turbines for the proposed development are not located in the vicinity of any surface water bodies to warrant hydrological connectivity.
			Wigeon *Anas Penelope* [A050]	
			Golden Plover *Pluvialis apricaria* [A140]	
			Lapwing *Vanellus vanellus* [A142]	
			Greenland White-fronted Goose *Anser albifrons flavirostris* [A395]	
			Wetlands [A999]	
Castlesampson Esker SAC [001625]	NPWS, 2021; S.I. No. 544 of 2018	7.17km	Turloughs* [3180]	No. The Castlesampson Esker SAC is located upstream from any potential hydrogeological influence from the

Site Name [Code]	Conservation Objectives; Statutory Instrument	Approximate Distance from Proposed Wind Farm	Qualifying Interests/Special Conservation Interests	Connectivity with TDR POIs
			Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) [6210]	proposed TDR (POIs 1 and 2 are the nearest, and there is no hydrological pathway between the two locations.
Ballynamona Bog and Corkip Lough SAC [002339]	NPWS, 2016d: S.I. No. 554 of 2021	7.45km	Turloughs* [3180] Active raised bogs* [7110] Degraded raised bogs still capable of natural regeneration [7120] Depressions on peat substrates of the *Rhynchosporion* [7150] Bog woodland* [91D0]	No. The Ballynamona Bog and Corkip Lough SAC is located upstream from any potential hydrogeological influence from the proposed TDR (POIs 1 and 2 are the nearest, and there is no hydrological pathway between the two locations.
Carn Park Bog SAC [002336]	NPWS, 2015b; S.I. No. 648 of 2016	7.96km	Active raised bogs* [7110] Degraded raised bogs still capable of natural regeneration [7120]	No. The Carn Park Bog SAC is located upstream from any potential hydrogeological influence from the proposed TDR (POIs 1 and 2 are the nearest, and there is no hydrological pathway between the two locations.
Mount Jessop Bog SAC [002202]	NPWS, 2023a; S.I. No. 733 of 2022	8.07km	See Table 6.19	No. The Mount Jessop Bog SAC is located within the Longford Ballinalee WFD groundwater body, i.e. not hydrological nor hydrogeologically connected with any of the POIs for the proposed TDR.

Site Name [Code]	Conservation Objectives; Statutory Instrument	Approximate Distance from Proposed Wind Farm	Qualifying Interests/Special Conservation Interests	Connectivity with TDR POIs
Lisduff Turlough SAC [000609]	NPWS, 2018c;S.I. No. 267 of 2016	8.88km	Turloughs* [3180]	No. The Lisduff Turlough SAC is located within the Suck South WFD groundwater body (IE_SH_G_225), i.e. not hydrological nor hydrogeologically connected with any of the POIs for the proposed TDR.
Pilgrim's Road Esker SAC [001776]	NPWS, 2018d;	10.30km	Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) [6210]	No. While the Pilgrim's Road Esker SAC is located approximately 200m from the Shannon (Upper)_120 WFD river water body (part of the hydrological pathway from the proposed TDR – Section 6.1.2.2.1), its QI 6210 is not associated with any hydrological attributes.
Mongan Bog SAC [000580]	Version 1 (NPWS, 2016e); S.I. No. 448 of 2017	10.56km	Active raised bogs* [7110] Degraded raised bogs still capable of natural regeneration [7120] Depressions on peat substrates of the *Rhynchosporion* [7150]	No. The Mongan Bog SAC is located upstream from any potential hydrological and/or hydrogeological influence from the proposed TDR (POIs 1 and 2 are the nearest.

Site Name [Code]	Conservation Objectives; Statutory Instrument	Approximate Distance from Proposed Wind Farm	Qualifying Interests/Special Conservation Interests	Connectivity with TDR POIs
Ballykenny-Fisherstown Bog SPA [004101]	First Order Site-specific Conservation Objectives Version 1.0 (NPWS, 2025b)	10.62km	See Table 6.19	No. The Ballykenny-Fisherstown Bog SPA is located upstream from any potential hydrological and/or hydrogeological influence from the proposed TDR (POI 6 is the nearest. Furthermore, none of the POIs for the proposed TDR hold favoured habitat for the European site's SCI, Greenland White-fronted Goose (*Anser albifrons flavirostris*). Similarly, the habitats present within the affected POIs are not considered to be of functional importance to other waterbird or wetland bird species occurring within the wider receiving environment. Consequently, no pathway exists by which the proposed TDR could give rise to significant effects on the SCI of the SPA or on habitats supporting other bird species associated with the wider area.
Lough Forbes Complex SAC [001818]	Version 1 (NPWS, 2016a); S.I. No. 452 of 2017	10.65km	See Table 6.19	No. The Lough Forbes Complex SAC is located upstream from any potential hydrological and/or hydrogeological influence from the proposed TDR (POI 6 is the nearest.

Site Name [Code]	Conservation Objectives; Statutory Instrument	Approximate Distance from Proposed Wind Farm	Qualifying Interests/Special Conservation Interests	Connectivity with TDR POIs
Mongan Bog SPA [004017]	First Order Site- specific Conservation Objectives Version 1.0 (NPWS, 2025c)	10.65km	Greenland White-fronted Goose *Anser albifrons flavirostris* [A395]	No. The Mongan Bog SPA is located upstream from any potential hydrological and/or hydrogeological influence from the proposed TDR (POIs 1 and 2 are the nearest. Furthermore, none of the POIs for the proposed TDR hold favoured habitat for the European site's SCI.
Lough Funshinagh SAC [000611]	Version 1 (NPWS, 2018e); S.I. No. 211 of 2019	10.95km	Turloughs* [3180] Rivers with muddy banks with *Chenopodion rubri* p.p. and *Bidention* p.p. vegetation [3270]	No. The Lough Funshinagh SAC is located upstream from any potential hydrological and/or hydrogeological influence from the proposed TDR.
Brown Bog SAC [002346]	Version 1 (NPWS, 2016b); S.I. No. 288 of 2018	11.05km	See Table 6.19	No. The Brown Bog SAC is located within the Newtown Forbes WFD groundwater body (IE_SH_G_192), not hydrological and/or hydrogeologically connected with the proposed TDR.
Aughrim (Aghrane) Bog SAC [002200]	First Order Site-specific Conservation Objectives Version 1.0 (NPWS, 2023b); S.I. No. 731 of 2022	11.75km	Degraded raised bogs still capable of natural regeneration [7120]	No. The Aughrim (Aghrane) Bog SAC is located within the Suck South WFD groundwater body (IE_SH_G_225), not hydrological and/or hydrogeologically connected with the proposed TDR.

Site Name [Code]	Conservation Objectives; Statutory Instrument	Approximate Distance from Proposed Wind Farm	Qualifying Interests/Special Conservation Interests	Connectivity with TDR POIs
Fin Lough (Offaly) SAC [000576]	Version 1 (NPWS, 2019a); S.I. No. 223 of 2017	12.02km	Geyer's Whorl Snail *Vertigo geyeri* [1013] Alkaline fens [7230]	No. The Fin Lough (Offaly) SAC is located within the GWDTE-Fin Lough Fen (SAC000571) WFD groundwater body (IE_SH_G_060), not hydrological and/or hydrogeologically connected with the proposed TDR. Also, the proposed TDR is separated from the Fin Lough (Offaly) SAC by a distance that would devoid any potential ecological/terrestrial link connectivity (for the mobile QI 1013) of likelihood.
Four Roads Turlough SPA [004140]	First Order Site-specific Conservation Objectives Version 1.0 (NPWS, 2025d); S.I. No. 589 of 2011	13.00km	Golden Plover *Pluvialis apricaria* [A140] Greenland White-fronted Goose *Anser albifrons flavirostris* [A395]	No. The Four Roads Turlough SPA is located within the GWDTE-Fin Lough Fen (SAC000571) WFD groundwater body (IE_SH_G_060), not hydrological and/or hydrogeologically connected with the proposed TDR. Furthermore, none of the POIs for the proposed TDR hold favoured habitat for the European site's SCI.
Four Roads Turlough SAC [001637]	Version 1 (NPWS, 2018f); S.I. No. 451 of 2017	13.00km	Turloughs* [3180]	No. The Four Roads Turlough SAC is located within the Suck South WFD groundwater body, not hydrogeologically connected with the proposed TDR.

Site Name [Code]	Conservation Objectives; Statutory Instrument	Approximate Distance from Proposed Wind Farm	Qualifying Interests/Special Conservation Interests	Connectivity with TDR POIs
Lough Croan Turlough SAC [000610]	Version 1 (NPWS, 2018g);	14.01km	Turloughs* [3180]	No. The Lough Croan Turlough SAC is located within the Suck South WFD groundwater body, not hydrogeologically connected with the proposed TDR.
Lough Croan Turlough SPA [004139]	First Order Site-specific Conservation Objectives Version 1.0 (NPWS, 2025e); S.I. No. 292 of 2011	14.01km	Shoveler *Anas clypeata* [A056] Golden Plover *Pluvialis apricaria* [A140] Greenland White-fronted Goose *Anser albifrons flavirostris* [A395] Wetland and Waterbirds [A999]	No. The Lough Croan Turlough SPA is located within the Suck South WFD groundwater body, not hydrogeologically connected with the proposed TDR. Furthermore, none of the POIs for the proposed TDR hold favoured habitat for the SPA's SCIs.
Ballygar (Aghrane) Bog SAC [002199]	Version 1 (NPWS, 2023b); S.I. No. 730 of 2022	14.18km	Active raised bogs* [7110] Degraded raised bogs still capable of natural regeneration [7120]	No. The Ballygar (Aghrane) Bog SAC is located within the Ballygar WFD groundwater body (IE_SH_G_028), not hydrogeologically connected with the proposed TDR.
Lough Derg, North-east Shore SAC [002241]	Version 1 (NPWS, 2019b); S.I. No. 74 of 2018	40.61km	*Juniperus communis* formations on heaths or calcareous grasslands [5130] Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae** [7210] Alkaline fens [7230]	No. The road works proposed to accommodate the transport of the turbines for the proposed development are not located in the vicinity of any surface water bodies to warrant hydrological connectivity.

Site Name [Code]	Conservation Objectives; Statutory Instrument	Approximate Distance from Proposed Wind Farm	Qualifying Interests/Special Conservation Interests	Connectivity with TDR POIs
			Limestone pavements* [8240]	
			Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)* [91E0]	
			Taxus baccata woods of the British Isles* [91J0]	
Lough Derg (Shannon) SPA [004058]	First Order Site-specific Conservation Objectives Version 1.0 (NPWS, 2024b); S.I. No. 331 of 2019	40.84km	Cormorant *Phalacrocorax carbo* [A017]	No. The road works proposed to accommodate the transport of the turbines for the proposed development are not located in the vicinity of any surface water bodies to warrant hydrological connectivity.
			Tufted Duck *Aythya fuligula* [A061]	
			Goldeneye *Bucephala clangula* [A067]	
			Common Tern *Sterna hirundo* [A193]	
			Wetland and Waterbirds [A999]	

* *indicates a priority habitat under the Habitats Directive*

7.0 STAGE 1: SCREENING FOR APPROPRIATE ASSESSEMENT

7.1 MANAGEMENT OF EUROPEAN SITES

Screening for Appropriate Assessment is not required where a proposed development is connected with, or necessary for the management of any European site.

The proposed development is not directly connected with, or necessary to the management of any European site(s), consequently a Screening for Appropriate Assessment is required.

7.2 ASSESSMENT OF SOURCE-PATHWAY-RECEPTOR MODEL

As described in Section 5.3, this AASR-NIS adopts a combined assessment approach to evaluate the potential for significant effects on European sites. The SPR model is used to assess potential effects on QI habitats and species of SACs, while the Percival (2003) methodology is applied to assess effects on SCI bird species of SPAs. The use of both methods is considered appropriate and necessary given the varying nature and sources of potential effects across the construction, operation, and decommissioning phases of the proposed development. This tailored approach ensures a thorough and ecologically robust assessment of all relevant effects proposed development.

7.2.1 Scoping of Effects on European Sites

7.2.1.1 Proposed Wind Farm

7.2.1.1.1 Construction Phase

7.2.1.1.1.1 Siltation Effects

The construction phase of the proposed development will include the construction of drainage which might appear capable of generating a higher sediment release than the drainage system settling capacity (Appendix F, and Section 6.1.1.3.5). However, the efficiency of this water management network that is operational at the proposed wind farm site (e.g. drains, water pumps, settlement ponds, regular monitoring and maintenance – Section 6.1.1.3.5), which has been designed by Bord na Móna and EPA to be able to accommodate the settlement of sediment generated by peat extraction activities throughout the whole site, is demonstrable by the fact that no exceedances to the SS limit have been reported over 12 years.

Runoff generated during the Construction Phase will be managed through a combination of temporary construction settlement ponds, silt control measures and the existing settlement pond network already present within the site drainage system. Having regard to the scale of the proposed earthworks, the extensive existing drainage infrastructure and the available settlement capacity, sediment mobilised during construction activities is expected to be effectively retained within the site drainage system. Accordingly, any residual discharge of suspended solids to downstream watercourses is expected to be limited and is not predicted to result in significant increases in suspended solids concentrations or significant effects on downstream aquatic receptors. Accordingly, potential siltation reaching river water bodies connected by the hydrological pathway from the proposed wind farm is not expected to result in significant effects.

7.2.1.1.1.2 Contamination Effects

During the construction phase of the proposed development, there are multiple activities—outlined in Chapter 3 (Description of Proposed Development) that present a risk of contaminant release to nearby water bodies. These include:

- Refuelling at the Construction Compounds;
- Storage of contaminants at the Construction Compounds (e.g. hydrocarbons);
- Refuelling with mobile bowser;
- Machinery and vehicle movement;
- Use of bentonite in drilling or trenchless installation activities; and
- Concrete washout and handling during turbine base construction and civil works.

The use of mobile bowsers and onsite fuel storage poses a risk of hydrocarbon spills at unconfined or sensitive locations, potentially leading to contamination of surface water features. Likewise, improper handling or containment of bentonite slurry, a common lubricant and support fluid in drilling operations, can result in suspended solids entering nearby streams or wetlands, increasing turbidity and reducing oxygen levels, which may impair aquatic life.

Additionally, if concrete washout is not managed in a designated, lined area, alkaline runoff rich in lime and other caustic substances may leach into the surrounding soils or watercourses. Such discharges can significantly elevate pH levels, causing chemical burns to aquatic organisms, disrupting microbial communities, and degrading water quality.

These contaminants, particularly hydrocarbons, bentonite fines, and alkaline concrete washout, can have acute and chronic effects on aquatic species. Hydrocarbons are known to be bioavailable and can bioaccumulate in organisms (Sekhar et al., 2003; Li et al., 2009), while their persistence in sediments can prolong exposure (McGrath et al., 2019; Wu et al., 2019). Without adequate mitigation, such pollutants may alter the ecological integrity of receiving waters.

Therefore, likely significant contamination effects on the European sites hydrologically connected to the project area could occur during the construction phase, particularly through the transport of pollutants into adjacent water bodies, posing a risk to sensitive aquatic habitats and species.

7.2.1.1.1.3 Water Levels Effects

The design mapping included in Appendix F proposes two types of culverts to be built during the Construction Phase of the proposed development:

- 600 mm interceptor drainage culvert pipe – approximately 61 structures; and
- 1200 mm culvert pipe – approximately 40 structures.

Culverts can fragment populations by acting as barriers to the movement of organisms, breaking the continuity a river or stream provides (i.e. the *River Continuum Concept* - Vannote *et al.*, 1980). Box culverts, in particular pipe culverts as the ones proposed (Appendix F), are considered to be the type of watercourse crossing that mostly prompts this barrier effect, causing deviations from natural flow conditions, which affect not only fish communities, but also various other organisms (Clarke *et al.*, 1999; Peay, 2002; Kemp *et al.*, 2008; Cocchiglia *et al.*, 2012; Anderson *et al.*, 2014; Brunen *et al.*, 2020; Riley *et al.*, 2020; Kelly-Quinn *et al.*, 2022). This type of culvert usually fills rapidly after rainfall, leading to pooling and deposition in its upstream

entrance, while increasing flow velocity and erosion downstream (NRA, 2006), being its use not recommended unless under exceptional circumstances (Clarke *et al.*, 1999; NRA, 2006; IFI, 2016; Kelly-Quinn *et al.*, 2022), even within urban environments (IFI, 2020). As per Appendix F, both types of culverts proposed for the proposed development are of box/pipe type (Table 6.6).

In terms of hydromorphological effects to the aquatic ecology, the construction of culverts within the proposed wind farm site will likely have limited significance. The drainage network is formed by artificial channels, with rare bank vegetation cover (Section 6.2.1.2), likely used opportunistically by mammals, amphibians and insects. It is highly unlikely these channels hold sustainable fish communities, and the macroinvertebrate assemblages are likely to be dominated by tolerant/opportunistic taxa. Therefore, it is unlikely the Construction Phase of the proposed development will produce hydromorphological significant effects on European sites hydrologically connected.

7.2.1.1.1.4 Disturbance Effects

During the construction phase of the proposed development, Otter, a QI of Lough Ree SAC, could be disturbed by the machinery, and movement of vehicles at the proposed wind farm site during this period. Although disturbance seems to affect Otter during the reproduction period, its distribution and foraging appear to be unconstrained by anthropogenic presence and activity, even in urban locations (Tolrà *et al.*, 2024). However, despite the low Otter activity recorded at the proposed wind farm site (Section 6.2.1.3.1.1), the movement of vehicles during its Construction Phase may disturb some individuals (outside Lough Ree SAC) and affect this mobile QI distribution.

With regards to SCIs (i.e. birds) of the European sites connected with the proposed wind farm site the minimum distance at which humans should be separated from wildlife to avoid disturbance/displacement effects is defined as 'Minimum Approach Distance' (MAD), and is the distance metric used in herein to assess disturbance effects on SCIs[25]. Goodship and Furness (2022), BES (2020), and Ruddock and Whitfield (2007), published important reviews to establish indicative MAD for some bird species in each season (Table 7.1), which form the basis for the delineation of two protective buffers in this assessment of disturbance effects outside the Lough Ree SPA:

1) A buffer from the areas associated with the construction works – represents the unusable areas/habitats for each relevant species, during each season due to disturbance; and
2) A buffer from the relevant observations of each species – represents the location and range of habitats whose use will be interrupted by the construction phase of the proposed development.

The extents of buffers 1) and 2) are defined by a scoping process. The scoping process consisted, in a first instance, on the selection of important locations for SCIs based on the findings of the field study, including: a) locations where 'Confirmed' breeding behaviour was identified; b)

[25] There are other distance metrics used in scientific literature to assess disturbance: 'Flight Initiation Distance' (FID) – distance at which a bird moves away from a source of human disturbance; 'Alert Distance' (AD) - the distance at which a bird or group of birds starts to show alert behaviour; 'Flight Initiation Distance' (FID) - the distance at which a bird or group of birds starts to escape (Goodship and Furness, 2022)

locations used during the non-breeding season. For the purpose of defining these assessment buffers, all individuals of species listed as SCIs of the Lough Ree SPA recorded within the wind farm site were assumed to be functionally linked to the SPA unless evidence was available to indicate otherwise. This precautionary assumption was applied to ensure that potentially relevant impact pathways were fully considered within the assessment and should not be interpreted as confirmation that the wind farm site constitutes an ecologically important area for SPA SCI populations. Rather, the ecological importance of the site and the degree of functional connectivity for individual SCI populations are evaluated subsequently within the NIS based on the available survey evidence and species-specific ecological characteristics. This approach reflects best practice guidance and recognises the difficulty in conclusively determining the origin of individual birds, particularly for mobile waterbird species.

While it is acknowledged that not all birds recorded within the site necessarily form part of the Lough Ree SPA population—for example, Mallard (*Anas platyrhynchos*) is a widespread and resident species—it is not always possible to distinguish local or migratory individuals without tagging or other detailed tracking data. As such, and particularly for SCI species with high mobility and broader foraging ranges, potential connectivity is assumed in the absence of site-specific exclusion evidence.

This conservative approach ensures that the ecological importance of the site is not underestimated and that potential impacts on the SPA population are adequately considered in line with the requirements of Article 6 of the Habitats Directive.Following these considerations, because the MAD for Northern Lapwing has not been included, the MAD value suggested for European Golden Plover (species considered as presenting similar traits) will be used.

The scoping process resulted in three SCIs during the breeding season, and eight SCIs during the non-breeding season, being scoped-in for the appraisal of possible disturbance/displacement effects outside the respective SPA, during the duration of the construction phase of the proposed development (24-30 months) - Table 7.1.

Finally, the intersection of buffer 1) and buffer 2) represents the areas that are currently used by the relevant bird species (listed in Table 7.1), which could be affected by the construction phase of the proposed development by means of disturbance/displacement, during the breeding and non-breeding seasons (Figure 7.1).

Nevertheless, it is important to note that due consideration must be employed on the interpretation of MAD and the delineation of protection buffers. MAD can sometimes be circumstantial, where one species can displays a MAD of a few metres in one context, and of over 100 m in a different setting (Goodship and Furness, 2022).

Table 7.1: Indicative MAD for Scoped SCIs

Species	Breeding Season indicative MAD*	Non-breeding Season indicative MAD	Source
Whooper Swan	-	600m	Goodship and Furness (2022)
Mallard	100m	100m	Goodship and Furness (2022)
Eurasian Wigeon	-	500m	Goodship and Furness (2022)
Eurasian Teal	-	500m	BES (2020)
Northern Shoveler	-	200m	Goodship and Furness (2022)
European Golden Plover	-	500m	Goodship and Furness (2022)

Species	Breeding Season indicative MAD*	Non-breeding Season indicative MAD	Source
Northern Lapwing	500m	500m	Goodship and Furness (2022)
Little Grebe	200m	200m	BES (2020)

*Tufted Duck [A061], Common Scoter [A065], Common Goldeneye [A067], Common Tern [A193] and Eurasian Coot [A125], despite being SCIs of the Lough Ree SAC, are excluded from further appraisal in Section 6.2.1.4.

As outlined in Section 6.2.1.1, the assessment of disturbance and displacement effects has also considered the LFRE at the commencement of the Construction Phase. While some habitat change is anticipated to occur through ongoing natural regeneration prior to construction, these changes are not expected to materially reduce the availability of alternative habitats within the wider 5 km receiving environment. Consequently, the habitat availability assessment remains considered representative of the Construction Phase LFRE and suitable for determining the magnitude of potential displacement effects.

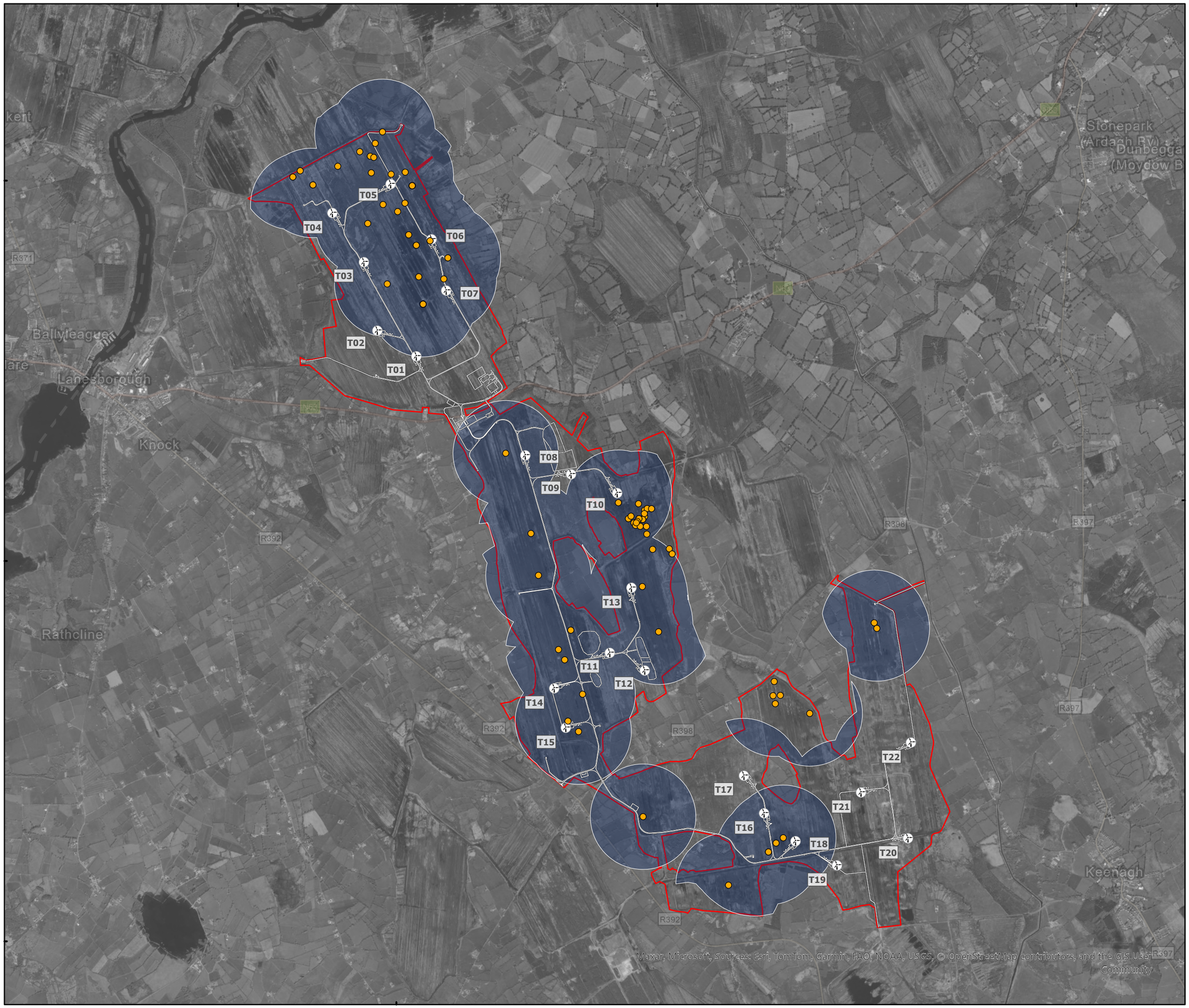
For the determination of the *Magnitude* of the disturbance/displacement effect on these species it is important to take in consideration that, if displacement occurs in an area where there is abundant alternative habitat to easily accommodate the disturbed/displaced birds, the effect may actually be inconsequential (Percival, 2003). It is therefore necessary to determine whether habitats of a similar nature and extent to those potentially affected by disturbance/displacement are available within the wider receiving environment.

To inform this assessment, the extent of each habitat within the areas formed by the intersection of buffer 1) and buffer 2), for each of the Breeding and Non-breeding Seasons, was calculated (based on the results of the habitat surveys – Section 6.2.1.1), and their incidence within 5km from the proposed wind farm site boundary was calculated (as suggested by Percival, 2003). This process provides numerical extents from which the individual Magnitude is estimated for each habitat type, for the breeding (Table 7.2) and non-breeding seasons (Table 7.3).

However, appropriate consideration has been given to the evolving nature of habitats within the proposed wind farm site. While some changes in habitat extent and condition are anticipated over time, these are expected to arise primarily through ongoing natural regeneration following the cessation of industrial peat extraction in 2019. As outlined in Section 6.2.1.1, no targeted rehabilitation measures are anticipated to have been implemented prior to the commencement of the Construction Phase, currently anticipated in 2031. Consequently, while gradual changes in habitat composition are expected to occur, these changes are not anticipated to materially alter the availability, distribution or functionality of habitats utilised by the assessed species, and the habitat availability assessment remains representative of the Construction Phase LFRE. The basis for this assumption and the anticipated timeline for the Construction Phase LFRE are provided in Section 6.2.1.1. The basis of this assumption and the associated LFRE timeline are set out in Section 6.2.1.1. Furthermore, habitats within the wider receiving environment are assumed to remain broadly consistent in extent and ecological function over the same period, and no material changes are anticipated that would alter the conclusions of the habitat availability assessment. Rehabilitation measures and their influence on future habitat development are considered in Section 7.2.1.1.2.Furthermore, habitats within the wider receiving environment are assumed to remain broadly consistent in extent,

composition and ecological function over the period considered by the Construction Phase LFRE. While localised changes associated with natural ecological processes may occur, no material changes are anticipated that would alter the conclusions of the habitat availability assessment.

7°58'0"W
7°53'40"W
7°49'20"W
53°41'40"N
53°39'20"N
53°37'0"N
772000
767500
763000
600000
606000
612000





Legend

- Proposed wind farm site boundary
- Turbine Layout
- Site Layout
- Non-flight locations of Whooper Swan
- Intersection of Buffer 1) and Buffer 2)

0 1 2
Kilometres

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	06/05/2025	First issue	S.P	I.H

Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Figure 7.1 Example of the Assessment of Disturbance/ Displacement Effects (Whooper Swan)

Scale @ A3: 1:40,000

Prepared by:	Checked by:	Date:
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Map Ref: 11399-122-DIS..WS-P.APP.BO-TOB-A

Draft: A

Following the methodology described in Section 5.6.3, the *Significance* of the effect of disturbance/displacement is calculated from the species *Sensitivity* (Table 5.1) and the combined *Magnitude* (Table 5.2). Taking into account the individual Magnitude for each habitat within the intersection of buffers 1) and 2), the necessary weighting is applied to estimate a qualitative combined Magnitude. This incorporates each species' favoured habitats to effectively assess disturbance effects from the construction phase of the proposed development, considering the local context (using the Corine 2018 dataset). This qualitative combined Magnitude serves as the basis for assessing effects due to displacement or disturbance during the construction phase of the proposed development (Table 7.2 and Table 7.3). It should be noted that Mallard is not included in Table 7.2 for the Breeding Season due to the fact that buffer 1) and buffer 2) did not intersect for this SCI for this season, i.e. the records for Mallard during the Breeding Seasons were located beyond the disturbance distance estimated for the construction phase of the proposed development.

The habitat availability assessment presented in Tables 7.2 and 7.3 is based on habitat extents recorded during the baseline surveys. As outlined in Section 6.2.1.1 and summarised in Table 6.15, while some habitat change is anticipated prior to the commencement of the Construction Phase in 2031, these changes are not expected to materially alter the availability, distribution or functionality of habitats utilised by the assessed KARs within the wider receiving environment. Although a moderate reduction in cutover bog habitat is anticipated through ongoing natural regeneration, this habitat is expected to remain widespread both within the proposed wind farm site and throughout the wider 5 km receiving environment. Accordingly, the habitat availability assessment is considered representative of the Construction Phase LFRE and remains suitable for determining the magnitude of potential disturbance and displacement effects.

Habitat types contributing a negligible magnitude and not materially influencing the overall displacement assessment have been omitted from the summary tables for clarity but were considered in the assessment.

Table 7.2: Magnitude estimate for Displacement/Disturbance Effects during the Breeding Season and Consequent Effect Description

Species	Habitat	Area within indicative MAD (ha)	Corresponding Corine Code	% within the 5km Zone	Individual Magnitude	Combined Magnitude	Displacement/Disturbance Effect
Little Grebe	WN7 - Bog woodland	9.52	324	1.6%	Low	**Negligible**	*Sensitivity*: Very High *Magnitude*: Negligible ***Significance***: Low Significance Due to very limited spatial overlap with suitable habitats and the low likelihood of sustained disturbance no significant effects are anticipated.
	FL8 - Other artificial lakes and ponds	8.47	512	2.6%	Low		
Northern Lapwing	PB4 - Cutover bog	162.33	412	2.2%	Low		*Sensitivity*: Very High *Magnitude*: Low ***Significance***: Medium Significance While portions of suitable breeding habitat (cutover bog, artificial wetlands) are within the indicative MAD, the extent and fragmentation of the affected areas, no significant effects are anticipated.
	WN7 - Bog woodland	73.63	324	12.1%	Medium		
	FL8 - Other artificial lakes and ponds	54.14	512	16.7%	Medium		
	FS1 - Reed and large sedge swamps	9.71	411	9.3%	Medium		
	BL3 - Buildings and artificial surfaces	1.15	121	4.4%	Low		

Table 7.3: Magnitude estimate for Displacement/Disturbance Effects during the Non-breeding Season

Species	Habitat	Area within indicative MAD (ha)	Corresponding Corine Code	% within the 5km Zone	Individual Magnitude	Combined Magnitude	Displacement/Disturbance Effects
Non-breeding Season							
European Golden Plover	WS1 - Scrub	6.66	324	1.1%	Low	**Low**	*Sensitivity*: Very High; *Magnitude*: Low; ***Significance***: Medium Significance. While species sensitivity is very high, the magnitude of potential disturbance is low, and therefore the effect is not considered significant.
	WN7 - Bog woodland	64.56	324	10.6%	Medium		
	PB4 - Cutover bog	277.75	412	3.7%	Low		
	GS4 - Wet grassland	2.12	411	2.0%	Low		
	FS1 - Reed and large sedge swamps	13.72	411	13.2%	Medium		
	FL8 - Other artificial lakes and ponds	44.06	512	13.6%	Medium		
	BL3 - Buildings and artificial surfaces	3.18	121	12.2%	Medium		
Little Grebe	WN7 - Bog woodland	25.28	324	4.2%	Low	**Low**	*Sensitivity*: Very High; *Magnitude*: Low; ***Significance***: Medium Significance. While species sensitivity is very high, the magnitude of potential disturbance is low, and therefore the effect is not considered significant.
	FS1 - Reed and large sedge swamps	6.36	411	6.1%	Medium		
	FL8 - Other artificial lakes and ponds	14.96	512	4.6%	Medium		
Northern Shoveler	WN7 - Bog woodland	7.34	324	1.2%	Low	**Negligible**	*Sensitivity*: Very High; *Magnitude*: Negligible

Species	Habitat	Area within indicative MAD (ha)	Corresponding Corine Code	% within the 5km Zone	Individual Magnitude	Combined Magnitude	Displacement/Disturbance Effects
	FS1 - Reed and large sedge swamps	1.48	411	1.4%	Low		***Significance*** **Low Significance** The potential for disturbance is negligible and therefore, even for a sensitive species, no likely significant effect is expected
Eurasian Teal	WS2 - Immature woodland	5.78	324	1.0%	Low	**Low**	*Sensitivity* Very High *Magnitude* Low ***Significance*** **Medium Significance** The species is very sensitive; however, given the limited potential for disturbance, significant effects can reasonably be ruled out.
	WN7 - Bog woodland	98.8	324	16.3%	Medium		
	PB4 - Cutover bog	197.05	412	2.6%	Low		
	GS4 - Wet grassland	3.75	411	3.6%	Low		
	FS1 - Reed and large sedge swamps	23.67	411	22.8%	High		
	FL8 - Other artificial lakes and ponds	27.33	512	8.4%	Medium		
	BL3 - Buildings and artificial surfaces	1.13	121	4.3%	Low		
Eurasian Wigeon	WN7 - Bog woodland	28.32	324	4.7%	Low	**Negligible**	*Sensitivity* Very High *Magnitude* Negligible ***Significance*** **Low Significance** While the species demonstrates high sensitivity to disturbance, the very small scale of impact indicates the effect is not significant.
	GS4 - Wet grassland	1	411	1.0%	Low		
	FL8 - Other artificial lakes and ponds	4.43	512	1.4%	Low		
	BL3 - Buildings and artificial surfaces	1.27	121	4.9%	Low		

Species	Habitat	Area within indicative MAD (ha)	Corresponding Corine Code	% within the 5km Zone	Individual Magnitude	Combined Magnitude	Displacement/Disturbance Effects
Northern Lapwing	WS1 - Scrub	6.66	324	1.1%	Low	**Low**	*Sensitivity*: Very High; *Magnitude*: Low; ***Significance***: Medium Significance. The expected level of disturbance is low and, even accounting for high sensitivity, is not considered likely to result in a significant effect
	WN7 - Bog woodland	64.56	324	10.6%	Medium		
	PB4 - Cutover bog	277.75	412	3.7%	Low		
	GS4 - Wet grassland	2.12	411	2.0%	Low		
	FS1 - Reed and large sedge swamps	13.72	411	13.2%	Medium		
	FL8 - Other artificial lakes and ponds	44.06	512	13.6%	Medium		
	BL3 - Buildings and artificial surfaces	3.18	121	12.2%	Medium		
Whooper Swan	WS2 - Immature woodland	9	324	1.5%	Low	**Low**	*Sensitivity*: Very High; *Magnitude*: Low; ***Significance***: Medium Significance. Although the species is highly disturbance-sensitive, the scale of the potential effect is insufficient to give rise to significant impacts.
	WS1 - Scrub	22.94	324	3.8%	Low		
	WN7 - Bog woodland	208.17	324	34.3%	High		
	WN6 - Wet willow-alder-ash woodland	1.15	311	1.1%	Low		
	WD4 - Conifer plantation	6.3	312	3.4%	Low		
	WD1 - (Mixed) broadleaved woodland	1.72	311	1.6%	Low		

Species	Habitat	Area within indicative MAD (ha)	Corresponding Corine Code	% within the 5km Zone	Individual Magnitude	Combined Magnitude	Displacement/Disturbance Effects
	PF2 - Poor fen and flush	3.52	411	3.4%	Low		
	PB4 - Cutover bog	644.85	412	8.5%	Medium		
	GS4 - Wet grassland	5.79	411	5.6%	Medium		
	FS1 - Reed and large sedge swamps	26.59	411	25.6%	High		
	FL8 - Other artificial lakes and ponds	71.97	512	22.2%	High		
	ED2 - Spoil and bare ground	6.42	112	3.2%	Low		
	ED1 - Exposed sand, gravel or till	2.46	112	1.2%	Low		
	BL3 - Buildings and artificial surfaces	13.52	121	52.0%	High		

In summary the following species are likely to be subject to significant effects of *Medium* Significance (i.e. likely significant effects) due to disturbance/displacement during the construction phase of the proposed development:

- **Breeding Season** (Table 7.2)
  - Northern Lapwing.
- **Non-breeding Season** (Table 7.3)
  - European Golden Plover;
  - Little Grebe;
  - Eurasian Teal;
  - Northern Lapwing; and
  - Whooper Swan.

- **Breeding Season**

  - Northern Lapwing:

  Following the process described above, the inhibition of use of the habitats 'WN7 – Bog Woodland' (73.63ha), 'FL8 - Other artificial lakes and ponds' (54.14ha), 'FS1 - Reed and large sedge swamps' (9.71ha), and 'BL3 - Buildings and artificial surfaces' (1.15ha) during the construction phase of the proposed development are the determinant factors for the appraisal of the combined *Magnitude* as 'Low' (Table 7.2). This conclusion remains valid having regard to the Construction Phase LFRE, as the anticipated habitat changes are not expected to materially alter habitat availability within the wider receiving environment. This species 'Confirmed' breeding records during the field study are located within flooded habitats and open water features. WN7 (Bog Woodland) and BL3 (Buildings and Artificial Surfaces) are not considered suitable habitat for Little Grebe and their occurrence within the assessment area reflects incidental spatial overlap rather than habitat use by the species. With regards to habitat FL8 and FS1, no material change in the extent of these habitats is anticipated prior to the commencement of the Construction Phase. While some gradual habitat change is expected through ongoing natural regeneration, the availability of these habitats within the proposed wind farm site and wider receiving environment is expected to remain broadly consistent with the baseline conditions described in Section 6.2.1.1. Accordingly, the *Magnitude* of the disturbance/displacement effects remains as assessed and no significant effects are predicted.

- **Non-breeding Season**

  The following four species could experience hindered use of key habitats during the non-breeding season due to potential disturbance or displacement effects arising from the construction phase of the proposed development (Table 7.3):

  - European Golden Plover:
    - 'FS1 - Reed and large sedge swamps': 13.72ha;
    - 'FL8 - Other artificial lakes and ponds': 44.06ha; and
    - 'BL3 - Buildings and artificial surfaces': 3.18ha.
  - Little Grebe:

  - 'WN7 – Bog Woodland': 25.28ha; and
  - 'FS1 - Reed and large sedge swamps': 6.36ha.

- Eurasian Teal:
  - 'WN7 – Bog Woodland': 98.8ha;
  - 'FS1 - Reed and large sedge swamps': 23.67ha;

- Northern Lapwing:
  - 'WN7 – Bog Woodland': 64.56ha;
  - 'FS1 - Reed and large sedge swamps': 13.72ha;
  - 'FL8 - Other artificial lakes and ponds': 44.06ha; and
  - 'BL3 - Buildings and artificial surfaces': 3.18ha.

For all of these SCIs, and as discussed above for Northern Lapwing during the breeding season, habitat WN7 (Bog Woodland) is not considered a favoured habitat resource for these species and does not materially influence the displacement assessment. With regard to habitats FS1 (Reed and Large Sedge Swamps) and FL8 (Other Artificial Lakes and Ponds), no material change in habitat availability is anticipated prior to the commencement of the Construction Phase. As outlined in Section 6.2.1.1 and summarised in Table 6.16, these habitats are expected to remain broadly consistent with the current baseline within both the proposed wind farm site and the wider receiving environment. Accordingly, the habitat availability assessment remains representative of the Construction Phase LFRE and the Combined Magnitude and Significance of disturbance/displacement effects remain as assessed. Therefore, no significant disturbance/displacement effects are predicted for European Golden Plover, Little Grebe, Eurasian Teal and Northern Lapwing during the non-breeding season.

- Whooper Swan

The appraisal of the *Combined Magnitude* associated with the potential effects from disturbance/displacement on Whooper Swan during the construction phase of the proposed development was influenced on the *Individual Magnitude* classifications of in Table 7.3. With regards to the habitat WN7, this is not a favoured habitat for wintering Whooper Swan, similarly to the situation described for the SCIs described above. Concerning habitats GS4 and PB4, Whooper Swan uses those habitats for roosting, particularly due to their current graminoid cover. However, it can be concluded that the significance of the disturbance/displacement effects during the Construction Phase of the proposed wind farm will have a **Low** significance for Whooper Swan.

Taking into account a careful and evidence-based consideration of the methodology used to assess potential disturbance effects on SCIs during the construction phase of the proposed development, it is concluded that the construction works and associated activities are not expected to result in likely significant effects on these SCIs of the Lough Ree SPA.

7.2.1.1.1.5 Direct Mortality Effects

The potential direct mortality effects to QI species (i.e. Otter [1355]) may occur as a consequence of the same sources identified for the disturbance effects identified for the same QI in the previous Section 7.2.1.1.1.4. In fact, road mortality is one of the most relevant causes

of Otter mortality in Europe (Jancke and Giere, 2011), and could constitute a likely significant effect on this QI population.

During the Construction Phase of the proposed wind farm, the movement of vehicles and machinery, as well as excavation and vegetation clearance works, may result in the direct mortality of adult KARs, particularly during the breeding season when birds may be laying or incubating eggs. These activities also pose a risk of destruction to eggs and nests. Given that ground preparation and vegetation clearance will occur across habitats with varied vegetation cover (e.g. grassland, bog, woodland), all KARs breeding within the affected areas of the site may be vulnerable to this impact.

7.2.1.1.1.6 Spread of IAPS

Rhododendron, an IAPS identified at the proposed wind farm site (Section 6.2.1.5). Rhododendron plants produce large amounts of seeds, that are of very reduced dimensions (approximately 1.5mm long and 0.5mm wide) and weight (approximately 0.063mg), dispersed by the action of wind, water and/or vectors, such as animals or human clothing (Higgins, 2008).

The IAPS is located within a hedgerow located approximately 11m from the proposed construction compound at Mountdillion Works. Considering the separation distance between the IAPS and the construction compound, together with the absence of any requirement for vegetation clearance or trimming within the hedgerow, there is no potential for the Rhododendron to be disturbed during the construction works. The LFRE does not alter this conclusion. Accordingly, there is no potential for the proposed development to result in effects on European sites associated with the spread and dispersal of the IAPS.

While the action of wind is reported by Higgins (2008) as being able to promote the plant's dispersal for distances up to 1km, considering the capacity of dispersal by attaching to human clothing, without mitigation, Rhododendron has the capacity of dispersal to much larger distances.

7.2.1.1.2 Operation Phase

7.2.1.1.2.1 Disturbance Effects

With regards to the potential disturbance of Otter during the Operation Phase of the proposed development, as mentioned above, this species distribution and foraging appear to be unconstrained by anthropogenic presence and activity, even in urban locations (Tolrà *et al.*, 2024). Therefore, it is not considered likely that Otter will be significantly affected by the proposed wind farm during its Operation Phase.

Based on the data collected during the field study (Section 6.2.1.4) and the desk study (Section 6.1.1.2), it is important to note that the proposed wind farm is located approximately 2.5 km from the River Shannon, a recognised ecological corridor. This separation distance is considered sufficient to avoid disruption, thereby likely ensuring the unconstrained use of the corridor by commuting and migratory birds, including SCI species associated with relevant European sites hydrologically or ecologically connected to the proposed development. It is also relevant to highlight that the potential effects of disturbance/displacement by the presence of the proposed wind farm during its Operation Phase. Therefore, although the proposed activities associated with the operation phase are of a different nature than the proposed works and activities during the Construction Phase of the proposed wind farm, a similar rationale used for

the assessment of disturbance/displacement effects during the Construction Phase are employed herein for the Operation Phase (Section 7.2.1.1.1.4).

The assessment of potential disturbance to birds during the Operational Phase of the proposed wind farm includes consideration of both the continuous presence of turbines and the use of amenity trails across the site. While operational noise from turbines may result in some level of disturbance, the potential for regular human presence along amenity trails represents a more dynamic and spatially variable source of disturbance.

Regular recreational use of trails can lead to avoidance behaviour in disturbance-sensitive species, particularly ground-nesting birds, and may cause increased energy expenditure or displacement from preferred foraging or breeding habitats. These effects are most likely within a buffer zone adjacent to frequently used paths, and their significance will depend on trail usage intensity, frequency, and seasonality.

While some disturbance may occur, it is expected to be localised and of low intensity, and is not predicted to result in significant disturbance of habitats or species associated with any European site. Therefore, the adoption of the precautionary approach used to assess disturbance during the Construction Phase is considered appropriate for the Operational Phase, particularly given that operational activities are more continuous and predictable, and birds may exhibit habituation behaviours over time.

With these mitigation measures in place, the residual effects of disturbance from trail use are assessed as not significant in terms of their impact on bird populations and habitat use. A supporting table has been included to summarise these potential impacts and mitigation strategies.

Therefore, taking into account the considerations in Section 6.1.1.3.4.1 with respect to the proposed wind farm site habitat succession, and its consequences regarding the activity of SCIs of European sites connected with the proposed wind farm at the site, the disturbance effects during the Operation Phase of the proposed wind farm are considered to be of the similar *Significance* than those appraised in Section 7.2.1.1.1.4, i.e. no likely significant effects.

7.2.1.1.2.2 Collision Risk Effects

One of the most apparent effects of wind farm developments on bird communities is the risk of collision-related injuries or fatalities. While this may seem contradictory to the earlier point about displacement during the operational phase since birds disturbed by the turbines might be expected to avoid those areas the reality is more complex. Birds may initially avoid areas with active turbines, but over time, they can become habituated to the disturbance. As they begin to return to these previously abandoned areas, their risk of collision with turbine blades increases (Band et al., 2007)

Bird collisions with turbines may represent a highly detrimental effect to the respective populations. Markedly, the effects of collisions involving low density bird species (e.g. birds of prey), and species with low reproductive rates, will be of higher significance to their respective populations than those involving higher and more frequent broods (e.g. passerine species). Also, beyond the local topography, and the physical characteristics of the obstacle (e.g. turbine height, number of turbines), collision risk also differs significantly amongst species, depending on their morphology, foraging and flight behaviours (Linder *et al.*, 2022). For example, the visual field for

some species can be quite restrictive and, while flying and foraging (i.e. head pitched forward, to maximise binocular vision of the ground) these birds can be blind in the direction of travel, becoming highly vulnerable to collisions with tall structures in their path (Martin *et al.*, 2012). Also, birds' 'wing loading', i.e. the ration between body weight and wing area, is associated with low manoeuvrability and high occurrence of collisions (Janss, 2000). Nevertheless, the collision risk is proportional to the abundance of birds in the wind farm area, i.e. greater if a wind farm is located at (or near) feeding/roosting locations, or on migratory flyways or local flight paths (Drewitt and Langston, 2006).

The CRM (Appendix L) further assesses the uncertainty associated with the modelling process, following NatureScot (2024). It assessed the role of several individual factor, such as (Table 7.4):

- Sampling effects –when the results from the VP survey show higher or lower levels of flight activity relative to the overall distribution of flight activity in the respective season;
- Height distribution – accounts for misestimation of flight heights during the VP survey;
- Nocturnal flight activity – derived from the correction factor applied to account for nocturnal activity;
- Single transit risk – relates to Band (2024, sec. 7.2) addressing the simplifications included in the model for Stage C could represent a collision probability within around ±20%;
- Other factors – other sources of uncertainty that cannot be quantified

CRM was undertaken only for those species considered to have sufficient levels of flight activity within the rotor-swept zone, or otherwise identified as having the potential for meaningful interaction with the proposed turbines. Other SCI species recorded during surveys were screened from detailed collision risk assessment on the basis of their infrequent occurrence, negligible site utilisation, absence or very limited flight activity within the collision risk zone, or because the available evidence indicated a negligible likelihood of significant collision mortality. Accordingly, collision risk effects for these species were excluded from further assessment and the uncertainty analysis presented below relates only to those species taken forward for detailed CRM assessment.

Table 7.4: Summary of Uncertainty Factors Accounted for the CRM (adapted from Appendix L)

Species	Season	Sampling effects	Height bands	Nocturnal activity	Single transit risk	Overall
Whooper Swan	winter	0.69-1.67	1.02	1.00	0.8-1.2	**0.55-2.04**
Eurasian Teal	winter	-	-	0.84-1.16	0.8-1.2	**-**
Mallard	all year	0.64-1.86	1.03	0.84-1.16	0.8-1.2	**0.43-2.67**
European Golden Plover	winter	0.54-2.59	1.00	0.74-1.25	0.8-1.2	**0.32-3.89**
Northern Lapwing	breeding	0.52-3.69	1.00	0.88-1.12	0.8-1.2	**0.37-4.96**
	winter	0.49-2.67	1.00	0.71-1.29	0.8-1.2	**0.28-4.13**

The uncertainty factors indicate the degree by which the predicted collision risk should be increased or decreased to indicate the range of uncertainty around the estimate. A value of 1.00 means that the relevant issue did not cause measurable uncertainty.

7.2.1.1.2.2.1 Collision Risk Assessment

The Collision Risk Assessment included in Appendix L also appraises the significance of the increase in annual mortality generated by the predicted collision risk on each species included in the CRM. When this increase in absolute mortality is higher than 1%, the collision risk effects are considered significant to the respective species population (Percival, 2003), at national, regional and/or local scales, depending on available information on population sizes.

The CRM assessment has been updated following the request from ACP for clarification regarding the population estimates used to calculate the potential increase in mortality arising from collisions with wind turbines, particularly in relation to the Whooper Swan population of Lough Ree SPA. The response document addressing this request and the collision risk assessment for the SCI Whooper Swan population of Lough Ree SPA is presented in Appendix M. The document should be read in conjunction with the full CRM assessment presented in Appendix L. The assessment does not assume that all Whooper Swans recorded within the proposed wind farm site form part of the Lough Ree SPA SCI population. Rather, a precautionary approach has been applied whereby potential collision mortality is assessed against the conservation objective population for Lough Ree SPA. The assessment has had regard to the potential ecological connectivity between the proposed wind farm site and the SPA population. The proposed wind farm site is not considered an extension of the SPA; however, the assessment has considered the possibility that birds recorded using the site may contribute to the wider SPA population and therefore represents a precautionary assessment of potential effects on the SCI.

As discussed in the response document, the CRM assessment considered two population estimates presented in the NPWS (2025a) SSCO for Lough Ree SPA. The 'baseline' population estimate, which was used to inform the original designation of the SPA, was based on a three-year period from 1997/98 to 1999/00. The 'recent' population estimate was based on a four-year monitoring period from 2018/19 to 2022/23, excluding 2021/22. For the purposes of this updated NIS, the 'recent' population estimates of Whooper Swan at Lough Ree SPA are considered the most appropriate for assessing the potential effects of the proposed development and have therefore been used in the assessment presented in Table 7.5 below. Table 7.5 presents the updated result for Whooper Swan of the Lough Ree SPA, including both the uncorrected and corrected estimates, accounting for distance effects (i.e. under-detection of distant flightlines), and the range of uncertainty due to the factors identified in Table 7.4. Values presented in brackets indicate the lower and upper mortality estimates derived from the collision risk modelling and are provided to illustrate the range of uncertainty associated with the assessment.

Table 7.5: Potential Increase in Annual Mortality Rates Due to the Predicted Collision Risk from the Derryadd Wind Farm (adapted from Appendix M, with supporting CRM outputs presented in Appendix L)

Species	Season	Scale	Distance Effects	
			Uncorrected	Corrected
Whooper Swan	Non-breeding	National	0.0% (0.0% - 0.0%)	0.0% (0.0% - 0.0%)
		Regional	0.2% (0.1% - 0.4%)	0.4% (0.2% - 0.8%)
		Local	**0.4% (0.2% - 0.7%)**	**0.6% (0.3% - 1.2%)**
		Lough Ree SPA	**0.7% (0.4%–1.4%)**	**1.2% (0.7%–2.4%)**
Eurasian Teal	Non-breeding	National	0.0%	0.0%
		Lough Ree SPA	0.2%	0.2%
Mallard	Non-breeding	National	0.0% (0.0% - 0.0%)	0.0% (0.0% - 0.0%)
		Lough Ree SPA	0.2% (0.1%–0.5%)	0.3% (0.1%–0.9%)
Golden Plover (99.6%)*	Non-breeding	National	0.0% (0.0% - 0.0%)	0.0% (0.0% - 0.1%)
		Local	**0.7% (0.2% - 2.7%)**	**2.1% (0.7% - 8.0%)**
		Lough Ree SPA	**0.9% (0.3%–3.6%)**	**2.7% (0.9%–10.6%)**
Golden Plover (99.8%)*	Non-breeding	National	0.0% (0.0% - 0.0%)	0.0% (0.0% - 0.1%)
		Local	**0.4% (0.1% - 1.4%)**	**1.0% (0.3% - 4.0%)**
		Lough Ree SPA	**0.5% (0.1%–1.8%)**	**1.4% (0.4%–5.3%)**
Northern Lapwing	Breeding	National	0.0% (0.0% - 0.1%)	0.0% (0.0% - 0.1%)
		Local	**2.5% (0.9% - 12.6%)**	**4.2% (1.6% - 21.0%)**
	Non-breeding	National	0.0% (0.0% - 0.0%)	0.0% (0.0% - 0.0%)
		Lough Ree SPA	0.2% (0.0%–0.7%)	**0.4% (0.1%–1.8%)**
*avoidance rate applied in the respective estimate				

The estimates in Table 7.5: anticipate significant increases in mortality for some species, with corrections for distance effects, and without corrections. The populations for which the mean values for increased mortality due to collision risk are considered significant are:

- Uncorrected for distance effects:
  - Local breeding population of Northern Lapwing.
- Corrected for distance effects:
  - Local and Lough Ree SPA non-breeding population of Golden Plover (for both 99.6% and 99.8% avoidance rates) and the Lough Ree SPA population for Whooper Swan;
  - Local breeding population of Northern Lapwing.

Furthermore, when accounting for uncertainty, the upper limit exceeds 1% for some SCIs of the European sites connected with the proposed wind farm: the local and Lough Ree SPA non-breeding populations of Whooper Swan (corrected and uncorrected), the local and Lough Ree

SPA non-breeding populations of Golden Plover (uncorrected, with 99.6% and 99.8% avoidance rates) and the Lough Ree SPA non-breeding population of Lapwing (using corrected abundance estimates).

However, the Collision Risk Modelling Report (Appendix L) and response to FI request document (see Appendix M) includes several considerations for the interpretation of the increases in mortality displayed in Table 7.5: , such as:

- The threshold defined by Percival (2003) of 1% of increased mortality to classify the significance of the collision risk might be very precautionary, particularly attending to the precautionary assumptions of the collision risk model (e.g. fatalities are adult birds; collision mortality is additive and not compensatory). To this effect, the author considers that a threshold substantially higher that 1% of increased mortality would be required to cause significant effects on the respective populations;
- **Northern Lapwing**
  The highest significance of the modelled increase in mortality was for the local breeding population of Northern Lapwing, which upper limit of the corrected estimate could reach a 21% increase, significantly higher than the 1% threshold. However, the Collision Risk Modelling Report (Appendix L) describes some factors other than the passive action of the proposed wind farm for this estimated increase in mortality:
    - The apparent overrepresentation of Northern Lapwing flight activity in the lowest flight band in the first two seasons of the field study may have caused an overestimation of the collision risk;
    - The local Northern Lapwing population estimate is based on the field surveys undertaken for the proposed development. As the assessment expresses collision mortality as a proportion of the estimated local population, any larger underlying population would result in a correspondingly lower proportional mortality effect than that presented;
    - may have been under-recorded (which, in term, could have resulted in a lower significance for the mortality associated with the collision risk);
    - The collision risk model for Northern Lapwing was highly dependent on a restricted number of records, some of which could refer to wider populations than local - e.g. ~50% of the total flight activity was generated by a single record of a flock with 26 birds in late July, which could be a migratory flock and not part of the local population;
    - The inclusion of juvenile birds in the collision risk model, which have higher annual mortality rates, and would likely reduce the increased mortality associated with the collision risk; and
    - The used avoidance rate may not be reflective of the Northern Lapwing behaviour around turbines.
- **European Golden Plover**
    - As many European Golden Plover occur away from wetland sites, the size of the local population used for the collision risk assessment (data from IWeBS was used - may have been significantly underestimated (i.e. the estimated increase in mortality would have been lower than the range in (Table 7.5:);

- The Collision Risk Modelling Report elaborates on the fact that European Golden Plover is a quarry species, with an open season in Ireland from September and January. The report considers that, given the absence of regulation on the harvest levels for this species, low levels of mortality associated with anthropogenic activities are unlikely to affect significantly the conservation status of the non-breeding population of European Golden Plover.
- It is also noted that the correction for distance effects may have resulted in an overestimation of the predicted collision risk for European Golden Plover. As most of the predicted collision risk was associated with records of large flocks, the effects of under-detection of distant flightlines are likely to be less significant than for smaller groups or individual birds. Therefore, the lower collision risk predicted by the uncorrected model may provide a more reliable estimate in this case.

- Whooper Swan
  - The significance of the collision risk estimated for the Lough Ree Whooper Swan wintering population only just exceed the 1% threshold defined by Percival (2003). The population estimates used in the assessment are based on daytime I-WeBS and Irish Whooper Swan Census (ISC) counts and may therefore represent only a proportion of the Whooper Swan population using Lough Ree, particularly if birds use the SPA as a nocturnal roost and commute to surrounding bogland and fields to feed during the day. This is supported by ISC counts within 5 km of the proposed development, which recorded 247 birds compared with 195 birds at Lough Ree, and almost twice the recent Lough Ree population estimate.
  - Given the size of Lough Ree and the estimated 5 km core foraging range of Whooper Swan (SNH, 2016), it is possible that several discrete Whooper Swan populations occur within the wider area, only some of which are likely to interact with the proposed development. Analysis of Whooper Swan movements undertaken for the 2019 planning application (Gittings, 2019) indicated that a substantial proportion of the flight and ground activity recorded within the proposed development site appeared to be associated with a local population centred on a presumed night roost along the Shannon to the north of the site, with limited connectivity to the Lough Ree SPA population. Allocating the entire predicted collision risk to the Lough Ree SPA population is therefore likely to overestimate the potential impact on that population. More recent ornithological surveys undertaken between 2021 and 2024 confirmed the continued presence of Whooper Swan within the wider receiving environment, including records from Fortwilliam Turlough and other wetlands surrounding the proposed development. These records demonstrate the continued use of a wider network of foraging and roosting habitats by the species and indicate that the proposed development site forms part of a broader landscape utilised by Whooper Swan, rather than representing the sole area of use by the Lough Ree SPA population.

- Accordingly, the potential increase in annual mortality presented in Table 7.5 should be regarded as a precautionary estimate of the potential impact on the Lough Ree SPA Whooper Swan population. Considering this and the precautionary nature of the 1% threshold defined by Percival (2003), the Collision Risk Modelling Report (Appendix L) and response to ACPs FI request (Appendix M) concludes that it is unlikely that the predicted collision risk will give rise to significant effects on the Lough Ree SPA Whooper Swan population.

Upon these considerations of the collision mortality estimates, the precautionary assumptions built into the Collision Risk Modelling and the available evidence regarding population connectivity, the predicted collision risk is unlikely to give rise to significant effects on the relevant SCI populations. Consequently, it is concluded that the predicted collision risk is unlikely to give rise to significant effects on any of the populations of these birds. The implication of these mortality estimates for the achievement of the relevant COs of Lough Ree SPA are assessed further below.

7.2.1.1.3 Decommissioning Phase

The decommissioning phase of the proposed development will involve the dismantling and removal of the wind turbines and associated above-ground infrastructure, together with the transport of materials off-site. While the scale and duration of activities are expected to be substantially less than those associated with the Construction Phase, decommissioning will involve temporary disturbance associated with personnel, plant, machinery and vehicle movement. As there are no plans for the construction of new, or improvements of existing infrastructure, during the decommissioning phase, these activities, would likely be brief and not likely to hold a significance to the local biodiversity higher than imperceptible. While certain amenity infrastructure, including amenity tracks and associated recreational facilities, may remain in situ following decommissioning, these elements would not give rise to any new impact pathways beyond those already considered as part of the operational phase assessment. Therefore, the decommissioning of the proposed development is not predicted to result in likely significant effects on any European sites.

7.2.1.2 Proposed TDR

As described in Section 6.2.2, the works proposed to facilitate turbine transport for the proposed development are not located in proximity to any surface water bodies. The absence of hydrological pathways from these locations to downstream European sites confirms that no likely significant effects on such sites are anticipated as a result of the proposed Turbine Delivery Route (TDR). Furthermore, no habitats suitable for SCI species have been identified at the POIs of the TDR, reaffirming that the proposed works will not result in disturbance or displacement of species of conservation interest.

Table 7.6: Relevant Source-Pathway-Receptor Model for the proposed development. (Elements Scoped-in as Potentially Resulting in Likely Significantly Effects on European sites are Highlighted/Bolded)

Works Phase	Works Activity	Source of Potential Effect	Pathway	Potential Effect Identification and Respective Potential Receptor
Construction	▪ Borrow pits; ▪ Site Roads and amenity tracks; ▪ Excavations, e.g. for turbine hardstands, foundations for Battery Storage modular building, Construction Compound buildings; ▪ Underground cabling.	▪ Earth works; ▪ Excavation; ▪ Excavated material storage;	▪ Hydrological (surface water runoff)	Sediment/silt release, potentially affecting: ▪ Lough Ree SAC [000440]; ▪ Lough Ree SPA [004064].
	▪ Storage of contaminants; ▪ Mobile refuelling operations.	▪ Storage of contaminants at the Construction Compounds; ▪ Refuelling at the Construction Compounds; ▪ Refuelling using a mobile bowser.	▪ Hydrological (surface water runoff)	**Contamination, potentially affecting:** ▪ **Lough Ree SAC [000440]** ▪ **Lough Ree SPA [004064].**
	▪ Water pumping to facilitate the works for borrow pits, turbine foundations, substation, battery storage, and construction compounds.	▪ Water abstraction	▪ Hydrological (surface water runoff)	Reduction to water levels of receiving surface water bodies, potentially affecting: ▪ Lough Ree SAC [000440]; ▪ Lough Ree SPA [004064].
	▪ Vehicle and machinery operation; ▪ All construction works.	▪ Vehicle, machinery, and personnel movement and	▪ Terrestrial	**Disturbance effects, potentially affecting:** ▪ The mobile QI of the Lough Ree SAC [000440] ▪ **Otter Lutra *lutra* [1355];** and ▪ **Lough Ree SPA [004064].**

Works Phase	Works Activity	Source of Potential Effect	Pathway	Potential Effect Identification and Respective Potential Receptor
	▪ Mechanised works that involve vehicles and/or mobile machinery.	▪ Vehicle/machinery movement	▪ Terrestrial.	**Direct mortality, potentially affecting:** ▪ The mobile QI of the Lough Ree SAC [000440] ▪ **Otter Lutra *lutra* [1355].**
	▪ All infrastructure construction	▪ Earth works; ▪ Excavations; ▪ Construction of infrastructure	▪ Terrestrial	Favoured habitat loss, potentially affecting *ex-situ*: ▪ Lough Ree SPA [004064].
Operation	▪ Operating turbines	▪ Disturbing movement of turbines	▪ Terrestrial	Disturbance effects, potentially affecting: ▪ Lough Ree SPA [004064].
	▪ Operating turbines	▪ Collision with moving turbines	▪ Terrestrial	Injury/mortality due to collision risk effects, potentially affecting: ▪ Lough Ree SPA [004064].

7.2.2 In-Combination Effects

Article 6(3) of the Habitats Directive requires that "*Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives*". It is, therefore, required that the potential effects of the proposed development are considered in-combination with any other relevant plans or projects.

The assessment of in-combination effects has regard to developments potentially affecting the Lough Ree SAC [000440] and Lough Ree SPA [004064], for which impact pathways arising from the Construction and Operation Phases of the proposed wind farm have been identified (Table 7.6). The Natura Standard Data Forms of the Lough Ree SAC (NPWS, 2020a), and Lough Ree SPA (NPWS, 2020b) identifies the most important negative threats, pressures and activities with impacts on the site (Table 7.7).

Table 7.7: Threats, Pressures and Activities with Impacts on the Respective European Site

European site	Code	Description
Lough Ree SAC [000440] (NPWS, 2020a)	I01	Invasive non-native species
	J02.11.02	Other siltation rate changes
	K03.05	Antagonism arising from introduction of species
	A03.03	Abandonment/lack of mowing
	A04	Grazing
	A08	Use of biocides, hormones and chemicals
	B02	Forest and Plantation management & use
	E01.03	Dispersed habitation
	F02.03	Leisure fishing
	F03.01	Hunting
	G01.01	Nautical sports
	H01.08	Diffuse pollution to surface waters due to household sewage and waste waters
	H02.06	Diffuse groundwater pollution due to agricultural and forestry activities
Lough Ree SPA [004064] (NPWS, 2020b)	I01	Invasive non-native species
	A08	Use of biocides, hormones and chemicals
	G01.01	Nautical sports
	F02.03	Leisure fishing
	F03.01	Hunting
	G01.02	Walking, horse-riding and non-motorised vehicles
	A04	Grazing

For the purposes of the LFRE, the threats, pressures and activities identified in Table 7.7 are assumed to remain broadly consistent with current conditions. While some habitat change is

anticipated within the proposed wind farm site through ongoing natural regeneration and, subsequently, rehabilitation measures, no material changes are anticipated in the nature or intensity of the external pressures acting on Lough Ree SAC [000440] or Lough Ree SPA [004064]. Accordingly, the in-combination assessment remains valid under the LFRE.

7.2.2.1 Plans

7.2.2.1.1 Longford County Development Plan 2021-2027

The Longford County Development Plan 2021-2027 (LCC, 2021), holds one specific County Policy Objective (CPO) regarding the area associated with the proposed wind farm (i.e. Mount Dillon), stating:

> **CPO 10.24** *Support the repurposing of the Lough Ree Power Station and Bord na Móna Mount Dillon infrastructure and associated work depots for alternative uses in association with the Just Transition process. A Lough Ree Visitor Centre shall be developed in Lanesborough to tell the storey of Lough Ree and its unique position not only in human life but also its importance for natural heritage.*

Although the plan does not provide specifics on the envisaged works associated with CPO 10.24, three other CPOs illustrate the County commitment to comply with the Habitats Directive, specifically with Article 6(3):

> **CPO 12.7** *Ensure that any plan or project that could have a significant adverse impact (either by themselves or in combination with other plans and projects) upon the conservation objectives of any Natura 2000 Site or would result in the deterioration of any habitat or any species reliant on that habitat will not be permitted* (…);
>
> **CPO 12.8** *Ensure that all development proposals relating to European Sites will comply with the DoECLG publication 'Appropriate Assessment of Plans and Projects in Ireland- Guidance for Planning Authorities'* [i.e. DoEHLG (2010)];
>
> **CPO 12.9** *Ensure an Appropriate Assessment is carried out in respect of any plan or project not directly connected with or necessary for the management of the site but likely to have a significant effect on the integrity of a European Site(s), either individually or in-combination with other plans or projects, in view of the site's conservation objectives to comply with the Habitats Directive.*

Therefore, it is reasonable to expect that the repurposing of the Lough Ree Power Station and Mount Dillon infrastructure, as well as any other development proposed to the Longford County for approval, will be compliant with the CPO 12-7 to 12-9, observing the potential for in-combination effects on European sites with other plans or projects, and, if they will be appraised as likely, a NIS will accompany the respective planning application(s), with the prescription of mitigation measures protecting European site from adverse effects.

7.2.2.2 Projects

A search was conducted of planning applications (projects) within the vicinity of the proposed development and respective pathways for potential likely significant effects, using:

- Longford County Council Planning Section[26];
- Roscommon County Council ePlan[27];
- Westmeath County Council ePlan[28];
- Department of Housing, Planning and Local Government EIA portal map viewer[29];
- Department of Agriculture, Food and the Marine:
    - Felling Licence Decisions[30];
    - Afforestation Licence Decisions[31].
- ACP[32].

The search was originally undertaken for the 2025 submission and has subsequently been reviewed and updated to reflect the assumed commencement of the Construction Phase in 2031. Accordingly, any projects permitted, progressed or otherwise identified as relevant to the assessment since the original search date have been considered, ensuring that the in-combination assessment reflects the most up-to-date planning context available. The relevant projects with potential for in-combination effects with the proposed development are detailed in Table 7.8.

Upon review of the relevant documentation publicly available in reference to each of the projects summarised in Table 7.8, the mitigation measures included in the documentation of the projects that were associated with potentially significant effects to biodiversity were considered by the Competent Authorities as sufficient to devoid any residual effects of significance. However, 16 planning applications (2460132, 18139, 19201, 2275 (ABP-315485-22), 16303 (ABP-249090 - 18), 17320, 2360124, 22225, 22275, 2360108, 19222 (ABP-305969-20), 1747 (ABP-248470-18), 19546, 18320 (ABP-302597-19), 23342, ABP-309513-21 - Table 7.8) mentioned the potential for the respective projects to significantly affect the water quality of receiving surface water bodies. Given that water quality could be significantly affected by the proposed development in the absence of mitigation, particularly through potential contamination, the magnitude of this effect is considered to arise primarily from the proposed development itself. However, when assessed in combination with other plans or projects that may contribute to similar pressures, significant in-combination effects on water quality cannot be ruled out.

[26] Available at https://www.longfordcoco.ie/services/planning/. Accessed February 2025
[27] Available at https://www.eplanning.ie/RoscommonCC/searchtypes. Accessed in February 2025
[28] Available at https://www.eplanning.ie/WestmeathCC/searchtypes. Accessed in February 2025
[29] Available online at http://housinggovie.maps.arcgis.com/apps/webappviewer/index.html?id=d7d5a3d48f104ecbb206e7e5f84b71f1. Accessed in February 2025.
[30] Available at https://www.gov.ie/en/collection/f19df-felling-licence-decisions/. February 2025.
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Table 7.8: Summary of Projects Considered for Cumulative Assessment with the proposed development

Planning Application Reference Number	Project/ Applicant Name	Brief Development Description	Approximate Distance from proposed development	Date Planning Application Granted	Summary of Respective Assessments Relevant Findings
Longford County Council					
2460132	Bord na Mona Energy Limited	Development of a recreational tourism trail, which includes: repurposing of 5.2km on existing former rail bed; 3.1km along existing bog headlands/former high fields; 185m along pre-existing machine access routes; construction of car and/or bicycle parking facilities at seven locations; pavilion structures, totem feature, surface water drainage, and other auxiliar works and structures.	0m	07/01/2025	▪ Works: linear development in nature and is approximately 8.3 kilometres long utilising existing rail bed infrastructure with the inclusion of landscape elements including pavilion structures, 'walker' totem, and a thematic experience comprising a framed structure which will act as a visitor periscope. It includes a maximum of 147 at parking spaces, 127 of which are existing car parking spaces with 20 proposed new car parking spaces; ▪ Potential effects (NIS) – Construction: ▪ Lough Ree SAC, Lough Forbes Complex SAC – potential effects to water quality, potentially affecting water dependent and nutrient sensitive QIs; ▪ Lough Ree SPA, Ballykenny-Fisherstown Bog SPA – potential effects to water quality; ex-situ disturbance effects; ▪ Operation ▪ Lough Ree SAC – ex-situ disturbance of mobile QI (Otter); ▪ Lough Ree SPA, Ballykenny-Fisherstown Bog SPA – ex-situ disturbance. ▪ Mitigation: ▪ Construction: restriction on proximity of construction compounds to watercourses; generated wastewater from the temporary toilet facilities to be stored in tanks and removed to suitable wastewater disposal facility; bunded re-fuelling area within the construction compounds; designated areas for material storage; adoption of Ecological Restriction Zones (150m buffer from wetlands) for the protection against disturbance of SCI birds; work restrictions may apply between October to March, inclusive; general best-practice measures for re-fuelling, management of accidental spillages, and storage of contaminants; general best-

Planning Application Reference Number	Project/ Applicant Name	Brief Development Description	Approximate Distance from proposed development	Date Planning Application Granted	Summary of Respective Assessments Relevant Findings
					practice measures for the protection against dust nuisance; ▪ Operation: screen fencing – no screening along Lanesborough to Derryarogue section of the route; signage to highlight potential wintering bird disturbance; general best-practice measures for maintenance works ▪ Residual effects: upon implementation of mitigation measures, no residual effects are expected.
18139	EirGrid PLC	Refurbishment works on the Cloon to Lanesboro 110 kV Overhead Line (approximately 65 kilometres long).	2km	27/09/2018	• Works: replacement of 212 poles. 25 polesets and 1 angle mast; upgrading 21 angle masts; other associated works; ▪ Potential effects (Planning and Environmental Considerations Report - PECR): ▪ Sites of Ecological Importance – no effects on common sites with the proposed wind farm site; ▪ Habitats – significant effects on raised bog (total of 196m^2) and cutover bog (total of 168m^2) habitats; ▪ Aquatics – no effects of significance; ▪ Protected Species - no effects of significance. ▪ Mitigation: ▪ Use of low ground pressure machinery; ▪ Delineation of works areas; ▪ Replanting of cut vegetation; ▪ Restriction on material storage; ▪ Silt fence (at 24 locations) and silt trap (at 2 locations) – 9 works locations drain into the Shannon (Upper)_100; • Despite in-stream works being mentioned as not required, mitigation includes construction of clear span bridges (at 22 water features crossings); ▪ 'Best Practice' for pollution control; ▪ Biosecurity measures (use of Virkon®). ▪ Residual effects: upon mitigation, negligible to low significance effects would be expected.

Planning Application Reference Number	Project/ Applicant Name	Brief Development Description	Approximate Distance from proposed development	Date Planning Application Granted	Summary of Respective Assessments Relevant Findings
19201	EirGrid PLC	Redevelop the existing 110 kV Air Insulated Switchgear (AIS) substation in Lanesboro.	2km	01/07/2020	▪ Works: re-routing 11kV underground cable (trenching, 600mm wide; 1250mm deep); construction of new substation (15mx15mx54m); construction of roads and parking; other associated works; ▪ Potential Effects (PECR): • Sites of Ecological Importance – Lough Ree SAC (Natural Eutrophic Lakes; Otter); Lough Ree SPA (distribution; prey biomass available; wetland habitat); Lough Ree pNHA ▪ Habitats – no significant effects; ▪ Aquatics – siltation; ▪ Protected Species - no effects of significance. ▪ Mitigation measures: ▪ Works area isolation from watercourses; ▪ Regulating water discharges and stockpiling; ▪ Restriction of concrete pouring near the outfall; ▪ Regulating refuelling operations (50m from watercourses); ▪ 'Best practice' biosecurity measures. • No residual effects of significance are anticipated upon implementation of mitigation measures.
2275 (ABP-315485-22)	ESB	Demolition and site reinstatement; followed by Development of grid services within the existing power station boundaries comprising 75MW battery storage; 200MVAR synchronous condenser; other associated works	2km	29/09/2020	• Works (Construction, Operation and Decommissioning Phases): Demolition and site reinstatement; followed by development of grid services within the existing power station boundaries comprising: 75MW battery storage; 200MVAR synchronous condenser; other associated works; ▪ Potential Effects (PECR): • Sites of Ecological Importance – Lough Ree SAC (Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* - type vegetation; Otter); Lough Ree SPA (distribution; prey biomass available; wetland habitat); Lough Ree pNHA (deterioration of water quality); Lough Bannow pNHA (deterioration of water quality) ▪ Habitats – no significant effects;

Planning Application Reference Number	Project/ Applicant Name	Brief Development Description	Approximate Distance from proposed development	Date Planning Application Granted	Summary of Respective Assessments Relevant Findings
					▪ Aquatics – siltation/contamination; ▪ Protected Species – lighting effects on bats; Otter (deterioration of water quality). ▪ Mitigation measures: ▪ Prescription of 'Best practice' methods; ▪ Lighting to be fitted with directional cowls, and of lowest lumen ▪ Monitoring and maintenance of current drainage system; ▪ Dust suppression ▪ Spatial restriction of crushing concrete works; ▪ Sediment barriers (e.g. silt fences); ▪ Regulating stockpiling; ▪ Works area isolation from watercourses; and ▪ Biosecurity measures (use of Virkon®). • No residual effects of significance are anticipated upon implementation of mitigation measures.
16303 (ABP-249090 - 18)	Ronnie Walsh	Decommissioning of existing bovine/porcine agricultural structure; construction of three pig houses	475m	16/05/2018	• Works: Construction – 'Best practice' methods; Operation: manure will be collected, stored and transferred to customers for fertilisation; ▪ Potential Effects (EIS): ▪ Sites of Ecological Importance –no significant effects mentioned; ▪ Habitats – no significant effects; ▪ Aquatics – siltation/contamination; • Protected Species – lighting effects on bats; Otter (deterioration of water quality) none identified due to the farm being in operation for several years, and the distance to European sites; • Despite the absence of identified significant effects, mitigation measures are proposed: ▪ 'Best practice' construction methods; ▪ Silt traps or geotextile curtains to be installed at undefined locations; ▪ Protection of riparian and hedgerow habitats;

Planning Application Reference Number	Project/ Applicant Name	Brief Development Description	Approximate Distance from proposed development	Date Planning Application Granted	Summary of Respective Assessments Relevant Findings
					▪ Undefined primary treatment of surface runoff during operation; • Storage of contaminants in bunded surfaces "well away from watercourses"; ▪ Advise to customers on the fertiliser application.
17320	ESB	Increase in the capacity of the operational Ash Disposal Facility to allow for the deposition of 130,000 tonnes of dry ash over and above the 550,000 tonnes permitted until the planning application.	850m	28/03/2018	▪ Works: the development will not include any physical change to the permitted structure, just a continuation of the activity; ▪ Potential Effects (EIAR): ▪ Sites of Ecological Importance –no significant effects mentioned; ▪ Habitats – loss of Bog Woodland habitat (0.87ha) is not considered significant; • Aquatics – emissions are regulated by the EPA through the IPC licence P0610-02, and no significant effects to aquatic ecology are anticipated; • Protected Species – no significant effects are anticipated. • Despite the absence of identified significant effects, mitigation measures are proposed: ▪ Vegetation clearance to be undertaken between September and February. • No residual effects of significance are anticipated upon implementation of mitigation measures.
2360056	EirGrid Plc	Construction of a Gas Insulated Switchgear compound (approximately 4ha)	2km	15/09/2023	• Works: Construction of a Gas Insulated Switchgear; redevelopment of existing substation; construction of distribution system operator compound; modify existing drainage system; Ground Investigation works (e.g. boreholes); associated works (roads, ancillary); ▪ Potential Effects (EIAR): ▪ Sites of Ecological Importance – Lough Ree SAC (Naturally Eutrophic Lakes; Otter): deterioration of water quality; disturbance to Otter; Lough Ree SPA: deterioration of water quality

Planning Application Reference Number	Project/ Applicant Name	Brief Development Description	Approximate Distance from proposed development	Date Planning Application Granted	Summary of Respective Assessments Relevant Findings
					▪ Habitats – no habitats of significant ecological valuation will be removed, thus no significant effects on habitats are considered; ▪ Aquatics – although the risk is considered low, potential significant siltation/contamination effects are considered during construction; • Protected Species – lighting significant effects on roosting bats identified within the site; no significant effects on other species are anticipated given the mentioned abundance of alternative habitats. ▪ Mitigation measures: ▪ Spatial restriction for works and excavation storage; ▪ Silt fence installation for works on banks, excavation storage (with specific instructions); ▪ Pumping any occurring water to 10m from any watercourse; ▪ Restriction to concrete pouring ▪ 'Check, Clean, Dry' protocol; ▪ Restriction on contaminant use/storage; ▪ 'Best practice' measures (e.g. light shields, directional lighting) for lighting installation; and ▪ Retention of 0.5ha of recolonising bare ground to be seeded with "common native grassland herb species from the locality" as an enhancement measure. • No significant residual effects on are anticipated upon implementation of mitigation measures.

Planning Application Reference Number	Project/ Applicant Name	Brief Development Description	Approximate Distance from proposed development	Date Planning Application Granted	Summary of Respective Assessments Relevant Findings
2360124	EirGrid Plc	Uprate the 110 kV Overhead Line (OHL), consisting of works to a ca. 27.6km section of the OHL at 142 supporting structures	1.7km	17/11/2023	• Works: Replacement of existing overhead line, 52 polesets, 4 towers, one angle mast, stay arrangements and crossarms at 27 locations, vibration dampers at 12 locations, and hardware and fittings; installation of insulators at 13 locations; reinstallation of anti-climbing guards and aircraft warning sphere; ▪ Potential Effects (PECR): • Sites of Ecological Importance – Lough Ree SAC (Lake vegetation [3150], Fens [7230], Alluvial forest [91E0] and Otter [1355]): deterioration of water quality); Lough Ree SPA: deterioration of water quality (SCI collision risk with overhead lines dismissed; only effects to Wetlands [A999] considered); Royal Canal pNHA (deterioration of water quality); Lough Bannow pNHA (wet grassland/hedgerow habitats loss); Lough Ree pNHA (similar effect to those for Lough Ree SAC/SPA); • Habitats – direct effects of significance on wetland/raised bog/wet grassland/scrub and hedgerow habitats (tracking of plant and machinery; habitat loss); indirect effects on wetlands similar to those accounted for aquatic ecology; no habitats of significant ecological valuation will be removed, thus no significant effects on habitats are considered. The spread of Japanese Knotweed accounted as potential effect; ▪ Aquatics – potential siltation and contamination effects are considered during construction; ▪ Protected Species – potential effects on Otter (through deterioration of water quality) and birds (loss of nesting habitat). ▪ Mitigation measures: ▪ Silt fence installation at sensitive locations (with specified characteristics); ▪ Installation of silt traps (with specified characteristics); ▪ Primary treatment (i.e. settlement tank system) of any water pumped off to accommodate works; ▪ Delineation of valuable, raised bog/wet grassland habitats and ground protection measures (detailed);

Planning Application Reference Number	Project/ Applicant Name	Brief Development Description	Approximate Distance from proposed development	Date Planning Application Granted	Summary of Respective Assessments Relevant Findings
					▪ Restriction of works between 1st March and 31st August; • Refuelling to be restricted to construction compounds designated area; • Restriction of hydrocarbon storage to designate areas ▪ Concrete batching/production not allowed onsite; • No residual effects are anticipated upon implementation of mitigation measures.
22225	Electricity Supply Board Networks DAC	Integrated constructed wetland over a total area of 5.58ha to provide total treatment of ash leachate, with a closed loop design	600m	14/12/2022	• Works: excavation, placement and compaction of earth/soil for the creation of 2 open water cells and 3 treatment cells; road upgrading; provision of pipework and water pumps (for internal circuit only); ▪ Potential Effects (Planning Report): ▪ Sites of Ecological Importance – Lough Ree SAC (Naturally Eutrophic Lakes; Otter): deterioration of water quality; disturbance to Otter; Lough Ree SPA: deterioration of water quality; • Habitats – no negative effects are identified; ▪ Aquatics – general account of potential effects on aquatic ecology; ▪ Protected Species – no potential effects mentioned. ▪ Mitigation measures: ▪ Spatial restriction for works area; ▪ Setback distance from aquatic receptors; • Refuelling and hydrocarbon storage to be restricted to designated bunded area; ▪ Instructions for clear felling (to opposite direction from drains); ▪ Use and maintenance of brash mats; ▪ Restrictions for soil storage; ▪ Restriction on concrete production onsite; ▪ Spatial and time restrictions for fertilisation.

Planning Application Reference Number	Project/ Applicant Name	Brief Development Description	Approximate Distance from proposed development	Date Planning Application Granted	Summary of Respective Assessments Relevant Findings
22275	Harmony Solar Longford Ltd	Underground electrical cable and transformer compound which will connect permitted solar farms to the national grid via the proposed transformer compound at Lough Ree Power Station	1.6km	19/05/2023	▪ Works: excavation of 10 trial pit (one 3-4m deep; nine of 1.5-2m deep); Site Investigation (SI) works; construction of transformer compound of 3,800m^2 – excavation to existing 110kv underground cable, temporary construction compound, SI works; construction of Control Module (26.6m^2); construction of transformer unit (including a 8m high lightening mast); excavation to accommodate underground cable; installation of diesel generator; associated works; no instream works required, although there are 5 watercourse crossings; vegetation clearance; • Potential Effects (no EIAR or PECR/EcIA available; information from NIS) - through deterioration of water quality; disturbance/ displacement: ▪ Lough Ree SAC (Natural eutrophic lakes [3150]; Alluvial forests [91E0]; Otter [1355]; ▪ Lough Ree SPA. ▪ Mitigation measures: ▪ Spatial restriction for works area; ▪ Silt traps and silt fencing would be provided at stream crossings; ▪ Spatial restriction for SI works (6m from watercourses); ▪ Compaction and covering of stockpiles; ▪ Restriction to batching wet-cement products onsite; ▪ Restriction on weather conditions for cast-in-place concrete; ▪ Restriction on washing out any plant used in concrete transport or concreting operations; ▪ Area designation for chute cleaning; ▪ Restriction of refuelling to the construction compound; ▪ Designation of exclusion areas of 350m around any nest of Lapwing, Coot or Mallard found in the bog along the development; • No effects on European sites are anticipated upon implementation of mitigation measures.

Planning Application Reference Number	Project/ Applicant Name	Brief Development Description	Approximate Distance from proposed development	Date Planning Application Granted	Summary of Respective Assessments Relevant Findings
20263	Michael & Nancy Casserly	Retention of existing extended commercial storage yard, and construction of car park and drainage system	1.9km	07/04/2021	▪ Works: laying a sealed surface across the year; installation of gullies, by-pass interceptor; construction of car park and loading, storage areas; associated works; • Potential Effects (no EIAR or PECR/EcIA available; information from Screening for Appropriate Assessment): deterioration of receiving water quality through inadequate water treatment; sedimentation during construction phase through road traffic; ▪ Assessment: because the application would provide drainage and water treatment, no effects on European sites are predicted.
2360108	EirGrid Plc	Replacement of overhead line (9.5km)	2km	27/10/2023	• Works: Replacement (involving excavation) of existing overhead line, 21 polesets, 2 towers, stay arrangements (3) and crossarms (6), insulators at 22 locations; reinstallation of anti-climbing guards at 2 locations; vegetation cutting and dewatering; Site Investigation works; associated works; ▪ Potential Effects (PECR): • Sites of Ecological Importance – Lough Ree SAC (Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* - type vegetation [3150], Alkaline Fens [7230], Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) [91E0], and Otter [1355]): deterioration of water quality); Lough Ree SPA: deterioration of water quality (SCI collision risk with overhead lines dismissed; only effects to Wetlands [A999] considered). Lough Ree pNHA (similar effects to those described for Lough Ree SAC/SPA); • Habitats – direct effects of significance on wetland/raised bog/wet grassland/scrub and hedgerow habitats (tracking of plant and machinery; habitat loss); indirect effects on wetlands similar to those accounted for aquatic ecology; ▪ Aquatics – potential siltation and contamination effects are considered during construction;

Planning Application Reference Number	Project/ Applicant Name	Brief Development Description	Approximate Distance from proposed development	Date Planning Application Granted	Summary of Respective Assessments Relevant Findings
					▪ Protected Species – potential effects on Otter (through deterioration of water quality) and birds (loss of nesting habitat). ▪ Mitigation measures: ▪ Spatial restriction for works within 50m of surface water features; ▪ Silt fence installation at 8 sensitive locations (with specified characteristics); ▪ Installation of silt traps at 8 sensitive locations (with specified characteristics); ▪ Primary treatment (i.e. settlement tank system – e.g. Dirtbox) of any groundwater pumped off to accommodate works; ▪ Ground protection maps use at specified locations; ▪ Restriction of hedgerow and scrub vegetation from the 1st of March until the 31st of August; • Refuelling to be restricted to construction compounds designated areas; • Restriction of oil storage to designate areas ▪ Concrete batching/production not allowed on works areas. • No residual effects of significance are anticipated upon implementation of mitigation measures. Local scale disturbance effects to bogland, hedgerow, scrubland and wet grassland habitats are to be expected.
16256	Blacksmith Ventures Ltd	Development of a distillery and visitor centre (0.2814ha site)	2.3km	31/01/2017	▪ Works: no details of works are described in the Screening for Appropriate Assessment; • Potential Effects (no EIAR or PECR/EcIA available; information from Screening for Appropriate Assessment): deterioration of receiving water quality during construction (foul water, hydrocarbons, silt, etc); ▪ Assessment: with the application of 'best practice' methods, no effects on European sites are predicted.

Planning Application Reference Number	Project/ Applicant Name	Brief Development Description	Approximate Distance from proposed development	Date Planning Application Granted	Summary of Respective Assessments Relevant Findings
19222 (ABP-305969-20)	Ballykenny Solar Ltd	25 year permission for a solar farm (9MW capacity; 19ha)	7.0km	08/05/2020	▪ Works: no details of works are described; development to include photovoltaic panels mounted on steel frames; single storey building, customer room, control building storage container, HV kiosk, 6 inverter transformer enclosures, etc; • Potential Effects (EcIA): • Construction • Sites of Ecological Importance – Lough Forbes Complex SAC (Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* - type vegetation [3150], Alkaline Fens [7230], Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) [91E0], and Otter [1355]): deterioration of water quality; Lough Forbes pNHA (similar to homonymous SAC); Ballykenny-Fisherstown Bog SPA: deterioration of water quality; ▪ Habitats – loss/fragmentation of grassland (low ecological value) and mature trees/hedgerow habitat (75m total extent); ▪ Aquatics – potential siltation and contamination effects are considered during construction; ▪ Protected Species – significant effects on pollinators from habitat/grassland habitat loss; potential effects birds (temporary disturbance), bird nests and foraging habitat (loss), bats (loss of roosting sites); • Operation ▪ Protected Species – disturbance to birds and mammals during maintenance; terrestrial barrier effect from fence; ▪ Mitigation measures: ▪ Spatial restriction for works to be confined to the proposed development; ▪ 'Best practice' methods; ▪ 10m exclusion zone from the stream for construction works; ▪ 50m exclusion from the stream for stockpiling; ▪ Restriction for washing concrete off materials offsite;

Planning Application Reference Number	Project/ Applicant Name	Brief Development Description	Approximate Distance from proposed development	Date Planning Application Granted	Summary of Respective Assessments Relevant Findings
					▪ Refuelling and hydrocarbon storage to be carried on bunded areas; ▪ Enhancement – planting of 410m of new hedgerows and 1,835m of existing hedgerows will be enhanced/ • Residual effects of neutral significant are anticipated upon implementation of mitigation measures.
1747 (ABP-248470-18)	Grian PV Ltd.	Ten year permission for a solar farm with an export capacity of 11.1MW	7.9km	22/03/2018	▪ Works: erecting security fence and temporary construction compound; piling frame supports to the ground; affixing mounting frames and panels; concrete base formation for substations and inverters and their construction; cable route trenching (no specific details for construction methods) ▪ Potential Effects (Ecological Appraisal – EA): • Sites of Ecological Importance –Ballykenny-Fisherstown Bog SPA: habitat (grassland) loss – although the loss of potential grazing habitat for geese, the abundance of this type of habitat in the local area is appointed to reduce the significance of this effect to not significant; ▪ Habitats – loss/fragmentation of grassland (low ecological value) and mature trees/hedgerow habitat (75m total extent); ▪ Aquatics – potential siltation and contamination effects are considered during construction; ▪ Protected Species –potential effects birds (breeding and foraging habitat loss), bats (loss of roosting sites), Badger (exclusion from habitats; accidental trapping), Otter (disturbance; damage resting places), Pygmy Shrew and Hedgehog (loss of foraging and shelter habitat), and Common Lizard (loss of shelter habitat). ▪ Mitigation: ▪ Restriction of vegetation clearance to the period outside the birds breeding season (March to August, inclusive);

Planning Application Reference Number	Project/ Applicant Name	Brief Development Description	Approximate Distance from proposed development	Date Planning Application Granted	Summary of Respective Assessments Relevant Findings
					• Before vegetation clearance at the locations identified in the field survey as holding bat roosting features a 'bat roost assessment' should be undertaken; ▪ Enhancement of existing habitats; ▪ Covering excavations to prevent accidental trapping of Badger and/or Otter; ▪ Fence gap of a minimum of 10cm at the bottom. • With the implementation of the mitigation/enhancement measures, the development is expected to represent a positive net gain to local biodiversity.
2074 (ABP-307880-20)	Beacon Assets Ltd	Construction of a residential development of 37 no. dwelling houses	8.5km	14/12/2020	▪ Works: installation of 184,500m^2 of photovoltaic panels, 12 inverter/transformer units and 6 hardstands; drainage and internal tracks (~1.8km); construction of one Main Control Building; internal cabling (underground) and grid connection (intersecting watercourses); associated works; • Potential Effects: none are considered due to small scale and temporary nature of construction works; separation distance to European sites; absence of hydrological connectivity. Although an 'Ecology Report' accompanied the planning application, its scope was the investigation of the presence of IAPS listed under the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477 of 2011, as amended) – none was identified onsite.
21225	Harmony Solar Longford Limited	Ten year permission for a solar farm (34.54ha)	650m	20/10/2021	▪ Works: removal of 10 foundations; construction of new residential development; associated works (no detailed description of construction works is included in the Screening for Appropriate Assessment or Ecology Report); ▪ Potential Effects (PECR):

Planning Application Reference Number	Project/ Applicant Name	Brief Development Description	Approximate Distance from proposed development	Date Planning Application Granted	Summary of Respective Assessments Relevant Findings
					• Sites of Ecological Importance – Ballykenny-Fisherstown Bog SPA: there are no records of this species since 1990-91; Lough Ree SAC and SPA: as the Whooper Swan core winter foraging range is <5km (SNH, 2016), it was considered the Whooper Swan individuals that could occur at the site were not associated with the SPA population. Also, the construction phase would be of short duration, and there would be enough alternative habitat to devoid any potential disturbance/displacement of significance; the separation distance, dilution effect, and landscape slope would prevent any significant effects from siltation and contamination; no reported connectivity with any sites of National Importance; ▪ Habitats – the habitats that will lie under the solar panels are considered to be altered/enhanced, rather than destroyed; the removal of 10m of Hedgerow habitat is considered a long-term effect of slight significance; the loss of 0.022ha of Wet Willow-Alder Woodland/Bog Woodland habitat under one of the options for the grid connection works is appraised as being a long-term effect of moderate significance; • Aquatics – siltation effects on receiving water courses from construction works (including the placement of culverts on drainage ditches) is considered to be of slight significance;

Planning Application Reference Number	Project/ Applicant Name	Brief Development Description	Approximate Distance from proposed development	Date Planning Application Granted	Summary of Respective Assessments Relevant Findings
					▪ Protected Species –effects of moderate significance on Kingfisher, Mallard, Meadow Pipit, Skylark (disturbance) and Woodcock (habitat loss - woodland); Effects of moderate significance (disturbance) are likely to affect Badger (6 setts were identified onsite); Moderate effects are predicted for Red Squirrel (loss/destruction of breeding sites), Pine Marten and Irish Stoat (disturbance and/or destruction of den sites within woodland), and Pygmy Shrew and Hedgehog (disturbance or destruction of nesting sites); effects on bats (one of the grid connection options passes through a bridge with roosting features) is appraised as medium-term and significant; due to the potential habitat loss, deterioration of water quality and disturbance, Frog is also appraised as potentially being moderately affected in the short-term; ▪ Mitigation: ▪ Covering excavated material; ▪ 10m exclusion zone for construction works at natural watercourses; ▪ Fencing drainage ditches; ▪ Wheel washing facilities to be provided at the entrance of the site, draining into silt traps (no specifications) ▪ to prevent accidental trapping of Badger and/or Otter; ▪ 'Best practice' methodologies; ▪ Mitigation for the removal of the Wet Willow Alder Woodland/Bog Woodland to be defined at a later stage; ▪ Restriction of trees and hedgerow trimming between 1st of March and 31st of August; ▪ Mitigation for Meadow Pipit, Skylark, Lapwing, and Mallard to be defined at a later stage;

Planning Application Reference Number	Project/ Applicant Name	Brief Development Description	Approximate Distance from proposed development	Date Planning Application Granted	Summary of Respective Assessments Relevant Findings
					▪ Exclusion of vegetation clearance from March to August, inclusive (for protection of breeding Hedgehog and Pygmy Shrew); woodland felling will only occur between September and December, inclusive (for protection of Red Squirrel); Fence gap of a minimum of 200mm at the bottom, or incorporating a mammal access point (every 100m along the fence); ▪ Habitat enhancement – includes the installation of bat boxes, bird boxes, insect hotels, hedgerow plantation, and log piles, plantation of several types of native species, and enhancement of existing hedgerows.
Roscommon County Council					
21529	Roscommon Co. Co.	Mid-Shannon Wilderness Park Greenway (74km long; average of 3m wide)	1km	Unknown	▪ Works: removal of rail line and soil; construction of bridge/culvert, drainage, and auxiliary infrastructure; • Potential Effects: none are considered due to lack of connectivity with European sites, despite the Screening for Appropriate Assessment reporting that "rivers (…) were found crossing the route at a number of occasions".
2390	Michael O'Connor Chairperson St. Dominic's GAA Club	Modifications on sports facility, including provision of tertiary sewerage treatment plan with percolation system	12.8km	02/10/2023	• Works: relocation and replacement of fence; realignment of bottom steps of stand; construction of additional car spaces; provision of tertiary sewerage treatment plant and percolation system for dispersal of treated effluent; flood lighting; other associated works; • Potential Effects (no EIAR or PECR/Ecological Impact Assessment (EcIA) available; information from Screening for Appropriate Assessment): none are considered due to limited scale of development, and proposal including water treatment.

Planning Application Reference Number	Project/ Applicant Name	Brief Development Description	Approximate Distance from proposed development	Date Planning Application Granted	Summary of Respective Assessments Relevant Findings
19546	Irish Water	Upgrade of the Tarmonbarry Wastewater Treatment Plant	4.4km	29/01/2020	▪ Works: excavation (3m deep; 10m wide); importation of stone for backfilling; placement of pre-cast tanks • Potential Effects (no EIAR or PECR/EcIA available; information from Screening for Appropriate Assessment): the small scale of the works; the separation distance to the hydrological pathway (172m) and barrier (palisade fence) preclude the potential connectivity with European sites and, consequently, of likely significant effects. • A 'Planner Report' has been submitted with the application, which states "*The construction* (…) *could lead to impacts in relation to surface run-off, potential spillages and dust*", but these potential effects were deemed insignificant.
19311	Lough Ree Lanesborough Angling Hub	Convert existing Waterways Ireland storage shed to an outdoor recreational centre/lake access centre facility to Lough Ree	2.3km	12/09/2019	▪ Works: alterations to existing elevators; removal of existing green area; construction of car park; associated works; • Potential Effects (no EIAR or PECR/EcIA available; information from Screening for Appropriate Assessment): the "change of use" nature of the development, would preclude any likely significant effects on European sites.
18320 (ABP-302597-19)	EirGrid Plc.	Refurbishment of the existing circuit within County Roscommon of the existing Cloon to Lanesboro 110 kV Overhead Line	2km	19/03/2019	• Works: Replacement of 1 angle mast, 212 wooden polesets, crossarms of 5 structures, equipment of 20 structures; foundation upgrades on 19 towers; other associated works; • Potential Effects (no EIAR or PECR/EcIA available; information from NIS): through deterioration of water quality; disturbance/ displacement; and biosecurity: ▪ Lough Ree SAC: no effects considered due to the nature of the application and the 290m separation distance between the works and the SAC; ▪ Lough Ree SPA: no effects considered due to the 290m separation distance between the works and the SPA. • No other effects on European sites common with the proposed development are anticipated (only Camderry Bog SAC was screened in for NIS).

Planning Application Reference Number	Project/ Applicant Name	Brief Development Description	Approximate Distance from proposed development	Date Planning Application Granted	Summary of Respective Assessments Relevant Findings
23342	EirGrid Plc	Uprate the existing Lanesboro - Sliabh Bawn 100kV overhead line 9.5km)	5km	10/11/2023	• Works: Replacement (involving excavation) of existing overhead line, 21 polesets, 2 towers, stay arrangements (3) and crossarms (6), vibration dampers (all locations) insulators at 22 locations; reinstallation of anti-climbing guards at 2 locations; vegetation cutting and dewatering; Site Investigation works; associated works; ▪ Potential Effects (PECR): • Sites of Ecological Importance – Lough Ree SAC (Natural eutrophic lakes with *Magnopotamion* or Hydrocharition - type vegetation [3150], Alkaline Fens [7230], Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) [91E0], and Otter [1355]): deterioration of water quality); Lough Ree SPA: deterioration of water quality (SCI collision risk with overhead lines dismissed; only effects to Wetlands [A999] considered); Lough Ree pNHA (similar to Lough Ree SAC and SPA); ▪ Habitats – direct effects of significance on wetland/raised bog/wet grassland/scrub habitats (tracking of plant and machinery; habitat loss; and/or accidental contamination); • the internationally important FL5 and associated habitats have been historically modified and fragmented, while its trophic status is not expected to be altered (i.e. eutrophic). The potential for invasive species spread is also accounted (as a permanent, moderate effect). Nevertheless, potential effects are rated as permanent and moderate in the absence of 'best practice'; ▪ Aquatics – effects from silt-laden runoff and/or contamination on water quality and aquatic environment during construction;

Planning Application Reference Number	Project/ Applicant Name	Brief Development Description	Approximate Distance from proposed development	Date Planning Application Granted	Summary of Respective Assessments Relevant Findings
					▪ Protected Species - potential effects on Otter (deterioration of water quality) and birds (loss of nesting habitat from hedgerow clearance – although no hedgerow loss was accounted in potential habitats' effects). ▪ Mitigation measures: ▪ Spatial restriction for works within 50m of surface water features; ▪ Ground protection mats will be used during construction; ▪ Site clearance works to take place outside of 1st of March to 31st of August; ▪ Silt fence installation at 8 locations (with specified characteristics); ▪ Installation of silt traps at 8 sensitive locations (with specified characteristics); • Refuelling to be restricted to construction compounds designated areas; ▪ Restriction of hydrocarbon storage to designated areas; ▪ Concrete batching/production not allowed on works areas. • No significant residual effects are anticipated upon implementation of mitigation measures.
22581	Eugene Kiernan	Demolish and dispose of existing structures on site consisting of 21 mushroom houses, an office building and store rooms, and permission to construct 26 houses, service road	2.8km	15/11/2023	▪ Works: no details provided; • Potential Effects (no EIAR or PECR/EcIA available; information from NIS): the limited scale and proposal to discharge to public sewer would preclude any likely significant effects on European sites.

Planning Application Reference Number	Project/ Applicant Name	Brief Development Description	Approximate Distance from proposed development	Date Planning Application Granted	Summary of Respective Assessments Relevant Findings
ABP-313750- 23	Energia Renewables ROI Ltd	Seven Hills Wind Farm and all associated works (NIS not available from ACP website[33])	22.5km	23/11/2023	▪ Works: 20 wind turbines (blade tip height: 180m); one meteorological mast (100m heigh); one 110kV substation; 15 spoil storage areas; internal and grid connection works; 2 construction compounds; 7 overburden storage areas; site drainage; access and internal road construction ▪ Potential Effects: ▪ Lough Ree SPA (all SCIs except Whooper Swan [A038] and Wetlands [A999]): ex-situ habitat loss; disturbance/displacement; collision risk/barrier effect during operation; ▪ Mitigation measures: inaccessible NIS for confirmation of specific mitigation measures for the protection of Lough Ree SPA.
Westmeath County Council					
ABP-309513-21	Alanna Roadbridge Developments Ltd	576 no. residential dwellings (285 no. houses, 291 no. apartments), creche and associated works	21.5km	15/06/2021	▪ Works: construction of 285 '2-storey' houses; 18 apartment buildings (291 apartments; max. 5-storey); 2 2-storey crèches; road and associated works; ▪ Potential Effects (EIAR): • Construction ▪ Sites of Ecological Importance – no sites of importance are considered connected with this application; ▪ Habitats – habitat loss of agricultural grassland and disturbed ground (unspecified area) and 990m of hedgerow; ▪ Aquatics – no effects on water quality; ▪ Protected Species – birds (loss of nesting habitat; direct morality: significant and permanent effects. • Operation ▪ Sites of Ecological Importance – no effects considered;

[33] Attempted access at https://www.pleanala.ie/publicaccess/EIAR-NIS/313750/Seven%20Hills%20WF%20SID/Natura%20Impact%20Statement/#Natura%20Impact%20Statement%20-%20F%20-%202022.06.03%20-%20190907.pdf?r=874643760539 in February 2025

Planning Application Reference Number	Project/ Applicant Name	Brief Development Description	Approximate Distance from proposed development	Date Planning Application Granted	Summary of Respective Assessments Relevant Findings
					• Habitats – loss of ecological corridors/hedgerows considered to give rise to effects of unspecified magnitude nor significance; ▪ Aquatics – imperceptible effects on water quality; ▪ Protected Species – general species (disturbance from human activity, lighting): significant and permanent effects; bats (movement disruption from lighting): significant and permanent effects. ▪ Mitigation measures: ▪ Maintenance and enhancement of existing hedgerows (26% of existing hedgerows will be lost); ▪ Site clearance to take place outside of 1st of March to 31st of August; ▪ Pre-clearance survey for Badger setts, bat roost and/or bird nests; • Implementation of a SuDS scheme; ▪ Surface water runoff to be directed to existing settlement ponds, where unspecified measures will be implemented for its treatment (primary) before discharge to receiving watercourses; ▪ Concrete batching to be carried out offsite; ▪ Pumped-off ground water to be directed to the existing settlement ponds; ▪ Storage of hydrocarbons and other chemicals in bunded hardstand area within an unspecified location; ▪ Refuelling and machinery servicing to be undertaken at a hardstand area, remote from surface water features, at unspecified location. ▪ No long-term residual effects. Given the abundance of hedgerow habitat in the area, its loss is not considered significant in the residual impact assessment.

7.3 SCREENING FOR APPROPRIATE ASSESSMENT CONCLUSION

The Screening for Appropriate Assessment provided herein has examined potential likely significant effects on designated SACs and SPAs potentially linked to the proposed development (i.e. proposed wind farm site and proposed TDR).

A total of 29 European sites were appraised for the presence of pathways with the proposed development that could give rise to likely significant effects, namely 21 SCAs and eight SPAs. Following screening, it can be concluded that there is no likelihood of significant effects on 27 European sites within the ZoI as a result of the proposed development, either alone or in-combination with other plans or projects. The European sites screened out from further appraisal are:

- Mount Jessop Bog SAC [002202];
- Fortwilliam Turlough SAC [000448];
- Ballykenny-Fisherstown Bog SPA [004101];
- Lough Forbes Complex SAC [001818];
- Brown Bog SAC [002346];
- Corbo Bog SAC [002349];
- Clooneen Bog SAC [002348];
- Middle Shannon Callows SPA [004096];
- River Shannon Callows SAC [000216];
- Ballinturly Turlough SAC [000588];
- Crosswood Bog SAC [002337];
- River Suck Callows SPA [004097];
- Castlesampson Esker SAC [001625];
- Ballynamona Bog and Corkip Lough SAC [002339];
- Carn Park Bog SAC [002336];
- Lisduff Turlough SAC [000609];
- Pilgrim's Road Esker SAC [001776];
- Mongan Bog SAC [000580];
- Mongan Bog SPA [004017];
- Lough Funshinagh SAC [000611];
- Aughrim (Aghrane) Bog SAC [002200];
- Fin Lough (Offaly) SAC [000576];
- Four Roads Turlough SPA [004140]
- Lough Croan Turlough SPA [004139]
- Ballygar (Aghrane) Bog SAC [002199]
- Lough Derg, North-east Shore SAC [002241]
- Lough Derg (Shannon) SPA [004058]

Therefore, two European sites have been appraised as potentially being significantly affected by the Construction Phase of the proposed development. These European sites are:

- Lough Ree SAC [000440]; and
- Lough Ree SPA [004064].

While no likely significant effects are anticipated from the works and activities involved with the TDR POI's, potential likely significant effects associated with the proposed wind farm and its construction activities cannot be excluded on the basis of objective scientific information. Accordingly, the proposed development is carried through to Stage 2: Appropriate Assessment (Section 8.0), where the potential for adverse effects on European site integrity and the requirement for mitigation measures are assessed in detail.

8.0 STAGE 2: APPROPRIATE ASSESSMENT/NIS

The Stage 2: Appropriate Assessment (Natura Impact Statement) examines the potential for significant adverse effects on the integrity of European sites as a result of the proposed development, based on the source-pathway-receptor model, appraised in Section 7.2, and further scoped in Section 7.2.1.

Four types of sources for potential adverse effects on European sites from the proposed development have been identified (Table 7.6). This section specifically appraises the significance of any effects on the QI of the Lough Ree SAC [000440], and Lough Ree SPA [004064], considering their Conservation Objectives (CO).

8.1 SOURCES FOR LIKELY SIGNIFICANT EFFECTS

The source-pathway-receptor model conceptualized for the proposed development (Section 7.2.1) identified three types of sources for likely significant effects on European sites associated with the construction phase of the proposed development. The sources are

- Storage and use of potential contaminants, posing a risk of environmental contamination (e.g., hydrocarbons, concrete, construction-related pollutants, bentonite);
- Dust generated effects
- Construction activities can generate airborne dust, which may disperse and settle on surrounding habitats and water bodies, leading to ecological degradation through reduced vegetation health, water quality, and habitat suitability for sensitive species.

8.2 CONSTRUCTION ACTIVITIES POSING A RISK OF DIRECT MORTALITY. PATHWAYS FOR LIKELY SIGNIFICANT EFFECTS

The main pathways identified that link the sources of potential likely significant effects (Section 8.1) to the QIs of the Lough Ree SAC and/or SCIs of the Lough Ree SPA, in accordance with the source-pathway-receptor (SPR) model developed for the proposed development (Table 7.6) are:

- Hydrological pathways (e.g. surface water runoff and hydrological connectivity);
- Terrestrial pathways, including direct contact surfaces and visual disturbance within the field of view; and
- Activities may result in disturbance or transfer of contamination and generation of airbourne dust particles.

8.3 CONSERVATION OBJECTIVES LIKELY AFFECTED BY THE PROPOSED DEVELOPMENT

The appraisal of the likelihood of significant adverse effects on the relevant CO of the Lough Ree SAC [000440], and Lough Ree SPA [004064] has been undertaken with reference to the current NPWS Site-Specific Conservation Objectives, including the 2025 Conservation Objectives published for both European sites scoped in Section 7.2.1, considers the proposed development without the incorporation of mitigation measures (Section 8.4). Accordingly, all conclusions presented herein reflect the most up-to-date conservation objectives available for these sites.

Therefore, following the assessment of the source-pathway-receptor model of the proposed development in Section 7.2, the Construction Phase of the proposed development has been identified as potentially giving rise to likely significant adverse effects on the QIs of the Lough Ree SAC and SCIs of the Lough Ree

8.3.1 Lough Ree SAC

The Construction Phase of the proposed development, including the wind farm site and associated TDR works, has been identified as potentially giving rise to likely significant adverse effects on the following QIs of the Lough Ree SAC:

- Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation [3150]; and
- Otter *Lutra lutra* [1355].

Table 8.1 below sets out the conservation objectives for the QIs of the Lough Ree SAC for which pathways for likely significant adverse effects from the proposed development have been identified.

Table 8.1: Conservation Objectives of the QIs of Lough Ree SAC (two QIs)for which pathways of likely adverse effects to the proposed wind farm have been identified, with adverse effects anticipated on the grey-highlighted QIs or attributes during the construction phase in the absence of mitigation.

Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation [3150] - SSCO - To restore the favourable conservation condition
Otter Lutra lutra [1355] - SSCO - To maintain the favourable conservation condition

	Qualifying Interest [Code]	Attribute	Potential effects of the proposed development, both individually and in combination with other projects			
			Airborne Dust	Contamination	Disturbance	Direct Mortality
	Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation [3150]	Habitat area	Dust dispersion from a typical wind farm construction site is influenced by a range of environmental and operational factors, including soil type, prevailing weather conditions, particularly wind speed and direction. During the installation of infrastructure such as access tracks, light to moderate dust deposition can typically occur within a range of approximately 100 to 250 metres beyond the immediate work areas. Under dry, windy conditions, and where there is continuous movement of	The contamination of surface water features during the Construction Phase of the proposed development is unlikely to affect the 3150 QI habitat area and distribution.	It is unlikely that potential disturbance and/or direct mortality effects during the Construction Phase of the proposed development would affect directly and/or indirectly any of the attributes and targets of QI 3150	
		Habitat distribution				
		Typical species		The contaminants to be used and stored during the Construction Phase of the proposed development are bioavailable and bioaccumulated (e.g. hydrocarbons - Sekhar *et al.*, 2003; Li *et al.*, 2009), beyond being highly toxic, mutagenic, and carcinogenic in nature (Kuppusamy *et al.*, 2020), and may become lethal or sub-		
		Vegetation composition: characteristic zonation				

	Qualifying Interest [Code]	Attribute	Potential effects of the proposed development, both individually and in combination with other projects			
			Airborne Dust	Contamination	Disturbance	Direct Mortality
		Vegetation distribution: maximum depth	construction vehicles or excavation activity on unpaved or exposed soil surfaces, dust particles may be transported even further, with potential travel distances reaching up to 400 to 500 metres. However, in the context of the proposed development, given that the SAC is located 2.3 km from the proposed wind farm site no viable pathway for effect has been identified, indicating that even if dust is generated were to be generated in significant amounts, it is unlikely to lead to significant effects to the QI 3150.	lethal to all biota. The significance of the potential effects is highly dependent on the volumes that could be spilled, which information is not available at this moment in time. Therefore, applying the precautionary principle (European Commission, 2000), this appraisal will consider the volumes involved in the potential contamination of surface water bodies during the Construction Phase of the proposed development is sufficient to adversely affect the assemblages of all aquatic and water-dependent ecosystems.		
		Hydrological regime: water level fluctuations		This attribute is associated with the target of maintaining natural lake water level fluctuations. It is unlikely that any potential contamination during the Construction Phase of the proposed development will have any effect on this attribute and target.		

	Qualifying Interest [Code]	Attribute	Potential effects of the proposed development, both individually and in combination with other projects			
			Airborne Dust	Contamination	Disturbance	Direct Mortality
		Lake substratum quality		Despite this attribute being mostly associated with the granulometry of the lake substrate, it also involves its chemical quality (e.g. pH, Ca, Fe). Contamination from the Construction Phase of the proposed development could affect the chemical quality of the substrate, adversely affecting this attribute and target.		
		Water quality: transparency		These attributes are mostly related with changes in the habitat trophic status as a consequence of nutrient inputs. It is unlikely that any contamination during the Construction Phase of the proposed development would affect nutrient concentrations at habitat 3150.		
		Water quality: nutrients				
		Water quality: phytoplankton biomass				
		Water quality: phytoplankton composition				
		Water quality: attached algal biomass				

	Qualifying Interest [Code]	Attribute	Potential effects of the proposed development, both individually and in combination with other projects			
			Airborne Dust	Contamination	Disturbance	Direct Mortality
		Water quality: macrophyte status				
		Acidification status		Depending on the nature and characteristics of the contaminant spilled during the Construction Phase of the proposed development, the water colour and/or pH (water and sediment) could be significantly and adversely affected.		
		Water colour				
		Dissolved organic carbon (DOC)		The contaminants to be stored and used at the proposed wind farm site during its Construction Phase are unlikely to be biodegradable (associated with organic carbon). Therefore, it is unlikely that its potential spillage would affect habitat 3150 DOC.		
		Turbidity		The contamination of surface water features during the Construction Phase of the proposed development is unlikely to adversely affect water turbidity of the 3150 QI.		

	Qualifying Interest [Code]	Attribute	Potential effects of the proposed development, both individually and in combination with other projects			
			Airborne Dust	Contamination	Disturbance	Direct Mortality
		Fringing habitat: area		It is unlikely the potential contamination during the Construction Phase of the proposed development would adversely affect the shoreline communities of QI 3150.		
	Otter *Lutra lutra* [1355]	Distribution	Given the distance of the SAC from the proposed wind farm site (2.4 km) airborne dust generated during the Construction Phase is not expected to affect Otter distribution or the extent of their terrestrial, riverine, or lacustrine habitats. Otters primarily depend on aquatic and riparian environments, and the SAC lies well beyond the typical dust dispersion range (100–500 metres). Given the separation distance and lack of viable pathways, dust deposition is unlikely to habitat quality in a manner that would impact Otter	The contamination of surface water features during the Construction Phase of the proposed development may restrict the availability of Otter prey items (e.g. fish), affecting Otter distribution. Also, as the contaminants to be used and stored during the Construction Phase are bioavailable and bioaccumulated (e.g. hydrocarbons - Sekhar *et al.*, 2003; Li *et al.*, 2009), beyond being highly toxic, mutagenic, and carcinogenic in nature (Kuppusamy *et al.*, 2020), they may become lethal or sub-lethal to Otter.	The works and activities potentially causing disturbance to Otter during the proposed development Construction Phase may hinder the usage of the terrestrial habitats available to Otter within the site (e.g. drainage ditches, flooding areas). Despite the habitat being of low quality for Otter (Sections 6.2.1.1 and 6.2.1.2), the potential disturbance effects may reduce the availability of terrestrial habitat and, consequently, Otter distribution.	Otter direct mortality from the movement of vehicles and machinery during the Construction Phase can reduce the Lough Ree SAC Otter population, and consequently its distribution.

	Qualifying Interest [Code]	Attribute	Potential effects of the proposed development, both individually and in combination with other projects			
			Airborne Dust	Contamination	Disturbance	Direct Mortality
		Extent of terrestrial habitat	within the SAC. Therefore, no significant effects are anticipated.	It is not likely that any potential contamination effects would affect the extent of terrestrial habitat to Otter.	-	The proposed development is located outside of the SAC and will not impact the extent of terrestrial habitat for Otter and will result in potential direct ex-situ mortality effects to the species at the SAC.
		Extent of freshwater (river) habitat		The volumes of contaminants to be stored and/or used within the proposed wind farm site during its Construction Phase present to the extent of available river and lake habitat for Otter. Hydrocarbons, for example, are highly toxic, mutagenic, and carcinogenic in nature (Kuppusamy et al., 2020), and can become lethal or sub-lethal to Otter.	The proposed development is located outside of the SAC and will not result in any potential disturbance and/or direct mortality effects to Otter with the SAC during the Construction Phase restricting the riverine and/or lacustrine habitat to Otter.	
		Extent of freshwater (lake) habitat				

	Qualifying Interest [Code]	Attribute	Potential effects of the proposed development, both individually and in combination with other projects			
			Airborne Dust	Contamination	Disturbance	Direct Mortality
		Couching sites and holts	Airborne dust from construction activities is unlikely to affect the number or condition of couching sites or holts, particularly given that no such sites were identified within or near the proposed wind farm sites. Therefore, no significant effect is anticipated. Furthermore, the Lough Ree SAC, designated for Otter conservation, is located over 2.4 km away from the proposed wind farm site. At this separation distance, airborne dust is highly unlikely to travel far enough to impact Otter habitats within the SAC, and therefore no significant effect is anticipated.	It is unlikely that any potential contamination effects would affect the number of couching sites or holts available for Otter.	No couches or holts have been recorded at the proposed wind farm site during the field study (Sections 6.2.1.1), while the value of the river water bodies that intersect the proposed wind farm site in terms of fisheries/prey or riparian vegetation is low. Therefore, it is unlikely that the Construction Phase of the proposed development may affect the number of couching sites and holts for Otter.	It is unlikely that potential direct mortality effects would affect the number of couching sites or holts available for Otter.

		Fish biomass available	Given the separation distance of the SAC from the proposed wind farm site fish biomass at the SAC is unlikely to be affected by airborne dust. Should Otters from the Lough Ree SAC range into the proposed wind farm site, as is plausible given their typical dispersal and foraging behaviour, there is potential for localised ex situ impacts. Airborne dust could affect aquatic features within the proposed wind farm site, potentially impacting prey availability and foraging conditions. Although the watercourses present have been assessed as being of limited foraging suitability for Otter, and effects are therefore expected to be minor, the potential for disturbance to dispersing individuals cannot be entirely ruled out.	The contaminants to be used and stored during the Construction Phase are bioavailable and bioaccumulated (e.g. hydrocarbons - Sekhar *et al.*, 2003; Li *et al.*, 2009), beyond being highly toxic, mutagenic, and carcinogenic in nature (Kuppusamy *et al.*, 2020). In addition, bentonite—used in HDD, although generally considered non-toxic, can pose a risk to aquatic environments if released in large quantities. Excessive bentonite in watercourses can alter water chemistry, increase turbidity, cause sedimentation, and smother benthic habitats, thereby impairing primary production and affecting the availability of food for Otter. Despite the river water bodies that intersect the proposed wind farm site have low fisheries value, the potential contamination effects during the Construction Phase of the proposed development may significantly and adversely reduce the available fish biomass to Otter, within and outside the SAC.	It is not likely that any potential disturbance and/or direct mortality effects to Otter during the Construction Phase of the proposed development will reduce the fish biomass available to Otter. The separation distance between the construction footprint and the aquatic features of the Lough Ree SAC significantly reduces the likelihood of any indirect impacts. Therefore, the potential for the proposed development to adversely affect fish biomass, and by extension, Otter foraging resources, is negligible.

	Qualifying Interest [Code]	Attribute	Potential effects of the proposed development, both individually and in combination with other projects			
			Airborne Dust	Contamination	Disturbance	Direct Mortality
		Barriers to connectivity	Airborne dust will not result in physical or ecological barriers to Otter movement or connectivity between habitats. Otter commuting routes along rivers and lakes remain unaffected, and no dust-related disruption to landscape permeability is expected.	Neither the potential effects from contamination, disturbance, and/or direct mortality would create barriers to commuting Otter.		

8.3.2 Lough Ree SPA

The Construction Phase of the proposed development has been identified as potentially giving rise to likely significant adverse effects on the following SCIs of the Lough Ree SPA

- Little Grebe [A004];
- Whooper Swan [A038];
- Wigeon [A050];
- Teal [A052];
- Mallard [A053];
- Shoveler [A056];
- Tufted Duck [A061];
- Common Scoter [A065];
- Goldeneye [A067];
- Coot [A125];
- Golden Plover [A140];
- Lapwing [A142];
- Common Tern [A193]; and
- Wetlands and Waterbirds [A999].

The identification of these SCIs reflects the range of impact pathways screened into the Stage 2 Appropriate Assessment.

Potential disturbance/displacement and collision risk effects are relevant only to those SCI species recorded using the proposed wind farm site and wider receiving environment in a manner that could result in interaction with the proposed development.

In contrast, potential water-quality related effects arising from accidental contamination represent a pathway associated with the Wetlands and Waterbirds [A999] SCI and, where relevant, those SCI species dependent on aquatic and wetland habitats within Lough Ree SPA.

Siltation and changes in water levels were not identified as pathways likely to result in significant effects on the SCI species of Lough Ree SPA, having regard to the nature of the proposed development, the separation distances involved and the absence of any mechanism by which such effects could alter the availability or function of supporting habitats within the SPA.

The above thirteen SCI species can be grouped according to their SSCO attributes which reflect species ecological function and habitat requirements. The groups are:

Wintering Waterbird Group 1:

- Little Grebe
- Shoveler
- Tufted Duck
- Goldeneye
- Coot

These species are all wintering waterbirds whose conservation objectives are based on the maintenance of the following Attributes:

- Winter population trend
- Winter spatial distribution
- Disturbance at wintering sites
- Barriers to connectivity and site use
- Forage spatial distribution, extent and abundance
- Roost spatial distribution and extent

The attributes common to the species highlights population depend on the availability of suitable wintering habitat, adequate food resources, safe roosting areas, unrestricted access between ecological resources, and the absence of significant disturbance.

Wintering Waterbird Group 2:

- Whooper Swan
- Wigeon
- Teal
- Mallard
- Golden Plover
- Lapwing

These species share all the Attributes as Group 1 species but include an additional attribute:

- Supporting habitat: area and quality

This attribute recognises that the ecological requirements of these SCI species may extend beyond the SPA boundary and that habitats within the wider landscape can contribute to feeding, roosting, movement and other ecological functions that support the SPA populations. Accordingly, consideration must be given to whether habitats within the proposed wind farm site constitute supporting habitat of relevance to the achievement of the conservation objectives for these SCI species. The inclusion of this attribute is particularly relevant to the assessment of whether the proposed development site comprises an ecologically important area for the SCI populations associated with Lough Ree SPA, as raised by ACP.

Breeding Water Bird Group 1:

Common Scoter has a unique set of conservation attributes focused on breeding ecology rather than wintering ecology. These comprise:

- Breeding population trend
- Productivity rate
- Distribution of nesting habitat
- Extent and condition of nesting habitat
- Disturbance at breeding sites
- Barriers to connectivity and site use
- Forage spatial distribution, extent and abundance

The above attributes highlight that the Lough Ree SPA is designated for its breeding Common Scoter population rather than for wintering birds. The critical ecological processes are therefore

breeding success, nesting habitat availability, productivity and chick survival, rather than winter distribution and roosting requirements.

Breeding Water Bird Group 2:

Common Tern also has attributes that reflecting its colony breeding and highly mobile foraging behaviour:

- Breeding population size
- Productivity rate
- Availability and distribution of nesting sites
- Foraging habitat availability
- Disturbance at breeding colonies
- Disturbance in ecologically connected waters
- Barriers to connectivity

Common Tern breeds in nesting colonies and depend on extensive feeding areas surrounding the colony. Attributes are included for disturbance in ecologically connected areas and for maintaining connectivity between nesting and feeding habitats.

The SPA is also designated for the SCI:

- Wetland and Waterbirds [A999]

Wetlands at the SPA play a crucial role in supporting wintering waterbirds, providing essential feeding, roosting, and breeding grounds for numerous migratory species. Recognising this ecological importance, Wetland and Waterbirds [A999] are designated as a SCI for certain European site. This designation is particularly relevant for SPAs identified for wintering waterbirds that encompass wetland habitats of significant importance to one or more species of conservation concern.

Wetlands within SPAs contribute to maintaining the overall biodiversity of the site by supporting a diverse range of waterbird species, ensuring the ecological integrity of the habitat, and facilitating the survival of migratory populations. These habitats provide critical ecosystem services, such as water filtration, carbon storage, and flood mitigation, further underscoring their value.

The attributes for Wetlands (A999) comprise:

- Habitat area
- Habitat quality and functioning

These attributes are intended to ensure that the wetland resource continues to support the bird species for which the SPA has been designated.

Based on the above the following Tables sets out the conservation objectives for the SCIs of the SPA for which pathways for likely significant adverse effects from the proposed development have been identified:

- Wintering Waterbird Group 1 - see Table 8.2
- Wintering Waterbird Group 2 - see Table 8.3
- Breeding Water Bird Group 1 - see Table 8.4
- Breeding Water Bird Group 2 - see Table 8.5

- Wetland and Waterbirds [A999] - see Table 8.6

Table 8.2: Conservation Objectives Wintering Waterbird Group 1 (five SCIs) of Lough Ree SPA for which pathways of likely adverse effects to the proposed wind farm have been identified, with adverse effects anticipated on the grey-highlighted SCI or attributes during the construction phase in the absence of mitigation.

Attribute	Target	Potential effects of the proposed development, both individually and in combination with other projects		
		Contamination	Disturbance	Direct Mortality
• **Little Grebe [A004] - SSCO - To maintain the favourable conservation condition** • **Shoveler [A056] - SSCO - To maintain the favourable conservation condition** • **Tufted Duck [A061] - SSCO - To maintain the favourable conservation condition** • **Goldeneye [A067] - SSCO - To restore the favourable conservation condition** • **Coot [A125] - SSCO - To maintain the favourable conservation condition**				
Winter population trend	Long term winter population trend is stable or increasing	The contaminants to be used and stored during the Construction Phase of the proposed development are bioavailable and bioaccumulated (e.g. hydrocarbons - Chandra Sekhar *et al.*, 2003; Li *et al.*, 2009), beyond being highly toxic, mutagenic, and carcinogenic in nature (Kuppusamy et al., 2020), and may become lethal or sub-lethal to all biota. The significance of the potential effects on the SCIs of Lough Ree SPA is highly dependent on the volumes that could be spilled, which information is not available at this moment in time. Therefore, applying the precautionary principle (European Commission, 2000), this appraisal will consider the volumes involved	Disturbance effects on the Lough Ree SPA have been appraised and screened-out at Stage 1: Screening for Appropriate Assessment. (Section 7.2.1.1.1.4).	Considering the nature of the works and activities during the Construction Phase of the proposed development, as well as the vehicles and machinery involved (Appendix A), it is unlikely the proposed development will give rise to direct mortality to birds at a scale likely to influence population dynamics of the SCIs of Lough Ree SPA. During the operational phase, as describe in the Collision Risk Assessment (section 7.2.1.1.2.2.1) the predicted collision risk is unlikely to give rise to significant effects on the populations of any of the SCIs of Lough Ree SPA.
Winter spatial distribution	Sufficient number of locations, area, and availability (in terms of timing and intensity of use) of suitable habitat to support the population target			
Forage spatial distribution, extent and abundance	Sufficient number of locations, area of suitable habitat and available forage biomass to support the population target			

Attribute	Target	Potential effects of the proposed development, both individually and in combination with other projects		
		Contamination	Disturbance	Direct Mortality
Roost spatial distribution and extent	Sufficient number of locations, area and availability of suitable roosting habitat to support the population targe	in the potential contamination of surface water bodies during the Construction Phase of the proposed development is sufficient to adversely affect the food resources of all of all the SCIs of Lough Ree SPA (e.g. aquatic vegetation, invertebrates, phyto and zooplankton), adversely affecting their attributes of population dynamics, natural range, and habitat extent, along with their associated targets.		
Disturbance at wintering sites	Disturbance occurs at levels that do not significantly impact the achievement of targets for population trend and spatial distribution	The potential for disturbance effects on wintering SCI species was assessed through consideration of species occurrence, habitat utilisation, disturbance/displacement effects and the availability of alternative habitats within the wider receiving environment. The assessment concluded that the proposed development would not result in disturbance at a level that would significantly affect the winter population trend or spatial distribution of SCI species associated with Lough Ree SPA. Accordingly, the conservation objective relating to disturbance at wintering sites would be maintained.		
Barriers to connectivity and site use	Barriers do not significantly impact the wintering population's access to the SPA or other ecologically important sites outside the SPA	The potential for the proposed development to create barriers to connectivity and site use was assessed through analysis of species movements, flight activity, habitat utilisation and disturbance/displacement effects. This assessment found no evidence that the proposed development would significantly impede movement between the SPA and other ecologically important habitats used by SCI species, nor would it materially affect access to foraging, roosting or breeding resources that support the SPA populations. Accordingly, the conservation objective relating to barriers to connectivity and site use would be maintained		

Table 8.3: Conservation Objectives Wintering Waterbird Group 2 (six SCIs) of Lough Ree SPA for which pathways of likely adverse effects to the proposed wind farm have been identified, with adverse effects anticipated on the grey-highlighted SCI or attributes during the construction phase in the absence of mitigation.

Attribute	Target	Potential effects of the proposed development, both individually and in combination with other projects		
		Contamination	Disturbance	Direct Mortality
• **Whooper Swan [A038] - SSCO - To restore the favourable conservation condition** • **Wigeon [A050] - SSCO - To restore the favourable conservation condition** • **Teal [A052] - SSCO - To restore the favourable conservation condition** • **Mallard [A053] - SSCO - To restore the favourable conservation condition** • **Golden Plover [A140] - SSCO - To restore the favourable conservation condition** • **Lapwing [A142] - SSCO - To restore the favourable conservation condition**				
Winter population trend	Long term winter population trend is stable or increasing	The contaminants to be used and stored during the Construction Phase of the proposed development are bioavailable and bioaccumulated (e.g. hydrocarbons - Chandra Sekhar *et al.*, 2003; Li *et al.*, 2009), beyond being highly toxic, mutagenic, and carcinogenic in nature (Kuppusamy et al., 2020), and may become lethal or sub-lethal to all biota. The significance of the potential effects on the SCIs of Lough Ree SPA is highly dependent on the volumes that could be spilled, which information is not available at this moment in time. Therefore, applying the precautionary principle (European Commission, 2000), this appraisal will consider the volumes involved	Disturbance effects on the Lough Ree SPA have been appraised and screened-out at Stage 1: Screening for Appropriate Assessment. (Section 7.2.1.1.1.4).	Considering the nature of the works and activities during the Construction Phase of the proposed development, as well as the vehicles and machinery involved (Appendix A), it is unlikely the proposed development will give rise to direct mortality to birds at a scale likely to influence population dynamics of the SCIs of Lough Ree SPA. During the operational phase, as describe in the Collision Risk Assessment (section 7.2.1.1.2.2.1) the predicted collision risk is unlikely to give rise to significant effects on the populations of any of the SCIs of Lough Ree SPA.
Winter spatial distribution	Sufficient number of locations, area, and availability (in terms of timing and intensity of use) of suitable habitat to support the population target			
Forage spatial distribution, extent and abundance	Sufficient number of locations, area of suitable habitat and available forage biomass to support the population target			

Attribute	Target	Potential effects of the proposed development, both individually and in combination with other projects		
		Contamination	Disturbance	Direct Mortality
Roost spatial distribution and extent	Sufficient number of locations, area and availability of suitable roosting habitat to support the population target	in the potential contamination of surface water bodies during the Construction Phase of the proposed development is sufficient to adversely affect the food resources of all of all the SCIs of Lough Ree SPA (e.g. aquatic vegetation, invertebrates, phyto and zooplankton), adversely affecting their attributes of population dynamics, natural range, and habitat extent, along with their associated targets.		The construction footprint is located outside the boundaries of the SPA and does not overlap with known roosting areas for these SCI species.
Disturbance at wintering sites	Disturbance occurs at levels that do not significantly impact the achievement of targets for population trend and spatial distribution	The assessment considered the distribution of wintering SCI species, the suitability and availability of supporting habitats, and the potential for disturbance or displacement arising from the proposed development. On this basis, it was determined that any disturbance associated with the proposed development would not be of a nature, scale or duration capable of materially altering the wintering distribution or abundance of SCI species associated with Lough Ree SPA. The Conservation Objective relating to disturbance at wintering sites would therefore be maintained.		
Barriers to connectivity and site use	Barriers do not significantly impact the wintering population's access to the SPA or other ecologically important sites outside the SPA	The assessment evaluated the extent to which the proposed development could affect the movement of SCI species between the SPA and the wider network of habitats used for feeding, roosting, breeding and other ecological functions. Having regard to recorded flight activity, habitat use patterns and species movements, no significant restriction of access to ecologically important resources was identified. Consequently, the proposed development would not adversely affect habitat connectivity or site use by SCI species, and the relevant Conservation Objective would be maintained.		

Table 8.4: Conservation Objectives Breeding Water Bird Group 1 (one SCI) of Lough Ree SPA for which pathways of likely adverse effects to the proposed wind farm have been identified, with adverse effects anticipated on the grey-highlighted SCI or attributes during the construction phase in the absence of mitigation.

Attribute	Target	Potential effects of the proposed development, both individually and in combination with other projects		
		Contamination	Disturbance	Direct Mortality
• **Common Scoter [A065] - SSCO - To restore the favourable conservation condition**				
Breeding population trend	Long term trend is stable or increasing	The contaminants to be used and stored during the Construction Phase of the proposed development are bioavailable and bioaccumulated (e.g. hydrocarbons - Chandra Sekhar et al., 2003; Li et al., 2009), beyond being highly toxic, mutagenic, and carcinogenic in nature (Kuppusamy et al., 2020), and may become lethal or sub-lethal to all biota. The significance of the potential effects on the SCIs of Lough Ree SPA is highly dependent on the volumes that could be spilled, which information is not available at this moment in time. Therefore, applying the precautionary principle (European Commission, 2000), this appraisal will consider the volumes involved in the potential contamination of surface water bodies during the Construction Phase of the proposed development is sufficient to adversely affect the food resources of all of all the SCIs	Disturbance effects on the Lough Ree SPA have been appraised and screened-out at Stage 1: Screening for Appropriate Assessment. (Section 7.2.1.1.1.4).	The construction footprint is located outside the boundaries of the SPA and does not overlap with known core nesting or foraging areas for common scoter. It is therefore highly unlikely that direct mortality impacts on this species could be caused from the proposed development. During the operational phase, as describe in the Collision Risk Assessment (section 7.2.1.1.2.2.1) the predicted collision risk is unlikely to give rise to significant effects on the populations of any of the SCIs of Lough Ree SPA.
Productivity rate	Sufficient productivity to maintain the population trend as stable or increasing			
Distribution of nesting habitat	Sufficient No significant loss of distribution in the long term, other than that occurring due to natural patterns of variation			
Extent and condition of nesting habitat	Sufficient area of high quality habitat to support the population target			
Forage spatial distribution, extent and abundance	Sufficient number of locations, area of suitable habitat, and available forage biomass to			

Attribute	Target	Potential effects of the proposed development, both individually and in combination with other projects		
		Contamination	Disturbance	Direct Mortality
	support the population target	of Lough Ree SPA (e.g. aquatic vegetation, invertebrates, phyto and zooplankton), adversely affecting their attributes of population dynamics, natural range, and habitat extent, along with their associated targets.		
Disturbance at breeding site	Disturbance occurs at levels that do not significantly impact the achievement of targets for population trend and distribution	Assessment of this attribute focused on the potential for the proposed development to influence the behaviour, distribution and use of wintering habitats by SCI species. Having regard to the scale of predicted effects and the availability of suitable habitat within the wider landscape, no significant effect on the wintering populations or their spatial distribution was identified. Accordingly, the Conservation Objective relating to disturbance at wintering sites would be maintained.		
Barriers to connectivity and site use	Barriers do not significantly impact the breeding population's access to the SPA or other ecologically important sites outside the SPA	Assessment of this attribute considered whether the proposed development could disrupt ecological linkages between the SPA and habitats utilised by SCI species elsewhere in the landscape. The findings indicate that the proposed development would not create a significant impediment to movement, nor restrict access to important feeding, roosting or breeding areas. Therefore, the Conservation Objective relating to barriers to connectivity and site use would be maintained.		

Table 8.5: Conservation Objectives Breeding Water Bird Group 2 (one SCI) of Lough Ree SPA for which pathways of likely adverse effects to the proposed wind farm have been identified, with adverse effects anticipated on the grey-highlighted SCI or attributes during the construction phase in the absence of mitigation.

Attribute	Target	Potential effects of the proposed development, both individually and in combination with other projects		
		Contamination	Disturbance	Direct Mortality
• **Common Tern [A193] - SSCO - To restore the favourable conservation condition**				
Breeding population size	Long term SPA population trend is stable or increasing	The contaminants to be used and stored during the Construction Phase of the proposed development are bioavailable and bioaccumulated (e.g. hydrocarbons - Chandra Sekhar et al., 2003; Li et al., 2009), beyond being highly toxic, mutagenic, and carcinogenic in nature (Kuppusamy et al., 2020), and may become lethal or sub-lethal to all biota. The significance of the potential effects on the SCIs of Lough Ree SPA is highly dependent on the volumes that could be spilled, which information is not available at this moment in time. Therefore, applying the precautionary principle (European Commission, 2000), this appraisal will consider the volumes involved in the potential contamination of surface water bodies during the Construction Phase of the proposed development is sufficient to adversely affect the food resources of all of all the SCIs of	Disturbance effects on the Lough Ree SPA have been appraised and screened-out at Stage 1: Screening for Appropriate Assessment. (Section 7.2.1.1.1.4).	The construction footprint is located outside the boundaries of the SPA and does not overlap with known core nesting or foraging areas for common tern. It is therefore highly unlikely that direct mortality impacts on this species could be caused from the proposed development. During the operational phase, as describe in the Collision Risk Assessment (section 7.2.1.1.2.2.1) the predicted collision risk is unlikely to give rise to significant effects on the populations of any of the SCIs of Lough Ree SPA.
Productivity rate	Sufficient productivity to maintain the population trend as stable or increasing			
Distribution: extent of available nesting options within the SPA	Sufficient availability of suitable nesting sites throughout the SPA to maintain a stable or increasing population			
Forage spatial distribution, extent and abundance	Sufficient number of locations, area of suitable habitat and available forage biomass to support the population target			

Attribute	Target	Potential effects of the proposed development, both individually and in combination with other projects		
		Contamination	Disturbance	Direct Mortality
		Lough Ree SPA (e.g. aquatic vegetation, invertebrates, phyto and zooplankton), adversely affecting their attributes of population dynamics, natural range, and habitat extent, along with their associated targets.		
Disturbance at the breeding site	Disturbance occurs at levels that do not significantly impact on birds at the breeding site	The assessment considered the potential for the proposed development to affect breeding Common Tern through disturbance of nesting areas or other factors capable of influencing breeding behaviour and productivity. Having regard to the location of the proposed development relative to the SPA breeding colony and the pathways for effect identified, no impact was identified that would significantly affect breeding birds at the colony. Accordingly, the Conservation Objective relating to disturbance at the breeding site would be maintained.		
Disturbance at areas ecologically connected to the colony	Disturbance occurs at levels that do not significantly impact on breeding population	The assessment considered whether the proposed development could give rise to disturbance within areas functionally connected to the breeding colony, including habitats that may support foraging or other ecological requirements of Common Tern. Based on the recorded use of the site and the pathways for effect identified, no disturbance effect was identified that would be likely to adversely influence the breeding population. Therefore, the Conservation Objective relating to disturbance within areas ecologically connected to the colony would be maintained.		
Barriers to connectivity	Barriers do not significantly impact the population's access to the SPA or other ecologically important sites outside the SPA	The assessment considered the potential for the proposed development to affect movement between the breeding colony and habitats that support the ecological requirements of Common Tern. Having regard to the spatial relationship between the proposed development, the SPA and functionally connected habitats, no significant impediment to movement or access to important ecological resources was identified. Consequently, the proposed development would not adversely affect connectivity between the SPA and ecologically important supporting habitats, and the relevant Conservation Objective would be maintained.		

Table 8.6: Conservation Objectives Wetland and Waterbirds [A999] of Lough Ree SPA for which pathways of likely adverse effects to the proposed wind farm have been identified, with adverse effects anticipated on the grey-highlighted SCI or attributes during the construction phase in the absence of mitigation.

Attribute	Target	Potential effects of the proposed development, both individually and in combination with other projects		
		Contamination	Disturbance	Direct Mortality
• **Wetlands [A999] - SSCO - To maintain the favourable conservation condition**				
Wetland habitat area	No significant loss to wetland habitat within the SPA, other than that occurring from natural patterns of variation	The contaminants to be used and stored during the Construction Phase of the proposed development are bioavailable and bioaccumulated (e.g. hydrocarbons - Chandra Sekhar et al., 2003; Li et al., 2009), beyond being highly toxic, mutagenic, and carcinogenic in nature (Kuppusamy et al., 2020), and may become lethal or sub-lethal to all biota. The significance of the potential effects on the SCIs of Lough Ree SPA is highly dependent on the volumes that could be spilled, which information is not available at this moment in time. Therefore, applying the precautionary principle (European Commission, 2000), this appraisal will consider the volumes involved in the potential contamination of surface water bodies during the Construction Phase of the proposed development is sufficient to adversely affect the food resources of all of all the SCIs of Lough Ree SPA (e.g. aquatic vegetation, invertebrates, phyto and zooplankton), adversely affecting their attributes of population dynamics, natural range, and habitat extent, along with their associated targets.	It is unlikely that potential disturbance and/or direct mortality effects arising from any phases of the proposed wind farm would affect directly and/or indirectly any of the attributes and targets of this SCI within the SPA.	
Wetland habitat quality and functioning	No significant impact on the quality or functioning of the wetland habitat within the SPA, other than that occurring from natural patterns of variation			

8.4 MITIGATION MEASURES

As construction is not anticipated to commence until 2031, and some habitat change may occur in the interim as a result of ongoing natural recolonisation, a pre-construction habitat and biodiversity verification survey will be undertaken by a suitably qualified ecologist. The survey will confirm the extent, distribution and condition of habitats within the proposed development footprint and associated working areas, identify any material ecological changes relative to the baseline surveys informing this assessment, and inform the finalisation of the Construction Environmental Management Plan (CEMP - Appendix N) and the implementation of ecological mitigation measures. Where necessary, mitigation and ecological protection measures will be refined by the Ecological Clerk of Works (ECoW) to reflect the verified pre-construction baseline, while ensuring that the conclusions of this NIS remain valid.

Construction Phase mitigation measures proposed herein are aimed at preventing the proposed development Construction Phase to give rise to any adverse effects to European sites and their CO, in particular the avoidance of the sources identified in the source-pathway-receptor model for the proposed development (Table 7.6) and scoped in Section 7.2.1. Moreover, all works and activities to be undertaken during the proposed development's Construction and Operation Phases will fully comply with Best Practice/Industry Standards, such as from IFI (2016), Irish Wind Energy Association (Fehily Timoney & Company, 2012), Construction Industry Research and Information Association (CIRIA)[34], and 'Guidance for Pollution Prevention' documents (GPPs)[35], particularly in respect of the protection of water quality, and the reduction of emissions, such as:

- CIRIA Report C502 Environmental Good Practice on Site;
- CIRIA Report C532 Control of Water Pollution from Construction Sites;
- CIRIA Report C648 Control of Pollution from Linear Construction Project; Technical Guidance;
- CIRIA Handbook C650 Environmental good practice on site;
- CIRIA Handbook C651 Environmental good practice on site checklist;
- CIRIA Report C609 – SuDS – hydraulic, structural & water quality advice;
- CIRIA Report C697 – The SuDS Manual;
- GPP 1: Understanding your environmental responsibilities – good environmental practices;
- GPP 2: Above ground oil storage tanks;
- GPP 5: Works and maintenance in or near water;
- GPP 6: Working at construction and demolition sites;
- GPP 8: Safe storage and disposal of used oils;
- GPP 13: Vehicle Washing and Cleaning;
- GPP 21: Pollution incident response planning; and
- GPP 22: Dealing with spills.

[34] Available at https://www.ciria.org/. Accessed in February 2025
[35] Available at https://www.netregs.org.uk/environmental-topics/guidance-for-pollution-prevention-gpp-documents/. Accessed in February 2025

Beyond the specific mitigation measures for the avoidance, or reduction of significance of adverse effects on European sites, prior to commencement of the works associated with the Construction Phase of the proposed development, the appointed contractor will comply with the CEMP, which, amongst other prescriptions, contains all the mitigation measures included herein, and ensure they are fully implemented. The CEMP is a live document that will be updated according to changing circumstances on the project, and to reflect activities on site. Furthermore, an ECoW, experienced in the management of peatland habitats, will be employed by the appointed contractor to oversee construction works and monitor any possible sources for significant effects on European sites. The ECoW will guarantee the Construction Phase of the proposed development will be undertaken in strict agreement with the methods described in Appendix A, the mitigation measures in Section 8.4, and will have the power to stop the works in case any activities/works are not compliant.

Table 8.7: Proposed Mitigation Measures for the Construction Phase of the proposed development

Potential Effect	Proposed Wind Farm Activity	Proposed Mitigation Measure	Further description
Changes in habitat extent and condition prior to commencement of construction	All construction activities	Pre-construction habitat and biodiversity verification survey	• A suitably qualified ecologist shall undertake a pre-construction ecological survey of the proposed wind farm site and associated construction areas no more than 12 months prior to commencement of construction. • The survey shall verify the extent, distribution and condition of habitats present and identify any material changes relative to the baseline surveys used to inform the NIS. • Particular regard shall be had to habitats and ecological features relevant to European sites, protected species, invasive species and Key Avian Receptors. • The findings shall be used to update and refine the Construction Environmental Management Plan (CEMP), including the location of exclusion zones, sensitive habitat buffers, biosecurity measures, pollution prevention measures and ecological monitoring requirements. • Should any material ecological changes be identified, the appointed ECoW shall review the proposed mitigation measures and recommend any additional measures necessary to ensure the conclusions of the NIS remain valid.
Contamination	Storage of contaminants at the Construction Compounds	Designation of Storage Area	• Fuels storage will be minimised onsite; • It will not be practical to refuel all vehicles and machinery offsite, areas will be designated for contaminant storage at each Construction Compound; • The designated areas for contaminant storage will be enclosed, appropriately signed, and demarked from the remainder areas of the Construction Compounds; • Any diesel, fuel, hydraulic oils, paints or any other type of contaminant that will require to be kept onsite, will be stored in bunded storage tanks, only at the designated areas within each of the four Construction Compounds; • Each bund area will have a volume of at least 110% of the volume of the respective stored contaminant(s); • Each container within the bund area will be appropriately labelled and sealed; • Only authorised and appropriately trained personnel may access the contaminant storage designated area; • The designated area for contaminant storage will be provided with a log book. The log book will be a register of: – the number of containers for each contaminant;

Potential Effect	Proposed Wind Farm Activity	Proposed Mitigation Measure	Further description
			– volume of each container; – approximate volume of each contaminant stored; – date/time contaminants are taken off/stored in the designated area, and respective destination; – Signature of the authorised person responsible for the log entry; – Stock of spillage containment material (e.g. spill kits). • The ECoW will make a daily verification of the log books, confirming the accuracy of the information logged in; • The designated contaminant storage areas will also keep a stock of absorbent materials (e.g. oil binder granules), pads/mats, and drip trays to be made available if necessary.
	Refuelling at the Construction Compounds	Refuelling operation restriction	• At each Construction Compound, an area will be designated as "Refuelling Area"; • The Refuelling Area will be delineated at an easily accessible location by vehicles and mobile machinery, and in the immediate vicinity of the designated area for contaminant storage; • The Refuelling Area will be appropriately demarked and signalled, for easy identification; • When refuelling, drip trays and fuel absorbent mats will be used to capture any potential spills;
	Refuelling with mobile bowser	Specific Characteristics	• The mobile bowser will be custom-built, and consist of a double skinned, double-axel fuel bowser; • It will be towed around the site by a 4x4 vehicle to where machinery is located; • It will be re-filled at the designated Refuelling Area at the Construction Compound, or off site; • The 4x4 vehicle will be provided with a log book, where every refuelling operation will be noted: – Date and time; – Refuelled vehicle/machinery unique identification; – Description of any spillages; – Description of containment measures; – Any inspection of the bowser itself.
		Operation conditions	• The fuel bowser will be parked on a level area in the construction compound when not in use; • The fuel bowser will be inspected by the ECoW at the end of each day for leaks and fitness for purpose;

Potential Effect	Proposed Wind Farm Activity	Proposed Mitigation Measure	Further description
			• The fuel bowser is to be used on immobile machinery and/or it will be possible to move the respective vehicles or machinery to the Construction Compound; • Only designated, trained and competent operatives will be authorised to refuel vehicles and machinery on site; • The 4x4 jeep will carry fuel absorbent material (e.g. oil binder granules) and pads/mats in the event of any accidental spillages; • While refuelling, drip trays and fuel absorbent mats will be used to capture any spills; • The vehicle logbook will be inspected by the ECoW every day, and any spillage incidents will be verified by the ECoW as soon as possible. The ECoW will determine the efficacy of the containment measures employed or decide if further measures are required.
	Dust generation and movement associated with excavation, vehicle traffic, access track construction, and material handling near aquatic feature	Integrated dust suppression and control strategy	▪ Water bowsers will be used to suppress dust on exposed soils and haul roads, especially during dry and windy periods; ▪ Works will be phased to minimise disturbed ground area; ▪ Spoil and loose material will be covered where feasible; ▪ Fencing will be established near aquatic features to intercept dust and sediment; ▪ Speed limits and designated access routes will be enforced; • Dust levels will be periodically monitored to assess the effectiveness of dust control measures.
	Release of contaminants	▪ Refuelling; ▪ Movement of vehicles and machinery; Contamination.	• Water bowsers will be used to suppress dust on exposed soils and haul roads, especially during dry and windy periods; • Works will be phased to minimise the area of disturbed ground at any one time; • Spoil and loose materials will be covered or sealed where feasible to prevent wind-blown dispersal; • Fencing or sediment barriers will be established near aquatic features to intercept airborne dust and runoff; • Speed limits and designated access routes will be enforced to reduce dust generation and minimise disturbance; • Dust levels will be periodically monitored to assess the effectiveness of control measures and adjust as necessary; • Vegetation buffers will be retained where possible around sensitive habitats to act as natural dust filters;

Potential Effect	Proposed Wind Farm Activity	Proposed Mitigation Measure	Further description
			• Wheel washing facilities will be provided at site exits to prevent mud and dust being carried onto public roads; • Stockpiles will be located away from watercourses and sensitive ecological receptors, and shaped to reduce wind exposure; • Regular site inspections will ensure dust control measures remain effective and are promptly maintained or improved as required
	Machinery and vehicle movement and operation	Regular Maintenance of vehicles and machinery	• The ECoW will undertake weekly checks for spillages to all machinery and vehicles used onsite; • The ECoW will maintain a logbook to register all checks undertaken and required maintenance to eliminate leaks.
		Spill containment equipment	• All vehicles and machinery will be provided with emergency drip trays and spill kits.
Spread of IAPS	All construction works in the proximity of the Rhododendron stand	Pre-construction survey.	A pre-construction dedicated IAPS survey at the proposed wind farm site will be undertaken by the appointed ECoW, particularly focused to the areas near the Mountdillon Works, where the Rhododendron stand has been identified. All IAPS individual plants/stands present at the site will be identified, counted and georeferenced.
		Biosecurity area.	A strict biosecurity demarcation area will be installed by the ECoW within the zone where scheduled IAPS (e.g. Rhododendron) are present - 10m from each stand (unless it is not feasible for Health & Safety reasons – e.g. roadside); Only works outside the biosecurity area will be allowed to proceed.
		ISMP	If any of the proposed works will be required to break the biosecurity area mentioned above, a specific and detailed Invasive Species Management Plan (ISMP) will be developed by the contractor; The ISMP will detail a strategy of uprooting the Rhododendron plants, currently present at the proposed wind farm site, the most effective management measure for the control of this species (NRA, 2010).

Potential Effect	Proposed Wind Farm Activity	Proposed Mitigation Measure	Further description
Direct mortality	▪ Movement of vehicles and machinery.	Onsite speed limit	• A temporary speed limit of 20km/h will be set for all vehicles transiting the proposed wind farm site for the duration of the Construction Phase; • Appropriate signs will be placed at the tracks used by vehicles and machinery, with the following specifications (adapted from Department of Transport, 2024): – Sign reference: RUS 065; – Normal sign diameter: 450mm; – Repeater sign diameter: 300mm; – Spacing between repeaters: 500m.

9.0 CONCLUSION

This combined AASR and NIS has been prepared in accordance with the requirements of Article 6(3) of the EU Habitats Directive (92/43/EEC), the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended), and relevant national guidance. The report provides the necessary scientific information and ecological assessment to support the competent authority in carrying out an Appropriate Assessment of the proposed development.

The Stage 1 Appropriate Assessment (see Section 7.0) identified a potential for likely significant effects on specific European sites, namely Lough Ree SAC [000440] and Lough Ree SPA [004064], due to potential hydrological and ecological connectivity. Accordingly, these sites were brought forward for detailed assessment in the NIS (see Section 8.0).

The Stage 2 NIS has considered the potential impacts of the proposed development on the QIs and SCIs of the identified European sites, both individually and in combination with other relevant plans or projects. The assessment was informed by desk-based research, field surveys, hydrological analysis, and a review of conservation objectives and site vulnerabilities.

A comprehensive suite of mitigation measures has been proposed to avoid or reduce potential adverse effects, particularly during the construction phase. These include best-practice construction methodologies, pollution prevention safeguards, habitat protection measures. Where applicable, additional site-specific safeguards have been designed to address potential risks to designated habitats and species.

Following a thorough examination of the predicted effects, the implementation of mitigation, and with regard to the site-specific conservation objectives, it is concluded that the proposed development will not result in adverse effects on the integrity of any European site, either alone or in combination with other plans or projects.

This conclusion has been reached with reference to the most recent SSCOs published by the NPWS for Lough Ree SAC [000440] and Lough Ree SPA [004064], including the attributes and targets established for the restoration and maintenance of their favourable conservation condition. The assessment has considered both European sites and the wider connected landscape that supports the ecological functions underpinning their conservation objectives, including habitats used for feeding, breeding, roosting, commuting and dispersal. Particular consideration was given to whether the proposed development site constitutes an ecologically important area for any qualifying habitats, qualifying interests or SCI species, both under current baseline conditions and following the anticipated progression of habitat rehabilitation and natural succession within the receiving environment.

Having regard to the best available ecological and ornithological survey data, species distribution and movement patterns, habitat utilisation, collision risk modelling, disturbance and displacement assessments, and the potential role of the site in supporting the conservation objectives of both European sites, it is concluded that the proposed development, either alone or in combination with other plans and projects, would not undermine, delay or prevent the achievement of the conservation objectives of Lough Ree SAC [000440] or Lough Ree SPA [004064], including the restoration and maintenance of favourable conservation condition for any qualifying habitats, qualifying interests or SCI species for which the sites are designated.

Furthermore, the assessment has considered the implications of habitat loss, disturbance, displacement, collision mortality, hydrological effects and ecological connectivity in the context of the relevant qualifying interests and SCI populations and the applicable conservation objectives. On the basis of the evidence presented, no adverse effect on the integrity of Lough Ree SAC [000440] or Lough Ree SPA [004064] can be concluded beyond reasonable scientific doubt. This conclusion is based on the continued coherence of the ecological structure and function of both European sites and the maintenance of the habitats, ecological processes and species populations that support their conservation objectives. Accordingly, the information presented herein is considered sufficient to allow the competent authority, ACP, to complete the Appropriate Assessment and to make a determination that the proposed development may proceed in accordance with Article 6(3) of the Habitats Directive, as it will not adversely affect the integrity of any European site

10.0 REFERENCES

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APPENDIX A PROPOSED DEVELOPMENT DESCRIPTION

APPENDIX A-1.0 PROPOSED DEVELOPMENT COMPONENTS

APPENDIX A-1.1 WIND TURBINES

The proposed wind turbine layout has been optimised using wind farm design software (e.g. WAsP (Wind Atlas Analysis and Application Program), WindPro Computational Fluid Dynamics and WindFarmer) to optimise the energy yield from the Proposed Wind Farm Site, while maintaining sufficient distances between the proposed turbines to ensure turbulence and wake effects do not compromise turbine performance.

Appendix A-1.1.1 Wind Turbine Specifications

The exact rating and design of the proposed turbine type will be subject to a competitive procurement process that will only commence if and when the proposed development receives planning permission. The proposed turbine type will be detailed by the turbine manufacturer on award of the contract, but the turbines will be the typical three bladed, horizontal axis type with general specifications as follows:

- The turbines will have a tip height of 190m above the top of foundation level;
- Rotor diameter will be 165m with a corresponding blade length of 81m;
- A turbine hub height of 107.5m; and
- Anticipated installed capacity of approximately 6MW per turbine resulting in an estimated 132MW in total for the Proposed Wind Farm.

Modern wind turbines from the main turbine manufacturers have evolved to share a common appearance and other major characteristics with only minor cosmetic differences differentiating one from another.

A typical turbine begins generating electricity at wind speeds of 2.5 to 3.5m/s, with optimum power generation at wind speeds of approximately 12 to 20m/s. Turbines usually shut down at wind speeds greater than 25m/s in order to protect themselves from excessive wear. Modern turbines typically turn at 9 to 18 revolutions per minute (rpm) depending on wind speed and type of turbine. The entire nacelle and rotor are designed to swing around, or 'yaw', in order to face the prevailing wind. A wind vane located on the nacelle of the turbine controls the yaw mechanism. Rotors of all 22 No. turbines will rotate in the same direction. A control unit is located at the base of the turbine and an internal ladder leads up to the nacelle where the shaft, gearbox and generator are located.

When operating, the rotational energy of the blades is utilised to drive the wind turbine generator. The generated power is of low voltage and connected via low voltage cables to the wind turbine transformer, which steps up the generated low voltage to medium voltage, reducing electrical losses when transmitting power over large distances. The medium voltage from the wind turbine transformers will connect to the proposed on-site substation, which will be stepped up to high voltage for connection to the transmission system.

Appendix A-1.1.2 Turbine Tower

The turbine tower is typically a conical steel tube with triple paint finish, although modern tower designs also provide for the use of concrete sections. Towers generally comprise a steel ring at the base of the tower, which is assembled on top of the concrete foundations using locally

supplied concrete, and then pre-stressed. The tower is typically delivered to site in three to six sections. The first section is bolted to the steel base, which is cast into the concrete foundation. The base of the tower is typically around 4m in diameter, tapering to approximately 2m where it is attached to the nacelle. The tower is accessed by a galvanised steel hatch door, which will be kept locked except during maintenance.

Appendix A-1.1.3 Turbine Blades

Wind turbine blades are airfoil-shaped blades that harness wind energy and drive the rotor of a wind turbine. The airfoil-shaped-design (which provides lift in a fixed wing aircraft) is used to allow the blades to exert lift perpendicular to wind direction. The difference in air pressure across the two sides of the blade creates both lift and drag. The force of the lift is stronger than the drag and this causes the rotor to spin. The blades of modern turbines are generally made of fibreglass or carbon fibre reinforced polyester and are aerodynamically shaped to improve efficiency and lower noise production.

The wind farm has been designed to accommodate turbines with a blade length of 81m. The turbine delivery haul route utilised for the nearby and constructed Sliabh Bawn windfarm accommodated turbines blades of 49m in length, which is a similar route used for the proposed development. Furthermore, the previous permitted Derryadd Wind Farm application (ABP Ref. 303592-19) demonstrated that the turbine delivery route is capable of accommodating 65m blades to be delivered to the site without issue. While the proposed development will utilise the same delivery route which was previously assessed, an updated traffic and transport assessment has been prepared as part of this EIAR Chapter 15 (Traffic and Transport) with Swept Path Analysis modelling undertaken for an 81m blade.

Appendix A-1.1.4 Turbine Foundations

Construction of the turbine bases will require excavation of the surrounding soil or peat from the foundation and crane hardstanding area to founding level with access being provided from adjacent tracks at or near the surrounding ground level. The soil or peat will be replaced with granular fill where required.

Each wind turbine will require piled foundations, bored foundations or a gravity foundation of reinforced concrete (RC) foundation comprising a base slab bearing onto rock or other competent substrata with a central upstand to support the tower. The foundations for each turbine will be designed by the appointed Civil Designer. Piled foundation, bored foundations and gravity foundation bases are generally 24-26 m in diameter with detailed foundation design being dictated by the local ground conditions.

Each wind turbine is secured to a reinforced concrete foundation that is installed below the finished ground surface. The size of the foundation will be dictated by the turbine manufacturer, and the final turbine selection will be the subject of a competitive procurement process. Different turbine manufacturers use different shaped turbines foundations, ranging from circular to hexagonal and square, depending on the requirements of the final turbine supplier. The turbine foundation transmits any load on the wind turbine into the ground. After the foundation level of each turbine has been formed using piling methods or on competent strata, the bottom section of the turbine tower or "cage" is levelled (Plate A- 1). Reinforcing steel is then

built up around and through the cage (Plate A- 2), and the outside of the foundation is shuttered with demountable formwork to allow the pouring of concrete (Plate A- 3).



Plate A- 1 : Levelled Turbine Anchor Cage



Plate A- 2: Turbine Anchor Cage with Adjustment Feet



Plate A- 3: Completed Turbine Base Cage

Hardstands

Hardstand areas consisting of levelled and compacted hardcore are required around each turbine base to facilitate access, turbine assembly and turbine erection. The hard-standing areas are typically to accommodate cranes used in the assembly and erection of the turbine, offloading and storage of turbine components, and generally provide a safe, level working area around each turbine position. The hard-standing areas are extended to cover the turbine foundations once the turbine foundation is in place.

The hard- standing area is intended to accommodate a crane during turbine assembly and erection. The hard- standing areas shown represent a design based on manufacturer's requirements and seeks to accommodate a number of different turbine types and models.

Appendix A-1.1.5 Assembly Area

Unbound, levelled assembly areas will be located on either side of each hard-standing area. These assembly areas are required for offloading turbine blades, tower sections and hub from trucks until such time as they are ready to be lifted into position by cranes.

Appendix A-1.1.6 Turbine Colour

The turbines are multi-ply coated to protect against corrosion. It is proposed that the turbines would be of an off-white or light grey colour to blend into the sky background. This minimises visual impact as recommended by the following guidelines on wind energy development:

- Department of the Environment, Heritage and Local Government (DoEHLG, 2006); and
- ETSU W/14/005333/00/2000 (TJP Envision Ltd., 1999).

Appendix A-1.1.7 Power Output

The proposed wind turbines have an assumed rated electrical power output of 6 MW. This may vary as a result of the final turbine type, power output modelling and turbine development over the period leading up to construction. For the purposes of this EIAR, a rated output of 6 MW has been used to calculate the power output of the proposed development, which would result in an estimated installed capacity of 132 MW.

Based on the above, the proposed wind farm has the potential to produce up to 337,645 MWh (Megawatt hours) of electricity per year, based on the following calculation: A x B x C = Megawatt Hours of electricity produced per year where:

- A = The number of hours in a year: 8,760 hours
- B = The capacity factor, which takes into account the intermittent nature of the wind, the availability of wind turbines and array losses etc. A capacity factor of 29.2% is applied here and corresponds to the average wind capacity factor for the period 2023. Wind Capacity factor for 2024 is not available yet.
- C = Rated output of the wind farm: 132 MW

The MWh of electricity produced by the Proposed Development would be sufficient to supply a range of approximately 80,392 Irish households with electricity per year, based on the average Irish households using 4.2 MWh of electricity (this latest figure is available from the March 2017 CER Review of Typical Consumption Figures Decision)

Appendix A-1.1.8 Internal Site Access Roads

The proposed wind farm site will be accessed primarily via the main site access A to the southern part of Derryadd Bog, off the R392 and will facilitate both materials delivery (stone, steel and concrete) as well as large oversize components such as turbine blades, tower sections and substation components. Additional access points for HGVs and LGVs are provided on the N63 National Road (Existing Mountdillon access and site Access C (see figure 3-2 below)). Internal site access roads will be constructed as part of the initial phase of the construction of the wind farm. Material will either be won from the proposed borrow pits, if deemed suitable based on testing, or imported into the site to provide the required base of the internal site access roads. The internal site access roads will be a mixture of permanent (construction/operational and amenity) roads, and amenity access track (pathways/cycleways).

New roadways will have a running width of approximately 6 m, with wider section at corners and on the approaches to turbine locations. All new access roads will be constructed with a 2.5% camber to aid drainage and surface water runoff. The proposed new access roads will incorporate passing bays to allow traffic to pass easily while traveling around the site.

Two road construction methodologies will be used:

- Floating Roads; and
- Founded Roads

APPENDIX A-1.2 BORROW PITS

There are four borrow pit locations identified to produce excavated material to provide fill material for roads (for permanent site access roads and amenity access tracks), passing bays, hardstands, upfill to foundations and temporary compounds, dependent on testing results. The borrow pits are all located within Derryadd Bog (i.e., centre of the proposed wind farm site) and are at advantageous locations with regards to the hauling of materials within the site.

Approximate volumes of materials available on site are summarised in Table A- 1. The estimates are based upon specific dimensions so as to provide a safe working zone and to minimise land take.

Table A- 1:Borrow Pit Summary

Borrow Pit	Approximate Surface Area (m^2)	Material composition
Borrow pit 1	112,514	Granular Fill/Rock
Borrow pit 2	50,881	Granular Fill/Rock
Borrow pit 3	46,009	Granular Fill/Rock
Borrow pit 4	13,745	Granular Fill/Rock

Using the average borrow pit depth of ca. 5.5m bgl, the available volume of useable material is 648,379m^3, which includes sand, gravel and stone. No blasting is proposed for extracting material from these borrow pits. Rock breaking, crushing and screening will be required for some of the material won from borrow pits, with some limited rock ripping. Extraction from borrow pits will be from above and below the water table.

Given the volumes of material available from these borrow pits, it is possible that they will fulfil a large portion of the material requirements for the proposed wind farm site. The use of on-site borrow pits will reduce the environmental effect of other aspects of the development by reducing the need to transport material to the site.

Post-construction, the borrow pit area will be partially backfilled with overburden and excavated material from elsewhere on the site and permanently secured. A 2.4 m high chain-link security fence will be erected around the perimeter to prevent access as necessary. Appropriate health and safety signage will also be erected on the security fence and at locations around the borrow pits.

APPENDIX A-1.3 SAND AND STONE REQUIREMENTS

The volumes of granular fill (sand and stone) required for the construction of the proposed development, outlined in the below table, have been estimated based on the proposed development footprint, the anticipated excavation levels to suitable formation or suitable subgrade, and the proposed final levels for the infrastructure components. Construction grade granular fill and higher quality, final surfacing fill (including sand) will be required for the construction of the proposed wind farm site. Granular fill volumes have been estimated using the following methodology:

- The peat beneath the substation, all proposed hardstanding areas including temporary construction compounds will be excavated and replaced with construction grade granular fill up to the existing ground level.
- Roads will generally be constructed as floating roads except in areas with shallow peat and highly trafficked areas (e.g. site entrances and access roads in and out of borrow pits).
- The hardstanding areas and roads will be constructed to the 100-year flood level. Roads will generally comprise approximately 650 mm of granular fill and approximately 150 mm of final surfacing layer (or capping). Geotextile separators will be placed on the subgrade and geogrids will be installed within the road build-up.
- The proposed substation compound will be constructed to approximately 42.588mOD. The peat and unsuitable soil excavated beneath the substation footprint will be replaced with select granular fill in accordance with Eirgrid requirements. The final 250 mm shall comprise capping material.
- The internal site underground cable trenches will be approximately 1200 mm in depth. The cable trench will be backfilled up to approximately 600 mm with peat, within which the ducting will be placed. Suitable materials from the excavations of the trenches will be reinstated to form the final layer of the trench

Table A- 2 outlines the volumes of both the construction grade and surfacing granular fill required.

Table A- 2: Granular Fill Volumes Required

Area		Surface Area m^2	Required stone material (m^3)	Borrow pit stone required (m^3)	Import stone requirement (m^3)	Stone from Turbine excavation (m^3)
Internal Haul Roadways	Enabling works	7,218	5,774	-	5,774	-
Passing Bays	Enabling works	458	275	-	275	-
Substation	Enabling works	15,250	45,750	-	45,750	-
Battery Storage/ EBOP compound	Enabling works	5,000	15,000	-	15,000	-

Construction Compounds 1, 2, 3 & 4	Enabling works	22,400	22,400	22,400	-	-
Internal Site Access Roads	Permanent works	146,070	116,856	102,249	14,607	-
Amenity Access Track	Permanent works	22,467	13,480	11,234	2,247	-
Passing Bays	Permanent works	13,835	11,068	11,068	-	-
Security Hut	Permanent works	600	480	480	-	-
Amenity Carpark	Permanent works	1,045	850	850	-	-
Pump Station Access Tracks & Hardstand Area	Permanent works	10,438	8,350	7,819	531	-
Met Mast Plinth & Hardstand	Permanent works	2,450	2,940	2,770	170	-
Turbine Foundations	Permanent works	11,682	42,845	-	5,841	37,004
Crane Hardstand	Permanent works	58,520	158,004	158,004	-	-
Grid Connection & 110kV access track	Permanent works	1,850	1,295	1,295	-	-
Total			**445,367**	**318,169**	**90,195**	**37,004**

Presently the estimated volumes of compacted material required for construction is 445,367m^3. As not all stone material can be sourced from the on-site borrow pits, importing of stone from licensed external quarries will be required. Stone material estimated to be required for import from local quarries include stone fill directly below the turbine foundation, the surface capping layer on the running surface of the proposed site roadways and hardstands, and all elements of the enabling works package including the substation and battery storage hardstand. An estimation of 90,195m^3 imported stone volume will be required.

APPENDIX A-1.4 ELECTRICITY SUBSTATION COMPOUND

It is proposed to construct a 110 kV substation compound within the site to house the Transmission System Operator (TSO) substation and the Independent Power Producer (IPP) substation. The construction and electrical components of the substations will be to EirGrid specifications. Further details regarding the connection between the substation and the national electricity grid are provided in Appendix A-1.7. The footprint of the proposed substation is approximately 135m in length by approximately 101m. The substation footprint will include two control buildings (Appendix A-1.6) and electrical apparatus necessary to facilitate the generated power from the wind turbines to export onto the transmission system.

APPENDIX A-1.5 BATTERY STORAGE

Provision has been made for a battery energy storage system. This includes 20 no. containerised modules with the following dimensions per container 13.5 m x 4.7 m x 2.8 m. The containerised modules will be mounted on concrete foundations; 2no. adjoining containers per foundation.

APPENDIX A-1.6 SUBSTATION CONTROL BUILDINGS

The TSO and IPP control buildings will be located within the substation compound. The TSO control building will measure approximately 25 metres by 18 metres and approximately 9.7 metres in height. The IPP control building will measure approximately 19 metres by 12 metres and approximately 7.0 metres in height

Both control buildings will include welfare facilities for the staff. Toilet facilities will be installed with a low-flush cistern and low-flow wash basin. Due to the specific nature of the proposed development, there will be a very small water requirement for occasional toilet flushing and hand washing and therefore the water requirement of the proposed development is minimal. It is proposed to install a groundwater well adjacent to the substation in accordance with the Institute of Geologists Ireland, Guide for Drilling Wells for Private Water Supplies (IGI, 2007). The well will be flushed to the ground and covered with a standard manhole. A pump house is not currently required as an in-well pump will direct water to a water tank within the roof space of the control building (subject to final design). It is proposed to manage wastewater from the staff welfare facilities in the control buildings by means of a sealed storage tank, with all wastewater being tankered off-site by a permitted waste collector to a wastewater treatment plant. It is not proposed to treat wastewater on-site, and therefore the EPA's '*Code of Practice: Wastewater Treatment and Disposal Systems Serving Single Houses'* (EPA, 2021) does not apply. Similarly, the EPA's manual on '*Treatment Systems for Small Communities, Business, Leisure Centres and Hotels'* (EPA, 1999) also does not apply, as it too deals with on-site treatment of wastewater.

Such a proposal for managing the wastewater arising on site has become standard practice on wind farm sites, which are often proposed in areas where finding the necessary percolation requirements for on-site treatment would be challenging and has been accepted by numerous Planning Authorities and ACP as an acceptable proposal. The proposed wastewater storage tank will be fitted with an automated alarm system that will provide sufficient notice that the tank requires emptying. Full details of the proposed tank alarm system will be submitted to the Planning Authority in advance of any works commencing on-site. The wastewater storage tank alarm will be integrated with the on-site electrical equipment for alarm notification that will be

monitored remotely 24 hours a day, 7 days per week. Only waste collectors holding valid waste collection permits under the Waste Management (Collection Permit) Regulations, 2007 (as amended), will be employed to transport wastewater away from the site. When the final destination of the materials is known following the appointment of a permitted contractor, this information will be submitted to the Planning Authority if necessary.

APPENDIX A-1.7 UNDERGROUND CABLING FROM TURBINES TO SUBSTATION

Each turbine will be connected to the proposed on-site 110kV substation via underground Medium Voltage (MV) cables. Fibre-optic cables will also connect each wind turbine to the wind turbine control system located within the IPP Control Building. The electrical and fibre-optic cables running from the turbines to the substation compound will be run in cable ducts approximately 1.2m below the ground surface within the proposed wind farm internal roadways.

APPENDIX A-1.8 GRID CONNECTION

The proposed 110 kV substation will be connected to the national electricity grid via a loop-in connection to the nearby Lanesborough-Richmond 110kV Overhead Line (OHL) Network, located approximately 250m south of the proposed substation. The loop-in connection will comprise of high voltage underground cables connecting the substation to the Lanesborough-Richmond 110kV OHL.

All new build transmission infrastructure required for the proposed development is contained within the proposed wind farm site, while the proposed underground cables will cross under the N63 National Road which is located between the substation and Lanesborough-Richmond OHL. The proposed development requires approximately 460m of 110kV underground cable (UGC) installation from the 110kV onsite substation to the existing OHL to the south. The entire UGC has been assessed throughout this EIAR, where relevant.

The 110kV cable route from the proposed substation to the existing Lanesborough-Richmond 110kV OHL encounters a number of natural and manmade obstacles along the route that will require minor amendments to the cable installation methodology. The location, description and methodology amendments are detailed in Table A- 3 below.

Table A- 3: Cable Routes Installation Methodology Variations

Location	Description	Installation Methodology
N63 National Road Crossing	Horizontal Directional Drilling (HDD)	• Work areas will be fenced on both sides of the HDD away from the N63 road. • The drilling rig and fluid handling units located on one side of the crossing will be stored on double bunded 0.5mm PVC bunds which will contain any accidental fluid spills and storm water run-off. • Entry and exit pits (1m x 1m x 2m) will be excavated; the excavated material will be temporarily stored within the works area and used for reinstatement or disposed of to a licensed facility.

Location	Description	Installation Methodology
		• A 1m x 1m x 2m steel box will be placed in each pit. This box will capture any drilling fluid returns from the borehole. • The drill bit will be set up by a surveyor, and the driller will push the drill string into the ground and will steer the bore path under the stream-ways and the forestry. • A surveyor will monitor drilling works to ensure that the modelled stresses and collapse pressures are not exceeded. • The drilled cuttings will be flushed back by drilling fluid to the steel box in the entry pit. • Once the first pilot hole has been completed a hole-opener or back reamer will be fitted in the exit pit and will pull a drill pipe back through the bore to the entry side. • When all bore holes have been completed, a towing assembly will be set up on the drill and this will pull the ducting into the bore. • The steel boxes will be removed, and the drilling fluid disposed of to a licensed facility. • The ducts will be cleaned and proven and their installed location surveyed. • The entry and exit pits will be reinstated as per the landowners' requirements. • 3 Days is assumed for completion of this work.
Crossing point at existing culverts	Utilising Existing Culvert at drain	Sufficient space for the proposed 110 kV cable to perform an over-the-top crossing between the top of the culvert material and the surface of the road. Depth is approximately 1m

Due consideration will be given to the possible presence of existing underground and overhead services, traffic management requirements and existing ground conditions within the designated working area for the grid connection. Before the construction commences, contractors will carry out detailed site investigations along the proposed route in advance of the approved designs being finalised for the UGC trenching and ducting civil works. These site investigations will include slit trenches along the roadways to detail the route and ensure sufficient space to install a 110kV cable trench typically measuring approximately 0.6m (width) by 1.2m (depth). The cables will be laid in trenches as per Eirgrid/ESB Networks Specification, similar to the underground cable duct installation shown in Plate A- 4.

At the crossing point on N63 National Road, the cable duct will be drilled under the road using single shot Horizontal Directional drilling (HDD). The cable duct will be drilled at 2m depth. A launch pit for the directional drilling run will be excavated on one side of the road and a reception pit will be excavated on the other side. A pilot borehole will be drilled on the proposed route and this hole will be enlarged by passing a larger cutting tool of sufficient diameter to allow the cable duct to pass. The cable duct will be pulled through the hole by the drill stem and cutting head to allow for the centring of the pipe through the newly cut hole.

The proposed design for the 110kV Loop-In from the existing OHL will require two new Line Cable Interface Masts (LCIM; Plate A- 5), which will be constructed under the existing Lanesborough-Richmond 110kV OHL. The existing OHL conductor will be terminated at these towers connecting to the substation via underground cable. LCIMs are used where a high-

voltage underground cable connects to an overhead line and comprises of a mast and associated equipment



Plate A- 4: Typical Cable Duct Installation

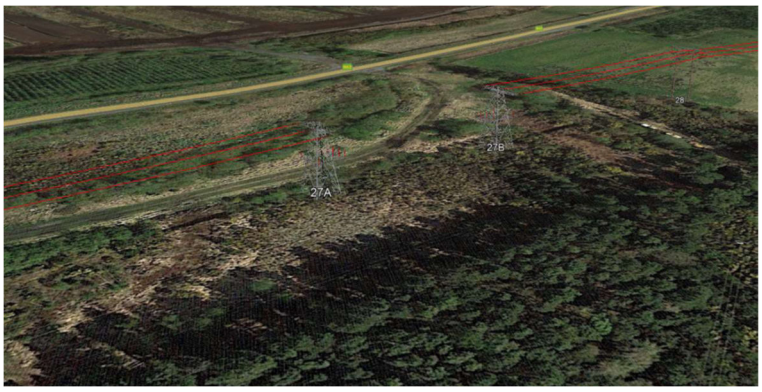


Plate A- 5: Line Cable Interface Mast

The proposed LCIMs are within the proposed wind farm site. Each mast has a footprint of approximately 45m^2 and an overall height of up to 20m. They will be lattice steel structures with cross-arms which can extend over the base footprint and internal bracing.

The duration of works of the overhead line construction is expected to be approximately 12 weeks. Construction of foundations for masts circa. 7 days each, with time allowing for curing of the concrete, erection of the masts circa 5 days each, weather dependant. Stringing of conductor will be a 2-week process and final connection to the existing grid will be carried out by ESBN (ESB Networks) and at that point in time commissioning of the substation can start.

APPENDIX A-1.9 LOCAL ELECTRICITY SUPPLY

As part of the development, a local supply will be required as a back-up power supply to the proposed substations for light, heat and power purposes. The local electricity supply adjacent to the proposed substation compound (i.e. N63 National Road) will be utilised. The local supply will be designed and constructed by ESB Networks. The exact source of supply is to be confirmed, however, the supply will enter the site by either MV overhead line or MV cable. The rural/local supply will have an associated step-down transformer (i.e. MV to LV) and will enter the substation building by underground cable and terminate onto the control building AC distribution board.

APPENDIX A-1.10 METEOROLOGICAL MASTS

Two permanent meteorological masts are proposed as part of the proposed development. The met masts will be equipped with wind monitoring equipment at various heights. Each mast will

be a slender, free- standing lattice structure, each 120 metres in height. The masts will be constructed on a hardstanding area sufficiently large to accommodate the crane that will be used to erect the mast, adjacent to the existing track.

APPENDIX A-1.11 TEMPORARY CONSTRUCTION COMPOUNDS

Four temporary construction compounds are included as part of the proposed development; the four temporary compounds strategically situated to serve wind farm construction on all bogs (i.e. south of Derryaroge, south of Derryadd, and north of Lough Bannow bogs - Table A- 4).

Table A- 4: Temporary Construction Compounds

Compound No.	Location	Townland	Dimensions	Total Area (m^2)
1	Existing Mountdillon Works Yard	Cloonfore	130m x 75m	9,750
2	West of proposed onsite substation in Derryadd Bog and North of Mountdillon Works	Cloonfore	100m x 40m	4,000
3	South of T15 in Derryadd Bog	Derraghan More	100m x 40m	4,000
4	West of T16 in Lough Bannow Bog	Cloontabeg	100m x 40m	4,000

The construction compounds will typically consist of temporary site offices, staff welfare facilities, storage areas (including waste and recycling areas), and car-parking areas for staff and visitors. The layout of the temporary construction compounds is shown on Planning Drawings 11399 – 2029 to 2030.

Temporary toilets will be used during the construction phase as part of the welfare facilities for site staff and visitors. Wastewater from toilets will be directed to a sealed storage tank, which will be collected and tankered off site by an appropriately consented waste collector to wastewater treatment plants.

APPENDIX A-1.12 TEMPORARY SECURITY CABINS

four temporary security cabins will be installed within the site for the duration of the construction phase of the proposed development. The temporary security cabins will be located at the main site entrance points; Site Entrance A, Site Entrance B, Site Entrance C and the existing entrance at Mountdillon Works.,

Each security cabin will be the same prefabricated structure measuring 7.2m by 2.5m, and 2.85m in height. Each temporary security cabin will serve as the check in and check out point for staff and visitors during the construction phase only and will be removed as part of the post-construction reinstatement works upon commissioning of the proposed development.

APPENDIX A-1.13 AMENITY TRACK AND CARPARKS

A total of approximately 18km of site roads within the proposed wind farm site will provide permanent amenity access (including pedestrian and cyclist access) once the proposed development construction phase has concluded. An additional c.7.5km of dedicated amenity track is also proposed to provide connectivity to local roads and allow local access to the wind

farm amenity areas. These amenity tracks will have a gravel/crushed stone finish surface and will be approximate 3m in width on average.

The approximate 7.5 km of dedicated amenity access tracks will provide linkages between the proposed wind farm site roadways, royal canal greenway (to the east of the proposed wind farm site) and the Corlea Visitor Centre and amenity areas (to the south) and the Midlands Trail Networks project (Planning Reference No: 24/60132 (to the north)).

In addition to the amenity access tracks, 3 no. new permanent amenity car parks will be provided. Two of these car parks are located within the construction compounds (Compound No.1 and Compound No. 3) which will be converted into permanent amenity carparks following completion of the construction phase. The remaining carpark is located along the local access road on the western boundary of Derryaroge bog. The existing amenity carpark area at Corlea Bog (L1136 Local Road) adjacent to the proposed amenity access track in Lough Bannow Bog will accommodate amenity car parking access to the proposed development. Additionally, the carpark of the Midlands Trail Networks project (Planning Reference No: 24/60132), which is located across the local road, will connect to the proposed amenity access track north of Derryaroge Bog and will accommodate for amenity car parking access to the proposed development.

APPENDIX A-2.0 TURBINE DELIVERY ROUTE

The turbine delivery route (TDR) has been identified from a detailed Swept Path Analysis and traffic and transport assessment (Appendix G). The port of entry is unknown as this is often determined by the turbine manufacturer, which will be subject to a competitive procurement process. It is assumed that turbine delivery will be coming from Galway Port or Foynes Port. A detailed Swept Path Analysis from the final portion of the route has been completed from the N6 Eastbound Slip Road in Athlone.

The deliveries of turbine components to the site will be made in convoys of three to five vehicles and mostly at night when roads are quietest. Convoys will be accompanied by escorts at the front and rear operating a "stop and go" system. Although the turbine delivery vehicles are large, they will not prevent other road users or emergency vehicles passing, should the need arise. The delivery escort vehicles will ensure the turbine transport is carried out in a safe and efficient manner with minimal delay or inconvenience for other road users.

APPENDIX A-3.0 SURFACE WATER MANAGEMENT

APPENDIX A-3.1 EXISTING SITE DRAINAGE

The proposed development is located within a former peat extraction site. An extensive network of drainage channels is present throughout the peatland, which is managed under IPC licence P0504-01 Mountdillon Bog Group (Appendix D).

The surface of the cutover bog is drained by a network of parallel northwest-southeast generally orientated field drains that are typically spaced every 15-20m. The field drains are approximately 0.5-1.5m deep and, in most areas, they intercept the mineral subsoil underlying the peat. These field ditches mostly feed into larger surface water ditches, which drain the main catchments across the three bog formations. The surface water drains are primarily in a

northwest-southeast orientation, but there are a number of shorter cross drains which intersect the small field drains. There are also a number of pump stations located at low points in the larger drains to direct the surface water to the outfall locations and boundary drains. There are various outfalls on the bog boundaries, which comprise mainly pumped outfalls, but also some areas of gravity drainage. Surface water draining/pumped from the site is routed via existing IPC settlement / slit ponds (in accordance with the IPC licence requirements) prior to discharge into off-site drainage channels, streams and rivers which ultimately flow into the River Shannon and Lough Ree. A flood risk assessment was undertaken, which included a description of the existing drainage system, and proposed drainage features for the Construction Phase of the proposed wind farm (Appendix F).

APPENDIX A-3.2 PRELIMINARY DRAINAGE DESIGN CONCEPT

The surface water drainage system utilises sustainable drainage devices and methods, where appropriate, with surface water runoff to be maintained at greenfield runoff rates. The drainage layout for the operational stage of the proposed development has been designed to collect surface water run-off from hardstanding areas within the proposed development and discharge to construction settlement ponds prior to entering existing drainage system within the bogs. This treated water will then move into the existing bog drainage network at appropriate greenfield run-off rates. Any treated surface water from the wind farm that finds its way into the existing drainage system will then be captured in the existing system of silt ponds before final discharge to the receiving watercourse. There will be no direct discharges from the proposed wind farm to any existing natural watercourse.

During the construction phase, all run-off from construction areas will be controlled and treated to reduce suspended solids concentration prior to being discharged into the existing drainage network. Suspended solid (silt) removal features will be implemented in accordance with CIRIA C753 (Ballard *et al.*, 2015), and CIRIA C648 (Murnane *et al.*, 2006).

Within the proposed development layout there are sections of proposed floating road between turbine infrastructure. In these sections, and depending on intermediate topography, a collector drain (dirty water system, as described above) may be used during construction stage, or over the edge (OTE) drainage will occur. Over the edge drainage allows runoff from access tracks to flow into local field drains and be managed via the existing site drainage system. OTE drainage will only occur where topography allows, and it is only proposed in areas of low risk and remote from outfall locations (at least 150m from bog outfall locations). Silt traps and check dams will be installed in field drains downstream of OTE drainage areas, and these will provide attenuation and water treatment.

During the construction phase, all runoff from works areas will be attenuated and treated prior to being released within the proposed wind farm site. All drainage outfall from the proposed wind farm site is routed through existing settlement ponds that remain in-situ from the previous site use.

All temporary and permanent drainage from the site shall be designed to have as a minimum three stages of treatment, as defined in by Ballard *et al.* (2015). Management of runoff will include:

- Filtration of water through filter media (sand / stone check dam, silt fence);

- Detention / settlement in settlement ponds or behind check dam in swales; and
- Conveyance of shallow depths of water in vegetated swale.

The proposed wind farm site drainage process flow is shown in the figure below employing the measures further described below.

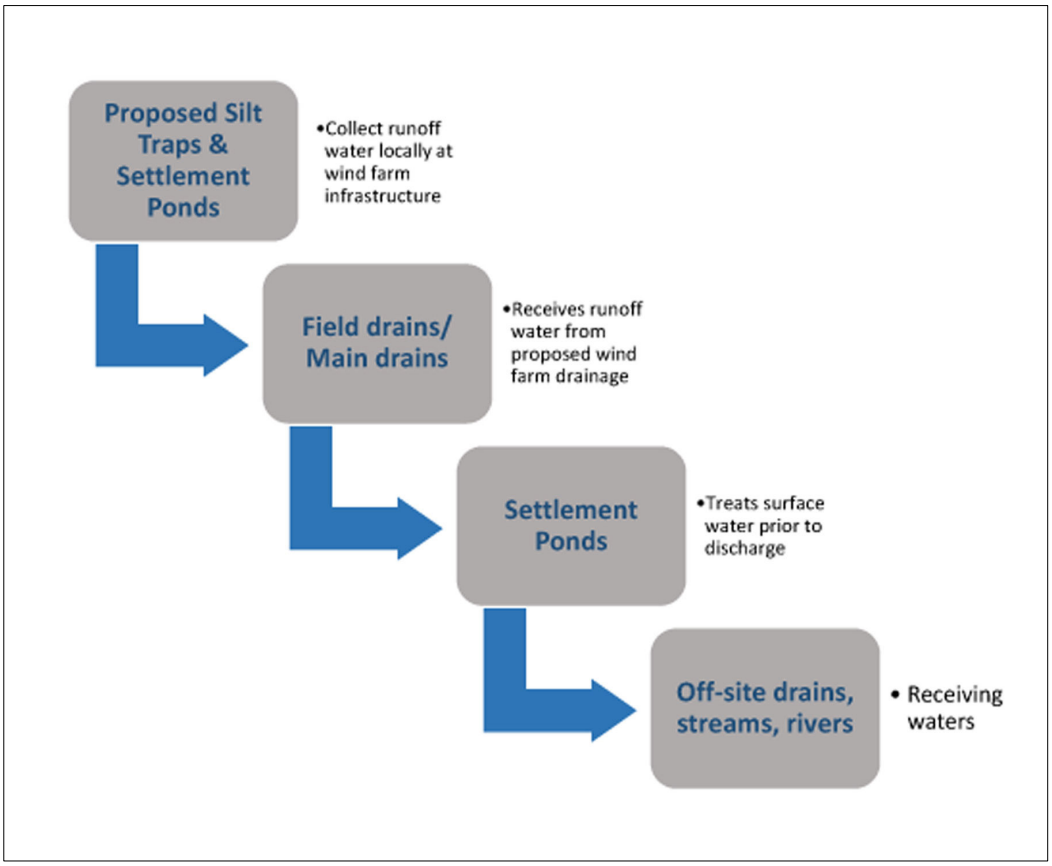


Figure A- 1: Proposed Wind Farm Drainage Process Flow

Appendix A-3.2.1 Interceptor Drains

Interceptor drains/diversion ditches will be installed ahead of the main earthworks activities to minimise the effects of collected water on the stripped/exposed soils once earthworks commence. This drainage will integrate into the existing peatland drainage. These drainage ditches will be installed on the upgradient boundary of the areas affected by the access track earthworks operations and installed ahead of the main track construction operations commencing. They will generally follow the natural flow of the ground. The interceptor drains will intercept any storm water surface run-off and collect it to the existing low points in the ground, allowing the clean water flows to be transferred independently through the works without mixing with the construction drainage. It will then be directed to areas where it can be redistributed over the ground by means of a level spreader.

Appendix A-3.2.2 Swales

Track edge drainage/swales are required to control run-off from the running surface to lower water levels in the subgrade, to control surface water and to carry this flow to outlet points. Swales along access tracks are to be installed in advance of the main construction phase. On sections of track where there is significant longitudinal gradient, regular surface water

interception channels will be employed – these will typically be at 10-20 m intervals to collect any surface water that is discharging as sheet flow along the track and discharge the flow into the trackside swale.

Appendix A-3.2.3 Temporary Construction Settlement Ponds

Run-off arising from the development will discharge into settlement ponds specifically constructed for managing surface water from the proposed wind farm. Settlement ponds will be located downstream of road swale sections and at turbine/hardstand locations, to manage/buffer volumes of runoff discharging from the drainage system during periods of high rainfall, thereby reducing the hydraulic loading to watercourses. Settlement ponds will be located as close to the source of sediment as possible while also maintaining the appropriate setback distance from existing watercourses (i.e. 50 m).

Once treated in the settlement pond the treated surface water will then be allowed to spread across the adjacent cutaway peatland. A number of temporary peat settlement ponds will be established during the construction phase along roadways and in areas of high construction activity to minimise silt laden run-off entering the drainage network. Those not required permanently shall be reinstated upon completion of the main construction works.

As discussed above, it is proposed to limit the rate of outflow from the development area through a variety of measures, which can be classified as sustainable drainage measures. Permanent ponds are proposed for management of run-off from the proposed development areas. Additional ponds will be provided during the construction stage, as required, to accommodate the additional levels of sediments anticipated during this stage.

Subject to potential planning permission and associated conditions, and prior to commencement of construction activity, this drainage design (including construction specific measures) will be reviewed by the appointed Contractor as part of the review of the Construction Environmental Management Plan (CEMP; Appendix N).

A Surface Water Management Plan (SWMP) has been developed to ensure that all site works are conducted in an environmentally responsible manner so as to minimise any adverse effects from the proposed development on surface water quality. The plan incorporates the following specific objectives:

- Provide overall surface water management principles and guidelines for the construction phase of the proposed development;
- Address erosion, sedimentation and water quality issues; and
- Present measures and management practices for the prevention and/or mitigation of potential downstream effects.

During the operational phase of the proposed development, the management of surface water will be carried out in accordance with the proposed design and associated management features. The design of the wind farm has been developed following a detailed examination of the existing drainage system on site. The drainage design ensures that any surface water arising from the proposed wind farm operation will be contained and treated to ensure it can be dispersed out from the proposed development without any significant effects.

The decommissioning phase will utilise the proposed operation phase infrastructure and follow future best practise decommissioning measures in place to minimise effects.

The protection of water quality and prevention of pollution events requires a sustained and concentrated input from the Contractor with regard to the provision and maintenance of sediment control structures. The drainage system, as it is designed, does not affect the existing drainage regime on site.

APPENDIX A-3.3 SILT CONTROL

Silt control measures will be implemented, as required, during the construction phase. Dewatering silt bags allow the flow of water through them, while trapping any silt or sediment suspended in the water. The silt bags provide a passive, non-mechanical method of removing silt from silt-laden water collected from works areas within a construction site. Silt bags will be disposed by a licensed waste contractor.



Plate A- 6: Examples of Proprietary Silt Control Measures

In specific locations, silt fences (Plate A- 6) will be installed as an additional water protection measure around existing watercourses, particularly where works are proposed within 50m from a stream.

APPENDIX A-3.4 OVERT THE EDGE DRAINAGE (OTE)

Within the proposed development layout there are sections of proposed floating road between turbine infrastructure. In these sections, and depending on intermediate topography, a collector drain may be used during construction stage, or over the edge (OTE) drainage will occur. Over the edge drainage allows runoff from access tracks to flow into local field drains and be managed via the existing site drainage system. OTE drainage will only occur where topography allows, and it is only proposed in areas of low risk and remote from outfall locations (at least 150m from bog outfall locations). Silt traps (Plate A- 7) and check dams will be installed in field drains downstream of OTE drainage areas, and these will provide attenuation and water treatment.



Plate A- 7: Examples of Silt fences

APPENDIX A-3.5 CULVERTS

Culverts will be required where site roads, crane pads and turbine pads cross the main bog drainage network. Precast concrete culverts of 600mm and 1200mm in diameter will be provided.

APPENDIX A-4.0 PEAT MANAGEMENT

The proposed wind farm site is flat, and consists predominantly of bare, locally re-vegetated cutaway and shallow peat, with an established drainage network. The site has been harvested by Bord na Móna using mechanical harvesting equipment. Bord na Móna has experience managing peat in similar terrain, both during peat production operations and during wind farm construction projects, particularly Mountlucas, Bruckana, Cloncreen and Oweninny wind farms. These projects have demonstrated safe and effective methods for peat management and

storage. The proposed methodology as outlined in the Peat Management Plan is summarised below:

- The following recommendations/best practice guidelines for the placement of peat and non-peat spoil alongside the proposed infrastructure elements should be considered and taken into account during the Construction Phase; and
- All excavated peat and non-peat will be placed/spread alongside the proposed infrastructure elements on site, where possible.

APPENDIX A-4.1 PEAT QUANTITIES

The approximate quantity of peat and non-peat material (spoil) requiring management for the proposed development has been calculated, as presented in Table A- 5. These quantities were calculated as part of the Peat Management Plan.

Table A- 5: Approximate Peat and Spoil Volumes Requiring Management

Development Components	Peat Volumes (m^3)	Spoil Volumes (m^3)
22 no. Turbines and Hardstanding Areas	70,2823	142,811
Site Access Roads	3,840	0
Temporary Construction Compounds and Security Cabin Compounds	0	0
Substation	49,585	5,490
Battery Storage	4,242	1,818
2 Met Masts and hardstands	3,528	504
Borrow Pits	156,126	419,184
Cable and grid route connection	12,096	0
Total Peat and Spoil to be managed (m^3)	**299,700**	**569,807**

APPENDIX A-5.0 CONSTRUCTION MANAGEMENT

APPENDIX A-5.1 CONSTRUCTION TIMING

The Construction Phase will take approximately 24 months, from starting onsite to completion of turbine commissioning. All vegetation clearance that is required during construction works will commence outside the breeding bird season, which runs from the 1st of March to the 31st of August.

The hours of construction activity will be limited to avoid unsociable hours where possible. Construction operations shall generally be restricted to between 08:00hrs and 20:00hrs weekdays and between 08:00hrs and 13:00hrs on Saturdays.

APPENDIX A-5.2 CONSTRUCTION SEQUENCING

The construction phase can be broken down into three main phases:

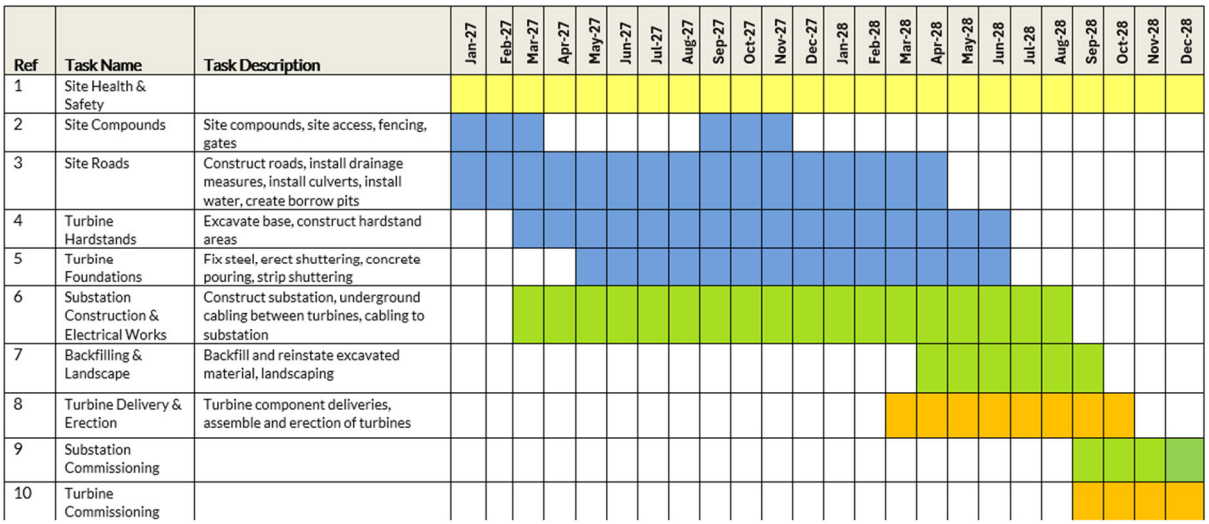
1) Civil engineering works: approximately 18 months;
2) Electrical works: approximately 18 months (will commence shortly after the civil works and will then run in parallel); and
3) Turbine erection and commissioning: approximately 9 months.

The main tasks under each phase are outlined below.

- **Civil Engineering Works**:
    - Create new entrance(s) and hardcore existing entrances (where required).
    - Construct new internal site access roads, drainage ditches and culverts. The internal site access roads will be a mixture of permanent (construction/operational and amenity) internal site access roads and amenity access tracks.
    - Construct internal site access roads to borrow pit locations and open borrow pits.
    - Clear and hardcore area for temporary construction compounds, including material storage, site welfare facilities, and site offices and install.
    - Construct turbine hard-standings and crane pads.
    - Construct substation compound and associated drainage ditches and culverts.
    - Construct electrical apparatus bases/plinths and bund for transformer.
    - Excavate/pile as required for turbine bases. Sidecast or store soil/peat locally for backfilling and re-use, if deemed feasible.
    - Place blinding concrete to turbine bases using either a piled solution or on competent strata. Fix reinforcing steel and anchorage system for tower section. Construct shuttering. Fix any ducts to be cast in. Pour concrete bases. Cure concrete. Remove shutters after 1-2 days.
    - Decommission existing 100 m high meteorological mast at Lough Bannow bog.
    - Install new 120 m high permanent meteorological masts.
    - Excavate cable trenches and install electrical ducting
- **Electrical Works**
    - Install external electrical equipment at substation;
    - Install transformer at substation compound;
    - Erect stock proof and palisade fencing around substation area;
    - Install internal collector network and communication cabling; and

- Construct grid connection.

- **Turbine Erection and Commissioning**
  - Backfill tower foundations and cover with suitable material;
  - Erect towers, nacelles and blades;
  - Complete electrical installation;
  - Commission and test turbines;
  - Complete site works and reinstate site;
- Remove temporary construction compounds including material storage, site welfare facilities, and site offices. Construct permanent amenity parking in location of temporary compounds no. 1 and 3.
  - Provide any gates, landscaping, signs, etc. which may be required.



Ref	Task Name	Task Description	Jan-27	Feb-27	Mar-27	Apr-27	May-27	Jun-27	Jul-27	Aug-27	Sep-27	Oct-27	Nov-27	Dec-27	Jan-28	Feb-28	Mar-28	Apr-28	May-28	Jun-28	Jul-28	Aug-28	Sep-28	Oct-28	Nov-28	Dec-28
1	Site Health & Safety																									
2	Site Compounds	Site compounds, site access, fencing, gates																								
3	Site Roads	Construct roads, install drainage measures, install culverts, install water, create borrow pits																								
4	Turbine Hardstands	Excavate base, construct hardstand areas																								
5	Turbine Foundations	Fix steel, erect shuttering, concrete pouring, strip shuttering																								
6	Substation Construction & Electrical Works	Construct substation, underground cabling between turbines, cabling to substation																								
7	Backfilling & Landscape	Backfill and reinstate excavated material, landscaping																								
8	Turbine Delivery & Erection	Turbine component deliveries, assemble and erection of turbines																								
9	Substation Commissioning																									
10	Turbine Commissioning																									

The phasing and scheduling of the main construction task items is outlined above, where 'January 2027' has been selected as an example start date for construction activities.

APPENDIX A-6.0 CONSTRUCTION METHODOLOGIES

APPENDIX A-6.1 TEMPORARY COMPOUNDS, HARDSTANDS, MATERIAL STORAGE AREAS AND SITE OFFICES

At the commencement of the Construction Phase, four temporary compound areas will be constructed to provide office space, welfare facilities, hardstands for storing materials and hazardous materials.

The site accommodation is likely to consist of temporary porta-cabins constructed on a granular platform. The peat/topsoil will be stripped where hardstands or development is proposed. The hardstanding's shall be constructed to heights of >0.5 m above existing ground level based on the various extents of potential surface water flooding across the site.

Ground investigation in the form of peat probing and trial pitting has been carried out along the proposed turbine and hardstanding locations to inform the depth of excavation and upfill required. Preliminary volume calculations provide a rough estimation of fill required for the hardstands and access tracks.

It is likely that the majority of this material volume (particularly subbase) will be obtained from onsite borrow pits. Any volumes of materials required from offsite quarries will only be sourced from those which are within a reasonable proximity of the site.

APPENDIX A-6.2 TURBINE FOUNDATIONS

Foundations for wind turbines may be of the gravity, bored or piled type. Trial pitting and/or windrow sampling has been carried out at each of the turbine base locations. The geotechnical investigations to date indicate that the majority of the foundations at the proposed wind farm site will be piled with some turbines being able to utilise gravity foundations. Piling depths will depend on site conditions. Pre-construction final design will be carried out. Additional geotechnical investigations will be undertaken at each turbine location with associated sampling and laboratory testing.

For the piled turbine foundations, the piling type and configuration could be up to 50 - 70 no. 300 mm x 300 mm square concrete driven piles or up to 20 no. 600 – 1200mm cylindrical piles diameter bore piles for the bored turbine foundations. While final piling depths will depend on localised ground conditions as discussed, the drawings detail a piling depth of 15 m – 18 m for indicative purposes.

A Peat Stability Risk Report has been prepared for the proposed development, including the turbine foundations.

Each of the turbines to be erected on site will have a reinforced concrete base. Overburden will be stripped off the foundation area to a suitable formation using a 360° excavator and will be placed across the site as close to the excavation as practical. A five-metre-wide working area will be required around each turbine base, with the sides of the excavated areas sloped sufficiently to ensure that slippage does not occur. Material excavated to create the working area will be stored locally for later reuse in backfilling the working area around the turbine foundation. The excavated material will be surrounded by silt fences to ensure sediment-laden run-off does not occur.

The formation material will be approved by an Engineer as meeting the turbine manufacturer's requirements. In the case of gravity foundations, if the formation level is reached at a depth greater than the depth of the foundation, the ground level will have to be raised with compacted structural fill. Drainage measures will be installed to protect the formation by forming an interceptor drain around the perimeter of the base which will outfall out at the lowest point level with the spreader or settlement pond. In the case of piled foundations, the piling of concrete piles to the required depth will be carried out. The piles will either be constructed by coring and inserting a steel sleeve which will be filled with reinforced concrete prior to sleeve removal, or driven. Where piling is carried out soil/peat will be excavated with the provision of a surrounding work area to allow placing of shuttering etc.

An embankment approximately 600mm high will be constructed around the perimeter of each turbine base where required and a fence or berm will be erected to prevent construction traffic from driving into the excavated hole and also to demarcate the working area. All necessary health and safety signage will be erected to warn of deep excavations etc. Access to and from excavated bases will be formed by excavating a pedestrian walkway to a standard 1:12 grade (appropriate for designated walking routes and recreational trails).

There will be a minimum of 100mm of blinding concrete laid on the formation material positioned using concrete skip and 360° excavator to protect ground formation and to give a safe working platform.

An approved and certified mobile telescopic crane or teleporter of suitable size will be used to unload reinforcing steel to required areas. The turbine anchor cage will be assembled and lifted into position using a crane and approved lifting appliances, prior to fixing the bottom matt of steel, reinforcing steel will be positioned around the anchor cage in accordance with the turbine suppliers' requirements. The anchor cage will be levelled using the adjustable base plates at the base of the anchor cage. The top flange of the anchor cage will be checked to ensure it is level using an automatic optical level. The remaining reinforcing steel will then be fixed and earthing material attached. The level of the anchor cage will be checked again prior to, and during the concrete pour. The detailed design and exact dimensions will be determined once a turbine manufacturer has been selected following a competitive procurement process.

Formwork to concrete bases will be propped/supported sufficiently so as to prevent failure. Concrete for bases will be poured using a concrete pump. After a period of time when the concrete has set sufficiently, the top surface of the concrete surface is to be finished with a power float.

Once the base has sufficient curing time it will be filled with suitable fill up to existing ground level. The working area around the perimeter of the foundation will be backfilled with suitable material.

APPENDIX A-6.3 INTERNAL SITE ROADS AND CRANE PAD AREAS

Internal site access roads will be constructed to each turbine base and at each base a crane hard standing will be constructed to the turbine manufacturer's specifications. Tracked excavators will carry out excavation for roads with appropriate equipment attached. Material excavated to create the working area will be stored locally for later reuse in backfilling the working area around the turbine foundation. Any surplus excavated peat will be side cast, profiled and bermed as close to the excavation areas as practical as set out in the Peat Management Plan. A two to three-metre-wide working area will be required around each hard-standing area, with the sides of the excavated areas sloped sufficiently to ensure that slippage does not occur.

When the formation layer has been reached, stone from the on-site borrow pits or local quarries shall be placed to form the road foundation. In the event of large clay deposits being encountered in sections of road, a geotextile layer will be required at sub base level. The sub grade will be compacted with the use of a roller or other approved compaction method. The final top layer of unbound material will not be provided until all turbine bases have been poured. This prevents damage to the wearing course due to stone and concrete trucks movements. All roads will be maintained for the duration of the project.

APPENDIX A-6.4 BORROW PITS

Extraction from borrow pits will be from above and below the water table.

The construction of the borrow pits will follow a standard sequence, as follows:

- Prior to work commencing, an extensive GPR scan for hidden services will be carried out and services will be relocated where required.

- The working area will be cordoned using temporary fencing.
- Extraction plant and vehicles on low loaders will be mobilised to site.
- An interceptor drain will be installed upslope of the borrow pit, where necessary. This drain will divert any surface water away from the borrow pit and hence prevent water from ponding and lodging during construction and when reinstated.
- Peat layer will be stripped and stored in the peat deposition area adjacent to the borrow pit. Other extracted materials deemed unsuitable following testing, for re-use will be temporary stored in the adjacent deposition area.
- Peat and spoil materials will be stored separately but spoil material can be used in cell berms to contain excavated peat material. Slopes of a maximum of 1(H):3(V) will be used in peat material and 1(H):2(V) in spoil material. However suitable drainage will be required.
- Material will be extracted using excavators.
    - A large rock breaking excavator progressively breaks out the solid rock from the ground in the borrow pit areas
    - A smaller rock breaker, in the 30-40 tonne size range, then breaks the rocks down to a size that can then be fed into a crusher
    - Other extracted materials deemed unsuitable following testing, for re-use will be reinstated within the borrow pits.
- Material will be processed to crush cobbles and boulders by using a mobile crusher and screener. The extracted, broken rock is loaded into a mobile crusher using a wheeled loading shovel and crushed down to the necessary size of graded stone required for the on-site civil works.
- The processed material will be stockpiled in designated areas within the borrow pit.
- A site access road to the borrow pit will be constructed to tie in with the internal site access road infrastructure.
- Processed material will be loaded into lorries or articulated dumpers and transported to areas within the site for the construction of internal roads, hardstand, compound and other infrastructure which require stone fill.
- Temporary excavation side slopes will be designed by a geotechnical engineer.
- Upon completion, all faces of excavation will be constructed to safe permanent side slopes to be designed by a geotechnical engineer.
- Infilling of the peat and spoil will commence at the back edge of the borrow pit and progress towards the borrow pit entrance.
- The surface layer will be placed with the vegetation part of the sod facing the right way up to encourage growth of plants and vegetation at the surface of the peat and spoil.
- Extraction plant and vehicles on low loaders will be demobilised via internal site roads and main site entrance.

APPENDIX A-6.5 SUBSTATION AND GRID CONNECTION

The main elements of the electricity substation, which comprises the TSO (Transmission System Operator) substation and the Independent Power Producer (IPP) substation, will be constructed as follows:

- The area of the onsite electrical substation will be marked out using ranging rods or wooden posts and the soil and overburden stripped and removed to nearby temporary storage area for later use in landscaping. Any excess material will be sent to one of the proposed borrow pit areas for reinstatement or removed from the site by an appropriate and licensed waste facility;

- The foundations will be excavated down to the level indicated by the designer and appropriately shuttered reinforced concrete will be laid over it. An anti-bleeding admixture will be included in the concrete mix. The block work walls will be built up from the footings to damp proof course level and the floor slab constructed, having first located any ducts or trenches required by the follow on mechanical and electrical contractors;
- The block work will then be raised to wall plate level, and the gables and internal partition walls formed. Scaffold will be erected around the outside of the building for this operation. The timber roof trusses will then be lifted into position using a telescopic load all or mobile crane depending on site conditions; and
- The roof trusses will then be felted, battened, tiled and sealed against the weather. The electrical equipment will be installed and commissioned. The base for the 36m telecommunications mast will be formed and the mast sections and associated equipment installed. Perimeter fencing will be erected.

The construction and components of the substation have been designed to ESB/Eirgrid specifications.

The proposed wind farm will connect to the existing national grid via a loop-in connection in the form of a 110kV underground cable, from the proposed 110kV substation to the existing Lanesborough-Richmond 110kV OHL.

The substation compound includes the construction and placement of battery storage units to the north of the compound. The proposed construction of the battery storage area will include development of civil works for siting the battery storage units and associated ancillary equipment. The battery units and ancillary equipment will be crane lifted and affixed into their final positions. Once fixed into position, all electrical connections will be made and commissioned prior to entering into service.

Appendix A-6.5.1 110 kV Underground Cables

The number and layout of cables is an important consideration in the design of the site. Minimum safety distances and angles, etc. must always be maintained. This has been a fundamental consideration in determining the final location of the station buildings and the Line Interface Cable Masts.

The cables will be installed primarily within the proposed wind farm site as indicated on the planning application drawings. It should be noted that an underground cable crossing of the N63 National Road will be carried out by horizontal directional drilling (HDD).

Appendix A-6.5.2 ESB Networks

All cables will be laid in underground ducts and/or culverts. Ducts will be installed by open trenching. The typical sequence of operations for installing ducts in trenches is to strip off the ground material and top soil/peat. A trench is then formed to the required depth and width. The ducts are generally laid on a bed of lean mix concrete and surrounded with lean mix concrete. The small amount of surplus soil/peat will be used for local restoration and landscaping or backtracked to the nearby peat repository area to the north of the substation compound. Should any contaminants are be found, the material will be removed from site and disposed at an appropriately licenced facility.

The underground cable required to facilitate the grid connection will be laid beneath the surface of the site and/or public road using the following methodology:

- The area where excavations are planned will be surveyed, prior to the commencement of works, with a cable locating tool and all existing underground services will be identified;
- A trench will be opened using an excavator to accommodate the formation required as per the agreed ESB Networks standards and specifications or any updated versions;
- The excavated material will be cast to the side to be reused as backfilling material where appropriate; and
- The trench will be surfaced as per the road surface specifications of the national or local public road or the wind farm road as appropriate.

Appendix A-6.5.3 Cable Interference Masts (Loop-in Towers)

Two cable interface masts (loop-in towers) will need to be inserted into the existing Overhead Line to facilitate the connection of the underground cables. The existing OHL conductor will be terminated at these two towers in order to facilitate a new OHL loop into the proposed 110kV substation. The existing conductor will be removed between the loop in towers with the new connection looped through to the proposed 110kV substation. The new loop in structure locations have been selected based on, ground profiles, allowable angles and ruling span checks. The following section outlines the methodology to be followed during construction works of the new loop in tower structures which will be constructed underneath the existing Lanesborough-Richmond 110kV overhead line (Plate A- 8, Plate A- 9, and Plate A- 10):

1) Mast sites are scanned for underground services such as cables, water pipes etc. Consultation with the landowners will help to identify hazards and ensure there are no unidentified services in the area;
2) For each leg of the 2 No. masts (8 legs in total) a foundation circa. 4m x 4m x 3m deep is required. To allow for safe construction the excavation will be stepped back which requires additional area to be excavated or shutter piles used if ground material is not suitable for benching. The formation levels (depths) will be checked by the onsite engineer. The excavated material will be temporarily stored close to the excavation and excess material will be used as berms along the site access roads;
3) To aid construction, a concrete pipe is placed into each excavation to allow operatives level the mast at the bottom of the excavation. The frame of the reinforcing bars will be prepared and strapped to a concrete pipe with spacers as required. The reinforcing bars will be lifted into each excavated foundation using the excavator and chains/slings. The base and body section of each mast will then be assembled next to the excavation;
4) Concrete trucks will pour concrete directly into each excavation in distinct stages;
5) A final pour for the mast is the encasing of the mast leg which will be finished 300mm over finished ground level. The leg of the mast is required to be shuttered with metal panels to form the required shape;
6) Once the concrete is set after five days the shuttering is removed and if used sheet piles removed;
7) The Mast foundations will be backfilled one leg at a time with the material already excavated at the location. The backfill will be placed and compacted in layers. All

dimensions will be checked following the backfilling process. All surplus excavated material will be removed from the mast locations and stored in berms for reuse across the construction site;

8) As the masts are located under the existing 110kV line, the line will be de-energised by ESB so work can commence on the construction of the masts;
9) An earth mat consisting of copper or aluminium wire will be laid circa 400mm below ground around the mast. This earth mat is a requirement for the electrical connection of the equipment on the mast structure;
10) Once the base section of each mast is completed and the concrete sufficiently cured, it is ready to receive the mast body;
11) A hardstand area for the crane will be created by laying geogrid material on the ground surface and overlaying this geogrid with a suitable grade of aggregate;
12) A physical barrier (Heras Fence Site Boundary) will be put in place to restrict plant from coming too close to the OHL;
13) The mast will be constructed lying flat on the ground beside the recently installed mast base;
14) The conductor will be moved off centre using a stay wire and weights to anchor the stay wire to ground;
15) The mast section will be lifted into place using the crane and guide ropes;
16) The body sections will be bolted into position;
17) The conductor will be centred over the masts and held in place. Once the conductor is secured at both ends it is then cut and attached onto each mast. The section of conductor in between the two masts will be removed and utilised as connector wire for the new masts;
18) Down dropper conductors (For Electrical Connections, Insulators, Surge arrestors), shackles and all associated accessories required for transition from line to cable will be installed on the interface masts; and
19) The circuit will be tested in both directions before the line is re-energised.

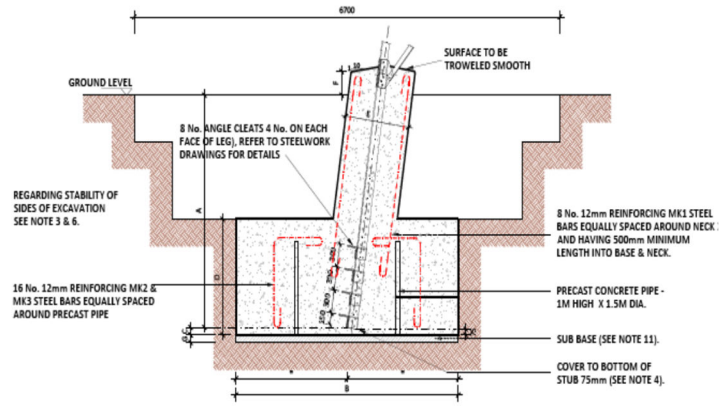


Plate A- 8: Steel lattice tower foundation



Plate A- 9: Steel lattice tower foundation complete



Plate A- 10: Typical Completed End Mast Tower

APPENDIX A-6.6 DECOMMISSIONING OF EXISTING METEOROLOGICAL MAST

The proposed development will include the decommissioning of the existing 100m high meteorological mast on the site. This work will include the following steps:

- **Day one**
  - Mobilise on site with one tractor & trailer and one 13 tonne excavator;
  - Establish safe working area around mast; and
  - Climb mast and remove instruments and logger box.
- **Day two**
  - On one side of the mast, transfer guy ropes from ground anchors to the 13T+ excavator;
  - Cut guy rope attached to 13T+ excavator to allow mast to fall; and
  - Excavate mast anchors and anchor bases making good the ground.
- **Day Three**
  - Dismantle and remove mast components and accessories from site using trailer; and
  - Demobilise from the site.

APPENDIX A-7.0 ENVIRONMENTAL MANAGEMENT

APPENDIX A-7.1 CONSTRUCTION PHASE MONITORING AND OVERSIGHT

The requirement for a CEMP to be prepared in advance of any construction works commencing on any wind farm site and submitted for agreement to the Planning Authority is now well-established.

A CEMP has been prepared for the proposed development (Appendix N). It is intended that the CEMP would be updated prior to the commencement of the construction of the wind farm, to ensure that all mitigation measures, conditions and or alterations to the application documents that may emerge during the course of the planning process are included. Following the update, the CEMP will be submitted to the Planning Authority for written approval.

The CEMP also includes a Traffic Management Plan.

All of the mitigation measures specified in the CEMP will be implemented, and the construction contractor will be responsible for actioning and communicating the requirements with all staff on-site. The implementation of the mitigation measures will be overseen by the supervising Ecological Clerk of Works (ECoW), ecologists, archaeologists and/or geotechnical engineers, as appropriate.

APPENDIX A-7.2 SURFACE WATER MONITORING DURING CONSTRUCTION

The surface water drainage system will require regular inspection during construction works and operations to ensure that it is working optimally. Where issues arise, the works should be

stopped immediately and the source of potential effects on the surface water quality investigated.

Records of all maintenance and monitoring activities associated with the construction site will be retained by the Contractor on-site.

APPENDIX A-7.3 CONCRETE DELIVERIES

Only ready-mixed concrete will be used during the Construction Phase, with all concrete being delivered from local batching plants in sealed concrete delivery trucks. The use of ready-mixed concrete deliveries will eliminate any potential environmental risks of on-site batching. When concrete is delivered to site, only the chute of the delivery truck will require cleaning, using the smallest volume of water necessary, before leaving the site. Concrete trucks will be washed out fully at the batching plant, where facilities are already in place.

The small volume of water that will be generated from washing of the concrete lorry's chute will be directed into a temporary lined impermeable containment area, or a concrete wash unit. This type of unit catches the solid concrete and filters and holds wash liquid for pH adjustment and further solids separation. The residual liquids and solids can be disposed of off-site at an appropriate waste facility. Where temporary lined impermeable containment areas are used, such containment areas are excavated and lined with an impermeable membrane.

The areas are generally covered when not in use to prevent infill of rainwater. In periods of dry weather, the areas can be uncovered to allow much of the water to be lost to evaporation. At the end of the concrete pours, any of the remaining liquid contents is tankered off-site. Any solid contents that will have been cleaned down from the chute will have solidified and can be broken up and disposed of along with other construction waste.

Due to the volume of concrete required for each turbine foundation, and the requirement for the concrete pours to be continuous, deliveries are often carried out outside normal working hours in order to limit the traffic impact on other road users, particularly peak period school and work commuter traffic. Such activities are limited to the day of turbine foundation concrete pours.

The risks of pollution arising from concrete deliveries will be further reduced by the following actions:

- Concrete trucks will not be washed out on the site but will be directed back to their batching plant for washout other than the delivery chutes;
- Site roads will be constructed to a high standard to allow transport of the turbine components around the site, and hence, concrete delivery trucks will be able to access all areas where the concrete will be needed. No concrete will be transported around the site in open trailers or dumpers so as to avoid spillage while in transport. All concrete used in the construction of turbine bases will be pumped directly into the shuttered formwork from the delivery truck. If this is not practical, the concrete will be pumped from the delivery truck into a hydraulic concrete pump or into the bucket of an excavator, which will transfer the concrete to the location where it is needed;

- The arrangements for concrete deliveries to the site will be discussed with suppliers before work starts, agreeing routes, prohibiting on-site full washout and discussing emergency procedures; and
- Clearly visible signage will be placed in prominent locations close to concrete pour areas specifically stating washout of concrete lorries is not permitted on the site.

Appendix A-7.3.1 Concrete Pouring

Because of the scale of the main concrete pours that will be required to construct the proposed wind farm, the main pours will be planned weeks in advance, and refined in the days leading up to the pour. Special procedures will be adopted in advance of, and during, all concrete pours to minimise the risk of pollution. These include:

- Using weather forecasting to assist in planning large concrete pours and avoiding large pours where prolonged periods of heavy rain is forecast;
- Restricting concrete pumps and machine buckets from slewing over watercourses while placing concrete;
- Ensuring that excavations are sufficiently dewatered before concreting begins and that dewatering continues while concrete sets;
- Ensuring that covers are available for freshly placed concrete to avoid the surface washing away in heavy rain;
- Disposing of surplus concrete after completion of a pour will be off-site.

APPENDIX A-7.4 REFUELLING

Wherever possible, vehicles will be refuelled off-site. This will be the case for regular, road-going vehicles. However, for construction machinery that will be based on-site continuously, a limited amount of fuel will have to be stored on site.

No refuelling of machinery will occur within 50 m of surface water features. Refuelling of machinery will be carried out using a mobile double skinned fuel bowser to allow for ease of work. The fuel bowser will be re-filled off site or at the contractors site compound and will be towed around the site by a 4x4 jeep to where machinery is located. Spill kits (fuel absorbent material and pads) will be stored in the event of any accidental spillages. Mobile measures such as drip trays and fuel absorbent mats will be used during all refuelling operations. Only designated trained and competent operatives will be authorised to refuel plant on site

APPENDIX A-7.5 ROAD CONSTRUCTION

Appendix A-7.5.1 Permanent Roads, including Amenity access tracks (founded/floating)

The construction methodology for excavated roads, is summarised as follows:

- Interceptor drains should be installed upslope of the access road alignment to divert any surface water away from the construction area;
- Excavation of roads shall be to the line and level given in the detailed design requirements. Excavation should take place to a competent stratum beneath the peat (as agreed with the site designer);

- All excavated peat shall be placed/spread and profiled for temporary storage or side-cast alongside the excavations where possible;
- Side slopes of the excavations will be battered as the excavation progresses;
- The surface of the excavated road will be developed using granular fill. The depth will vary based on the depth of peat and on the designer requirements;
- A layer of geogrid/geotextile may be required at the surface of the competent stratum (to be confirmed by the designer);
- A final unbound surface layer shall be placed over the excavated road, as per design requirements, to provide a road profile and graded to accommodate wind turbine construction and delivery traffic;
- An additional 50mm surface of quarry dust will be placed over the roads selected for use as amenity access roads; and
- Permanent founded roads for wind farm access will be designed to a running width of approximately 6.0m, while permanent roads for amenity use will be designed to approximately 3.0m in width.

The construction methodology for permanent floating roads/amenity access tracks is:

- A geotextile separation layer is placed on the existing ground surface;
- A biaxial geogrid is then placed over the geotextile;
- Where the CBR of the underlying material is >1%, 400mm of class 1A/6F2/6I/6J material followed by 100mm of a compacted Clause 804 will be used for a running layer to give a total road thickness of 500m;
- Where CBR of the underlying material is <1%, 300mm of Class 1A/6F2/6I/6J material will be placed, followed by a second layer of biaxial geogrid, followed by 300mm of Class 1A/6F2/6I/6J material, followed by a 100mm of a compacted Clause 804 running layer for a total road thickness of 700mm;
- Permanent floating roads for wind farm access will be designed to a running width of approximately 6.0m, while permanent roads for amenity use will be designed to approximately 3.0m in width.

Where required, the road widths will be increased to form the indicated passing bays.

APPENDIX A-7.6 DUST SUPPRESSION

In periods of extended dry weather, dust suppression may be necessary along haul roads and around the borrow pit area(s) to ensure dust does not cause a nuisance. If necessary, water will be taken from stilling ponds in the site's drainage system and will be pumped into a bowser or water spreader to dampen down haul roads and site compounds to prevent the generation of dust. Silty or oily water will not be used for dust suppression, because this would transfer the pollutants to the haul roads and generate polluted runoff or more dust. Water bowser movements will be carefully monitored, as the application of too much water may lead to increased runoff.

APPENDIX A-7.7 VEHICLE WASHING

Wheels or vehicle underbodies are often washed before leaving sites to prevent the build-up of mud on public (and site) roads. Site roads will be already formed using on-site materials before

other road- going vehicles begin to make regular or frequent deliveries to the site (e.g., with steel, ducting or concrete). The site roads will be well finished with compacted hardcore, and so the public road-going vehicles will not be travelling over soft or muddy ground where they might pick up mud or dirt.

However, in the interest of best practice and to avoid the potential for the transfer of alien invasive plant species into the site, it is proposed to install a self-contained wheelwash system at the proposed development site. The wheelwash will be located at the construction and delivery entrance of the site, off the R392.

A road sweeper will be available if any section of the surrounding public roads becomes soiled by vehicles associated with the proposed development.

APPENDIX A-8.0 WIND FARM OPERATION

The proposed wind farm development is expected to have a lifespan of 30 years. During this period, on a day-to-day basis, the wind turbines will operate automatically, responding by means of anemometry equipment and control systems to changes in wind speed and direction.

The wind turbines will be connected together, and data relayed from the wind turbines to a control centre. Each turbine will also be monitored off-site by the wind turbine supplier or Operations and Maintenance (O&M) service provider. The monitoring of turbine output, performance, wind speeds, and responses to any key alarms will be monitored at a control centre 24-hours per day.

Each turbine will be subject to a routine maintenance programme involving a number of checks and changing of consumables, including oil changes. In addition, there will be a requirement for unscheduled maintenance, which could vary between resetting alarms to major component changes requiring a crane. Typically, maintenance traffic will consist of four-wheel drive vehicles or vans. The electricity substations components and site tracks will also require periodic maintenance in accordance with appropriate operation maintenance plans, procedures and health and safety plans.

Once operational, the wind farm will support 6–8 long term, high quality technical jobs in operation and maintenance as well as a number of jobs in ancillary functions.

APPENDIX A-9.0 WIND FARM DECOMMISSIONING

As stated previously the wind turbines proposed as part of the proposed development are expected to have a lifespan of 30 years. Following the end of their useful life, the wind turbines may be replaced with a new set of machines, subject to planning permission being obtained, or the site may be decommissioned fully, with the exception of the electricity substation.

Upon decommissioning of the proposed wind farm, the wind turbines would be disassembled in reverse order to how they were erected. All above ground turbine components would be separated and removed off-site for recycling. Turbine foundations would remain in place underground and would be covered with earth and allowed to revegetate or reseed as appropriate. Leaving the turbine foundations in-situ is considered a more environmentally prudent option, as to remove that volume of reinforced concrete from the ground could result

in potentially significant environment nuisances such as noise, dust and/or vibration. The majority of the site roadways will be in use for additional purposes to the operation of the wind farm (such as a mature amenity and recreational use) by the time the decommissioning of the project is to be considered, and therefore it will be more appropriate to leave the site roads in situ for future use.

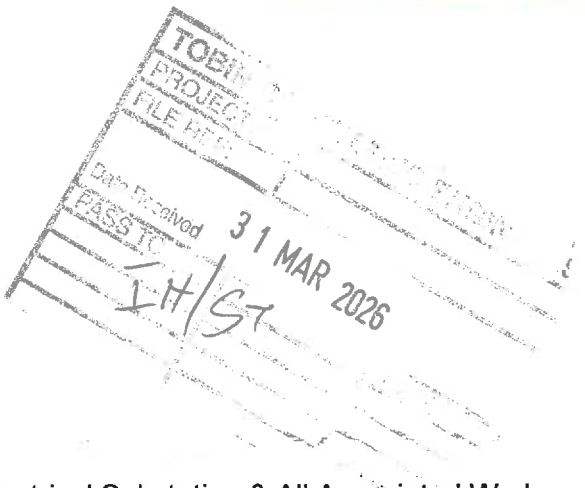
The on-site substation and all the associated transmission infrastructure i.e. underground cables and overhead lines will not be removed at the end of the useful life of the wind farm project as it will form part of the national electricity network and will be managed by EirGrid/ESB. Therefore, the substation will be retained as a permanent structure and will not be decommissioned

APPENDIX B AN COIMISIÚN PLEANÁLA REQUEST FOR FURTHER INFORMATION

Our Case Number: ABP-322485-25

Your Reference: Bord na Móna Powergen Ltd

An Coimisiún Pleanála



Tobin
Block 10-4
Blanchardstown Corporate Park
Dublin
Dublin 15

Date: 30 March 2026

Re: 22 no. Wind Turbines & 1 no. 110kV Electrical Substation & All Associated Works.
Within the townlands of Aghamore, Annaghbeg, Ards, Ballynakill, Barnacor, Cloonbearla, Cloontabeg, Derraghan Beg/More, Derryad, Derrynaskea, Grillagh, Kilmakinlan, Kilnacarrow, Lyneen, Mosstown, Mount Davys, Rappareehill, at Lanesborough, Co. Longford, Ballypheasan, Co. Roscommon. (https://www.derryaddwindfarmplanning.ie)

Dear Sir / Madam,

I have been asked by An Coimisiún Pleanála to refer further to the above mentioned proposed development which is before the Commission for consideration.

Please be advised that the Commission, in accordance with section 37F(1)(a) of the Planning and Development Act 2000, as amended, hereby requires you to furnish the following further information in relation to the proposed development:

1. The Commission notes that since the planning application was lodged, site specific conservation objectives have been published for Lough Ree SPA (004064) (NPWS, April 2025).

   The applicant is requested to provide an updated detailed assessment of the implications of the proposed development in view of the site-specific conservation objectives and the attributes and targets required to meet these objectives for the species for which the SPA is designated.

   Of particular concern is impacts on the listed population of **Whooper Swan**, the conservation objective of which is to **restore favorable conservation condition**.

   The Commission is of the view that the assessment based on generic conservation objectives presented in the Natura Impact Statement is not adequate to address implications for the integrity of the SPA in view of the site specific conservation objectives in particular those which relate to ecologically important areas outside of the SPA of which the proposed development site could be considered to comprise, now, and in the future in view of bog rehabilitation plans.

   The revised assessment should consider all potential impacts against targets and attributes as relevant to the listed bird species and where the conservation objective is to restore favorable

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Ríomhphost	**Email**	communications@pleanala.ie

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conservation condition, provide detail on how the proposed development (alone or in combination with other plans and project) will not delay or prevent that objective for the SPA.

In addition, the Commission seeks clarification on the exact population levels used in the estimation of increase in background mortality as part of the Collision Risk Model assessment for the Lough Ree **SPA populations.** The Commission notes that the significance of predicted collision risk is considered at National scale and regional or local scale as described in the Collision Risk Model Report, EIAR Appendix 8.4 prepared by Tom Gittings. The population reference level used for Lough Ree appears to incorporate a wider area (see Section 2.7, page 22) and thus higher numbers of birds than for which the SPA baseline was determined. Therefore, that being the case, the Commission requests that an updated estimate of mortality thresholds is provided for the relevant species listed for Lough Ree as defined by the **SPA population** cited in the Conservation objectives.

The updated assessment for Lough Ree SPA should be provided as an addendum to the Natura Impact Statement and should include a revised screening stage and detailed assessment (stage 2) in view of the site specific conservation objectives to inform the Commission's Appropriate Assessment of the implications of the proposed development on the integrity of the SPA.

2. The Commission notes the concerns outlined in the submissions received regarding the interplay between the draft cutaway bog decommissioning and rehabilitation works on the proposed wind farm development, the baseline characterisation and the dynamic nature of the site, and concerns that baseline surveys are unlikely to capture the current improved ecological value of the site arising from natural regeneration.

   It is also noted that decommissioning works on the site are still ongoing and an application for substitute consent for historic peat harvesting is currently before the Commission.

   Having regard to the above, the Commission seeks clarity as to whether the EIAR baseline represents the findings at the time of surveys or whether consideration has been given to the likely future receiving environment following further bogland rehabilitation and completion of decommissioning on site.

   In carrying out the EIA, it is necessary to measure impact against a definitive baseline to appropriately assess the actual impact of the proposed development thereby requiring clarity on the appropriate environmental baseline. This is particularly the case for the water, soils, climate and biodiversity environmental factors.

   The applicant should, therefore, consider the presentation of two scenarios ("existing" and "likely future receiving environment") as the environmental baseline for the relevant environmental factors addressed in the EIAR and a revised EIAR or an Addendum to the existing EIAR should be submitted to the Commission.

3. Provide an estimation of carbon emissions in a "do nothing" and a "do something" scenario taking into consideration pumped drainage and oxidisation of exposed peat. Provide a baseline of existing CO_2 emissions from existing drainage and assess the carbon emission benefits of allowing for the site to naturally regenerate as a biodiversity rich carbon sink in the absence of wind farm development.

4. The Response to Submissions Report, Section 11, has set out that the area to be affected by construction and operation of the proposed development is 78ha with 38ha to be reinstated post construction. Therefore, the permanent development footprint is c.40ha for which reinstatement and rehabilitation will not occur if the proposed development is to proceed. Table 18.6 Construction Phase Greenhouse Gas Emissions provides a total value of tonnes CO2e for the construction phase.

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It is recommended that this is updated to take account of the loss of bog area (c.40ha) that would otherwise be rehabilitated if the proposed development were not to proceed.

5. Appendix 7-2 of the EIAR provides Draft Cutaway Bog Decommissioning and Rehabilitation Plans for the site. It has been stated in the EIAR that drainage for the decommissioning and operational phases of the proposed development will be compatible with the Decommissioning and Rehabilitation Plans. It has also been stated in the Surface Water Management Plan (Section 1.1) that the measures implemented for the proposed construction phase will provide flow management for the operational and decommissioning phases.

   The applicant shall provide clarity in regard to how the drainage proposed for the construction phase as set out in drainage layout Drawings 20852-NOD-01-XX-DR-C-0801 to 20852-NOD-01-XX-DR-C-0815 will transition in the decommissioning and operational phases. This has particular relevance to the proposed drainage infrastructure in areas which are within or adjacent to areas proposed to be rehabilitated into wetlands as outlined on Drawing BNM-ECO-23-27-20 in Appendix 7-2 and as to how they will interact and co-exist.

   Where additional design drawings and detail are required, these shall be submitted as part of the response.

The further information referred to above should be received by the Commission within six months from the date of this notice **(i.e. no later than the 30th of September 2026).**

In this regard, please submit 3 hard copies and one electronic copy of the above information.

Please note that following its examination of any information lodged in response to this request for additional information, the Commission will then decide whether or not to invoke its powers under section 37F(2) of the Planning and Development Act 2000, as amended, requiring you to publish notice of the furnishing of any additional information and to allow for inspection or purchase of same and the making of further written submissions in relation to same to the Commission.

If you have any queries in relation to the matter please contact the undersigned officer of the Commission. Please quote the above mentioned An Coimisiún Pleanála reference number in any correspondence or telephone contact with the Commission.

Yours faithfully,

Sinead White

Sinead White
Executive Officer
Direct Line: 01-8737202

PA11

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APPENDIX C DERRYADD WIND FARM: SITE INVESTIGATION CONTRACT FACTUAL REPORT (IRISH DRILLING LTD.)

IRISH DRILLING LIMITED

LOUGHREA, CO. GALWAY, IRELAND

CONTRACT DRILLING
SITE INVESTIGATION

Phone: (091) 841 274
Fax: (091) 847 687

email: info@irishdrilling.ie

DERRYADD WIND FARM

SITE INVESTIGATION CONTRACT FACTUAL REPORT

Bord na Mona Powergen Ltd.,
Main Street,
Newbridge,
Co. Kildare.

	Prepared by	Approved by	Rev. Issue Date:	Revision No.
	Ronan Killeen	Declan Joyce	8th September 2021	21 _LD _101/02
Signature	RK	DJ		

FOREWORD

The borehole, probe, window sample and trial pit records have been compiled from an examination of the samples by a Geotechnical Engineer and from the Drillers' descriptions.

The report presents an opinion on the configuration of the strata within the site based on the borehole, probe, window sample and trial pit results. The assumptions, though reasonable, are given for guidance only and no liability can be accepted for changes in conditions not revealed by the boreholes, probes, window samples and trial pits.

The fieldwork was carried out in accordance with IS EN 1997-2 and BS5930, 2015 Code of Practice for Site Investigations with precedence given to IS EN 1997-2 where applicable.

Contents:

1.0	Introduction
2.0	The Site & Geology
3.0	Fieldwork
4.0	Laboratory Testing

Book 1 of 1

Appendix 1	Borehole Records (Cable Percussive)
Appendix 2	Borehole Records (Rotary Core)
Appendix 3	Trial Pit Records
Appendix 4	Dynamic Probe Records
Appendix 4A	Window Sample Records
Appendix 5	Geophysical Survey
Appendix 5A	Electrical Resistivity Tests
Appendix 6	Groundwater Readings
Appendix 7	Plate Bearing Test Records
Appendix 8	Dynamic Cone Penetration Test Records
Appendix 9	Permeability Test Records
Appendix 10	Laboratory Test Results (Soils / Rock)
Appendix 11	Photographs (Rotary Core)
Appendix 12	Photographs (Trial Pits)
Appendix 13	‘As-Built’ Drawings
Appendix 14	Digital Data (AGS / Autocad)

1.0 Introduction.

Irish Drilling Ltd. (IDL) was instructed by Bord na Mona Powergen Limited to carry out a site investigation at the site of the proposed Derryadd Wind Farm.

This site investigation was carried out to provide detailed factual geotechnical information of the underlying ground conditions for a proposed 24nr turbine wind farm with ancillary access roads and structures.

The fieldwork commenced on February 8th 2021 and was completed on May 25th 2021.

2.0 Site & Geology

The site is spread out over three bogs namely Derryaroge, Derryadd and Lough Bannow County Longford. The site is located approximately 8.0km east of Lanesborough, County Longford.

The fieldwork was carried out predominantly on peat bog and the site itself is adjoined by agricultural lands and bogland.

Weather conditions in general were quite variable with the majority of the fieldwork carried out over a typical spring period in Ireland. Boglands in particular were occasionally difficult to access, due to rutting, as land became soft caused by sustained wet periods. Tractors and excavators were occasionally used to assist moving of plant and machinery.

Site Plans, prepared by the client's representatives and amended by IDL to show 'As-Built' fieldwork locations, are included with this report.

The following were the main published information sources used:
Geological Map of Ireland: 1:750,000 scale map series.

Site investigation data is available as point source data along the proposed route, and the majority of the ground in between the points can only be assumed to follow the characteristics of the nearest available data.

<u>Overview of Subsoil Geology</u>

Glacial Till:

Glacial Till is what was often referred to as Boulder Clay. It is a diverse material that is largely deposited sub-glacially and has a wide range of characteristics due to the variety of parent materials and different processes of deposition. Tills are often tightly packed, unsorted, heterogeneous, unbedded, and can have a wide range of particle sizes and types, which are often but not exclusively angular or sub-angular.

The type of parent material plays a critical role in providing the particles that create different subsoil permeability with sandstones giving rise to a high proportion of sand sized grains in the till matrix, clean limestones providing a relatively high proportion of silt, while shales, shaly limestones and mudstones break down to the finer clay sized particles.

Glacial Outwash Deposits:

Deposition of sand and gravel takes place mainly when glaciers are melting, which gives rise to large volumes of meltwater with great erosive and transporting power. The subsoils deposited in this environment are predominantly, but not exclusively, rounded to subrounded gravel and sand, with the finer fractions of clay and silt washed out.

Peat:

The deposition of peat occurred in post-glacial periods and is generally associated with the start of warmer and wetter climatic conditions. Peat is an unconsolidated usually dark brown to black organic material comprising a mixture of decomposed and undecomposed plant matter that accumulated in an acidic waterlogged environment. Peat has an extremely high-water content generally averaging over 90% by volume.

Made Ground:
Made Ground is material which has been purposefully emplaced by humans.

Solid Geology
The Geological Map of Ireland: 1:750,000 scale map series indicate that the site is underlain by the Lower Carboniferous Limestone Rock Formations.

3.0 Fieldwork.

3.1 Fieldwork Plant:
The following plant was mobilised to site to carry out fieldwork operations:

Dando 2000 Cable Percussive Boring Rigs.
GT1100 GoTract Rotary Core Drilling Rigs.
Hyundai 140 LC-9 Excavator.
LMSR-V(k) Geotool Dynamic Probing Rig.

Fieldwork carried out to date has included the following:

3.2 Cable Percussive Boreholes:
Ninety-four cable percussion (Shell & Auger) boreholes were completed using Dando 2000 Cable Percussive Boring Rigs. The boreholes were bored to 'refusal' or to depths as instructed by the client's representatives.

The borehole depths ranged from 1.10m to 7.40m below ground level.

In–Situ testing consisting of Standard Penetration Tests were carried out at regular intervals (predominantly 1.0m intervals) or as instructed by the client's representatives.

Disturbed bulk and jar soil samples were taken at each change in strata and were returned to the laboratory and logged by a Geotechnical Engineer and presented for testing. Groundwater samples were taken where possible and returned to the laboratory for storage and analysis.

Undisturbed (U100, Piston) soil samples were also recovered where possible in cohesive soils and returned to the laboratory for logging and testing.

Detailed engineering logs for the cable percussive boreholes completed are included with this report in Appendix 1.

3.3 Rotary Core Boreholes:
Ninety rotary core boreholes were carried out to establish overburden conditions and rockhead and to establish the nature and integrity of the underlying rock.

The rotary core boreholes were predominantly carried out as 'extension follow-on' boreholes at locations where the cable percussive boreholes encountered 'refusals' at relatively shallow depths.

The boreholes were completed using wireline drilling techniques, and HQ size (64mm core diameter, 96mm hole diameter) drill strings to recover soil and rock core samples.

A water based flush system was used as the drilling medium while a biodegradable polymer gel was also used where necessary to aid the drilling and soil / rock recovery process.

The samples were stored in wooden boxes and returned to the laboratory where there were logged and photographed by a Geotechnical Engineer and presented for testing.

In-Situ testing consisting of Standard Penetration Tests were carried out in the overburden in a number of the boreholes.

The rotary core boreholes were carried out to depths ranging from 6.00m to 30.00m below ground level.

A 50mm diameter standpipe was installed in a number of boreholes and as instructed by the Client's Engineer, to allow for monitoring of groundwater levels over a prolonged period of time.

Variable Head Permeability Tests (Rising and Falling Head) were carried out at a number of borehole standpipe locations and the records of same are included as Appendix 9.

A summary of water levels recorded during the fieldwork period is included with this report as Appendix 6.

Detailed engineering logs for the rotary core boreholes completed are included with this report in Appendix 2.

3.4 Trial Pits:

Three hundred and thirty-six trial pits were excavated on site using a 14T wide-padded tracked excavator.

The pits were logged and photographed by an Engineer with observations made on ground conditions, pit stability, water ingress and services encountered. The pits were excavated to depths ranging from 0.20m to 4.50m below ground level.

Small and bulk disturbed soil samples were recovered at each change in strata and returned to the laboratory and presented for testing.

In-Situ Tests consisting of plate bearing tests were carried out at many of the trial pit locations, as instructed by the client's representatives. A 610mm diameter steel plate was used and was jacked against a tracked excavator.

The Plate Test graphs were used to measure the co-efficient of subgrade reaction (k_s) and to estimate the CBR values. The records of these test are included in Appendix 7 of this report.

Dynamic cone penetration tests were also carried out at a number of trial pit locations (predominantly at locations and depths where plate bearing tests could not be completed safely) and the records of same are included as Appendix 8.

In-Situ tests consisting of shear vane tests were also carried out where possible in cohesive soils and a summary of the shear vane test results are included on the trial pit logs.

Detailed engineering logs for the trial pits completed are included with this report in Appendix 3.

3.5 Dynamic Probes:

Three hundred and forty-three dynamic probes (Dynamic Probe Heavy, DPH) were carried out to 'refusal' using a LMSR-V(k) Geotool Dynamic Probing Rig.

The dynamic probes were carried out to depths ranging from 0.50m to 9.50m below ground level.

The Dynamic Probing Rig involves the dropping of a 50 kg hammer onto rods from a standard height (500mm) and recording the number of blows it takes to penetrate the rods (with a cone tip) to depth of 100mm increments into the soil.

The dynamic probe engineering logs then graph the number of blow counts required to penetrate each 100mm incremental depth. The probe is considered to have encountered 'refusal' when a blow count of 25 does not achieve the full 100mm incremental depth.

Detailed engineering logs for the trial pits completed are included with this report in Appendix 4.

3.6 Windowless Samples:

Four windowless sample probe holes were also carried out to 'refusal' using a LMSR-V(k) Geotool Dynamic Probing Rig.

The window samples were carried out at locations adjacent to a 'live' rail track and where a tracked excavator could not access safely.

The windowless samples were carried out in order to recover undisturbed (50mm diameter) and to depths ranging from 1.70m to 5.00m below ground level.

Detailed engineering logs for the window samples completed are included with this report in Appendix4A.

3.7 Geophysical Survey:

A Geophysical Survey was carried out by Minerex Geophysics Limited at each proposed turbine location.

The geophysical survey consisted of 2D-Resistivity and Seismic Refraction (p-wave) and the main objectives of the survey were to determine ground conditions, estimate the depth to rock, overburden thickness and reduce the risk of encountering unknown subsurface conditions (including soft ground, shallow bedrock or bedrock karstification) during construction.

The geophysical models and interpretations give guidance about the geological ground and in conjunction with the boreholes a detailed picture of the subsurface conditions.

The records of the geophysical survey and interpretations are included as a 'stand-alone' report in appendix 5.

Electrical Resistivity testing was also carried out by Minerex Geophysics Limited at the proposed turbine locations and at the proposed substation site.

The testing consisted of Vertical Electrical Sounding (VES) using the Wenner electrode configuration and the records of the testing are presented as a 'stand-alone' report in appendix 5A.

3.8 General Summary:

The borehole, probe, windowless sample and trial pit locations were set out on site using a Trimble CU Bluetooth GPS Surveying Unit and the co-ordinates are included on the logs presented in the appendices.

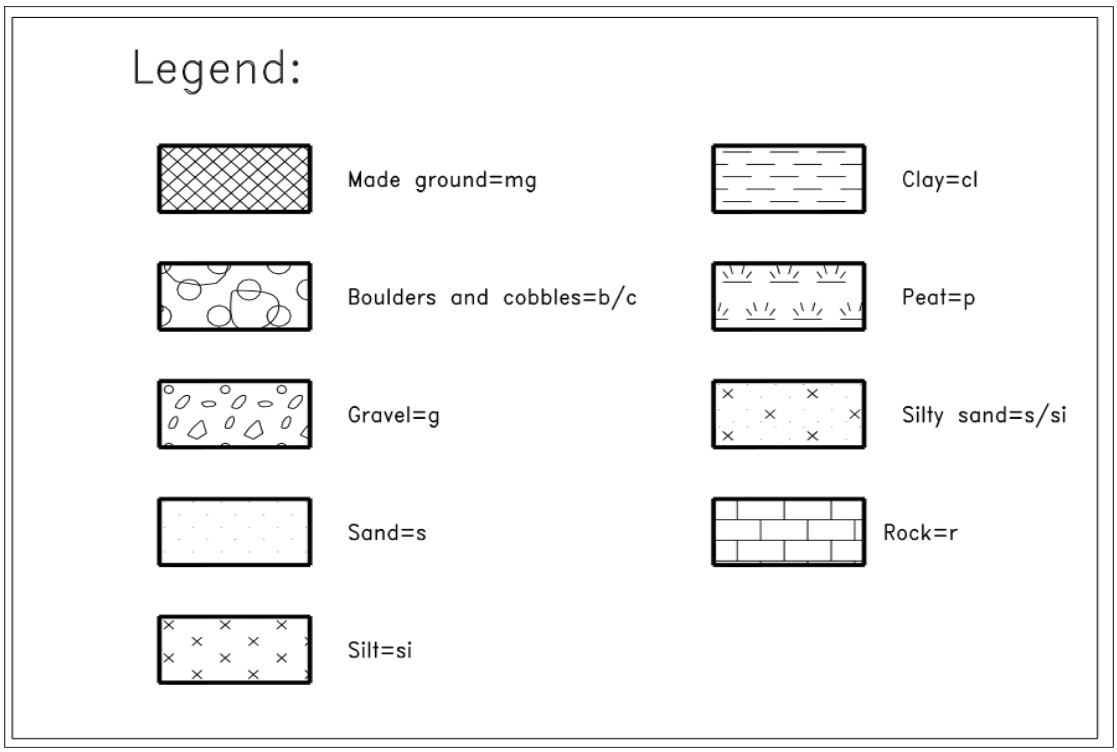
All fieldwork co-ordinates are reported to Irish National Grid (ING) with Reduced Levels recorded relative to Malin Head Datum and with an accuracy level of + or – 0.10m.

Ground conditions encountered during the completion of the fieldwork were typical and as expected for this region and predominantly consisted of Peat overlying Glacial Tills overlying Bedrock. The Glacial Tills in general consisted of slightly sandy slightly gravelly silt/clay with cobbles and boulders and/or silty sands and/or gravels with cobbles and boulders.

Intact bedrock was encountered in the rotary core boreholes at depths varying from 1.00m to 19.50m below ground level. Weathered bedrock was also encountered in many of the boreholes at shallower depths.

It is further noted that bedrock was not encountered in a number of the boreholes before borehole termination and for detailed descriptions of bedrock and ground conditions encountered please refer to the engineering logs included in the appendices of this report.

The following Key Legend Table details the symbology used on the engineering logs to describe ground conditions encountered:



The fieldwork was carried out in accordance with IS EN 1997-2 and BS5930, 1999 Code of Practice for Site Investigations with precedence given to IS EN 1997-2 where applicable.

4.0 Laboratory Testing

Representative samples recovered from the boreholes and trial pits were scheduled for testing in the laboratory.

The test schedules were prepared by the Client's Engineer and included some or all of the following tests on disturbed and undisturbed soil samples:

* Natural Moisture Content.
* Atterberg Limits.
* Particle Density.
* Particle Size Distribution.
* Sedimentation.
* Consolidation.
* Shearbox.
* Triaxial.
* Shearbox.
* Compaction (MCV, CBR).
* Chemical (Ph, Sulphate (Total/Water), Organic Content/LOI, Carbonate).

The test schedules included some or all of the following tests on rock core samples:

* Point Load.

* UCS.
* LA Abrasion.
* Water Absorption.
* Slake Durability.
* Magnessium Sulphate Soundess.
* Flakiness Index.

The test schedules were carried out predominantly at the IDL Laboratory located at Loughrea, County Galway.

A number of specialist tests not available at the IDL laboratory were carried out by designated laboratories on a subcontract basis as follows:

Laboratory chemical tests were carried out by Alcontrol Laboratories, UK.
Shear Strength, Triaxial and Shear Box Tests were carried out by NMTL, County Carlow.

Soil samples (disturbed and undisturbed) in general were recovered from the excavation of trial pits and completion of cable percussive boreholes. Rock core samples were recovered from the completion of rotary core boreholes and the records of soil and rock core laboratory test results carried out on same are reported in Appendix 10.

A number of laboratory test results not available at the time of issuance of this report will be presented as an Addendum to this report.

The soil and rock descriptions as noted on the borehole and trial pit logs are in general visual descriptions as observed and logged by our Engineers and are described in accordance with IS EN 1997-2 and BS5930, 1999 Code of Practice for Site Investigations.

Soils descriptions (cohesive or otherwise) are also initially assessed based on the texture and ‘feel’ of the soil materials as witnessed by our Geotechnical Engineers and in accordance with IS EN 1997-2 and BS5930.

Where laboratory classification tests have been carried out on soil or rock samples then these visual descriptions have been amended accordingly to take into account the results of these classification tests.

The records of all fieldwork, laboratory test results and photographs are included in the appendices of this Factual Report.

Ronan Killeen

Ronan Killeen
Chartered Engineer
Irish Drilling Limited
September 8th 2021

APPENDIX D INTEGRATED POLLUTION CONTROL (IPC) LICENCE

Appendix D.1 IPC P0504-01



Headquarters,
Johnstown Castle Estate,
County Wexford, Ireland

INTEGRATED POLLUTION CONTROL LICENCE

Licence Register Number:	504
Licensee:	Bord na Mona Energy Limited, Mountdillon Group, Boora, Leabeg, Tullamore, County Offaly.
Location of Activity:	Mountdillon Works, Lanesboro, County Longford.

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Glossary of Terms

The Agency	Environmental Protection Agency.
The Licensee	Bord na Mona Energy Limited, Mountdillon Group, Boora, Leabeg, Tullamore, Co. Offaly.
AER	Annual Environmental Report.
Annually	All or part of a period of twelve consecutive months.
BATNEEC	Best Available Technology Not Entailing Excessive Cost.
Bi-annually	All or part of a period of six consecutive months.
COD	Chemical Oxygen Demand.
Daily	During all days of plant operation, and in the case of emissions, when emissions are taking place; with no more than 1 measurement on any one day.
Day	Any 24 hr. period.
Daytime	0800 hrs to 2200 hrs.
dB(A)	Decibels (A weighted).
EMP	Environmental Management Programme.
EWC	European Waste Catalogue (94/3/EEC, see also Agency Guidance Note on the EWC).
Fortnightly	At least 20 measurements in a calendar year with no more than one measurement in any one week.
IPC	Integrated Pollution Control.
Leq	Equivalent continuous sound level.
Lighting-up time	30 minutes after sun set.
Local Authority	Longford County Council and Roscommon County Council.
Location of the Activity	Mountdillon Works, Lanesboro, Co. Longford
Monthly	At least 12 times per year at approximately monthly intervals.
NHA	National Heritage Area.
Night-time	2200 hrs to 0800 hrs.

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

Reasons for the Decision

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

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

Activities Licensed

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

Bord na Mona Energy Limited, Mountdillon Group, Boora, Leabeg, Tullamore, County Offaly

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

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

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

Conditions

Condition 1 Scope

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

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

1.2.1 The nature or quantity of any emission,

1.2.2 The abatement/treatment or recovery systems,

1.2.3 The range of processes to be carried out,

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

or any changes in:

1.2.5 The site management and control with adverse environmental significance,

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

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

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

Reason: To clarify the scope of this licence.

Condition 2 Management of the Activity

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

2.2 Environmental Management Programme (EMP)

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

(i) designation of responsibility for targets;

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

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

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

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

(ii) Rationalisation of surface water discharge points.

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

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

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

(vi) Reuse of silt pond waste.

(vii) Collection, storage and reuse of polythene covering.

(viii) Use of reusable material for stockpile protection.

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

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

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

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

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

2.3 Documentation

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

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

2.4 Corrective Action

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

2.5 Awareness and Training

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

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

2.6 Responsibilities

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

2.7 Communications

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

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

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

Condition 3 Interpretation

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

3.1.1 Dust deposition at Dust Sensitive Location's:

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

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

3.2.1 Non-Continuous Monitoring:

(i) No pH value shall deviate from the specified range.

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

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

3.3 Noise:

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

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

Condition 4 Notification

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

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

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

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

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

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

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

4.4 In the case of any incident as set out in Condition 4.1.2 above which relates to discharges to water, the licensee shall notify either the Eastern or Shannon Regional Fisheries Board, as appropriate, as soon as practicable after such an incident.

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

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

4.7 In the case of any incident, as set out in Condition 4.1.3, which has the potential to impact the conservation objectives of the NHA and SAC areas having taken place, the licensee shall notify Dúchas of the Department of Arts, Heritage, Gaeltacht and the Islands as soon as practicable after such an incident.

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

Condition 5 Emissions to Atmosphere

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

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

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

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

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

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

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

Condition 6 Emissions to Water

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

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

6.3 The licensee shall, within six months of date of grant of licence, present a proposal for the installation (on a long term basis) of a composite sampler to one representative discharge point within the licensed area. The proposal shall set out the rational for selection of the nominated discharge point as well as the sampling programme. The results of this monitoring are to be reported each year as part of the AER. Any proposal to relocate the composite sampler is to be dealt with under Condition 6.2.

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

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

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

6.7 Within three months of the date of grant of licence, the licensee shall prepare an operational procedure for de-silting of the silt ponds. The procedure shall as a minimum provide for visual inspection of all ponds on a fortnightly basis. The de-silting roster shall be based on recommendations of such visual inspection. A log of visual inspection and de-silting shall be maintained and a summary report on the de-silting programme shall be included in the AER. The licensee shall within 12 months of the date of grant of licence demonstrate to the satisfaction of the Agency that the programme of inspection is adequate.

6.8 Silt ponds serving operational bogs shall be cleaned as a minimum twice a year, once before ditching and once before harvesting, and more frequently as inspections may dictate (refer Condition 6.7). Septic tanks and interceptors are required to be inspected and cleaned as necessary with a log being maintained.

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

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

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

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

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

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

(i) drainage manholes are protected and maintained free of excessive peat,

(ii) headlands are kept clean and free of excessive loose peat,

(iii) all new manholes and outfalls are set well back from turning grounds, drivers of bog plant do not turn short (over drains) at headlands,

(iv) harrows, millers, ridgers do not drag loose peat onto manholes or into drains, outside harrow spoons are directed away from drains,

(v) silt run-off, while piping or ditching, is minimised,

(vi) outfalls are controlled to minimise silt discharge during cleaning operations,

(vii) drains are ditched in dry weather,

(viii) while ditching, outfalls are blocked and ditch towards outfall,

(ix) outlets from stockpile field drains are blocked during stockpile loading,

(x) field drains adjacent to stockpiles are cleaned as soon as practicable after stockpile loading,

(xi) adequate room is allowed for rail bed beside Peco stockpiles,

(xii) all fields that have been milled are ridged at the end of the production season,

(xiii) all fields liable to winter flooding have been cleared of milled peat or re-compacted at the end of the production season.

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

Condition 7 Waste Management

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

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

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

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

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

7.3.3 The ultimate destination of the waste.

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

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

7.3.6 Details of any rejected consignments.

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

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

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

Condition 8 Noise

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

Daytime: 55 dB(A)

Night-time: 45 dB(A).

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

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

Condition 9 Water Protection

9.1 Surface & Groundwater Protection - Workshop areas and Depots

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

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

9.1.3 In the event that any analyses or observations made on the quality or appearance of surface water runoff should indicate that contamination has taken place, the licensee shall;

(i) carry out an immediate investigation to identify and isolate the source of the contamination,

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Condition 10 Cutaway Bog Rehabilitation

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

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

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

10.2 Cutaway Bog Rehabilitation Plan:

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

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

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

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

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

10.3.3 A programme to achieve the stated criteria.

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

10.3.5 A programme for aftercare and maintenance.

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

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

Condition 11 Monitoring

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

Schedule 1(ii) Monitoring of Emissions to Water

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

of this licence.

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

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

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

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

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

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

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

(i) Waste storage areas on-site,

(ii) Surface water discharges,

(iii) Dust sampling locations,

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

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

Condition 12 Recording and Reporting to Agency

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

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

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

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

12.5 Reports of all recording, sampling, analyses, measurements, examinations, calibrations and maintenance as set out in *Schedule 4 Recording and Reporting to the Agency* of this licence, shall be submitted to the Agency Headquarters as specified in this licence.

The format of these reports shall be to the satisfaction of the Agency. One original and three copies shall be submitted as and when specified.

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

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

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

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

Reason: To provide for the collection and reporting of adequate information on the activity.

Condition 13 Emergency Response

13.1 The licensee shall, within six months of date of grant of this licence, ensure that a documented Emergency Response Procedure is in place which shall address any emergency situation which may originate on-site. This Procedure shall include provision for minimising the effects of any emergency on the environment.

Reason: To provide for the protection of the environment.

Condition 14 Financial Provisions

14.1 Agency Charges

14.1.1 The licensee shall pay to the Agency an annual contribution of £4,080 or such sum as the Agency from time to time determines, towards the cost of monitoring the activity as the Agency considers necessary for the performance of its functions under the Environmental Protection Agency Act, 1992. The licensee shall in 2001 and subsequent years, not later than January 31 of each year, pay to the Agency this amount updated in accordance with changes in the Consumer Price Index from the date of the licence to the renewal date. The updated amount shall be notified to the licensee by the Agency. For 2000, the licensee shall pay a pro rata amount from the date of this licence to December 31 2000. This amount shall be paid to the Agency within one month of the date of grant of this licence.

Reason: To provide for adequate financing for monitoring and financial provisions for measures to protect the environment.

Schedule 1(i) Emissions to Water

Emission Point Reference No.: All surface water outfalls from boglands within the licensed area.

Location: As detailed in Section 11 and Attachment 11 of the IPC licence application form, and any additional locations as may be agreed under Condition 4.6.

Parameter	Emission Limit Value
Suspended Solids	35mg/l

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Schedule 1(ii) Monitoring of Emissions to Water

Emission Point Reference No's.: As agreed under Condition 6.2.

Parameter	Monitoring Frequency	Analysis Method/Technique
pH	Quarterly	Standard Methods
Flow	Quarterly	Agreed Method
Suspended Solids	Quarterly	Standard Methods
Total Phosphorus	Quarterly	Standard Methods
Ammonia	Quarterly	Standard Methods
Colour	Quarterly	Standard Methods
COD	Quarterly	Standard Methods

¾ ¾ ¾ ¾ ¾ ¾ ❖¾ ¾ ¾ ¾ ¾ ¾

Schedule 2(i) Hazardous Wastes for Disposal/Recovery

Waste Materials	Method of disposal/recovery Notes 1, 2, 3
Lubricating Oils	Agreed hazardous waste disposal contractor.
Hydraulic Oils	Agreed hazardous waste disposal contractor.
Oil/Fuel Filters	Agreed hazardous waste disposal contractor.
Lead Acid Batteries	Agreed hazardous waste disposal contractor.
Florescent lights	Agreed hazardous waste disposal contractor.
Degreasing still-bottoms	Agreed hazardous waste disposal contractor.
Anti- freeze liquid	Agreed hazardous waste disposal contractor.
Other Note 4	

Note 1: The licensee may treat, reuse, recycle or recover waste subject to the prior written agreement of the Agency.

Note 2: Any variation from those contractors named in the IPC Licence application, or subsequent agreements, must have the prior written agreement of the Agency. In cases where a previously agreed waste contractor is considered by the Agency not to exercise due care in respect of the transport and disposal of the licensees waste, the Agency may at any time instruct a licensee to stop using this contractor.

Note 3: Other method to be agreed with the Agency

Note 4: No other waste shall be disposed of/recovered off-site without prior notice to, and prior written agreement of the Agency.

Schedule 2(ii) Other Wastes for Disposal/Recovery

Waste Materials	Method of disposal/recovery Notes 1, 2, 3
Scrap Metal/Welding Rods	Agreed waste recovery contractor.
Ash/Cinders/Screenings	Agreed waste disposal contractor/On- site landfill.
Polythene covering	Agreed recycling disposal contractor.
Wooden pallets and timber	Agreed waste disposal/recovery contractor.
Hand cleansing rags	Agreed waste disposal contractor.
Paint waste	Agreed waste disposal contractor.
General Office & Canteen Waste	Agreed waste disposal contractor.
Other Note 4	

Note 1: The licensee may treat, reuse, recycle or recover waste subject to the prior written agreement of the Agency.

Note 2: Any variation from those contractors named in the IPC Licence application, or subsequent agreements, must have the prior written agreement of the Agency. In cases where a previously agreed waste contractor is considered by the Agency not to exercise due care in respect of the transport and disposal of the licensees waste, the Agency may at any time instruct a licensee to stop using this contractor.

Note 3: Other method to be agreed with the Agency

Note 4: No other waste shall be disposed of/recovered off-site without prior notice to, and prior written agreement of the Agency.

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

Emission Point Reference No's.: All surface water discharges from workshops and depots associated with the licensed activity

Parameter		Analysis Method/Technique
Visual	Weekly	-
COD	Monthly	Standard Methods

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Schedule 4 Recording and Reporting to the Agency

Completed reports shall be submitted to: The Environmental Protection Agency
Headquarters
Johnstown Castle Estate
Co Wexford
Ireland,

or Any other address as may be specified by the Agency.

Reports are required to be forwarded as set out below:

Recurring Reports:

Report	Reporting Frequency	Report Submission Date
Surface Water (Schedule 1(ii) and Schedule 3)	Quarterly	Ten days after end of the quarter being reported on.
Complaints (where these arise)	Monthly	Ten days after end of the month being reported on.
Report on monitoring of emissions to water	Quarterly	Ten days after end of the quarter being reported on.
Annual Environment Report(AER)	Annually	1 March of each year

Annual Environmental Report Content	
• Emissions to water summary	• Surface water discharge monitoring location programme
• Waste management report.	• Environmental management programme - proposal
• Resource consumption summary	• Environmental management programme - report
• Complaints summary	• Reported incidents summary
• Air emissions report	• Bog development and operational programme
• Report on de-silting programme	• Bog rehabilitation progress report

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Once-off Reports:

Report	Report Submission Date
Bund integrity assessment.	Within eighteen months of the date of grant of licence.
Composite sampling proposal (Condition 6.3).	Within six months of the date of grant of licence.
Environmental management programme proposal.	Within six months of the date of grant of licence.
Proposal for dust monitoring locations (Condition 5.3).	Within three months of the date of grant of licence.
Proposal for surface water monitoring locations (Condition 6.2).	Within three months of the date of grant of licence.
Programme for fitting of silt ponds to all bog discharges (Condition 6.6).	Within six months of the date of grant of licence.
Upgrade of sedimentation pond treatment system (Condition 6.9).	Within six months of the date of grant of licence.
Proposal for screenings disposal (Condition 7.4).	Within nine months of the date of grant of licence.
Bog rehabilitation programme (Condition 10.2).	Within eighteen months of the date of grant of licence.

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Signed on behalf of the Agency

Iain MacLean

_____

Director/Authorised person

Dated this 9th day of May, 2000

Appendix D.2 IPC PO504-01 - TECHNICAL AMENDMENT A

Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

Headquarters
P.O. Box 3000
Johnstown Castle Estate
County Wexford
Ireland

TECHNICAL AMENDMENT A
TO
IPPC LICENCE

Licence Register Number:	P0504-01
Licensee:	Bord na Mona Energy Limited, Mountdillon Group, Boora, Leabeg, Tullamore, County Offaly.
Location of Facility:	Mountdillon Works, Lanesboro, County Longford.

Reasons for the Decision

The Environmental Protection Agency is satisfied, on the basis of the information available, that subject to compliance with the conditions of Integrated Pollution Prevention and Control (IPPC) licence Reg. No. P0504-01 granted on the 9th May 2000, as well as any amendments noted herein, any emissions from the activity will comply with and not contravene any of the requirements of Section 83(5) of the Environmental Protection Agency Acts, 1992 to 2012.

Technical Amendment

In pursuance of the powers conferred on it by Section 96(1)(c) of the Environmental Protection Agency Acts, 1992 to 2012, the Agency amends the licence, granted to Bord na Mona Energy Limited, Mountdillon Group, Boora, Leabeg, Tullamore, County Offaly.

Henceforth, the licence shall be read in conjunction with the amendments set out below.

This technical amendment is limited to the following Glossary of Terms, Condition(s) and Schedule:

Amendments

Amend Glossary of Terms as follows

Extractive waste	As defined in regulation 3(2) of the Waste Management (Management of Waste from the Extractive Industries) Regulations, 2009, SI 566 of 2009.
Sanitary effluent	Wastewater from installation toilet, washroom and canteen facilities.
Trigger level	A parameter value, the achievement or exceedance of which requires certain actions to be taken by the licensee.
Waste facility	As defined in regulation 3(2) of the Waste Management (Management of Waste from the Extractive Industries) Regulations 2009, SI 566 of 2009.

New and Amended Conditions

Amend condition 6.2 of the licence to read as follows.

6.2 The licensee shall, by the 1st February 2013, submit for agreement by the Agency a revised proposal for a surface water discharge monitoring programme. This programme shall have regard to the following:

(i) The current status of each bogland (virgin, under development, operational or worked out);
(ii) The sensitivity of the receiving water;
(iii) The relevant River Basin Management Plan;
(iv) The nature, magnitude and variability of the discharges;
(v) The reliability of the silt ponds control measures; and,
(vi) The status of the silt pond upgrade programme.

The revised surface water discharge monitoring location programme shall ensure that a representative selection of all surface water emission points from boglands within the licensed area is monitored annually and that all emission points are monitored at least once every five years. Surface water emission points shall be monitored as set out in Schedule 1(ii) *Monitoring of Emissions to Water* of this licence.

Add condition 6.13 to include the following after condition 6.12.

6.13 The licensee shall trend the monitoring results for total ammonia and determine any statistically significant relationship that exists between the results and the current status of each bogland (virgin, under development, operational or worked out), rainfall, silt pond control measures or other factors. The licensee shall report annually as part of the AER on the trends and on any statistically significant relationship identified.

Add condition 6.14 to include the following after condition 6.13.

6.14 The licensee shall, by 1st February 2013, establish a suitable trigger level for total ammonia in surface water discharges. The licensee shall have in place a response programme to address the attainment or exceedence of the trigger level value. This response programme shall include the necessary actions to ensure there will be no emissions to surface water of environmental significance.

Add condition 7.5 to include the following after condition 7.4.

7.5 Extractive Waste Management

The licensee shall draw up a Waste Management Plan (to be known as an Extractive Waste Management Plan) for the minimisation, treatment, recovery and disposal of extractive waste. This Plan shall meet the requirements of regulation 5 of the Waste Management (Management of Waste from the Extractive Industries) Regulations, 2009. The Plan shall be submitted for agreement by the Agency by the 31st December 2012. The Plan shall be reviewed at least once every five years thereafter in a manner agreeable to the Agency and amended in the event of substantial changes to the operation of a waste facility or to the waste deposited. Any amendments shall be notified to the Agency.

All extractive waste shall be managed in accordance with the Extractive Waste Management Plan. A report on the implementation of the Extractive Waste Management Plan shall be provided in the AER.

Add condition 7.6 to include the following after condition 7.5.

7.6 Waste Facility

(i) No new waste facility may be developed or an existing waste facility modified unless agreed by the Agency.

(ii) The licensee shall ensure that all existing waste facilities are managed and maintained to ensure their physical stability and to prevent pollution or contamination of soil, air, surface water or groundwater.

(iii) The licensee shall ensure that all new waste facilities are constructed, managed and maintained to ensure their physical stability and to prevent pollution or contamination of soil, air, surface water or groundwater.

(iv) Operational measures shall be continuously employed to prevent damage to waste facilities from personnel, plant or equipment.

(v) The licensee shall establish and maintain a system for regular monitoring and inspection of waste facilities.

(vi) All records of monitoring and inspection of waste facilities, as required under the licence, shall be maintained on-site in order to ensure the appropriate handover of information in the event of a change of operator or relevant personnel.

Add condition 7.7 to include the following after condition 7.6.

7.7 Excavation Voids

7.7.1 Unless otherwise agreed by the Agency, only extractive waste shall be placed in excavation voids.

7.7.2 When placing extractive waste into excavation voids for rehabilitation and construction purposes, the licensee shall, in accordance with regulation 10 of the Waste Management (Management of Waste from the Extractive Industries) Regulations, 2009, and the Extractive Waste Management Plan:

(i) Secure the stability of the waste.
(ii) Put in place measures to prevent pollution of soil, surface water and ground water.
(iii) Carry out monitoring of the extractive waste and excavation void.

Add condition 9.2 to include the following after condition 9.1.

9.2 Sanitary Effluent

The waste water treatment system and any percolation area used for the treatment of sanitary effluent arising on–site, shall, by the 1st August 2013, satisfy the criteria set out in the '*Code of Practice: Waste Water Treatment and Disposal Systems Serving Single Houses*', published by the Environmental Protection Agency.

Amend Schedule 1(ii) Monitoring of Emissions to Water to read as follows:

Schedule 1(ii) Monitoring of Emissions to Water

Emission Point Reference No's.: As agreed under Condition 6.2

Parameter	Monitoring Frequency	Analysis Method/Technique
pH	Quarterly	Standard Methods
Flow	Quarterly	Agreed Method
Suspended Solids	Quarterly	Standard Methods
Total Solids	Quarterly	Standard Methods
Total Phosphorus (as P)	Quarterly	Standard Methods
Total Ammonia (as N)	Monthly Note 1	Standard Methods
Colour	Quarterly	Standard Methods
COD	Quarterly	Standard Methods

Note 1: The frequency of monitoring can be reduced with agreement by the Agency under Condition 11.5 of this licence.

This technical amendment shall be cited as Amendment A (in pursuance of Section 96(1)(c) of the EPA Acts 1992 to 2012) to IPPC Licence Register No. P0504-01.

Sealed by the Seal of the Agency on this the 26th day of September, 2012

PRESENT when the seal of the Agency was affixed hereto

Mary Turner, Authorised Person

APPENDIX E BORD NA MÓNA DRAFT REHABILITATION PLANS

Appendix E.1 DERRYAROGUE DRAFT REHABILITATION PLAN 2025

Bord na Móna

Derryarogue Bog

Draft Cutaway Bog Decommissioning and Rehabilitation Plan

2025

Draft

This document seeks to address the requirements of Condition 10.2 of IPC Licence Ref. P0504-01:

> "*The licensee shall prepare, to the satisfaction of the Agency, a fully detailed and costed plan for permanent rehabilitation of the cutaway boglands within the licensed area.*"

This licence condition requires Bord na Móna agree with the EPA the measures that will provide for rehabilitation, i.e. stabilisation of Derryarogue Bog upon cessation of peat production and complements the licence requirement to decommission the site.

***Rehabilitation** generally comprises site stabilisation with natural colonisation with or without targeted management.*

Industrial peat production has now fully ceased at Derryarogue Bog.

Bord na Móna have defined the key rehabilitation outcome at Derryarogue Bog as environmental stabilisation.

The extent of Derryarogue Bog that is subject to this standard rehabilitation plan is located within the eastern subsection of the wider extent of Derryarogue bog. The rehabilitation plan for this eastern extent of Derryarogue Bog has been updated but not fully finalised. As such it remains a draft rehabilitation plan until it is fully finalised. Bord na Móna expect to update and finalise this rehabilitation plan in the future as part of the Derryadd Wind Farm development or at a later date.

A rehabilitation plan for the western and northern subsections of Derryarogue Bog (Derryarogue West (Cloonbony) and Derryarogue North (Cloonbearla)), was fully finalised in 2023 and rehabilitation as part of the Peatland Climate Action Scheme commenced in late 2023 and is still ongoing (see 2023 Bogs - BNM Peatlands Climate Action Scheme (bnmpcas.ie)*.*

Any consideration of any other future after-uses for Derryarogue Bog will be conducted in adherence to the relevant planning guidelines and consultation with relevant authorities and will be considered within the framework of this rehabilitation plan.

Bord na Móna are planning to develop a renewable energy project at Derryadd Bog as part of the proposed Derryadd Wind Farm. This project is currently in the pre-planning stages and is expected to be submitted for planning permission in 2025. The wind farm planning boundary overlaps the Derryarogue Bog rehabilitation boundary that is subject to this standard rehabilitation plan. This area has been mapped as a constraint in the rehabilitation plan.

Draft

Document Control Sheet	
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Document File Path:	Q:\Ecology Team\EPA draft rehab plans 2017 word docs\Mountdillon ref.504 (Lough Ree) \Derryarogue
Document Status:	Draft

This document comprises:	DCS	TOC	Text (Body)	References	Maps	No. of Appendices
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Draft

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Non-technical summary

- Bord na Móna is planning to rehabilitate Derryarogue Bog, located in Co. Longford.
- Derryarogue Bog is located approximately 2.5 km north-east of Lanesborough in County Longford (Grid reference: N 02256 70341).
- The extent of Derryarogue Bog that is subject to this standard rehabilitation plan is located within the eastern sub section of Derryarogue Bog.
- Derryarogue West (Cloonbony) and Derryarogue North (Cloonbearla), which adjoin Derryarogue to the west and north of the bog, are being rehabilitated under the Peatlands Climate Action Scheme (PCAS) and rehabilitation measures are ongoing.
- Derryarogue bog is part of the Mountdillon group (Lough Ree sub-group) of bogs (Ref. P0504-01).
- Derryarogue Bog has a pumped drainage regime, with five pumps in the rehabilitation footprint.
- Industrial peat harvesting has now finished at Derryarogue Bog.
- This rehabilitation plan has been prepared by Bord na Móna as part of obligations to carry out peatland rehabilitation via an IPC Licence issued by the Environmental Protection Agency. This rehabilitation plan excludes Derryarogue west (Cloonbony) and Derryarogue North (Cloonbearla) which are proposed for rehabilitation separately, under the Peatland Climate Action Scheme (see 'Derryarogue Rehabilitation Plan', 2023 Bogs - BNM Peatlands Climate Action Scheme (bnmpcas.ie)).
- The key objective of peatland rehabilitation is environmental stabilisation. This means developing vegetation and promoting re-establishment of more typical cutaway peatland communities such as Birch woodland, fen habitat and *Sphagnum*-rich embryonic bog communities.
- Rehab measures will include drain-blocking and other measures to raise water levels to the surface of the bog, thus encouraging the development of naturally functioning cutaway peatland habitats.
- These rehabilitation measures will be planned by a team consisting of expert ecologists, hydrologists and engineers. It is a guiding principle of Bord na Móna rehabilitation planning that no actions or activities will be undertaken that would negatively impact on adjacent land. No boundary drains will be blocked. Water will still leave the bog via the existing outlets.
- Peatland rehabilitation of this bog will bring a range of benefits to the local community via improvements to the local landscape and is also important for supporting national policies and strategies in relation to reduction of carbon emissions from these peatlands, supporting biodiversity and improvements to water quality.
- Drain blocking at Derryarogue Bog will result in improved water quality, climate benefits with the reduction of carbon emissions and enhanced biodiversity when the residual peat is re-wetted.
- Many Bord na Móna bogs cannot be restored back to raised bog in the short-term, as so much peat has been removed and the environmental conditions have been modified. However other natural habitats will develop like poor fen and *Sphagnum* (embryonic bog communities) (on deeper peat); and wetlands with Reedbeds and Birch woodland on shallower peat. In time a naturalised peatland can be developed.
- It will take some time for vegetation and habitats to fully develop at Derryarogue Bog, and a peatland ecosystem to be restored. However, it is expected that most of the bog will be developing pioneer habitats after 5-10 years.
- The development of a range of habitats at Derryarogue Bog will support biodiversity including plants, insects, birds and mammals. This includes some species that are rare and protected in the wider landscape. It will increase the national area of native woodland. Many wetland habitats in the wider landscape have been reclaimed for agriculture and other uses and peatland rehabilitation is an opportunity to create new peatland and wetland habitats.

- Longford County Council lodged a Part 8 Planning Application in 2021 named 'No. 88 Mid Shannon Wilderness Park trackways' which includes greenway or amenity walking/cycling tracks along the northern headland at Derryarogue Bog. This links two local access roads and connects to Knappoge Bog.
- This is a peatland rehabilitation plan. This plan does not consider future after-use or development. Bord na Móna continually reviews its land-bank to consider future commercial or industrial developments. Any other proposed development will be planned in adherence to relevant planning guidelines and will consider the rehabilitation and the condition of the bog.

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1. INTRODUCTION

Bord na Móna operates under IPC Licence issued and administered by the EPA to extract peat within the Mount Dillon Bog Group (Ref. P0504-01), of which Derryarogue Bog is a part (see Appendix I for details of the bog areas within this Group). As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. Derryarogue Bog is located in Co. Longford.

This plan is a specific rehabilitation plan for the bog and outlines:

- Description of site management and status.
- Main issues and approaches to rehabilitation.
- Consultation to date with interested parties.
- Interaction with other policy and legislative frameworks (Appendix V).
- The planned rehabilitation goals and outcomes.
- The scope of the rehabilitation plan.
- Criteria which define the successful rehabilitation and key targets to validate rehabilitation.
- Proposed rehabilitation actions.
- Proposed timeframe to implement these measures.
- Budget and Costings.
- Associated aftercare, maintenance, and monitoring.

Note: This plan should be read in conjunction with the accompanying Map book.

Bord na Móna have announced the complete cessation of industrial peat production across its estate (January 2021).

This draft rehabilitation plan outlines the proposed approach to be taken for IPC compliance in respect of Derryarogue Bog, and how the site will be rehabilitated. Bord na Móna is fully committed to meeting its obligations relating to rehabilitation and decommissioning under the Integrated Pollution Control Licence.

It has been proposed by Government that Bord na Móna carry out a Peatlands Enhanced Decommissioning, Rehabilitation and Restoration Scheme on its peatlands. Note this proposal is also known colloquially as the 'Peatlands Climate Action Scheme' (PCAS). The additional costs of the Scheme will be supported by Government through the Climate Action Fund and Ireland's National Recovery and Resilience Plan, administered by the Department of Environment, Climate and Communications (DECC), while the National Parks and Wildlife Service (NPWS) will act as the Scheme regulator. The Peatlands Climate Action Scheme is expected to operate between 2021-2025. Over 13,000 ha of cutaway peatlands have already been rehabilitated as part of this scheme to date, across multiple Bord na Móna peatlands. Enhanced rehabilitation measures have started as part of the PCAS project at Derryarogue West (Cloonbony) and Derryarogue North (Cloonbearla).

PCAS measures are NOT proposed as part of this draft Derryarogue rehabilitation plan, which applies specifically to the remaining eastern area of the Derryarogue Bog at this stage. The potential implementation of enhanced rehabilitation measures across this remaining area of Derryarogue will be dependent on the selection of the bog to be included in PCAS.

1.1 Constraints and Limitations

This document seeks to address the requirements of Condition 10.2 of IPC Licence Ref. P0504-01:

> "*The licensee shall prepare, to the satisfaction of the Agency, a fully detailed and costed plan for permanent rehabilitation of the cutaway boglands within the licensed area.*"

The extent of Derryarogue Bog that is subject to this standard rehabilitation plan is located within the main eastern section of the Derryarogue site. This document specifically covers the area of **Derryarogue Bog** shown as a red outline in the site location map (drawing number BNM-ECO-23-27-01).

Industrial peat extraction at Derryarogue Bog permanently ceased in 2019, having commenced in 1952. Currently the cutaway area comprises a mosaic of pioneering cutaway habitats, scrub, wetland/open water, birch woodland and bare peat, in addition to marginal[1] habitats.

Some of the high bog remnants (within the areas owned and under the control of Bord na Móna) are currently being used by domestic turf cutters to harvest peat. These areas are ecologically and hydrologically linked to the area owned by Bord na Móna where rehabilitation is planned. It is beyond the scope of this rehabilitation plan to address turf cutting issues on Derryarogue Bog. Nevertheless, Bord na Móna are aware of such issues which may constrain the proposed rehabilitation actions, and this rehabilitation plan considered potential impacts of these on the delivery of the stated objectives.

There are known rights of way around the margins of Derryarogue Bog. Where a public right of way or similar burden exists on Bord na Móna property, consideration will be given to ensuring that this remain intact where possible. In some instances, depending upon previous land uses and management, alternative solutions may be required. These will be explored in consultation with local communities and statutory bodies during the consultation work associated with the decommissioning and rehabilitation work described here.

Rehabilitation in other areas of the bog may also be constrained due to other property issues

This is a peatland rehabilitation plan. Bord na Móna are planning to develop a renewable energy project at Derryarogue Bog as part of the proposed Derryadd Wind Farm (see Location | Derryadd Wind Farm). This proposed wind farm project is located within Derryarogue Bog as well as the adjacent Bord na Móna bogs of Derryadd and Lough Bannow. Derryadd Wind Farm is currently in the pre-planning stage and is expected to be submitted for planning permission in 2025.

Derryarogue Bog will be rehabilitated as part of the Derryadd Wind Farm development or at a later date. The wind farm and associated amenity trail overlaps the Derryarogue Bog rehabilitation boundary. These areas have been mapped as a constraint in the rehabilitation plan.

Derryarogue Bog will be rehabilitated **either** in association with the proposed Derryadd Wind Farm Project, with peatland rehabilitation integrated into the proposed project, **or** will be completed in the event of an unsuccessful planning application. It is expected that Bord na Móna will revise and update the rehabilitation plan for Derryarogue when a decision is made in relation to planning permission for the Wind Farm. Bord na Móna remain fully committed to rehabilitating Derryarogue Bog and meeting the conditions of the IPC License. Any consideration of any other future after-uses for Derryarogue Bog will be conducted in adherence to the relevant planning guidelines, and consultation with relevant authorities, and will be considered within the framework of this rehabilitation plan.

[1] Marginal land is defined as land around the margin of the industrial peat production area. This margin generally contains a range of habitats including scrub, Birch woodland, cutover bog and raised bog remnants.

Longford County Council lodged a Part 8 Planning Application in 2021 named 'No. 88 Mid Shannon Wilderness Park trackways' which includes a greenway or amenity walking/cycling track through Derryarogue Bog.

There are further proposals to create additional amenity tracks through Derryarogue Bog as part of the amenity plan for the proposed Derryadd Wind Farm Project (see Location | Derryadd Wind Farm).

A wayleave agreement (relating to a third-party grid connection) is in place in respect of the rail line corridor that forms the southern boundary of the Derryarogue Bog; this will be unaffected by the measures currently proposed.

Rehabilitation in other areas of the bog may also be constrained due to other property issues or archaeological features. There are known archaeological features present at Derryarogue Bog, which may constrain rehabilitation activities.

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2. METHODOLOGY

This rehabilitation plan was developed with a combination of desktop and field surveys, consultations with internal and external stakeholders. The development of this rehabilitation plan considered recently published guidance issued by the EPA in 2020 – '*Guidance on the process of preparing and implementing a bog rehabilitation plan*'.

The ecological information and site information collected during the Bord na Móna ecological baseline surveys, additional confirmatory site visits (covering the period 2012 to 2023 inclusive) and monitoring and desktop analysis, forms the basis for the development of this rehabilitation plan for the bog along with:

- Experience of 40 years of research on the after-use development and rehabilitation of the Bord na Móna cutaway bogs (Clarke, 2010; Bord na Móna, 2016);
- Significant international engagement during this period with other counties in relation to best-practice regarding peatland rehabilitation and after-use through the International Peat Society and the Society for Ecological Restoration (Joosten & Clarke, 2002; Clarke & Rieley, 2010; Gann *et al*., 2019);
- Consultation and engagement with internal and external stakeholders;
- GIS Mapping;
- BNM drainage surveys;
- Bog topography and peat depth data;
- Hydrological modelling;

2.1 Desk Study

The desk study involved collecting all relevant environmental and ecological data for the study area. The development of the rehabilitation plan also takes account of research, experience and engagement with other peatland restoration and rehabilitation projects and peatland research including Irish, UK, European and International best practice guidance (full citations are in the References Section):

- Anderson *et al*. (2017). An overview of the progress and challenges of peatland restoration in Western Europe.
- Barry, T.A. et al (1973). A survey of cutover peats and underlying mineral soils. Soil Survey Bulletin No. 30. Dublin, Bord na Móna and An Foras Taluntais.
- Bonn *et al*. (2017). Peatland restoration and ecosystem services- science, policy and practice.
- Carroll *et al*. (2009). *Sphagnum* in the Peak District. Current Status and Potential for Restoration. Moors for the Future Report No 16.
- Clark & Rieley (2010). Strategy for responsible peatland management.
- Eades *et al*. (2003). The Wetland Restoration Manual.
- Farrell & Doyle (2003). Rehabilitation of Industrial Cutaway Atlantic Blanket Bog, NW Mayo, Ireland.
- Feehan, J. (2004). A long-lived wilderness. The future of the north midlands peatland network. Department of Environmental Resource Management, UCD.
- Foss, P.J., Crushell, P. & Gallagher, M.C. (2017). Title: Counties Longford &Roscommon Wetland Study. Report prepared for Longford and Roscommon County Councils.
- Gann *et al*. (2019). International Principles and Standards for the practice of Ecological Restoration.
- Hinde *et al*. (2010). *Sphagnum* re-introduction project: A report on research into the re-introduction of *Sphagnum* mosses to degraded moorland. Moors for the Future Research Report 18.

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- Joosten & Clarke (2002). Wise Use of mires and peatlands – Background and Principles including a framework for Decision-making.
- Lindsay (2010). Peatbogs and Carbon: A Critical Synthesis to Inform Policy Development in Oceanic Peat Bog Conservation and Restoration in the Context of Climate Change.
- Mackin *et al*. (2017). Best practice in raised bog restoration in Ireland. Irish Wildlife Manuals, No. 99. National Parks and Wildlife Service,
- McBride *et al*. (2011). The Fen Management Handbook (2011), Scottish Natural Heritage.
- McDonagh (1996). Drain blocking by machines on Raised Bogs. Unpublished report for National Parks and Wildlife Service.
- NPWS (2017a). National Raised Bog Special Areas of Conservation management plan. Department of Arts, Heritage and the Gaeltacht.
- Pschenyckyj *et al.* (2021). Optimising Water Quality Returns from Peatland Management while Delivering Co-Benefits for Climate and Biodiversity. An Fóram Uisce.
- Quinty & Rochefort (2003). Peatland Restoration Guide, second edition. Canadian *Sphagnum* Peat Moss Association and New Brunswick Department of Natural Resources and Energy.
- Regan*, et. al.* (2020). Ecohydrology, Greenhouse Gas Dynamics and Restoration Guidelines for Degraded Raised Bogs. EPA Research Report. Prepared for the Environmental Protection Agency by Trinity College Dublin.
- Renou-Wilson *et al*. (2011). BOGLAND - Sustainable Management of Peatlands in Ireland. STRIVE Report No 75 prepared for the Environmental Protection Agency.
- Schouten (2002). Conservation and Restoration of Raised Bogs: Geological, Hydrological and Ecological Studies. Dúchas - The Heritage Service of the Department of the Environment and Local Government, Ireland;
- Thom (2019). Conserving Bogs – Management Handbook.
- Wheeler & Shaw (1995). Restoration of Damaged Peatlands – with Particular Reference to Lowland Raised Bogs Affected by Peat Extraction.
- Wittram *et al*. (2015). A Practitioners Guide to Sphagnum Reintroduction. Moors for the Future Partnership.

Additional on-line resources were also incorporated into the desk study, including:

- Mountdillon Integrated Pollution Control Licence;
- Mountdillon Annual Environmental Reports;
- Review of the National Biodiversity Data Centre (NBDC) webmapper;
- Inland Fisheries Ireland (IFI) Reports;
- Environmental Protection Agency database (www.epa.ie);
- EPA Guidance on Requests for Alterations to a Licensed Industrial or Waste Activity;
- BirdWatch Ireland online data (including I-WeBS and CBS datasets; www.birdwatchireland.ie);
- Geological Survey of Ireland - National Draft Bedrock Aquifer map;
- Geological Survey of Ireland - Groundwater Database (www.gsi.ie);
- Historic Environment Viewer at https://webgis.archaeology.ie/historicenvironment/
- National Parks & Wildlife Services Public Map Viewer (www.npws.ie);
- Water Framework Directive catchments.ie/maps/ Map Viewer (www.catchments.ie);
- OPW Indicative Flood Maps (www.floodmaps.ie);
- CFRAM Preliminary Flood Risk Assessment (PFRA) maps (www.cfram.ie);

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- River Basin Management Plan for Ireland 2022-2027
- Bord na Móna Annual Report 2024.
- Spatial data in respect of Article 17 reporting, available online at https://www.npws.ie/maps-and-data/habitat-and-species-data/article-17.

2.2 Consultation

A number of stakeholders have been identified during the course of Bord na Móna's rehabilitation and Biodiversity Action Plan activities and are contacted during the rehabilitation planning process for their views. See Section 4.

2.3 Field Surveys

Bord na Móna carried out a baseline ecological survey of all of its properties in 2009-2012 and developed habitat maps. As part of this exercise, Derryarogue Bog was surveyed in 2012. Habitat maps were updated in 2017. A survey also took place in February of 2023, in advance of the preparation of this rehabilitation plan. Habitat maps have been updated, where required. This rehabilitation plan is informed by the original baseline survey as well as subsequent confirmatory site walk-over surveys and visits, and updates to baseline data.

Habitat mapping followed best practice guidance from Smith *et al.* (2011). Map outputs including all habitat maps and target notes were produced using GIS software application packages (ArcGIS). General marginal habitats and other habitats that had not been modified significantly by industrial peat extraction were classified using Fossitt *et al*. (2000). Plant nomenclature for vascular plants follows Stace (2019), while mosses and liverworts nomenclature follows identification keys published by the British Bryological Society (2010). A more detailed Bord na Móna classification system was previously developed for classifying pioneer cutaway habitats as Fossitt categories were deemed not to be detailed enough for cutaway bog (much of cutaway bog could be classified as Cutover Bog - PB4). Much of the pioneer cutaway vegetation is still at an early stage of its development and cannot be assigned to Fossitt Level 3 categories yet.

A detailed ecological survey report for Derryarogue Bog is contained in Appendix II. Note the ecological survey report covers the entirety of Derryarogue bog including the areas within PCAS, Derryarogue west (Cloonbony Bog) and Derryarogue north (Cloonbearla), as well as the area of Derryarogue that is in the footprint of the Derryadd Wind Farm development.

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3. SITE DESCRIPTION

Derryarogue Bog is located approximately three kilometres to the east of Lanesborough in County Longford. The extent of Derryarogue Bog that is subject to this standard rehabilitation plan is located within the main eastern section of the Derryarogue site. Derryarogue Bog is part of the Mountdillon group (Lough Ree sub-group) of bogs. The River Shannon flows close to the western and northern boundaries of the wider Derryarogue Bog site.

The surrounding landscape is dominated by a mosaic of farmland, largely consisting of improved grassland, and other bogs, many owned and managed by Bord na Móna. A long section of rail line to the west of the site connects the Roscommon Bogs of the Mountdillon Bog Group to the ESB Power Station in Lanesborough. The N63 Longford to Roscommon Road is located to the south of Derryarogue bog, with access to the bog provided via local roads off the N63.

The Ballynakill_26 (EPA code: 26B22) flows along the eastern boundary of the site before joining with the River Shannon (Upper) (EPA code: 26S02).

Derryarogue Bog was in industrial peat production since the 1950's therefore, much of the harvestable peat resource has been removed. Industrial peat extraction has now ceased. The majority of the site has shallow residual peat. Gravel and other sub-soils are exposed in places across the site. Sections of Derryarogue that have come out of peat extraction in the past 20 years have been developing pioneer cutaway habitats (wetlands, Birch scrub and woodland). This has led to a patchy heterogeneous mosaic of pioneer habitats that reflect the peat production history and the underlying environmental conditions. Derryarogue Bog has a pumped drainage regime with five pumps within the lands subject to the current Plan.

Derryarogue west (Cloonbony Bog) and Derryarogue north (Cloonbearla) are separated from the main bog via a headland and industrial bog railway, and these lobes of Derryarogue are being rehabilitated under PCAS and are subject to a separate rehabilitation plan (see Derryarogue Rehabilitation Plan 2023 Bogs - BNM Peatlands Climate Action Scheme (bnmpcas.ie). See Drawing number BNM-ECO-23-27-01: Bog Site Location, included in the accompanying Mapbook[2] , which illustrates the location of Derryarogue Bog in context to the surrounding area.

3.1 Status and Situation

3.1.1 Site history

Derryarogue Bog was used to supply the adjacent Lanesborough and subsequently Lough Ree ESB Power Station. Derryarogue Bog was in industrial peat extraction from 1952 to 2019. Much of the site was cutaway at various stages prior to 2019 with industrial peat extraction reducing on a phased basis, therefore cutaway habitats have been developing across the site for some time.

Numerous power lines cross the site and are in place to power the surface water drainage pumps that are located across the bog.

[2] Cutaway Bog Decommissioning and Rehabilitation Plan – Derryarogue Bog Map Book

3.1.2 Current land-use

Bord na Móna are planning to develop a renewable energy project at Derryarogue Bog as part of the proposed Derryadd Wind Farm (see Location | Derryadd Wind Farm). This wind farm project is in pre-planning stages and is expected to be submitted for planning permission in 2025. The proposed Derryadd Wind Farm infrastructure **partially** overlaps with the Derryarogue rehabilitation footprint (see drawing number BNM-ECO-23-27-20: Standard Rehab Measures); the wind farm and its associated infrastructure have been mapped as a constraint in the rehabilitation plan.

The Proposed Development will comprise:

The Proposed Derryadd Wind Farm Development will comprise:

- 22 no. wind turbines with a blade tip height of 190 m, blade rotor diameter of 165 m, hub height of 107.5 m and the associated infrastructure including tower sections, nacelle, hub, and rotor blades and all associated foundations and hard-standing areas in respect of each turbine;
- New internal site access roads, approximately 27,500m in length including passing bays and associated drainage;
- 2 no. permanent Meteorological Masts, both of which will be 120 m in height, and associated hardstanding areas for both masts, as well as the decommissioning and removal of an existing 100 m Meteorological Mast on site in Lough Barrow Bog;
- 4 No. Borrow pits in Derryadd Bog; All works associated with the opening, gravel and spoil extraction, and decommissioning of the borrow pits;
- 4 No. temporary construction compounds, including material storage, site welfare facilities, and site offices;
- 4 No. temporary security cabins at the main construction site entrances as well as at a number of access points around the proposed wind farm site;
- 1 no. 110 kV electrical substation compound in Derryarogue Bog. The substation will consist of 2 No. control buildings, a 36 m high telecommunications tower, associated electrical plant and equipment, ground water well, wastewater holding tank and welfare facilities;
- All associated underground electrical and communications cabling connecting the turbines and masts to the proposed electrical substation, including road crossing at N63 and associated grid connection via a 110 kV loop-in connection to the existing Lanesborough-Richmond 110 kV overhead line which traverses the proposed wind farm site;
- 1 No. 16 MW battery storage facility;
- 2 No. Peat Deposition Area, one to the north of the proposed substation compound in Derryarogue Bog and one in Derryadd Bog;
- New site access entrances, temporary improvements and modifications to existing public road infrastructure to facilitate delivery of abnormal loads including locations on N6 Eastbound Slip Road, N6/N61 Roundabout at Athlone, N61/N63 Roundabout at Roscommon, N63 Roscommon Arts Centre Roundabout and N61/N63 Roundabout, Northeast of Roscommon;

- Hinge 3 No. permanent lighting fixtures in Folio RN40465F in Roscommon town to facilitate the delivery of abnormal loads (i.e. turbine blades);
- Approximately 7,500m of dedicated amenity access tracks to provide linkages between the proposed wind farm site roads and the existing royal canal greenway (to the east) and Corlea visitor centre and amenity areas (to the south);
- 3 No. permanent amenity carparks, one of which is situated in Derryarogue Bog (19 no. car parking spaces in total) and two carparks in Derryadd Bog (19 no. car parking spaces in each carpark);
- All associated site work and ancillary works including new drainage and upgrading existing drainage, access road, earthworks, site reinstatement and erosion control, which will be aligned with the existing and future site rehabilitation plans; and,
- A 10-year planning permission is being sought with a 30-year operational life from the date of commissioning of the entire wind farm.

Several BnM industrial railways occur at the site. It is anticipated that this railway will be decommissioned when peat stocks are removed from neighbouring bogs.

Only a small area of remnant raised bog occurs along the margins of Derryarogue Bog. This bog remnant has been subject to drainage, associated with domestic turf cutting and the remaining peat is almost exhausted in this area.

There was hydrological management via pumping to support the former industrial peat production and its infrastructure. Pumping will remain ongoing during the decommissioning phase.

3.1.3 Socio-Economic conditions

Bord na Móna has historically been a vital employer for the rural communities in the Irish Midlands. Bord na Móna compiled a report on the role of peat extraction in the midlands historically in which they report that in 1986, by the end of Bord na Móna's Third Development Programme, a total of twenty-three work locations had been established around the country. The company had an average employment of approximately 4,688 in the mid 1980's, with a peak employment of 6,100 during the production season, which placed it among the country's largest commercial employers. The importance of such levels of employment were largely due to its regional concentration in the Midlands and the lack of alternative employment opportunities in these areas at the time.

According to the Energy Crop Socio-Economic Study undertaken by Fitzpatrick Associates in 2011, there were an estimated 1,443 jobs supported by the peat-to-power industry in Ireland at the time, some 81% of which were located in the catchment areas of the three peat-fired generating stations (Lough Ree, West Offaly, and Edenderry Power Stations). These constituted jobs in the plants and in peat extraction, jobs indirectly supported in upstream supply industries and jobs induced through the trickle-down effects of the wages and salaries of those supported directly or indirectly. These job numbers have now declined with the cessation of peat extraction.

In respect of Derryarogue Bog, jobs included in the above study would have included those to facilitate extraction of peat at this site and associated processing and transfer to Lanesborough and subsequently Lough Ree power stations.

As the primary employer in many Midland counties, Bord na Móna played a central role in building communities through several initiatives, including development and construction of local housing complexes, education bursaries, support of local sporting clubs, the provision of community gain funds, charity programmes and the provision and building of amenity areas.

Employment numbers have now declined following the cessation of peat extraction at this bog.

3.2 Geology and Peat Depths

3.2.1 Sub-soil geology

The underlying geology[3] at Derryarogue Bog comprises Visean Limestones (undifferentiated). Quaternary sediment maps indicate that Derryarogue is primarily underlain by peat, with till derived chiefly from Limestone. The site is underlain with a mix of limestone till and marl/lacustrine clay sub-soils.

3.2.2 *Peat type and depths*

Much of Derryarogue Bog is now cutaway and the majority of the original raised bog has now been removed, with exposed sub-soils in places. Derryarogue is considered to be a shallow peat cutover bog, and in general between 0.5m - 1.5m of residual fen or minerotrophic peat remains. There are also some isolated pockets with residual peat of deeper than 2 m in the south-west of the bog (Barnacor).

3.3 Key Biodiversity Features of Interest

Different cutaway habitats developing across the site reflect the underlying and varying environmental conditions. Environmental factors such as hydrology, residual peat depths and topography all have a significant influence on the future development of cutaway habitats and proposed rehabilitation. Hydrology tends to have the most significant influence on the development of future cutaway habitats. All bogs have hydrological gradients from wet to dry habitats. Shallow residual peat usually means there are stronger fen influences on the pioneer cutaway development as fen peat is the residual peat type and ground-water has a stronger influence.

The majority of Derryarogue Bog comprises a mosaic of bare peat along with cutaway habitats. Some of these areas contain developing wetlands. The former production bog is surrounded by some typical marginal habitats of high local value including intact raised bog (PB1) and Birch woodland (WN7). The River Shannon flows close to the western edge of the northern lobe of Derryarogue bog (Cloonbearla) bog. The River Shannon is an important wildlife corridor along which species can move from one area to another. During winter, parts of the bog flood, occasionally attracting Whooper Swans (*Cygnus cygnus*) to roost, with flocks of up to 100 birds recorded (Tobin, 2019). Marsh Fritillary (*Euphydryas aurinia*) have been recorded on the bog and could potentially breed there due to the presence of suitable habitat containing the larval foodplant Devil's Bit Scabious (*Succisia pratensis*).

Derryarogue Mineral Island is a feature of high ecological value due to the presence of calcareous grassland (GS1), scrub and woodland (WS1/WN2), Rich fen and flush (PF1) and calcareous springs (FP1). The rich fen and flush habitat had previously been classified as wet calcareous grassland (Appendix II). A recent survey (Fitzgerald, 2023) has found that both the rich fen and flush and calcareous springs are of Annex I Habitat quality. Rich fen and flush (PF1) corresponds with Alkaline fen (7230) due to its species assemblage and abundance of indicator species. The calcareous springs correspond with the priority EU Annex I Habitat (*7220) Petrifying springs with tufa formation (Cratoneurion). The presence of two Annex I habitats means this area has **National** ecological importance, given the scarcity and conservation status of these particular habitats.

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

3.3.1 Current habitats

The most common habitats[4] present in the former production areas at Derryarogue include:

- Bare peat (0-50% cover) (BP)
- Pioneer *Juncus effusus* poor fen community (pJeff) with less frequent pioneer *Eriophorum angustifolium* (pEang) or *Carex rostrata* community (pRos) dominated poor fen.
- Willow-dominated scrub (in mosaic with *Juncus effusus* poor fen community) (in those areas that are flooded regularly)
- Permanent pools and lakes (OW) and temporary open water (TOW)
- Emergent *Betula*-dominated community (A) (eBir) and open *Betula*-dominated community (B) (oBir) (on drier higher ground that is not flooded)
- Dry *Calluna* community (dHeath) (mainly in mosaic with Birch scrub)
- Dry pioneer *Molinia caerulea* dominated grassland community (gMol)
- Access routes (Acc)
- Riparian zones (Rip) (with drains and associated habitats such as scrub and Birch woodland)
- Silt ponds (Silt) with *Ulex*-dominated scrub community/Birch scrub and *Molinia caerulea* dominated grassland community (gMol)

The most common habitats found around the margins of the site include:

- Raised bog (PB1)
- Cutover Bog (PB4)
- Scrub (WS1)
- Wet (callows-type) grassland (GS4)
- Birch woodland (WN7)
- Dense Bracken (HD1)
- Improved grassland (GA1) where boundary extends into adjacent fields

See Drawing number BNM-ECO-23-27-17 titled **Derryarogue Bog: Current Habitat Map**, included in the accompanying Mapbook, which illustrates the habitats at Derryarogue Bog.

[4] Codes refer BnM classification of pioneer habitats of production bog

3.3.2 Species of conservation interest

A number of species of conservation concern utilize the habitats available at Derryarogue Bog. The following is a summary of the records of these species available within both BnM records and those of the National Biodiversity Data Centre, along with records from a previously compiled (2019) Ornithology Chapter in respect of a former application for planning permission (Planning Ref: PA14.303592) in respect of Derryadd Wind Farm[5].

- Multiple mammal species have been recorded on or in close proximity to the bog including Badger (*Meles meles*), Red Fox (*Vulpes vulpes*), West European Hedgehog (*Erinaceus europaeus*), Pine Marten (*Martes martes*), Irish Stoat (*Mustela erminea subsp. hibernica*), Irish Hare (*Lepus timidus subsp. hibernicus*), European Rabbit (*Oryctolagus cuniculus*), European Otter (*Lutra lutra*), Eurasian Red Squirrel (*Sciurus vulgaris*), Eurasian Pygmy Shrew (*Sorex minutus*), and the invasive species American Mink (*Mustela vison*) and Eastern Grey Squirrel (*Sciurus carolinensis*).
- Marsh Fritillary (*Euphydryas aurinia*) butterfly has been recorded on Derryarogue Bog. This species is using calcareous grassland (GS1) in Derryarogue Island – a mineral island within Derryarogue Bog.

Derryadd Wind Farm EIAR Bird Records

A review of the Ornithology Chapter for the previously proposed Derryadd Wind Farm Ecological Impact Assessment Report (EIAR) (Planning Ref. No. ABP-303592-19) was also undertaken. The below paragraphs provide a summary of the bird species of conservation concern (previously) recorded during surveys to inform the above, and which may still occur at the bog.

Five Red Listed (BoCCI) species were recorded within the boundary of Derryarogue during dedicated bird surveys for the proposed development. These species include Snipe (*Gallinago gallinago*), Golden Plover (*Pluvialis apricaria*), Woodcock (*Scolopax rusticola*), Meadow Pipit (*Anthus pratensis*) and Kestrel (*Falco tinnunculus*). Eight Amber List species (BoCCI) were recorded, including Black-headed Gull (*Larus ridibundus*), Lesser Black-backed Gull (*Larus fuscus*), Ringed plover (*Charadrius hiaticula*), Common Gull (*Larus canus*), Short Eared Owl (*Asio flammeus*), Cormorant (*Phalacrocorax carbo*), Mallard (*Anas platyrhynchos*) and Mute Swan (*Cygnus olor*). A number of additional Green listed target species recorded included Peregrine Falcon (*Falco peregrinus*), Buzzard (*Buteo buteo*), Sparrowhawk (*Accipiter nisus*), Little Egret (*Egretta garzetta*) and Grey Heron (*Ardea cinerea*). Three of these species are also listed on Annex I of the EU Birds Directive, namely Golden Plover, Peregrine Falcon and Little Egret.

Surveys in the wider Derryadd Wind Farm study area (Derryadd, Lough Bannow), outside the boundary of Derryarogue bog also recorded additional Red Listed (BoCCI) species including Curlew (*Numenius arquata*), Redshank (*Tringa totanus*), Herring gull (*Larus argentatus*), Grey wagtail (*Motacilla cinerea*), Lapwing (*Vanellus vanellus)* and Wigeon (*Mareca penelope*). The results of the breeding bird surveys (2015, 2016 and 2017) undertaken in the wider wind farm study area also recorded several additional Red List species (BoCCI), including Woodcock, Curlew, Lapwing and Quail (*Coturnix coturnix*). A number of species recorded during the winter months in the wind farm study area are listed on Annex I of the EU Birds Directive, namely Golden Plover, Greenland White-fronted Goose (*Anser albifrons flavirostris*), Hen Harrier (*Circus cyaneus*), Kingfisher (*Alcedo atthis*), Merlin (*Falco columbarius*) and Peregrine Falcon. Golden Plover, Hen Harrier, Merlin and Peregrine Falcon were also recorded during breeding season surveys along with Common Tern (*Sterna hirundo*) and Little Egret.

[5] Tobin, 2019, Derryadd Wind Farm Environmental Impact Assessment Report (EIAR), Volume II, EIAR Main Report.

It should be noted that much of the wildfowl, wader and gull observations recorded as part of the ornithological study were associated with the River Shannon and associated wet grasslands to the north of the area.

Bord na Móna are planning to develop a renewable energy project at Derryarogue Bog as part of the proposed Derryadd Wind Farm (see Location | Derryadd Wind Farm). This proposed wind farm project is located within Derryarogue Bog as well as the adjacent Bord na Móna bogs of Derryadd, and Lough Bannow.

A review of the interim bird survey report detailing the results of bird surveys undertaken by Tobin Consulting Engineers at the Derryadd Wind Farm Site from April 2022-April 2023 was also undertaken. The below paragraphs provide a summary of the bird species of conservation concern recorded. These records are from the wind farm study area including Derryarogue Bog as well as Derryadd Bog and Lough Bannow Bog located to the south.

In total, during the range of ornithological surveys conducted since April 2022, 98 bird species have been observed at the proposed Derryadd Wind Farm site. A number of species recorded in the Wind Farm study area are listed on Annex I of the EU Birds Directive, including Little Egret, Greater White-fronted Goose, Peregrine Falcon, Whooper Swan, Kingfisher, Merlin, Hen Harrier, Curlew and Golden Plover. The following Red Listed (BoCCI) species were recorded in the study area: Kestrel, Snipe, Meadow Pipit, Lapwing and Northern Shoveler (*Anas clypeata*). The following Amber Listed (BoCCI) species were also recorded in the study area: Cormorant, Eurasian Teal (*Anas crecca*), Wigeon, Ringed Plover, Black-headed Gull, Lesser Black-backed Gull, Tufted Duck (*Aythya fuligula*), Greylag Goose (*Anser anser*), Common Gull, Common Coot (*Fulica atra*), and Short-eared Owl (*Asio flammeus*).

3.3.3 Invasive species

The invasive species American Mink (*Mustela vison*) has previously been recorded from Derryarogue Bog. There are no other BNM records for high impact invasive species recorded from the bog.

A broad range of common garden escapes are occasionally present around the margins of Bord na Móna bogs, and although spatial overlap with the proposed rehabilitation is expected to be limited, these are, where necessary, to be treated in line with best practice during rehabilitation activities.

3.4 Statutory Nature Conservation Designations

There are a number of European Sites in close proximity (i.e. within a 5km radius at minimum) to Derryarogue Bog.

Lough Ree SAC (site code: 000440) lies approximately 2.3 km south-west of Derryarogue Bog. The qualifying interests of Lough Ree SAC include Natural eutrophic lakes with *Magnopotamion or Hydrocharition* - type vegetation [3150] Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) [6210], Active raised bogs [7110], Degraded raised bogs still capable of natural regeneration [7120], Alkaline fens [7230], Limestone pavements [8240], Bog woodland [91D0], Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae*) [91E0] and *Lutra lutra* (Otter) [1355].

Lough Ree SPA (Site code: 004064) lies approximately 2.5 km south-west of Derryarogue Bog and overlaps Lough Ree SAC. This SPA is designated for a variety of waterfowl and waders and wetland habitat [A999]. Lough Ree is also designed as a pNHA (site code: 000440).

Lough Forbes Complex SAC (site code: 001818) lies approximately 4.6 km north-east of Derryarogue Bog. This EU site is designated for Natural eutrophic lakes [3150], Active raised bogs [7110], Degraded raised bogs still capable of natural regeneration [7120], Depressions on peat substrates of the *Rhynchosporion* [7150] and Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0].

Ballykenny-Fisherstown Bog SPA (site code: 004101) lies approximately 4.6 km north-east of Derryarogue Bog and overlaps Lough Forbes Complex SAC. This SPA is designated for Greenland White-fronted Goose (*Anser albifrons flavirostris*) [A395].

A number of NHA's (Natural Heritage Areas) and pNHA's (Proposed Natural Heritage Areas) also occur within 5km of Derryarogue Bog including:

- Lough Bannow pNHA (Site code: 000449) lies approximately 90 m south
- Lough Ree pNHA (site code: 000440) lies approximately 2.4 km south-west
- Royal Canal pNHA (site code: 002103) lies approximately 2.7 km east
- Lough Forbes Complex pNHA (site code: 001818) lies approximately 4.4 km north-east

3.4.1 Other Nature Conservation Designations

The Ramsar Convention entered into force in Ireland on 15th March 1985. Ireland currently has 45 sites/wetlands designated as Wetlands of International Importance (Ramsar Sites). These cover a surface area of 66,994ha.

There are no Ramsar sites in close proximity to Derryarogue Bog.

3.5 Hydrology and Hydrogeology

Derryarogue Bog lies in the Shannon (Upper) catchment (Catchment ID: 26C), the Shannon (Upper) sub-catchment (Catchment ID: 26C), as defined by the EPA under the Water Framework Directive (WFD).

There are several drains/channelised streams around the margins of the site that drain the site. Ballynakill (EPA Code: 26B22) flows northerly along the eastern bog boundary. The Kilnacarrow Stream (EPA Code: 26K64), flows in a northerly direction along the north-western boundary of the bog.

Derryarogue Bog has a pumped drainage regime. There are five pumps located on site. These facilitate drainage from several discharge points for the former peat production and support of infrastructure.

GSI data indicates that Derryarogue Bog is primarily underlain by visean limestones (undifferentiated), which is classified as a regionally important aquifer - karstified (conduit).

Geological Survey of Ireland (GSI) mapping identifies several karst features (enclosed depressions) approximately 1km east of the bog. No data exists concerning depth to bedrock, however, there is a small area of bedrock in close proximity to the bog.

An aquifer is an underground body of water-bearing rock or unconsolidated materials (gravel or sand) from which groundwater can be extracted in useful amounts. GSIs Aquifer classes are divided into three main groups based on their resource potential, and further subdivided based on the type of openings through which groundwater flows. There are nine aquifer categories in total. Locally important aquifers are capable of supplying locally important abstractions (e.g. smaller public water supplies, group schemes), or good yields (100-400 m3/d). This data gives an indication of sub-surface deposits (bedrock and unconsolidated materials) in terms of their groundwater resource potential and dominant groundwater flow type.

Regionally important aquifers are those in which the network of fractures, fissures and joints, through which groundwater flows, is well connected and widely dispersed, resulting in a relatively even distribution of highly permeable zones. There is good aquifer storage and groundwater flow paths can be up to several kilometres in length. There is likely to be substantial groundwater discharge to surface waters ('baseflow') and large (>2,000 m3/d), dependable springs may be associated with these aquifers.

The entirety of the bog is located in an area mapped by GSI as of low groundwater vulnerability (GSI Mapviewer). Groundwater vulnerability for the area surrounding Derryarogue Bog is generally of low/moderate vulnerability. Groundwater Vulnerability is a term used to represent the intrinsic geological and hydrogeological characteristics that determine the ease with which groundwater may be contaminated by human activities. Groundwater vulnerability maps are based on the type and thicknesses of subsoils (sands, gravels, glacial tills (or boulder clays), peat, lake and alluvial silts and clays), and the presence of karst features. Groundwater is most at risk where the subsoils are absent or thin and, in areas of karstic limestone, where surface streams sink underground at swallow holes. These data indicate there is generally low risk of any groundwater contamination occurring at this site. Groundwater Vulnerability is typically used to indicate the susceptibility to groundwater pollution, it can provide a useful proxy indication of likely groundwater flow rates in the surrounding area.

3.6 Emissions to surface-water and watercourses

Drainage is an important feature of industrial peat production and there were extensive field drains maintained throughout bog areas to facilitate industrial peat production annually, each of which eventually drains into a terminal silt pond that allows for settlement of suspended solids before entering the main river systems. In accordance with the existing Integrated Pollution Control licence, all drainage water from boglands in a licensed area is discharged via an appropriately designed silt pond treatment arrangement as required in Condition 6.6. of the licence. Industrial peat production has now permanently ceased at Derryarogue Bog.

Silt ponds are the key silt control infrastructure to control potential emissions from industrial peat production sites. As required under licence, BNM have a number of procedures for how it manages and maintains its silt pond network. The silt that builds up in silt ponds is excavated on a regular basis by Bord na Móna to facilitate an efficient level of silt control. Silt ponds will continue to be maintained during the rehabilitation and decommissioning. Silt pond decommissioning will be considered when sites are deemed to be on a trajectory of environmental stability and peatland rehabilitation has been completed.

Derryarogue Bog has three main surface water discharge locations from previously active peat extraction catchments, which discharge to the Kilnacarrow River (IE_SH_26S021600)) and the Ballynakill River (IE_SH_26B220790) both of which flow to the River Shannon. The River Shannon was listed as being under pressure from peat extraction in the 2nd cycle of the River Basin Management Plan for Ireland and is indicated as remaining so in the third cycle which is currently in preparation.

Details of silt ponds, associated surface water emission points and monitoring and sampling locations are detailed in Drawing numbers BNM-ECO-23-27-SP01 titled *Derryarogue Bog: Sampling Points*, along with Drawing number BNM-ECO-23-27-WQ01 titled *Derryarogue Bog: Water Quality Map* included in the accompanying Mapbook, which illustrate the various drainage and water quality infrastructure present at Derryarogue Bog.

There is a robust monitoring program to track and verify any changes in baseline water quality conditions pre and post decommissioning and rehabilitation so that the success or otherwise can be tracked and verified for the Environmental Protection Agency.

Decommissioning and Rehabilitation Programme Water Quality Monitoring

Rehabilitation of cutaway peatland is closely linked with control of emissions. One of the criteria for successful rehabilitation is stabilisation through re-vegetation, which will stabilise all substrates and in turn remove the need for further silt control measures. This site is already largely vegetated. Re-wetted peat also aids the primary objective of stabilizing peat, as when peat is re-wetted it is not vulnerable to wind erosion. Re-wetted peat and the development of wet peatland habitats can also act as sinks for silt and mobile peat, and increases additional retention time for solids, and the peatland vegetation can quickly stabilise this material within blocked drains on site (by acting like constructed wetlands).

Water quality of water discharges from restored peatlands normally improves as a result of bog restoration measures and the restoration of natural peatland processes (Bonn *et al*., 2017). Bog restoration is also expected to improve water attenuation of the site as the drains are blocked, slowing water movement and water release from the site. Restored peatlands help slow the release of water and aid the natural regulation of floods downstream (Minayeva *et al*., 2017). The National River Basin Management Plan (NRBMP) 2018-2021 (DHPCLG, 2017) is the key national plan for Ireland to achieve the objectives of the Water Framework Directive (WFD). The NRBMP outlines how key actions such as the Bord na Móna peatland rehabilitation is expected to have a positive impact on water quality and help the NWBMP deliver its objectives in relation to the WFD.

Water will still discharge from designated emission points when rehabilitation at Derryarogue has been completed. This discharge will have improved water quality and there will be increased wetland attenuation, meaning slower release of water. This is expected to have a positive impact on status of the key waterbody receptors, the River Shannon (IE_SH_26S021600 SHANNON (Upper)_100) and Ballynakill River (IE_SH_26B220790 BALLYNAKILL_010) and will support the future status of the waterbodies achieving Good Status.

Water quality monitoring will be established. There will be initial quarterly monitoring assessments of the site to determine the general status of the site, the condition of the silt-ponds, assess the condition of the rehabilitation work, asses the progress of natural colonisation, monitoring of any potential impacts on neighbouring land and general land security. The number of site visits will reduce after 2 years to bi-annually. These site visits will assess the need to additional rehabilitation.

Monitoring results will be maintained, trended and reported on each year as part of the requirement to report on Condition 10.1 of the IPC Licence on Bog Rehabilitation in the Annual Environmental Report, which will be available in April each year at www.epa.ie.

The parameters to be included (as per condition 6.2 of the IPC Licence) include monthly monitoring for pH, Flow, Suspended Solids, Total Solids, Total Phosphorus, Total Ammonia, Colour, and COD.

This sampling regime on a selected number of silt ponds will be carried out over a two-year cycle. The original (licence) requirement was for a quarterly sampling regime.

3.7 Fugitive Emissions to air

Rehabilitation of the drained peatland will seek to re-wet the dry peat where possible. Collectively re-wetting and re-vegetating will minimise any risk of emission to air from dust.

3.8 Carbon emissions

Irish peatlands are a huge carbon store, containing more than 75% of the national soil organic carbon (Renou-Wilson *et al*., 2012). Peatland drainage and extraction transforms a natural peatland which acts as a modest carbon sink (taking in 0.1 to 1.1 t of carbon as CO2-C /ha/yr) into a cutaway ecosystem which is a large source of carbon dioxide (releasing 1.3 to 2.2 t of carbon as CO2-C /ha/yr) based on Tier 1 Emission factors (Evans et al. 2017). Renou-Wilson et al. (2018) reported losses of between 0.81 – 1.51 CO2-C /ha/yr from drained peatlands located in Ireland.

Re-wetting of dry peatlands will increase methane emissions (Gunther *et al.*, 2020) as a consequence of the anoxic conditions within the peat body that provide a suitable environment for the microbial breakdown of plant litter and root exudates. Tanneberger *et al.* (2021) describes how peatland management has to choose between CO2 emissions from drained peatlands or increased methane (CH4) emissions from rewetted industrial peatlands. However, when radiative effects and atmospheric lifetimes of both GHG gases are considered and modelled, postponing rewetting increases the long-term warming effect of continued CO2 emissions (Gunther *et al.*, 2020). This means the increase in methane due to rewetting of dry peatlands is still negated by the CO2 emissions reductions. Further, Wilson *et al.* (2022) confirmed the benefit of rapid rewetting to achieve strong carbon reductions and potentially altering the warming dynamics from warming to cooling depending upon the climate scenario.

It is expected that Derryarogue Bog will become a reduced carbon source following rehabilitation. The potential of any cutaway site to develop as a carbon sink in the longer-term depends on the success of the rehabilitation measures, the extent of development of *Sphagnum*-rich or other peat-forming habitats, the balance of carbon fluxes from different cutaway habitats and future climatic conditions. Much of this bog is expected to develop wetland habitats on shallow peat with open water, reed swamp and fen habitats with alkaline peatland emission factors. A small area will develop as regenerating wet deep peat vegetation on deep peat areas. Birch woodland is expected to develop on the drier mounds and along peripheral headlands.

3.9 Current ecological rating

(Following NRA (2009) Evaluation Criteria)

The majority of Derryarogue Bog can be rated as **Local Importance; lower value to Local Importance; higher value.** Bare peat and other intensively managed areas are assessed as **local importance (lower value)**. Marginal habitats including wetland, woodland, scrub, pioneer cutaway habitats and bog remnant may act as a refuge and as ecological corridors for wildlife and are therefore deemed to be **locally important (higher value)**.

The area known as Derryarogue Mineral Island is rated as having **National Importance**, due to the presence of Annex I habitats and species.

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4. CONSULTATION

4.1 Consultation to date

Consultation seeks to engage an audience of relevant stakeholders at both a national and local level. National stakeholders have been identified from varied bog restoration and rehabilitation efforts undertaken by Bord na Móna over the past 40 years, with particular emphasis on engagement with stakeholders during their Biodiversity Action Plan programme, since 2010. National Stakeholders includes relevant government departments and agencies, relevant semi-state bodies, NGOs and other environmentally-focused groups with a national remit.

There has been ongoing consultation on rehabilitation, biodiversity and other general issues at Derryarogue Bog in relation to the proposed Derryadd Wind Farm (Bord na Móna Wind Farm | Derryadd Wind Farm). Specific consultation relating to the wind farm development and associated amenity development is not listed here, although there has been detailed consultation with stakeholders in relation to these issues and overlap with rehabilitation and biodiversity.

There has been ongoing consultation about rehabilitation, biodiversity and other general issues over the years about Mountdillon bog group, including Derryarogue Bog, with various stakeholders in relation to:

- General consultation with range of stakeholders at annual Bord na Móna Biodiversity Action Plan review days 2010-2018.
- Longford Wetland Wilderness (general proposal led by Longford County Council and other stakeholders. This has had several iterations. See Lough Ree and Mid Shannon, Spirit Level 2017. A feasibility study for Longford County Council).
- Feehan, J. (2004) A Long-Lived Wilderness; the future of the north midlands peatland network UCD/NWWPC.
- Lauder, A. & O'Toole L. (2017). Concept development for a landscape-scale Wetland Wilderness Park in the Mid Shannon Region. A report funded by the Heritage Council's Heritage Grant Scheme.
- Foss, P.J., Crushell, P. & Gallagher, M.C. (2017). Counties Longford &Roscommon Wetland Study. Report prepared for Longford and Roscommon County Councils.
- Archaeological Liaison Committee (National Museum of Ireland & Dept of Culture Heritage and the Gaeltacht).
- Midlands & East Regional WFD Operational Committee (River Basin Management Plans).
- Sub-committee on Shannon Flooding Work Programme and Measures (OPW, Waterways Ireland, ESB, LA's, Fisheries Ireland, NPWs etc.).
- Greenway development at Derryarogue (Longford County Council).
- Consultation for the preparation of Derryarogue **West** Rehabilitation Plan 2023 (PCAS) 2023 Bogs - BNM Peatlands Climate Action Scheme (bnmpcas.ie).

To inform the current Plan, both national and local stakeholders, including neighbours whose land adjoins Derryarogue Bog and local representatives of national bodies (such as Regional National Parks and Wildlife Service staff) and relevant offices in County Councils (such as the Heritage or Environmental Offices) will be contacted. Any identified local interest groups will be sought and informed of the opportunity to engage with this rehabilitation plan, and when identified invited to submit their comments or observations in relation to the proposed rehabilitation at Derryarogue Bog.

All correspondence received will be acknowledged and evaluated against the rehabilitation work proposed here, and the final draft of the Derryarogue Bog Rehabilitation Plan will contain a review of the consultation.

4.2 Issues raised by Consultees

N/A as yet, as consultation has not commenced.

4.3 Bord na Móna response to issues raised during consultation

N/A as yet, as consultation has not commenced.

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5. REHABILITATION GOALS AND OUTCOMES

The rehabilitation goals and outcomes outline what Bord na Móna want to achieve by implementing the rehabilitation. These include:

- Meeting conditions of IPC Licence.
- Environmental stabilisation of the former peat production areas and mitigation of potential silt run-off.
- Stabilisation or reduction in water quality parameters of water discharging from the site (e.g. suspended solids).
- Reducing pressure on receiving waterbodies that have been classified as At Risk from peatlands and from peat extraction, via stabilization or improving water-quality from this bog, and therefore, reducing pressures.
- Optimising hydrological conditions for the protection of exposed archaeological structures, their retention in situ and preservation into the future.
- Supporting the proposed Derryadd Wind Farm Project. Integrating rehabilitation measures with current amenity infrastructure on site. It is not proposed to carry out any rehabilitation actions to change or negatively affect any infrastructure.
- The main goal and outcome of this plan is the successful rehabilitation (environmental stabilisation) of peatlands used for industrial peat production at the bog in a manner that is acceptable to both external stakeholders and to Bord na Móna.

The rehabilitation goals and outcomes take account of the following issues.

- Natural colonisation will form the basis for the environmental stabilisation of the bare peat areas. Re-wetting of the cutaway, where possible, is a general rehabilitation strategy. The main target will be to maintain water-levels close to the peat surface, and to avoid the creation of large-water bodies where possible. However, this is dependent on the topography of the cutaway bog and the final drainage regime. Re-wetting and water levels close to the peat surface accelerates the re-vegetation processes, the development of vegetation cover and therefore environmental stabilisation. There is already significant potential for the creation of wet cutaway habitats at Derryarogue Bog due to the local topography (localised basins).
- It will take some time for stable naturally functioning habitats to fully develop at Derryarogue Bog. This will happen over a longer timeframe than the implementation of this rehabilitation plan.
- It is not expected that the site has the potential to develop active raised bog (ARB) analogous to the priority EU Habitats Directive Annex I habitat within the foreseeable future (c.50 years). Furthermore, the majority of the bog is shallow peat and only a small proportion of the bog has potential to develop *Sphagnum*-rich habitats in this timeframe. Nevertheless, re-wetting across the entire bog will improve habitat conditions of the whole bog. Other peatland habitats will develop in a wider mosaic that reflects underlying conditions.
- Re-wetting residual peat will initially maintain and enhance the carbon storage capacity of the bog. There is scientific consensus that restoration of hydrology in damaged bog can improve carbon storage, water storage and attenuation and help support biodiversity both on the site and in the catchment (See Section 3.8). This will reduce Carbon emissions from the site from a larger carbon source to a smaller Carbon source.

- Rehabilitating former industrial peat production bog will also in the longer-term support other ecosystem services such as such the development of new habitat to support biodiversity and local attenuation of water flows from the bog.
- WFD status in receiving water bodies can be affected by peatlands and peat extraction but is also affected by other sources such as agriculture. In addition, receiving water bodies that are assessed as At Risk from peatlands and from peat extraction are likely to have several contributary sources of impacts (private peat extraction and Bord na Mona). Reducing pressures due to former peat extraction activities at Derryarogue Bog will contribute to stabilising or improving water quality status of receiving water bodies in general. Ultimately, improving the WFD status of the receiving water body will depend on reducing pressure from a range of different sources, including peatlands in general (private and Bord na Mona).
- Bord na Móna are also planning rehabilitation measures in some nearby bogs, including the remainder of Derryarogue outside of the windfarm footprint, Derryadd East and Derryshannoge in 2023, and rehabilitation has taken place in several surrounding bogs through PCAS including Killashee, Begnagh, Clooneeny, Knappoge, Derrycashel and Derraghan bogs. There are expected to be cumulative water quality and other ecosystem service benefits to receiving water bodies from rehabilitating more than one bog in the same catchment.
- Re-wetting in general will benefit the future preservation of most known and unknown archaeological features.
- Planned land uses, such as renewable energy generation infrastructure.

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6. SCOPE OF REHABILITATION

The principal scope of this rehabilitation plan is the environmental stabilisation of the bog. This is defined by:

- The area of Derryarogue Bog excluding Derryarogue West (Cloonbony) and Derryarogue North (Cloonbearla).
- EPA IPC Licence - Ref. P0504-01. As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the bog lands within the licensed area.
- The local environmental conditions of Derryarogue Bog mean that wetland creation along with some dry cutaway measures and deep peat measures is the most suitable rehabilitation approach for this site. Derryarogue Bog has a pumped drainage regime and has small patches of residual deep peat along with larger areas of shallow cutaway and shallow cutaway areas that are already developing as wetland, heath and birch scrub.
- Bord na Móna have defined the key goal and outcome of rehabilitation at Derryarogue Bog as **environmental stabilisation**, and **optimising residual peat re-wetting,** to enhance the development of compatible habitats.
- Bord na Móna are planning to develop a renewable energy project at Derryarogue Bog as part of the proposed Derryadd Wind Farm. The wind farm planning boundary overlaps the Derryarogue Bog rehabilitation boundary and has been mapped as a constraint in the rehabilitation plan. Derryarogue Bog will be rehabilitated as part of the Derryadd Wind Farm development or at a later date. Any other proposed development will be planned in adherence to relevant planning guidelines and will consider the rehabilitation and the condition of the site.
- The cutaway is already developing a mosaic of woodland, grassland, wetland and cutaway peatland habitats. A significant portion of this cutaway has largely stabilised. Rehabilitation is proposed to enhance residual peat re-wetting in these areas while taking account of existing habitats, future infrastructure and land-uses (e.g. amenity).
- Rehabilitation of Derryarogue Bog will support multiple national strategies of climate action, biodiversity action and other key environmental strategies such was the Water Framework Directive.
- The time frame for the delivery of the planned rehabilitation will be undertaken according to available resources and appropriate constraints.
- It is not proposed to carry out rehabilitation on all marginal or peripheral cutover bog zones. Generally, these bog remnants are narrow, or are subject to turbary, and do not have positive bog restoration prospects.

6.1 Key constraints

- **Bog conditions.** Rehabilitation outcomes of sites are constrained by the environmental characteristics of these particular areas. For example, there is potential for raised bog restoration at some sites where there has not been significant industrial peat extraction, and the peat body is largely intact (deep peat sites that are drained). At other sites, most of the peat mass has been removed, the environmental characteristics of these areas have therefore changed radically (peat depths, hydrology, water chemistry, substrate type, nutrient status, etc.) and there will therefore be different habitat outcomes (wetlands, fen, heathland, grassland and Birch woodland).

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- The majority of this bog has been cutaway. Derryarogue bog has a pumped drainage regime, which will need to be considered as part of the wider rehabilitation. A mosaic of wetland habitats are the most compatible habitat that can be developed in response to re-wetting.
- **Potential land-use.** Bord na Móna are planning to develop a renewable energy project at Derryarogue Bog as part of the proposed Derryadd Wind Farm. This wind farm project is in pre-planning and is expected to be submitted for planning permission in 2025. Derryarogue will be rehabilitated **either** in association with the proposed Derryadd Wind Farm Project, with peatland rehabilitation integrated into the proposed project **or** will be completed in the event of an unsuccessful planning application. It is expected that Bord na Móna **will revise and update** the rehabilitation plan for Derryarogue when a decision is made in relation to the wind farm planning application. Bord na Móna remain fully committed to rehabilitating Derryarogue Bog and meeting the conditions of the IPC license.
- **Amenity development.** Longford County Council lodged a Part 8 Planning Application in 2021 named 'No. 88 Mid Shannon Wilderness Park trackways' which includes a greenway or amenity walking/cycling track through Derryarogue Bog. There are additional proposals to create an amenity route through Derryarogue Bog as part of the proposed Derryadd Wind Farm.
- **Surrounding landscape and neighbours.** Another key constraint is the interaction between the Bord na Móna sites and the surrounding landscape. Care must be taken that no active rehabilitation management is carried out that could negatively and knowingly impact on surrounding land. This includes any hydrological management on neighbouring farmland. It is anticipated that the work proposed here (blocking drains and re-wetting cutaway peatlands) will not have any flooding impacts on adjacent land.
- **Archaeology**. There are archaeological features present at Derryarogue Bog, which may similarly constrain rehabilitation activities. The discovery of monuments or archaeological objects during peatland rehabilitation may potentially constrain the rehabilitation measures proposed for a particular area. The rehabilitation will optimise hydrological conditions for the protection of exposed archaeological structures, their retention in situ and preservation into the future. Any newly discovered archaeology may require rehabilitation measures to be reviewed and adapted. A review of known archaeology and an archaeological impact appraisal of the proposed rehabilitation will be carried out. In the worst-case scenario works affecting the surface and sub-surface of the bog might disturb previously unknown archaeological deposits or artefacts without preservation by record taking place. Should any previously unknown archaeological material be uncovered during the rehabilitation works, it will be avoided and reported to the Bord na Móna Archaeological Liaison Officer and the National Museum of Ireland. The results of this assessment will be incorporated into the rehabilitation plan to minimise known archaeological disturbance, where possible.
- **Public Rights of Way**. There are known rights of way at Derryarogue Bog. Where a public right of way or similar burden exists on Bord na Móna property, consideration will be given to ensuring that this remain intact where possible. In some instances, depending upon previous land uses and management, alternative solutions may be required. These will be explored in consultation with local communities and statutory bodies during the consultation work associated with the decommissioning and rehabilitation work described here.
- **Turf-cutting.** A small area of remnant of high bog along the eastern margins, will not be subject to rehabilitation measures. This is largely due to turf cutting, and the small area that this parcel of land covers and the limited effectiveness of rehabilitation measures in this area. This area is ecologically and hydrologically linked to the area owned by Bord na Móna where rehabilitation is planned.

6.2 Key Assumptions

- It is assumed that Bord na Móna will have all resources required to deliver this project.
- It is expected that weather conditions will be within normal limits over the rehabilitation plan timeframe. Long periods of wet weather have the capacity to significantly affect ground conditions and constrain drain blocking and other ground activities.

6.3 Key Exclusions

The scope of this rehabilitation plan does not cover:

- Areas subject to turf cutting are excluded.
- The proposed Derryadd Wind Farm footprint is excluded from the rehabilitation footprint where they overlap.
- The longer-term development of stable naturally functioning habitats at Derryarogue Bog. The plan covers the short-term rehabilitation **actions** and **an additional monitoring and after-care programme** to monitor the rehabilitation and to respond to any needs.
- This plan is not intended to be an after-use or future land-use plan for Derryarogue Bog.
- The longer-term management of this site, potentially as a nature conservation site, or for amenity, or for other uses in the future.
- **Derryarogue West** (Cloonbony) and Derryarogue North (Cloonbearla). These areas are part of a separate rehabilitation plan that was finalised as part of the Peatland Climate Action Scheme in 2023 and rehabilitation measures have commenced and are ongoing.

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7. CRITERIA FOR SUCCESSFUL REHABILITATION

This section outlines what criteria will be used to indicate successful rehabilitation and what critical success factors are needed to achieve successful rehabilitation. All criteria used to indicate successful rehabilitation will be measured to validate the achievement of the rehabilitation goals and outcomes and validate the completion of the rehabilitation.

The key objective of this rehabilitation plan is **environmental stabilisation** and the stabilisation of any emissions from the site that related to the former industrial peat extraction activities.

Rehabilitation is generally defined by Bord na Móna as:

- stabilisation of bare peat areas via targeted active management (e.g. drain-blocking/re-wetting) slowing movement of water across the site and encouraging natural colonisation; and
- mitigation of key emissions (e.g. potential run-off of suspended solids).

7.1. Criteria for successful rehabilitation to meet EPA IPC licence conditions:

- Rewetting of residual peat in the former area of industrial peat production to offset potential silt run off and to encourage and accelerate development of vegetation cover via natural colonisation and reducing the area of bare exposed peat. See Table 7.1 for a summary of the criteria for successful rehabilitation and associated monitoring. The target will be the delivery of measures and this will be measured by an aerial survey after rehabilitation is completed.
- That there is a stabilizing/improving concentration of suspended solids and ammonia in discharges from Bord na Móna sites, associated with the measures undertaken to stabilize the peat surface by the blocking of the internal drainage system and the maximized rewetting of the peat surface. This will be demonstrated by developing a stable or downward trajectory of water quality indicators (suspended solids and ammonia) towards what would be typical of a re-wetted cutaway bog. This will be measured via water quality monitoring (suspended solids and ammonia) for at least 2 years after the rehabilitation has been completed.
- Receiving water bodies have been classified under the River Basin Management Plan and this classification includes waters that are At Risk from peatlands and peat extraction. The success criteria will be that the *At Risk* classification will see improvements in the associated pressures from this peatland or if remaining *At Risk*, that there is an improving trajectory in the pressure from this peatland.

With regard to predicting and estimating likely trends that might materialize or could be considered as a target, monitoring of surface water ammonia emissions from Longfordpass bog in Littleton over 3 years, post cessation of peat extraction with ongoing rehabilitation, were considered. These are indicating a downward trend in Ammonia concentrations (Figure 7.1).

Similarly monitoring of surface water ammonia emissions from Corlea bog in Mountdillon over the past 4 yrs. post cessation of peat extraction with ongoing rehabilitation, indicate downward trends.

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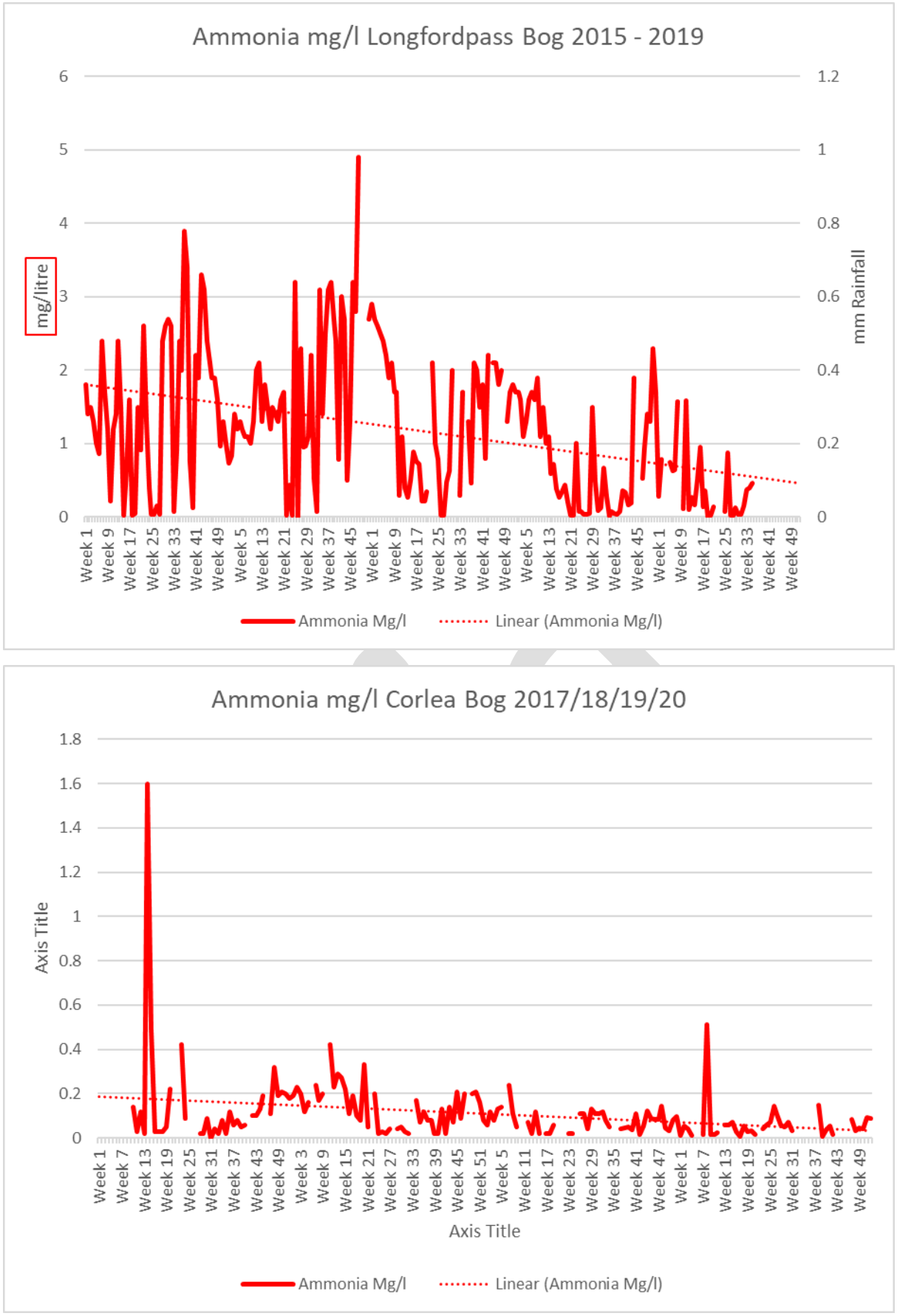


Figure 7.1. Ammonia levels over the period 2015-2019 at Longfordpass and the period 2017-2020 at Corlea.

Table 7.1. Summary of Success criteria, targets, how various success criteria will be measured and expected time-frames.

Criteria type	Criteria	Target	Measured by	Expected Time-frame
IPC validation	Rewetting in the former area of industrial drainage.	Delivery of rehabilitation measures Restoration of hydrological regime.	Aerial photography after rehabilitation has been completed – to demonstrate measures (drain-blocking) Establishment of a baseline for future monitoring of bare peat, vegetation establishment and habitat condition.	2 years
IPC validation	Key water quality parameters Ammonia, Phosphorous, Suspended solids, pH and conductivity	Reduction or stabilisation of key water quality parameters associated with this bog	Water quality monitoring for a period after rehabilitation has been completed	2 years
IPC validation	Reducing pressure from drainage on the local water body catchment (WFD)	Where this section of the water body (that this bog drains to) has not been identified as under pressure from peat extraction, that the intervening EPA monitoring programme associated with its Programme of Measures for this water body, confirms that its classification remains at not being at risk from peat extraction associated with activities at this bog.	EPA WFD monitoring programme	WFD schedule

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7.2. Critical success factors needed to achieve successful rehabilitation as outlined in the plan

The achievement of successful rehabilitation as outlined in the plan requires:

- **Funding to pay for resources required to deliver the planned rehabilitation (Bord na Móna).** Bord na Móna maintains a Provision on its balance sheet to pay for these future costs when industrial peat extraction ceases. Bord na Móna is fully committed to meeting its obligations relating to rehabilitation and decommissioning under the Integrated Pollution Control Licence.
- **Bord na Móna to have sufficient resources (staff and training) to deliver the planned rehabilitation with required associated skills and competencies.**
- **Bord na Móna to have sufficient resources (suitable machinery) and staff to maintain this machinery.**
- **Weather conditions to be within normal limits over the rehabilitation plan timeframe.** Long periods of wet weather have the capacity to significantly affect ground conditions and constrain the delivery of rehabilitation. The potential impact of wet weather on ground conditions can be reduced by appropriate planning and management. Bord na Móna have significant experience of managing these issues through 70 years of working in these peatland environments.
- **Rehabilitation measures to be effective.** The rehabilitation measures proposed in this plan are based on 40 years of Bord na Móna experience of peatland management and best practice applied internationally in peatland management. Measures proposed in this plan have already been shown to be affective at other sites. Bord na Móna will apply a flexible and adaptable approach to the more innovative rehabilitation measures proposed in this plan. If measures are not initially effective, Bord na Móna will review any requirement for additional practical rehabilitation.
- **Natural colonisation of vegetation to develop semi-natural habitats at a rate within the normal limits.** The development of naturally functioning semi-natural habitats on cutaway peatland takes time. Pioneer vegetation can develop relatively quickly (3-10 years) and wetland habitats can develop relatively quickly. Birch woodland make take 20-30 years to develop. However, it may take 50 years for active raised bog vegetation to re-develop on ground that was previously cutaway. Different environmental conditions will have a significant impact on the rate of natural colonisation, and as a result of the combination of different environmental conditions and the application of different rehabilitation measures, there will be a variety of habitat outcomes. Future habitat modelling has taken cognisance of the proposed hydrological regime post construction.
- Rehabilitation measures have been designed to accelerate and work with natural colonisation and other natural processes. Bord na Móna experience of rehabilitation and restoration has shown that re-wetting improves conditions for natural colonisation and that natural colonisation is accelerated where the environmental conditions are most suitable. Rehabilitation measures have been designed to modify the conditions of areas within sites where conditions are less suitable for natural colonisation (modifying hydrology, topography, nutrient status or availability of potential seed sources).
- **Monitoring to be robust and effective.** Rehabilitation Monitoring will be established to validate the success of rehabilitation as required by Condition 10 of the IPC Licence. This will focus on a collecting a range of scientific data that can then quickly be adapted and into metrics that can be used to measure changes in various ecosystem services.

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8. REHABILITATION ACTIONS AND TIME FRAME

Peatland restoration and rehabilitation requires detailed planning and the use of data from desktop surveys and field surveys. This data in association with topographical and hydrological modelling will be important in planning the future peatland landscapes and planning the use of the most appropriate rehabilitation methodologies based on environmental characteristic. Hydrological modelling indicates those areas that are likely to re-wet when drains are blocked, based on the current topography. This planning is essential for matching the most sustainable rehabilitation methodology to the most suitable cutaway environment to maximise the benefits of the resource outlay (maximising cost/benefit).

A number of illustrative figures have been produced to inform rehab planning and design, including aerial photography, peat depths and lidar surface maps, these are included in the accompanying mapbook as the drawings referenced below:

BNM-ECO-23-27-21 titled **Derryarogue Bog: Aerial Imagery 2000**

BNM-ECO-23-27-22 titled **Derryarogue Bog: Aerial Imagery 2020**

BNM-ECO-23-27-04 titled **Derryarogue Bog: Peat Depths**

BNM-ECO-23-27-03 titled **Derryarogue Bog: LiDAR Map**

The restoration and rehabilitation measures are provisionally outlined in drawing titled **BNM- ECO-23-27-20 Derryarogue Bog: Rehabilitation Measures** in the accompanying Mapbook.

These rehabilitation measures for Derryarogue Bog will include (see Table 8.1):

- Re-assessment of the pumping regime and removing pumps or reducing pumping if this is desired and has no significant external impact or impacts on proposed future land-uses. Initial hydrological modelling indicates that a part of the site will develop a mosaic of wetland habitats with some permanent deeper water if pumps are decommissioned, or pumping is reduced. 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, where possible. More sustainable permanent gravity drainage solutions will be examined. Some pumping may have to be retained. Some targeted bunding may be required. It is expected that a natural seasonal regime of water fluctuation will develop, with water-levels fluctuating in association with levels of surrounding rivers.
- A widespread drain-blocking programme and hydrological management will be implemented across the cutaway, where possible. In general, field drains will be blocked where possible to re-wet cutaway and re-wet to the optimum water-level. More intensive measures will be targeted towards the bare peat.
- Less intensive measures (targeted drain-blocking) will be used in areas where habitats have already established.
- Hydrological measures will include drain blocking (3/100 m), modifying outfalls and managing water levels with overflow pipes;
- The existing silt ponds will be retained and maintained during the rehabilitation phase. During the monitoring and verification phase the silt ponds will be continually inspected and maintained, where appropriate. When it is deemed that the silt ponds are not required, as the bog has been successfully stabilised and there is no silt run-off, the condition of the silt ponds will be reviewed. The silt ponds will

either be de-watered (water levels lowered to a level where the silt pond will naturally develop as a small wetland feature), left in situ, or infilled (where discharges do not require silt control).

Table 8.1: Types of and areas for rehabilitation measures at Derryarogue Bog.

Type	Code	Description	Area (Ha)
Deep peat cutover bog	DPT1	Regular drain blocking (3/100 m) + modifying outfalls and managing water levels with overflow pipes.	32.4
Dry cutaway	DCT1	Modifying outfalls and managing water levels with overflow pipes	289.6
Wetland cutaway	WLT1	Modifying outfalls and managing water levels with overflow pipes	84.2
Marginal land	MLT1	No work required	46.4
Silt Pond	Silt Pond	Silt Pond	0.3
Constraint	Constraint	Constraint	121.8
Total Area			**574.7**

Note that the types of rehab and areas of rehab may change in response to stakeholder consultation and refinement of the rehabilitation measures.

8.1 Completed and Ongoing

- A significant part of the site has already re-vegetating, with significant cover of pioneer vegetation developing a mosaic of typical cutaway peatland and wetland habitats. Natural re-colonisation of the cutaway so far has been quite effective. Bare peat areas within the cutaway parts of the site are shrinking as vegetation develops and consolidates.

8.2 Short-term planning actions (0-1 years post plan finalisation)

- Seek formal approval of the rehabilitation plan from the EPA.
- Develop a detailed site plan outlining how the various rehabilitation methods will be applied to Derryarogue Bog. This will take account of peat depths, topography, drainage and hydrological modelling (see rehabilitation map for an indicative view of the application of different rehabilitation methodologies).
- A drainage management assessment of the proposed rehabilitation measures will be carried out and any issues identified resolved and the rehabilitation plan adapted.
- A review of known archaeology and an archaeological impact appraisal of the proposed rehabilitation will be carried out. The results of this assessment will be incorporated into the rehabilitation plan to minimise known archaeological disturbance, where possible.
- A review of issues that may constrain rehabilitation such as known rights of way, turbary and existing land agreements is to be carried out.
- A review of remaining milled peat stocks is to be carried out.
- An ecological appraisal of the potential impacts of the planned rehabilitation on the presence of sensitive ground-nesting bird breeding species (e.g. breeding waders) is to be carried out. The scheduling of rehabilitation operations will be adapted, where required.
- Ensure all activities comply with the environmental protection requirements of the IPC Licence.

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- Carry out Appropriate Assessment (AA) of the Rehabilitation Plan. Incorporate any required mitigation measures from the AA in the plan for the delivery of rehabilitation and decommissioning across the site.
- Track implementation and enforcement of the relevant IPC Licence conditions, the mitigation measures (AA) and other environmental control measures during the implantation of the rehabilitation plan.

8.3 Short-term practical actions (0-2 years post plan finalisation)

- Carry out proposed measures as per the detailed site plan. All rehabilitation will be carried out with regard to best practice environmental control measures (Appendix III).
- Monitor the success of rehabilitation measures in relation to developing suitable hydrological conditions.
- Carry out the proposed monitoring, as outlined in Section 9.
- Silt ponds will be monitored during this period and there will be continued maintenance and cleaning to prevent potential suspended solids run-off from the site during the rehabilitation phase.

8.4 Long-term (>3 years post plan finalisation)

- Evaluate success of short-term rehabilitation measures outlined above and remediate where necessary.
- Delivery of a monitoring, aftercare and maintenance programme (See section 9 below).
- Decommissioning of silt-ponds will be assessed and carried out, where required.
- Reporting to the EPA will continue until the IPC Licence is surrendered.

8.5 Timeframe (when updated and finalised)

- **Year 1 post finalisation**: Short-term planning actions (specific year is dependent on planning consent).
- **Year 1-3 post finalisation**: Short-term practical actions.
- **Year 1-3 post finalisation**: Long term practical actions. Evaluate success of short-term rehabilitation measures outlined above and remediate where necessary.
- **> Year 3 post finalisation**: Decommission silt-ponds, if necessary

8.6 Budget and costing

Bord na Móna maintains a provision on its balance sheet to pay for the future costs of standard rehabilitation and decommissioning when industrial peat extraction ceases. This is updated every year - for more information see the Bord na Móna Annual Report (Bord na Móna, 2024). Bord na Móna is fully committed to meeting its obligations relating to rehabilitation and decommissioning under the Integrated Pollution Control Licence.

At this time, a ‘standard’ rehabilitation provision (sufficient to discharge the requirement of Condition 10 in the licence) has been allocated to the bog based on the area of different cutaway types across the bog.

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9. AFTERCARE AND MAINTENANCE

9.1 Programme for monitoring, aftercare and maintenance

This programme for monitoring, aftercare and maintenance has been designed to meet the Conditions of the IPC Licence. This is defined as:

- There will be **initial quarterly monitoring assessments** of the site to determine the general status of the site, the condition of the silt ponds, assess the condition of the rehabilitation work, monitoring of any potential impacts on neighbours land, general land security, boundary management, dumping and littering.
- The number of these site visits will reduce after 2 years to bi-annually.
- These monitoring visits will also consider any requirements for further practical rehabilitation measures.
- The **baseline condition of the site will be established** post-rehabilitation implementation by using an aerial survey to take an up to date aerial photo, when rehabilitation is completed. This will be used to verify completion of rehabilitation measures. The extent of bare peat will be assessed using this baseline data, and habitat maps will be updated, if needed. It is proposed that sites can be monitored against this baseline in the future.
- **Water quality monitoring** at the bog will be established. The main objective of this water quality monitoring will be to establish a baseline and then monitor the impact of peatland rehabilitation on water quality from the bog.
- Monitoring results will be maintained, trended and reported on each year and as required, as part of the requirement to report on Condition 10.1 of the IPC Licence on Bog Rehabilitation in the Annual Environmental Report, and will be provided to LAWPRO and the EPA as required to inform progress and national monitoring requirements under the WFD. These results will also be available in April each year as a requirement of the Annual Environmental Report at www.epa.ie.
- The parameters to be included (as per condition 6.2 of the IPC Licence) include monthly monitoring for pH, Flow, Suspended Solids, Total Solids, Total Phosphorus, Total Ammonia, Colour, and COD.
- This monthly sampling regime on a selected number of silt ponds will be carried out over a two-year cycle.
- If, after two years, key criteria for successful rehabilitation are being achieved and key targets are being met, then the water quality monitoring will be reviewed, with consideration of potential ongoing research on site. The water quality data, the aerial surveys and the habitat mapping will be collated and will be submitted to the EPA as part of the final validation report.
- If, after two years, key criteria for successful rehabilitation have **not** been achieved and key targets have **not** been met, then the rehabilitation measures and status of the site will be evaluated and enhanced, where required. This evaluation may indicate no requirement for additional enhancement of rehabilitation measures but may demonstrate that more time is required before key criteria for rehabilitation has been achieved. Monitoring of water quality will then also continue for another period to be defined.
- Where other uses are proposed for the site that are compatible the provision of biodiversity and ecosystem services, these will be assessed by Bord na Móna in consultation with interested parties. Other after-uses can be proposed for licensed areas and must go through the required assessment process and planning procedures.

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9.2 Rehabilitation plan validation and licence surrender – report as required under condition 10.4

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

Reporting to the EPA will continue until the IPC Licence is surrendered. The bog will be included in the full licence surrender process as per the Guidance to Licensees on Surrender, Cessation and Closure of Licensed Sites EPA, 2012, when:

- The planned rehabilitation has been completed;
- The key criteria for successful rehabilitation has been achieved and key targets have been met;
- Water quality monitoring demonstrates that water quality of discharge is stabilising or improving; and
- The site has been environmentally stabilised.

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APPENDIX I: BOG GROUP CONTEXT

The Mount Dillon Bog Group IPC Licenced area is made up of two sub-groups (Lough Ree- the Mount Dillon Energy Peat Group) and Mostrim) and the bog units within the group have been in industrial peat production for several decades. There are 28 defined bog units covering a total area of 11,322 ha. Of the 28 units, 23 mainly straddle the River Shannon within counties Roscommon and Longford, with five sites partially in County Westmeath to the east. Each bog area further comprises a range of habitats from bare milled peat former production areas to re-colonising cutaway to workshops areas and transport infrastructure. Industrial peat extraction from these sites mainly supplied ESB power stations at Lanesborough (LRP) or for horticultural peat products.

Industrial peat extraction in the Mount Dillon Bog Group finally ceased in 2021. Peat stockpiles which were harvested within the Bog Group continued to be delivered to Lough Ree Power Station until its closure in 2020. The removal of harvested peat stocks from the Mount Dillon Bog Group to supply other customers finally ceased in 2024. Intensive decommissioning and rehabilitation for the Mount Dillon Bog Group started in 2020/2021.

One bog site, Cloonmore, was never used for industrial peat production. Several bogs in the Mostrim group were drained but never fully developed and still retain typical high bog characteristics. These include Clonwhelan, Glenlough and a section of Mostrim. These sites have been zoned for biodiversity and a high bog drain blocking has been used to re-wet the high bog and encourage restoration of the raised bog habitat. Several sites (Glenlough, Mostrim, Clonwhelan and Clynan) were assessed by consultants for NPWS as part of the review of the raised bog Natural Heritage Area network (NPWS, 2014).

The rehabilitation plan for the Mount Dillon Bog Group encompasses all areas involved in industrial peat production including former industrial production areas and associated facilities. It also includes rehabilitation measures for those bogs that were initially drained but not fully developed.

A breakdown of the component bog areas for the Mount Dillon Bog Group IPC Licence Ref. P0-504-01 is outlined in Table Ap-1.

Industrial peat production history varies across the Mount Dillon bog group, so there is a wide range of peat depths at present. Bogs close to Lanesborough tend to have shallower peat depths or have been cutaway, while some bogs on the periphery of the group tend to have deeper peat reserves. Several sites such as Mount Dillion and Derrycashel have been mostly cutaway to the fen peat layers or in some cases to expose the underlying gravel/sub-soil. Several bogs in the Mostrim group have only been partially developed or have had no industrial peat production and have relatively deep peat depths.

Table Ap-1: Mount Dillon Bog Group names, area and indicative status (Mount Dillon Energy Peat sub-group)

Bog Name	Area (ha)	Stage of development	Land-Use and History	Peat Production Cessation	Rehab Plan Status
Begnagh	265	Cutover Bog Industrial peat production commenced at Begnagh Bog in 1977 and ceased in 2020. Deep peat reserves remain on much of the former production area. Begnagh is considered a deep peat cutover bog.	Begnagh Bog formerly supplied a range of commercial functions including fuel peat for Lough Ree Power Some areas of cutaway on site are developing pioneer cutaway vegetation communities. A greenway through Begnegh has been proposed as part of an amenity project with Faillte Ireland and Longford County Council (Midlands Trail Network).	2020	Finalised 2022 Rehab started in 2022

Bog Name	Area (ha)	Stage of development	Land-Use and History	Peat Production Cessation	Rehab Plan Status
Clooneeny	358	Cutover Bog Industrial peat production commenced at Clooneeny Bog in 1985 and ceased in 2020. Deep peat reserves remain on much of the former production area. Clooneeny is considered a deep peat cutover bog.	Clooneeny Bog formerly supplied a range of commercial functions including horticultural peat and fuel peat for Lough Ree Power Most of the former production area on site is bare peat. Some areas of cutaway on site are developing pioneer cutaway vegetation communities.	2020	Finalised 2022 Rehab started in 2022
Cloonmore	102	N/A	Never developed for industrial peat production. scattered plots.	N/A	N/A
Moher	494	Cutover Bog Industrial peat production commenced at Moher Bog in 1985 and ceased in 2020. Deep peat reserves remain across the former production area. Moher is considered a deep peat cutover bog.	Moher Bog formerly supplied a range of commercial functions including horticultural peat and fuel peat for Lough Ree Power Restoration work has been carried out on a 38ha section of high bog within Moher Bog. Some of the former production area on site is developing pioneer cutaway vegetation communities, the remainder of the site is bare peat. A greenway through Moher has been proposed as part of an amenity project with Faillte Ireland and Roscommon County Council (Midlands Trail Network).	2020	Finalised 2024 Rehab to start in 2025
Moher Rail Link	28	Moher rail link is a link between sites.	N/A	N/A	N/A
Corlea	163	Cutaway Bog Industrial peat production commenced at Corlea Bog in 1960 and ceased in 2018. Long-term peat extraction has reduced peat reserves on this bog. Corlea is considered a shallow peat cutaway bog.	The former production area at Corlea has already extensively colonised. Pioneer wetland and scrub development has occurred over much of the site. Some wetland and rehabilitation management was undertaken between 2016-2018. Part of site leased to local community development group to develop amenity walkway in association with Longford County Council. This greenway has been constructed.	2018	Finalised in 2023 Rehab started in 2023
Derraghan	289	Cutover Bog Industrial peat production commenced at Derraghan Bog in the 1940's and ceased in 2020. Most of the former production area has shallow peat reserves. Some pockets of deep peat remain. Derraghan is considered a shallow peat cutover bog.	Derraghan Bog formerly supplied a range of commercial functions including fuel peat for Lough Ree Power Much of the former production area at Derraghan has been out of production for some time. These areas have already extensively colonised with pioneer wetland and scrub vegetation communities.	2020	Plan Finalised 2021 Rehab commenced 2022
Derryadd	653	Cutover Bog Industrial peat production commenced at Derryadd Bog in 1964 and ceased in 2019. Long-term peat extraction has reduced peat reserves on this bog. Most of the former production area has shallow peat reserves. Some pockets of deep peat remain. Derryadd is considered a shallow peat cutover bog.	Much of the former production area at Derryadd has been out of production for some time. These areas have already extensively colonised with pioneer wetland and scrub vegetation communities Derryadd Bog will form part of the footprint of the proposed Derryadd Wind Farm Project (in pre-planning). An amenity walkway through part of Derryadd Bog is proposed for the Derryadd Wind Farm project	2019	Draft 2025

Bog Name	Area (ha)	Stage of development	Land-Use and History	Peat Production Cessation	Rehab Plan Status
Derryadd2 (Derryadd East)	328	Cutover Bog Industrial peat production commenced at Derryadd 2 Bog in 1960 and ceased in 2020. Long-term peat extraction has reduced peat reserves on this bog. Most of the former production area has shallow peat reserves. Some pockets of deep peat remain. Derryadd 2 is considered a shallow peat cutover bog.	Much of the former production area at Derryadd 2 has been out of peat production for some time. These areas have already extensively colonised with pioneer wetland and scrub vegetation communities	2020	Finalised 2023 Rehab started 2023
Derryarogue	895	Cutover Bog Industrial peat production commenced at Derryarogue Bog in 1952 and ceased in 2019. Long-term peat extraction has reduced peat reserves on this bog. Most of the former production area has shallow peat reserves. Some pockets of deep peat remain. Derryarogue is considered a shallow peat cutover bog.	Much of the former production area at Derryarogue has been out of production for some time. These areas have already extensively colonised with pioneer wetland, cutaway and scrub vegetation communities. Derryarogue Bog will form part of the footprint of the proposed Derryadd Wind Farm project (in pre-planning). An amenity walkway through part of Derryarogue is proposed for the Derryadd Wind Farm project. Additional greenway through Derryarogue is in construction as part of an amenity project with Longford County Council. A further section of greenway has been proposed as part of an amenity project with Faillte Ireland and Longford County Council (Midlands Trail Network).	2019	Derryarogue West Finalised in 2023 Rehab started in 2023 Derryarogue Draft 2024 (remainder of site)
Derrycashel	388	Cutover Bog Industrial peat production commenced at Derrycashel Bog in 1951 and ceased in 2018. Long-term peat extraction has reduced peat reserves on this bog. Most of the former production area has shallow peat reserves. Some pockets of deep peat remain. Derrycashel is considered a shallow peat cutover bog.	Derrycashel Bog formerly supplied a range of commercial functions including fuel peat for Lough Ree Power Much of the former production area at Derryarogue has been out of production for some time. These areas have already extensively colonised with pioneer wetland and scrub vegetation communities. Some wetland and rehabilitation management was undertaken (c.60ha) between 2014-2015.	2018	Finalised 2021 Rehab started in 2021
Derrycolumb	454	Cutover Bog Industrial peat production commenced at Derrycolumb Bog in the 1980's and ceased in 2019. Most of the former production area still has deep peat reserves. Derrycolumb is considered a deep peat cutover bog.	Derrycolumb Bog formerly supplied a range of commercial functions including fuel peat for Lough Ree Power Much of the former production area at Derrycolumb has been out of production for some time. These areas have already extensively colonised with pioneer wetland and scrub vegetation communities. A greenway through Derrycolumb has been constructed as part of an amenity project with Longford County Council.	2018	Finalised 2021 Rehab started in 2021
Derrymoylin	356	Cutover Bog Industrial peat production commenced at Derrymoylin Bog in 1985 and ceased in 2020. Long-term peat extraction has reduced peat reserves on this bog. Derrymoylin is considered a shallow peat cutover bog.	Derrymoylin Bog formerly supplied a range of commercial functions including fuel peat for Lough Ree Power. Most of the former production area on site is bare peat. A greenway through Derrymoylin has been proposed as part of an amenity project with Faillte Ireland and Roscommon County Council (Midlands Trail Network).	2020	Finalised 2024 Rehab to start in 2025

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Bog Name	Area (ha)	Stage of development	Land-Use and History	Peat Production Cessation	Rehab Plan Status
Derryshannoge	452	Cutover Bog Industrial peat production commenced at Derryshannoge Bog in 1985 and ceased in 2020. Deep peat reserves remain across most of the site. Derryshannoge is considered a deep peat cutover bog.	Derryshannoge Bog formerly supplied a range of commercial functions including fuel peat for Lough Ree Power. Much of the former production area at Derryshannoge has been out of production for some time. These areas have already extensively colonised with pioneer cutaway and scrub vegetation communities.	2020	Finalised 2023 Rehab started in 2024
Edera	281	Cutover Bog Development for industrial peat production commenced at Edera Bog in 1990's. Active extraction from Edera began in 2003 and ceased in 2018. Edera is considered a deep peat cutover bog.	Edera Bog formerly supplied a range of commercial functions including fuel peat for Lough Ree Power. The majority of Edera Bog former production area is bare peat.	2020	Finalised 2021 Rehab started in 2021
Erenagh	93	Cutover Bog Development for industrial peat production commenced at Erenagh Bog in 1970's. Erenagh is considered a deep peat cutover bog.	Erenagh Bog formerly supplied a range of commercial functions including fuel peat for Lough Ree Power. Much of the former production area at Erenagh has been out of production for some time. These areas have already extensively colonised with pioneer cutaway and scrub vegetation communities.	2020	To be finalised in 2025
Granaghan	212	Cutover Bog Development for industrial peat production commenced at Granaghan Bog in 1980's. Long-term peat extraction has reduced peat reserves on this bog but deep peat reserves remain on site. Granaghan is considered a deep peat cutover bog.	Granaghan Bog formerly supplied a range of commercial functions including horticultural peat and fuel peat for Lough Ree Power. The majority of Granaghan Bog former production area is bare peat.	2020	Finalised 2023 Rehab to start in 2025
Killashee	110	Cutover Bog Development for industrial peat production commenced at Killashee Bog in 1985. Killashee is considered a deep peat cutover bog.	Killashee Bog formerly supplied a range of commercial functions including horticultural peat and fuel peat for Lough Ree Power. The majority of Killashee Bog former production area is bare peat. Some areas have colonised with pioneer cutaway and scrub vegetation communities.	2020	Finalised 2023 Rehab started in 2024
Knappoge	313	Cutaway Bog Peat Production at Knappoge bog commenced in 1963 and finished in 2018. Peat depths on the former production area are generally shallow. There are some pockets of deeper peat. Knappoge is considered a shallow peat cutaway bog.	Knappoge Bog formerly supplied a range of commercial functions including fuel peat for Lough Ree Power. The majority of Knappoge Bog former production area is bare peat. Some areas have colonised with pioneer cutaway and scrub vegetation communities. A greenway through Knappoge has been constructed as part of an amenity project with Longford County Council. An additional section has been proposed as part of an amenity project with Faillte Ireland and Longford County Council (Midlands Trail Network).	2018	Finalised 2021 Rehab started in 2022

Draft

Bog Name	Area (ha)	Stage of development	Land-Use and History	Peat Production Cessation	Rehab Plan Status
Lough Bannow	739	Cutaway Bog Peat Production at Lough Bannow bog commenced in 1964 and finished in 2019. Peat depths on the former production area are generally shallow. There are some pockets of deeper peat. Lough Bannow is considered a shallow peat cutaway bog.	Much of the former production area at Lough Bannow has been out of production for some time. These areas have already extensively colonised with pioneer cutaway and scrub vegetation communities. A small (35ha) conifer plantation was established in 1980's. Lough Bannow will form part of the footprint of proposed Derryadd Wind Farm Project (in pre-planning). An amenity walkway through part of Lough Bannow is proposed for the Derryadd Wind Farm project	2019	Draft 2025
Moher	483	Cutover Bog Peat Production at Moher Bog commenced in the 1960's and finished in 2020. Peat depths on the former production area remain relatively deep. Moher is considered a deep peat cutover bog.	Moher Bog formerly supplied a range of commercial functions including fuel peat for Lough Ree Power. Much of the former production area at Moher has been out of production for some time. These areas have already extensively colonised with pioneer cutaway and scrub vegetation communities.	2020	To be finalised 2025 Rehab to start 2025
Mount Dillon	592	Cutaway Bog Peat Production at Mount Dillon bog commenced in the 1940's and finished in 2020. Peat depths on the former production largely shallow and the peat is considered cutaway. Some deep peat remains on the west of the site. Mount Dillon is considered a shallow peat cutaway bog.	Mount Dillon Bog formerly supplied a range of commercial functions including fuel peat for Lough Ree Power. Much of the former production area at Mount Dillon has been out of production for some time. These areas have already extensively colonised with pioneer cutaway, wetland and scrub vegetation communities.	2020	To be finalised 2025 Rehab to start 2025

See Drawing number BNM-ECO-23-27-24 titled **Mount Dillon Bog Group**, included in the accompanying Mapbook which illustrates the location of Derryarogue bog and the Mount Dillon Bog Group in context to the surrounding area.

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APPENDIX II: ECOLOGICAL SURVEY REPORT

Note: this report covers the whole of Derryarogue bog including the area proposed as part of the associated Derryadd Wind Farm development. There may be references to receptors or habitats not present within the lands subject to the current Plan. See Section 3.3. for Biodiversity features of Interest within the footprint of the current Plan.

Ecological Survey Report

Note: This report outlines an ecological survey of the bog. This report should not be taken as a management plan for the site as other land-uses may still be considered. Information within this report may inform the development of other land-uses and identify areas with particular biodiversity value.

Bog Name:	**Derryarogue**	**Area (ha):**	458ha
Works Name:	Mount Dillon	**County:**	Longford
Recorder(s):	BnM Ecology Section	**Survey/ monitoring Date(s):**	11th October 2012 A range of additional ecological surveys were carried out 2014-2019 to inform the EIAR for the proposed Derryadd Wind Farm. These baseline surveys have also informed this rehabilitation plan.

Habitats present (in order of dominance)

The most common habitats present at this site include:

- Bare peat (Codes refer BnM classification of pioneer habitats of production bog)
- Pioneer Soft Rush-dominated poor fen (pJeff) with less frequent Bog Cotton (pEang) or Bottle Sedge (pRos) -dominated poor fen.
- Willow-dominated scrub (eWill) (in mosaic with pJeff) (in those areas that are flooded regularly)
- Open water (OW) (permanent) and Temporary open water (TOW)
- Birch-dominated scrub (eBir, oBir) (on drier higher ground that is not flooded))
- Pioneer dry heath (dHeath) (mainly in mosaic with Birch scrub)
- Dry pioneer Purple Moorgrass-dominated grassland (gMol)
- Access routes (Acc)
- Riparian zones (Rip) (with drains and associated habitats such as scrub and Birch woodland)
- Silt ponds (Silt) with Gorse/Birch scrub and Purple Moorgrass-dominated grassland (gMol)

The most common habitats found around the margins of the site include:

- Raised bog (PB1) (Codes refer to Heritage Council habitat classification, Fossitt 2000)
- Cutover Bog (PB4)
- Scrub (WS1)
- Wet (callows-type) grassland (GS4)
- Birch woodland (WN7)
- Dense Bracken (HD1)
- Improved grassland (GA1) around the boundary where the GIS boundary extends into adjacent fields

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Description of site

Derryarogue Bog is located approximately three kilometres to the east of Lanesborough in County Longford. This bog is located within two main section, a western (smaller) section and an eastern section in which the majority of the site is located. A mineral island is located on the site and this area was previously surveyed and is described in the Derryarogue Mineral Island ecological survey. A long section of rail line to the west of the site connects the Roscommon Bogs with the Power Station in Lanesborough. A rail bridge across the River Shannon is also part of the site.

The peat that was harvested from Derryarogue was used as fuel peat in the adjacent Lough Ree Power Station. Large areas of the site are cutaway and have developed a range of cutaway habitats. Numerous power lines cross the site and are in place to power to the pumps that are scattered across the site.

The northern section of the site is separated from the rest of the site by a rail line that crosses the site in an east west direction. A range of pioneer habitats have developed in areas that were formerly in peat production. Habitats that have developed on the older cutaway habitats include closed Birch scrub that was primarily made up of Birch and Willow with Oak and Pine becoming established also. These habitats are at least twenty years old and were located on higher ground. Younger pioneer habitats include gCal, pTrig, eBir and pPhrag. Large areas of exposed gravel are also common across this section of the site. A grey clay type sub-soil is located under this section of the site and it is clearly visible in the field drains. The western side of this section appears to be lower lying than the rest of the section and many of the field drains contained pioneer reed-beds (pPhrag). A flood defence berm was constructed in 2011 along the south western edge of this section in order to prevent flood water from the River Shannon entering the site.

The main section of the site is very varied in terms of habitats that are located there. This area also contains the mineral Island that is dealt with in a separate report. Large areas within this section are cutaway. Gravel protrudes from the ground in various locations. Pioneer habitats include Birch scrub (eBir, oBir and cBir). The centre of this section of the site appears to be considerably lower than the surrounding areas.

Several areas of wetland are developing within this section of the site and are mainly comprised of small areas of open water, and a mix of species such as Reed-mace, Soft Rush, Club Rush, Bulbous Rush, Marsh Arrow Grass and Mint. Charaphytes were also present to the open water. These areas appeared to have been developing for a number of years and although they are small they were becoming diverse and provided habitat for Mallard and Snipe.

Other habitats on the site include dry heath (on elevated areas), scrub and areas of pioneer poor fen. A large area of bare peat was located at the western edge of this section.

The eastern section of the site was largely in industrial peat production until recently; however areas of cutaway of varying ages were also present. The areas of cutaway were becoming colonised with pioneer poor fen and scrub. The areas of scrub along the eastern edge were quite well developed and were approaching mature Birch woodland.

During the spring of 2012 a honey project was started on the site. Ten bee hives were located on the mineral island. These hives were managed by *Hyland Honey*. This project finished in 2013.

Derryarogue Mineral Island

This site is known as Derryarogue Island and is part of Derryarogue Bog and the Mount Dillon Group of bogs. It is located in Co. Longford to the north-east of Lanesborough and Lough Ree. The River Shannon flows 2 km west of the site. Derryarogue island is a typical 'mineral island' or mound of glacial material and bedrock that protrudes from the surrounding bog (now cutaway and production bog) landscape. There are many examples of these types of small glacial mounds surrounded by bog in this area. The habitats found on these mounds are in contrast to the surrounding bog as they are strongly influenced by the calcareous bedrock and calcareous glacial deposits or sub-soil that underlay the site. Many of these areas are managed as farmland and Derryarogue Island is also mapped as farmland on the 2nd edition OSI 6 inch map, prior to the development of the BnM production bog.

The island is surrounded by typical habitats developing on production and production-related bog. These include bare peat fields of the still-active production bog to the south of the site and the developing Birch scrub and dry heath that surrounds the majority of the remainder of the site. There is also frequent cover of other typical habitats found in the transitional zone between cutaway and mineral soil such as Bracken and several grassland communities (gMol, gDa-An). The main part of the island is dominated by scrub and grassland. These habitats are criss-crossed with travel-paths, where there is exposed soil and some rutting where the ground is wet.

The scrub is dominated by Blackthorn and is thick and impenetrable, although there are frequent young and maturing Ash trees developing within the scrub. Other species present include Hawthorn, Elder, Privet, Rowan, Honeysuckle, Bramble, Ivy, Male Fern and Soft Shield Fern. The ground cover is generally quite poor and dominated by Ivy. Some of the Blackthorn-scrub transitions to a band of Gorse or to a Bramble thicket. There are also locations around the margins where there is transition to Birch and Willow scrub. Alder is also present on the site towards the southern end where there has been some clearance in the past for electric lines. A small area to the south of the site was classified as woodland as it was dominated by mature Ash. However, this habitat was surrounded by a band of scrub and Brambles, making it difficult to survey.

There are several different grassland communities present on the site. The vegetation types vary according to hydrology and other environmental factors such as soil depth, amount of peat etc. The main grassland type is a dry calcareous grassland community. This is dominated by species such as Glaucous Sedge, Yellow Sedge, Sweet Vernal-grass, Red Fescue and Bird's-foot Trefoil. Other species present include Knapweed, Perennial Rye-grass, Quaking Grass, False Oat-grass, Yorkshire Fog, Dandelion, Long-leaved Plantain, Broad-leaved Plantain, Nettle, Red Clover, Hawkbit sp., Ox-eye Daisy, Primrose, Creeping Thistle, Timothy, Mouse-ear, Yarrow, Wild Carrot, Ladies-Bedstraw, Purging Flax, Yellow-wort, Mouse-ear Hawkweed, Daisy, White Clover, Milkwort, Common Spotted Orchid and Marsh Hellaborine. Several Dog Rose plants appear in this habitat and single Gorse, Blackthorn and some Hawthorn also appear within the grassland.

The dry grassland frequently grades into damper grassland, sometimes over short distances, which is also significantly influenced by the calcareous-rich soils but is likely to be more prevalent of peaty soils. This community contains frequent Yellow Sedge, Carnation Sedge, Star Sedge and Purple Moorgrass. This community contains species including Common Sedge, Green-ribbed Sedge, Flea Sedge, Hard Rush, Compact Rush, Heath Grass, Knotted Pearlwort, Common Sorrel, Marsh Bedstraw, Bog Thistle, Common Century, Common Chickweed, Self Heal, Mash Horsetail, Crested Dogstail, Devil's-Bit, Rough Meadow-grass, Marsh Valerian, Silverweed, Jointed Rush, Marsh Thistle, Creeping Buttercup, Meadowsweet and Curled Dock. *Calliergonella cuspidata* is frequently found within this grassland type as well as extensive low hummocks of some brown moss species such as *Campylium stellatum*. One small area close to the edge of the scrub contained a small patch of Bladder Sedge. Species more typical of drier areas also appear in this community and vice-versa.

There are some areas where the drainage is impeded to a greater extent and these areas contain frequent Soft Rush and Hard Rush. Other species present included Water Plantain, Spike-rush sp., Water Forget-me-not, Bulbous Rush and Floating Sweet-grass. Some of the travel paths contained wet grassland vegetation that was dominated by Rush species.

Small springs or damp hollows are found in the largest open grassland area in the centre of the site and along some of the old travel patches around the margins of the site. Most of these did not have any standing water at the time of the survey (after an exceptionally dry May-June period), although they were all damp. Several others contained, probably from heavy rainfall the previous evening. There was no sign of running water, which could be associated with springs. Calcareous-rich groundwater seepage into these shallow hollows with a high water-table could create the same habitats. The hollows were generally 1-5 m in diameter and > 0.5 m deep. The vegetation cover within the hollows was variable, with some hollows being dominated by exposed whitish mud and others dominated by brown mosses. Typical moss species associated with these hollows included brown mosses such as *Scorpidium scorpoides, Drepanocladus* spp. and *Campylium stellatum, as well as Calliergonella cuspidata*. The majority of the hollows had some development of tufa, generally a calcareous coating on plant material and mosses within the hollow. The tufa was not very well developed. Other species found in these hollows included Yellow Sedge, Silverweed, Marsh Arrowgrass, Lesser Spearwort, Spike-Rush sp., Mint, Jointed Rush, Creeping Bent and Brookweed. The species assemblage varied from hollow to hollow. Several of these hollows seemed to have been created by heavy machinery creating ruts in the travel paths that were subsequently colonised by typical species. The tufa spring indicator moss species, *Palustriella commutata* was searched for but was not recorded.

The meadow type grassland community is a tussocky type of grassland dominated by Cocksfoot, Tufted Hairgrass, Tall Fescue, Yorkshire Fog Purple Moor-grass and Sweet Vernal-grass. This vegetation type occurs on deeper soils and is less diverse than the former two communities. Bramble and Bracken both spread into this grassland type in places. Tussocky Purple Moorgrass and Meadowsweet dominates in one area close to the margins along with Tufted Hairgrass.

There are several places around the main part of the site where there is a little more peat and a dry heath type vegetation develops. This is dominated by Heather and also contains species such as Cross-leaved Heath, Purple Moorgrass, Multi-flowered Woodrush, Tormentil, Slender St John's-wort, and Common Twayblade.

A small area to the south of the site within a small hollow is developing rich fen like vegetation, adjacent to a small area with mature Willow. A small area is dominated by Greater Tussock Sedge and there are also several tussocks of Tufted Sedge. Surrounding vegetation contains Common Bog-cotton, Bottle Sedge, Cuckoo Flower, Water Horsetail, *Calliergonella cuspidata, Scorpidium scorpoides*, *Campylium stellatum,* Birch, Eared Willow, Lesser Spearwort, Common Spotted orchid, Angelica, Purple Moor-grass and

Devil's-Bit. This very small area also has some Reedmace. This area is likely to have a fluctuating water table with the possibility of flooding during the winter.

The margins of the site generally contain transitional type grassland communities that are similar to pioneer cutaway grassland communities. The main community is dominated by Purple Moorgrass (gMol) and this has developed along some of the old travel paths.

Designated areas on site (cSAC, NHA, pNHA, SPA other)

None

Adjacent habitats and land-use

Adjacent habitats include wet grassland (GS4), improved agricultural grassland (GA1), raised bog (PB1), scrub (WS1), Birch woodland (WD7), conifer plantation along with active and inactive cutover bog (PB4).

Watercourses (major water features on/off site)

- The Derrygeel Stream flows through the site, this stream is a tributary of the Lough Bannow River that in turn flows into the River Shannon above Lanesborough.
- Another tributary of the Derrygeel Stream flows along the western boundary of the site.

Peat type and sub-soils

The site is underlain with a mix of gravel and marl.

Fauna biodiversity

Birds

Several bird species were noted on the site during the survey.

- Mallard (24)
- Raven
- Snipe
- Whooper Swan (6)
- Other more common species included Blackbird, Grey Crow, Meadow Pipit, Pheasant, Robin and Long tailed Tit.

Mammals

Signs of several mammal species were noted on the site during the survey.

- Badger
- Fox
- Mink

Other species

Frog

Draft

Fish in the watercourses

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APPENDIX III. ENVIRONMENTAL CONTROL MEASURES TO BE APPLIED TO BOG REHABILITATION

- Bog restoration/rehabilitation measures will be restricted to within the footprint of the proposed rehabilitation area.
- The proposed rehabilitation will have due regard to noise limits and hours of operation (i.e. dusk and dawn) to minimise any potential disturbance on resident and local fauna that utilise the site and immediate environs.
- All plant and equipment for use will comply with the Construction Plant and Equipment Permissible Noise Levels Regulations (SI 359/1996).
- The proposed activities will be restricted to daylight hours and there will be no requirement for artificial lighting.
- Silt ponds will be inspected and maintained as per the IPC Licence.
- During periods of heavy precipitation and run-off, activities will be halted.
- Measures will be carried out using a suitably sized machine and, in all circumstances,, excavation depths and volumes will be minimised where possible.
- All machines will be regularly checked and maintained prior to arrival at the site to prevent hydrocarbon leakage.
- Hoses and valves will be checked regularly for signs of wear and will be closed and securely locked when not in use.
- Fuelling and lubrication of equipment shall only be carried out in designated areas away from surface water drainage features and ecologically sensitive areas.
- Waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the site for disposal or re-cycling.
- Vehicles will never be left unattended during refuelling.
- No direct discharges to waters will be made. No washings from vehicles, plant or equipment will be carried out on site.
- All plant refuelling will take place using mobile fuel bowsers. Only dedicated trained and competent personnel will carry out refuelling operations.
- Mobile storage such as fuel bowsers will be bunded to 110% capacity to prevent spills. Tanks for bowsers and generators shall be double skinned. When not in use, all valves and fuel trigger guns from fuel storage containers will be locked. All pumps using fuel or containing oil will be locally and securely bunded where there is the possibility of discharge to waters.
- Potential impacts caused by spillages etc. during rehabilitation will be reduced by keeping spill kits and other appropriate equipment on-site.
- Site activities will be carried out in accordance with 'best practice'. In order to ensure compliance and implementation of 'best practice', these measures will be communicated to relevant Bord na Móna staff and updated as required.

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APPENDIX IV. BIOSECURITY

The potential for importation or introduction of non-native plant species (such as Japanese Knotweed, Himalayan Balsam, etc.) during future rehabilitation management, such as drain-blocking using excavators, has the potential to result in the establishment of invasive species within the site. Section 49 of the European Communities (Birds and Natural Habitats) Regulations 2011 prohibits the introduction and dispersal of invasive alien species (particularly plant species) listed on Part 1 (third column) of the 'Third Schedule'.

This section aims to reduce the risk from, and impacts of, invasive species and protecting biodiversity on lands under Bord na Móna ownership. Rehabilitation and decommissioning in the bog will have due regard to the relevant biosecurity measures outlined below:

- Records of problematic invasive species within the various bog units will be marked out with signs to highlight areas of infestation to personnel.
- All plant machinery will be restricted from disturbing known colonies of invasive species.
- All plant machinery will avoid unnecessary crossings to adjoining lands.
- Good site hygiene will be employed to prevent the introduction and spread of problematic invasive alien plant species (i.e. Japanese Knotweed (*Fallopia japonica*), Himalayan Balsam (*Impatiens glandulifera*), Himalayan Knotweed (*Persicaria wallichii*), etc.) by thoroughly washing vehicles prior to entering the area.

The biosecurity measures outlined above are in line with best practice guidelines issued by the National Roads Authority (NRA, 2010) – The Management of Noxious Weeds and Non-native Invasive Plant Species on National Roads and broadly based on the Environment Agency's (2013) – The Knotweed Code of Practice: Managing Japanese Knotweed on Development Sites (Version 3, amended in 2013).

In addition to the above, Best Practice measures around the prevention and spread of Crayfish plague[6] will be adhered with throughout all rehabilitation measures and activities.

[6] https://www.biodiversityireland.ie/projects/invasive-species/crayfish-plague/

APPENDIX V. POLICY AND REGULATORY FRAMEWORK

Bord na Móna Plc is a publicly owned company, originally established in 1934 to develop some of Ireland's extensive peat resources for the purposes of economic development and to support energy security. In the decades since its establishment the company has employed tens of thousands of people in its fuel, energy, and horticultural growing media businesses. For much of its history the company's support of important national policy aims has been enabled and encouraged in a variety of ways by Government.

Today, Bord na Móna is undertaking a number of highly significant actions in support of climate policy. These actions involve a radical transformation and decarbonisation of nearly the entire Bord na Móna business. This transformation will be driven by unlocking the full potential of our land and creating significant value for Ireland and the Midlands in particular.

Bord na Móna is an integral part of the economic, social, and environmental fabric of Ireland and Irish life. As a key employer in the Midlands, the company is conscious that its obligations go beyond purely commercial and environmental – there is also a social responsibility to employees and the communities served by Bord na Móna. It is the company's role and absolute priority to ensure that its long-term strategy delivers on all of these important areas in a robust and balanced way.

There are a wide range of policies, plans, legislation and land designations that inform the development of this Bord na Móna peatland rehabilitation plan. Bord na Móna have also developed and operate various policies and strategies that also inform the development of this rehabilitation plan.

1 EPA IPC Licence

Bord na Móna operates under IPC Licence issued and administered by the EPA to extract peat within the Mount Dillon bog group (Ref. PO-504-01). As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. The bog is part of the Mount Dillon group. This regulatory requirement is the main driver of the development of this rehabilitation plan.

2 The Peatlands Climate Action Scheme (PCAS)

Bord na Móna (BnM) understand that it is the Minister's (DECC) intention to impose an obligation on Bord na Móna to develop a programme of measures, 'the Scheme', for the enhanced decommissioning, rehabilitation and restoration of boglands previously used to supply peat for electricity generation within the State. The enhanced decommissioning, rehabilitation and restoration of the peatlands funded by the Scheme (PCAS) will deliver benefits across climate action (GHG mitigation through reduced carbon emissions and acceleration towards carbon sequestration), enrich the State's natural capital, increase eco-system services, strengthen biodiversity, improve water quality and storage attenuation as well as developing the amenity potential of the peatlands.

It is envisaged that Bord na Móna carry out an enhanced decommissioning, rehabilitation and restoration, under the Scheme (PCAS), and supported by the Climate Action Fund and Ireland's National Recovery and Resilience Plan across a footprint of 33,000 ha. This scheme will significantly go beyond what is required to meet rehabilitation and decommissioning obligations under existing EPA IPC licence conditions. Interventions and measures supported by the Scheme will ensure that environmental stabilisation is achieved (meaning IPC obligations are met), and importantly, significant additional benefits, particularly relating to climate action and other ecosystem services, will also be delivered. However, only the additional costs associated with the additional

and enhanced rehabilitation, i.e., those activities which go beyond the existing decommissioning and rehabilitation requirements arising from Condition 10 will be eligible for support under the Scheme.

3 National and EU Climate and Biodiversity Policy

The National Policy Position establishes the fundamental national objective of achieving a transition to a competitive, low carbon, climate-resilient and environmentally sustainable economy by 2050. It sets out:

- the context for the objective;
- clarifies the level of GHG mitigation ambition envisaged; and
- establishes the process to pursue and achieve the overall objective.

The evolution of climate policy in Ireland will be an iterative process based on the adoption by government of a series of national plans over the period to 2050. GHG mitigation and adaptation to the impacts of climate change are to be addressed in parallel national plans – respectively through the National Climate Action Plan. The plans will be continually updated, as well as being reviewed on a structured basis at appropriate intervals and, at a minimum, every five years. This will include early identification and ongoing updating of possible transition pathways to 2050 to inform sectoral strategic choices.

Bord na Móna is following a decarbonisation programme aimed at reducing the carbon emissions from its activities. Industrial peat production has now ceased, and several other decarbonisation measures are being implemented. The company aims to further develop renewable energy and resource recovery markets with a key objective of reducing the carbon intensity of all products. In addition, the carbon emission mitigation benefits associated with the post-peat extraction rehabilitated peatland following re-wetting, revegetation and colonisation of significant areas with native woodland will make a significant contribution to achieving the State's carbon emission reduction targets.

Peatlands rehabilitation and restoration is referenced in Section 17.3.3 of the Land Use, Land Use Change, Forestry and Marine Chapter of the National Climate Action Plan 2021 as follows:

"The rehabilitation of degraded peatlands to a condition in which they regain their ability to deliver specific ecosystem services has considerable potential for initial mitigation gains, and future carbon sequestration. Additional benefits of peatland restoration include positive socio-economic outcomes for the Midlands, increased natural capital, enriched biodiversity, improved water quality, and flood attenuation."

The scheme is included as Action 33 in the Climate Action Plan 2021 Annex of Actions - Deliver the Enhanced Decommissioning, Rehabilitation and Restoration (EDRR) Scheme for Bord na Mona Peatlands.

EDRRS is also referenced in the Climate Action Plan 2021 as a measure to deliver a Just Transition in the Midlands.

International research and scientific understanding of peatlands is now reflected in key Irish national policy and strategy documents such as the National Raised Bog Special Areas of Conservation (SACs) Management Plan 2017 - 2022 (Department of Arts, Heritage and the Gaeltacht 2017), The National Peatland Strategy (Department of Arts, Heritage and the Gaeltacht 2015), The National Biodiversity Action Plan (National Parks and Wildlife Service 2017), The River Basin Management Plan for Ireland 2018-2021 (Department of Housing, Planning and Local Government 2018), and the Biodiversity – Climate Change Sectoral Action Plan (Department of Arts, Heritage and the Gaeltacht 2019). Each of the national plans, which are also complemented with the recently published EU Green Deal communication on Biodiversity Strategy for 2030 (COM 2020) have overlapping

objectives and actions that focus on the restoration of peatlands damaged by turf-cutting, drainage and other impacts, as well as the re-wetting of Bord na Móna industrial peat extraction bogs.

While not specifically identified as a restoration implementor, EDRRS objectives are in line with those of the United Nations Decade on Ecosystem Restoration 2021-2030 of Preventing, Halting and Reversing the Degradation of Ecosystems worldwide.

EDRRS is also in line with the EU Commission proposal for a Nature Restoration Law which will apply legally binding targets for nature restoration in different eco-systems to every Member State. The aim is to cover at least 20% of the EU's land and sea areas by 2030 with nature restoration measures and eventually extend these to all ecosystems in need of restoration by 2050.

4 National Peatlands Strategy

The National Peatlands Strategy (2015) contains a comprehensive list of actions, necessary to ensure that Ireland's peatlands are preserved, nurtured and become living assets within the communities that live beside them. It sets out a cross-governmental approach to managing issues that relate to peatlands, including compliance with EU environmental law, climate change, forestry, flood control, energy, nature conservation, planning, and agriculture. The Strategy has been developed in partnership between relevant Government Departments/State bodies and key stakeholders through the Peatlands Council.

The strategy recognises that Ireland's peatlands will continue to contribute to a wide variety of human needs and to be put to many uses. It aims to ensure that Ireland's peatlands are sustainably managed so that their benefits can be enjoyed responsibly. It aims to inform appropriate regulatory systems to facilitate good decision making in support of responsible use. It also aims to inform the provision of appropriate incentives, financial supports and disincentives where required. The strategy attempts to strike an appropriate balance between different needs, including local stakeholders like turf-cutters and semi-state bodies such as Bord na Móna.

In line with a National Peatlands Strategy recommendation, a Peatlands Strategy Implementation Group (PSIG), was established, assisted in the finalisation of the Strategy, is overseeing subsequent implementation and will report to Government on an annual basis on the implementation of the actions and principles contained within the Strategy.

Bord na Móna is a key stakeholder in the National Peatlands Strategy and the Peatlands Strategy Implementation Group. The strategy recognises the potential for some Bord na Móna sites to be restored and to contribute to the national SAC and NHA network of protected raised bog sites. The strategy (agreed in 2015) also recognises the various different values of cutaway bog and developed six key principles (with Bord na Móna) for the after-use of cutaway bog.

- Bord na Móna will continue to assess and evaluate the potential of the company's land bank, using a land use review system. The assessment will help prepare a set of evidence-based management plans for the various areas of peatland. These plans will also inform its cutaway bog rehabilitation.
- The policy of Bord na Móna is not to open up any undrained new bogs for peat production.
- Lands identified by Bord na Móna as having high biodiversity value and/or priority habitats will be reserved for these purposes as the principal future land use.
- Generally, Bord na Móna cutaway bogs that flood naturally will be permitted to flood unless there is a clear environmental and/or economic case to maintain pumped drainage.

- In deciding on the most appropriate afteruse of cutaway peatlands, consideration shall be given to encouraging, where possible, the return to a natural functioning peatland ecosystem.
- This will require re-wetting of the cutaway peatlands which may lead in time to the restoration of the peatland ecosystem.
- Environmentally, socially and economically viable options should be analysed to plan the future use of industrial cutaway peatlands, in conjunction with limiting factors as outlined in Bord na Móna's Strategic Framework for the Future Use of Peatlands.

The National Peatlands Strategy highlights the importance and value of developing peatland rehabilitation plans for Bord na Móna cutaway sites and implementing this peatland rehabilitation. Some of these principles have now been superseded by the company's decision to cease industrial peat extraction. The National Peatlands Strategy is currently being reviewed by Government.

5 Draft National River Basin Management Plan 2022-2027 (Water Framework Directive)

The National River Basin Management Plan (Department of Housing, Planning, Community and Local Government 2017) is the key national plan for Ireland to achieve the objectives of the Water Framework Directive (WFD). In broad terms, the objectives of the WFD are (1) to prevent the deterioration of water bodies and to protect, enhance and restore them with the aim of achieving at least good status and (2) to achieve compliance with the requirements for designated protected areas.

The NRBMP 2018-2021 outlined how peat extraction can be a potentially significant pressure on various water quality parameters. Peatland rehabilitation of Bord na Móna cutaway (in addition to other measures) was part of the WFD (2018-2021) programme of measures. The NRBMP 2018-2021 takes account of the fact that Bord na Móna was in the process of phasing out the extraction of peat for energy production, that it set a target to rehabilitate 9,000 ha of cutaway bogs (covering 25 peatlands) by 2021 (in 2018) and will look to implement best-available mitigation measures to further reduce water quality impacts caused by peat extraction while the phasing-out process is taking place. This NRBMP 2018-2021 rehabilitation target was superseded by the acceleration of the Bord na Móna de-carbonisation programme and the Scheme **(PCAS)**.

The development of site rehabilitation plans and the delivery of peatland rehabilitation by Bord na Móna was expected to have a positive impact on water quality and will help the NRBMP 2018-2021 deliver its objectives in relation to the Water Framework Directive and is one of the five key principle actions.

The draft NWBMP 2022-2027 describes how the number of waterbodies impacted by peat, industry and forestry have decreased by 10, 10 and 5 waterbodies, respectively since the second cycle. Impacts on water quality and river habitat arising from peat and peat extraction and associated drainage include the release of ammonium and fine-grained suspended sediments, and physical alteration of aquatic habitats. Drainage of peatlands also results in changes to the hydromorphological condition of rivers.

The draft NWBMP 2022-2027 outlines how maintaining and restoring Irish bogs will lead to a decrease in waterborne carbon leaching to levels comparable with intact bogs as well as reducing losses of peat silt and ammonia. Vegetation on the surface of the peat can also slow the flow of water over the land surface. Based on the EPA's most recent reports, peat extraction and drainage is impacting on 106 water bodies across the country, with peat the single pressure on 28 of these water bodies. However, compared to the data in the second-cycle plan, the number of water bodies impacted by peat has decreased.

The cessation of industrial peat extraction by Bord na Móna in 2021 was expected to have a significant positive impact on water quality of receiving water courses by reducing the impact of peat extraction as a key pressure on particular water courses. This is now being supported by the results and conclusions of the draft NWBMP 2022-2027.

6 4th National Biodiversity Action Plan 2023-2030

Ireland's 4th National Biodiversity Action Plan (NBAP) sets the national biodiversity agenda for the period 2023-2030 and aims to deliver the transformative changes required to the ways in which we value and protect nature. The 4th NBAP has been developed with the support, advice and input of the interdepartmental Biodiversity Working Group and the independent Biodiversity Forum. Ireland's 2nd National Biodiversity Conference was held to gather insights and recommendations for the development of the NBAP and a public consultation process was held to provide further opportunities to engage with the Plan.

The 4th NBAP strives for a "whole of government, whole of society" approach to the governance and conservation of biodiversity. The aim is to ensure that every citizen, community, business, local authority, semi-state and state agency has an awareness of biodiversity and its importance, and of the implications of its loss, while also understanding how they can act to address the biodiversity emergency as part of a renewed national effort to "act for nature".

The delivery of rehabilitation via PCAS is expected to significantly contribute in the future to actions and targets of the 4th National Biodiversity Action Plan 2023-2030, particularly in relation to peatland restoration, nature restoration and creation of new habitats such as wetlands and woodlands.

7 EU Nature Restoration Law

The EU Nature Restoration Law is a key element of the EU Biodiversity Strategy, which sets binding targets to restore degraded ecosystems, in particular those with the most potential to capture and store carbon and to prevent and reduce the impact of natural disasters. The regulation combines an overarching restoration objective for the long-term recovery of nature in the EU's land and sea areas with binding restoration targets for specific habitats and species. These measures should cover at least 20% of the EU's land and sea areas by 2030, and ultimately all ecosystems in need of restoration by 2050.

This regulation has now been adapted and it is expected that all Member States will be required to produce a National Restoration Plan within two years of adoption. This will be led by the National Parks and Wildlife Service and will comprise a broad and deep public participation process, informed by robust ecological and socio-economic impact assessments. Bord na Móna are working with NPWS to identify bog restoration and other re-wetted cutaway sites that can contribute towards Irelands targets for the Nature Restoration Law.

8 National Conservation Designations

Bord na Móna operates in a wider landscape that also includes a network of European and National nature conservation sites (Special Areas of Conservation (SACs), Special Protection Areas (SPAs), National Heritage Areas (NHAs, cNHAs) and National Nature Reserves). Bord na Móna will take account of this network of conservation objectives and their conservation objectives when developing these rehabilitation plans. It is expected that

peatland rehabilitation will, in general, benefit the conservation objectives of this network of nature conservation sites.

9 National Raised Bog Special Area of Conservation Management Plan 2017-2022.

The National Raised Bog Special Area of Conservation Management Plan 2017-2022 sets out a roadmap for the long-term management, restoration and conservation of protected raised bogs in Ireland. The Plan strikes an appropriate balance between the need to conserve and restore Ireland's raised bog network as part of Ireland's commitments towards the EU Habitats Directive, and the needs of stakeholders and gives recognition to the important role that communities have to play in the conservation and restoration of raised bogs. The National Raised Bog Special Areas of Conservation (SACs) Management Plan 2017-2022 is part of the measures being implemented in response to the on-going infringement action against Ireland in relation to the implementation of the EU Habitats Directive, with regard to the regulation of turf cutting on the Special Areas of Conservation (SACs). The then Minister for Arts, Heritage and the Gaeltacht, also published a **Review of Raised Bog Natural Heritage Area Network** in 2014.

Bord na Móna has played a key role in the development of the National Raised Bog Special Area of Conservation Management Plan 2017-2022 and the Review of the Raised Bog Natural Heritage Area Network. Several Bord na Móna sites were assessed by the National Parks and Wildlife Service as part of the above Plan and Review and there is an expectation that several Bord na Móna sites will be designated as SACs and NHAs in the future. This will reinforce the network of protected raised bog sites and replace in part sites that will be de-designated as they have been deemed to be significantly damaged and are deemed to have no raised bog restoration prospects. PCAS is expected to restore several sites that will contribute to The National Raised Bog Special Areas of Conservation (SACs) Management Plan 2017-2022 targets in relation to the restoration of raised bog habitat.

Bord na Móna has also responded to the needs of the NRBMP and provided several sites to the government for the relocation of turf-cutters from SACs. This is part of a suite of ongoing bog conservation measures in the NRBMP to manage turf-cutting in protected sites. Bord na Móna and the National Parks and Wildlife Service continues to engage regarding the ongoing relocation of turf-cutters from protected raised bog sites.

10 All-Ireland Pollinator Plan 2021-2025

The All-Ireland Pollinator Plan 2021-2025 outlines key objectives and actions to protect and support pollinating insects and the habitats they rely on. A Bord na Móna specific action in this plan includes the adoption of pollinator-friendly management within the Bord na Móna network of sites. One action to help achieve this objective is habitat rehabilitation and restoration, where possible, of pollinator-friendly habitats, including peatland habitats.

11 Land-use Planning Policies

As Bord na Móna operates in many counties across Ireland, it is important to note the respective development plans in these counties. Many of the existing development plans recognise the potential that exists in the after-use of cutover/cutaway peatlands. Bord na Móna seeks to work with all of the relevant local authorities to ensure that the most appropriate after-uses are reflected in local planning policy. The following areas of consistent

importance are of both direct and indirect relevance to Bord na Móna: heritage, tourism, biodiversity/conservation, landscape, renewable energy, and economy/enterprise.

12 National Archaeology Code of Practice

Bord na Móna operates under an agreed Code of Practice regarding archaeology with the Department of Arts, Heritage and the Gaeltacht and the National Museum of Ireland which provides a framework to enable the Company to progress peat extraction whilst carrying out archaeological mitigation. (https://www.archaeology.ie/sites/default/files/media/publications/cop-bord-na-mona-en.pdf

The Code replaced a set of Principles agreed with the Department of Arts, Heritage and the Gaeltacht in the 1990s. Under the Code Bord na Móna, the Minister and Director work together to ensure that appropriate archaeological mitigation is carried out in advance of peat extraction.

- BNM must ensure that any monuments or archaeological objects discovered during peat extraction are protected in an appropriate manner by following the Archaeological Protection Procedures.
- BNM must ensure that any newly discovered monuments on Bord na Móna lands are reported in a timely manner to the National Monuments Service of the Department of Arts, Heritage and the Gaeltacht.
- BNM must ensure that any archaeological objects discovered on Bord na Móna lands are reported immediately to the Duty Officer of the National Museum of Ireland.
- Bord na Móna will adhere to the Archaeology Code of Practice relating to management of any archaeological finds that may arise during cutaway peatland rehabilitation and decommissioning.

13 Bord na Móna Biodiversity Action Plan 2016-2021

Rehabilitation of industrial peatlands is a key objective of the Bord na Móna Biodiversity Action Plan 2016-2021. This action plan outlines the main objectives and actions around biodiversity on Bord na Móna lands. The Bord na Móna Biodiversity Action Plan also outlines key International and European policy in relation to biodiversity. This includes the **United Nations Convention on Biodiversity 2011-2020 (CBD)** and **European Biodiversity Strategy to 2020**. Further details of these policies and Bord na Móna s responses can be found in the Bord na Móna Biodiversity Action Plan (Bord na Móna, 2016). Both policy documents highlight targets such as reducing pressure on biodiversity, promoting sustainability, habitat restoration and benefits of ecosystem services.

One example of a key CBD target is:

- *"Restore at least 15% of degraded areas through conservation and restoration activities."*

The EUs headline target for progress by 2020 is to:

- *"halt the loss of biodiversity and the degradation of ecosystems in the EU by 2020, restore them as far as feasible, while stepping up the EU contribution to averting global biodiversity loss."*

This rehabilitation plan is aligned to the CBD target and the EU Biodiversity Strategy target and will help Ireland meet its commitment to these international Biodiversity polices.

14 Bord na Móna Commitments

Bord na Móna made the commitment in 2009 not to develop any new peatland sites for industrial peat production. The company has continued to work with different stakeholders.

The company announced that industrial peat production would be cut by over 50 percent in 2019 and would entirely cease over most of its lands by the mid-2020s. Rehabilitation measures would continue to be carried out with the focus on re-wetting and rehabilitation of cutover and cutaway areas in line with national policies (such as the National Peatland Strategy, the National Biodiversity Action Plan, the Climate Action Plan 2019, the Water Framework Directive, etc.) and rehabilitation guidelines set down by the Environmental Protection Agency. To date, 15,000 hectares of cutaway and cutover bog have been rehabilitated using this approach with 5,000 hectares in active rehabilitation.

In line with Bord na Móna's accelerated decarbonisation programme, the company made a further commitment to a significantly larger rehabilitation target. This was reflected in our plans to rehabilitate a further 20,000 hectares of cutaway and cutover bog to wetland and woodland mosaics by 2025. In addition, we planned to restore a further 1,000 hectares of raised bog habitat by 2025.

The above commitments have now been followed by the decision by the company to cease industrial peat extraction and rehabilitate a target of 33,000 ha between 2021-2025.

These commitments outline the importance of peatland rehabilitation to Bord na Móna. The company will continue to demonstrate environmental responsibility and continue to deliver on these commitments in relation to peatland rehabilitation and in relation to the future management of these lands to maximise their benefits, particularly their ecosystem service benefits, along with the sustainable development of a portion of the land bank for other uses, such as renewable energy.

15 Bord na Móna Strategic Framework for the future use of cutaway peatlands 2020 (Draft)

The general after-use strategy of Bord na Móna is outlined in the Bord na Móna Strategic Framework for Future-Use of Cutaway Bogs 2020 (draft document). This document outlines how Bord na Móna's cutover peatland estate is complex in nature with great variability in terms of peat depths, peat types, drainage, subsoil condition and environmental value. Thus, future options require consideration on a site-specific basis, also bearing in mind the considerable internal variation within bogs. The development of the land-bank will also take account of national needs, while also taking account of the various national legislation, policies and plans related to the management of peatlands. In general, Bord na Móna will seek to balance and optimise commercial, social, and environmental value of these sites, and develop integrated land-uses, while taking account of the need for sustainability and their biodiversity value.

Any consideration of other future after-uses for Bord na Móna land such as development or other mixed uses will be conducted following the relevant planning guidelines and consultation with relevant authorities and will be considered within the framework of this peatland rehabilitation plan.

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APPENDIX VI. DECOMMISSIONING

1. Condition 10 Decommissioning

Decommissioning is a requirement of the applicable Integrated Pollution Control Licence issued by the Environmental Protection Agency. This condition 10.1 requires the following:

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

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

The main success criteria pertaining to successfully complying with this condition is ensuring that no environmental liability remains from this infrastructure and material and that the bog can be deemed suitable for surrender of the licence under section 95 of the EPA Acts. This is achieved by Bord na Móna identifying and quantifying any mechanical and infrastructural resources that were installed in the bog to enable the development and production operation at the site. This list is then refined to identify any items that would be deemed as possibly resulting in environmental pollution, should they not be removed.

Typically, these items/infrastructures would be any remaining, unconsolidated plant, equipment and attachments, waste materials, unused raw materials such as land drainage pipes, remaining peat stockpiles, stock pile covering, pumps, septic tanks and fuel tanks.

In relation to this bog, the list and tasks would be as follows:

Item	Description	Derryarogue Decommissioning Plan
1	Clean-up of remaining or unconsolidated waste or materials located in Bogs, Yards, Buildings and Offices	Where relevant
2	Cleaning Silt Ponds	Cleaning Silt Ponds
3	Decommissioning Peat Stockpiles	Where relevant
4	Decommissioning or Removal of Buildings and Compounds	Where relevant
5	Decommissioning Fuel Tanks and associated facilities	Where relevant
6	Decommissioning and Removal of Bog Pump Sites	Where relevant
7	Decommissioning or Removal of Septic Tanks	Where relevant

In addition, condition 7 of the licence requires these now defined waste items to be disposed of or recovered as follows:

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

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

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

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

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

waste.

7.3.3 The ultimate destination of the waste.

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

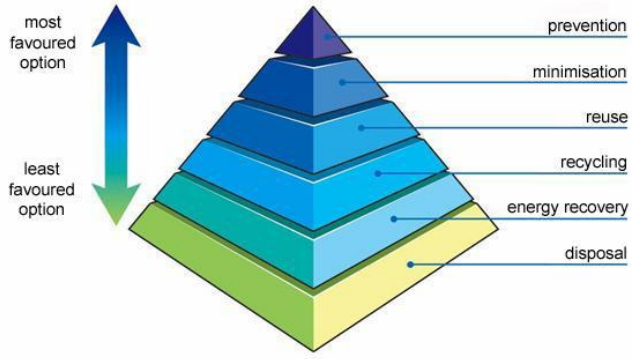
7.3.5 The tonnages and EWC Code for the waste materials listed in *Schedule 2(i) Hazardous Wastes for Disposal/Recovery* and *Schedule 2(ii) Other Wastes for Disposal/Recovery* sent off-site for disposal/recovery.

7.3.6 Details of any rejected consignments.

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

As required by the licence, these waste items will be removed for recycling or disposal, using external contractors with the required waste collection permits, approved under 7.2, with waste records maintained as required under 7.3.

Where possible, Bord na Móna will utilize the appropriate waste hierarchy to identify waste that can reused or recycled ahead of disposal.



The validation of the success of condition 10.1 is carried out through an Independent Closure Audit (ICA), followed by and EPA Exit Audit (EA) and the eventual partial or full surrender of the licence.

APPENDIX VII. GLOSSARY

Cutaway Bog: A Bord na Móna site generally becomes cutaway when it is economically unviable to continue industrial peat extraction or when the majority of peat has been removed.

Deep peat cutover bog. Deep peat cutover bog is defined as former raised bogs that have been in industrial peat production, where production has ceased but the residual peat depth is typically in excess of 2m. *Sphagnum* mosses are key species of raised bogs and the majority of the peat mass is formed from these mosses. *Sphagnum* species and other raised bog species are a key part of raised bog habitat function and prefer more acidic, nutrient poor, water-logged conditions. Typical raised bog *Sphagnum* mosses and other bog species do not thrive with the more typical alkaline water chemistry of cutaway bog but do grow well in these more acidic conditions where peat has been re-wetted. There is potential to re-develop embryonic *Sphagnum*-rich plant communities in these conditions if the peat can be re-wetted. This brings the opportunity of re-developing embryonic *Sphagnum*-rich vegetation communities that are considered Carbon sinks or peat-forming habitats and restoring the carbon sequestration function of these sites.

Dry cutaway bog: Cutaway bog is categorised as dry cutaway where it is not practical or feasible to re-wet these areas completely. It is inevitable that some areas of cutaway will remain relatively dry due to the heterogenous topography of the cutaway, as well as requirements for continued drainage on site for identified after-uses, or off site in relation to neighbouring lands or other infrastructure. Ridges and mounds of glacial deposits can become exposed during peat extraction and form a heterogenous topographical mosaic separated by basins. Dry cutaway may have very thin or no residual peat where ridges and mounds have been exposed. The exposed sub-soils are a mix of glacial gravels, muds and tills that can be quite free-draining. Dry cutaway may also have deeper residual peat but in a location (i.e. at the margin) where the peat cannot be re-wetted due to boundary constraints. Dry cutaway may also develop in situations where there a relatively steep slope that inhibits re-wetting. The majority of dry cutaway will develop towards grassland, heath, scrub and dry woodland habitats.

Environmental stabilisation: The key objective of peatland rehabilitation is environmental stabilisation. This means developing habitats and vegetation back onto the bare peat, slowing water movement across the bog, minimising effects to downstream waterbodies and meeting the conditions of the IPC Licence. This is achieved by a combination of re-wetting, where possible, and natural colonisation of the former cutaway, with or without intervention**.** Habitats will develop that reflect the underlying environmental conditions. Other after-use development may also serve to act as environmental stabilisation.

Marginal land. Marginal land is defined as land around the margin of the industrial peat production area. This margin generally contains a range of habitats including scrub, Birch woodland, cutover bog and raised bog remnants. It has a variety of land-uses including turf-cutting (private turbary).

Rehabilitation: Rehabilitation is defined in general by Bord na Móna as environmental stabilisation of the former cutaway. This is generally achieved via re-wetting, where possible, and natural colonisation of the former cutaway, with or without intervention. It is not possible to restore raised bog habitats on BnM cutaway in general in the short-term. In general, most of the peat mass has been removed from many BnM cutaway sites and the environmental characteristics of these areas have therefore changed radically (peat depths, hydrology, water chemistry, substrate type, nutrient status. This means there will therefore be different habitat outcomes (wetlands, fen, heathland, grassland and Birch woodland). Other after-use development may also serve to act as rehabilitation.

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Restoration: Ecological restoration to defined as the process of re-establishing to the extent possible the structure, function and integrity of indigenous ecosystems and the sustaining habitats they provide" (SER 2004). Defined in this way, restoration encompasses the repair of ecosystems (Whisenant 1999) and the **improvement of ecological conditions in damaged wildlands** through the **reinstatement of ecological processes**. In general, Bord na Móna cutaway peatlands cannot be restored back to raised bog in a reasonable timeframe as their environmental conditions has changed so radically (with the removal of the acrotelem – the living layer and much of the peat mass). However, they can be returned to a **trajectory** towards a naturally functioning peatland system (Renou-Wilson 2012). **Raised bog restoration** is an objective of some BnM sites where there is residual natural raised bog vegetation and where the majority of the peat is still intact.

Standard rehabilitation: This is defined as rehabilitation that is designed to meet the conditions of the EPA IPC Licence. The key objective of rehabilitation is environmental stabilisation. This is achieved by a combination of re-wetting, where possible, and natural colonisation of the former cutaway, with or without intervention**.** Other after-use development may also serve to act as rehabilitation.

Standard decommissioning: This is defined as decommissioning that is designed to meet the conditions of the EPA IPC Licence. This is defined as to render safe or remove for disposal/recovery, any soil, subsoils, buildings, plant or equipment, or any waste, materials or substances or other matter contained therein or thereon, that may result in environmental pollution.

Wetland cutaway bog. Wetland cutaway bog is defined as former raised bogs that have been in industrial peat production, where production has ceased and the majority of peat has been cutaway, and where this cutaway has the potential to be re-wetted. A significant number of Bord na Móna sites have pumped drainage and these sites are likely to develop a mosaic of wetland habitats when pumping in reduced or stopped. The water chemistry of wetland cutaway frequently is strongly influenced by the more alkaline sub-soils that have been exposed during peat production. This means that pioneer vegetation is more typical of fen and wetland, rather than raised bog. Wetland cutaway will have a broad range of hydrological conditions depending on the local topography. In some cases, these wetlands may form deep water (> 0.5 m) whilst other areas may have the water table at or just below the surface of the ground.

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APPENDIX VIII. EXTRACTIVE WASTE MANAGEMENT PLAN

(Minimisation, treatment, recovery and disposal)

Objective:
The objective of this generic plan is to comply with the requirements of regulation 5 of the Waste Management (Management of Waste from Extractive Industries) Regulations, and to prevent or reduce waste production and its harmfulness.

Scope:
This plan covers IPPC Licence's Ref P0504-01, Mountdillon Group of Bogs located in Co. Longford.

1.0 Extractive Waste:
Waste classified as extractive waste from peat extraction operations arise from three operations associated with this activity.

1.1 Silt Pond excavations and maintenance.
All peat extraction activities in the Mountdillon bog group are serviced by silt lagoons/ponds. During the excavation of these silt ponds, pre IPPC Licensing in 1999 and since licensing, the excavated material is stored adjacent to the silt pond, where it either remains in situ ores levelled out. As required by condition 6.6, these silt lagoons are cleaned twice per annum or more often if inspections dictate. These silt cleanings are also deposited on the same location, adjacent to the silt pond, where they may be levelled periodically to allow room for subsequent cleanings. These mounds of silt pond excavation material and cleanings are generally no higher that 2-3 metres.

1.2 Power Station screenings:
Lough Ree Power Station screens the peat from the bogs prior to processing. This screening removes oversized peat, stones and bogs timbers. Schedule 3 (ii) of the IPPC licence permits disposal of these peat screenings back to the bog, where it is levelled and graded into the surrounding peat landscape. These locations have been agreed with the Agency as per condition 7.4 of the IPPC Licence, and as per the attached locations.

1.3 Bog Timbers:
During peat extraction operations, bog timbers often arise in the bog surface and are required to be cleared. These timbers consist of bog pine, oak and some yew. Some of these timbers, such as the oak and yew are removed for use in the wood craft industry, with the remaining bog pine stockpiled in locations at the opposite end of each bog, where it generally becomes a habitat for flora and fauna. These piles of timber are generally no higher than 1-2 metres.

2.0 P0504-01 IPPC Licence Extractive Waste Conditions

2.1 Condition 7.5 Extractive Waste Management
The licensee shall draw up a Waste Management Plan (to be known as an Extractive Waste Management Plan) for the minimisation, treatment, recovery and disposal of extractive waste. This Plan shall meet the requirements of regulation 5 of the Waste Management (Management of Waste from the Extractive Industries) Regulations,2009. The Plan shall be submitted for agreement by the Agency by the 31' December 2012. The Plan shall be reviewed at least once every five years thereafter in a manner agreeable to the Agency and amended in the event of substantial changes to the operation of a waste facility or to the waste deposited. Any amendments shall be notified to the Agency.
All extractive waste shall be managed in accordance with the Extractive Waste Management Plan. A report on the implementation of the Extractive Waste Management Plan shall be provided in the AER.

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2.2 Condition 7.6 Waste Facility

(i) No new waste facility may be developed or an existing waste facility modified unless agreed by the Agency.
(ii) The licensee shall ensure that all existing waste facilities are managed and maintained to ensure their physical stability and to prevent pollution or contamination of soil, air, surface water or groundwater.
(iii) The licensee shall ensure that all new waste facilities are constructed, managed and maintained to ensure their physical stability and to prevent pollution or contamination of soil, air, surface water or groundwater.
(iv) Operational measures shall be continuously employed to prevent damage to waste facilities from personnel, plant or equipment.
(v) The licensee shall establish and maintain a system for regular monitoring and inspection of waste facilities.
(vi) All records of monitoring and inspection of waste facilities, as required under the licence, shall be maintained on-site in order to ensure the appropriate handover of information in the event of a change of operator or relevant personnel.

2.3 Condition 7.7 Excavation Voids

7.7.1 Unless otherwise agreed by the Agency, only extractive waste shall be placed in excavation voids.
7.7.2 When placing extractive waste into excavation voids for rehabilitation and construction purposes, the licensee shall, in accordance with regulation 10 of the Waste Management (Management of Waste from the Extractive Industries) Regulations, 2009, and the Extractive Waste Management Plan:

- Secure the stability of the waste
- Put in place measures to prevent pollution of soil, surface water and ground water.
- Carry out monitoring of the extractive waste and excavation void.

Condition 7.5. Extractive Waste Management Plan. 5 (1)

3.0 Minimisation.

3.1 Silt pond excavation material and cleanings.

IPPC Licence conditions require all production areas to be serviced by an appropriately designed silt pond based on storage volume and retention time. Condition 6.6 requires all ponds to be cleaned bi-annually and more often if inspections dictate, so the only opportunity for minimisation of same is through Standard Operating Procedures. These are required under condition 2.2.2 (i) regarding minimisation of suspended solids, and are in-place to minimise the generation of silt, which in-turn will minimise the generation of silt pond waste.

3.2 Power Station Screenings.

These screenings cannot be minimised as they are a consequence of peat production, stones, timbers and oversize peat materials are naturally occurring on the bog, and are required to be removed prior to processing.

3.3 Bog Timbers.

Bog timbers are also naturally occurring materials within a bog and are required to be removed prior for production. The volume of these bog timbers varies from bog to bog and as such their minimisation is not controllable or quantifiable.

4.0 Treatment

4.1 Silt pond excavation material and cleanings.

The silt pond excavation material and silt cleanings do not require any treatment for its end use which will be either backfilling these silt pond voids as per condition 7.7.1 above as part of the Bog Rehabilitation Plan, or reincorporated into the surrounding peatlands.

4.2 Power Station Screenings.

The factory screenings are permitted to be returned to the bog as they were naturally occurring materials from the bog, and as such do not require any treatment to serve this purpose.

4.3 Bog Timbers
As per 1.3 above, these timbers are stockpiled at two locations in each bog, as per the attached list of sites and become habitats for various flora and fauna.

5.0 Recovery
5.1 Silt pond excavation material and cleanings.
Condition 2.2.2 (vi) requires the reuse of silt pond waste to be examined. This was undertaken in 2006, the outcome of which was that this waste peat silt material, as a fuel, was contaminated with sub-soils, rendering it unsuitable for combustion. In addition, volumes are small compared to overall peat production volumes.

5.2 Power Station Screenings.
Given the nature of these screenings as outlined in 1.2 above, there is no further use identified and they are permitted to be disposed of back to the bog.

5.3 Bog Timbers
Investigations into processing these materials into smaller fractions for potential heating purposes did not yield any viable results. In addition, these older stockpiles are now classified as habitats and as such would not be considered for reuse as a fuel.

6.0 Disposal
6.1 Silt pond excavation material and cleanings.
Schedule 3 (ii) permits the disposal of silt pond cleanings (Lagoon Sediments) to the bog and these locations, adjacent to the silt pond site, are presented in the attached spreadsheet, with associated grid coordinates.

6.2 Power Station Screenings.
Schedule 3 (ii) permits the disposal of screenings (Peat Screenings) to the bog at designated locations agreed under Condition 7.4, and these locations, are presented in the attached spreadsheet, with associated grid coordinates.

6.3 Bog Timbers
These naturally occurring bog timbers are stockpiled at locations in each bog, grid coordinates attached.

7.0 Extractive Waste Management Plan

5 (2a)(i)
The vast majority of peat extraction bogs were all designed and drained for production prior to the 1960's and as such the production fields layout cannot' be altered. Under our Cleaner Reduction Procedures, various design changes have been implemented to the production machines and process to reduce lost peat which eventually is captured in the silt ponds and requires removal as waste peat silt. This along with training and ongoing research and development will continuously reduce waste peat and subsequently waste silt pond cleanings. Bog timbers are present naturally in various volumes and quantities in different bogs and as peat production involves stripping peat in layers, the exposure, generation and removal of these timbers is unavoidable. Work has been undertaken recently into project looking at grinding of these bog timbers in situ using a timber miller, and if this project becomes viable it will contribute to the reduction of bog timbers.

5 (2a)(ii)
Given the nature and expanse of peat bogs, the stockpiling and storage of these waste materials do not present a visual, storage or stability problem. As required under Condition 10 of the IPPC Licence, the silt pond excavations and screenings will be utilised to backfill the silt pond voids once the bogs have finished and stabilised in accordance with out Bog Rehabilitation Plan. Storage of these wastes in the interim, open to the elements does

not present a change on the nature of these wastes that will threaten the environment or prevent their reuse during the bog rehabilitation process.

5 (2a)(iii)
Under Condition 10 of the IPPC Licence, all silt ponds will be decommissioned once the bog surface has stabilised, in agreement with the Agency. This will involve the removal of weirs and flow controls, returning the silt pond back to its original drain or removing the silt pond from the drainage system. Both of these activities will involve placing the silt pond extraction and cleaning material back into the excavation void.

5 (2a)(iv)
The peat bogs do not contain any topsoil, so this is not required.

5 (2a)(v)
Peat mineral resources do not undergo any treatment.

5 (2b)
These three extractive waste are all being reused and recovered back to their original extraction points and have not undergone any physical, chemical, or biological change.

5 (2c)(i, ii & iii)
These three extractive wastes, stored on the bog for reuse or recovery during the bog rehabilitation phase, do not require any management or monitoring during the operation of these bogs. Silt pond excavations and cleanings are stored adjacent to the silt pond and quickly revegetated and stabilise, the screenings are graded back into the bog at the agreed locations upon disposal and the bog timbers do not prevent any water or airborne danger to the environment.

5 (3)
The three extractive wastes arising from peat extraction operations at this site are classified wastes from mineral non-metalliferous excavation, with an EWC code of 0101 02. The materials are not classified as hazardous under Directive 91/689/EEC20, and do not contain substances or preparations classified as dangerous under Directives 67/548/EEC5 or 1999/45/EC6 above a certain threshold.
The peat excavations and cleanings are stored in locations and in a manner that they could not collapse, and are remote in their nature. The stockpiles are located adjacent to silt ponds that are cleaned regularly and as such these stockpiles are managed and levelled to facilitate further cleanings.
Therefore the material stored at these waste facilities would not be considered to be a Category A waste facility.

Classification in accordance Annex II.

Waste Material	Description	Classification	Chemical Process treatment	Deposition description	Transport System
Silt Pond Excavations and cleanings	Peat and mineral soils associated with peatlands. Stored for reuse during bog rehabilitation, with no displacement of overburden	01 01 02	None	Excavated from silt ponds by excavator and deposited adjacent to the silt pond.	Excavator
Peat Screenings	Stones, timbers and oversized peat particles, reincorporated into low	01 01 02	None	Removed by screen at the factory and	Tractor and trailer.

Waste Material	Description	Classification	Chemical Process treatment	Deposition description	Transport System
	areas, agreed with the Agency, and stabilized under normal natural bog conditions			transported by tractor and trailer to the designated and agreed locations	
Bog Timbers	Pine, Oak and Yew species, stored at locations in each bog. Not subject to any stability issues due to exposure to atmospheric/meteorological conditions.	01 01 02	None	Removed from the bog surface by excavator and transported by tractor and trailer to the agreed locations	Tractor and Trailer

Description of operations.
Silt pond excavations arise from the requirement to have silt ponds treating all peat extraction sites. Silt pond cleanings arise from the removal of peat silt from silt ponds as required under IPPC Licence. Bog timbers arise from preparation of the bogs surface for peat production. Estimated quantities of materials are below:

Closure plan. (Bog Rehabilitation Plan).
Condition 10.1 – 10.3 of the IPPC Licence requires the following:

- 10.1 Following termination of use or involvement of all or part of the site in the licensed activity, the licensee shall:
- 10.1.1 Decommission, render safe or remove for disposal/recovery, any soil, subsoils, buildings, plant or equipment, or any waste, materials or substances or other matter contained therein or thereon, that may result in environmental pollution.
- 10.1.2 Implement the agreed cutaway bog rehabilitation plan (refer Condition 10.2).

10.2 Cutaway Bog Rehabilitation Plan:

- 10.2.1 The licensee shall prepare, to the satisfaction of the Agency, a fully detailed and costed plan for permanent rehabilitation of the cutaway boglands within the licensed area. This plan shall be submitted to the Agency for agreement within eighteen months of the date of grant of this licence.
- 10.2.2 The plan shall be reviewed every two years and proposed amendments thereto notified to the Agency for agreement as part of the AER. No amendments may be implemented without the written agreement of the Agency.

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

- 10.3.1 A scope statement for the plan; to include outcome of consultations with relevant Agencies, Authorities and affected parties (to be identified by the licensee).
- 10.3.2 The criteria which define the successful rehabilitation of the activity or part thereof, which ensures minimum impact to the environment.
- 10.3.3 A programme to achieve the stated criteria.
- 10.3.4 Where relevant, a test programme to demonstrate the successful implementation of the rehabilitation plan.
- 10.3.5 A programme for aftercare and maintenance.

10.4 A final validation report to include a certificate of completion for the Rehabilitation Plan, for all or part of the site as necessary, shall be submitted to the Agency within six months of execution of the plan. The licensee

shall carry out such tests, investigations or submit certification, as requested by the Agency, to confirm that there is no continuing risk to the environment. This plan including maps and ecological classifications are available on file at the Mountdillon IPPC Licence Coordinators office.
The location in relation to the silt pond excavations and cleanings are adjacent to the silt ponds, which are considered under the Shannon River Basin Management Plan in accordance with the requirements of Directive 2000/60/EC.
Screenings and bog timbers are all naturally occurring elements of peatland and there placement back to the bog in smaller concentrated designated waste facilities does not constitute a risk to the prevention of water compliance.
The lands under where these materials are deposited are peatlands and are un-effected by the placing of this material.

Review.
This plan will be reviewed every five years, the first review to take place in September 2017. This review will entail an inspection of these waste facilities to ensure their placing, management, maintenance and stability comply with the requirements of the Extractive Waste Management requirements and condition 7.5, 7.6 and 7.7 of the Mountdillon IPPC Licence P0504-01.

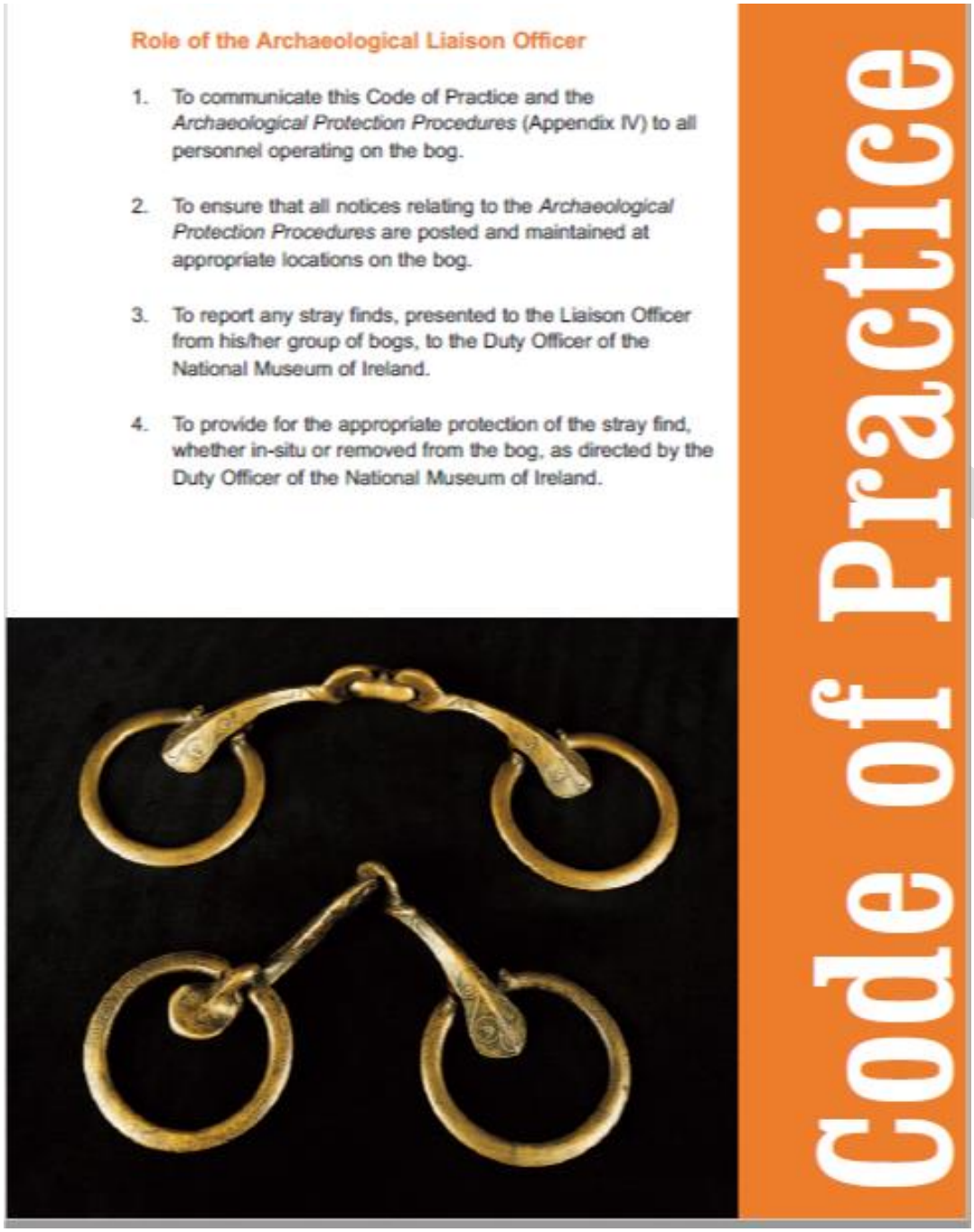
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APPENDIX IX. MITIGATION MEASURES FOR THE APPLICATION OF FERTILISER

- Any fertiliser used will be Rock Phosphate and will not be applied in the following conditions:
    1. The land is waterlogged;
    2. The land is flooded, or it is likely to flood;
    3. The land is frozen, or covered with snow;
    4. Heavy rain is forecast within 48 hours (forecasts will be checked from Met Éireann).
    5. The ground slopes steeply and there is a risk of water pollution, when factors such as surface run-off pathways, the presence of land drains, the absence of hedgerows to mitigate surface flow, soil condition and ground cover are taken into account.
- No fertiliser will be spread on land within 2 metres of a surface watercourse.
- Buffer zones in respect of using fertiliser near waterbodies, as specified on FAQ Listing | Environmental Protection Agency, will be adhered with at all times with regard to fertiliser application. Reproduced as follows:

Water body / Feature	Buffer zone
Any water supply source providing 100m^3 or more of water per day, or serving 500 or more people	200 metres (or as little as 30 metres where a local authority allows)
Any water supply source providing 10m^3 or more of water per day, or serving 50 or more people	100 metres (or as little as 30 metres where a local authority allows)
Any other water supply for human consumption	25 metres (or as little as 30 metres where a local authority allows)
Lake shoreline	20 metres
Exposed cavernous or karstified limestone features (such as swallow holes or collapse features)	15 metres
Any surface watercourse where the slope towards the watercourse exceeds 10%	10 metres
Any other surface waters	5 metres*

APPENDIX X. ARCHAEOLOGY



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Code of Practice

5. To arrange for the delivery or collection of the stray find, as directed by the Duty Officer of the National Museum of Ireland.

6. To complete the Report of Discovery of Archaeological Object(s) in Bogs (Appendix V), as directed by the Duty Officer of the National Museum of Ireland.

7. To maintain a file of all stray finds and associated documentation and provide copies to the Project Archaeologist.

8. To provide assistance, where required, to the Department during archaeological surveys.

9. To provide assistance, where required, to Bord na Móna's Consultant Archaeologists, during investigation and mitigation of monuments.

10. To report to the Bord na Móna members on the Archaeology Management Liaison Committee any planned developments or new activities on cutaway peatland areas within his/her group of bogs.



Bord na Móna	**Procedure: ENV017**	**Rev: 1**
Title: Archaeological Findings	**Approved: EM**	**Date: 13/10/2020**

1) Purpose

The purpose of this procedure is to describe the arrangements in Bord na Móna for findings of Archaeological material (Stray Finds).

All objects, sites or monuments, no matter how fragmentary, are important elements of our heritage.

2) Procedure

1. Check whether there are any known archaeological monuments in your area.
2. Be vigilant at all times - objects or traces of structures can be found on the field surfaces, in the drain faces, on the bog margins or caught within the mechanics of machinery.
3. If an object is found leave it in place, if it is safe to do so, note its position and immediately contact your Archaeological Liaison Officer who will assess the situation and contact the Duty Officer of the National Museum of Ireland.
4. Resist the temptation to investigate the find spot as this may disturb fragile archaeological deposits.
5. If the object is already dislodged or is in imminent danger, remove it carefully, mark its find spot and report it immediately to your Archaeological Liaison Officer.
6. Objects made of wood, leather or textile, which are removed from peat should be kept in conditions similar to those in which they are found. This can be done by packing them in peat or, if waterlogged, placing them in a clean basin of water and sealing the container. Resist the temptation to clean or remove peat from the object.
7. If timbers or other materials, such as gravel or stones, which could be part of a man-made structure are noted on the bog, mark the location and report it immediately to your Archaeological Liaison Officer. If you suspect the find is of archaeological importance, resist the temptation to expose it any further as this could result in damage to the structure.
8. Report anything that looks unnatural in the bog – your Archaeological Liaison Officer will decide whether it should be referred to the appropriate authorities.

NOTE: Our archaeological heritage is a finite, non-renewable resource. Once a site is destroyed its information is lost forever and we have lost the chance to understand a little more about our past, where we have come from and perhaps the opportunity to learn for the future.

Your Archaeological Liaison Officer is ……

3) Records

Revision Index			
Revision	Date	Description of change	Approved
1	13/09/2020	First release	EMcD
2			

Draft

Draft

Bord na Móna

Derryarogue Bog
Draft Rehab Plan
GIS Map Book
2025

Document Control Sheet	
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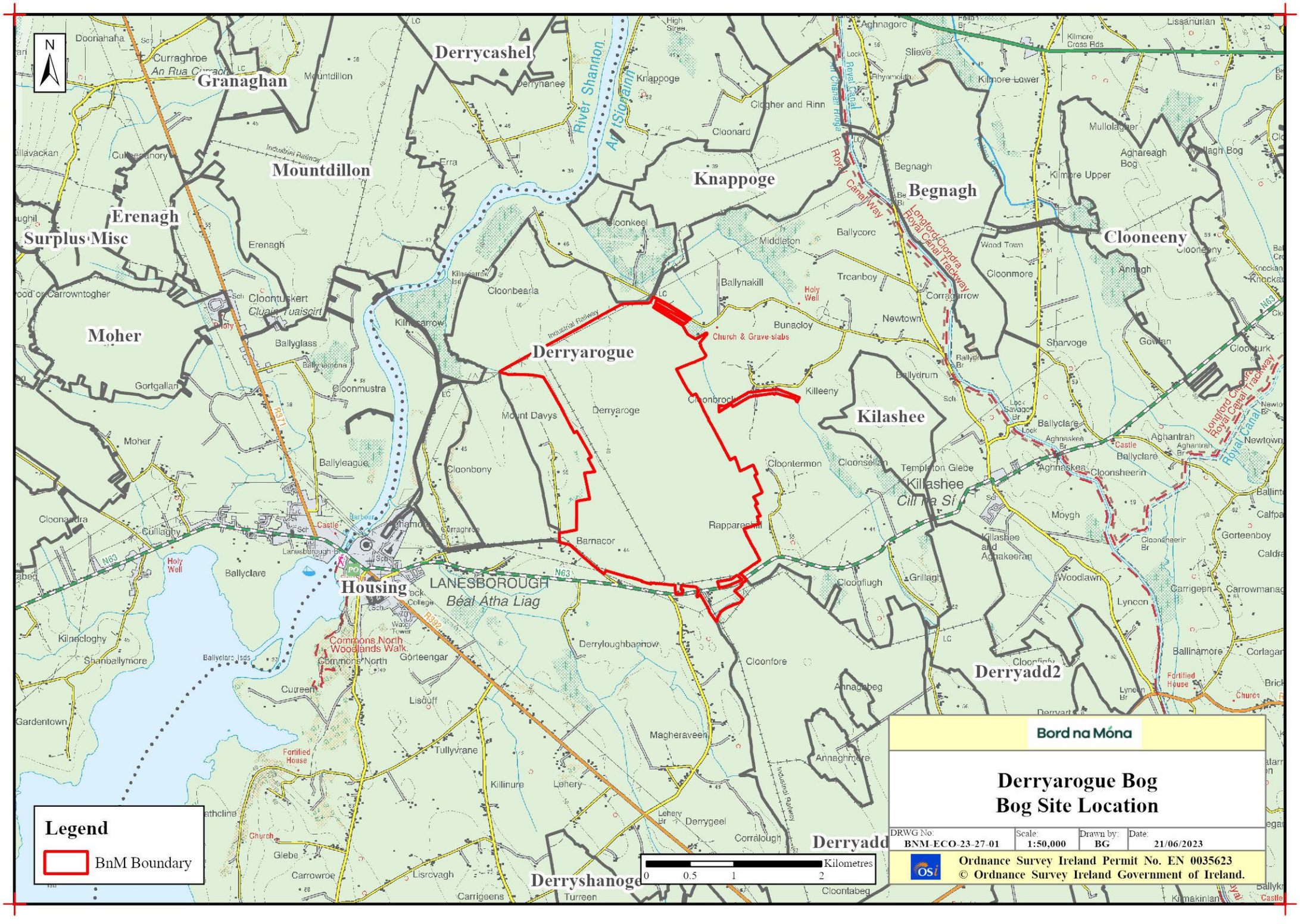
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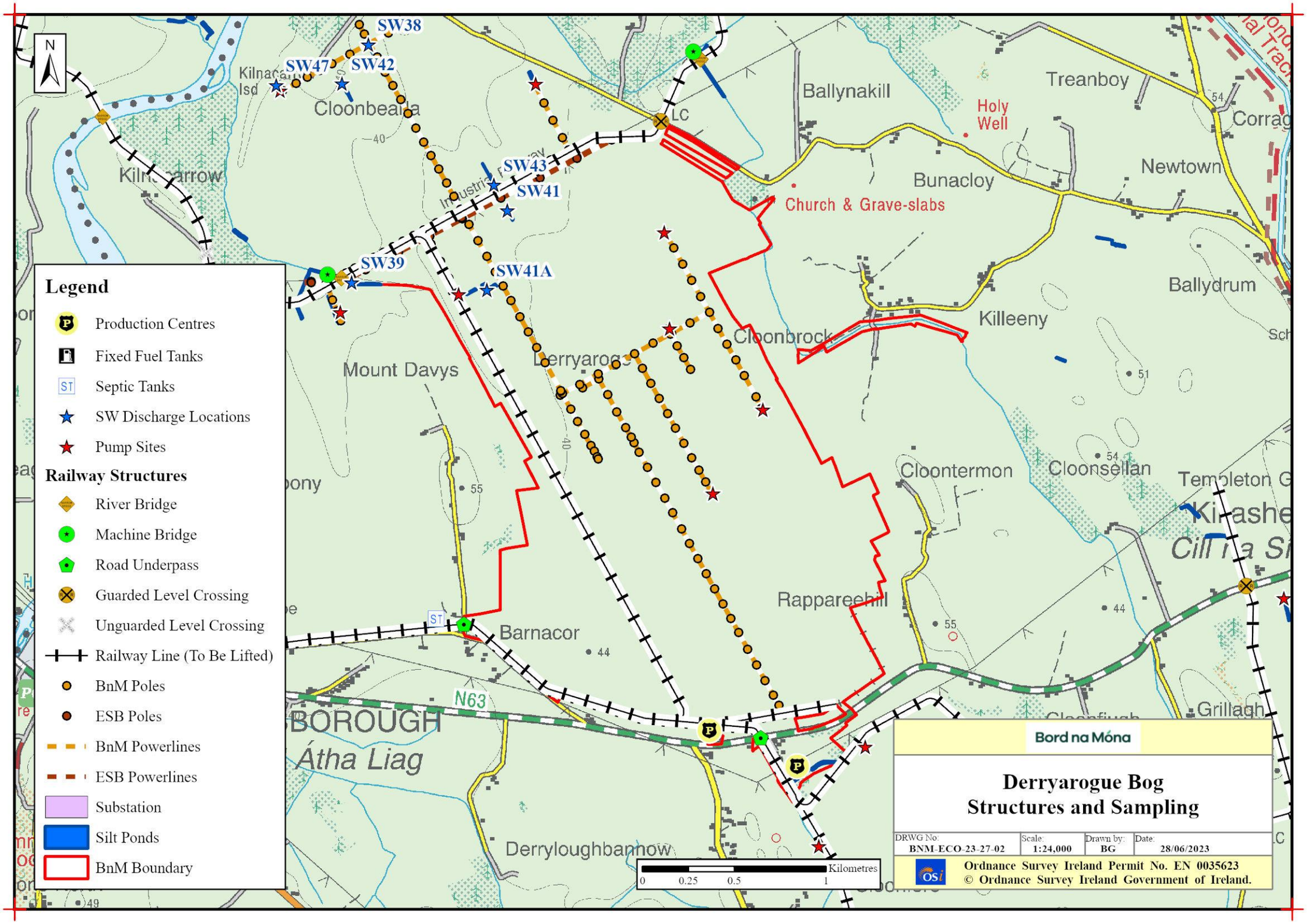
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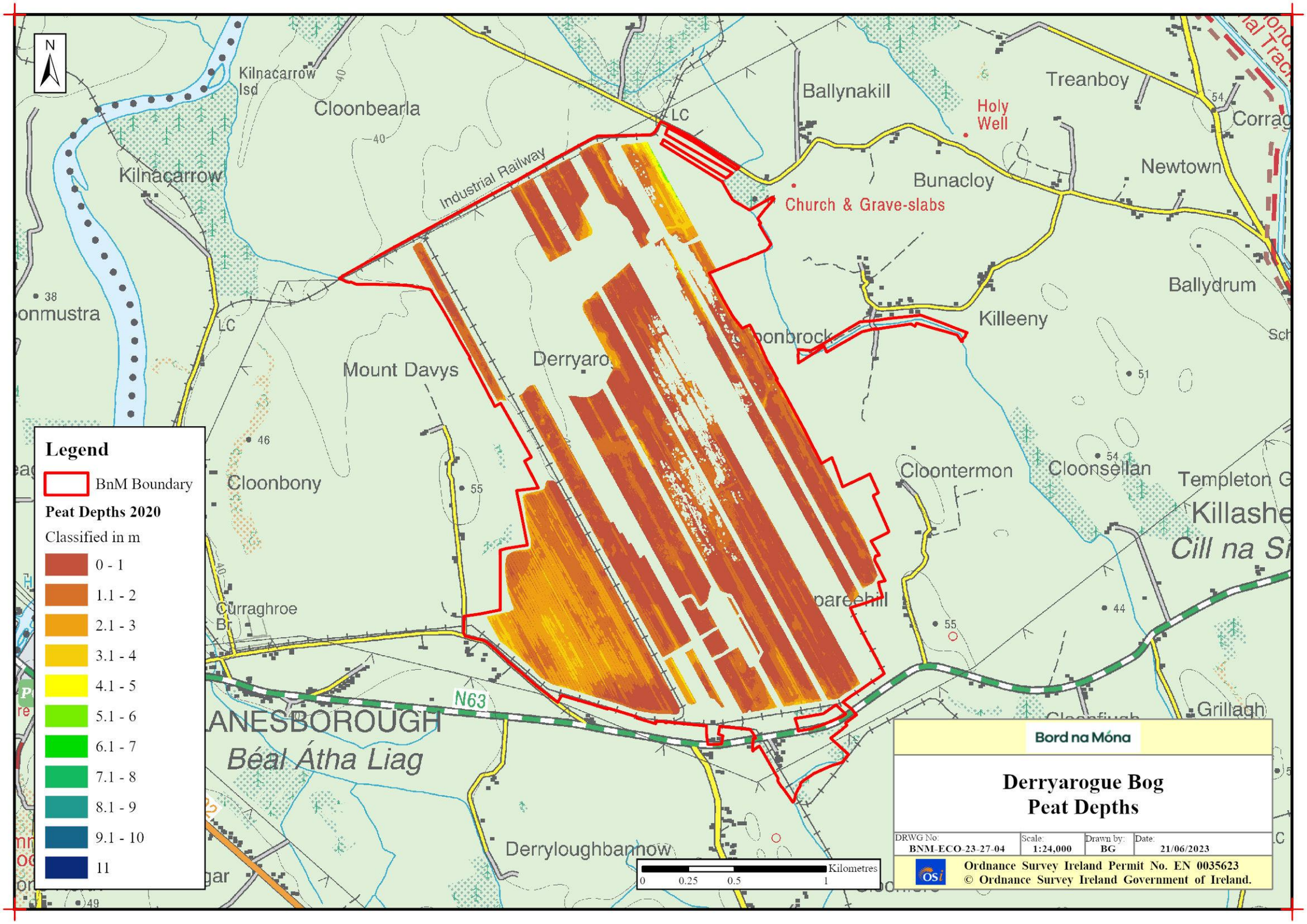
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Cloonbeala
Ballynakill
Holy Well
Treanboy
Newtown
Bunacloy
Church & Grave-slabs
Ballydrum
Killeeny
Cloonbrock
Mount Davys
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Railway Line (To Be Lifted)
BnM Poles
ESB Poles
BnM Powerlines
ESB Powerlines
Substation
Silt Ponds
BnM Boundary
Kilometres
0 0.25 0.5 1
Bord na Móna
Derryarogue Bog
Structures and Sampling
DRWG No: BNM-ECO-23-27-02
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Date: 28/06/2023
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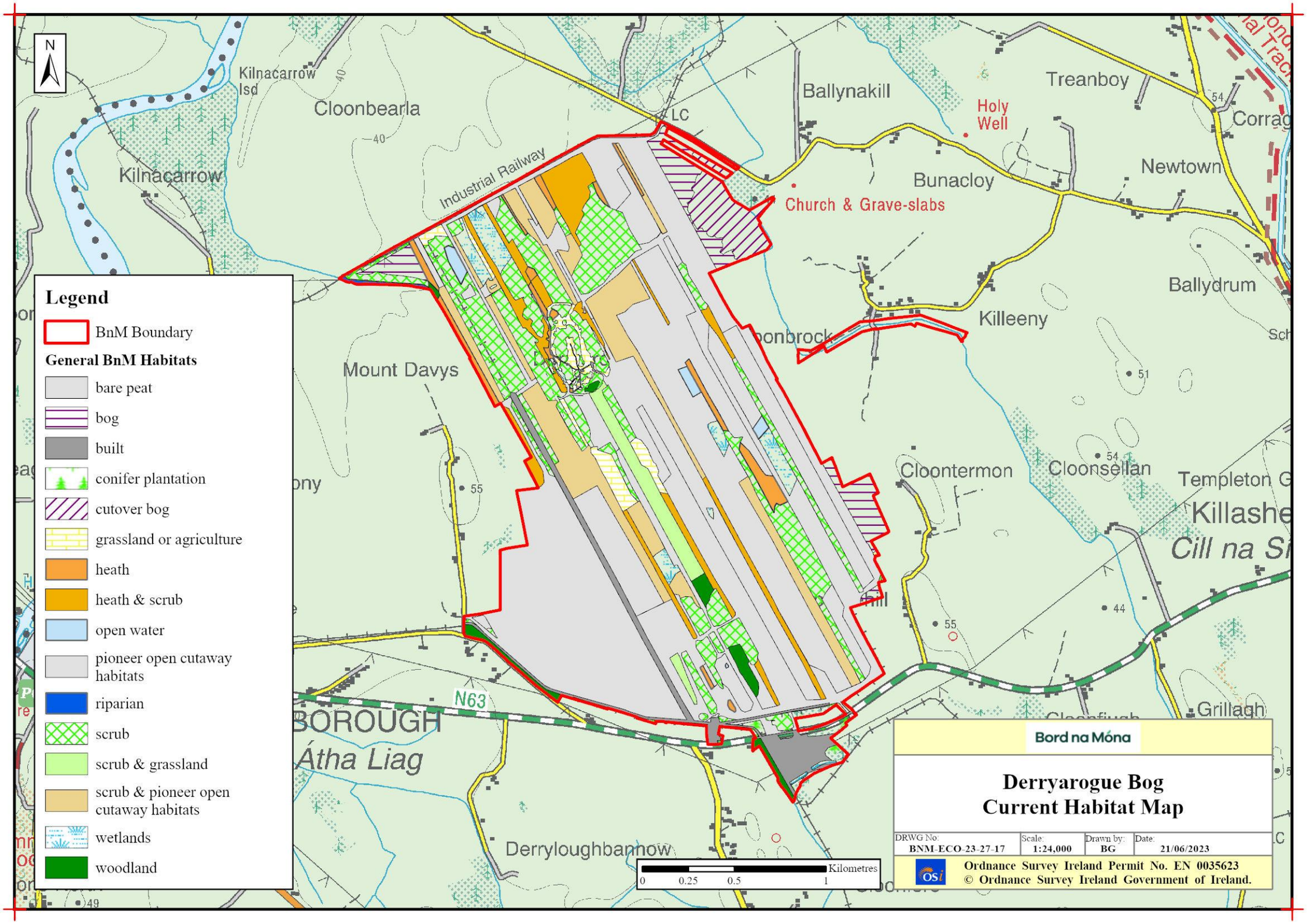
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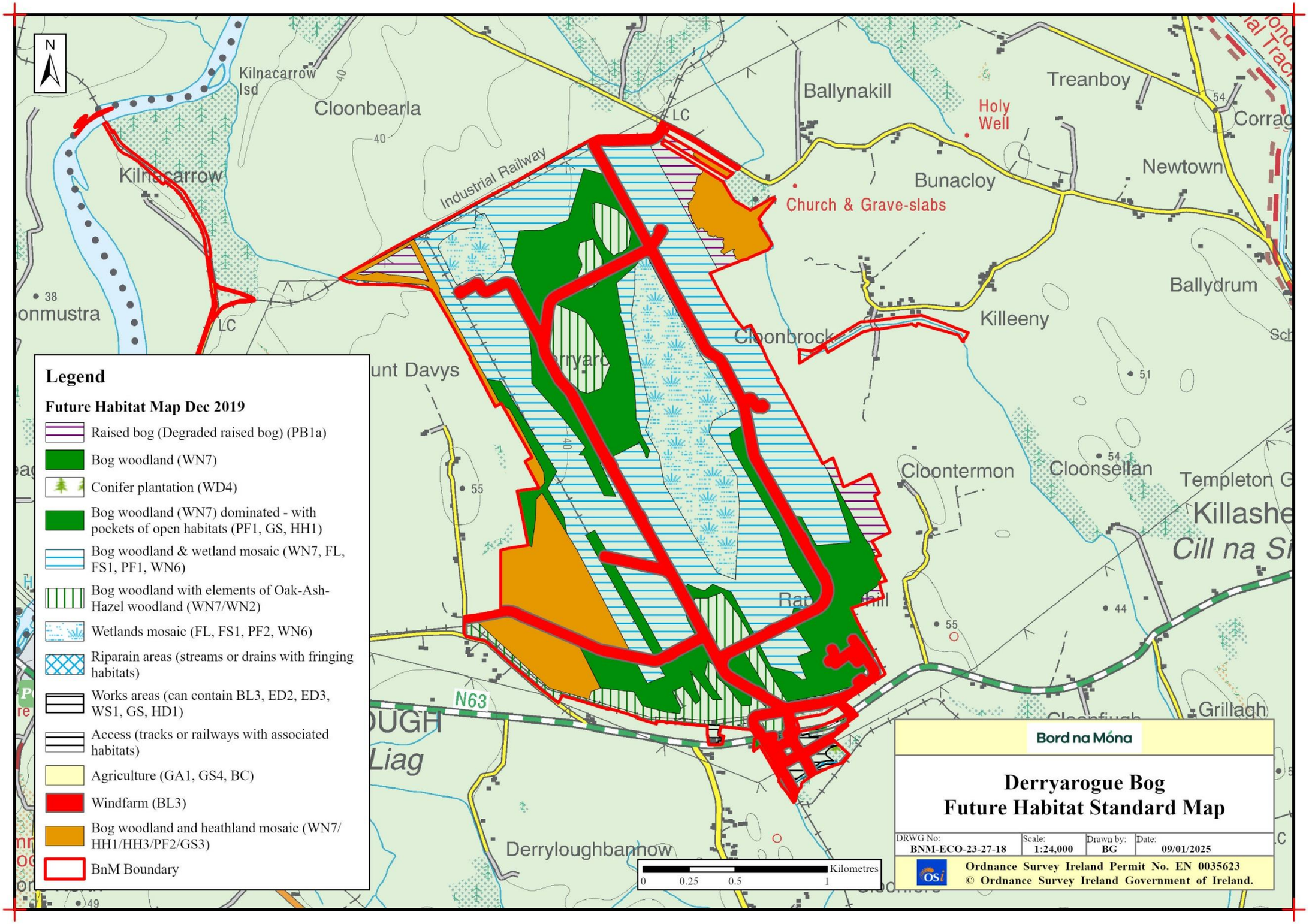
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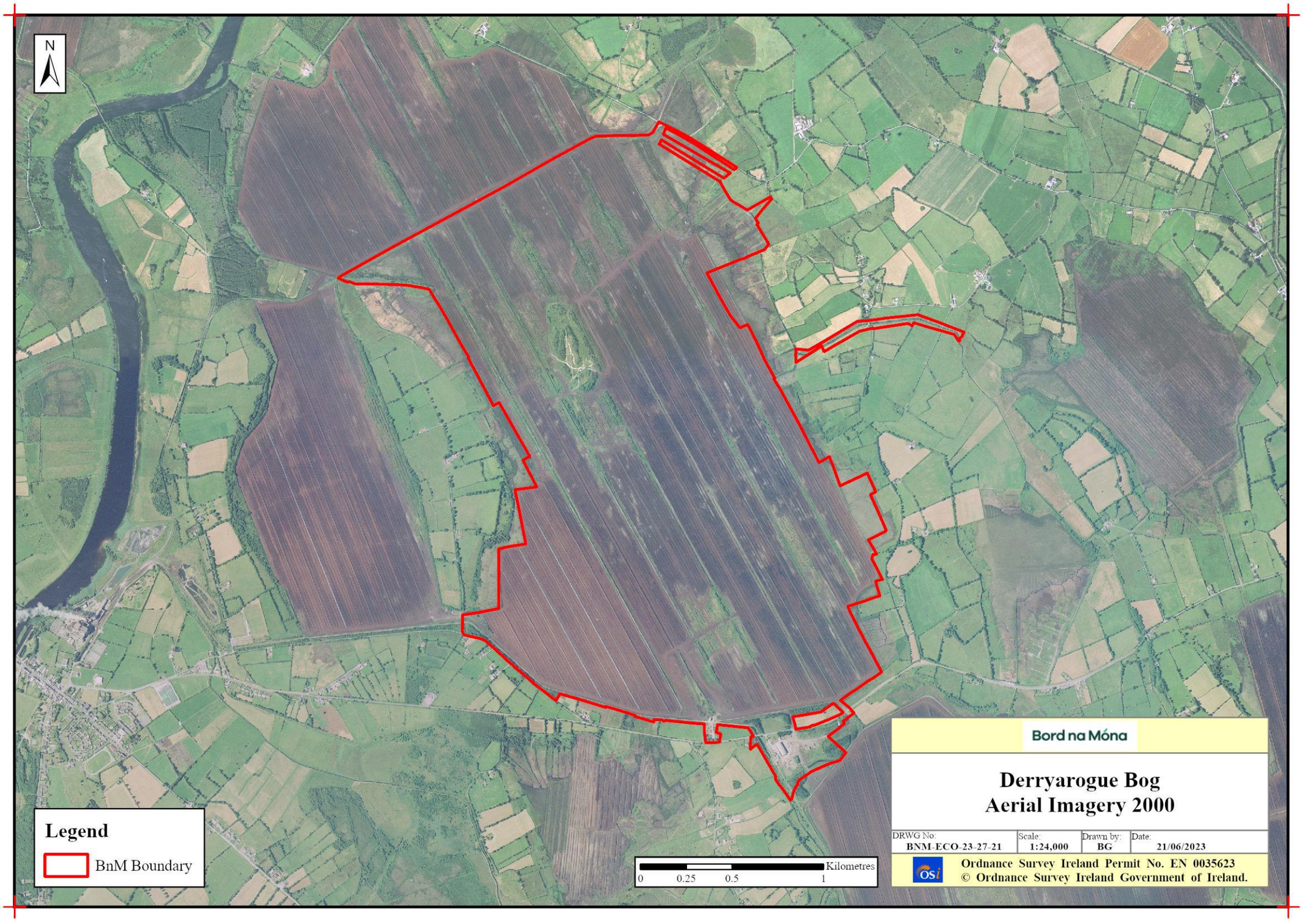
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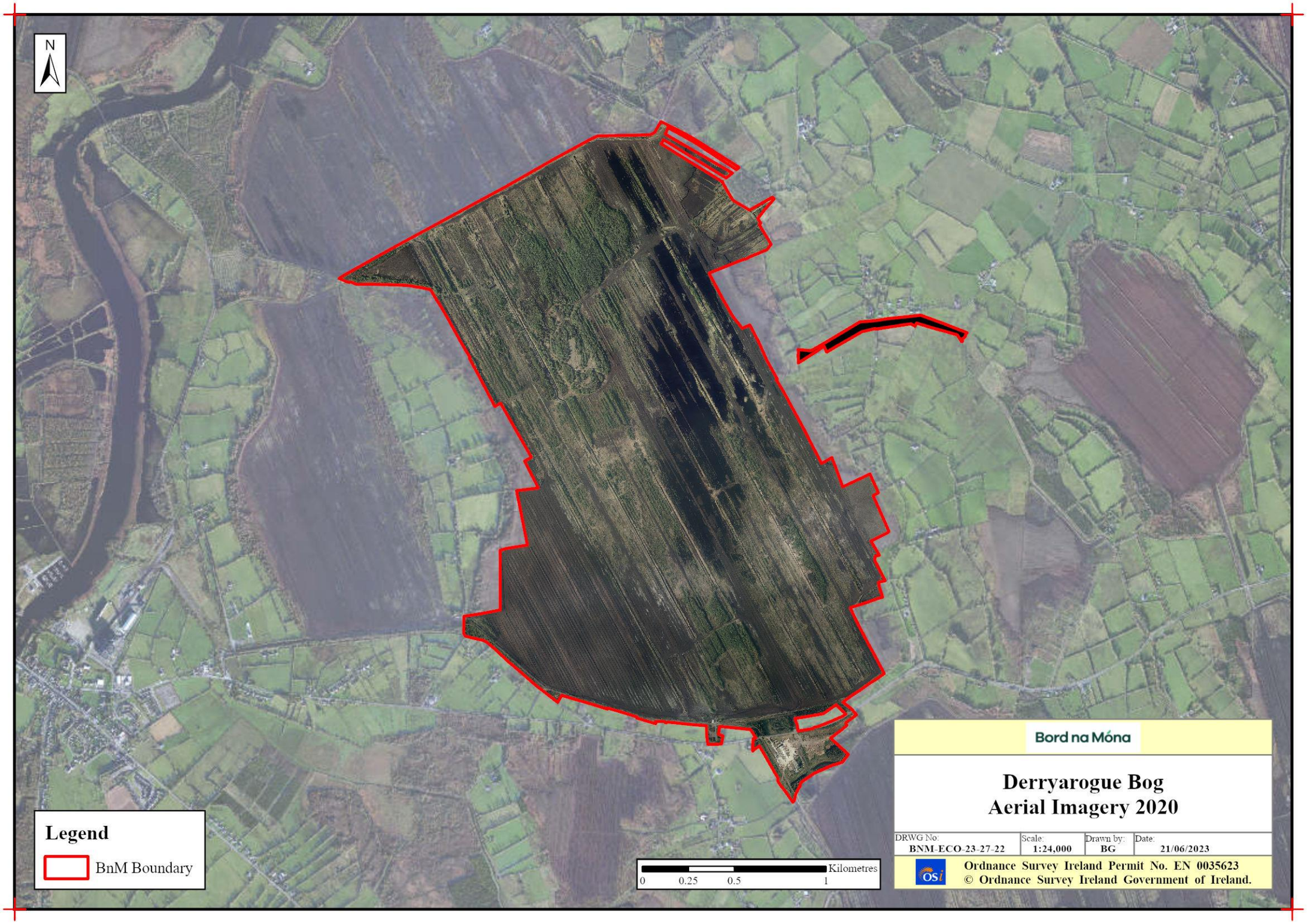
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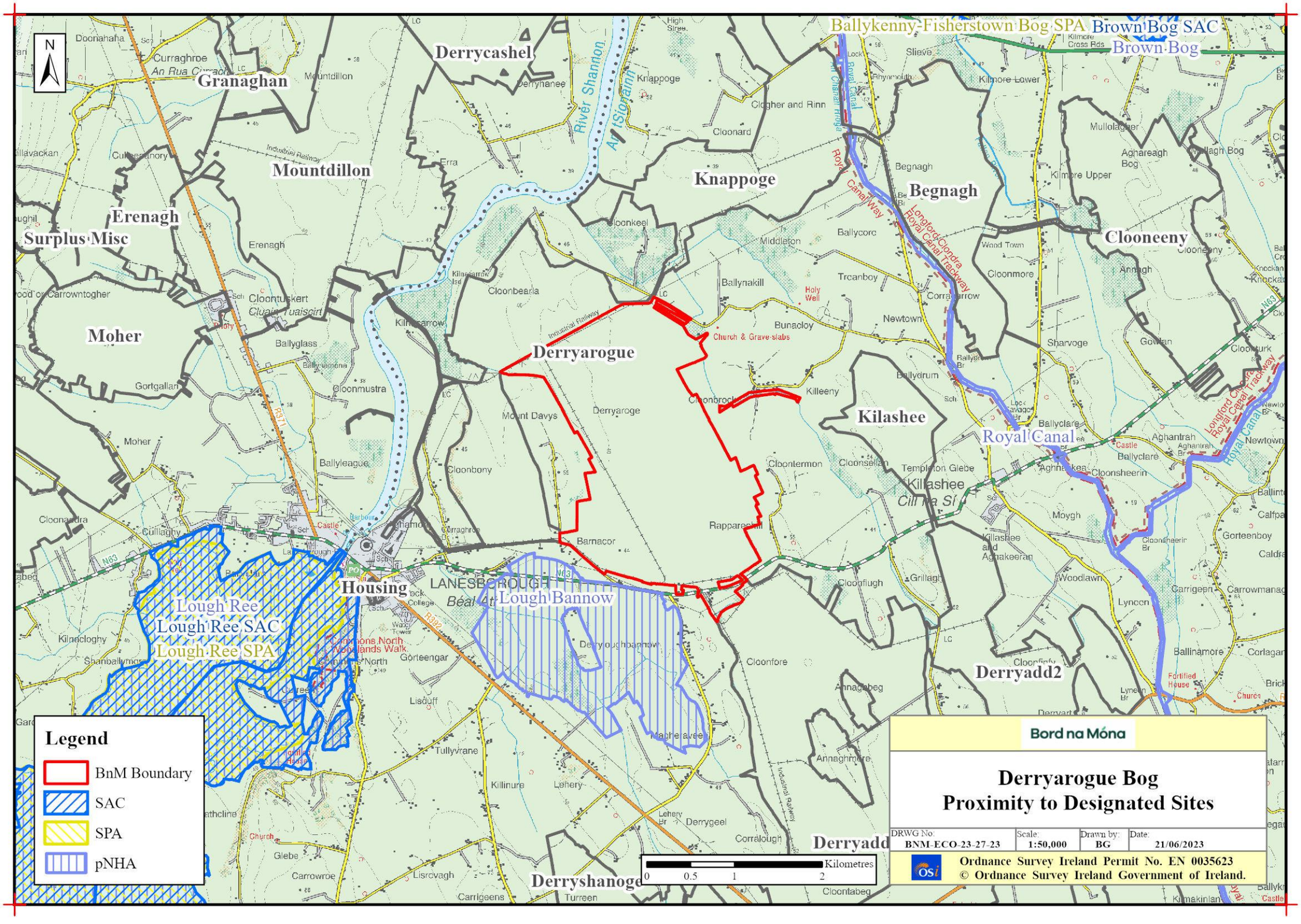
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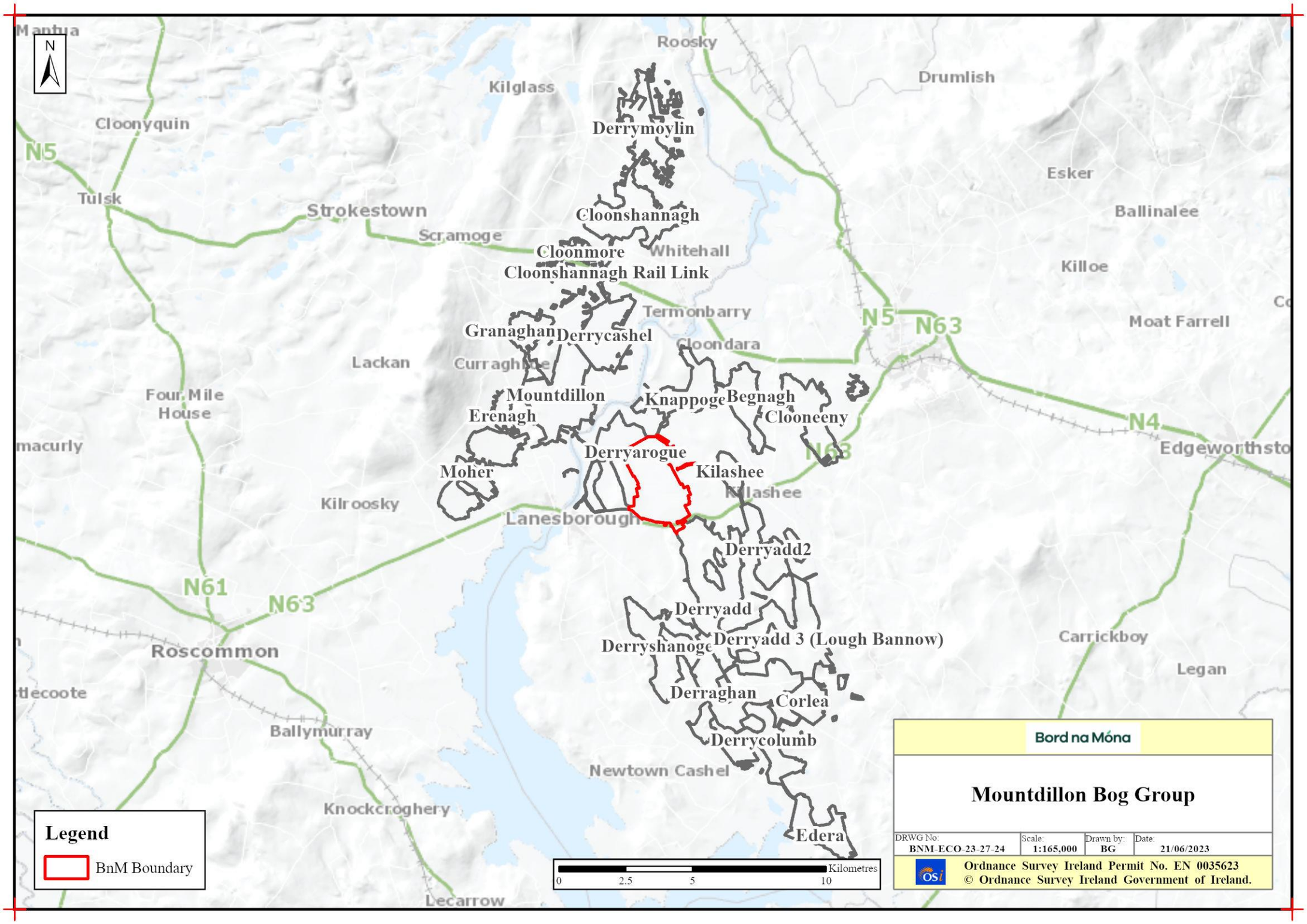
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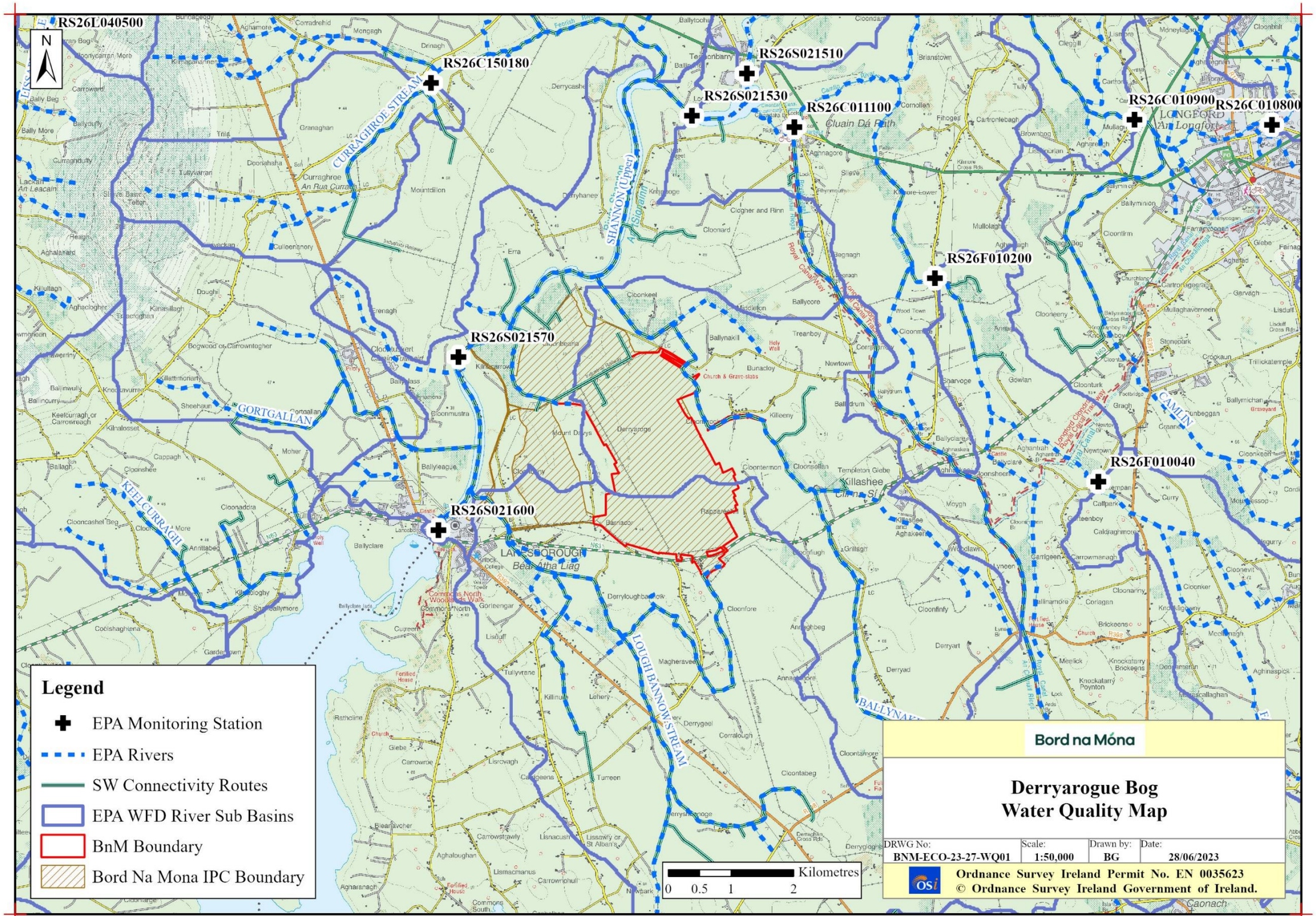
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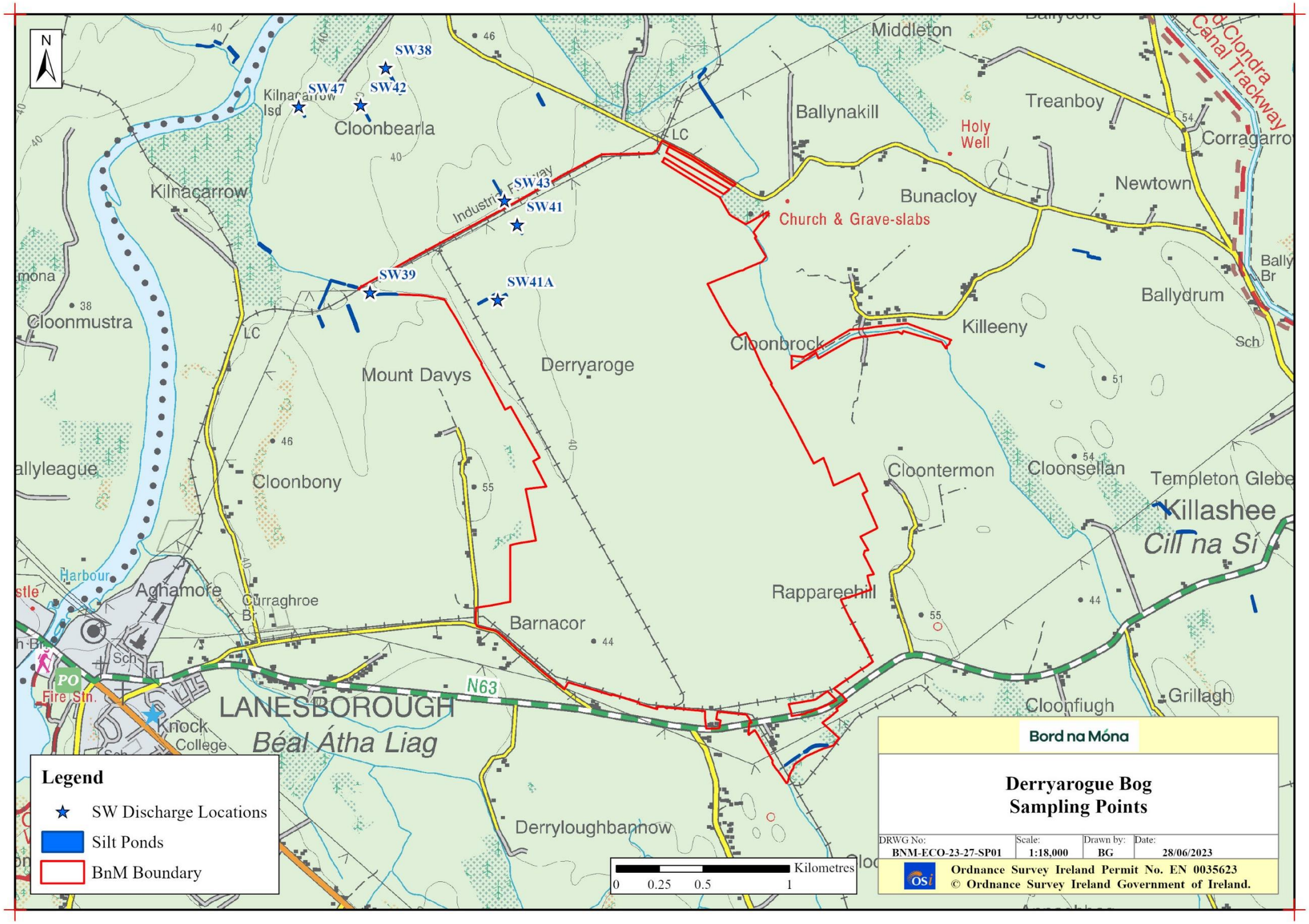
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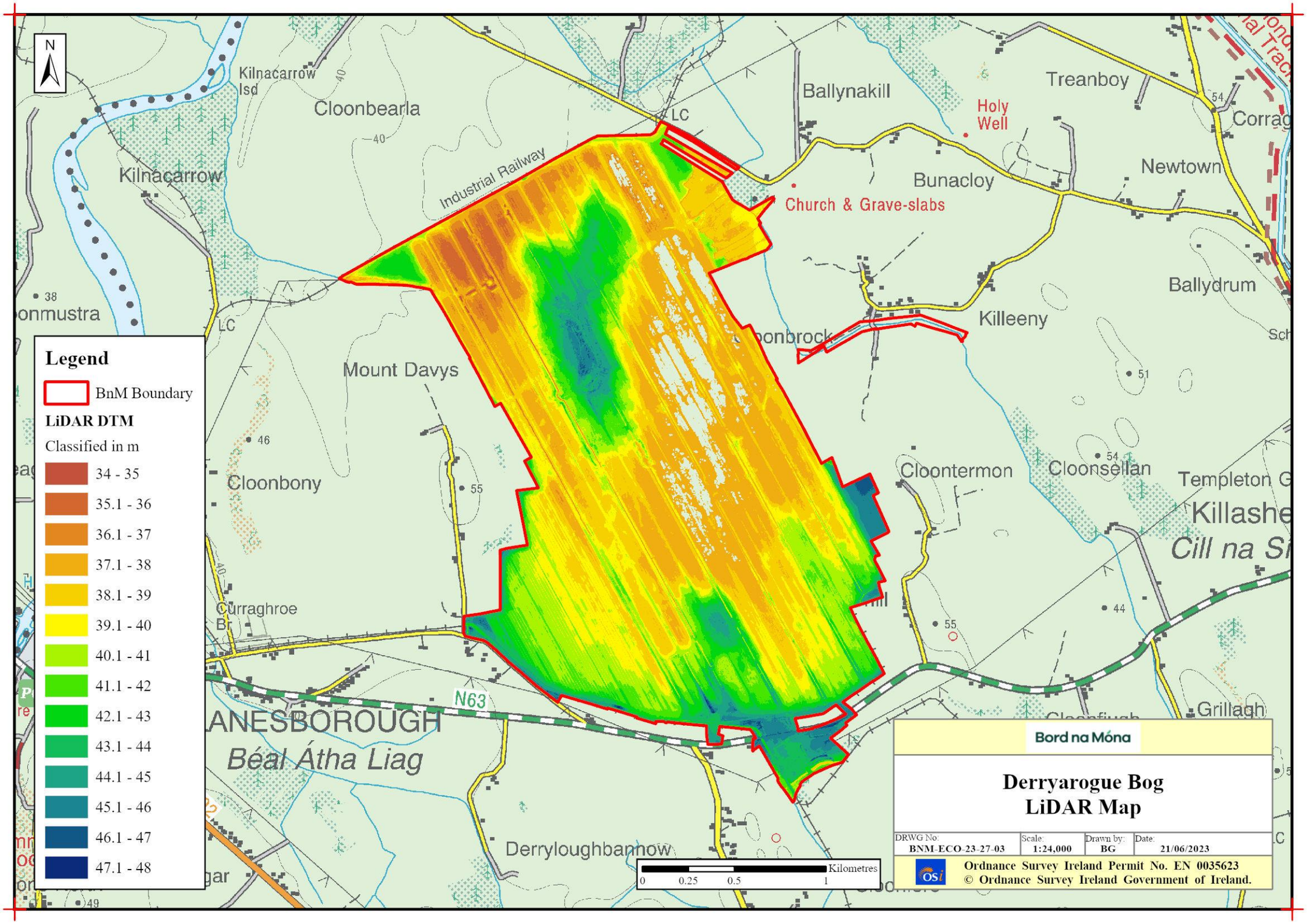
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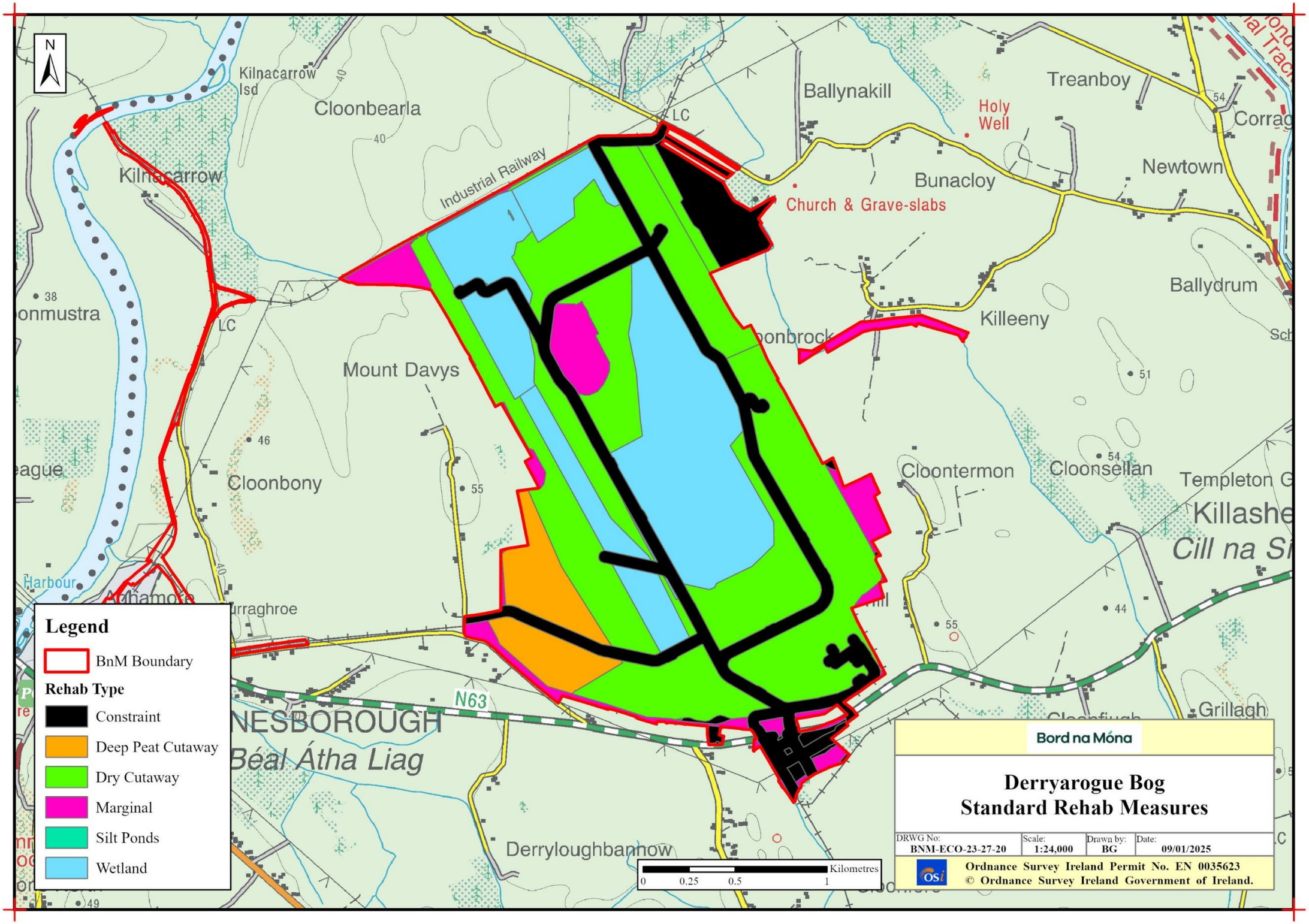
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Rehabilitation Maps

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Appendix E.2 DERRYADD DRAFT REHABILITATION PLAN 2025

Bord na Móna

Derryadd Bog

Draft Cutaway Bog Decommissioning and Rehabilitation Plan

2025

Draft

This document seeks to address the requirements of Condition 10.2 of IPC License Ref. P0504-01:

> "*The licensee shall prepare, to the satisfaction of the Agency, a fully detailed and costed plan for permanent rehabilitation of the cutaway boglands within the licensed area.*"

This licence condition requires Bord na Móna agree with the EPA the measures that will provide for rehabilitation, i.e. stabilisation of Derryadd Bog upon cessation of peat production and compliments the licence requirement to decommission the site.

***Rehabilitation** generally comprises site stabilisation with natural colonisation with or without targeted management.*

Industrial peat production has now fully ceased at Derryadd Bog.

Bord na Móna have defined the key rehabilitation outcome at Derryadd Bog as environmental stabilisation.

*This rehabilitation plan for Derryadd Bog has been updated but not fully finalised. As such it remains a **draft** rehabilitation plan until it is fully finalised. Bord na Móna expect to finalise this rehabilitation plan in the future as part of the Derryadd Wind Farm development or at a later date.*

Any consideration of any other future after-uses for Derryadd Bog, will be conducted in adherence to the relevant planning guidelines and consultation with relevant authorities and will be considered within the framework of this rehabilitation plan.

Bord na Móna are planning to develop a potential renewable energy project at Derryadd Bog as part of the proposed Derryadd Wind Farm. This project is currently in the pre-planning stages and is expected to be submitted for planning permission in 2025. The wind farm planning boundary overlaps the Derryadd Bog rehabilitation boundary. This area has been mapped as a constraint in the rehabilitation plan.

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Document File Path:	Z:\EPA draft rehab plans 2017 word docs\Mountdillon ref.504 (Lough Ree)\Derryadd\
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This document comprises:	DCS	TOC	Text (Body)	References	Maps	No. of Appendices
	1	1	29	4	0	12

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Non-technical summary

- Bord na Móna is updating the draft rehabilitation plan for Derryadd Bog, located approximately 4km east of Lanesborough in Co. Longford.
- This rehabilitation plan has been prepared by Bord na Móna as part of obligations to carry out peatland rehabilitation via an IPC License issued by the Environmental Protection Agency.
- Bord na Móna are planning to develop a potential renewable energy project at Derryadd Bog as part of the proposed Derryadd Wind Farm. The Wind Farm project is currently in the pre-planning stage and is expected to be submitted for planning permission in 2025. The wind farm planning boundary overlaps the Derryadd Bog rehabilitation boundary and has been mapped as a constraint in the rehabilitation plan. Derryadd Bog will be rehabilitated as part of the Derryadd Wind Farm development or at a later date. Any other proposed development will be planned in adherence to relevant planning guidelines and will consider the rehabilitation and the condition of the site.
- Derryadd Bog was in full industrial peat production since the early 1960's and supplied Lough Ree Power Station in Lanesborough up until its closure in 2020. This bog has a pumped drainage regime.
- Peat harvesting is now finished at Derryadd Bog.
- Two mineral islands (Annaghmore and Annaghbeg) are located within the bog, these areas are not within the ownership of Bord na Móna and are managed as grazing land for domestic animals.
- An industrial rail link connects the site with Derryarogue Bog to the north and Lough Bannow Bog to the south.
- A relatively large area of dry cutaway located to the north and south of the mineral islands at the centre of the site have developed as calcareous grassland and birch scrub. The remainder of the site is dominated by bare peat.
- The key objective of peatland rehabilitation is environmental stabilisation. This means developing vegetation and promoting re-establishment of more typical cutaway peatland communities such as Birch woodland, fen habitat and *Sphagnum*-rich embryonic bog communities.
- Rehab measures will include drain-blocking and other measures to raise water levels to the surface of the bog, thus encouraging the development of naturally functioning cutaway peatland habitats.
- These rehabilitation measures will be planned by a team consisting of expert ecologists and engineers. It is a guiding principle of Bord na Móna rehabilitation planning that no actions or activities will be undertaken that would negatively impact on adjacent land. No boundary drains will be blocked. Water will still leave the bog via the existing outlets.
- Peatland rehabilitation of this bog will bring a range of benefits to the local community via improvements to the local landscape and is also important for supporting national policies and strategies in relation to reduction of carbon emissions from these peatlands, supporting biodiversity and improvements to water quality.
- Drain blocking at Derryadd Bog will result in improved water quality, climate benefits with the reduction of carbon emissions and enhanced biodiversity when the residual peat is re-wetted.
- Many Bord na Móna bogs 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 will develop, like poor fen and *Sphagnum* rich embryonic bog communities (on deeper peat); and wetlands with Reedbeds and Birch woodland on shallower peat. In time a naturalised peatland can be developed.

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- It will take some time for vegetation and habitats to fully develop at Derryadd Bog, and a peatland ecosystem to be restored. However, it is expected that most of the remaining bare peat will be developing pioneer habitats after 5-10 years.
- The development of a range of habitats at Derryadd Bog will support biodiversity including plants, insects, birds and mammals. This includes some species that are rare and protected in the wider landscape. It will increase the national area of native woodland. Many wetland habitats in the wider landscape have been reclaimed for agriculture and other uses and peatland rehabilitation is an opportunity to create new wetland habitats.
- Longford County Council lodged a Part 8 Planning Application in 2021 named 'No. 88 Mid Shannon Wilderness Park trackways' which includes greenway or amenity walking/cycling tracks towards the southern and northern boundaries of Derryadd Bog. There are additional proposals to create an amenity plan through Derryadd Bog as part of the proposed Derryadd Wind Farm. It is proposed by Bord na Móna that a significant part of this section of the amenity will be delivered as part of the proposed Derryadd Wind Farm Project in Derryadd Bog.
- This peatland rehabilitation plan does not consider future after-use or development. Bord na Móna continually reviews its land-bank to consider future commercial or industrial developments. Any other proposed development will be planned in adherence to relevant planning guidelines and will consider the rehabilitation and the condition of the bog.

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1. INTRODUCTION

Bord na Móna operates under IPC Licence issued and administered by the EPA to extract peat within the Mountdillon bog group (Ref. P0504-01). As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. Derryadd Bog is part of the Mountdillon bog group (see Appendix I for details of the bog areas within the Mountdillon bog group). Derryadd Bog is located in Co. Longford, approximately 4km east of Lanesborough.

This plan is a specific rehabilitation plan for the bog and outlines:

- Description of site management and status.
- Main issues and approaches to rehabilitation.
- Consultation to date with interested parties.
- Interaction with other policy and legislative frameworks (Appendix V).
- The planned rehabilitation goals and outcomes.
- The scope of the rehabilitation plan.
- Criteria which define the successful rehabilitation and key targets to validate rehabilitation.
- Proposed rehabilitation actions.
- Proposed timeframe to implement these measures.
- Budget and Costings.
- Associated aftercare, maintenance, and monitoring.

Note: This plan should be read in conjunction with the accompanying Map book.

Bord na Móna announced the complete cessation of industrial peat production across its estate in January 2021.

This draft rehabilitation plan outlines the proposed approach to be taken for IPC compliance in respect of Derryadd Bog and how the site will be rehabilitated. Bord na Móna is fully committed to meeting its obligations relating to rehabilitation and decommissioning under the Integrated Pollution Control Licence.

It has been proposed by the Government that Bord na Móna carry out a Peatlands Enhanced Decommissioning, Rehabilitation and Restoration Scheme on its peatlands. This proposal is also known colloquially as the 'Peatlands Climate Action Scheme' (PCAS). The additional costs of the scheme will be supported by the Government through the Climate Action Fund and Ireland's National Recovery and Resilience Plan, administered by the Department of Environment, Climate and Communications (DECC), while the National Parks and Wildlife Service (NPWS) will act as the scheme regulator. The Peatlands Climate Action Scheme is expected to operate between 2021-2025. Over 13,000 ha of cutaway peatlands have been rehabilitated as part of this scheme to date, across multiple Bord na Móna peatlands.

Enhanced rehabilitation measures that have been proposed as part of PCAS are NOT proposed as part of this draft Derryadd Bog rehabilitation plan at this stage. The potential implementation of enhanced rehabilitation measures at Derryadd Bog will be dependent on the selection of Derryadd as a site to be included in PCAS.

1.1 Constraints and Limitations

This document seeks to address the requirements of Condition 10.2 of IPC License Ref. P0504-01:

> "*The licensee shall prepare, to the satisfaction of the Agency, a fully detailed and costed plan for permanent rehabilitation of the cutaway boglands within the licensed area.*"

This document covers the area of **Derryadd Bog**. Parts of Derryadd Bog (around the perimeter of the site) are currently being used by domestic turf cutters for intensive private sod peat production. These areas are ecologically and hydrologically linked to the area owned by Bord na Móna where rehabilitation is planned. It is beyond the scope of this rehabilitation plan to address turf cutting issues on Derryadd Bog that are outside of the control of Bord na Móna. Nevertheless, Bord na Móna are aware of such issues which may constrain the proposed rehabilitation actions, and this rehabilitation plan considered potential impacts of these on the delivery of the stated objectives.

There are known rights of way around the margins of Derryadd Bog. Where a public right of way or similar burden exists on Bord na Móna property, consideration will be given to ensuring that this remains intact where possible. In some instances, depending upon previous land uses and management, alternative solutions may be required. These will be explored in consultation with local communities and statutory bodies during the consultation work associated with the decommissioning and rehabilitation work described here.

Rehabilitation in other areas of the bog may also be constrained due to other property issues.

Derryadd Bog will be rehabilitated **either** in association with the proposed Derryadd Wind Farm Project, with peatland rehabilitation integrated into the proposed project, **or** will be completed in the event of an unsuccessful planning application. It is expected that Bord na Móna will revise and update the rehabilitation plan for Derryadd when a decision is made in relation to planning permission for the Wind Farm. Bord na Móna remain fully committed to rehabilitating Derryadd Bog and meeting the conditions of the IPC License. Any consideration of any other future after-uses for Derryadd Bog will be conducted in adherence to the relevant planning guidelines, and consultation with relevant authorities, and will be considered within the framework of this rehabilitation plan.

Longford County Council lodged a Part 8 Planning Application in 2021 named 'No. 88 Mid Shannon Wilderness Park trackways' which includes greenway or amenity walking/cycling tracks towards the southern and northern boundaries of Derryadd Bog. There are additional proposals to create an amenity plan through Derryadd Bog as part of the proposed Derryadd Wind Farm. It is proposed by Bord na Móna that a significant part of this section of the amenity will be delivered as part of the proposed Derryadd Wind Farm Project in Derryadd Bog. Future sections of further cycling and walking track will developed through Lough Bannow Bog as part of the proposed Derryadd Wind Farm Project (see Location | Derryadd Wind Farm).

Rehabilitation in other areas of the bog may also be constrained due to other property issues or archaeological features. There are known archaeological features present at Derryadd Bog, which may constrain rehabilitation activities.

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2. METHODOLOGY

This rehabilitation plan was developed with a combination of desktop and field surveys, consultations with internal and external stakeholders. The development of this rehabilitation plan considered recently published guidance issued by the EPA '*Guidance on the Process of Preparing and Implementing a Bog Rehabilitation Plan'* (EPA, 2020).

The ecological information and general bog information collected during the Bord na Móna ecological baseline surveys, additional site visits (covering the period 2012 to 2023 inclusive), monitoring and desktop analysis, forms the basis for the development of this rehabilitation plan for the bog along with:

- Experience of 40 years of research on the after-use development and rehabilitation of the Bord na Móna cutaway bogs (Clarke, 2010; Bord na Móna, 2016);
- Significant international engagement during this period with other counties in relation to best-practice regarding peatland rehabilitation and after-use through the International Peat Society and the Society for Ecological Restoration (Joosten & Clarke, 2002; Clarke & Rieley, 2010; Gann *et al*., 2019);
- Consultation and engagement with internal and external stakeholders;
- GIS Mapping;
- BNM drainage surveys;
- Bog topography and peat depth data;
- Hydrological modelling;

2.1 Desk Study

The desk study involved collecting all relevant environmental and ecological data for the study area. The development of the rehabilitation plan also takes account of research, experience and engagement with other peatland restoration and rehabilitation projects and peatland research including Irish, UK, European and International best practice guidance (full citations are in the references section):

- Anderson *et al*. (2017). An overview of the progress and challenges of peatland restoration in Western Europe.
- Barry, T.A. *et al.* (1973). A survey of cutover peats and underlying mineral soils. Soil Survey Bulletin No. 30. Dublin, Bord na Móna and An Foras Taluntais.
- Bonn *et al*. (2017). Peatland restoration and ecosystem services- science, policy and practice.
- Carroll *et al*. (2009). *Sphagnum* in the Peak District. Current Status and Potential for Restoration. Moors for the Future Report No 16.
- Clark & Rieley (2010). Strategy for responsible peatland management.
- Eades *et al*. (2003). The Wetland Restoration Manual.
- Farrell & Doyle (2003). Rehabilitation of Industrial Cutaway Atlantic Blanket Bog, NW Mayo, Ireland.
- Feehan, J. (2004). A long-lived wilderness. The future of the north midlands peatland network. Department of Environmental Resource Management, UCD.
- Foss, P.J., Crushell, P. & Gallagher, M.C. (2017) Title: Counties Longford &Roscommon Wetland Study. Report prepared for Longford and Roscommon County Councils.
- Gann *et al*. (2019). International Principles and Standards for the practice of Ecological Restoration.
- Hinde *et al*. (2010). *Sphagnum* re-introduction project: A report on research into the re-introduction of *Sphagnum* mosses to degraded moorland. Moors for the Future Research Report 18.

- Joosten & Clarke (2002). Wise Use of mires and peatlands – Background and Principles including a framework for Decision-making.
- Lindsay (2010). Peatbogs and Carbon: A Critical Synthesis to Inform Policy Development in Oceanic Peat Bog Conservation and Restoration in the Context of Climate Change.
- Mackin *et al*. (2017). Best practice in raised bog restoration in Ireland. Irish Wildlife Manuals, No. 99. National Parks and Wildlife Service,
- McBride *et al*. (2011). The Fen Management Handbook (2011), Scottish Natural Heritage.
- McDonagh (1996). Drain blocking by machines on Raised Bogs. Unpublished report for National Parks and Wildlife Service.
- NPWS (2017a). National Raised Bog Special Areas of Conservation management plan. Department of Arts, Heritage and the Gaeltacht.
- Pschenyckyj *et al.* (2021), Optimising Water Quality Returns from Peatland Management while Delivering Co-Benefits for Climate and Biodiversity. An Fóram Uisce.
- Quinty & Rochefort (2003). Peatland Restoration Guide, second edition. Canadian *Sphagnum* Peat Moss Association and New Brunswick Department of Natural Resources and Energy.
- Regan*, et al.* (2020). Ecohydrology, Greenhouse Gas Dynamics and Restoration Guidelines for Degraded Raised Bogs. EPA Research Report. Prepared for the Environmental Protection Agency by Trinity College Dublin.
- Renou-Wilson *et al*. (2011). BOGLAND - Sustainable Management of Peatlands in Ireland. STRIVE Report No 75 prepared for the Environmental Protection Agency.
- Schouten (2002). Conservation and Restoration of Raised Bogs: Geological, Hydrological and Ecological Studies. Dúchas - The Heritage Service of the Department of the Environment and Local Government, Ireland.
- Thom (2019). Conserving Bogs – Management Handbook.
- Wheeler & Shaw (1995). Restoration of Damaged Peatlands – with Particular Reference to Lowland Raised Bogs Affected by Peat Extraction.
- Wittram *et al*. (2015). A Practitioners Guide to Sphagnum Reintroduction. Moors for the Future Partnership.

Additional on-line resources were also incorporated into the desk study, including:

- Mountdillon bog group Integrated Pollution Control Licence;
- Mountdillon bog group Annual Environmental Reports;
- Review of the National Biodiversity Data Centre (NBDC) webmapper;
- Inland Fisheries Ireland (IFI) Reports;
- Environmental Protection Agency database (www.epa.ie);
- EPA Guidance on Requests for Alterations to a Licensed Industrial or Waste Activity;
- BirdWatch Ireland online data (including I-WeBS and CBS datasets; www.birdwatchireland.ie);
- Geological Survey of Ireland - National Draft Bedrock Aquifer map;
- Geological Survey of Ireland - Groundwater Database (www.gsi.ie);
- Historic Environment Viewer at https://webgis.archaeology.ie/historicenvironment/
- National Parks & Wildlife Services Public Map Viewer (www.npws.ie);
- Water Framework Directive catchments.ie/maps/ Map Viewer (www.catchments.ie);
- OPW Indicative Flood Maps (www.floodmaps.ie);
- CFRAM Preliminary Flood Risk Assessment (PFRA) maps (www.cfram.ie);

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- River Basin Management Plan for Ireland 2022-2027;
- Bord na Móna Annual Report 2024;
- Spatial data in respect of Article 17 reporting, available online at https://www.npws.ie/maps-and-data/habitat-and-species-data/article-17.

2.2 Consultation

A number of stakeholders have been identified during the course of Bord na Móna's rehabilitation and Biodiversity Action Plan activities and are contacted during the rehabilitation planning process for their views. See Section 4.

2.3 Field Surveys

Bord na Móna carried out a baseline ecological survey of all of its properties in 2009-2012 and developed habitat maps. As part of this exercise, Derryadd Bog was surveyed in July of 2012. Additional ecological walk-over surveys and visits have taken place at Derryadd Bog between 2014-2019. Habitat maps have been updated, where required. This rehabilitation plan is informed by the original baseline survey as well as subsequent confirmatory site walk-over surveys and visits, and updates to baseline data.

Habitat mapping followed best practice guidance from Smith *et al.* (2011). Map outputs including all habitat maps and target notes were produced using GIS software application packages (ArcGIS). General marginal habitats and other habitats that had not been modified significantly by industrial peat extraction were classified using Fossitt *et al*. (2000). Plant nomenclature for vascular plants follows Stace (2019), while mosses and liverworts nomenclature follows identification keys published by the British Bryological Society (2010). A more detailed Bord na Móna classification system was previously developed for classifying pioneer cutaway habitats as Fossitt categories were deemed not to be detailed enough for cutaway bog (much of cutaway bog could be classified as Cutover Bog - PB4).

A detailed ecological survey report for Derryadd Bog is contained in Appendix II.

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3. SITE DESCRIPTION

Derryadd Bog is located approximately 4km to the East of Lanesborough in County Longford (Grid reference: ITM 205880; 267866). Two mineral islands (areas that were not covered in peat) (Annaghmore and Annaghbeg) are located within the bog. These areas are not within the ownership of Bord na Móna and are managed for agriculture (livestock grazing). A minor road connects the mineral islands with a public road that adjoins the eastern edge of the site. Derryarogue Bog is located immediately to the north of the site (separated by the N63 Longford to Roscommon road). An industrial rail link connects the site with Derryarogue to the north and Lough Bannow to the south. Derryadd has a pumped drainage regime, with six pumps (one to the south, east and north and three along the western boundary).

Derryadd Bog was in full industrial peat production since the early 1960's and the majority of the site was in active industrial peat production in 2019. Industrial peat production in Derryadd Bog ceased in 2020. Much of Derryadd Bog is now cutaway and the majority of the original raised bog has now been removed.

See Drawing number BNM-ECO-23-27-01 titled *Derryadd Bog: Bog Site Location*, included in the accompanying Mapbook[1] , which illustrates the location of Derryadd Bog in context to the surrounding area.

3.1 Status and Situation

3.1.1 Site history

Industrial peat production commenced at Derryadd in the 1960's and ceased in 2020. Derryadd Bog formerly supplied fuel peat for Lough Ree Power Station in Lanesborough.

3.1.2 Current land-use

Bord na Móna are planning to develop a potential renewable energy project at Derryadd Bog as part of the proposed Derryadd Wind Farm (see Location | Derryadd Wind Farm). This proposed wind farm project is located within Derryadd Bog as well as the adjacent Bord na Móna bogs of Derryarogue, and Lough Bannow. Derryadd Wind Farm is currently in the pre-planning stage and is expected to be submitted for planning permission in 2025. The proposed Derryadd Wind Farm infrastructure **partially** overlaps with the Derryadd rehabilitation footprint (see drawing number BNM-ECO-23-27-20: Standard Rehab Measures); these (infrastructure) areas have been mapped as a constraint in the rehabilitation plan.

The Proposed Development will comprise:

The Proposed Derryadd Wind Farm Development will comprise:

- 22 no. wind turbines with a blade tip height of 190 m, blade rotor diameter of 165 m, hub height of 107.5 m and the associated infrastructure including tower sections, nacelle, hub, and rotor blades and all associated foundations and hard-standing areas in respect of each turbine;
- New internal site access roads, approximately 27,500m in length including passing bays and associated drainage;

[1] Cutaway Bog Decommissioning and Rehabilitation Plan – Derryadd Bog Map Book

- 2 no. permanent Meteorological Masts, both of which will be 120 m in height, and associated hardstanding areas for both masts, as well as the decommissioning and removal of an existing 100 m Meteorological Mast on site in Lough Barrow Bog;
- 4 No. Borrow pits in Derryadd Bog; All works associated with the opening, gravel and spoil extraction, and decommissioning of the borrow pits;
- 4 No. temporary construction compounds, including material storage, site welfare facilities, and site offices;
- 4 No. temporary security cabins at the main construction site entrances as well as at a number of access points around the proposed wind farm site;
- 1 no. 110 kV electrical substation compound in Derryarogue Bog. The substation will consist of 2 No. control buildings, a 36 m high telecommunications tower, associated electrical plant and equipment, ground water well, wastewater holding tank and welfare facilities;
- All associated underground electrical and communications cabling connecting the turbines and masts to the proposed electrical substation, including road crossing at N63 and associated grid connection via a 110 kV loop-in connection to the existing Lanesborough-Richmond 110 kV overhead line which traverses the proposed wind farm site;
- 1 No. 16 MW battery storage facility;
- 2 No. Peat Deposition Area, one to the north of the proposed substation compound in Derryarogue Bog and one in Derryadd Bog;
- New site access entrances, temporary improvements and modifications to existing public road infrastructure to facilitate delivery of abnormal loads including locations on N6 Eastbound Slip Road, N6/N61 Roundabout at Athlone, N61/N63 Roundabout at Roscommon, N63 Roscommon Arts Centre Roundabout and N61/N63 Roundabout, Northeast of Roscommon;
- Hinge 3 No. permanent lighting fixtures in Folio RN40465F in Roscommon town to facilitate the delivery of abnormal loads (i.e. turbine blades);
- Approximately 7,500m of dedicated amenity access tracks to provide linkages between the proposed wind farm site roads and the existing royal canal greenway (to the east) and Corlea visitor centre and amenity areas (to the south);
- 3 No. permanent amenity carparks, one of which is situated in Derryarogue Bog (19 no. car parking spaces in total) and two carparks in Derryadd Bog (19 no. car parking spaces in each carpark);
- All associated site work and ancillary works including new drainage and upgrading existing drainage, access road, earthworks, site reinstatement and erosion control, which will be aligned with the existing and future site rehabilitation plans; and,
- A 10-year planning permission is being sought with a 30-year operational life from the date of commissioning of the entire wind farm.

A relatively large area in the centre of the site has been cutaway for a number of years. This area of cutaway has developed as calcareous grassland and Birch-dominated scrub at various successional stages. In recent years some areas of Derryadd Bog have developed pioneer wetlands with pioneer wetland communities including Reedbeds. A watercourse flows through the southern section of the site. This watercourse is a tributary of the River Shannon and has been canalised.

Overall, large areas of the site contain less than 2m of peat and contain exposed marl and gravel; however some small areas of the bog, in the south-western corner of the site, have only recently come out of industrial peat

production and still contain some “red” or “*Sphagnum*” peat. These areas remain as bare peat. See Appendix II for more detail on site, habitats and local features.

There are some areas of active turbary outside the margins of the site. These are mapped in the accompanying Mapbook.

There was hydrological management via pumping to support the former industrial peat production and its infrastructure. Derryadd has six pumps (one to the south, east and north and three along the western boundary). Pumping is ongoing during the decommissioning phase.

3.1.3 Socio-Economic conditions

Bord na Móna has historically been a vital employer for the rural community of the Midlands of Ireland. Bord na Móna compiled a report on the role of peat extraction in the midlands historically in which they report that in 1986, by the end of Bord na Móna’s Third Development Programme, a total of twenty-three work locations had been established around the country. The company had an average employment of approximately 4,688 in the mid 1980’s, with a peak employment of 6,100 during the production season, which placed it among the country’s largest commercial employers. The importance of such levels of employment were largely due to its regional concentration in the Midlands and the lack of alternative employment opportunities at the time.

According to the Energy Crop Socio-Economic Study undertaken by Fitzpatrick Associates in 2011, there were an estimated 1,443 jobs supported by the peat-to-power industry in Ireland at the time, some 81% of which were located in the catchment areas of the three peat-fired generating stations (Lough Ree, West Offaly, and Edenderry Power Stations). These constituted jobs in the plants and in peat extraction, jobs indirectly supported in upstream supply industries and jobs induced through the trickle-down effects of the wages and salaries of those supported directly or indirectly.

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In respect of Derryadd Bog, jobs included in the above study would have included those to facilitate peat extraction for the supply of fuel peat for Lough Ree Power.

As the primary employer in many Midland counties, Bord na Móna played a central role in building communities through several initiatives, including Education bursaries, support of local sporting clubs, the provision of community gain funds, charity programmes and the provision and building of amenity areas. These job numbers have now declined with the cessation of peat extraction at this bog.

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3.2 Geology and Peat Depths

3.2.1 Sub-soil geology

The underlying geology[2] of Derryadd Bog is comprised completely of Visean Limestones (undifferentiated).

3.2.2 Peat type and depths

Much of Derryadd Bog is now cutaway and the majority of the original raised bog has now been removed. In some places there are exposed sub-soils. In general, between 0.5-1.5 of residual fen or minerotrophic peat remains. This will have a significant influence on the development of future pioneer habitats. There are also some isolated pockets with residual peat of deeper than 2 m. This may have the potential to develop embryonic *Sphagnum*-rich peat-forming communities if optimum hydrological conditions can be developed.

3.3 Key Biodiversity Features of Interest

The majority of Derryadd Bog comprises a mosaic of bare peat along with post-production cutaway habitats including birch scrub at various successional stages, wetlands and associated pioneer wetland habitats and calcareous grasslands. Part of the centre of the site has been cutaway for a number of years and has developed relatively mature dry cutaway habitats (mostly Birch woodland). Habitats of biodiversity interest are therefore largely confined to older cutaway and the marginal habitats fringing the former production area. A detailed ecological report is provided in Appendix II.

3.3.1 Current habitats

The most common vegetation communities/habitats[3] present include:

- Bare peat (community 'Bare peat (0-50% cover)'or BP) (PB4)
- Pioneer Heather communities (community 'Dry *Calluna* community' or dHeath) (PB4)
- Scrub (Emergent *Betula/Salix*-dominated community (A) (Birch/Willow), Open *Betula/Salix*-dominated community (B) (Birch/Willow), Closed Betula/Salix-scrub community (C) (Birch/Willow) or eBir, OBir and CBir) (WS1).
- Silt Ponds (Silt) with associated habitats such as scrub, Bracken, rank grassland (GS2), dry calcareous grassland (gCal) and typical pioneer communities of disturbed areas (disTuss).

The most common habitats found around the margins of the site include:

- Birch woodland (WN7)
- Scrub (WS1) (Gorse scrub and Birch scrub developing of dry high bog around margins)
- Raised bog (PB1)
- Cutover bog (PB4) (several small fragments)
- Wet grassland (GS4).

[2] https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=de7012a99d2748ea9106e7ee1b6ab8d5&scale=0

[3] Categories in brackets refer to the current BnM classification system for vegetation communities, along with an equivalent Heritage Council habitat classification or Fossitt Code, where relevant.

A relatively large area in the centre of the site has been classed as cutaway for a number of years. This area of cutaway is located on a ridge that extends to the north and south of the mineral islands at the centre of the site. These areas are dry and have colonised by a mixture of calcareous grassland (gCal) and scrub (eBir, oBir and cBir). The scrub is well developed in places and is comprised mainly of Birch, however a proportion of Pine (Scot's Pine and Lodge-pole Pine) along with smaller amounts of Hazel and Ash have also become established. These areas are located on gravel and are dry.

In recent years sections of the site have developed pioneer wetlands with pioneer wetland communities including Reed beds. These areas are used by wintering birds such as Whooper Swan (*Cygnus cygnus*) and breeding species including Ringed Plover (*Charadrius hiaticula*) and Lapwing (*Vanellus vanellus*). The drier sections of the site have also developed areas of Birch-dominated scrub.

A watercourse flows through the southern section of the site. This watercourse is a tributary of the River Shannon and has been canalised.

Other habitats along the margins of the site include bog woodland (birch dominated) (WN7), wet grassland (GS4), habitat 'dry heath (HH1) and cutover bog (PB4). Overall, large areas of the site contain less than 2m of peat and contain exposed marl and gravel; however, some small areas of the bog, in the south-western corner of the site, have only recently come out of industrial peat production and still contain some "red" or "*Sphagnum*" peat.

See Appendix II for more detail on site, habitats and local features.

See Drawing number BNM-ECO-23-27-17 titled ***Derryadd Bog: Current Habitat Map***, included in the accompanying Mapbook, which illustrates the habitats at Derryadd Bog.

3.3.2 Species of conservation interest

A number of species of conservation concern have been recorded at Derryadd Bog. The following is a summary of the records of these species available within both BnM records and those of the National Biodiversity Data Centre (NBDC). Multiple mammal species have been recorded on or within 1 Km of the bog including Irish Hare (*Lepus timidus subsp. Hibernicus)*, Eurasian Badger (*Meles meles),* Pine Marten (*Martes martes*) and European Otter (*Lutra lutra*).

The butterfly species Green-veined White (*Pieris napi*), Small Copper (*Lycaena phlaeas*), Small Heath (*Coenonympha pamphilus*), Large White (*Pieris brassicae*) and Meadow Brown (*Maniola jurtina*) have all been recorded during Bord na Mona surveys.

Numerous bird species are known to use the cutover bogs in Ireland's midlands as breeding grounds, wintering grounds or both. Heron (*Ardea cinerea*), Mallard (*Anas plathrhynchos*), Kestrel (*Falco tinnunculus*), Skylark (*Alauda arvensis*), Willow Warbler (*Phylloscopus trochilus*), Grasshopper Warbler (*Locustella naevia*), Wood Pigeon (*Columba palumbus*), Meadow Pipit (*Anthus pratensis*), Robin (*Erithacus rubecula*), Blackbird (*Turdus merula*), Hooded Crow (*Corvus cornix*), Magpie (*Pica pica*) have all been recorded during BNM ecology surveys.

NBDC records for red-listed[4] bird species of conservation concern recorded in the 10km square (N06) which Derryadd intersects include; Buzzard (*Buteo buteo*), Barn Owl (*Tyto alba*), Bewick's Swan (*Cygnus columbianus subsp. bewickii*), Black-headed Gull (*Larus ridibundus*), Common Redshank (*Tringa totanus*), Curlew (*Numenius arquata*), Golden Plover (*Pluvialis apricaria*), Herring Gull (*Larus argentatus*), Lapwing, Northern Pintail (*Anas*

[4] Gilbert G, Stanbury A and Lewis L (2021), "Birds of Conservation Concern in Ireland 2020 –2026". Irish Birds 9: 523—544

acuta), Northern Shoveler (*Anas clypeata*), Red Grouse (*Lagopus lagopus*) and Yellowhammer (*Emberiza citrinella*).

A review of the Ornithology Chapter for the previously proposed Derryadd Wind Farm Ecological Impact Assessment Report (EIAR)[3] (Planning Ref. No. ABP-303592-19) was also undertaken. The below paragraphs provide a summary of the bird species of conservation concern (previously) recorded during surveys to inform the above, and which may still occur at the site.

Three Amber Listed (BoCCI) species, including Black-headed Gull, Lesser-black-backed gull (*Larus fuscus*) and Mallard were recorded within the boundary of Derryadd East during dedicated bird surveys for the proposed development. In addition, Whooper Swan have also been recorded flying over the site during dedicated winter bird vantage point surveys (2021/2022).

Surveys in the wider study area, outside the boundary of Derryadd bog also recorded additional Red Listed (BoCCI) species including Curlew, Common Redshank, Herring Gull, Grey Wagtail (*Motacilla cinerea*), Lapwing and Eurasian Wigeon (*Mareca penelope*). The results of the breeding bird surveys (2015, 2016 and 2017) undertaken in the wider Wind Farm study area also recorded several additional Red List species (BoCCI), including Woodcock (*Scolopax rusticola*), Curlew, Lapwing and Quail (*Coturnix coturnix*). A number of species recorded during the winter months in the Wind Farm study area are listed on Annex I of the EU Birds Directive, namely, Golden Plover, Greenland White-fronted Goose (*Anser albifrons flavirostris*), Hen Harrier (*Circus cyaneus*), Kingfisher (*Alcedo atthis*), Merlin (*Falco columbarius*) and Peregrine Falcon (*Falco peregrinus*). Golden Plover, Hen Harrier, Merlin and Peregrine Falcon were also recorded during breeding season surveys along with Common Tern (*Sterna hirundo*) and Little Egret (*Egretta garzetta).* Habitat is limited for many of these species at Derryadd however.

It should be noted that much of the wildfowl, wader and gull observations recorded as part of the ornithological study were associated with the River Shannon and associated wet grasslands to the north of the area.

A review of the interim bird survey report for the potential renewable energy project at Derryadd Bog detailing the results of bird surveys undertaken by Tobin Consulting Engineers at the Derryadd Wind Farm Site from April 2022-April 2023 was also undertaken. The below paragraphs provide a summary of the bird species of conservation concern recorded. These records are from the wind farm study area including Derryadd Bog, Derryarogue Bog to the north and Lough Bannow Bog to the south.

In total, during the range of ornithological surveys conducted since April 2022, 98 bird species have been observed at the proposed Derryadd Wind Farm site. A number of species recorded in the Wind Farm study area are listed on Annex I of the EU Birds Directive, including Little Egret, Greenland White-fronted Goose, Peregrine Falcon, Whooper Swan, Common Kingfisher, Merlin, Hen Harrier, Curlew, and Golden Plover. The following Red Listed (BoCCI) species were recorded in the study area: Kestrel, Common Snipe (*Gallinago gallinago*), Meadow Pipit, Lapwing and Northern Shoveler. The following Amber Listed (BoCCI) species were also recorded in the study area: Cormorant (*Phalacrocorax carbo*), Eurasian Teal (*Anas crecca*), Eurasian Wigeon, Ringed Plover, Black-headed Gull, Lesser Black-backed Gull (*Larus fuscus*), Tufted Duck (*Aythya fuligula*), Greylag Goose (*Anser anser*), Mew Gull (*Larus canus*), Common Coot (*Fulica atra*), and Short-eared Owl (*Asio flammeus*).

[3] Tobin, 2019, Derryadd Wind Farm Environmental Impact Assessment Report (EIAR), Volume II, EIAR Main Report.

3.3.3 Invasive species

NBDC holds records for the high impact invasive species Japanese Knotweed (*Fallopia japonica*), and Rhododendron (*Rhododendron ponticum*), recorded in marginal scrub habitat along the northern boundary.

A broad range of common garden escapes are also occasionally present around the margins of Bord na Móna bogs. Although spatial overlap with the rehabilitation work is expected to be limited, these are, where necessary, to be treated in line with best practice during rehabilitation.

3.4 Statutory Nature Conservation Designations

There are no European Sites, Special Areas of Conservation (SAC) or Special Protection Areas (SPA), located within or adjacent to Derryadd Bog. The nearest EU Designated sites to Derryadd Bog are as follows:

- Mount Jessop SAC (Site Code: 002202) – 5.4 km east of Derryadd
- Lough Forbes Complex SAC (site code: 001818) – 6.4 km to the northeast of Derryadd
- Ballykenny-Fisherstown Bog SPA (site code: 004101) – 6.4 km to the northeast of Derryadd
- Brown Bog (site code: 002346) – 7 km to the north of Derryadd
- Lough Ree SAC (Site Code: 000440) – 4.1 km to the west of Derryadd
- Lough Ree SPA (Site Code: 004064) – 4.3 km to the west of Derryadd
- Fortwilliam Turlough SAC (site code: 000448) – 4.1 km to the south-west of Derryadd

A number of non-statutory designated sites also occur in the wider area around Derryadd Bog. Lough Ree pNHA (NPWS Site Code: 002103), occurs approximately 4.3 km to the west of Derryadd. Mount Jessop NHA (NPWS Site Code: 001450), occurs approximately 5.4 km to the east of Derryadd Bog. Forthill Bog NHA (NPWS Site Code: 001448), occurs approximately 5 km to the south of Derryadd Bog. Lisnanarriagh Bog NHA (NPWS Site Code: 002072), occurs approximately 9.5 km to the west of Derryadd.

See drawing *BNM-ECO-23-27-23: Derryadd Bog Proximity to Designated Sites* in the accompanying map book.

3.4.1 Other Nature Conservation Designations

The Ramsar Convention entered into force in Ireland on 15th March 1985. Ireland currently has 45 sites/wetlands designated as Wetlands of International Importance (Ramsar Sites). These cover a surface area of 66,994ha. There are no Ramsar sites located in proximity to Derryadd Bog.

3.5 Hydrology and Hydrogeology

Derryadd bog forms part of the Upper Shannon Catchment (Catchment ID: 26C) as defined by the EPA under the Water Framework Directive (WFD). The bog lies completely within the Shannon [Upper]_SC_80 sub-catchment.

There are several rivers and streams within the site and around the margins that drain the site. The Ballynakill_26 River (EPA code: 26B22) runs along the eastern boundary in a northerly eventually discharging to the River Shannon [Upper] (EPA code: 26S02) downstream. The Derrygeel (EPA code: 26B22) watercourse arises within the southern section of the site and flows west. The Rappareehill (EPA code: 26R40) arises adjacent to the northwest corner of the site and flows south then west. Both watercourses join the Lough Bannow Stream (EPA code: 26L12) which flows into the Shannon [Upper] (EPA code: 26S02).

Derryadd Bog has a pumped drainage regime. There are six pumps located on site. These facilitate drainage from several discharge points for the former peat production and support of infrastructure.

GSI data indicates that the majority of Derryadd Bog lies within a regionally important aquifer – Karstified (conduit). The southwest section of the site lies within a locally important aquifer - bedrock which is moderately productive only in local zones. An aquifer is an underground body of water-bearing rock or unconsolidated materials (gravel or sand) from which groundwater can be extracted in useful amounts. GSIs Aquifer classes are divided into three main groups based on their resource potential, and further subdivided based on the type of openings through which groundwater flows. There are nine aquifer categories in total. Locally important aquifers are capable of supplying locally important abstractions (e.g. smaller public water supplies, group schemes), or good yields (100-400 m3/d). This data gives an indication of sub-surface deposits (bedrock and unconsolidated materials) in terms of their groundwater resource potential and dominant groundwater flow type.

Regionally important aquifers are those in which the network of fractures, fissures and joints, through which groundwater flows, is well connected and widely dispersed, resulting in a relatively even distribution of highly permeable zones. There is good aquifer storage and groundwater flow paths can be up to several kilometres in length. There is likely to be substantial groundwater discharge to surface waters ('baseflow') and large (>2,000 m3/d), dependable springs may be associated with these aquifers.

The majority of Derryadd Bog is located in an area mapped by GSI as of low groundwater vulnerability (GSI Map viewer), with the two mineral islands to the centre mapped as moderate groundwater vulnerability. Groundwater vulnerability is a term used to represent the intrinsic geological and hydrogeological characteristics that determine the ease with which groundwater may be contaminated by human activities. Groundwater vulnerability maps are based on the type and thicknesses of subsoils (sands, gravels, glacial tills (or boulder clays), peat, lake and alluvial silts and clays), and the presence of karst features. Groundwater is most at risk where the subsoils are absent or thin and, in areas of karstic limestone, where surface streams sink underground at swallow holes. These data indicate there is generally low risk of any groundwater contamination occurring at this site.

Quaternary sediment maps show that Derryadd Bog is generally underlain by visean limestones (undifferentiated). The two mineral islands to the centre of the site are underlain by till derived from limestones. This combination of sediment is common in the wider context surrounding the site.

3.6 Emissions to surface-water and watercourses

Drainage is an important feature of industrial peat production and there were extensive field drains maintained throughout bog areas to facilitate industrial peat production annually, each of which eventually drains into a terminal silt pond that allows for settlement of suspended solids before entering the main river systems. In accordance with the existing Integrated Pollution Control licence, all drainage water from boglands in a licensed area is discharged via an appropriately designed silt pond treatment arrangement as required in Condition 6.6. of the licence. Industrial peat production has now permanently ceased at Derryadd Bog.

Silt ponds are the key silt control infrastructure to control potential emissions from industrial peat production sites. As required under licence, BNM have a number of procedures for how it manages and maintains its silt pond network. The silt that builds up in silt ponds is excavated on a regular basis by Bord na Móna to facilitate an efficient level of silt control. Silt ponds will continue to be maintained during the rehabilitation and decommissioning. Silt pond decommissioning will be considered when sites are deemed to be on a trajectory of environmental stability and peatland rehabilitation has been completed.

Derryadd Bog has 3 treated surface water outlets to the Upper Shannon (26C) catchment. Rappareehill (26R40) River flows from the northwest corner of the site along the western boundary before turning west and joining Lough Bannow Stream (26L12). Derrygeel (26D77) River flows from the south west of the site also joining Lough Bannow Stream. Ballynakill_26 (26B2) River flows along the eastern boundary and north into the River Shannon (Upper (100) (26S02). All three outlets are directed to the River Shannon (Upper)_100 (26S02). This river is listed as being under pressure from peat extraction in the 2nd cycle of the River Basin Management Plan for Ireland and is indicated as remaining so in the third cycle.

Details of silt ponds, associated surface water emission points and monitoring and sampling locations are detailed in Drawing numbers BNM-ECO-23-27-SP01 titled *Derryadd Bog: Sampling Points*, along with Drawing number BNM-ECO-23-27-WQ01 titled *Derryadd Bog: Water Quality Map* included in the accompanying Mapbook, which illustrate the various drainage and water quality infrastructure present at Derryadd Bog.

There is a robust monitoring program to track and verify any changes in baseline water quality conditions pre and post decommissioning and rehabilitation so that the success or otherwise can be tracked and verified for the Environmental Protection Agency.

Decommissioning and Rehabilitation Programme Water Quality Monitoring

Rehabilitation of cutaway peatland is closely linked with control of emissions. One of the criteria for successful rehabilitation is stabilisation through re-vegetation, which will stabilise all substrates and in turn remove the need for further silt control measures. This site is already largely vegetated. Re-wetted peat also aids the primary objective of stabilizing peat, as when peat is re-wetted it is not vulnerable to wind erosion. Re-wetted peat and the development of wet peatland habitats can also act as sinks for silt and mobile peat, and increases additional retention time for solids, and the peatland vegetation can quickly stabilise this material within blocked drains on site (by acting like constructed wetlands).

Water quality of water discharges from restored peatlands normally improves as a result of bog restoration measures and the restoration of natural peatland processes (Bonn *et al*., 2017). Bog restoration is also expected to improve water attenuation of the site as the drains are blocked, slowing water movement and water release from the site. Restored peatlands help slow the release of water and aid the natural regulation of floods downstream (Minayeva *et al*., 2017). The National River Basin Management Plan (NRBMP) (DHLGH 2024) is the key national plan for Ireland to achieve the objectives of the Water Framework Directive (WFD). The NRBMP outlines how key actions such as the Bord na Móna peatland rehabilitation is expected to have a positive impact on water quality and help the NWBMP deliver its objectives in relation to the WFD.

Water will still discharge from designated emission points when rehabilitation at Derryadd has been completed. This discharge will have improved water quality and there will be increased wetland attenuation, meaning slower release of water. This is expected to have a positive impact on status of the key watercourse receptors and the Shannon [Upper]_SC_080 sub catchment and will support the future status of the watercourses achieving Good Status.

Water quality monitoring will be established. There will be initial quarterly monitoring assessments of the site to determine the general status of the site, the condition of the silt-ponds, assess the condition of the rehabilitation work, asses the progress of natural colonisation, monitoring of any potential impacts on neighbouring land and general land security. The number of site visits will reduce after 2 years to bi-annually. These site visits will assess the need to additional rehabilitation.

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Monitoring results will be maintained, trended and reported on each year as part of the requirement to report on Condition 10.1 of the IPC Licence on Bog Rehabilitation in the Annual Environmental Report, which will be available in April each year at www.epa.ie.

The parameters to be included (as per condition 6.2 of the IPC Licence) include monthly monitoring for pH, Flow, Suspended Solids, Total Solids, Total Phosphorus, Total Ammonia, Colour, and COD.

This sampling regime on a selected number of silt ponds will be carried out over a two-year cycle. The original (licence) requirement was for a quarterly sampling regime.

3.7 Fugitive Emissions to air

Rehabilitation of the drained peatland will seek to re-wet the dry peat where possible. Collectively re-wetting and re-vegetating will minimise any risk of emission to air from dust.

3.8 Carbon emissions

Irish peatlands are a huge carbon store, containing more than 75% of the national soil organic carbon (Renou-Wilson *et al.,* 2012). Peatland drainage and extraction transforms a natural peatland which acts as a modest carbon sink (taking in 0.1 to 1.1 t of carbon as CO2-C /ha/yr) into a cutaway ecosystem which is a large source of carbon dioxide (releasing 1.3 to 2.2 t of carbon as CO2-C /ha/yr) based on Tier 1 Emission factors (Evans *et al.*, 2017). Renou-Wilson *et al.* (2018) reported losses of between 0.81 – 1.51 CO2-C /ha/yr from drained peatlands located in Ireland.

Re-wetting of dry peatlands will increase methane emissions (Gunther *et al.,* 2020) as a consequence of the anoxic conditions within the peat body that provide a suitable environment for the microbial breakdown of plant litter and root exudates. Tanneberger et al. (2021) describes how peatland management has to choose between CO2 emissions from drained peatlands or increased methane (CH4) emissions from rewetted industrial peatlands. However, when radiative effects and atmospheric lifetimes of both GHG gases are considered and modelled, postponing rewetting increases the longterm warming effect of continued CO2 emissions (Gunther et al. 2020). This means the increase in methane due to rewetting of dry peatlands is still negated by the CO2 emissions reductions. Further, Wilson *et al.* (2022) confirmed the benefit of rapid rewetting to achieve strong carbon reductions and potentially altering the warming dynamics from warming to cooling depending upon the climate scenario.

It is expected that Derryadd Bog will become a reduced carbon source following rehabilitation. The potential of any cutaway site to develop as a carbon sink in the longer-term depends on the success of the rehabilitation measures, the extent of development of *Sphagnum*-rich or other peat-forming habitats, the balance of carbon fluxes from different cutaway habitats and future climatic conditions. The majority of the bog will develop as birch woodland on drier areas and peripheral headlands. Large wetlands are expected to develop on shallow peat with open water, reed swamp and fen habitats with alkaline emission factors. Part of this bog is expected to develop regenerating wet deep peat vegetation on deep peat areas.

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3.9 Current ecological rating

(Following NRA (2009) Evaluation Criteria)

The majority of Derryadd Bog can be rated as **local importance; lower value to Local Importance; higher value.** Bare peat in the former production area of Derryadd Bog is assessed as **local importance (lower value)**.

The revegetated former production area dominated by birch scrub/woodland that runs north-south through the centre of the site and marginal habitats including woodland, scrub, pioneer cutaway habitats, fen, calcareous grassland, remnant raised bog, and wetlands may act as a refuge and as ecological corridors for wildlife and are therefore deemed to be **locally important (higher value)**.

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4. CONSULTATION

4.1 Consultation to date

Consultation seeks to engage an audience of relevant stakeholders at both a national and local level. National stakeholders have been identified from varied bog restoration and rehabilitation efforts undertaken by Bord na Móna over the past 40 years, with particular emphasis on engagement with stakeholders during their Biodiversity Action Plan programme, since 2010. National Stakeholders includes relevant government departments and agencies, relevant semi-state bodies, NGOs and other environmentally focused groups with a national remit.

There has been ongoing consultation on rehabilitation, biodiversity and other general issues at Derryadd Bog in relation to the proposed Derryadd Wind Farm (Bord na Móna Wind Farm | Derryadd Wind Farm). Specific consultation relating to the wind farm development and associated amenity development is not listed here, although there has been detailed consultation with stakeholders in relation to these issues and overlap with rehabilitation and biodiversity.

There has been ongoing consultation about rehabilitation, biodiversity, and other general issues over the years about Mountdillon bog group, including Derryadd Bog, with various stakeholders in relation to:

- General consultation with range of stakeholders at annual Bord na Móna Biodiversity Action Plan review days 2010-2018.
- Longford Wetland Wilderness (general proposal led by Longford County Council and other stakeholders. This has had several iterations. See Lough Ree and Mid Shannon, Spirit Level 2017. A feasibility study for Longford County Council).
- Feehan, J. (2004) A Long-Lived Wilderness; the future of the north midlands peatland network UCD/NWWPC.
- Lauder, A. & O'Toole L. (2017). Concept development for a landscape-scale Wetland Wilderness Park in the Mid Shannon Region. A report funded by the Heritage Council's Heritage Grant Scheme.
- Foss, P.J., Crushell, P. & Gallagher, M.C. (2017). Counties Longford &Roscommon Wetland Study. Report prepared for Longford and Roscommon County Councils.
- Archaeological Liaison Committee (National Museum of Ireland & Dept of Culture Heritage and the Gaeltacht).
- Midlands & East Regional WFD Operational Committee (River Basin Management Plans).
- Sub-committee on Shannon Flooding Work Programme and Measures (OPW, Waterways Ireland, ESB, LA's, Fisheries Ireland, NPWs etc.).
- Greenway development at Derryadd (Longford County Council).

To inform the current Plan, both national and local stakeholders, including neighbours whose land adjoins Derryadd Bog and local representatives of national bodies (such as Regional National Parks and Wildlife Service staff) and relevant offices in County Councils (such as the Heritage or Environmental Offices) will be contacted. Any identified local interest groups will be sought and informed of the opportunity to engage with this rehabilitation plan, and when identified invited to submit their comments or observations in relation to the proposed rehabilitation at Derryadd Bog.

All correspondence received will be acknowledged and evaluated against the rehabilitation work proposed here, and the final draft of the Derryadd Bog Rehabilitation Plan will contain a review of the consultation.

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4.2 Issues raised by Consultees

N/A Yet as consultation has not commenced.

4.3 Bord na Móna response to issues raised during consultation

N/A Yet as consultation has not commenced.

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5. REHABILITATION GOALS AND OUTCOMES

The rehabilitation goals and outcomes outline what Bord na Móna want to achieve by implementing the rehabilitation. These include:

- Meeting conditions of IPC Licence.
- Environmental stabilisation of the former peat production areas and mitigation of potential silt run-off.
- Stabilisation or reduction in water quality parameters of water discharging from the site (e.g. suspended solids).
- Reducing pressure on receiving waterbodies that have been classified as At Risk from peatlands and from peat extraction, via stabilization or improving water-quality from this bog, and therefore, reducing pressures.
- Supporting the proposed Derryadd Wind Farm Project. Integrating rehabilitation measures with planned renewable energy and any amenity infrastructure on site. It is not proposed to carry out any rehabilitation actions to change or negatively affect planned renewable energy infrastructure.
- Optimising hydrological conditions for the protection of exposed archaeological structures, their retention in situ and preservation into the future.
- The main goal and outcome of this plan is the successful rehabilitation (environmental stabilisation and restoration) of a peatland originally drained for industrial peat production, but not brought into production, in a manner that is acceptable to both external stakeholders and to Bord na Móna.

The rehabilitation goals and outcomes take account of the following issues.

- Natural colonisation will form the basis for the environmental stabilisation of the bare peat areas. Re-wetting of the cutaway, where possible, is a general rehabilitation strategy. The main target will be to maintain water-levels close to the peat surface, and to avoid the creation of large-water bodies. Re-wetting and water levels close to the peat surface accelerates the re-vegetation processes, the development of vegetation cover and therefore environmental stabilisation. There is already significant potential for the creation of wet cutaway habitats at Derryadd Bog due to the local topography (localised basins).
- It will take some time for stable naturally functioning habitats to fully develop at Derryadd Bog. This will happen over a longer timeframe than the implementation of this rehabilitation plan.
- Re-wetting residual peat will initially maintain and enhance the carbon storage capacity of the bog. There is scientific consensus that restoration of hydrology in damaged bog can improve carbon storage, water storage and attenuation and help support biodiversity both on the site and in the catchment (See Section 3.8). this will reduce carbon emissions from the site from a larger carbon source to a smaller carbon source. In time, a small section of the site has the capacity to develop in part as a carbon sink.
- It is not expected that the site has the potential to develop active raised bog (ARB) analogous to the priority EU Habitats Directive Annex I habitat within the foreseeable future (c.50 years). Furthermore, only a small proportion of the bog has potential to develop *Sphagnum*-rich habitats in this timeframe. Nevertheless, re-wetting across the entire bog, will improve habitat conditions of the whole bog. Other peatland habitats will develop in a wider mosaic that reflects underlying conditions.
- Rehabilitating former industrial peat production bog will also in the longer-term support other ecosystem services such as such the development of new habitat to support biodiversity and local attenuation of water flows from the bog.

- WFD status in receiving water bodies can be affected by peatlands and peat extraction but is also affected by other sources such as agriculture. In addition, receiving water bodies that are assessed as At Risk from peatlands and from peat extraction are likely to have several contributary sources of impacts (private peat extraction and Bord na Móna). Reducing pressures due to former peat extraction activities at Derryadd Bog will contribute to stabilising or improving water quality status of receiving water bodies in general. Ultimately, improving the WFD status of the receiving waterbody will depend on reducing pressure from a range of different sources, including peatlands in general (private and Bord na Móna).
- Re-wetting in general will benefit the future preservation of most known and unknown archaeological features
- Planned land uses, such as renewable energy generation infrastructure.

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6. SCOPE OF REHABILITATION

The principal scope of this rehabilitation plan is the environmental stabilisation of the bog. This is defined by:

- EPA IPC Licence - Ref. P0504-01. As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. Derryadd Bog is part of the Mountdillon bog group.
- The local environmental conditions of Derryadd Bog mean that intensive drain blocking is the most suitable rehabilitation approach for this site. Derryadd Bog while largely comprising shallower peat does retain deep peat reserves in places.
- The key goals and outcomes of rehabilitation set by Bord na Móna. Bord na Móna have defined the key goal and outcome of rehabilitation at Derryadd Bog as **environmental stabilisation**, **optimising residual peat re-wetting,** to enhance the development of compatible habitats.
- The cutaway is already developing a mosaic of woodland, grassland, wetland and cutaway peatland habitats. Much of this cutaway has largely stabilised. Rehabilitation is proposed to enhance residual peat re-wetting in these areas while taking account of future infrastructure and land-uses.
- Rehabilitation of Derryadd Bog will support multiple national strategies of climate action, biodiversity action and other key environmental strategies such was the Water Framework Directive.
- The proposed Derryadd Wind Farm Project at Derryadd Bog is a temporal constraint on the scope of rehabilitation. Derryadd Bog will be rehabilitated as part of the Derryadd Wind Farm development or at a later date.
- The time frame for the delivery of the planned rehabilitation will be undertaken according to available resources and appropriate constraints.
- It is not proposed to carry out rehabilitation on all marginal or peripheral cutover bog zones. Generally, these bog remnants are narrow, or are subject to turbary, and do not have positive bog restoration prospects.

6.1 Key constraints

- **Bog conditions.** Rehabilitation outcomes of sites are constrained by the environmental characteristics of these particular areas. Drain blocking can be widespread in scale with each field drain being blocked (e.g. Kellysgrove) or more localised with targeted drain-blocking (e.g. Mountlucas Wind Farm) and both can be very effective. This can be used in conjunction with local topographical features like natural hollows to manage water levels or with other typical features of cutaway peatlands like high peat fields, which act as berms to hold water to some extent. Active management to create low berms to manage water-levels and create shallow wetland habitats dominated by emergent vegetation has also been successfully developed (e.g. Mountlucas Wind Farm, Bruckana Wind Farm, Oweninny, Lough Boora Discovery Park, Ballycon).
- The majority of this bog has been cutaway. Derryadd bog has a pumped drainage regime, which will need to be considered as part of the wider rehabilitation. A mosaic of wetland habitats are the most compatible habitat that can be developed in response to re-wetting and reducing or stopping pumping.
- **Potential land-use.** Bord na Móna are planning to develop a potential renewable energy project at Derryadd Bog as part of the proposed Derryadd Wind Farm. This wind farm project is in pre-planning and is expected to be submitted for planning permission in 2025. Derryadd will be rehabilitated **either** in association with the proposed Derryadd Wind Farm Project, with peatland rehabilitation integrated into

the proposed project **or** will be completed in the event of an unsuccessful planning application. It is expected that Bord na Móna **will revise and update** the rehabilitation plan for Derryadd when a decision is made in relation to the wind farm planning application. Bord na Móna remain fully committed to rehabilitating Derryadd Bog and meeting the conditions of the IPC license.

- **Amenity development.** Longford County Council lodged a Part 8 Planning Application in 2021 named 'No. 88 Mid Shannon Wilderness Park trackways' which includes greenway or amenity walking/cycling tracks towards the southern and northern boundaries of Derryadd Bog. There are additional proposals to create an amenity plan through Derryadd Bog as part of the proposed Derryadd Wind Farm. It is proposed by Bord na Móna that a significant part of this section of the amenity will be delivered as part of the proposed Derryadd Wind Farm Project in Derryadd Bog.
- **Surrounding landscape and neighbours.** Another key constraint is the interaction between the Bord na Móna sites and the surrounding landscape. Care has to be taken that no active rehabilitation management is carried out that could negatively and knowingly impact on surrounding land. This includes any hydrological management on neighbouring farmland. It is anticipated that the work proposed here (blocking drains and re-wetting cutaway peatlands) will not have any flooding impacts on adjacent land.
- **Archaeology**. There are archaeological features present at Derryadd Bog, which may similarly constrain rehabilitation activities. The discovery of monuments or archaeological objects during peatland rehabilitation may potentially constrain the rehabilitation measures proposed for a particular area. The rehabilitation will optimise hydrological conditions for the protection of exposed archaeological structures, their retention in situ and preservation into the future. Any newly discovered archaeology may require rehabilitation measures to be reviewed and adapted. A review of known archaeology and an archaeological impact appraisal of the proposed rehabilitation will be carried out. In the worst-case scenario works affecting the surface and sub-surface of the bog might disturb previously unknown archaeological deposits or artefacts without preservation by record taking place. Should any previously unknown archaeological material be uncovered during the rehabilitation works, it will be avoided and reported to the Bord na Móna Archaeological Liaison Officer and the National Museum of Ireland. The results of this assessment will be incorporated into the rehabilitation plan to minimise known archaeological disturbance, where possible.
- **Public Rights of Way**. Where a public right of way or similar burden exists on Bord na Móna property, consideration will be given to ensuring that this remains intact where possible. In some instances, depending upon previous land uses and management, alternative solutions may be required. These will be explored in consultation with local communities and statutory bodies during the consultation work associated with the decommissioning and rehabilitation work described here.
- **Turf-cutting.** There is one isolated area (constrained), along the western margin that is subject to active turbary. This area is ecologically and hydrologically linked to the area owned by Bord na Móna where rehabilitation is planned.

6.2 Key Assumptions

- It is assumed that Bord na Móna will have all resources required to deliver this project.
- It is expected that weather conditions will be within normal limits over the rehabilitation plan timeframe. Long periods of wet weather have the capacity to significantly affect ground conditions and constrain drain blocking and other ground activities.

6.3 Key Exclusions

The scope of this rehabilitation plan does not cover:

- The longer-term development of stable naturally functioning habitats to fully develop at Derryadd Bog. The plan covers the short-term rehabilitation **actions** and **an additional monitoring and after-care programme** to monitor the rehabilitation and to respond to any needs.
- This plan is not intended to be an after-use or future land-use plan for Derryadd Bog.
- The longer-term management of this site, potentially as a nature conservation site, or for amenity, or for other uses in the future.

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7. CRITERIA FOR SUCCESSFUL REHABILITATION

This section outlines what criteria will be used to indicate successful rehabilitation and what critical success factors are needed to achieve successful rehabilitation. All criteria used to indicate successful rehabilitation will be measured to validate the achievement of the rehabilitation goals and outcomes and validate the completion of the rehabilitation.

The key objective of this rehabilitation plan is **environmental stabilisation** and the stabilisation of any emissions from the site that related to the former industrial drainage activities.

Rehabilitation is generally defined by Bord na Móna as:

- stabilisation of bare peat areas via targeted active management (e.g. drain-blocking/re-wetting) slowing movement of water across the site and encouraging a naturally functioning raised bog ecosystem; and
- mitigation of key emissions (e.g. potential suspended solids run-off).

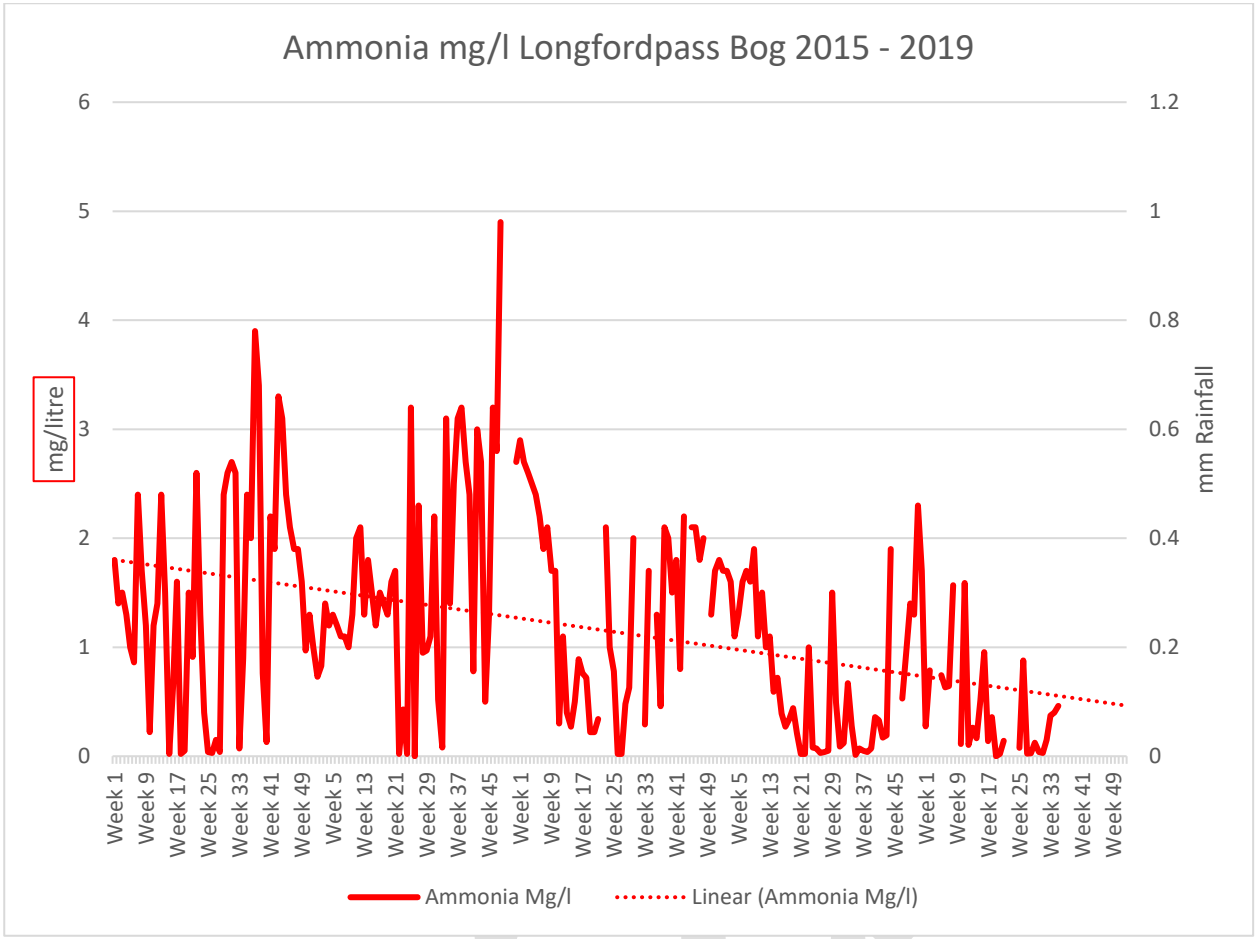
7.1 Criteria for successful rehabilitation to meet EPA IPC licence conditions:

- Rewetting of residual peat in the area originally drained for industrial peat production to offset potential run off of suspended solids and to encourage and accelerate development of vegetation cover via natural colonisation and increase in the area of potentially peat forming habitats. See Table 7.1 for a summary of the criteria for successful rehabilitation and associated monitoring. The target will be the delivery of measures, and this will be measured by an aerial survey after rehabilitation is completed.
- That there is a stabilizing/improving concentration of suspended solids and ammonia in discharges from Bord na Móna sites, associated with the measures undertaken to stabilize the peat surface by the blocking of the internal drainage system and the maximized rewetting of the peat surface. This will be demonstrated by developing a stable or downward trajectory of water quality indicators (suspended solids and ammonia) towards what would be typical of a re-wetted cutaway bog. This will be measured via water quality monitoring (suspended solids and ammonia) for at least 2 years after the rehabilitation has been completed.
- Receiving water bodies have been classified under the River Basin Management Plan and this classification includes waters that are At-Risk from peatlands and peat extraction. The success criteria will be that the At-Risk classification will see improvements in the associated pressures from this peatland or if remaining At-Risk, that there is an improving trajectory in the pressure from this peatland.

With regard to predicting and estimating likely trends that might materialize or could be considered as a target, monitoring of surface water ammonia emissions from Longfordpass bog in Littleton over 3 years, post cessation of peat extraction with ongoing rehabilitation, were considered. These are indicating a downward trend in Ammonia concentrations (Figure 7.1).

Similarly monitoring of surface water ammonia emissions from a Corlea bog in Mountdillon over the past 3 years post cessation of peat extraction with ongoing rehabilitation, indicate downward trends.

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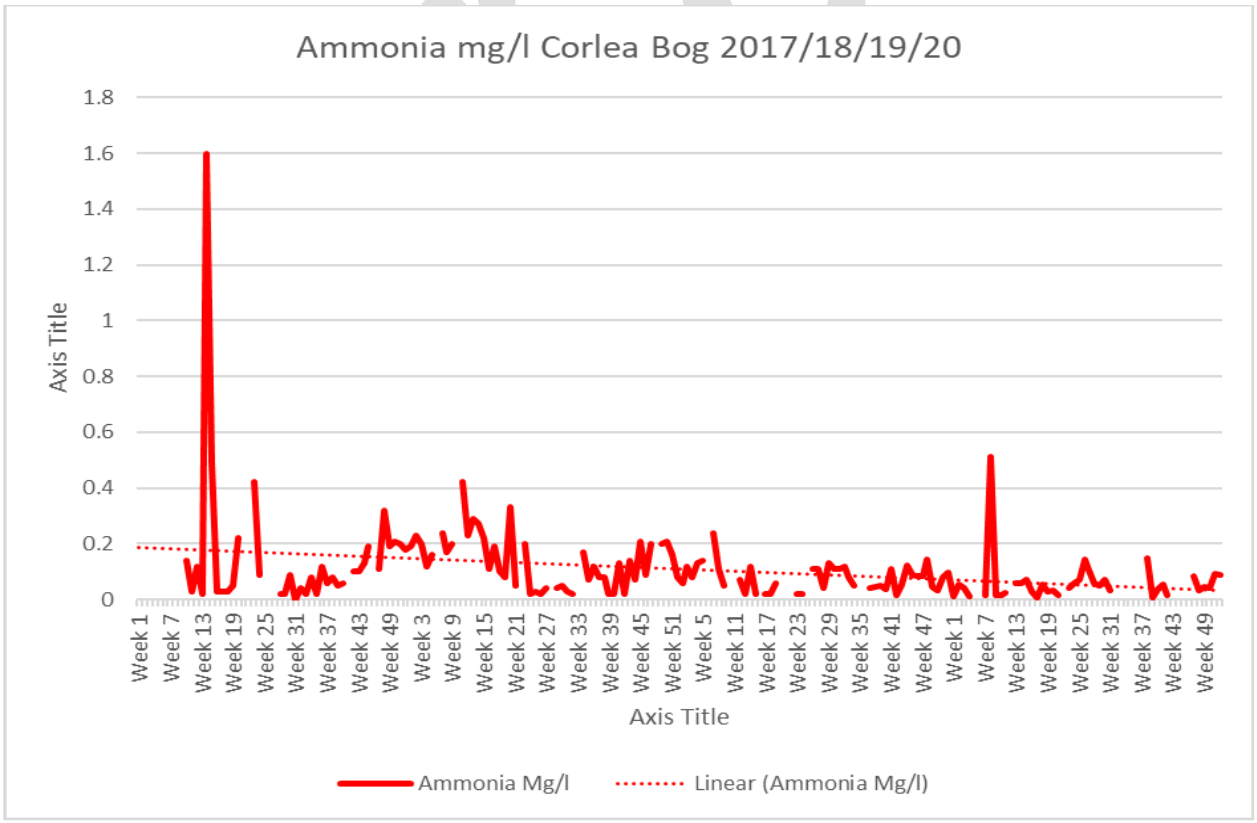


Figure 7.1. Ammonia levels over the period 2015-2019/2020 at Longfordpass and Corlea.

Table 7.1 Summary of Success criteria, targets, how various success criteria will be measured and expected time-frames.

Criteria type	Criteria	Target	Measured by	Expected Timeframe
IPC validation	Rewetting in the former area of industrial drainage.	Delivery of rehabilitation measures Restoration of hydrological regime.	Aerial photography after rehabilitation has been completed – to demonstrate measures (drain-blocking) Establishment of a baseline for future monitoring of bare peat, vegetation establishment and habitat condition.	3 years
IPC validation	Key water quality parameters Ammonia, Phosphorous, Suspended solids, pH and conductivity	Reduction or stabilisation of key water quality parameters associated with this bog	Water quality monitoring for a period after rehabilitation has been completed	2 years
IPC validation	Reducing pressure from drainage on the local water body catchment (WFD)	Where this section of the water body (that this bog drains to) has not been identified as under pressure from peat extraction, that the intervening EPA monitoring programme associated with its Programme of Measures for this water body, confirms that its classification remains at not being at risk from peat extraction associated with activities at this bog.	EPA WFD monitoring programme	WFD schedule

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7.2 Critical success factors needed to achieve successful rehabilitation as outlined in the plan

The achievement of successful rehabilitation as outlined in the plan requires:

- **Funding to pay for resources required to deliver the planned rehabilitation (Bord na Móna).** Bord na Móna maintains a Provision on its balance sheet to pay for these future costs when industrial peat extraction ceases. Bord na Móna is fully committed to meeting its obligations relating to rehabilitation and decommissioning under the Integrated Pollution Control Licence.
- **Bord na Móna to have sufficient resources (staff and training) to deliver the planned rehabilitation with required associated skills and competencies.**
- **Bord na Móna to have sufficient resources (suitable machinery) and staff to maintain this machinery.**
- **Weather conditions to be within normal limits over the rehabilitation plan timeframe.** Long periods of wet weather have the capacity to significantly affect ground conditions and constrain the delivery of rehabilitation. The potential impact of wet weather on ground conditions can be reduced by appropriate planning and management. Bord na Móna have significant experience of managing these issues through 70 years of working in these peatland environments.
- **Rehabilitation measures to be effective.** The rehabilitation measures proposed in this plan are based on 40 years of Bord na Móna experience of peatland management and best practice applied internationally in peatland management. Measures proposed in this plan have already been shown to be affective at other sites. Bord na Móna will apply a flexible and adaptable approach to the more innovative rehabilitation measures proposed in this plan. If measures are not initially effective, Bord na Móna will review any requirement for additional practical rehabilitation.
- **Natural colonisation of vegetation to develop semi-natural habitats at a rate within the normal limits.** The development of naturally functioning semi-natural habitats on cutaway peatland takes time. Pioneer vegetation can develop relatively quickly (3-10 years) and wetland habitats can develop relatively quickly. Birch woodland make take 20-30 years to develop. However, it may take 50 years for active raised bog vegetation to re-develop on ground that was previously cutaway. Different environmental conditions will have a significant impact on the rate of natural colonisation, and as a result of the combination of different environmental conditions and the application of different rehabilitation measures, there will be a variety of habitat outcomes. Future habitat modelling has taken cognisance of the proposed hydrological regime post construction.
- Rehabilitation measures have been designed to accelerate and work with natural colonisation and other natural processes. Bord na Móna experience of rehabilitation and restoration has shown that re-wetting improves conditions for natural colonisation and that natural colonisation is accelerated where the environmental conditions are most suitable. Rehabilitation measures have been designed to modify the conditions of areas within sites where conditions are less suitable for natural colonisation (modifying hydrology, topography, nutrient status or availability of potential seed sources).
- **Monitoring to be robust and effective.** Rehabilitation Monitoring will be established to validate the success of rehabilitation as required by Condition 10 of the IPC Licence. This will focus on a collecting a range of scientific data that can then quickly be adapted and into metrics that can be used to measure changes in various ecosystem services.

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8. REHABILITATION ACTIONS AND TIME FRAME

Peatland restoration and rehabilitation requires detailed planning and the use of data from desktop surveys and field surveys. This data in association with topographical and hydrological modelling will be important in planning the future peatland landscapes and planning the use of the most appropriate rehabilitation methodologies based on environmental characteristic. Hydrological modelling indicates those areas that are likely to re-wet when drains are blocked, based on the current topography. This planning is essential for matching the most sustainable rehabilitation methodology to the most suitable cutaway environment to maximise the benefits of the resource outlay (maximising cost/benefit).

A number of illustrative figures have been produced to inform Rehab Planning and Design, including Aerial Photography, Peat Depths and LiDAR Surface Maps, these are included in the accompanying Mapbook as the drawings referenced below:

BNM-ECO-23-27-21 titled ***Derryadd Bog: Aerial Imagery2000***

BNM-ECO-23-27-22 titled ***Derryadd Bog: Aerial Imagery2020***

BNM-ECO-23-27-04 titled ***Derryadd Bog: Peat Depths***

BNM-ECO-23-27-03 titled ***Derryadd Bog: LiDAR Map***

The restoration and rehabilitation measures are provisionally outlined in drawing titled BNM-ECO-23-27-20 ***Derryadd Bog: Standard Rehabilitation Measures*** in the accompanying Mapbook.

These rehabilitation measures for Derryadd Bog will include (see Table 8.1):

- Re-assessment of the pumping regime and removing pumps or reducing pumping if this is desired and has no significant external impact or impacts on proposed future land-uses. Initial hydrological modelling indicates that a part of the site will develop a mosaic of wetland habitats. 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, where possible. More sustainable permanent gravity drainage solutions will be examined. Some pumping is likely to be retained on site. Some targeted bunding may be required. It is expected that a natural seasonal regime of water fluctuation will develop, with water-levels fluctuating in association with levels of surrounding rivers.
- A widespread drain-blocking programme will be implemented across the cutaway, where possible. In general, field drains will be blocked where possible to re-wet cutaway and re-wet to the optimum water-level. More intensive measures will be targeted towards the bare peat.
- Less intensive measures (targeted drain-blocking) will be used in areas where habitats have already established.
- Measures will include drain blocking (3/100 m), modifying outfalls and managing water levels with overflow pipes.
- Wetland measures including blocking outfalls and managing water levels with overflow pipes.
- The existing silt ponds will be retained and maintained during the rehabilitation phase. During the monitoring and verification phase the silt ponds will be continually inspected and maintained, where appropriate. When it is deemed that the silt ponds are not required, as the bog has been successfully stabilised and there is no silt run-off, the condition of the silt ponds will be reviewed. The silt ponds will

either be de-watered (water levels lowered to a level where the silt pond will naturally develop as a small wetland feature), left in situ, or infilled (where discharges do not require silt control).

Table 8.1: Types of and areas for rehabilitation measures at Derryadd Bog.

Type	Code	Description	Area (Ha)
Deep peat cutover bog	DPT1	Regular drain blocking (3/100 m) + modifying outfalls and managing water levels with overflow pipes	46.8
Dry cutaway	DCT1	Modifying outfalls and managing water levels with overflow pipes	263.1
Wetland cutaway	WLT1	Turn off or reduce pumping to re-wet cutaway + modifying outfalls and managing water levels with overflow pipes	201.3
Marginal land	MLT1	No work required	63.6
Silt Pond	Silt Pond	Silt Pond	0.7
Constraint	Constraint	Constraint	78.56
Total Area			**654.1**

Note that the types of rehab and areas of rehab may change in response to stakeholder consultation and refinement of the rehabilitation measures.

8.1 Completed and Ongoing

- A significant part of the site has already re-vegetated, with pioneer vegetation maturing and developing a mosaic of typical cutaway peatland habitats with Birch woodland predominating. Bare peat areas within the older cutaway areas are reducing. Natural re-colonisation of the cutaway so far has been quite effective. Other parts of the site (younger cutaway) are naturally colonising for more than 10 years and are developing a mosaic of cutaway habitats. Natural re-colonisation of the cutaway so far has been quite effective.

8.2 Short-term planning actions (0-1 years post plan finalisation)

- Seek formal approval of the rehabilitation plan from the EPA.
- Develop a detailed site plan outlining how the various rehabilitation methods will be applied to Derryadd Bog. This will take account of peat depths, topography, drainage and hydrological modelling (see rehabilitation map for an indicative view of the application of different rehabilitation methodologies).
- A drainage management assessment of the proposed rehabilitation measures will be carried out and any issues identified resolved and the rehabilitation plan adapted.
- A review of known archaeology and an archaeological impact appraisal of the proposed rehabilitation will be carried out. The results of this assessment will be incorporated into the rehabilitation plan to minimise known archaeological disturbance, where possible.
- A review of issues that may constrain rehabilitation such as known rights of way, turbary and existing land agreements is to be carried out.
- An ecological appraisal of the potential impacts of the planned rehabilitation on the presence of sensitive ground-nesting bird breeding species (e.g. breeding waders) is to be carried out. The scheduling of rehabilitation operations will be adapted, where required.
- Ensure all activities comply with the environmental protection requirements of the IPC Licence.

- Carry out Appropriate Assessment (AA) of the Rehabilitation Plan. Incorporate any required mitigation measures from the AA in the plan for the delivery of rehabilitation and decommissioning across the site.
- Track implementation and enforcement of the relevant IPC Licence conditions, the mitigation measures (AA) and other environmental control measures during the implantation of the rehabilitation plan.

8.3 Short-term practical actions (0-2 years post plan finalisation)

- Carry out proposed measures as per the detailed site plan. This will include intensive drain blocking and targeted hydrological management prescriptions in the cutaway. All rehabilitation will be carried out with regard to best practice environmental control measures (Appendix III).
- Monitor the success of rehabilitation measures in relation to developing suitable hydrological conditions.
- Carry out the proposed monitoring, as outlined in section 9.
- Silt ponds will be monitored during this period and there will be continued maintenance and cleaning to prevent potential suspended solids run-off from the site during the rehabilitation phase.

8.4 Long-term (>3 years post plan finalisation)

- Evaluate success of short-term rehabilitation measures outlined above and remediate where necessary.
- Delivery of a monitoring, aftercare and maintenance programme (See section 9 below).
- Decommissioning of silt-ponds will be assessed and carried out, where required.
- Reporting to the EPA will continue until the IPC License is surrendered.

8.5 Timeframe

- **Year 1 post finalisation**: Short-term planning actions (specific year is dependent on planning consent).
- **Year 1-3 post finalisation**: Short-term practical actions.
- **Year 1-3 post finalisation:** Long term practical actions. Evaluate success of short-term rehabilitation. measures outlined above and remediate where necessary.
- **> Year 3 post finalisation**: Decommission silt-ponds, if necessary.

8.6 Budget and costing

Bord na Móna maintains a provision on its balance sheet to pay for the future costs of standard rehabilitation and decommissioning when industrial peat extraction ceases. This is updated every year - for more information see the Bord na Móna Annual Report (Bord na Móna, 2024). Bord na Móna is fully committed to meeting its obligations relating to rehabilitation and decommissioning under the Integrated Pollution Control Licence.

At this time, a ‘standard’ rehabilitation provision (sufficient to discharge the requirement of Condition 10 in the licence) has been allocated to the site based on the area of different cutaway types across the site.

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9. AFTERCARE AND MAINTENANCE

9.1 Programme for monitoring, aftercare and maintenance

This programme for monitoring, aftercare and maintenance has been designed to meet the Conditions of the IPC Licence. This is defined as:

- There will be **initial quarterly monitoring assessments** of the site to determine the general status of the site, the condition of the silt ponds, assess the condition of the rehabilitation work, monitoring of any potential impacts on neighbours land, general land security, boundary management, dumping and littering.
- The number of these site visits will reduce after 2 years to bi-annually.
- These monitoring visits will also consider any requirements for further practical rehabilitation measures.
- The **baseline condition of the site will be established** post-rehabilitation implementation by using an aerial survey to take an up to date aerial photo, when rehabilitation is completed. This will be used to verify completion of rehabilitation measures. The extent of bare peat will be assessed using this baseline data, and habitat maps will be updated, if needed. It is proposed that sites can be monitored against this baseline in the future.
- **Water quality monitoring** at the bog will be established. The main objective of this water quality monitoring will be to establish a baseline and then monitor the impact of peatland rehabilitation on water quality from the bog.
- Monitoring results will be maintained, trended and reported on each year and as required, as part of the requirement to report on Condition 10.1 of the IPC Licence on Bog Rehabilitation in the Annual Environmental Report, and will be provided to LAWPRO and the EPA as required to inform progress and national monitoring requirements under the WFD. These results will also be available in April each year as a requirement of the Annual Environmental Report at www.epa.ie.
- The parameters to be included (as per condition 6.2 of the IPC Licence) include monthly monitoring for pH, Flow, Suspended Solids, Total Solids, Total Phosphorus, Total Ammonia, Colour, and COD.
- This monthly sampling regime on a selected number of silt ponds will be carried out over a two-year cycle.
- If, after two years, key criteria for successful rehabilitation are being achieved and key targets are being met, then the water quality monitoring will be reviewed, with consideration of potential ongoing research on site. The water quality data, the aerial surveys and the habitat mapping will be collated and will be submitted to the EPA as part of the final validation report.
- If, after two years, key criteria for successful rehabilitation have **not** been achieved and key targets have **not** been met, then the rehabilitation measures and status of the site will be evaluated and enhanced, where required. This evaluation may indicate no requirement for additional enhancement of rehabilitation measures but may demonstrate that more time is required before key criteria for rehabilitation has been achieved. Monitoring of water quality will then also continue for another period to be defined.
- Where other uses are proposed for the site that are compatible the provision of biodiversity and ecosystem services, these will be assessed by Bord na Móna in consultation with interested parties. Other after-uses can be proposed for licensed areas and must go through the required assessment process and planning procedures.

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9.2 Rehabilitation plan validation and licence surrender – report as required under condition 10.4

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

Reporting to the EPA will continue until the IPC License is surrendered. The bog will be included in the full licence surrender process as per the Guidance to Licensees on Surrender, Cessation and Closure of Licensed Sites EPA, 2012, when:

- The planned rehabilitation has been completed;
- The key criteria for successful rehabilitation has been achieved and key targets have been met;
- Water quality monitoring demonstrates that water quality of discharge is stabilising or improving; and
- The site has been environmentally stabilised.

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APPENDIX I. BOG GROUP CONTEXT

The Mount Dillon Bog Group IPC Licenced area is made up of two sub-groups (Lough Ree- the Mount Dillon Energy Peat Group) and Mostrim) and the bog units within the group have been in industrial peat production for several decades. There are 28 defined bog units covering a total area of 11,322 ha. Of the 28 units, 23 mainly straddle the River Shannon within counties Roscommon and Longford, with five sites partially in County Westmeath to the east. Each bog area further comprises a range of habitats from bare milled peat former production areas to re-colonising cutaway to workshops areas and transport infrastructure. Industrial peat extraction from these sites mainly supplied ESB power stations at Lanesborough (LRP) or for horticultural peat products.

Industrial peat extraction in the Mount Dillon Bog Group finally ceased in 2021. Peat stockpiles which were harvested within the Bog Group continued to be delivered to Lough Ree Power Station until its closure in 2020. The removal of harvested peat stocks from the Mount Dillon Bog Group to supply other customers finally ceased in 2024. Intensive decommissioning and rehabilitation for the Mount Dillon Bog Group started in 2020/2021.

One bog site, Cloonmore, was never used for industrial peat production. Several bogs in the Mostrim group were drained but never fully developed and still retain typical high bog characteristics. These include Clonwhelan, Glenlough and a section of Mostrim. These sites have been zoned for biodiversity and a high bog drain blocking has been used to re-wet the high bog and encourage restoration of the raised bog habitat. Several sites (Glenlough, Mostrim, Clonwhelan and Clynan) were assessed by consultants for NPWS as part of the review of the raised bog Natural Heritage Area network (NPWS, 2014).

The rehabilitation plan for the Mount Dillon Bog Group encompasses all areas involved in industrial peat production including former industrial production areas and associated facilities. It also includes rehabilitation measures for those bogs that were initially drained but not fully developed.

A breakdown of the component bog areas for the Mount Dillon Bog Group IPC Licence Ref. P0-504-01 is outlined in Table Ap-1.

Industrial peat production history varies across the Mount Dillon bog group, so there is a wide range of peat depths at present. Bogs close to Lanesborough tend to have shallower peat depths or have been cutaway, while some bogs on the periphery of the group tend to have deeper peat reserves. Several sites such as Mount Dillion and Derrycashel have been mostly cutaway to the fen peat layers or in some cases to expose the underlying gravel/sub-soil. Several bogs in the Mostrim group have only been partially developed or have had no industrial peat production and have relatively deep peat depths.

Table Ap-1: Mount Dillon Bog Group names, area and indicative status (Mount Dillon Energy Peat sub-group)

Bog Name	Area (ha)	Stage of development	Land-Use and History	Peat Production Cessation	Rehab Plan Status
Begnagh	265	Cutover Bog Industrial peat production commenced at Begnagh Bog in 1977 and ceased in 2020. Deep peat reserves remain on much of the former production area. Begnagh is considered a deep peat cutover bog.	Begnagh Bog formerly supplied a range of commercial functions including fuel peat for Lough Ree Power Some areas of cutaway on site are developing pioneer cutaway vegetation communities. A greenway through Begnegh has been proposed as part of an amenity project with Faillte Ireland and Longford County Council (Midlands Trail Network).	2020	Finalised 2022 Rehab started in 2022

Bog Name	Area (ha)	Stage of development	Land-Use and History	Peat Production Cessation	Rehab Plan Status
Clooneeny	358	Cutover Bog Industrial peat production commenced at Clooneeny Bog in 1985 and ceased in 2020. Deep peat reserves remain on much of the former production area. Clooneeny is considered a deep peat cutover bog.	Clooneeny Bog formerly supplied a range of commercial functions including horticultural peat and fuel peat for Lough Ree Power Most of the former production area on site is bare peat. Some areas of cutaway on site are developing pioneer cutaway vegetation communities.	2020	Finalised 2022 Rehab started in 2022
Cloonmore	102	N/A	Never developed for industrial peat production. scattered plots.	N/A	N/A
Moher	494	Cutover Bog Industrial peat production commenced at Moher Bog in 1985 and ceased in 2020. Deep peat reserves remain across the former production area. Moher is considered a deep peat cutover bog.	Moher Bog formerly supplied a range of commercial functions including horticultural peat and fuel peat for Lough Ree Power Restoration work has been carried out on a 38ha section of high bog within Moher Bog. Some of the former production area on site is developing pioneer cutaway vegetation communities, the remainder of the site is bare peat. A greenway through Moher has been proposed as part of an amenity project with Faillte Ireland and Roscommon County Council (Midlands Trail Network).	2020	Finalised 2024 Rehab to start in 2025
Moher Rail Link	28	Moher rail link is a link between sites.	N/A	N/A	N/A
Corlea	163	Cutaway Bog Industrial peat production commenced at Corlea Bog in 1960 and ceased in 2018. Long-term peat extraction has reduced peat reserves on this bog. Corlea is considered a shallow peat cutaway bog.	The former production area at Corlea has already extensively colonised. Pioneer wetland and scrub development has occurred over much of the site. Some wetland and rehabilitation management was undertaken between 2016-2018. Part of site leased to local community development group to develop amenity walkway in association with Longford County Council. This greenway has been constructed.	2018	Finalised in 2023 Rehab started in 2023
Derraghan	289	Cutover Bog Industrial peat production commenced at Derraghan Bog in the 1940's and ceased in 2020. Most of the former production area has shallow peat reserves. Some pockets of deep peat remain. Derraghan is considered a shallow peat cutover bog.	Derraghan Bog formerly supplied a range of commercial functions including fuel peat for Lough Ree Power Much of the former production area at Derraghan has been out of production for some time. These areas have already extensively colonised with pioneer wetland and scrub vegetation communities.	2020	Plan Finalised 2021 Rehab commenced 2022
Derryadd	653	Cutover Bog Industrial peat production commenced at Derryadd Bog in 1964 and ceased in 2019. Long-term peat extraction has reduced peat reserves on this bog. Most of the former production area has shallow peat reserves. Some pockets of deep peat remain. Derryadd is considered a shallow peat cutover bog.	Much of the former production area at Derryadd has been out of production for some time. These areas have already extensively colonised with pioneer wetland and scrub vegetation communities Derryadd Bog will form part of the footprint of the proposed Derryadd Wind Farm Project (in pre-planning). An amenity walkway through part of Derryadd Bog is proposed for the Derryadd Wind Farm project	2019	Draft 2025

Bog Name	Area (ha)	Stage of development	Land-Use and History	Peat Production Cessation	Rehab Plan Status
Derryadd2 (Derryadd East)	328	Cutover Bog Industrial peat production commenced at Derryadd 2 Bog in 1960 and ceased in 2020. Long-term peat extraction has reduced peat reserves on this bog. Most of the former production area has shallow peat reserves. Some pockets of deep peat remain. Derryadd 2 is considered a shallow peat cutover bog.	Much of the former production area at Derryadd 2 has been out of peat production for some time. These areas have already extensively colonised with pioneer wetland and scrub vegetation communities	2020	Finalised 2023 Rehab started 2023
Derryarogue	895	Cutover Bog Industrial peat production commenced at Derryarogue Bog in 1952 and ceased in 2019. Long-term peat extraction has reduced peat reserves on this bog. Most of the former production area has shallow peat reserves. Some pockets of deep peat remain. Derryarogue is considered a shallow peat cutover bog.	Much of the former production area at Derryarogue has been out of production for some time. These areas have already extensively colonised with pioneer wetland, cutaway and scrub vegetation communities. Derryarogue Bog will form part of the footprint of the proposed Derryadd Wind Farm project (in pre-planning). An amenity walkway through part of Derryarogue is proposed for the Derryadd Wind Farm project. Additional greenway through Derryarogue is in construction as part of an amenity project with Longford County Council. A further section of greenway has been proposed as part of an amenity project with Faillte Ireland and Longford County Council (Midlands Trail Network).	2019	Derryarogue West Finalised in 2023 Rehab started in 2023 Derryarogue Draft 2024 (remainder of site)
Derrycashel	388	Cutover Bog Industrial peat production commenced at Derrycashel Bog in 1951 and ceased in 2018. Long-term peat extraction has reduced peat reserves on this bog. Most of the former production area has shallow peat reserves. Some pockets of deep peat remain. Derrycashel is considered a shallow peat cutover bog.	Derrycashel Bog formerly supplied a range of commercial functions including fuel peat for Lough Ree Power Much of the former production area at Derryarogue has been out of production for some time. These areas have already extensively colonised with pioneer wetland and scrub vegetation communities. Some wetland and rehabilitation management was undertaken (c.60ha) between 2014-2015.	2018	Finalised 2021 Rehab started in 2021
Derrycolumb	454	Cutover Bog Industrial peat production commenced at Derrycolumb Bog in the 1980's and ceased in 2019. Most of the former production area still has deep peat reserves. Derrycolumb is considered a deep peat cutover bog.	Derrycolumb Bog formerly supplied a range of commercial functions including fuel peat for Lough Ree Power Much of the former production area at Derrycolumb has been out of production for some time. These areas have already extensively colonised with pioneer wetland and scrub vegetation communities. A greenway through Derrycolumb has been constructed as part of an amenity project with Longford County Council.	2018	Finalised 2021 Rehab started in 2021
Derrymoylin	356	Cutover Bog Industrial peat production commenced at Derrymoylin Bog in 1985 and ceased in 2020. Long-term peat extraction has reduced peat reserves on this bog. Derrymoylin is considered a shallow peat cutover bog.	Derrymoylin Bog formerly supplied a range of commercial functions including fuel peat for Lough Ree Power. Most of the former production area on site is bare peat. A greenway through Derrymoylin has been proposed as part of an amenity project with Faillte Ireland and Roscommon County Council (Midlands Trail Network).	2020	Finalised 2024 Rehab to start in 2025

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Bog Name	Area (ha)	Stage of development	Land-Use and History	Peat Production Cessation	Rehab Plan Status
Derryshannoge	452	Cutover Bog Industrial peat production commenced at Derryshannoge Bog in 1985 and ceased in 2020. Deep peat reserves remain across most of the site. Derryshannoge is considered a deep peat cutover bog.	Derryshannoge Bog formerly supplied a range of commercial functions including fuel peat for Lough Ree Power. Much of the former production area at Derryshannoge has been out of production for some time. These areas have already extensively colonised with pioneer cutaway and scrub vegetation communities.	2020	Finalised 2023 Rehab started in 2024
Edera	281	Cutover Bog Development for industrial peat production commenced at Edera Bog in 1990's. Active extraction from Edera began in 2003 and ceased in 2018. Edera is considered a deep peat cutover bog.	Edera Bog formerly supplied a range of commercial functions including fuel peat for Lough Ree Power. The majority of Edera Bog former production area is bare peat.	2020	Finalised 2021 Rehab started in 2021
Erenagh	93	Cutover Bog Development for industrial peat production commenced at Erenagh Bog in 1970's. Erenagh is considered a deep peat cutover bog.	Erenagh Bog formerly supplied a range of commercial functions including fuel peat for Lough Ree Power. Much of the former production area at Erenagh has been out of production for some time. These areas have already extensively colonised with pioneer cutaway and scrub vegetation communities.	2020	To be finalised in 2025
Granaghan	212	Cutover Bog Development for industrial peat production commenced at Granaghan Bog in 1980's. Long-term peat extraction has reduced peat reserves on this bog but deep peat reserves remain on site. Granaghan is considered a deep peat cutover bog.	Granaghan Bog formerly supplied a range of commercial functions including horticultural peat and fuel peat for Lough Ree Power. The majority of Granaghan Bog former production area is bare peat.	2020	Finalised 2023 Rehab to start in 2025
Killashee	110	Cutover Bog Development for industrial peat production commenced at Killashee Bog in 1985. Killashee is considered a deep peat cutover bog.	Killashee Bog formerly supplied a range of commercial functions including horticultural peat and fuel peat for Lough Ree Power. The majority of Killashee Bog former production area is bare peat. Some areas have colonised with pioneer cutaway and scrub vegetation communities.	2020	Finalised 2023 Rehab started in 2024
Knappoge	313	Cutaway Bog Peat Production at Knappoge bog commenced in 1963 and finished in 2018. Peat depths on the former production area are generally shallow. There are some pockets of deeper peat. Knappoge is considered a shallow peat cutaway bog.	Knappoge Bog formerly supplied a range of commercial functions including fuel peat for Lough Ree Power. The majority of Knappoge Bog former production area is bare peat. Some areas have colonised with pioneer cutaway and scrub vegetation communities. A greenway through Knappoge has been constructed as part of an amenity project with Longford County Council. An additional section has been proposed as part of an amenity project with Faillte Ireland and Longford County Council (Midlands Trail Network).	2018	Finalised 2021 Rehab started in 2022

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Bog Name	Area (ha)	Stage of development	Land-Use and History	Peat Production Cessation	Rehab Plan Status
Lough Bannow	739	Cutaway Bog Peat Production at Lough Bannow bog commenced in 1964 and finished in 2019. Peat depths on the former production area are generally shallow. There are some pockets of deeper peat. Lough Bannow is considered a shallow peat cutaway bog.	Much of the former production area at Lough Bannow has been out of production for some time. These areas have already extensively colonised with pioneer cutaway and scrub vegetation communities. A small (35ha) conifer plantation was established in 1980's. Lough Bannow will form part of the footprint of proposed Derryadd Wind Farm Project (in pre-planning). An amenity walkway through part of Lough Bannow is proposed for the Derryadd Wind Farm project	2019	Draft 2025
Moher	483	Cutover Bog Peat Production at Moher Bog commenced in the 1960's and finished in 2020. Peat depths on the former production area remain relatively deep. Moher is considered a deep peat cutover bog.	Moher Bog formerly supplied a range of commercial functions including fuel peat for Lough Ree Power. Much of the former production area at Moher has been out of production for some time. These areas have already extensively colonised with pioneer cutaway and scrub vegetation communities.	2020	To be finalised 2025 Rehab to start 2025
Mount Dillon	592	Cutaway Bog Peat Production at Mount Dillon bog commenced in the 1940's and finished in 2020. Peat depths on the former production largely shallow and the peat is considered cutaway. Some deep peat remains on the west of the site. Mount Dillon is considered a shallow peat cutaway bog.	Mount Dillon Bog formerly supplied a range of commercial functions including fuel peat for Lough Ree Power. Much of the former production area at Mount Dillon has been out of production for some time. These areas have already extensively colonised with pioneer cutaway, wetland and scrub vegetation communities.	2020	To be finalised 2025 Rehab to start 2025

See Drawing number BNM-DR-23-27-24 titled **Mount Dillon Bog Group**, included in the accompanying Mapbook which illustrates the location of Derryadd bog and the Mount Dillon Bog Group in context to the surrounding area.

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APPENDIX II. ECOLOGICAL SURVEY REPORT

Ecological Survey Report

Note: This report outlines an ecological survey of the bog. This report should not be taken as a management plan for the site as other land-uses may still be considered. Information within this report may inform the development of other land-uses and identify areas with particular biodiversity value.

Bog Name:	**Derryadd**	**Area (ha):**	657ha
Works Name:	Mount Dillon	**County:**	Longford
Recorder(s):	BnM Ecology Section	**Survey/ monitoring Date(s):**	26th and 27th July 2012 Cutaway habitats re-surveyed in 2017 *A range of additional ecological surveys were carried out 2014-2019 to inform the EIAR for the proposed Derryadd Wind Farm. These surveys have also informed this rehabilitation plan.*

Habitats present (in order of dominance)

The most common habitats present at this site include:

- Bare peat (BP) (Codes refer BnM classification of pioneer habitats of production bog. See Appendix II).
- Pioneer dry heath communities (dHeath)
- Scrub (eBir, OBir and CBir).
- Silt Ponds (Silt) with associated habitats such as scrub, Bracken, rank grassland (GS2), dry calcareous grassland (gCal) and typical pioneer communities of disturbed areas (disTuss).

The most common habitats present around the margins at this site include:

- Birch woodland (WN7) (Codes refer to Heritage Council habitat classification, Fossitt 2000), See Appendix II)
- Scrub (WS1) (Gorse scrub and Birch scrub developing of dry high bog around margins)
- Raised bog (PB1)
- Cutover bog (PB4) (several small fragments)
- Wet grassland (GS4).

Description of site

Derryadd Bog is located approximately 4km to the East of Lanesborough in County Longford. This site is located within one main block. Two mineral islands (Annaghmore and Annaghbeg) are located within the site, these areas are not within the ownership of Bord na Móna and are managed as grazing land for domestic animals. A minor road connects the mineral islands with a public road that adjoins the eastern edge of the site. Derryarogue Bog is located immediately to the north of the site (separated by the N63 Longford to Roscommon road). An

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industrial rail link connects the site with Derryarogue to the north and Lough Bannow to the south. The majority of the site is in active industrial peat production. The peat is used as fuel peat in Lough Ree Power Station in Lanesborough. Derryadd Bog has been in full industrial peat production since the early 1960's and contains two pumps (south western corner of the site and along the northern boundary).

A relatively large area in the centre of the site has been classed as cutaway for a number of years. This area of cutaway is located on a ridge that extends to the north and south of the mineral islands at the centre of the site. These areas are dry and have colonised by a mixture of calcareous grassland (gCal) and scrub (eBir, oBir and cBir). The scrub is well developed in places and is comprised mainly of Birch, however a proportion of Pine (Scot's Pine and Lodge-pole Pine) along with smaller amounts of Hazel and Ash have also become established. These areas are located on gravel and are dry.

Smaller areas of cutaway have developed across the site; these areas mainly comprise of pioneer poor fen habitats.

Extensive drainage work was ongoing in the south western corner of the site at the time the ecological survey was undertaken.

A watercourse flows through the southern section of the site. This watercourse is a tributary of the River Shannon and has been canalised.

Other habitats along the margins of the site include Birch woodland, wet grassland, dry heath and cutover bog. Overall, large areas of the site contain less than 2m of peat and contain exposed marl and gravel; however some small areas of the bog, in the south western corner of the site, are young in terms of industrial peat production and still contain some "red" or "Sphagnum" peat. Two pumps are situated on the site.

Adjacent habitats and land-use

Adjacent habitats include lowland depositing river (FW2), wet grassland (GS4), improved agricultural grassland (GA1), cutaway bog (PB4), Conifer plantation and raised bog (PB1).

Watercourses (major water features on/off site)

- Tributaries of the River Shannon flow along the eastern and western boundaries of the site.
- A tributary of the River Shannon flows through the southern section of Derryadd Bog.

Peat type and sub-soils

The majority of Derryadd Bog contains between 1 to 2m of peat, however large areas of the site contain less than 1m of peat and are approaching the end of industrial peat production. The remaining peat on the site appears to be fen peat. The site is underlain with a mix of gravel and marl.

Fauna biodiversity (2012)

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Birds

Several bird species were noted on the site during the survey.

- Heron
- Mallard (4)
- Kestrel
- Skylark (6)
- Willow Warbler (3)
- Grasshopper Warbler
- Other more common species include Wood Pigeon, Meadow pipit, Robin, Blackbird, Grey Crow, Magpie

Mammals

Signs of several mammal species were noted on the site during the survey.

- Otter
- Badger
- Pine Marten
- Squirrel (Red or Grey)
- Hare

Other species

Frog

Butterflies – Green-veined White, Small Copper, Small Heath, Large White, Meadow Brown

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APPENDIX III. ENVIRONMENTAL CONTROL MEASURES TO BE APPLIED TO BOG REHABILITATION

- Bog restoration/rehabilitation measures will be restricted to within the footprint of the proposed rehabilitation area.
- The proposed rehabilitation will have due regard to noise limits and hours of operation (i.e. dusk and dawn) to minimise any potential disturbance on resident and local fauna that utilise the site and immediate environs.
- All plant and equipment for use will comply with the Construction Plant and Equipment Permissible Noise Levels Regulations (SI 359/1996).
- The proposed activities will be restricted to daylight hours and there will be no requirement for artificial lighting.
- Silt ponds will be inspected and maintained as per the IPC Licence.
- During periods of heavy precipitation and run-off, activities will be halted.
- Measures will be carried out using a suitably sized machine and, in all circumstances, excavation depths and volumes will be minimised where possible.
- All machines will be regularly checked and maintained prior to arrival at the site to prevent hydrocarbon leakage.
- Hoses and valves will be checked regularly for signs of wear and will be closed and securely locked when not in use.
- Fuelling and lubrication of equipment shall only be carried out in designated areas away from surface water drainage features and ecologically sensitive areas.
- Waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the site for disposal or re-cycling.
- Vehicles will never be left unattended during refuelling.
- No direct discharges to waters will be made. No washings from vehicles, plant or equipment will be carried out on site.
- All plant refuelling will take place using mobile fuel bowsers. Only dedicated trained and competent personnel will carry out refuelling operations.
- Mobile storage such as fuel bowsers will be bunded to 110% capacity to prevent spills. Tanks for bowsers and generators shall be double skinned. When not in use, all valves and fuel trigger guns from fuel storage containers will be locked. All pumps using fuel or containing oil will be locally and securely bunded where there is the possibility of discharge to waters.
- Potential impacts caused by spillages etc. during rehabilitation will be reduced by keeping spill kits and other appropriate equipment on-site.
- Site activities will be carried out in accordance with 'best practice'. In order to ensure compliance and implementation of 'best practice', these measures will be communicated to relevant Bord na Móna staff and updated as required.

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APPENDIX IV. BIOSECURITY

The potential for importation or introduction of non-native plant species (such as Japanese Knotweed, Himalayan Balsam, etc.) during future rehabilitation management, such as drain-blocking using excavators, has the potential to result in the establishment of invasive species within the site. Section 49 of the European Communities (Birds and Natural Habitats) Regulations 2011 prohibits the introduction and dispersal of invasive alien species (particularly plant species) listed on Part 1 (third column) of the 'Third Schedule'.

This section aims to reduce the risk from, and impacts of, invasive species and protecting biodiversity on lands under Bord na Móna ownership. Rehabilitation and decommissioning in the bog will have due regard to the relevant biosecurity measures outlined below:

- Records of problematic invasive species within the various bog units will be marked out with signs to highlight areas of infestation to personnel.
- All plant machinery will be restricted from disturbing known colonies of invasive species.
- All plant machinery will avoid unnecessary crossings to adjoining lands.
- Good site hygiene will be employed to prevent the introduction and spread of problematic invasive alien plant species (i.e. Japanese Knotweed (*Fallopia japonica*), Himalayan Balsam (*Impatiens glandulifera*), Himalayan Knotweed (*Persicaria wallichii*), etc.) by thoroughly washing vehicles prior to entering the area.

The biosecurity measures outlined above are in line with best practice guidelines issued by the National Roads Authority (NRA, 2010) – The Management of Noxious Weeds and Non-native Invasive Plant Species on National Roads and broadly based on the Environment Agency's (2013) – The Knotweed Code of Practice: Managing Japanese Knotweed on Development Sites (Version 3, amended in 2013, accessed on the Environment Agency's website on the 11th of July 2016).

In addition to the above, Best Practice measures around the prevention and spread of Crayfish plague[5] will be adhered with throughout all rehabilitation measures and activities.

[5] https://www.biodiversityireland.ie/projects/invasive-species/crayfish-plague/

APPENDIX V. POLICY AND REGULATORY FRAMEWORK

Bord na Móna Plc is a publicly owned company, originally established in 1934 to develop some of Ireland's extensive peat resources for the purposes of economic development and to support energy security. In the decades since its establishment the company has employed tens of thousands of people in its fuel, energy, and horticultural growing media businesses. For much of its history the company's support of important national policy aims has been enabled and encouraged in a variety of ways by Government.

Today, Bord na Móna is undertaking a number of highly significant actions in support of climate policy. These actions involve a radical transformation and decarbonisation of nearly the entire Bord na Móna business. This transformation will be driven by unlocking the full potential of our land and creating significant value for Ireland and the Midlands in particular.

Bord na Móna is an integral part of the economic, social, and environmental fabric of Ireland and Irish life. As a key employer in the Midlands, the company is conscious that its obligations go beyond purely commercial and environmental – there is also a social responsibility to employees and the communities served by Bord na Móna. It is the company's role and absolute priority to ensure that its long-term strategy delivers on all of these important areas in a robust and balanced way.

There are a wide range of policies, plans, legislation and land designations that inform the development of this Bord na Móna peatland rehabilitation plan. Bord na Móna have also developed and operate various policies and strategies that also inform the development of this rehabilitation plan.

1 EPA IPC Licence

Bord na Móna operates under IPC Licence issued and administered by the EPA to extract peat within the Mount Dillon bog group (Ref. P0-504-01). As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. The bog is part of the Mount Dillon group. This regulatory requirement is the main driver of the development of this rehabilitation plan.

2 The Peatlands Climate Action Scheme (PCAS)

Bord na Móna (BnM) understand that it is the Minister's (DECC) intention to impose an obligation on Bord na Móna to develop a programme of measures, 'the Scheme', for the enhanced decommissioning, rehabilitation and restoration of boglands previously used to supply peat for electricity generation within the State. The enhanced decommissioning, rehabilitation and restoration of the peatlands funded by the Scheme (PCAS) will deliver benefits across climate action (GHG mitigation through reduced carbon emissions and acceleration towards carbon sequestration), enrich the State's natural capital, increase eco-system services, strengthen biodiversity, improve water quality and storage attenuation as well as developing the amenity potential of the peatlands.

It is envisaged that Bord na Móna carry out an enhanced decommissioning, rehabilitation and restoration, under the Scheme (PCAS), and supported by the Climate Action Fund and Ireland's National Recovery and Resilience Plan across a footprint of 33,000 ha. This scheme will significantly go beyond what is required to meet rehabilitation and decommissioning obligations under existing EPA IPC licence conditions. Interventions and measures supported by the Scheme will ensure that environmental stabilisation is achieved (meaning IPC obligations are met), and importantly, significant additional benefits, particularly relating to climate action and other ecosystem services, will also be delivered. However, only the additional costs associated with the additional

and enhanced rehabilitation, i.e., those activities which go beyond the existing decommissioning and rehabilitation requirements arising from Condition 10 will be eligible for support under the Scheme.

3 National and EU Climate and Biodiversity Policy

The National Policy Position establishes the fundamental national objective of achieving a transition to a competitive, low carbon, climate-resilient and environmentally sustainable economy by 2050. It sets out:

- the context for the objective;
- clarifies the level of GHG mitigation ambition envisaged; and
- establishes the process to pursue and achieve the overall objective.

The evolution of climate policy in Ireland will be an iterative process based on the adoption by government of a series of national plans over the period to 2050. GHG mitigation and adaptation to the impacts of climate change are to be addressed in parallel national plans – respectively through the National Climate Action Plan. The plans will be continually updated, as well as being reviewed on a structured basis at appropriate intervals and, at a minimum, every five years. This will include early identification and ongoing updating of possible transition pathways to 2050 to inform sectoral strategic choices.

Bord na Móna is following a decarbonisation programme aimed at reducing the carbon emissions from its activities. Industrial peat production has now ceased, and several other decarbonisation measures are being implemented. The company aims to further develop renewable energy and resource recovery markets with a key objective of reducing the carbon intensity of all products. In addition, the carbon emission mitigation benefits associated with the post-peat extraction rehabilitated peatland following re-wetting, revegetation and colonisation of significant areas with native woodland will make a significant contribution to achieving the State's carbon emission reduction targets.

Peatlands rehabilitation and restoration is referenced in Section 17.3.3 of the Land Use, Land Use Change, Forestry and Marine Chapter of the National Climate Action Plan 2021 as follows:

"The rehabilitation of degraded peatlands to a condition in which they regain their ability to deliver specific ecosystem services has considerable potential for initial mitigation gains, and future carbon sequestration. Additional benefits of peatland restoration include positive socio-economic outcomes for the Midlands, increased natural capital, enriched biodiversity, improved water quality, and flood attenuation."

The scheme is included as Action 33 in the Climate Action Plan 2021 Annex of Actions - Deliver the Enhanced Decommissioning, Rehabilitation and Restoration (EDRR) Scheme for Bord na Mona Peatlands.

EDRRS is also referenced in the Climate Action Plan 2021 as a measure to deliver a Just Transition in the Midlands.

International research and scientific understanding of peatlands is now reflected in key Irish national policy and strategy documents such as the National Raised Bog Special Areas of Conservation (SACs) Management Plan 2017 - 2022 (Department of Arts, Heritage and the Gaeltacht 2017), The National Peatland Strategy (Department of Arts, Heritage and the Gaeltacht 2015), The National Biodiversity Action Plan (National Parks and Wildlife Service 2017), The River Basin Management Plan for Ireland (DHLGH 2024), and the Biodiversity – Climate Change Sectoral Action Plan (Department of Arts, Heritage and the Gaeltacht 2019). Each of the national plans, which are also complemented with the recently published EU Green Deal communication on Biodiversity Strategy for 2030 (COM 2020) have overlapping objectives and actions that focus on the restoration of peatlands damaged

by turf-cutting, drainage and other impacts, as well as the re-wetting of Bord na Móna industrial peat extraction bogs.

While not specifically identified as a restoration implementor, EDRRS objectives are in line with those of the United Nations Decade on Ecosystem Restoration 2021-2030 of Preventing, Halting and Reversing the Degradation of Ecosystems worldwide.

EDRRS is also in line with the EU Commission proposal for a Nature Restoration Law which will apply legally binding targets for nature restoration in different eco-systems to every Member State. The aim is to cover at least 20% of the EU's land and sea areas by 2030 with nature restoration measures and eventually extend these to all ecosystems in need of restoration by 2050.

4 National Peatlands Strategy

The National Peatlands Strategy (2015) contains a comprehensive list of actions, necessary to ensure that Ireland's peatlands are preserved, nurtured and become living assets within the communities that live beside them. It sets out a cross-governmental approach to managing issues that relate to peatlands, including compliance with EU environmental law, climate change, forestry, flood control, energy, nature conservation, planning, and agriculture. The Strategy has been developed in partnership between relevant Government Departments/State bodies and key stakeholders through the Peatlands Council.

The strategy recognises that Ireland's peatlands will continue to contribute to a wide variety of human needs and to be put to many uses. It aims to ensure that Ireland's peatlands are sustainably managed so that their benefits can be enjoyed responsibly. It aims to inform appropriate regulatory systems to facilitate good decision making in support of responsible use. It also aims to inform the provision of appropriate incentives, financial supports and disincentives where required. The strategy attempts to strike an appropriate balance between different needs, including local stakeholders like turf-cutters and semi-state bodies such as Bord na Móna.

In line with a National Peatlands Strategy recommendation, a Peatlands Strategy Implementation Group (PSIG), was established, assisted in the finalisation of the Strategy, is overseeing subsequent implementation and will report to Government on an annual basis on the implementation of the actions and principles contained within the Strategy.

Bord na Móna is a key stakeholder in the National Peatlands Strategy and the Peatlands Strategy Implementation Group. The strategy recognises the potential for some Bord na Móna sites to be restored and to contribute to the national SAC and NHA network of protected raised bog sites. The strategy (agreed in 2015) also recognises the various different values of cutaway bog and developed six key principles (with Bord na Móna) for the after-use of cutaway bog.

- Bord na Móna will continue to assess and evaluate the potential of the company's land bank, using a land use review system. The assessment will help prepare a set of evidence-based management plans for the various areas of peatland. These plans will also inform its cutaway bog rehabilitation.
- The policy of Bord na Móna is not to open up any undrained new bogs for peat production.
- Lands identified by Bord na Móna as having high biodiversity value and/or priority habitats will be reserved for these purposes as the principal future land use.
- Generally, Bord na Móna cutaway bogs that flood naturally will be permitted to flood unless there is a clear environmental and/or economic case to maintain pumped drainage.

- In deciding on the most appropriate afteruse of cutaway peatlands, consideration shall be given to encouraging, where possible, the return to a natural functioning peatland ecosystem.
- This will require re-wetting of the cutaway peatlands which may lead in time to the restoration of the peatland ecosystem.
- Environmentally, socially and economically viable options should be analysed to plan the future use of industrial cutaway peatlands, in conjunction with limiting factors as outlined in Bord na Móna's Strategic Framework for the Future Use of Peatlands.

The National Peatlands Strategy highlights the importance and value of developing peatland rehabilitation plans for Bord na Móna cutaway sites and implementing this peatland rehabilitation. Some of these principles have now been superseded by the company's decision to cease industrial peat extraction. The National Peatlands Strategy is currently being reviewed by Government.

5 Draft National River Basin Management Plan 2022-2027 (Water Framework Directive)

The National River Basin Management Plan (Department of Housing, Planning, Community and Local Government 2017) is the key national plan for Ireland to achieve the objectives of the Water Framework Directive (WFD). In broad terms, the objectives of the WFD are (1) to prevent the deterioration of water bodies and to protect, enhance and restore them with the aim of achieving at least good status and (2) to achieve compliance with the requirements for designated protected areas.

The NRBMP 2018-2021 outlined how peat extraction can be a potentially significant pressure on various water quality parameters. Peatland rehabilitation of Bord na Móna cutaway (in addition to other measures) was part of the WFD (2018-2021) programme of measures. The NRBMP 2018-2021 takes account of the fact that Bord na Móna was in the process of phasing out the extraction of peat for energy production, that it set a target to rehabilitate 9,000 ha of cutaway bogs (covering 25 peatlands) by 2021 (in 2018) and will look to implement best-available mitigation measures to further reduce water quality impacts caused by peat extraction while the phasing-out process is taking place. This NRBMP 2018-2021 rehabilitation target was superseded by the acceleration of the Bord na Móna de-carbonisation programme and the Scheme (PCAS).

The development of site rehabilitation plans and the delivery of peatland rehabilitation by Bord na Móna was expected to have a positive impact on water quality and will help the NRBMP 2018-2021 deliver its objectives in relation to the Water Framework Directive and is one of the five key principle actions.

The NWBMP 2022-2027 (DHLGH 2024) describes how the number of waterbodies impacted by peat, industry and forestry have decreased by 10, 10 and 5 waterbodies, respectively since the second cycle. Impacts on water quality and river habitat arising from peat and peat extraction and associated drainage include the release of ammonium and fine-grained suspended sediments, and physical alteration of aquatic habitats. Drainage of peatlands also results in changes to the hydromorphological condition of rivers.

The NWBMP 2022-2027 (DHLGH 2024) outlines how maintaining and restoring Irish bogs will lead to a decrease in waterborne carbon leaching to levels comparable with intact bogs as well as reducing losses of peat silt and ammonia. Vegetation on the surface of the peat can also slow the flow of water over the land surface. Based on the EPA's most recent reports, peat extraction and drainage is impacting on 106 water bodies across the country, with peat the single pressure on 28 of these water bodies. However, compared to the data in the second-cycle plan, the number of water bodies impacted by peat has decreased.

The cessation of industrial peat extraction by Bord na Móna in 2021 was expected to have a significant positive impact on water quality of receiving water courses by reducing the impact of peat extraction as a key pressure on particular water courses. This is now being supported by the results and conclusions of the draft NWBMP 2022-2027.

6 4th National Biodiversity Action Plan 2023-2030

Ireland's 4th National Biodiversity Action Plan (NBAP) sets the national biodiversity agenda for the period 2023-2030 and aims to deliver the transformative changes required to the ways in which we value and protect nature. The 4th NBAP has been developed with the support, advice and input of the interdepartmental Biodiversity Working Group and the independent Biodiversity Forum. Ireland's 2nd National Biodiversity Conference was held to gather insights and recommendations for the development of the NBAP and a public consultation process was held to provide further opportunities to engage with the Plan.

The 4th NBAP strives for a "whole of government, whole of society" approach to the governance and conservation of biodiversity. The aim is to ensure that every citizen, community, business, local authority, semi-state and state agency has an awareness of biodiversity and its importance, and of the implications of its loss, while also understanding how they can act to address the biodiversity emergency as part of a renewed national effort to "act for nature".

The delivery of rehabilitation via PCAS is expected to significantly contribute in the future to actions and targets of the 4th National Biodiversity Action Plan 2023-2030, particularly in relation to peatland restoration, nature restoration and creation of new habitats such as wetlands and woodlands.

7 EU Nature Restoration Law

The EU Nature Restoration Law is a key element of the EU Biodiversity Strategy, which sets binding targets to restore degraded ecosystems, in particular those with the most potential to capture and store carbon and to prevent and reduce the impact of natural disasters. The regulation combines an overarching restoration objective for the long-term recovery of nature in the EU's land and sea areas with binding restoration targets for specific habitats and species. These measures should cover at least 20% of the EU's land and sea areas by 2030, and ultimately all ecosystems in need of restoration by 2050.

This regulation has now been adapted and it is expected that all Member States will be required to produce a National Restoration Plan within two years of adoption. This will be led by the National Parks and Wildlife Service and will comprise a broad and deep public participation process, informed by robust ecological and socio-economic impact assessments. Bord na Móna are working with NPWS to identify bog restoration and other re-wetted cutaway sites that can contribute towards Irelands targets for the Nature Restoration Law.

8 National Conservation Designations

Bord na Móna operates in a wider landscape that also includes a network of European and National nature conservation sites (Special Areas of Conservation (SACs), Special Protection Areas (SPAs), National Heritage Areas (NHAs, cNHAs) and National Nature Reserves). Bord na Móna will take account of this network of conservation objectives and their conservation objectives when developing these rehabilitation plans. It is expected that

peatland rehabilitation will, in general, benefit the conservation objectives of this network of nature conservation sites.

9 National Raised Bog Special Area of Conservation Management Plan 2017-2022

The National Raised Bog Special Area of Conservation Management Plan 2017-2022 sets out a roadmap for the long-term management, restoration and conservation of protected raised bogs in Ireland. The Plan strikes an appropriate balance between the need to conserve and restore Ireland's raised bog network as part of Ireland's commitments towards the EU Habitats Directive, and the needs of stakeholders and gives recognition to the important role that communities have to play in the conservation and restoration of raised bogs. The National Raised Bog Special Areas of Conservation (SACs) Management Plan 2017-2022 is part of the measures being implemented in response to the on-going infringement action against Ireland in relation to the implementation of the EU Habitats Directive, with regard to the regulation of turf cutting on the Special Areas of Conservation (SACs). The then Minister for Arts, Heritage and the Gaeltacht, also published a Review of Raised Bog Natural Heritage Area Network in 2014.

Bord na Móna has played a key role in the development of the National Raised Bog Special Area of Conservation Management Plan 2017-2022 and the Review of the Raised Bog Natural Heritage Area Network. Several Bord na Móna sites were assessed by the National Parks and Wildlife Service as part of the above Plan and Review and there is an expectation that several Bord na Móna sites will be designated as SACs and NHAs in the future. This will reinforce the network of protected raised bog sites and replace in part sites that will be de-designated as they have been deemed to be significantly damaged and are deemed to have no raised bog restoration prospects. PCAS is expected to restore several sites that will contribute to The National Raised Bog Special Areas of Conservation (SACs) Management Plan 2017-2022 targets in relation to the restoration of raised bog habitat.

Bord na Móna has also responded to the needs of the NRBMP and provided several sites to the government for the relocation of turf-cutters from SACs. This is part of a suite of ongoing bog conservation measures in the NRBMP to manage turf-cutting in protected sites. Bord na Móna and the National Parks and Wildlife Service continues to engage regarding the ongoing relocation of turf-cutters from protected raised bog sites.

10 All-Ireland Pollinator Plan 2021-2025

The All-Ireland Pollinator Plan 2021-2025 outlines key objectives and actions to protect and support pollinating insects and the habitats they rely on. A Bord na Móna specific action in this plan includes the adoption of pollinator-friendly management within the Bord na Móna network of sites. One action to help achieve this objective is habitat rehabilitation and restoration, where possible, of pollinator-friendly habitats, including peatland habitats.

11 Land-use Planning Policies

As Bord na Móna operates in many counties across Ireland, it is important to note the respective development plans in these counties. Many of the existing development plans recognise the potential that exists in the after-use of cutover/cutaway peatlands. Bord na Móna seeks to work with all of the relevant local authorities to ensure that the most appropriate after-uses are reflected in local planning policy. The following areas of consistent

importance are of both direct and indirect relevance to Bord na Móna: heritage, tourism, biodiversity/conservation, landscape, renewable energy, and economy/enterprise.

12 National Archaeology Code of Practice

Bord na Móna operates under an agreed Code of Practice regarding archaeology with the Department of Arts, Heritage and the Gaeltacht and the National Museum of Ireland which provides a framework to enable the Company to progress peat extraction whilst carrying out archaeological mitigation. (https://www.archaeology.ie/sites/default/files/media/publications/cop-bord-na-mona-en.pdf

The Code replaced a set of Principles agreed with the Department of Arts, Heritage and the Gaeltacht in the 1990s. Under the Code Bord na Móna, the Minister and Director work together to ensure that appropriate archaeological mitigation is carried out in advance of peat extraction.

- BNM must ensure that any monuments or archaeological objects discovered during peat extraction are protected in an appropriate manner by following the Archaeological Protection Procedures.
- BNM must ensure that any newly discovered monuments on Bord na Móna lands are reported in a timely manner to the National Monuments Service of the Department of Arts, Heritage and the Gaeltacht.
- BNM must ensure that any archaeological objects discovered on Bord na Móna lands are reported immediately to the Duty Officer of the National Museum of Ireland.
- Bord na Móna will adhere to the Archaeology Code of Practice relating to management of any archaeological finds that may arise during cutaway peatland rehabilitation and decommissioning.

13 Bord na Móna Biodiversity Action Plan 2016-2021

Rehabilitation of industrial peatlands is a key objective of the Bord na Móna Biodiversity Action Plan 2016-2021. This action plan outlines the main objectives and actions around biodiversity on Bord na Móna lands. The Bord na Móna Biodiversity Action Plan also outlines key International and European policy in relation to biodiversity. This includes the United Nations Convention on Biodiversity 2011-2020 (CBD) and European Biodiversity Strategy to 2020. Further details of these policies and Bord na Móna s responses can be found in the Bord na Móna Biodiversity Action Plan (Bord na Móna, 2016). Both policy documents highlight targets such as reducing pressure on biodiversity, promoting sustainability, habitat restoration and benefits of ecosystem services.

One example of a key CBD target is:

- *"Restore at least 15% of degraded areas through conservation and restoration activities."*

The EUs headline target for progress by 2020 is to:

- *"halt the loss of biodiversity and the degradation of ecosystems in the EU by 2020, restore them as far as feasible, while stepping up the EU contribution to averting global biodiversity loss."*

This rehabilitation plan is aligned to the CBD target and the EU Biodiversity Strategy target and will help Ireland meet its commitment to these international Biodiversity polices.

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14 Bord na Móna Commitments

Bord na Móna made the commitment in 2009 not to develop any new peatland sites for industrial peat production. The company has continued to work with different stakeholders.

The company announced that industrial peat production would be cut by over 50 percent in 2019 and would entirely cease over most of its lands by the mid-2020s. Rehabilitation measures would continue to be carried out with the focus on re-wetting and rehabilitation of cutover and cutaway areas in line with national policies (such as the National Peatland Strategy, the National Biodiversity Action Plan, the Climate Action Plan 2019, the Water Framework Directive, etc.) and rehabilitation guidelines set down by the Environmental Protection Agency. To date, 15,000 hectares of cutaway and cutover bog have been rehabilitated using this approach with 5,000 hectares in active rehabilitation.

In line with Bord na Móna's accelerated decarbonisation programme, the company made a further commitment to a significantly larger rehabilitation target. This was reflected in our plans to rehabilitate a further 20,000 hectares of cutaway and cutover bog to wetland and woodland mosaics by 2025. In addition, we planned to restore a further 1,000 hectares of raised bog habitat by 2025.

The above commitments have now been followed by the decision by the company to cease industrial peat extraction and rehabilitate a target of 33,000 ha between 2021-2025.

These commitments outline the importance of peatland rehabilitation to Bord na Móna. The company will continue to demonstrate environmental responsibility and continue to deliver on these commitments in relation to peatland rehabilitation and in relation to the future management of these lands to maximise their benefits, particularly their ecosystem service benefits, along with the sustainable development of a portion of the land bank for other uses, such as renewable energy.

15 Bord na Móna Strategic Framework for the future use of cutaway peatlands 2020 (Draft)

The general after-use strategy of Bord na Móna is outlined in the Bord na Móna Strategic Framework for Future-Use of Cutaway Bogs 2020 (draft document). This document outlines how Bord na Móna's cutover peatland estate is complex in nature with great variability in terms of peat depths, peat types, drainage, subsoil condition and environmental value. Thus, future options require consideration on a site-specific basis, also bearing in mind the considerable internal variation within bogs. The development of the land-bank will also take account of national needs, while also taking account of the various national legislation, policies and plans related to the management of peatlands. In general, Bord na Móna will seek to balance and optimise commercial, social, and environmental value of these sites, and develop integrated land-uses, while taking account of the need for sustainability and their biodiversity value.

Any consideration of other future after-uses for Bord na Móna land such as development or other mixed uses will be conducted following the relevant planning guidelines and consultation with relevant authorities and will be considered within the framework of this peatland rehabilitation plan.

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APPENDIX VI. DECOMMISSIONING

1. Condition 10 Decommissioning

This is a requirement of the applicable Integrated Pollution Control Licence issued by the Environmental Protection Agency. This condition 10.1 requires the following:

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

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

The main success criteria pertaining to successfully complying with this condition is ensuring that no environmental liability remains from this infrastructure and material and that the bog can be deemed suitable for surrender of the license under section 95 of the EPA Acts. This is achieved by Bord na Móna identifying and quantifying any mechanical and infrastructural resources that were installed in the bog to enable the development and production operation at the site. This list is then refined to identify any items that would be deemed as possibly resulting in environmental pollution, should they not be removed.

Typically, these items/infrastructures would be any remaining, unconsolidated plant, equipment and attachments, waste materials, unused raw materials such as land drainage pipes, remaining peat stockpiles, stockpile covering, pumps, septic tanks and fuel tanks.

In relation to this bog, the list and tasks would be as follows:

Item	Description	Derryadd Decommissioning Plan
1	Clean-up of remaining or unconsolidated waste or materials located in Bogs, Yards, Buildings and Offices	Where relevant
2	Cleaning Silt Ponds	Cleaning Silt Ponds
3	Decommissioning Peat Stockpiles	Where relevant
4	Decommissioning or Removal of Buildings and Compounds	Where relevant
5	Decommissioning Fuel Tanks and associated facilities	Where relevant
6	Decommissioning and Removal of Bog Pump Sites	Where relevant
7	Decommissioning or Removal of Septic Tanks	Where required

In addition, condition 7 of the licence requires these now defined waste items to be disposed of or recovered as follows:

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

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

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

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

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

7.3.3 The ultimate destination of the waste.

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

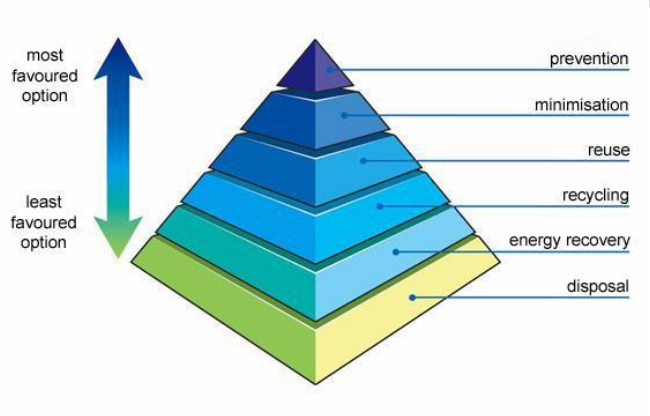
7.3.5 The tonnages and EWC Code for the waste materials listed in *Schedule 2(i) Hazardous Wastes for Disposal/Recovery* and *Schedule 2(ii) Other Wastes for Disposal/Recovery* sent off-site for disposal/recovery.

7.3.6 Details of any rejected consignments.

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

As required by the licence, these waste items will be removed for recycling or disposal, using external contractors with the required waste collection permits, approved under 7.2, with waste records maintained as required under 7.3.

Where possible, Bord na Móna will utilize the appropriate waste hierarchy to identify waste that can reused or recycled ahead of disposal.



The validation of the success of condition 10.1 is carried out through an Independent Closure Audit (ICA), followed by and EPA Exit Audit (EA) and the eventual partial or full surrender of the licence.

APPENDIX VII. GLOSSARY

Cutaway Bog: A Bord na Móna site generally becomes cutaway when it is economically unviable to continue industrial peat extraction or when the majority of peat has been removed.

Deep peat cutover bog: Deep peat cutover bog is defined as former raised bogs that have been in industrial peat production, where production has ceased but the residual peat depth is typically in excess of 2m. *Sphagnum* mosses are key species of raised bogs and the majority of the peat mass is formed from these mosses. *Sphagnum* species and other raised bog species are a key part of raised bog habitat function and prefer more acidic, nutrient poor, water-logged conditions. Typical raised bog *Sphagnum* mosses and other bog species do not thrive with the more typical alkaline water chemistry of cutaway bog but do grow well in these more acidic conditions where peat has been re-wetted. There is potential to re-develop embryonic *Sphagnum*-rich plant communities in these conditions if the peat can be re-wetted. This brings the opportunity of re-developing embryonic *Sphagnum*-rich vegetation communities that are considered Carbon sinks or peat-forming habitats and restoring the carbon sequestration function of these sites.

Dry cutaway bog: Cutaway bog is categorised as dry cutaway where it is not practical or feasible to re-wet these areas completely. It is inevitable that some areas of cutaway will remain relatively dry due to the heterogenous topography of the cutaway, as well as requirements for continued drainage on site for identified after-uses, or off site in relation to neighbouring lands or other infrastructure. Ridges and mounds of glacial deposits can become exposed during peat extraction and form a heterogenous topographical mosaic separated by basins. Dry cutaway may have very thin or no residual peat where ridges and mounds have been exposed. The exposed sub-soils are a mix of glacial gravels, muds and tills that can be quite free-draining. Dry cutaway may also have deeper residual peat but in a location (i.e. at the margin) where the peat cannot be re-wetted due to boundary constraints. Dry cutaway may also develop in situations where there a relatively steep slope that inhibits re-wetting. The majority of dry cutaway will develop towards grassland, heath, scrub and dry woodland habitats.

Environmental stabilisation: The key objective of peatland rehabilitation is environmental stabilisation. This means developing habitats and vegetation back onto the bare peat, slowing water movement across the bog, minimising effects to downstream waterbodies and meeting the conditions of the IPC Licence. This is achieved by a combination of re-wetting, where possible, and natural colonisation of the former cutaway, with or without intervention**.** Habitats will develop that reflect the underlying environmental conditions. Other after-use development may also serve to act as environmental stabilisation.

Marginal land: Marginal land is defined as land around the margin of the industrial peat production area. This margin generally contains a range of habitats including scrub, Birch woodland, cutover bog and raised bog remnants. It has a variety of land-uses including turf-cutting (private turbary).

Rehabilitation: Rehabilitation is defined in general by Bord na Móna as environmental stabilisation of the former cutaway. This is generally achieved via re-wetting, where possible, and natural colonisation of the former cutaway, with or without intervention. It is not possible to restore raised bog habitats on BnM cutaway in general in the short-term. In general, most of the peat mass has been removed from many BnM cutaway sites and the environmental characteristics of these areas have therefore changed radically (peat depths, hydrology, water chemistry, substrate type, nutrient status. This means there will therefore be different habitat outcomes (wetlands, fen, heathland, grassland and Birch woodland). Other after-use development may also serve to act as rehabilitation.

Restoration: Ecological restoration to defined as the process of re-establishing to the extent possible the structure, function and integrity of indigenous ecosystems and the sustaining habitats they provide" (SER 2004).

Defined in this way, restoration encompasses the repair of ecosystems (Whisenant 1999) and the **improvement of ecological conditions in damaged wildlands** through the **reinstatement of ecological processes**. In general, Bord na Móna cutaway peatlands cannot be restored back to raised bog in a reasonable timeframe as their environmental conditions has changed so radically (with the removal of the acrotelem – the living layer and much of the peat mass). However, they can be returned to a **trajectory** towards a naturally functioning peatland system (Renou-Wilson 2012). **Raised bog restoration** is an objective of some BnM sites where there is residual natural raised bog vegetation and where the majority of the peat is still intact.

Standard rehabilitation: This is defined as rehabilitation that is designed to meet the conditions of the EPA IPC Licence. The key objective of rehabilitation is environmental stabilisation. This is achieved by a combination of re-wetting, where possible, and natural colonisation of the former cutaway, with or without intervention**.** Other after-use development may also serve to act as rehabilitation.

Standard decommissioning: This is defined as decommissioning that is designed to meet the conditions of the EPA IPC Licence. This is defined as to render safe or remove for disposal/recovery, any soil, subsoils, buildings, plant or equipment, or any waste, materials or substances or other matter contained therein or thereon, that may result in environmental pollution.

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APPENDIX VIII. EXTRACTIVE WASTE MANAGEMENT PLAN

(Minimisation, treatment, recovery and disposal)

Objective:
The objective of this generic plan is to comply with the requirements of regulation 5 of the Waste Management (Management of Waste from Extractive Industries) Regulations, and to prevent or reduce waste production and its harmfulness.

Scope:
This plan covers IPPC Licence's Ref P0504-01, Mount Dillon Group of Bogs located in Counties Roscommon, Longford and Westmeath.

1.0 Extractive Waste:
Waste classified as extractive waste from peat extraction operations arise from three operations associated with this activity.

1.1 Silt Pond excavations and maintenance.
All peat extraction activities in the Mount Dillon bog group are serviced by silt lagoons/ponds. During the excavation of these silt ponds, pre IPPC Licensing in 1999 and since licensing, the excavated material is stored adjacent to the silt pond, where it either remains in situ ores levelled out. As required by condition 6.6, these silt lagoons are cleaned twice per annum or more often if inspections dictate. These silt cleanings are also deposited on the same location, adjacent to the silt pond, where they may be levelled periodically to allow room for subsequent cleanings. These mounds of silt pond excavation material and cleanings are generally no higher that 2-3 metres.

1.2 Power Station screenings:
Edenderry Power Station screens the peat from the bogs prior to processing. This screening removes oversized peat, stones and bogs timbers. Schedule 3 (ii) of the IPPC licence permits disposal of these peat screenings back to the bog, where it is levelled and graded into the surrounding peat landscape. These locations have been agreed with the Agency as per condition 7.4 of the IPPC Licence, and as per the attached locations.

1.3 Bog Timbers:
During peat extraction operations, bog timbers often arise in the bog surface and are required to be cleared. These timbers consist of bog pine, oak and some yew. Some of these timbers, such as Oak and Yew are removed for use in the wood craft industry, with the remaining bog pine stockpiled in locations at the opposite end of each bog, where it generally becomes a habitat for flora and fauna. These piles of timber are generally no higher than 1-2 metres.

2.0 P0504-01 IPPC Licence Extractive Waste Conditions

2.1 Condition 7.5 Extractive Waste Management
The licensee shall draw up a Waste Management Plan (to be known as an Extractive Waste Management Plan) for the minimisation, treatment, recovery and disposal of extractive waste. This Plan shall meet the requirements of regulation 5 of the Waste Management (Management of Waste from the Extractive Industries) Regulations,2009. The Plan shall be submitted for agreement by the Agency by the 31' December 2012. The Plan shall be reviewed at least once every five years thereafter in a manner agreeable to the Agency and amended in the event of substantial changes to the operation of a waste facility or to the waste deposited. Any amendments shall be notified to the Agency.
All extractive waste shall be managed in accordance with the Extractive Waste Management Plan. A report on the implementation of the Extractive Waste Management Plan shall be provided in the AER.

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2.2 Condition 7.6 Waste Facility

(i) No new waste facility may be developed or an existing waste facility modified unless agreed by the Agency.
(ii) The licensee shall ensure that all existing waste facilities are managed and maintained to ensure their physical stability and to prevent pollution or contamination of soil, air, surface water or groundwater.
(iii) The licensee shall ensure that all new waste facilities are constructed, managed and maintained to ensure their physical stability and to prevent pollution or contamination of soil, air, surface water or groundwater.
(iv) Operational measures shall be continuously employed to prevent damage to waste facilities from personnel, plant or equipment.
(v) The licensee shall establish and maintain a system for regular monitoring and inspection of waste facilities.
(vi) All records of monitoring and inspection of waste facilities, as required under the licence, shall be maintained on-site in order to ensure the appropriate handover of information in the event of a change of operator or relevant personnel.

2.3 Condition 7.7 Excavation Voids

7.7.1 Unless otherwise agreed by the Agency, only extractive waste shall be placed in excavation voids.
7.7.2 When placing extractive waste into excavation voids for rehabilitation and construction purposes, the licensee shall, in accordance with regulation 10 of the Waste Management (Management of Waste from the Extractive Industries) Regulations, 2009, and the Extractive Waste Management Plan:

- Secure the stability of the waste
- Put in place measures to prevent pollution of soil, surface water and ground water.
- Carry out monitoring of the extractive waste and excavation void.

Condition 7.5. Extractive Waste Management Plan. 5 (1)

3.0 Minimisation.

3.1 Silt pond excavation material and cleanings.

IPPC Licence conditions require all production areas to be serviced by an appropriately designed silt pond based on storage volume and retention time. Condition 6.6 requires all ponds to be cleaned bi-annually and more often if inspections dictate, so the only opportunity for minimisation of same is through Standard Operating Procedures. These are required under condition 2.2.2 (i) regarding minimisation of suspended solids, and are in-place to minimise the generation of silt, which in-turn will minimise the generation of silt pond waste.

3.2 Power Station Screenings.

These screenings cannot be minimised as they are a consequence of peat production, stones, timbers and oversize peat materials are naturally occurring on the bog, and are required to be removed prior to processing.

3.3 Bog Timbers.

Bog timbers are also naturally occurring materials within a bog and are required to be removed prior for production. The volume of these bog timbers varies from bog to bog and as such their minimisation is not controllable or quantifiable.

4.0 Treatment

4.1 Silt pond excavation material and cleanings.

The silt pond excavation material and silt cleanings do not require any treatment for its end use which will be either backfilling these silt pond voids as per condition 7.7.1 above as part of the Bog Rehabilitation Plan, or reincorporated into the surrounding peatlands.

4.2 Power Station Screenings.

The factory screenings are permitted to be returned to the bog as they were naturally occurring materials from the bog, and as such do not require any treatment to serve this purpose.

4.3 Bog Timbers
As per 1.3 above, these timbers are stockpiled at two locations in each bog, as per the attached list of sites and become habitats for various flora and fauna.

5.0 Recovery
5.1 Silt pond excavation material and cleanings.
Condition 2.2.2 (vi) requires the reuse of silt pond waste to be examined. This was undertaken in 2006, the outcome of which was that this waste peat silt material, as a fuel, was contaminated with sub-soils, rendering it unsuitable for combustion. In addition, volumes are small compared to overall peat production volumes.

5.2 Power Station Screenings.
Given the nature of these screenings as outlined in 1.2 above, there is no further use identified and they are permitted to be disposed of back to the bog.

5.3 Bog Timbers
Investigations into processing these materials into smaller fractions for potential heating purposes did not yield any viable results. In addition, these older stockpiles are now classified as habitats and as such would not be considered for reuse as a fuel.

6.0 Disposal
6.1 Silt pond excavation material and cleanings.
Schedule 3 (ii) permits the disposal of silt pond cleanings (Lagoon Sediments) to the bog and these locations, adjacent to the silt pond site, are presented in the attached spreadsheet, with associated grid coordinates.

6.2 Power Station Screenings.
Schedule 3 (ii) permits the disposal of screenings (Peat Screenings) to the bog at designated locations agreed under Condition 7.4, and these locations, are presented in the attached spreadsheet, with associated grid coordinates.

6.3 Bog Timbers
These naturally occurring bog timbers are stockpiled at locations in each bog, grid coordinates attached.

7.0 Extractive Waste Management Plan

5 (2a)(i)
The vast majority of peat extraction bogs were all designed and drained for production prior to the 1960's and as such the production fields layout cannot' be altered. Under our Cleaner Reduction Procedures, various design changes have been implemented to the production machines and process to reduce lost peat which eventually is captured in the silt ponds and requires removal as waste peat silt. This along with training and ongoing research and development will continuously reduce waste peat and subsequently waste silt pond cleanings. Bog timbers are present naturally in various volumes and quantities in different bogs and as peat production involves stripping peat in layers, the exposure, generation and removal of these timbers is unavoidable. Work has been undertaken recently into project looking at grinding of these bog timbers in situ using a timber miller, and if this project becomes viable it will contribute to the reduction of bog timbers.

5 (2a)(ii)
Given the nature and expanse of peat bogs, the stockpiling and storage of these waste materials do not present a visual, storage or stability problem. As required under Condition 10 of the IPPC Licence, the silt pond excavations and screenings will be utilised to backfill the silt pond voids once the bogs have finished and stabilised in accordance with out Bog Rehabilitation Plan. Storage of these wastes in the interim, open to the elements does

not present a change on the nature of these wastes that will threaten the environment or prevent their reuse during the bog rehabilitation process.

5 (2a)(iii)
Under Condition 10 of the IPPC Licence, all silt ponds will be decommissioned once the bog surface has stabilised, in agreement with the Agency. This will involve the removal of weirs and flow controls, returning the silt pond back to its original drain or removing the silt pond from the drainage system. Both of these activities will involve placing the silt pond extraction and cleaning material back into the excavation void.

5 (2a)(iv)
The peat bogs do not contain any topsoil, so this is not required.

5 (2a)(v)
Peat mineral resources do not undergo any treatment.

5 (2b)
These three extractive waste are all being reused and recovered back to their original extraction points and have not undergone any physical, chemical, or biological change.

5 (2c)(i, ii & iii)
These three extractive wastes, stored on the bog for reuse or recovery during the bog rehabilitation phase, do not require any management or monitoring during the operation of these bogs. Silt pond excavations and cleanings are stored adjacent to the silt pond and quickly revegetated and stabilise, the screenings are graded back into the bog at the agreed locations upon disposal and the bog timbers do not prevent any water or airborne danger to the environment.

5 (3)
The three extractive wastes arising from peat extraction operations at this site are classified wastes from mineral non-metalliferous excavation, with an EWC code of 0101 02. The materials are not classified as hazardous under Directive 91/689/EEC20, and do not contain substances or preparations classified as dangerous under Directives 67/548/EEC5 or 1999/45/EC6 above a certain threshold.
The peat excavations and cleanings are stored in locations and in a manner that they could not collapse, and are remote in their nature. The stockpiles are located adjacent to silt ponds that are cleaned regularly and as such these stockpiles are managed and levelled to facilitate further cleanings.
Therefore the material stored at these waste facilities would not be considered to be a Category A waste facility.

Classification in accordance Annex II.

Waste Material	Description	Classification	Chemical Process treatment	Deposition description	Transport System
Silt Pond Excavations and cleanings	Peat and mineral soils associated with peatlands. Stored for reuse during bog rehabilitation, with no displacement of overburden	01 01 02	None	Excavated from silt ponds by excavator and deposited adjacent to the silt pond.	Excavator
Peat Screenings	Stones, timbers and oversized peat particles, reincorporated into low	01 01 02	None	Removed by screen at the factory and	Tractor and trailer.

Waste Material	Description	Classification	Chemical Process treatment	Deposition description	Transport System
	areas, agreed with the Agency, and stabilized under normal natural bog conditions			transported by tractor and trailer to the designated and agreed locations	
Bog Timbers	Pine, Oak and Yew species, stored at locations in each bog. Not subject to any stability issues due to exposure to atmospheric/meteorological conditions.	01 01 02	None	Removed from the bog surface by excavator and transported by tractor and trailer to the agreed locations	Tractor and Trailer

Description of operations.

Silt pond excavations arise from the requirement to have silt ponds treating all peat extraction sites. Silt pond cleanings arise from the removal of peat silt from silt ponds as required under IPPC Licence. Bog timbers arise from preparation of the bogs surface for peat production. Estimated quantities of materials are below:

Closure plan. (Bog Rehabilitation Plan).

Condition 10.1 – 10.3 of the IPPC Licence requires the following:

- 10.1 Following termination of use or involvement of all or part of the site in the licensed activity, the licensee shall:
- 10.1.1 Decommission, render safe or remove for disposal/recovery, any soil, subsoils, buildings, plant or equipment, or any waste, materials or substances or other matter contained therein or thereon, that may result in environmental pollution.
- 10.1.2 Implement the agreed cutaway bog rehabilitation plan (refer Condition 10.2).

10.2 Cutaway Bog Rehabilitation Plan:

- 10.2.1 The licensee shall prepare, to the satisfaction of the Agency, a fully detailed and costed plan for permanent rehabilitation of the cutaway boglands within the licensed area. This plan shall be submitted to the Agency for agreement within eighteen months of the date of grant of this licence.
- 10.2.2 The plan shall be reviewed every two years and proposed amendments thereto notified to the Agency for agreement as part of the AER. No amendments may be implemented without the written agreement of the Agency.

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

- 10.3.1 A scope statement for the plan; to include outcome of consultations with relevant Agencies, Authorities and affected parties (to be identified by the licensee).
- 10.3.2 The criteria which define the successful rehabilitation of the activity or part thereof, which ensures minimum impact to the environment.
- 10.3.3 A programme to achieve the stated criteria.

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- 10.3.4 Where relevant, a test programme to demonstrate the successful implementation of the rehabilitation plan.
- 10.3.5 A programme for aftercare and maintenance.

10.4 A final validation report to include a certificate of completion for the Rehabilitation Plan, for all or part of the site as necessary, shall be submitted to the Agency within six months of execution of the plan. The licensee shall carry out such tests, investigations or submit certification, as requested by the Agency, to confirm that there is no continuing risk to the environment. This plan including maps and ecological classifications are available on file at the Mount Dillon IPPC Licence Coordinators office.

The location in relation to the silt pond excavations and cleanings are adjacent to the silt ponds, which are considered under the Shannon River Basin Management Plan in accordance with the requirements of Directive 2000/60/EC.

Screenings and bog timbers are all naturally occurring elements of peatland and there placement back to the bog in smaller concentrated designated waste facilities does not constitute a risk to the prevention of water compliance.

The lands under where these materials are deposited are peatlands and are un-effected by the placing of this material.

Review.

This plan will be reviewed every five years, the first review to take place in September 2017. This review will entail an inspection of these waste facilities to ensure their placing, management, maintenance and stability comply with the requirements of the Extractive Waste Management requirements and condition 7.5, 7.6 and 7.7 of the Mount Dillon IPPC Licence P0504-01.

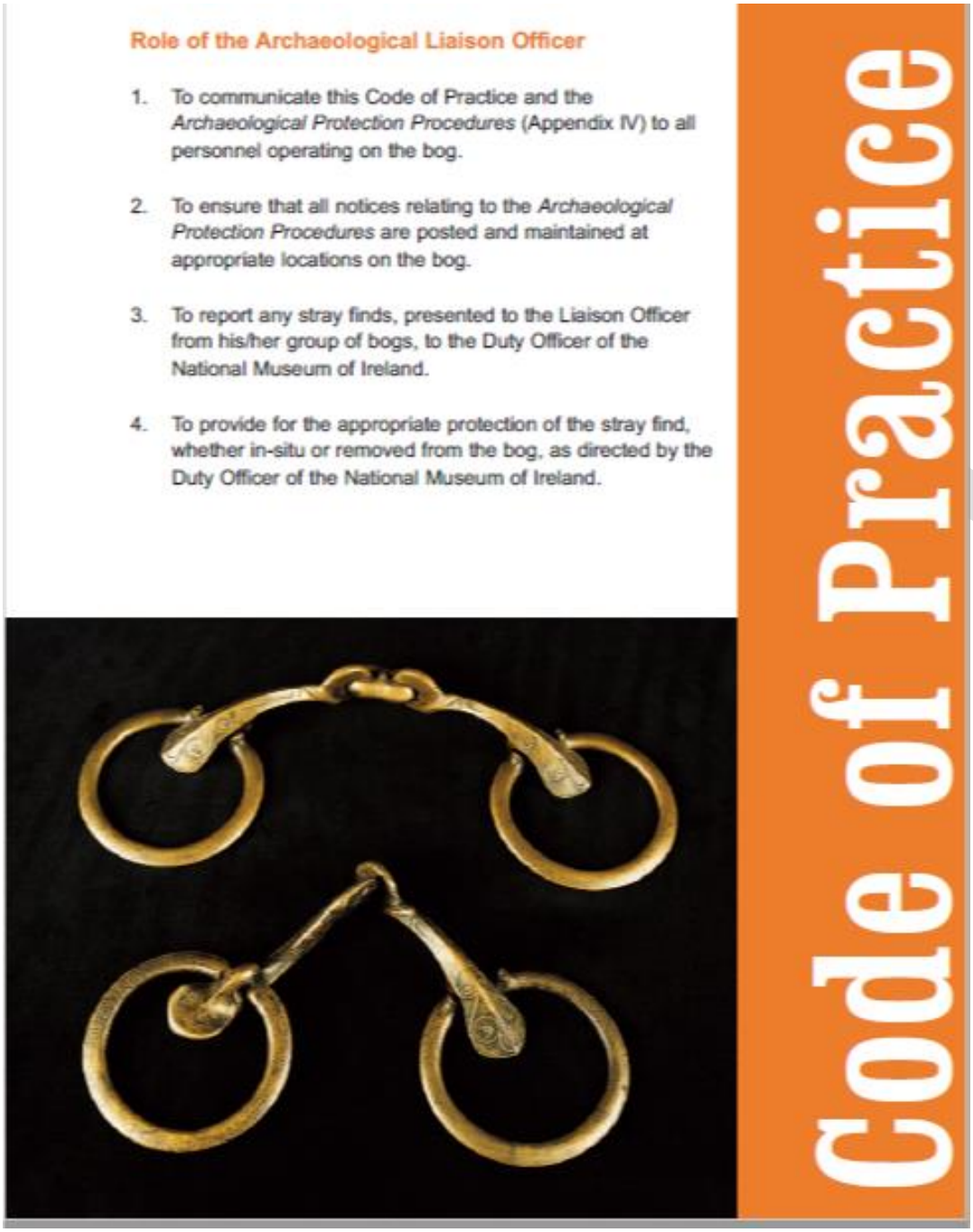
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APPENDIX IX. MITIGATION MEASURES FOR THE APPLICATION OF FERTILISER

- Any fertiliser used will be Rock Phosphate and will not be applied in the following conditions:
    1. The land is waterlogged;
    2. The land is flooded, or it is likely to flood;
    3. The land is frozen, or covered with snow;
    4. Heavy rain is forecast within 48 hours (forecasts will be checked from Met Éireann).
    5. The ground slopes steeply and there is a risk of water pollution, when factors such as surface run-off pathways, the presence of land drains, the absence of hedgerows to mitigate surface flow, soil condition and ground cover are taken into account.
- No fertiliser will be spread on land within 2 metres of a surface watercourse.
- Buffer zones in respect of waterbodies, as specified on https://www.epa.ie/resources/faqs/environment--you/faq-listing/ , will be adhered with at all times with regard to fertiliser application. Reproduced as follows:

Water body / Feature	Buffer zone
Any water supply source providing 100m^3 or more of water per day, or serving 500 or more people	200 metres (or as little as 30 metres where a local authority allows)
Any water supply source providing 10m^3 or more of water per day, or serving 50 or more people	100 metres (or as little as 30 metres where a local authority allows)
Any other water supply for human consumption	25 metres (or as little as 30 metres where a local authority allows)
Lake shoreline	20 metres
Exposed cavernous or karstified limestone features (such as swallow holes or collapse features)	15 metres
Any surface watercourse where the slope towards the watercourse exceeds 10%	10 metres
Any other surface waters	5 metres*

APPENDIX X. ARCHAEOLOGY



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Code of Practice

5. To arrange for the delivery or collection of the stray find, as directed by the Duty Officer of the National Museum of Ireland.

6. To complete the Report of Discovery of Archaeological Object(s) in Bogs (Appendix V), as directed by the Duty Officer of the National Museum of Ireland.

7. To maintain a file of all stray finds and associated documentation and provide copies to the Project Archaeologist.

8. To provide assistance, where required, to the Department during archaeological surveys.

9. To provide assistance, where required, to Bord na Móna's Consultant Archaeologists, during investigation and mitigation of monuments.

10. To report to the Bord na Móna members on the Archaeology Management Liaison Committee any planned developments or new activities on cutaway peatland areas within his/her group of bogs.



Bord na Móna	**Procedure: ENV017**	**Rev: 1**
Title: Archaeological Findings	**Approved: EM**	**Date:**

1) Purpose

The purpose of this procedure is to describe the arrangements in Bord na Móna for findings of Archaeological material (Stray Finds).

All objects, sites or monuments, no matter how fragmentary, are important elements of our heritage.

2) Procedure

1. Check whether there are any known archaeological monuments in your area.
2. Be vigilant at all times - objects or traces of structures can be found on the field surfaces, in the drain faces, on the bog margins or caught within the mechanics of machinery.
3. If an object is found leave it in place, if it is safe to do so, note its position and immediately contact your Archaeological Liaison Officer who will assess the situation and contact the Duty Officer of the National Museum of Ireland.
4. Resist the temptation to investigate the find spot as this may disturb fragile archaeological deposits.
5. If the object is already dislodged or is in imminent danger, remove it carefully, mark its find spot and report it immediately to your Archaeological Liaison Officer.
6. Objects made of wood, leather or textile, which are removed from peat should be kept in conditions similar to those in which they are found. This can be done by packing them in peat or, if waterlogged, placing them in a clean basin of water and sealing the container. Resist the temptation to clean or remove peat from the object.
7. If timbers or other materials, such as gravel or stones, which could be part of a man-made structure are noted on the bog, mark the location and report it immediately to your Archaeological Liaison Officer. If you suspect the find is of archaeological importance, resist the temptation to expose it any further as this could result in damage to the structure.
8. Report anything that looks unnatural in the bog – your Archaeological Liaison Officer will decide whether it should be referred to the appropriate authorities.

NOTE: Our archaeological heritage is a finite, non-renewable resource. Once a site is destroyed its information is lost forever and we have lost the chance to understand a little more about our past, where we have come from and perhaps the opportunity to learn for the future.

Your Archaeological Liaison Officer is ……

3) Records

Revision Index			
Revision	Date	Description of change	Approved
1			
2			

Draft

Bord na Móna

Derryadd Bog
Draft Rehab Plan
GIS Map Book
2025

Document Control Sheet	
Document Name:	Derryadd Bog Draft Rehab Plan GIS Map Book 2025
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This document comprises:	DCS	TOC	Text (Body)	References	Maps	No. of Appendices
	1	1	0	0	13	0

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Name(s):	BG	LC	MMC
Date:	17/05/2024	17/05/2024	17/05/2024

Rev. 0.2	Author(s):	Checked By:	Approved By:
Name(s):	BG	JOS	CC
Date:	09/01/2025	09/01/2025	09/01/2025

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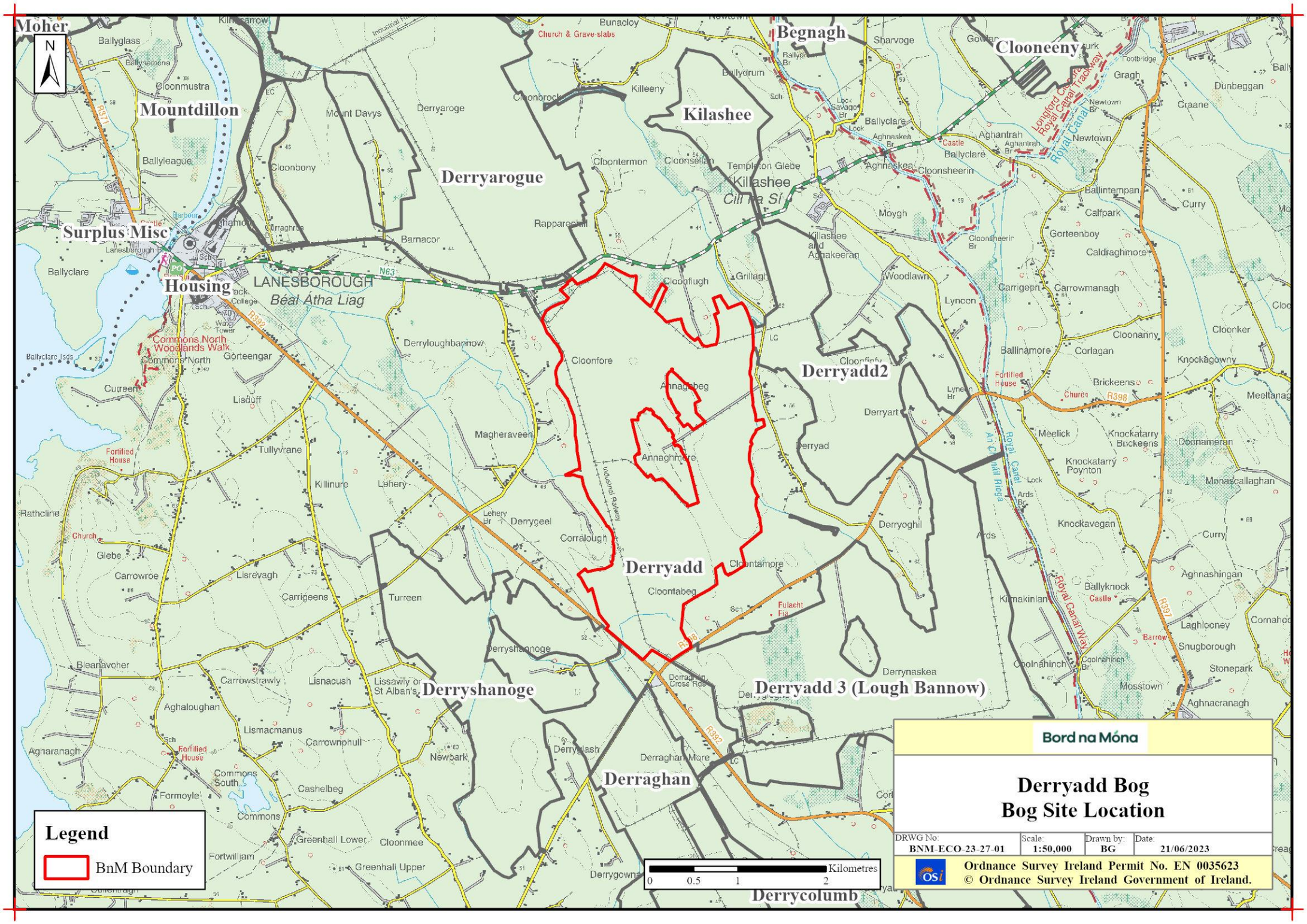
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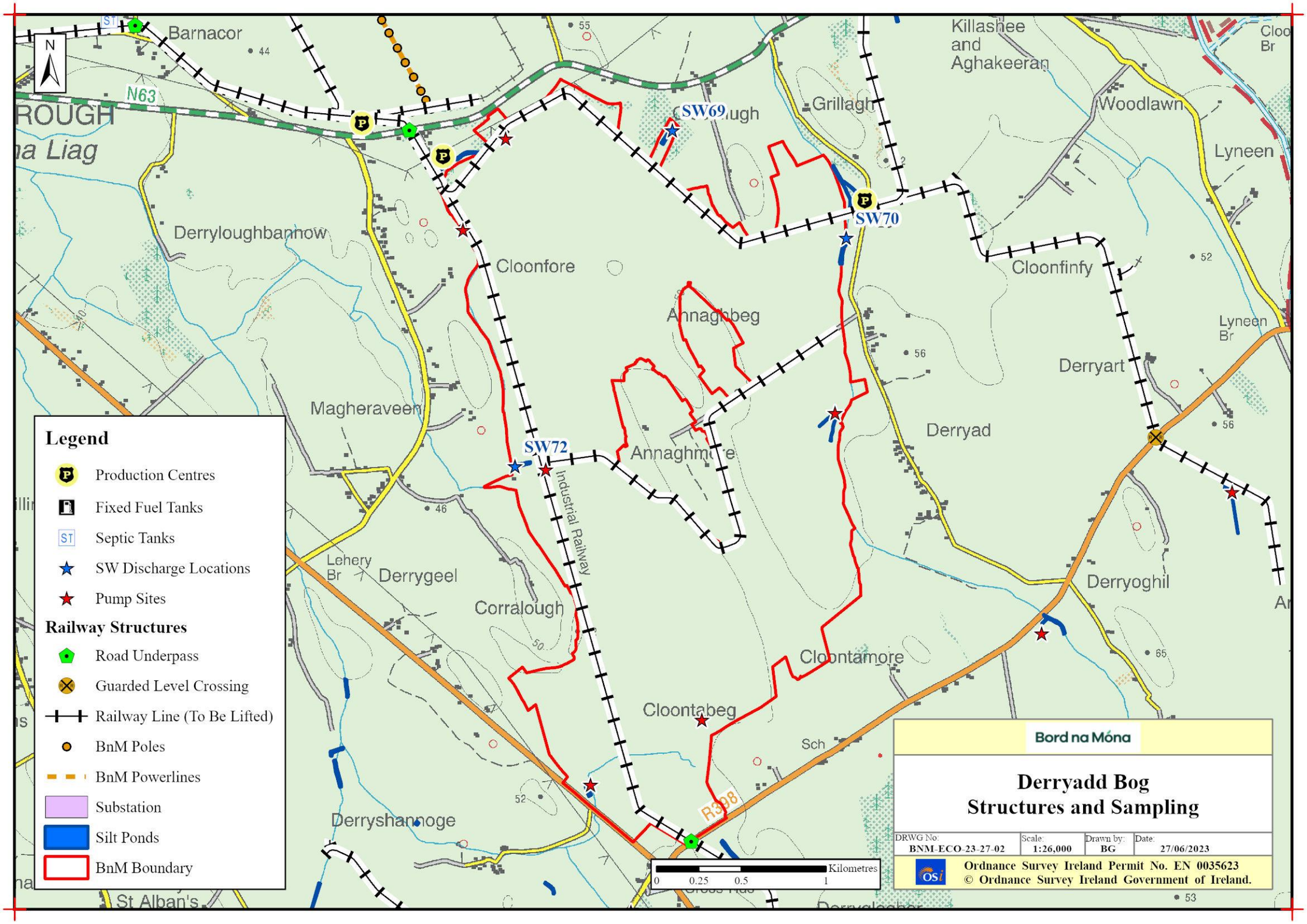
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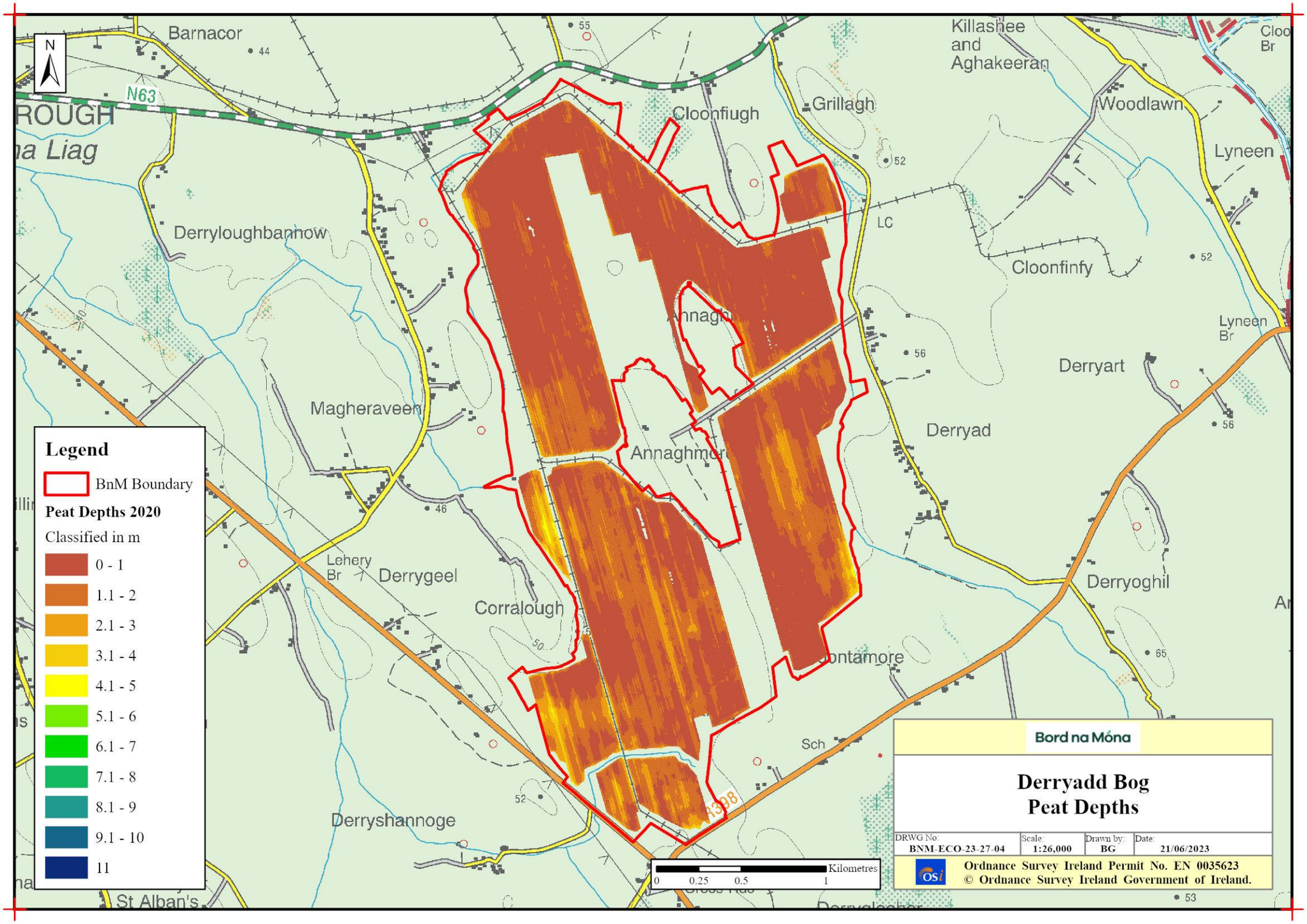
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Barnacor
N63
ROUGH
Derryloughbannow
Cloonfore
Magheraveen
Annaghbeg
Killashee and Aghakeeran
Grillagh
Woodlawn
Lyneen
Cloonfinfy
Lyneen Br
Derryart
Derryad
Derryoghil
Annaghmore
Lehery Br
Derrygeel
Corralough
Cloontamore
Cloontabeg
Derryshannoge
St Alban's
Industrial Railway
R398
SW69
SW70
SW72
Legend
Production Centres
Fixed Fuel Tanks
Septic Tanks
SW Discharge Locations
Pump Sites
Railway Structures
Road Underpass
Guarded Level Crossing
Railway Line (To Be Lifted)
BnM Poles
BnM Powerlines
Substation
Silt Ponds
BnM Boundary
Kilometres
0 0.25 0.5 1
Bord na Móna
Derryadd Bog
Structures and Sampling
DRWG No: BNM-ECO-23-27-02
Scale: 1:26,000
Drawn by: BG
Date: 27/06/2023
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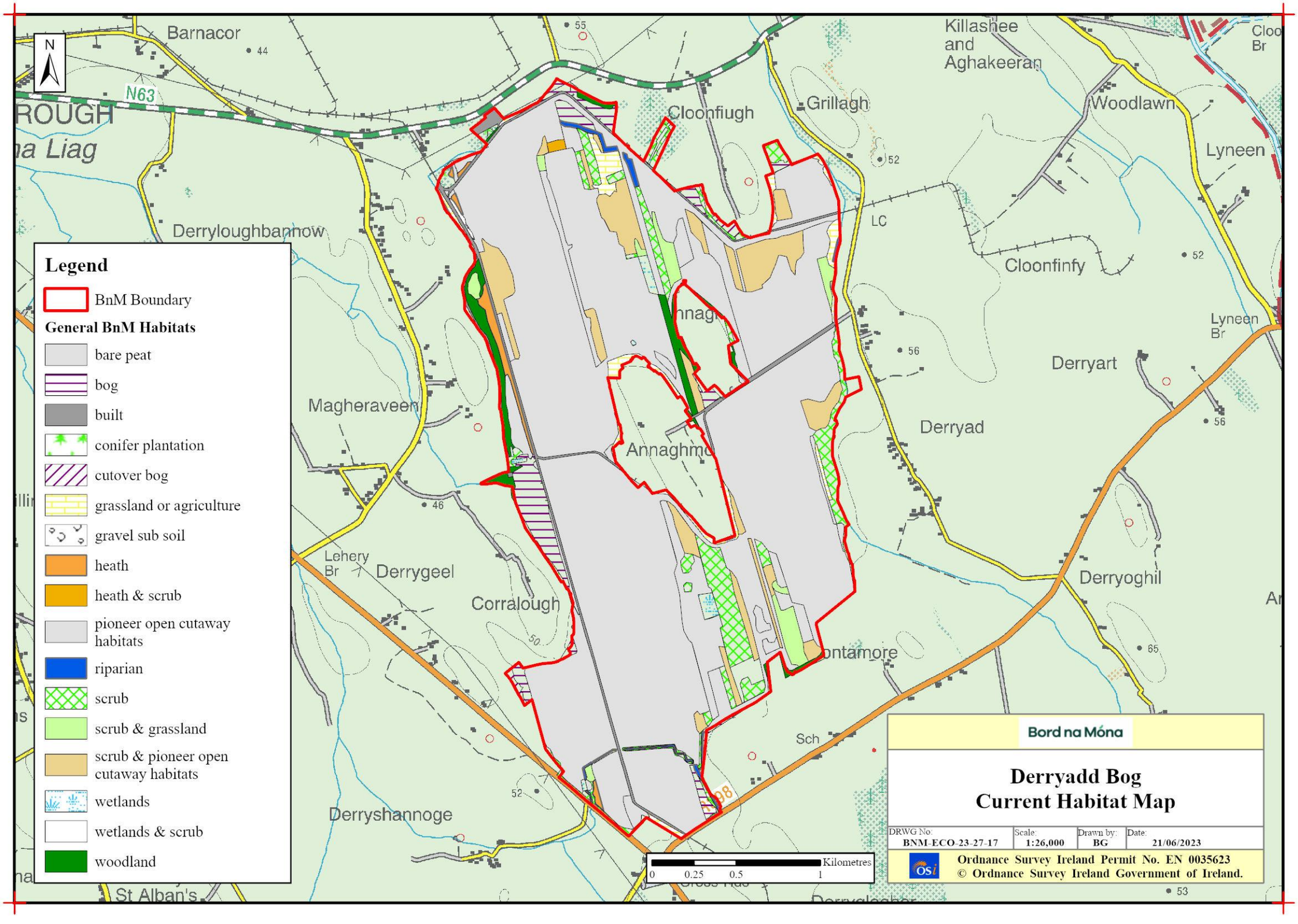
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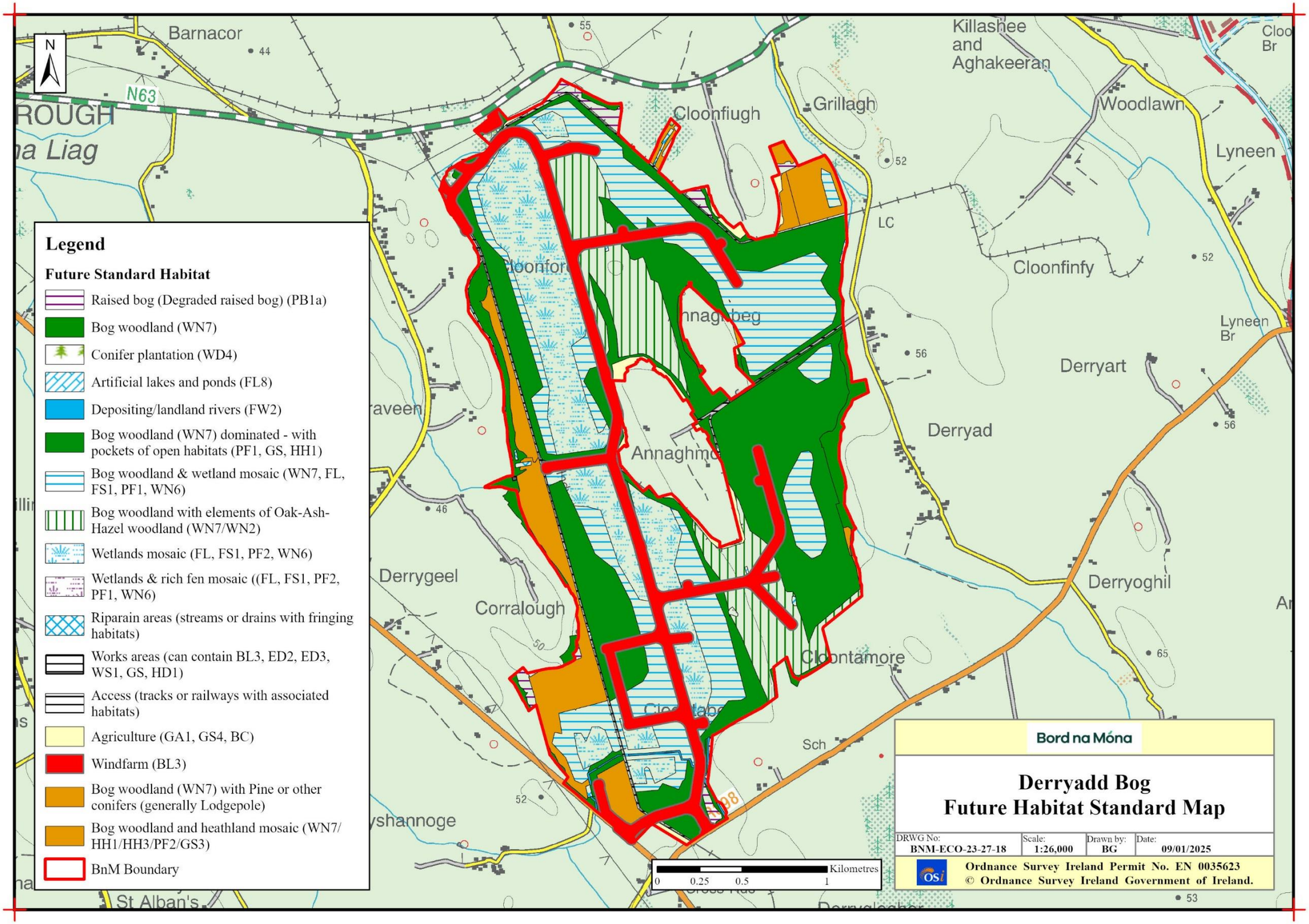
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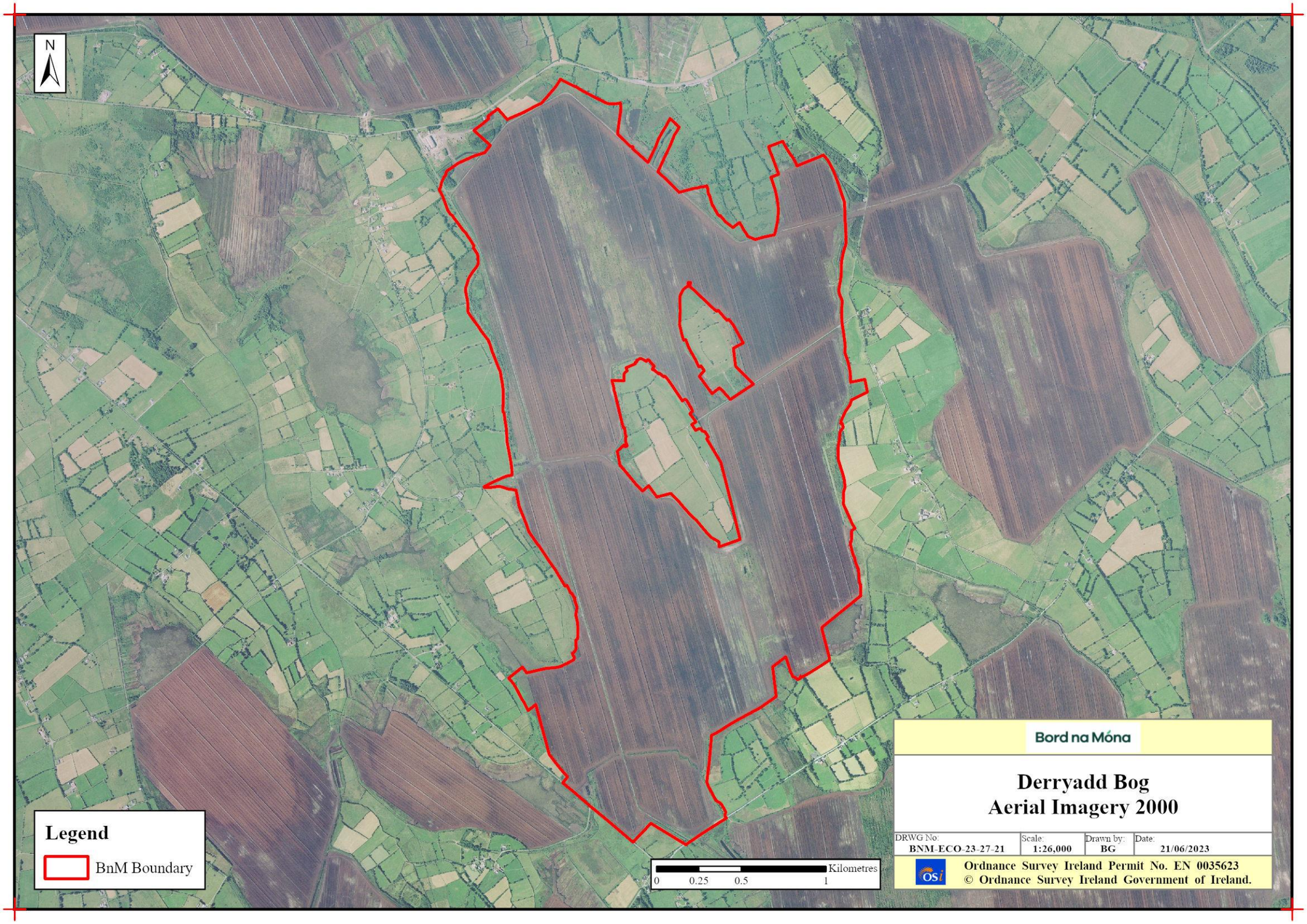
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BNM-ECO-23-27-21: Aerial Imagery 2000

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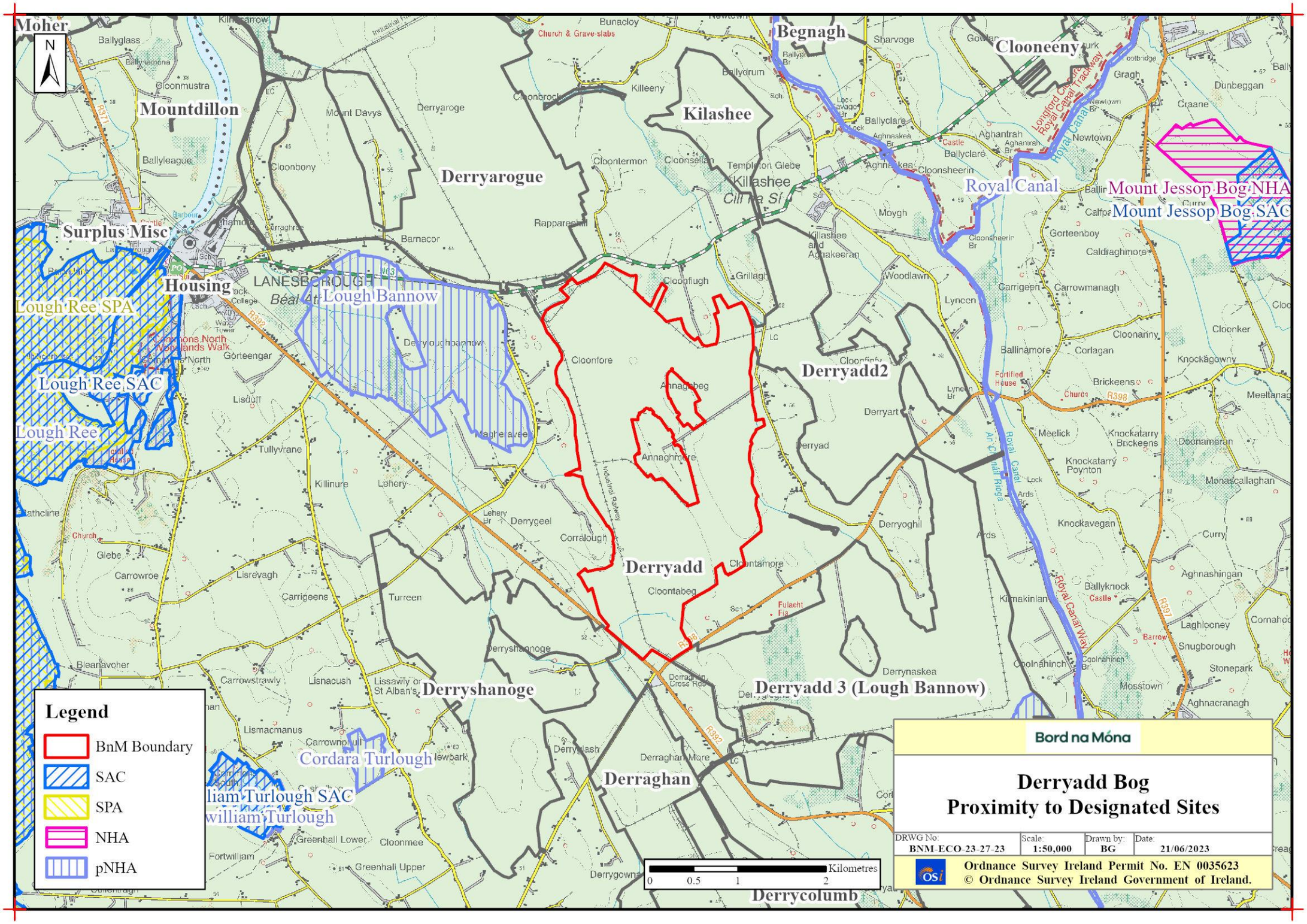
BNM-ECO-23-27-22: Aerial Imagery 2020

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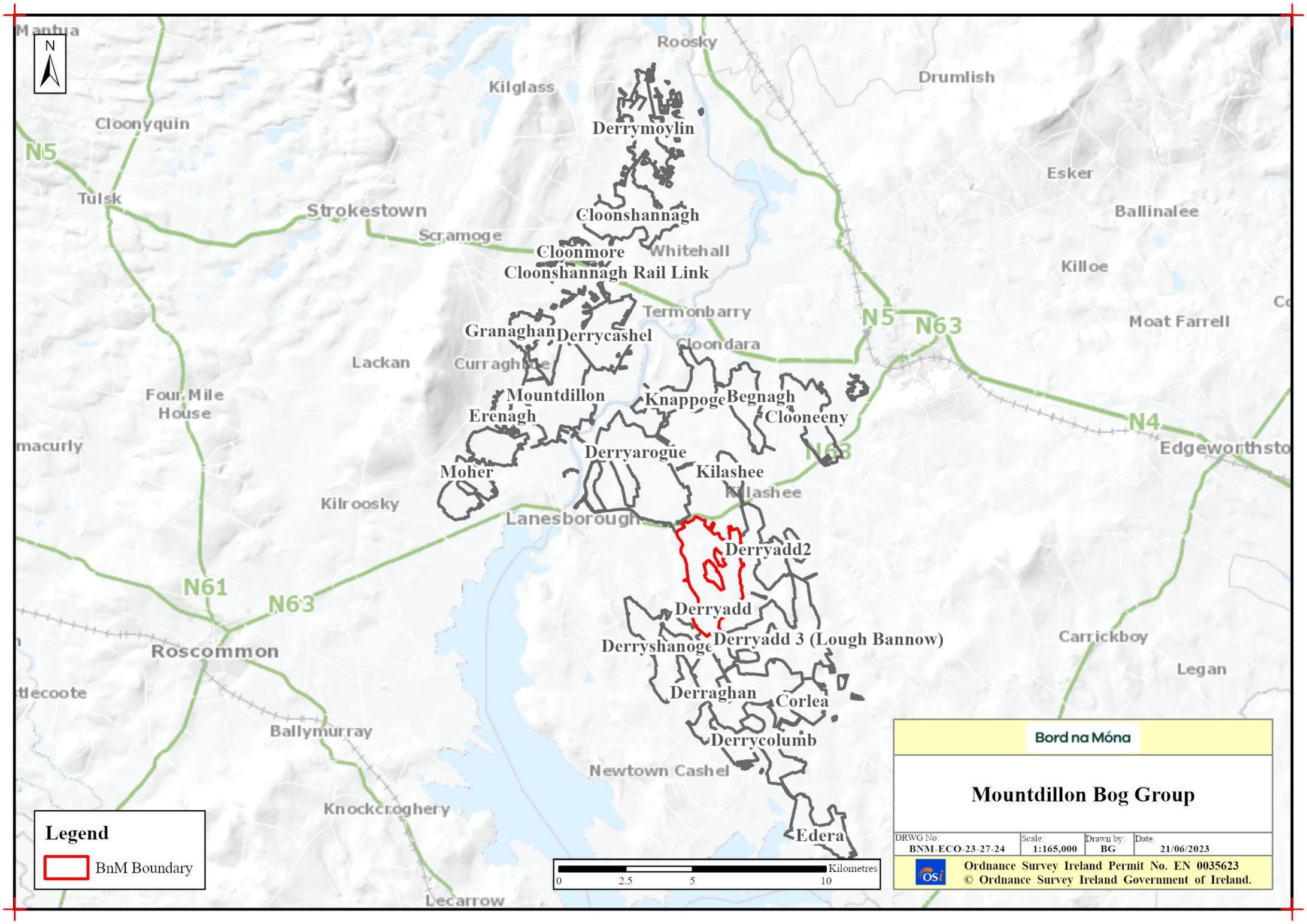
BNM-ECO-23-27-23: Proximity Designated Sites

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BNM-ECO-23-27-24: Bog Group Map

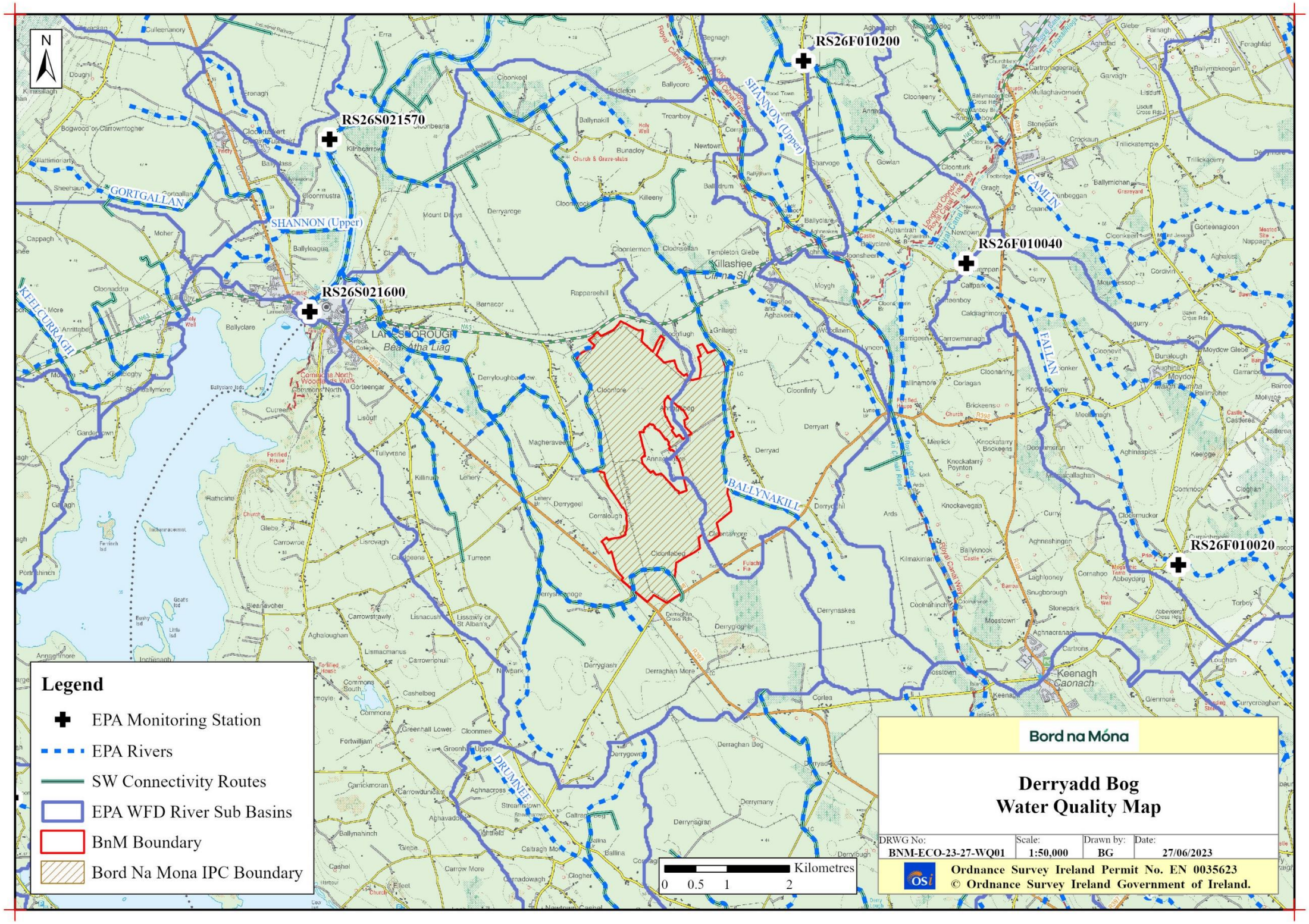
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Hydrology / Topography Maps

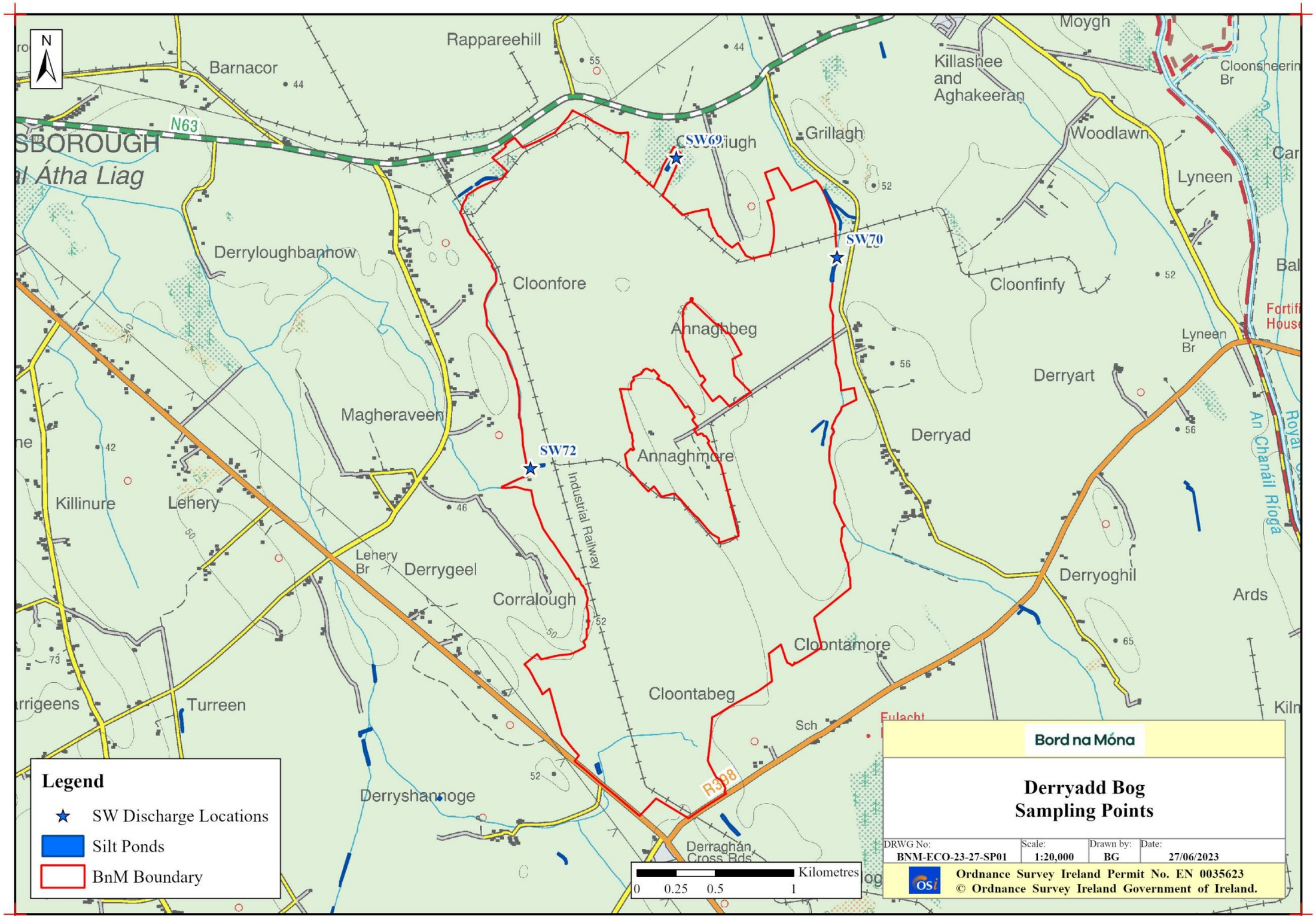
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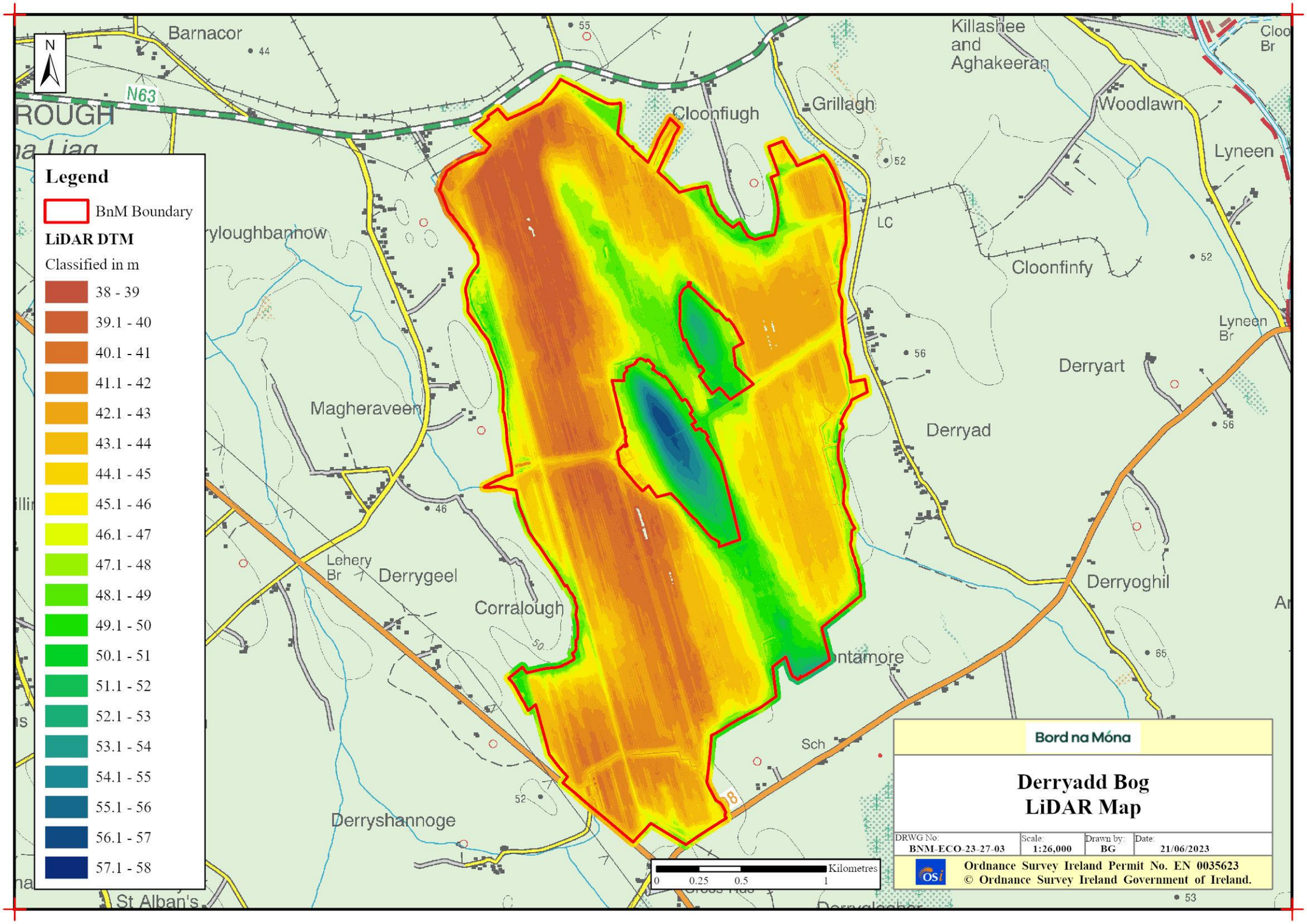
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BNM-ECO-23-27-03: LiDAR Map

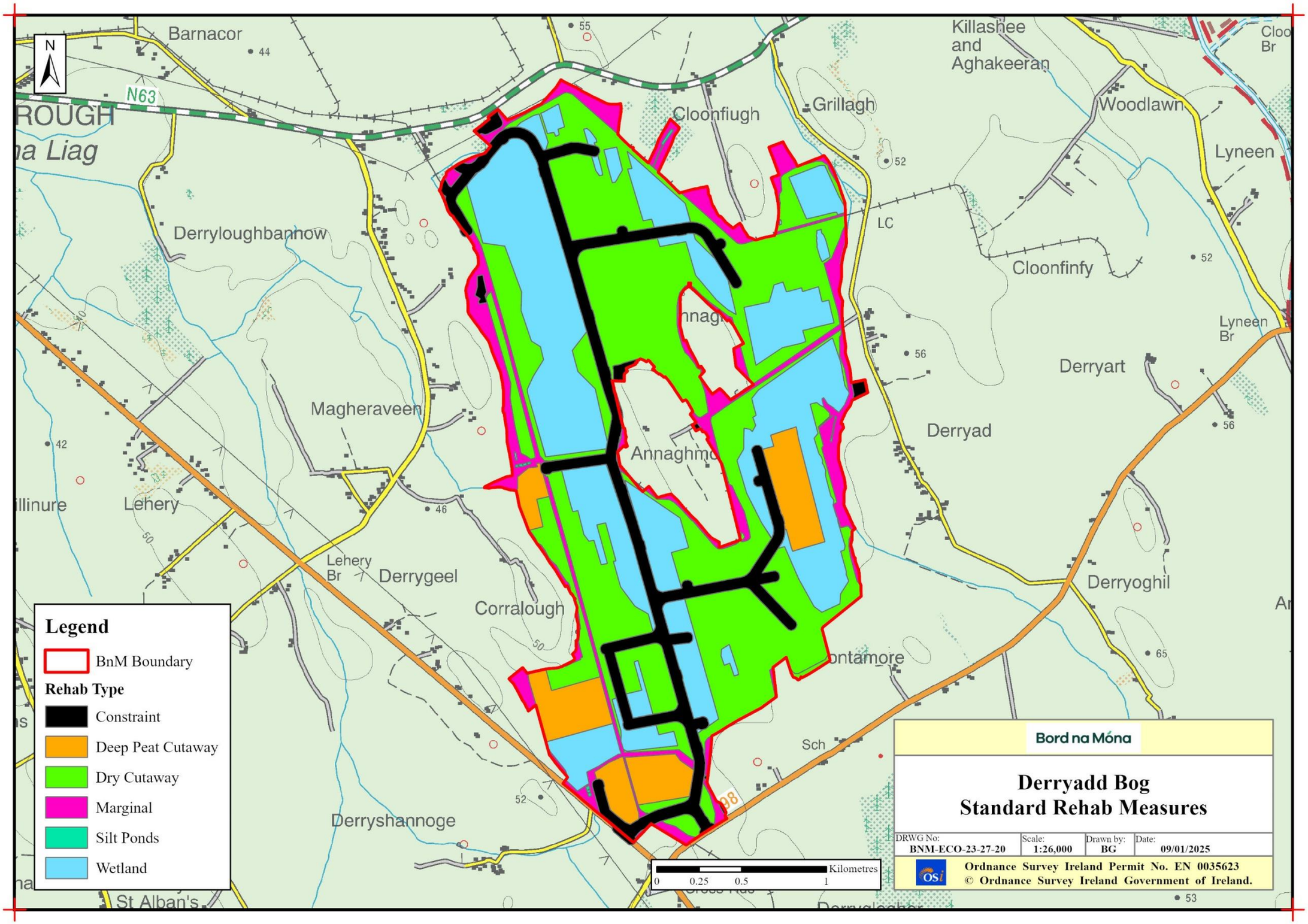
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Rehabilitation Maps

BNM-ECO-23-27-20: Standard Rehab Measures

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Appendix E.3 LOUGH BANNOW DRAFT REHABILITATION PLAN 2025

Bord na Móna

Lough Bannow Bog

Draft Cutaway Bog Decommissioning and Rehabilitation Plan

2025

Draft

This document seeks to address the requirements of Condition 10.2 of IPC Licence Ref. P0504-01:

> "*The licensee shall prepare, to the satisfaction of the Agency, a fully detailed and costed plan for permanent rehabilitation of the cutaway boglands within the licensed area.*"

This licence condition requires Bord na Móna agree with the EPA the measures that will provide for rehabilitation, i.e. stabilisation of Lough Bannow Bog upon cessation of peat production and compliments the licence requirement to decommission the site.

***Rehabilitation** generally comprises site stabilisation with natural colonisation with or without targeted management.*

Industrial peat production has now fully ceased at Lough Bannow Bog.

Bord na Móna have defined the key rehabilitation outcome at Lough Bannow Bog as environmental stabilisation.

*This rehabilitation plan for Lough Bannow Bog has been updated but not fully finalised. As such it remains a **draft** rehabilitation plan until it is fully finalised. Bord na Móna expect to finalise this rehabilitation plan in the future as part the Derryadd Wind Farm development or at a later date.*

Any consideration of any other future after-uses for Lough Bannow Bog, will be conducted in adherence to the relevant planning guidelines and consultation with relevant authorities and will be considered within the framework of this rehabilitation plan.

Bord na Móna are planning to develop a renewable energy project at Lough Bannow Bog as part of the proposed Derryadd Wind Farm. This project is currently in the pre-planning stages and is expected to be submitted for planning permission 2025. The wind farm planning boundary overlaps the Lough Bannow Bog rehabilitation boundary. This area has been mapped as a constraint in the rehabilitation plan.

Draft

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Document File Path:	Z:\EPA draft rehab plans 2017 word docs\Mountdillon ref.504 (Lough Ree)\Lough Bannow
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This document comprises:	DCS	TOC	Text (Body)	References	Maps	No. of Appendices
	1	1	29	4	0	12

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Name(s):	LC	JOS	JOS
Date:	11/05/2023	14/06/2023	14/06/2023

Rev. 1	Author(s):	Checked By:	Approved By:
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Name(s):	LC	JOS	MMC
Date:	09/01/2024	08/01/2025	10/01/2025

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NON-TECHNICAL SUMMARY

- Bord na Móna is updating the draft rehabilitation plan for Lough Bannow Bog (also known as Derryadd 3), located approximately 7 km south-east of Lanesborough in Co. Longford.
- Lough Bannow Bog was in full industrial peat production since the early 1960's and supplied Lough Ree Power Station in Lanesborough up until its closure in 2020.
- Peat harvesting is now finished at Lough Bannow Bog.
- Lough Bawn pNHA, overlaps the south-east corner of the site and has been subject to rehabilitation in the past (2017).
- This rehabilitation plan has been prepared by Bord na Móna as part of obligations to carry out peatland rehabilitation via an IPC Licence issued by the Environmental Protection Agency.
- The key objective of peatland rehabilitation is environmental stabilisation. This means developing vegetation and promoting re-establishment of more typical cutaway peatland communities such as Birch woodland, fen habitat and *Sphagnum*-rich embryonic bog communities.
- Rehab measures will include drain-blocking and other measures to raise water levels to the surface of the bog, thus encouraging the development of naturally functioning cutaway peatland habitats.
- These rehabilitation measures will be planned by a team consisting of expert ecologists and engineers. It is a guiding principle of Bord na Móna rehabilitation planning that no actions or activities will be undertaken that would negatively impact on adjacent land. No boundary drains will be blocked. Water will still leave the bog via the existing outlets.
- Peatland rehabilitation of this bog will bring a range of benefits to the local community via improvements to the local landscape and is also important for supporting national policies and strategies in relation to reduction of carbon emissions from these peatlands, supporting biodiversity and improvements to water quality.
- Drain blocking at Lough Bannow Bog will result in improved water quality, climate benefits with the reduction of carbon emissions and enhanced biodiversity when the residual peat is re-wetted.
- Many Bord na Móna bogs 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 will develop, like poor fen and *Sphagnum* rich embryonic bog communities (on deeper peat); and wetlands with Reedbeds and Birch woodland on shallower peat. In time a naturalised peatland can be developed.
- It will take some time for active raised bog communities (50 + years) to fully develop at Lough Bannow Bog, and for an active raised bog peatland ecosystem to be restored.
- The development of a range of habitats at Lough Bannow Bog will support biodiversity including plants, insects, birds and mammals. This includes some species that are rare and protected in the wider landscape. It will increase the national area of native woodland. Many wetland habitats in the wider landscape have been reclaimed for agriculture and other uses and peatland rehabilitation is an opportunity to create new wetland habitats.
- Bord na Móna are planning to develop a renewable energy project at Lough Bannow Bog as part of the proposed Derryadd Wind Farm. The Wind Farm project is currently in the pre-planning stage and is expected to be submitted for planning permission in 2025. The wind farm planning boundary overlaps the Lough Bannow Bog rehabilitation boundary and has been mapped as a constraint in the rehabilitation plan. Lough Bannow Bog will be rehabilitated as part of the Derryadd Wind Farm development or at a later date. Any other proposed development will be planned in adherence to relevant planning guidelines and will consider the rehabilitation and the condition of the site.

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- Longford County Council lodged a Part 8 Planning Application in 2021 named 'No. 88 Mid Shannon Wilderness Park trackways' which includes greenway or amenity walking/cycling tracks through Lough Bannow Bog. There are additional proposals to create an amenity track through Lough Bannow Bog as part of the proposed Derryadd Wind Farm Project.
- This peatland rehabilitation plan does not consider future after-use or development. Bord na Móna continually reviews its land-bank to consider future commercial or industrial developments. Any other proposed development will be planned in adherence to relevant planning guidelines and will consider the rehabilitation and the condition of the bog.

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1. INTRODUCTION

Bord na Móna operates under IPC Licence issued and administered by the EPA to extract peat within the Mountdillon bog group (Ref. P0504-01). As part of Condition 10.2 of this licence, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. Lough Bannow Bog is part of the Mountdillon bog group (see Appendix I for details of the bog areas within the Mountdillon bog group).

This plan is a specific rehabilitation plan for the bog and outlines:

- Description of site management and status.
- Main issues and approaches to rehabilitation.
- Consultation to date with interested parties.
- Interaction with other policy and legislative frameworks (Appendix V).
- The planned rehabilitation goals and outcomes.
- The scope of the rehabilitation plan.
- Criteria which define the successful rehabilitation and key targets to validate rehabilitation.
- Proposed rehabilitation actions.
- Proposed timeframe to implement these measures.
- Budget and Costings.
- Associated aftercare, maintenance, and monitoring.

Note: This plan should be read in conjunction with the accompanying Map book.

Bord na Móna have announced the complete cessation of industrial peat production across its estate (January 2021).

This draft rehabilitation plan outlines the proposed approach to be taken for IPC compliance in respect of Lough Bannow Bog and how the site will be rehabilitated. Bord na Móna is fully committed to meeting its obligations relating to rehabilitation and decommissioning under the Integrated Pollution Control Licence.

It has been proposed by Government that Bord na Móna carry out a Peatlands Enhanced Decommissioning, Rehabilitation and Restoration Scheme on its peatlands. Note this proposal is also known colloquially as the 'Peatlands Climate Action Scheme' (PCAS). The additional costs of the Scheme will be supported by Government through the Climate Action Fund and Ireland's National Recovery and Resilience Plan, administered by the Department of Environment, Climate and Communications (DECC), while the National Parks and Wildlife Service (NPWS) will act as the Scheme regulator. The Peatlands Climate Action Scheme is expected to operate between 2021-2025. Over 13,000 ha of cutaway peatlands have already been rehabilitated as part of this scheme to date, across multiple Bord na Móna peatlands.

PCAS measures are NOT proposed as part of this draft rehabilitation plan. The potential implementation of enhanced rehabilitation measures at Lough Bannow will be dependent on the selection of the bog to be included in PCAS.

1.1 Constraints and Limitations

This document seeks to address the requirements of Condition 10.2 of IPC Licence Ref. P0504-01:

> "*The licensee shall prepare, to the satisfaction of the Agency, a fully detailed and costed plan for permanent rehabilitation of the cutaway boglands within the licensed area.*"

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Parts of Lough Bannow Bog (around the perimeter of the site) are currently being used by domestic turf cutters for intensive private sod peat production. These areas are ecologically and hydrologically linked to the area owned by Bord na Móna where rehabilitation is planned. It is beyond the scope of this rehabilitation plan to address turf cutting issues on Lough Bannow Bog that are outside of the control of Bord na Móna. Nevertheless, Bord na Móna are aware of such issues which may constrain the proposed rehabilitation actions, and this rehabilitation plan considered potential impacts of these on the delivery of the stated objectives.

Bord na Móna are planning to develop a renewable energy project at Lough Bannow Bog as part of the proposed Derryadd Wind Farm (see Location | Derryadd Wind Farm). This proposed wind farm project is located within Lough Bannow Bog as well as the adjacent Bord na Móna bogs of Derryarogue and Derryadd. Derryadd Wind Farm is currently in the pre-planning stage and is expected to be submitted for planning permission in 2025.

There are known rights of way around the margins of Lough Bannow Bog. Where a public right of way or similar burden exists on Bord na Móna property, consideration will be given to ensuring that this remains intact where possible. In some instances, depending upon previous land uses and management, alternative solutions may be required. These will be explored in consultation with local communities and statutory bodies during the consultation work associated with the decommissioning and rehabilitation work described here.

Rehabilitation in other areas of the bog may also be constrained due to other property issues.

Lough Bannow Bog will be rehabilitated as part of the Derryadd Wind Farm development or at a later date. The wind farm associated amenity trail overlaps the Lough Bannow Bog rehabilitation boundary. The amenity trail and proposed wind farm infrastructure have been mapped as a constraint in the rehabilitation plan.

Lough Bannow Bog will be rehabilitated **either** in association with the proposed Derryadd Wind Farm Project, with peatland rehabilitation integrated into the proposed project, **or** will be completed in the event of an unsuccessful planning application. It is expected that Bord na Móna will revise and update the rehabilitation plan for Lough Bannow Bog when a decision is made in relation to planning permission for the Wind Farm. Bord na Móna remain fully committed to rehabilitating Lough Bannow Bog and meeting the conditions of the IPC Licence. Any consideration of any other future after-uses for Lough Bannow Bog will be conducted in adherence to the relevant planning guidelines, and consultation with relevant authorities, and will be considered within the framework of this rehabilitation plan.

Longford County Council lodged a Part 8 Planning Application in 2021 named 'No. 88 Mid Shannon Wilderness Park trackways' which includes greenway or amenity walking/cycling tracks through Lough Bannow Bog. Future sections of further cycling and walking amenity tracks will developed through Lough Bannow Bog as part of the proposed Derryadd Wind Farm Project (see Location | Derryadd Wind Farm).

Rehabilitation in other areas of the bog may also be constrained due to other property issues or archaeological features. There are known archaeological features present at Lough Bannow Bog, which may constrain rehabilitation activities.

2. METHODOLOGY

This rehabilitation plan was developed with a combination of desktop and field surveys, consultations with internal and external stakeholders. The development of this rehabilitation plan considered **recently published** guidance issued by the EPA in 2020 – **Guidance on the process of preparing and implementing a bog rehabilitation plan**.

The ecological information and site information collected during the Bord na Móna ecological baseline surveys, additional confirmatory site visits (covering the period 2012 to 2023 inclusive) and monitoring and desktop analysis, forms the basis for the development of this rehabilitation plan for the bog along with:

- Experience of 40 years of research on the after-use development and rehabilitation of the Bord na Móna cutaway bogs (Clarke, 2010; Bord na Móna, 2016);
- Significant international engagement during this period with other counties in relation to best-practice regarding peatland rehabilitation and after-use through the International Peat Society and the Society for Ecological Restoration (Joosten & Clarke, 2002; Clarke & Rieley, 2010; Gann *et al*., 2019);
- Consultation and engagement with internal and external stakeholders;
- GIS Mapping;
- BNM drainage surveys;
- Bog topography and peat depth data;
- Hydrological modelling;

2.1 Desk Study

The desk study involved collecting all relevant environmental and ecological data for the study area. The development of the rehabilitation plan also takes account of research, experience and engagement with other peatland restoration and rehabilitation projects and peatland research including Irish, UK, European and International best practice guidance (full citations are in the References Section):

- Anderson *et al*. (2017). An overview of the progress and challenges of peatland restoration in Western Europe.
- Barry, T.A. *et al.* (1973). A survey of cutover peats and underlying mineral soils. Soil Survey Bulletin No. 30. Dublin, Bord na Móna and An Foras Taluntais.
- Bonn *et al*. (2017). Peatland restoration and ecosystem services- science, policy and practice.
- Carroll *et al*. (2009). *Sphagnum* in the Peak District. Current Status and Potential for Restoration. Moors for the Future Report No 16.
- Clark & Rieley (2010). Strategy for responsible peatland management.
- Eades *et al*. (2003). The Wetland Restoration Manual.
- Farrell & Doyle (2003). Rehabilitation of Industrial Cutaway Atlantic Blanket Bog, NW Mayo, Ireland.
- Feehan, J. (2004). A long-lived wilderness. The future of the north midlands peatland network. Department of Environmental Resource Management, UCD.
- Foss, P.J., Crushell, P. & Gallagher, M.C. (2017) Title: Counties Longford &Roscommon Wetland Study. Report prepared for Longford and Roscommon County Councils.
- Gann *et al*. (2019). International Principles and Standards for the practice of Ecological Restoration.
- Hinde *et al*. (2010). *Sphagnum* re-introduction project: A report on research into the re-introduction of *Sphagnum* mosses to degraded moorland. Moors for the Future Research Report 18.
- Joosten & Clarke (2002). Wise Use of mires and peatlands – Background and Principles including a framework for Decision-making.
- Lindsay (2010). Peatbogs and Carbon: A Critical Synthesis to Inform Policy Development in Oceanic Peat Bog Conservation and Restoration in the Context of Climate Change.
- Mackin *et al*. (2017). Best practice in raised bog restoration in Ireland. Irish Wildlife Manuals, No. 99. National Parks and Wildlife Service,

- McBride *et al*. (2011). The Fen Management Handbook (2011), Scottish Natural Heritage.
- McDonagh (1996). Drain blocking by machines on Raised Bogs. Unpublished report for National Parks and Wildlife Service.
- NPWS (2017a). National Raised Bog Special Areas of Conservation management plan. Department of Arts, Heritage and the Gaeltacht.
- Pschenyckyj et al., 2021, Optimising Water Quality Returns from Peatland Management while Delivering Co-Benefits for Climate and Biodiversity. An Fóram Uisce.
- Quinty & Rochefort (2003). Peatland Restoration Guide, second edition. Canadian *Sphagnum* Peat Moss Association and New Brunswick Department of Natural Resources and Energy.
- Regan *et. al.* (2020). Ecohydrology, Greenhouse Gas Dynamics and Restoration Guidelines for Degraded Raised Bogs. EPA Research Report. Prepared for the Environmental Protection Agency by Trinity College Dublin.
- Renou-Wilson *et al*. (2011). BOGLAND - Sustainable Management of Peatlands in Ireland. STRIVE Report No 75 prepared for the Environmental Protection Agency.
- Schouten (2002). Conservation and Restoration of Raised Bogs: Geological, Hydrological and Ecological Studies. Dúchas - The Heritage Service of the Department of the Environment and Local Government, Ireland;
- Thom (2019). Conserving Bogs – Management Handbook.
- Wheeler & Shaw (1995). Restoration of Damaged Peatlands – with Particular Reference to Lowland Raised Bogs Affected by Peat Extraction.
- Wittram *et al*. (2015). A Practitioners Guide to Sphagnum Reintroduction. Moors for the Future Partnership.

Additional on-line resources were also incorporated into the desk study, including:

- Mountdillon bog group Integrated Pollution Control Licence;
- Mountdillon bog group Annual Environmental Reports;
- Review of the National Biodiversity Data Centre (NBDC) webmapper;
- Inland Fisheries Ireland (IFI) Reports;
- Environmental Protection Agency database (www.epa.ie);
- EPA Guidance on Requests for Alterations to a Licensed Industrial or Waste Activity;
- BirdWatch Ireland online data (including I-WeBS and CBS datasets; www.birdwatchireland.ie);
- Geological Survey of Ireland - National Draft Bedrock Aquifer map;
- Geological Survey of Ireland - Groundwater Database (www.gsi.ie);
- Historic Environment Viewer at https://webgis.archaeology.ie/historicenvironment/
- National Parks & Wildlife Services Public Map Viewer (www.npws.ie);
- Water Framework Directive catchments.ie/maps/ Map Viewer (www.catchments.ie);
- OPW Indicative Flood Maps (www.floodmaps.ie);
- CFRAM Preliminary Flood Risk Assessment (PFRA) maps (www.cfram.ie);
- River Basin Management Plan for Ireland 2022-2027
- Bord na Móna Annual Report 2024.
- Spatial data in respect of Article 17 reporting, available online at https://www.npws.ie/maps-and-data/habitat-and-species-data/article-17.

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2.2 Consultation

A number of stakeholders have been identified during the course of Bord na Móna's rehabilitation and Biodiversity Action Plan activities and are contacted during the rehabilitation planning process for their views. See Section 4.

2.3 Field Surveys

Bord na Móna carried out a baseline ecological survey of all of its properties in 2009-2012 and developed habitat maps. As part of this exercise, Lough Bannow Bog was surveyed in July of 2012. Additional ecological walk-over surveys and visits have taken place at Lough Bannow Bog between 2014-2019. Habitat maps have been updated, where required. This rehabilitation plan is informed by the original baseline survey as well as subsequent confirmatory site walk-over surveys and visits, and updates to baseline data.

Habitat mapping followed best practice guidance from Smith *et al.* (2011). Map outputs including all habitat maps and target notes were produced using GIS software application packages (ArcGIS). General marginal habitats and other habitats that had not been modified significantly by industrial peat extraction were classified using Fossitt *et al*. (2000). Plant nomenclature for vascular plants follows Stace (2019), while mosses and liverworts nomenclature follows identification keys published by the British Bryological Society (2010). A more detailed Bord na Móna classification system was previously developed for classifying pioneer cutaway habitats as Fossitt categories were deemed not to be detailed enough for cutaway bog (much of cutaway bog could be classified as Cutover Bog - PB4).

A detailed ecological survey report for Lough Bannow Bog is contained in Appendix II.

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3. SITE DESCRIPTION

Lough Bannow Bog is situated approximately 7 km south-east of Lanesborough, Co. Longford along the R392 Road. The R398 public road runs along the north of the site while a secondary road (Keenagh road) runs along part of the southern section of the bog. The Royal Canal passes within 500 metres of eastern edge of the site. Two large mineral islands are located within the site boundaries but are not under BnM ownership.

Much of Lough Bannow is now cutaway and the majority of the original raised bog has now been removed. In some places there are exposed sub-soils. Peat depth is in general shallow and between 0.5-1.5 of residual fen or minerotrophic peat remains. Some isolated pockets with residual peat of deeper than 2 m also occur at Lough Bannow.

See Drawing number BNM-ECO-23-27-01 titled ***Lough Bannow Bog: Bog Site Location***, included in the accompanying Mapbook[1] , which illustrates the location of Lough Bannow Bog in context to the surrounding area.

3.1 Status and Situation

3.1.1 Site history

Industrial peat production commenced at Lough Bannow in the 1960's and ceased in 2020. Lough Bannow Bog formerly supplied fuel peat for Lough Ree Power Station in Lanesborough.

3.1.2 Current land-use

The proposed Derryadd Wind Farm infrastructure partially overlaps with the Derryarogue rehabilitation footprint (see drawing number BNM-ECO-23-27-20: **Standard Rehab Measures**); the wind farm and its associated infrastructure have been mapped as a constraint in the rehabilitation plan.

The Proposed Derryadd Wind Farm Development will comprise:

- 22 no. wind turbines with a blade tip height of 190 m, blade rotor diameter of 165 m, hub height of 107.5 m and the associated infrastructure including tower sections, nacelle, hub, and rotor blades and all associated foundations and hard-standing areas in respect of each turbine;
- New internal site access roads, approximately 27,500m in length including passing bays and associated drainage;
- 2 no. permanent Meteorological Masts, both of which will be 120 m in height, and associated hardstanding areas for both masts, as well as the decommissioning and removal of an existing 100 m Meteorological Mast on site in Lough Barrow Bog;
- 4 No. Borrow pits in Derryadd Bog; All works associated with the opening, gravel and spoil extraction, and decommissioning of the borrow pits;
- 4 No. temporary construction compounds, including material storage, site welfare facilities, and site offices;
- 4 No. temporary security cabins at the main construction site entrances as well as at a number of access points around the proposed wind farm site;

[1] Cutaway Bog Decommissioning and Rehabilitation Plan – Lough Bannow Bog Map Book

- 1 no. 110 kV electrical substation compound in Derryarogue Bog. The substation will consist of 2 No. control buildings, a 36 m high telecommunications tower, associated electrical plant and equipment, ground water well, wastewater holding tank and welfare facilities;
- All associated underground electrical and communications cabling connecting the turbines and masts to the proposed electrical substation, including road crossing at N63 and associated grid connection via a 110 kV loop-in connection to the existing Lanesborough-Richmond 110 kV overhead line which traverses the proposed wind farm site;
- 1 No. 16 MW battery storage facility;
- 2 No. Peat Deposition Area, one to the north of the proposed substation compound in Derryarogue Bog and one in Derryadd Bog;
- New site access entrances, temporary improvements and modifications to existing public road infrastructure to facilitate delivery of abnormal loads including locations on N6 Eastbound Slip Road, N6/N61 Roundabout at Athlone, N61/N63 Roundabout at Roscommon, N63 Roscommon Arts Centre Roundabout and N61/N63 Roundabout, Northeast of Roscommon;
- Hinge 3 No. permanent lighting fixtures in Folio RN40465F in Roscommon town to facilitate the delivery of abnormal loads (i.e. turbine blades);
- Approximately 7,500m of dedicated amenity access tracks to provide linkages between the proposed wind farm site roads and the existing royal canal greenway (to the east) and Corlea visitor centre and amenity areas (to the south);
- 3 No. permanent amenity carparks, one of which is situated in Derryarogue Bog (19 no. car parking spaces in total) and two carparks in Derryadd Bog (19 no. car parking spaces in each carpark);
- All associated site work and ancillary works including new drainage and upgrading existing drainage, access road, earthworks, site reinstatement and erosion control, which will be aligned with the existing and future site rehabilitation plans; and,
- A 10-year planning permission is being sought with a 30-year operational life from the date of commissioning of the entire wind farm.

Overall, this site varies greatly from areas that are re-vegetating rapidly since they came out of industrial peat production to bare peat areas that were still in peat production until relatively recently (2020). The majority of the site is now developing pioneer cutaway habitats. Some parts of the site have recently developed pioneer wetlands communities including Reed beds. The drier sections of the site have developed areas of Birch dominated scrub.

Topographically, the site undulates and has regular small hills of gravel that are exposed between basins of low-lying peat. A rail line crosses the site in an east-west direction, dissecting the site into a much larger northern section and a smaller southern section.

An area covering approx. 35ha in the western section of the site is owned by Coillte and was planted with conifers in 1995, comprising Sitka Spruce and Norway Spruce. No rehabilitation works will be carried out within Coillte owned lands and this area has been mapped as a constraint.

Lough Bannow Bog contains three pumps (one to the south and two along the northern boundary). Some of the drains in the east of the site have been excavated down to limestone bedrock. There was ongoing hydrological management via pumping to support the former industrial peat production and its infrastructure. Pumping is ongoing during the decommissioning phase.

There are some areas of active turbary around the margins of the site. These are mapped in the accompanying Mapbook. See Appendix II for more detail on site, habitats and local features.

3.1.3. Socio-Economic conditions

Bord na Móna has historically been a vital employer for the rural community of the Midlands of Ireland. Bord na Móna compiled a report on the role of peat extraction in the midlands historically in which they report that in 1986, by the end of Bord na Móna's Third Development Programme, a total of twenty-three work locations had been established around the country. The company had an average employment of approximately 4,688 in the mid 1980's, with a peak employment of 6,100 during the production season, which placed it among the country's largest commercial employers. The importance of such levels of employment were largely due to its regional concentration in the Midlands and the lack of alternative employment opportunities at the time.

According to the Energy Crop Socio-Economic Study undertaken by Fitzpatrick Associates in 2011, there were an estimated 1,443 jobs supported by the peat-to-power industry in Ireland at the time, some 81% of which were located in the catchment areas of the three peat-fired generating stations (Lough Ree, West Offaly, and Edenderry Power Stations). These constituted jobs in the plants and in peat extraction, jobs indirectly supported in upstream supply industries and jobs induced through the trickle-down effects of the wages and salaries of those supported directly or indirectly.

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In respect of Lough Bannow Bog, jobs included in the above study would have included those to facilitate peat extraction for the supply of fuel peat for Lough Ree Power.

As the primary employer in many Midland counties, Bord na Móna played a central role in building communities through several initiatives, including Education bursaries, support of local sporting clubs, the provision of community gain funds, charity programmes and the provision and building of amenity areas. These job numbers have now declined with the cessation of peat extraction at this bog.

3.2 Geology and Peat Depths

3.2.1 Sub-soil geology

The underlying geology[2] of Lough Bannow Bog is comprised of Agrillaceous Limestones (Visean), Ballysteen Formation, Moathill Formation and Meath Formation.

[2] https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=de7012a99d2748ea9106e7ee1b6ab8d5&scale=0

3.2.2 *Peat type and depths*

Much of Lough Bannow is now cutaway and the majority of the original raised bog has now been removed. In some places there are exposed sub-soils. In general, there is between 0.5-1.5 of residual fen or minerotrophic peat. This will have a significant influence on the development of future pioneer habitats. There are also some isolated pockets with residual peat of deeper than 2 m. This may have the potential to develop embryonic *Sphagnum*-rich peat-forming communities if optimum hydrological conditions can be developed.

3.3 Key Biodiversity Features of Interest

Lough Bannow Bog is one of a group within the Mount Dillon bog group that is susceptible to being partially inundated with water during winter periods. In each of these bogs, a portion of the industrial peat production areas lie below the winter flood level of the Shannon and pumping these sites was critical to sustaining industrial peat production.

A detailed ecological report is provided in Appendix II.

3.3.1 Current habitats

The most common habitats[3] present in the former production areas at Lough Bannow Bog include:

- Poor fen (pEang, pJeff, pTyp, pPhrag and pTrig)
- Bare peat (0-50% cover) (BP)
- Pioneer dry calcareous and neutral grasssland (*Centaureo-Cynosuretum*) (gCal)
- *Tussilago farfara*-dominated community (vegetation > 50%) (Colt's Foot) (DisCf)
- Pioneer *Campylopus*-dominated community (pCamp)
- Rip - riparian areas (streams/drains with fringing habitats)
- Birch dominated scrub (ebir, oBir and cBir)
- Exposed gravel
- Pioneer dry *Calluna vulgaris*-dominated community (Heather) (dHeath)
- Temporary open water (tow)
- Conifer plantation (WD4)
- Transition mire and quaking bog (PF3)
- Birch woodland (WN7)
- Raised bog (PB1) remnant
- Oak-Ash-Hazel woodland (WN2)
- Possible calcareous springs (FP1)
- Dense Bracken (HD1)

3 Codes refer BnM classification of pioneer habitats of production bog and Heritage Council habitat classification, Fossitt 2000

- Wet grassland (GS4) along the fringes of the bog

See Drawing number BNM-ECO-23-27-17 titled ***Lough Bannow Bog: Current Habitat Map***, included in the accompanying Mapbook, which illustrates the habitats at Lough Bannow Bog.

3.3.2 Species of conservation interest

A number of species of conservation concern have been recorded at Lough Bannow Bog. The following is a summary of the records of these species available within both BnM records and those of the National Biodiversity Data Centre (NBDC).

Multiple mammal species have been recorded at Lough Bannow Bog including Irish Hare (*Lepus timidus subsp. Hibernicus)*, Eurasian Badger (*Meles meles),* Pine Marten (*Martes martes*) and European Otter (*Lutra lutra*).

Regarding lepidoptera species, there are NBDC/BNM records for the following species at Lough Bannow: Brimstone (*Gonepteryx rhamni*), Common Blue (*Polyommatus icarus*), Green Hairstreak (*Callophrys rubi*), Green-veined White (*Pieris napi*), Large Heath (*Coenonympha tullia*), Large White (*Pieris brassicae*), Orange-tip (*Anthocharis cardamines*), Peacock (*Inachis io*), Silver-washed Fritillary (*Argynnis paphia*), Small Copper (*Lycaena phlaeas*), Painted Lady (*Vanessa cardui*), Small Heath (*Coenonympha pamphilus*) and Speckled Wood (*Pararge aegeria*). Marsh Fritillary (Euphydryas aurinia) was recorded at Lough Bannow as part of the surveys carried out for the previous Derryadd Wind Farm application (Planning Ref. No. ABP-303592-19).

Numerous bird species are known to use the cutover bogs in Ireland's midlands as breeding grounds, wintering grounds or both. Raven (*Corvus corax*), Skylark (*Alauda arvensis*), Sand Martin (*Riparia riparia*), Common Gull (*Larus canus*), Snipe (*Gallinago gallinago*), Meadow Pipit (*Anthus pratensis*), Swallow (*Hirundo rustica*), Dunnock (*Prunella modularis*), Blackbird (*Turdus merula*), Chaffinch (*Fringilla coelebs*), Wood Pigeon (*Columba palumbus*), Pheasant (*Phasianus colchicus*) and Magpie (*Pica pica*) have all been recorded during BNM ecology surveys.

NBDC records for red-listed[4] bird species of conservation concern recorded in the 10km squares (N06, N16) which Lough Bannow intersects include; Barn Owl (*Tyto alba*), Bewick's Swan (*Cygnus columbianus subsp. bewickii*), Black-headed Gull (*Larus ridibundus*), Common Redshank (*Tringa totanus*), Corncrake (*Crex crex*), Curlew (*Numenius arquata*), Golden Plover (*Pluvialis apricaria*), Herring Gull (*Larus argentatus*), Lapwing (*Vanellus vanellus*), Northern Pintail (*Anas acuta*), Northern Shoveler (*Anas clypeata*), Red Grouse (*Lagopus lagopus*) and Yellowhammer (*Emberiza citrinella*) and Grey Partridge (*Perdix perdix*).

A review of the Ornithology Chapter for the previously proposed Derryadd Wind Farm Ecological Impact Assessment Report (EIAR)[3] (Planning Ref. No. ABP-303592-19) was also undertaken. The below paragraphs provide a summary of the bird species of conservation concern (previously) recorded during surveys to inform the above, and which may still occur at the site.

Surveys in the wind farm study area recorded Red Listed (BoCCI) species including Curlew, Redshank, Herring Gull, Grey Wagtail (*Motacilla cinerea*), Lapwing and Eurasian Wigeon (*Mareca penelope*). The results of the breeding bird surveys (2015, 2016 and 2017) undertaken in the wider wind farm study area also recorded several additional Red List species (BoCCI), including Woodcock (*Scolopax rusticola*), Curlew, Lapwing and Quail (*Coturnix*

[4] Gilbert G, Stanbury A and Lewis L (2021), "Birds of Conservation Concern in Ireland 2020 –2026". Irish Birds 9: 523—544

[3] Tobin, 2019, Derryadd Wind Farm Environmental Impact Assessment Report (EIAR), Volume II, EIAR Main Report.

coturnix). A number of species recorded during the winter months in the wind farm study area are listed on Annex I of the EU Birds Directive, namely Golden Plover, Greenland White-fronted Goose (*Anser albifrons flavirostris*), Hen Harrier (*Circus cyaneus*), Kingfisher (*Alcedo atthis*), Merlin (*Falco columbarius*) and Peregrine Falcon (*Falco peregrinus*). Golden Plover, Hen Harrier, Merlin and Peregrine Falcon were also recorded during breeding season surveys along with Common Tern (*Sterna hirundo*) and Little Egret (*Egretta garzetta*). Habitat is limited for many of these species at Lough Bannow however.

It should be noted that much of the wildfowl, wader and gull observations recorded as part of the ornithological study were associated with the River Shannon and associated wet grasslands to the north of the area.

A review of the interim bird survey report detailing the results of bird surveys undertaken by Tobin Consulting Engineers at the Derryadd Wind Farm Site from April 2022-April 2023 was also undertaken. The below paragraphs provide a summary of the bird species of conservation concern recorded. These records are from the Wind Farm study area including Derryadd Bog, Derryarogue Bog to the north and Lough Bannow Bog to the south.

In total, during the range of ornithological surveys conducted since April 2022, 98 bird species have been observed at the proposed Derryadd WF site. A number of species recorded in the Wind Farm study area are listed on Annex I of the EU Birds Directive, including Little Egret, Greater White-fronted Goose, Peregrine Falcon, Whooper Swan, Common Kingfisher, Merlin, Hen Harrier, Eurasian Curlew and European Golden Plover. The following Red Listed (BoCCI) species were recorded in the study area: Common Kestrel, Common Snipe, Meadow Pipit, Northern Lapwing, Northern Shoveler. The following Amber Listed (BoCCI) species were also recorded in the study area: Cormorant (*Phalacrocorax carbo*), Eurasian Teal (*Anas crecca*), Eurasian Wigeon, Ringed Plover (*Charadrius hiaticula*), Black-headed Gull, Lesser Black-backed Gull (*Larus fuscus*), Tufted Duck (*Aythya fuligula*), Greylag Goose (*Anser anser*), Common Gull, Common Coot (*Fulica atra*), and Short-eared Owl (*Asio flammeus*).

3.3.3 Invasive species

There are no NBDC/BNM records for invasive species at Lough Bannow Bog. A broad range of common garden escapes are also occasionally present around the margins of Bord na Móna bogs. Although spatial overlap with the rehabilitation work is expected to be limited, these are, where necessary, to be treated in line with best practice during rehabilitation.

3.4 Statutory Nature Conservation Designations

There are a number of European Sites (SAC's or SPA's) in close proximity (i.e. within a 5km radius at minimum) to Lough Bannow Bog. Lough Bannow Bog has no overlapping EU designated sites. The nearest EU Designated sites to Lough Bannow Bog are as follows:

- Mount Jessop SAC (Site Code: 002202) – 3.4 km east of Lough Bannow
- Lough Forbes Complex SAC (site code: 001818) – 8.2 km to the north east of Lough Bannow
- Ballykenny-Fisherstown Bog SPA (site code: 004101) – 8.2 km to the north east of Lough Bannow
- Brown Bog (site code: 002346) – 8 km to the north of Lough Bannow
- Lough Ree SAC (Site Code: 000440) – 4.2 km to the west of Lough Bannow
- Lough Ree SPA (Site Code: 004064) – 4.7 km to the west of Lough Bannow
- Fortwilliam Turlough SAC (site code: 000448) – 4.6 km to the south-west of Lough Bannow

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One non-statutory designated site, Lough Bawn pNHA, overlaps the south-east corner of the site and has been subject to rehabilitation in the past. A number of non-statutory designated sites also occur in the wider area around Lough Bannow Bog. Lough Ree pNHA (NPWS Site Code: 002103), occurs approximately 4.2 km to the west of Lough Bannow. Mount Jessop NHA (NPWS Site Code: 001450), occurs approximately 3.4 km to the east of Lough Bannow. Forthill Bog NHA (NPWS Site Code: 001448), occurs approximately 3.8 km to the south of Lough Bannow. Lisnanarriagh Bog NHA (NPWS Site Code: 002072), occurs approximately 10.8 km to the west of Lough Bannow Bog.

See drawing *BNM-ECO-23-27-23:* ***Lough Bannow Bog Proximity to Designated Sites*** in the accompanying map book.

3.4.1 Other Nature Conservation Designations

The Ramsar Convention entered into force in Ireland on 15th March 1985. Ireland currently has 45 sites/wetlands designated as Wetlands of International Importance (Ramsar Sites). These cover a surface area of 66,994ha. There are no Ramsar sites located in proximity to Lough Bannow Bog.

3.5 Hydrology and Hydrogeology

Lough Bannow bog forms part of the Upper Shannon Catchment (Catchment ID: 26C) as defined by the EPA under the Water Framework Directive (WFD). The bog lies within the Shannon [Upper]_SC_80, Shannon [Upper]_SC_60 and Bilberry_SC_10 sub-catchments.

There are several rivers and streams within the site and around the margins that drain the site. The Ballynakill_26 River (EPA code: 26B22) runs along the northern boundary in a northerly direction where it flows into the River Shannon donwstream. The Bilberry (26B03) River rises near the south west of the bog and its tributary, the Ledwithstown_26, rises near the south eastern boundary, both flow in a south westerly direction. The Bilberry eventually discharges to Lough Ree, located in the Shannon [Upper]_SC_9 sub-catchment.

Lough Bannow Bog has a pumped drainage regime. The site contains three pumps (one to the south and two along the northern boundary). These facilitate drainage from several discharge points for the former peat production and support of infrastructure.

GSI data indicates that the majority of Lough Bannow Bog lies within a locally important aquifer – bedrock which is moderately productive only in local zones. An aquifer is an underground body of water-bearing rock or unconsolidated materials (gravel or sand) from which groundwater can be extracted in useful amounts. GSIs Aquifer classes are divided into three main groups based on their resource potential, and further subdivided based on the type of openings through which groundwater flows. There are nine aquifer categories in total. Locally important aquifers are capable of supplying locally important abstractions (e.g. smaller public water supplies, group schemes), or good yields (100-400 m3/d). This data gives an indication of sub-surface deposits (bedrock and unconsolidated materials) in terms of their groundwater resource potential and dominant groundwater flow type.

Regionally important aquifers are those in which the network of fractures, fissures and joints, through which groundwater flows, is well connected and widely dispersed, resulting in a relatively even distribution of highly permeable zones. There is good aquifer storage and groundwater flow paths can be up to several kilometres in

length. There is likely to be substantial groundwater discharge to surface waters ('baseflow') and large (>2,000 m3/d), dependable springs may be associated with these aquifers.

The majority of Lough Bannow Bog is located in an area mapped by GSI as of low groundwater vulnerability (GSI Map viewer), with the two mineral islands to the centre and west mapped as moderate groundwater vulnerability. Groundwater Vulnerability is a term used to represent the intrinsic geological and hydrogeological characteristics that determine the ease with which groundwater may be contaminated by human activities. Groundwater vulnerability maps are based on the type and thicknesses of subsoils (sands, gravels, glacial tills (or boulder clays), peat, lake and alluvial silts and clays), and the presence of karst features. Groundwater is most at risk where the subsoils are absent or thin and, in areas of karstic limestone, where surface streams sink underground at swallow holes. These data indicate there is generally low risk of any groundwater contamination occurring at this site.

Quaternary sediment maps show that Lough Bannow Bog is generally underlain by cutover raised peat. The two mineral islands to the centre and west of the site are underlain by till derived from limestones. This combination of sediment is common in the wider context surrounding the site.

3.6 Emissions to surface-water and watercourses

Drainage is an important feature of industrial peat production and there were extensive field drains maintained throughout bog areas to facilitate industrial peat production annually, each of which eventually drains into a terminal silt pond that allows for settlement of suspended solids before entering the main river systems. In accordance with the existing Integrated Pollution Control licence, all drainage water from boglands in a licensed area is discharged via an appropriately designed silt pond treatment arrangement as required in Condition 6.6. of the licence. Industrial peat production has now permanently ceased at Lough Bannow Bog.

Silt ponds are the key silt control infrastructure to control potential emissions from industrial peat production sites. As required under licence, BNM have a number of procedures for how it manages and maintains its silt pond network. The silt that builds up in silt ponds is excavated on a regular basis by Bord na Móna to facilitate an efficient level of silt control. Silt ponds will continue to be maintained during the rehabilitation and decommissioning. Silt pond decommissioning will be considered when sites are deemed to be on a trajectory of environmental stability and peatland rehabilitation has been completed.

Lough Bannow Bog has 5 treated surface water outlets which discharge to the Upper Shannon (26C) and Upper Shannon (26E) catchments. The Derrygeel (26D77) River flows in close proximity to the north-west corner of the site into Lough Bannow Stream (26L12) and subsequently the River Shannon (Upper) (26S02). Two outlets are associated with Ballynakill_26 (26B2) River flow north and into the River Shannon (Upper) (26S02). The fourth outlet is located to the north east and provides hydrological connectivity with the Royal Canal. The fifth outlet is located in the south west and discharges to Bilberry (26B03) River which subsequently joins the Ledwithstown River (26L84) and discharges to Lough Ree. The River Shannon (Upper)_100 (26S02) is listed as being under pressure from peat extraction in the 2nd cycle of the River Basin Management Plan for Ireland and is indicated as remaining so in the third cycle. The Ledwithstown River (26L84) is listed as being under pressure from peat extraction in the 2nd cycle, but not indicated as being so in the third cycle.

Details of silt ponds, associated surface water emission points and monitoring and sampling locations are detailed in Drawing numbers BNM-ECO-23-27-SP01 titled ***Lough Bannow Bog: Sampling Points***, along with Drawing number BNM-ECO-23-27-WQ01 titled ***Lough Bannow Bog: Water Quality Map*** included in the accompanying Mapbook, which illustrate the various drainage and water quality infrastructure present at Lough Bannow Bog.

There is a robust monitoring program to track and verify any changes in baseline water quality conditions pre and post decommissioning and rehabilitation so that the success or otherwise can be tracked and verified for the Environmental Protection Agency.

Decommissioning and Rehabilitation Programme Water Quality Monitoring.

Rehabilitation of cutaway peatland is closely linked with control of emissions. One of the criteria for successful rehabilitation is stabilisation through re-vegetation, which will stabilise all substrates and in turn remove the need for further silt control measures. This site is already largely vegetated. Re-wetted peat also aids the primary objective of stabilizing peat, as when peat is re-wetted it is not vulnerable to wind erosion. Re-wetted peat and the development of wet peatland habitats can also act as sinks for silt and mobile peat, and increases additional retention time for solids, and the peatland vegetation can quickly stabilise this material within blocked drains on site (by acting like constructed wetlands).

Water quality of water discharges from restored peatlands normally improves as a result of bog restoration measures and the restoration of natural peatland processes (Bonn *et al*., 20017). Bog restoration is also expected to improve water attenuation of the site as the drains are blocked, slowing water movement and water release from the site. Restored peatlands help slow the release of water and aid the natural regulation of floods downstream (Minayeva *et al*., 2017). The National River Basin Management Plan (NRBMP) (DHPCLG, 2024) is the key national plan for Ireland to achieve the objectives of the Water Framework Directive (WFD). The NRBMP outlines how key actions such as the Bord na Móna peatland rehabilitation is expected to have a positive impact on water quality and help the NWBMP deliver its objectives in relation to the WFD.

Water will still discharge from designated emission points when rehabilitation at Lough Bannow has been completed. This discharge will have improved water quality and there will be increased wetland attenuation, meaning slower release of water. This is expected to have a positive impact on status of the key watercourse receptors and the Shannon [Upper]_SC_80, Shannon [Upper]_SC_60 and Bilberry_SC_10 sub-catchments and will support the future status of the watercourses achieving Good Status.

Decommissioning and Rehabilitation Programme Water Quality Monitoring

Water quality monitoring will be established. There will be initial quarterly monitoring assessments of the site to determine the general status of the site, the condition of the silt-ponds, assess the condition of the rehabilitation work, asses the progress of natural colonisation, monitoring of any potential impacts on neighbouring land and general land security. The number of site visits will reduce after 2 years to bi-annually. These site visits will assess the need to additional rehabilitation.

Monitoring results will be maintained, trended and reported on each year as part of the requirement to report on Condition 10.1 of the IPC Licence on Bog Rehabilitation in the Annual Environmental Report, which will be available in April each year at www.epa.ie.

The parameters to be included (as per condition 6.2 of the IPC Licence) include monthly monitoring for pH, Flow, Suspended Solids, Total Solids, Total Phosphorus, Total Ammonia, Colour, and COD.

This sampling regime on a selected number of silt ponds will be carried out over a two-year cycle. The original (licence) requirement was for a quarterly sampling regime.

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3.7 Fugitive Emissions to air

Rehabilitation of the drained peatland will seek to re-wet the dry peat where possible. Collectively re-wetting and re-vegetating will minimise any risk of emission to air from dust.

3.8 Carbon emissions

Irish peatlands are a huge carbon store, containing more than 75% of the national soil organic carbon (Renou-Wilson *et al.*, 2012). Peatland drainage and extraction transforms a natural peatland which acts as a modest carbon sink (taking in 0.1 to 1.1 t of carbon as CO2-C /ha/yr) into a cutaway ecosystem which is a large source of carbon dioxide (releasing 1.3 to 2.2 t of carbon as CO2-C /ha/yr) based on Tier 1 Emission factors (Evans *et al*., 2017). Renou-Wilson *et al.* (2018) reported losses of between 0.81 – 1.51 CO2-C /ha/yr from drained peatlands located in Ireland.

Re-wetting of dry peatlands will increase methane emissions (Gunther et al. 2020) as a consequence of the anoxic conditions within the peat body that provide a suitable environment for the microbial breakdown of plant litter and root exudates. Tanneberger *et al.* (2021) describes how peatland management has to choose between CO2 emissions from drained peatlands or increased methane (CH4) emissions from rewetted industrial peatlands. However, when radiative effects and atmospheric lifetimes of both GHG gases are considered and modelled, postponing rewetting increases the long-term warming effect of continued CO2 emissions (Gunther *et al.,* 2020). This means the increase in methane due to rewetting of dry peatlands is still negated by the CO2 emissions reductions. Further, Wilson *et al.* (2022) confirmed the benefit of rapid rewetting to achieve strong carbon reductions and potentially altering the warming dynamics from warming to cooling depending upon the climate scenario.

It is expected that Lough Bannow Bog will become a reduced Carbon source following rehabilitation. The potential of any cutaway site to develop as a carbon sink in the longer-term depends on the success of the rehabilitation measures, the extent of development of *Sphagnum*-rich or other peat-forming habitats, the balance of carbon fluxes from different cutaway habitats and future climatic conditions. The majority of the bog will develop as birch woodland on drier areas and peripheral headlands. Large wetlands are expected to develop on shallow peat with open water, reed swamp and fen habitats with alkaline emission factors. Part of this bog is expected to develop regenerating wet deep peat vegetation on deep peat areas.

3.9 Current ecological rating

(Following NRA (2009) Evaluation Criteria)

The majority of Lough Bannow Bog can be rated as **local importance; lower value to Local Importance; higher value.** Bare peat in the former production area of Lough Bannow Bog are assessed as **local importance (lower value)**.

The revegetated former production areas to the east and west of the site and marginal habitats including woodland, scrub, pioneer cutaway habitats, fen, calcareous grassland, remnant raised bog, and wetlands may act as a refuge and as ecological corridors for wildlife and are therefore deemed to be **locally important (higher value)**.

4. CONSULTATION

4.1 Consultation to date

Consultation seeks to engage an audience of relevant stakeholders at both a national and local level. National stakeholders have been identified from varied bog restoration and rehabilitation efforts undertaken by Bord na Móna over the past 40 years, with particular emphasis on engagement with stakeholders during their Biodiversity Action Plan programme, since 2010. National Stakeholders includes relevant government departments and agencies, relevant semi-state bodies, NGOs and other environmentally focused groups with a national remit.

There has been ongoing consultation on rehabilitation, biodiversity and other general issues at Lough Bannow Bog in relation to the proposed Derryadd Wind Farm (Bord na Móna Wind Farm | Derryadd Wind Farm). Specific consultation relating to the wind farm development and associated amenity development is not listed here, although there has been detailed consultation with stakeholders in relation to these issues and overlap with rehabilitation and biodiversity.

There has been ongoing consultation about rehabilitation, biodiversity, and other general issues over the years about Mountdillon bog group, including Lough Bannow Bog, with various stakeholders in relation to:

- General consultation with range of stakeholders at annual Bord na Móna Biodiversity Action Plan review days 2010-2018.
- Longford Wetland Wilderness (general proposal led by Longford County Council and other stakeholders. This has had several iterations. See Lough Ree and Mid Shannon, Spirit Level 2017. A feasibility study for Longford County Council).
- Feehan, J. (2004) A Long-Lived Wilderness; the future of the north midlands peatland network UCD/NWWPC.
- Lauder, A. & O'Toole L. (2017). Concept development for a landscape-scale Wetland Wilderness Park in the Mid Shannon Region. A report funded by the Heritage Council's Heritage Grant Scheme.
- Foss, P.J., Crushell, P. & Gallagher, M.C. (2017). Counties Longford &Roscommon Wetland Study. Report prepared for Longford and Roscommon County Councils.
- Archaeological Liaison Committee (National Museum of Ireland & Dept of Culture Heritage and the Gaeltacht).
- Midlands & East Regional WFD Operational Committee (River Basin Management Plans).
- Sub-committee on Shannon Flooding Work Programme and Measures (OPW, Waterways Ireland, ESB, LA's, Fisheries Ireland, NPWs etc.).
- Greenway development at Lough Bannow (Longford County Council).

To inform the current Plan, both national and local stakeholders, including neighbours whose land adjoins Lough Bannow Bog and local representatives of national bodies (such as Regional National Parks and Wildlife Service staff) and relevant offices in County Councils (such as the Heritage or Environmental Offices) will be contacted. Any identified local interest groups will be sought and informed of the opportunity to engage with this rehabilitation plan, and when identified invited to submit their comments or observations in relation to the proposed rehabilitation at Lough Bannow Bog.

All correspondence received will be acknowledged and evaluated against the rehabilitation work proposed here, and the final draft of the Lough Bannow Bog Rehabilitation Plan will contain a review of the consultation.

4.2 Issues raised by Consultees

N/A Yet as consultation has not commenced.

4.3 Bord na Móna response to issues raised during consultation

N/A Yet as consultation has not commenced.

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5. REHABILITATION GOALS AND OUTCOMES

The rehabilitation goals and outcomes outline what Bord na Móna want to achieve by implementing the rehabilitation. These include:

- Meeting conditions of IPC Licence.
- Environmental stabilisation of the former peat production areas and mitigation of potential silt run-off.
- Stabilisation or reduction in water quality parameters of water discharging from the site (e.g. suspended solids).
- Reducing pressure on receiving waterbodies that have been classified as At Risk from peatlands and from peat extraction, via stabilization or improving water-quality from this bog, and therefore, reducing pressures.
- Supporting the proposed Derryadd Wind Farm Project. Integrating rehabilitation measures with planned renewable energy and any amenity infrastructure on site. It is not proposed to carry out any rehabilitation actions to change or negatively affect planned renewable energy infrastructure.
- Optimising hydrological conditions for the protection of exposed archaeological structures, their retention in situ and preservation into the future.
- The main goal and outcome of this plan is the successful rehabilitation (environmental stabilisation and restoration) of cutaway bog, in a manner that is acceptable to both external stakeholders and to Bord na Móna.

The rehabilitation goals and outcomes take account of the following issues.

- Natural colonisation will form the basis for the environmental stabilisation of the bare peat areas. Re-wetting of the cutaway, where possible, is a general rehabilitation strategy. The main target will be to maintain water-levels close to the peat surface, and to avoid the creation of large-water bodies. Re-wetting and water levels close to the peat surface accelerates the re-vegetation processes, the development of vegetation cover and therefore environmental stabilisation. There is already significant potential for the creation of wet cutaway habitats at Lough Bannow Bog due to the local topography (localised basins).
- It will take some time for stable naturally functioning habitats to fully develop at Lough Bannow Bog. This will happen over a longer timeframe than the implementation of this rehabilitation plan.
- Re-wetting residual peat will initially maintain and enhance the carbon storage capacity of the bog. There is scientific consensus that restoration of hydrology in damaged bog can improve carbon storage, water storage and attenuation and help support biodiversity both on the site and in the catchment (See Section 3.8). This will reduce carbon emissions from the site from a larger carbon source to a smaller carbon source. In time, the site has the capacity to develop in part as a carbon sink.
- It is not expected that the site has the potential to develop active raised bog (ARB) analogous to the priority EU Habitats Directive Annex I habitat within the foreseeable future (c.50 years). Furthermore, only a small proportion of the bog has potential to develop *Sphagnum*-rich habitats in this timeframe. Nevertheless, re-wetting across the entire bog, will improve habitat conditions of the whole bog. Other peatland habitats will develop in a wider mosaic that reflects underlying conditions.
- Rehabilitating former industrial peat production bog will also in the longer-term support other ecosystem services such as such the development of new habitat to support biodiversity and local attenuation of water flows from the bog.

- WFD status in receiving water bodies can be affected by peatlands and peat extraction but is also affected by other sources such as agriculture. In addition, receiving water bodies that are assessed as At Risk from peatlands and from peat extraction are likely to have several contributary sources of impacts (private peat extraction and Bord na Móna). Reducing pressures due to former peat extraction activities at Lough Bannow Bog will contribute to stabilising or improving water quality status of receiving water bodies in general. Ultimately, improving the WFD status of the receiving waterbody will depend on reducing pressure from a range of different sources, including peatlands in general (private and Bord na Móna).
- Re-wetting in general will benefit the future preservation of most known and unknown archaeological features.
- Planned land uses, such as renewable energy generation infrastructure.

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6. SCOPE OF REHABILITATION

The principal scope of this rehabilitation plan is the environmental stabilisation of the bog. This is defined by:

- The area of Lough Bannow Bog.
- EPA IPC Licence - Ref. P0504-01. As part of Condition 10.2 of this licence, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. Lough Bannow bog is part of the Mountdillon bog group.
- The local environmental conditions of Lough Bannow Bog mean that drain blocking is the most suitable rehabilitation approach for this site. Lough Bannow Bog while largely comprising shallower peat does retain deep peat reserves in places.
- The key goals and outcomes of rehabilitation set by Bord na Móna. Bord na Móna have defined the key goal and outcome of rehabilitation at Lough Bannow Bog as **environmental stabilisation**, **optimising residual peat re-wetting,** to enhance the development of compatible habitats.
- The cutaway is already developing a mosaic of woodland, grassland, wetland and cutaway peatland habitats. Much of this cutaway has largely stabilised. Rehabilitation is proposed to enhance residual peat re-wetting in these areas while taking account of future infrastructure and land-uses.
- Rehabilitation of Lough Bannow Bog will support multiple national strategies of climate action, biodiversity action and other key environmental strategies such was the Water Framework Directive.
- The time frame for the delivery of the planned rehabilitation will be undertaken according to available resources and appropriate constraints.
- It is not proposed to carry out rehabilitation on all marginal or peripheral cutover bog zones. Generally, these bog remnants are narrow, or are subject to turbary, and do not have positive bog restoration prospects.

6.1 Key constraints

- **Bog conditions.** Rehabilitation outcomes of sites are constrained by the environmental characteristics of these particular areas. Drain blocking can be widespread in scale with each field drain being blocked (e.g. Kellysgrove) or more localised with targeted drain-blocking (e.g. Mountlucas Wind Farm) and both can be very effective. This can be used in conjunction with local topographical features like natural hollows to manage water levels or with other typical features of cutaway peatlands like high peat fields, which act as berms to hold water to some extent. Active management to create low berms to manage water-levels and create shallow wetland habitats dominated by emergent vegetation has also been successfully developed (e.g. Mountlucas Wind Farm, Bruckana Wind Farm, Oweninny, Lough Boora Discovery Park, Ballycon).
- The majority of this bog has been cutaway. Lough Bannow bog has a partially pumped drainage regime, which will need to be considered as part of the wider rehabilitation. A mosaic of wetland habitats are the most compatible habitat that can be developed in response to re-wetting, if pumping ceases or is reduced.
- **Potential land-use.** Bord na Móna are planning to develop a renewable energy project at Lough Bannow Bog as part of the proposed Derryadd Wind Farm. This wind farm project is in pre-planning and is expected to be submitted for planning permission in 2025. Lough Bannow will be rehabilitated **either** in association with the proposed Derryadd Wind Farm Project, with peatland rehabilitation integrated into the proposed project or will be completed in the event of an unsuccessful planning application. It is

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expected that Bord na Móna will revise and update the rehabilitation plan for Lough Bannow Bog when a decision is made in relation to the wind farm planning application. Bord na Móna remain fully committed to rehabilitating Lough Bannow Bog and meeting the conditions of the IPC licence.

- **Amenity development.** Longford County Council lodged a Part 8 Planning Application in 2021 named 'No. 88 Mid Shannon Wilderness Park trackways' which includes greenway or amenity walking/cycling tracks through Lough Bannow Bog. There are additional proposals to create an amenity track through Lough Bannow Bog as part of the proposed Derryadd Wind Farm Project.
- **Coillte.** An area covering approx. 35ha in the western section of the site is owned by Coillte and has been mapped as a constraint. No rehabilitation works will be carried out within Coillte owned lands.
- **NPWS.** Lough Bawn Proposed Natural Heritage Area (pNHA) partially overlaps the southeastern corner of the bog and has been subject to previous rehabilitation (2017).
- **Surrounding landscape and neighbours.** Another key constraint is the interaction between the Bord na Móna sites and the surrounding landscape. Care has to be taken that no active rehabilitation management is carried out that could negatively and knowingly impact on surrounding land. This includes any hydrological management on neighbouring farmland. It is anticipated that the work proposed here (blocking drains and re-wetting cutaway peatlands) will not have any flooding impacts on adjacent land.
- **Archaeology**. There are archaeological features present at Lough Bannow Bog, which may similarly constrain rehabilitation activities. The discovery of monuments or archaeological objects during peatland rehabilitation may potentially constrain the rehabilitation measures proposed for a particular area. The rehabilitation will optimise hydrological conditions for the protection of exposed archaeological structures, their retention in situ and preservation into the future. Any newly discovered archaeology may require rehabilitation measures to be reviewed and adapted. A review of known archaeology and an archaeological impact appraisal of the proposed rehabilitation will be carried out. In the worst-case scenario works affecting the surface and sub-surface of the bog might disturb previously unknown archaeological deposits or artefacts without preservation by record taking place. Should any previously unknown archaeological material be uncovered during the rehabilitation works, it will be avoided and reported to the Bord na Móna Archaeological Liaison Officer and the National Museum of Ireland. The results of this assessment will be incorporated into the rehabilitation plan to minimise known archaeological disturbance, where possible.
- **Public Rights of Way**. Public rights of way occur in the SW of Lough Bannow. Where a public right of way or similar burden exists on Bord na Móna property, consideration will be given to ensuring that this remain intact where possible. In some instances, depending upon previous land uses and management, alternative solutions may be required. These will be explored in consultation with local communities and statutory bodies during the consultation work associated with the decommissioning and rehabilitation work described here. Two Rights of Way exist at or around the margin of Lough Bannow Bog.
- **Turf-cutting.** Some marginal areas of Lough Bannow Bog are subject to active turf cutting. These areas are ecologically and hydrologically linked to the area owned by Bord na Móna where rehabilitation is planned.

6.2 Key Assumptions

- It is assumed that Bord na Móna will have all resources required to deliver this project.
- It is expected that weather conditions will be within normal limits over the rehabilitation plan timeframe. Long periods of wet weather have the capacity to significantly affect ground conditions and constrain drain blocking and other ground activities.

6.3 Key Exclusions

The scope of this rehabilitation plan does not cover:

- The longer-term development of stable naturally functioning habitats to fully develop at Lough Bannow Bog. The plan covers the short-term rehabilitation **actions** and **an additional monitoring and after-care programme** to monitor the rehabilitation and to respond to any needs.
- This plan is not intended to be an after-use or future land-use plan for Lough Bannow Bog.
- The longer-term management of this site, potentially as a nature conservation site, or for amenity, or for other uses in the future.

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7. CRITERIA FOR SUCCESSFUL REHABILITATION

This section outlines what criteria will be used to indicate successful rehabilitation and what critical success factors are needed to achieve successful rehabilitation. All criteria used to indicate successful rehabilitation will be measured to validate the achievement of the rehabilitation goals and outcomes and validate the completion of the rehabilitation.

The key objective of this rehabilitation plan is **environmental stabilisation** and the stabilisation of any emissions from the site that related to the former industrial drainage activities.

Rehabilitation is generally defined by Bord na Móna as:

- stabilisation of bare peat areas via targeted active management (e.g. drain-blocking/re-wetting) slowing movement of water across the site and encouraging a naturally functioning raised bog ecosystem; and
- mitigation of key emissions (e.g. potential suspended solids run-off).

7.1 Criteria for successful rehabilitation to meet EPA IPC licence conditions:

- Rewetting of residual peat in the former production area to offset potential run off of suspended solids and to encourage and accelerate development of vegetation cover via natural colonisation and increase in the area of potentially peat forming habitats. See Table 7.1 for a summary of the criteria for successful rehabilitation and associated monitoring. The target will be the delivery of measures, and this will be measured by an aerial survey after rehabilitation is completed.
- That there is a stabilizing/improving concentration of suspended solids and ammonia in discharges from Bord na Móna sites, associated with the measures undertaken to stabilize the peat surface by the blocking of the internal drainage system and the maximized rewetting of the peat surface. This will be demonstrated by developing a stable or downward trajectory of water quality indicators (suspended solids and ammonia) towards what would be typical of a re-wetted cutaway bog. This will be measured via water quality monitoring (suspended solids and ammonia) for at least 2 years after the rehabilitation has been completed.
- Receiving water bodies have been classified under the River Basin Management Plan and this classification includes waters that are At-Risk from peatlands and peat extraction. The success criteria will be that the At-Risk classification will see improvements in the associated pressures from this peatland or if remaining At-Risk, that there is an improving trajectory in the pressure from this peatland.

With regard to predicting and estimating likely trends that might materialize or could be considered as a target, monitoring of surface water ammonia emissions from Longfordpass bog in Littleton over 3 yrs., post cessation of peat extraction with ongoing rehabilitation, were considered. These are indicating a downward trend in Ammonia concentrations (Figure 7.1).

Similarly monitoring of surface water ammonia emissions from a Corlea bog in Mountdillon over the past 3 yrs. post cessation of peat extraction with ongoing rehabilitation, indicate downward trends.

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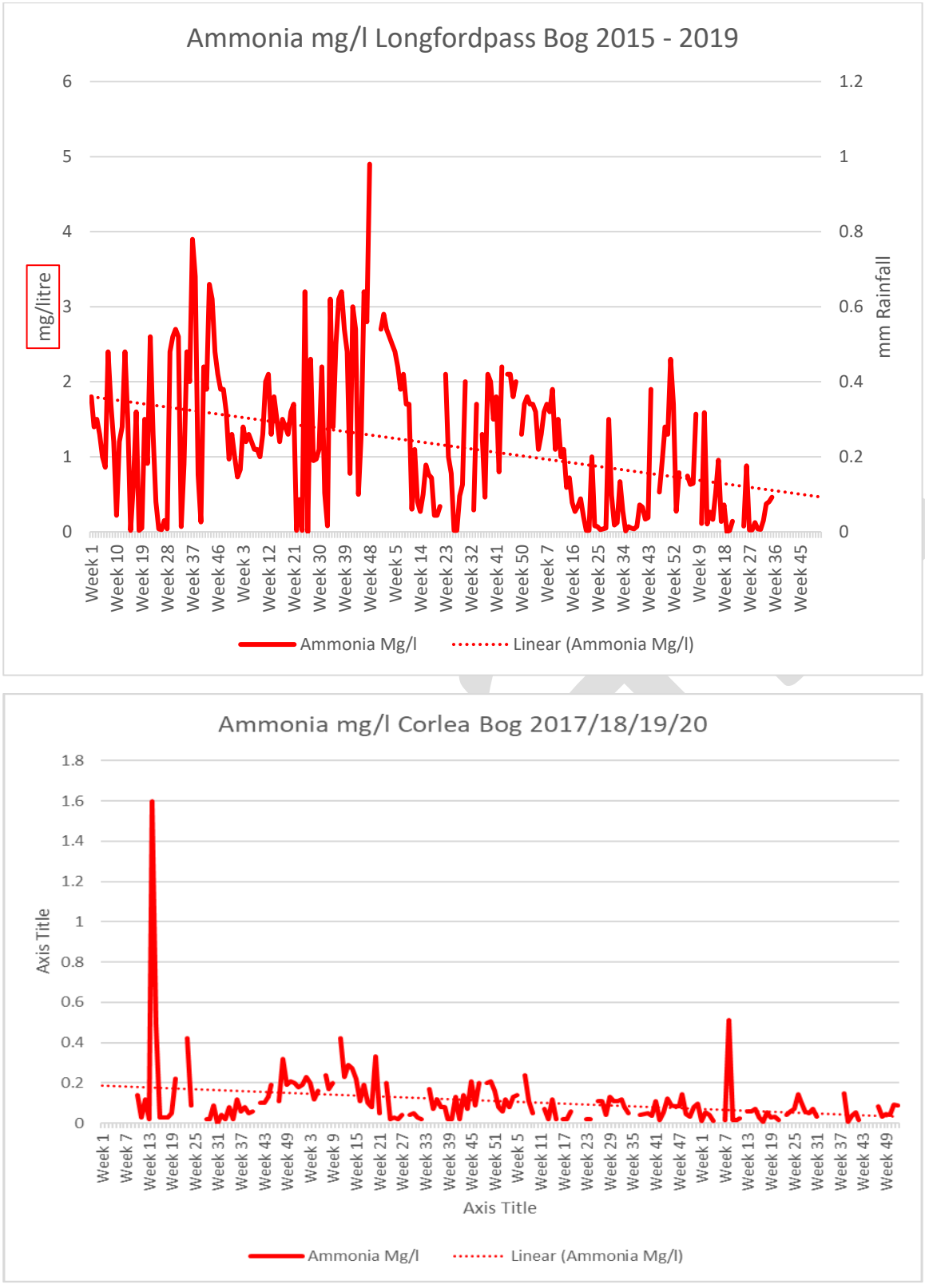


Figure 7.1. Ammonia levels over the period 2015-2019/2020 at Longfordpass and Corlea.

Table 7.1. Summary of Success criteria, targets, how various success criteria will be measured and expected time-frames.

Criteria type	Criteria	Target	Measured by	Expected Time-frame
IPC validation	Rewetting in the former area of industrial drainage.	Delivery of rehabilitation measures Restoration of hydrological regime.	Aerial photography after rehabilitation has been completed – to demonstrate measures (drain-blocking) Establishment of a baseline for future monitoring of bare peat, vegetation establishment and habitat condition.	3 years
IPC validation	Key water quality parameters Ammonia, Phosphorous, Suspended solids, pH and conductivity	Reduction or stabilisation of key water quality parameters associated with this bog	Water quality monitoring for a period after rehabilitation has been completed	2 years
IPC validation	Reducing pressure from drainage on the local water body catchment (WFD)	Where this section of the water body (that this bog drains to) has not been identified as under pressure from peat extraction, that the intervening EPA monitoring programme associated with its Programme of Measures for this water body, confirms that its classification remains at not being at risk from peat extraction associated with activities at this bog.	EPA WFD monitoring programme	WFD schedule

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7.2 Critical success factors needed to achieve successful rehabilitation as outlined in the plan

The achievement of successful rehabilitation as outlined in the plan requires:

- **Funding to pay for resources required to deliver the planned rehabilitation (Bord na Móna).** Bord na Móna maintains a Provision on its balance sheet to pay for these future costs when industrial peat extraction ceases. Bord na Móna is fully committed to meeting its obligations relating to rehabilitation and decommissioning under the Integrated Pollution Control Licence.
- **Bord na Móna to have sufficient resources (staff and training) to deliver the planned rehabilitation with required associated skills and competencies.**
- **Bord na Móna to have sufficient resources (suitable machinery) and staff to maintain this machinery.**
- **Weather conditions to be within normal limits over the rehabilitation plan timeframe.** Long periods of wet weather have the capacity to significantly affect ground conditions and constrain the delivery of rehabilitation. The potential impact of wet weather on ground conditions can be reduced by appropriate planning and management. Bord na Móna have significant experience of managing these issues through 70 years of working in these peatland environments.
- **Rehabilitation measures to be effective.** The rehabilitation measures proposed in this plan are based on 40 years of Bord na Móna experience of peatland management and best practice applied internationally in peatland management. Measures proposed in this plan have already been shown to be affective at other sites. Bord na Móna will apply a flexible and adaptable approach to the more innovative rehabilitation measures proposed in this plan. If measures are not initially effective, Bord na Móna will review any requirement for additional practical rehabilitation.
- **Natural colonisation of vegetation to develop semi-natural habitats at a rate within the normal limits.** The development of naturally functioning semi-natural habitats on cutaway peatland takes time. Pioneer vegetation can develop relatively quickly (3-10 years) and wetland habitats can develop relatively quickly. Birch woodland make take 20-30 years to develop. However, it may take 50 years for active raised bog vegetation to re-develop on ground that was previously cutaway. Different environmental conditions will have a significant impact on the rate of natural colonisation, and as a result of the combination of different environmental conditions and the application of different rehabilitation measures, there will be a variety of habitat outcomes. Future habitat modelling has taken cognisance of the proposed hydrological regime post construction.
- Rehabilitation measures have been designed to accelerate and work with natural colonisation and other natural processes. Bord na Móna experience of rehabilitation and restoration has shown that re-wetting improves conditions for natural colonisation and that natural colonisation is accelerated where the environmental conditions are most suitable. Rehabilitation measures have been designed to modify the conditions of areas within sites where conditions are less suitable for natural colonisation (modifying hydrology, topography, nutrient status or availability of potential seed sources).
- **Monitoring to be robust and effective.** Rehabilitation Monitoring will be established to validate the success of rehabilitation as required by Condition 10 of the IPC Licence. This will focus on a collecting a range of scientific data that can then quickly be adapted and into metrics that can be used to measure changes in various ecosystem services.

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8. REHABILITATION ACTIONS AND TIME FRAME

Peatland restoration and rehabilitation requires detailed planning and the use of data from desktop surveys and field surveys. This data in association with topographical and hydrological modelling will be important in planning the future peatland landscapes and planning the use of the most appropriate rehabilitation methodologies based on environmental characteristic. Hydrological modelling indicates those areas that are likely to re-wet when drains are blocked, based on the current topography. This planning is essential for matching the most sustainable rehabilitation methodology to the most suitable cutaway environment to maximise the benefits of the resource outlay (maximising cost/benefit).

A number of illustrative figures have been produced to inform Rehab Planning and Design, including Aerial Photography, Peat Depths and LiDAR Surface Maps, these are included in the accompanying Mapbook as the drawings referenced below:

BNM-ECO-23-27-21 titled ***Lough Bannow Bog: Aerial Imagery 2000***

BNM-ECO-23-27-22 titled ***Lough Bannow Bog: Aerial Imagery2020***

BNM- ECO-23-27-04 ***Lough Bannow Bog: Peat Depths***

BNM-ECO-23-27-03 titled ***Lough Bannow Bog: LiDAR Map***

The restoration and rehabilitation measures are provisionally outlined in drawing titled BNM-ECO-23-27-20 ***Lough Bannow Bog: Standard Rehabilitation Measures*** in the accompanying Mapbook.

These rehabilitation measures for Lough Bannow Bog will include (see Table 8.1):

- Re-assessment of the pumping regime and removing pumps or reducing pumping if this is desired and has no significant external impact or impacts on proposed future land-uses. Initial hydrological modelling indicates that a part of the site will develop a mosaic of wetland habitats with some permanent deeper water if pumps are decommissioned, or pumping is reduced. 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, where possible. More sustainable permanent gravity drainage solutions will be examined. Some pumping may have to be retained. Some targeted bunding may be required. It is expected that a natural seasonal regime of water fluctuation will develop, with water-levels fluctuating in association with levels of surrounding rivers.
- A widespread drain-blocking programme will be implemented across the cutaway, where possible. In general, field drains will be blocked where possible to re-wet cutaway and re-wet to the optimum water-level. More intensive measures will be targeted towards the bare peat.
- Less intensive measures (targeted drain-blocking) will be used in areas where habitats have already established.
- Measures will include drain blocking (3/100 m), modifying outfalls and managing water levels with overflow pipes.
- Wetland measures including blocking outfalls and managing water levels with overflow pipes.
- The existing silt ponds will be retained and maintained during the rehabilitation phase. During the monitoring and verification phase the silt ponds will be continually inspected and maintained, where appropriate. When it is deemed that the silt ponds are not required, as the bog has been successfully stabilised and there is no silt run-off, the condition of the silt ponds will be reviewed. The silt ponds will

either be de-watered (water levels lowered to a level where the silt pond will naturally develop as a small wetland feature), left in situ, or infilled (where discharges do not require silt control).

Table 8.1: Types of and areas for rehabilitation measures at Lough Bannow Bog.

Type	Code	Description	Area (Ha)*
Deep peat cutover bog	DPT1	Regular drain blocking (3/100 m) + modifying outfalls and managing water levels with overflow pipes	46.1
Dry cutaway	DCT1	Modifying outfalls and managing water levels with overflow pipes	295.3
Wetland cutaway	WLT1	Turn off or reduce pumping to re-wet cutaway + modifying outfalls and managing water levels with overflow pipes	188.4
Marginal land	MLT1	No work required	96.2
Silt Pond	Silt Pond	Silt Pond	0.4
Constraint	Constraint	Constraint	130.8
Total Area			**757.2**

**Note that the types of rehab and areas of rehab may change in response to stakeholder consultation and refinement of the rehabilitation measures.*

8.1 Completed and Ongoing

- A significant part of the site has already re-vegetated, with pioneer vegetation maturing and developing a mosaic of typical cutaway peatland habitats with Birch woodland predominating. Bare peat areas within the older cutaway areas are reducing. Natural re-colonisation of the cutaway so far has been quite effective. Other parts of the site (younger cutaway) are naturally colonising for more than 10 years and are developing a mosaic of cutaway habitats.

8.2 Short-term planning actions (0-1 years post plan finalisation)

- Seek formal approval of the rehabilitation plan from the EPA.
- Develop a detailed site plan outlining how the various rehabilitation methods will be applied to Lough Bannow Bog. This will take account of peat depths, topography, drainage and hydrological modelling (see rehabilitation map for an indicative view of the application of different rehabilitation methodologies).
- A drainage management assessment of the proposed rehabilitation measures will be carried out and any issues identified resolved and the rehabilitation plan adapted.
- A review of known archaeology and an archaeological impact appraisal of the proposed rehabilitation will be carried out. The results of this assessment will be incorporated into the rehabilitation plan to minimise known archaeological disturbance, where possible.
- A review of issues that may constrain rehabilitation such as known rights of way, turbary and existing land agreements is to be carried out.
- An ecological appraisal of the potential impacts of the planned rehabilitation on the presence of sensitive ground-nesting bird breeding species (e.g. breeding waders) is to be carried out. The scheduling of rehabilitation operations will be adapted, where required.
- Ensure all activities comply with the environmental protection requirements of the IPC Licence.

- Carry out Appropriate Assessment (AA) of the Rehabilitation Plan. Incorporate any required mitigation measures from the AA in the plan for the delivery of rehabilitation and decommissioning across the site.
- Track implementation and enforcement of the relevant IPC Licence conditions, the mitigation measures (AA) and other environmental control measures during the implantation of the rehabilitation plan.

8.3 Short-term practical actions (0-2 years post plan finalisation)

- Carry out proposed measures as per the detailed site plan. This will include intensive drain blocking and targeted hydrological management prescriptions in the cutaway. All rehabilitation will be carried out with regard to best practice environmental control measures (Appendix III).
- Monitor the success of rehabilitation measures in relation to developing suitable hydrological conditions.
- Carry out the proposed monitoring, as outlined in section 9.
- Silt ponds will be monitored during this period and there will be continued maintenance and cleaning to prevent potential suspended solids run-off from the site during the rehabilitation phase.

8.4 Long-term (>3 years post plan finalisation)

- Evaluate success of short-term rehabilitation measures outlined above and remediate where necessary.
- Delivery of a monitoring, aftercare and maintenance programme (See section 9 below).
- Decommissioning of silt-ponds will be assessed and carried out, where required.
- Reporting to the EPA will continue until the IPC Licence is surrendered.

8.5 Timeframe

- **Year 1 post finalisation:** Short-term planning actions (specific year is dependent on planning consent).
- **Year 1-3 post finalisation:** Short-term practical actions.
- **Year 1-3 post finalisation**: Long term practical actions. Evaluate success of short-term rehabilitation measures outlined above and remediate where necessary.
- **> Year 3 post finalisation:** Decommission silt-ponds, if necessary.

8.6 Budget and costing

Bord na Móna maintains a provision on its balance sheet to pay for the future costs of standard rehabilitation and decommissioning when industrial peat extraction ceases. This is updated every year - for more information see the Bord na Móna Annual Report (Bord na Móna, 2024). Bord na Móna is fully committed to meeting its obligations relating to rehabilitation and decommissioning under the Integrated Pollution Control Licence.

At this time, a ‘standard’ rehabilitation provision (sufficient to discharge the requirement of Condition 10 in the licence) has been allocated to the site based on the area of different cutaway types across the site.

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9. AFTERCARE AND MAINTENANCE

9.1 Programme for monitoring, aftercare and maintenance

This programme for monitoring, aftercare and maintenance has been designed to meet the Conditions of the IPC Licence. This is defined as:

- There will be **initial quarterly monitoring assessments** of the site to determine the general status of the bog, the condition of the silt ponds, assess the condition of the rehabilitation work, monitoring of any potential impacts on neighbours land, general land security, boundary management, dumping and littering.
- The number of these site visits will reduce after 2 years to bi-annually.
- These monitoring visits will also consider any requirements for further practical rehabilitation measures.
- The **baseline condition of the site will be established** post-rehabilitation implementation by using an aerial survey to take an up to date aerial photo, when rehabilitation is completed. This will be used to verify completion of rehabilitation measures. The extent of bare peat will be assessed using this baseline data, and habitat maps will be updated, if needed. It is proposed that sites can be monitored against this baseline in the future.
- **Water quality monitoring** at the bog will be established. The main objective of this water quality monitoring will be to establish a baseline and then monitor the impact of peatland rehabilitation on water quality from the bog.
- Monitoring results will be maintained, trended and reported on each year and as required, as part of the requirement to report on Condition 10.1 of the IPC Licence on Bog Rehabilitation in the Annual Environmental Report, and will be provided to LAWPRO and the EPA as required to inform progress and national monitoring requirements under the WFD. These results will also be available in April each year as a requirement of the Annual Environmental Report at www.epa.ie.
- The parameters to be included (as per condition 6.2 of the IPC Licence) include monthly monitoring for pH, Flow, Suspended Solids, Total Solids, Total Phosphorus, Total Ammonia, Colour, and COD.
- This monthly sampling regime on a selected number of silt ponds will be carried out over a two-year cycle.
- If, after two years, key criteria for successful rehabilitation are being achieved and key targets are being met, then the water quality monitoring will be reviewed, with consideration of potential ongoing research on site. The water quality data, the aerial surveys and the habitat mapping will be collated and will be submitted to the EPA as part of the final validation report.
- If, after two years, key criteria for successful rehabilitation have **not** been achieved and key targets have **not** been met, then the rehabilitation measures and status of the site will be evaluated and enhanced, where required. This evaluation may indicate no requirement for additional enhancement of rehabilitation measures but may demonstrate that more time is required before key criteria for rehabilitation has been achieved. Monitoring of water quality will then also continue for another period to be defined.
- Where other uses are proposed for the site that are compatible the provision of biodiversity and ecosystem services, these will be assessed by Bord na Móna in consultation with interested parties. Other after-uses can be proposed for licensed areas and must go through the required assessment process and planning procedures.

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9.2 Rehabilitation plan validation and licence surrender – report as required under condition 10.4

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

Reporting to the EPA will continue until the IPC Licence is surrendered. The bog will be included in the full licence surrender process as per the Guidance to Licensees on Surrender, Cessation and Closure of Licensed Sites EPA, 2012, when:

- The planned rehabilitation has been completed;
- The key criteria for successful rehabilitation has been achieved and key targets have been met;
- Water quality monitoring demonstrates that water quality of discharge is stabilising or improving; and
- The site has been environmentally stabilised.

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APPENDIX I: BOG GROUP CONTEXT

The Mount Dillon Bog Group IPC Licenced area is made up of two sub-groups (Lough Ree- the Mount Dillon Energy Peat Group) and Mostrim) and the bog units within the group have been in industrial peat production for several decades. There are 28 defined bog units covering a total area of 11,322 ha. Of the 28 units, 23 mainly straddle the River Shannon within counties Roscommon and Longford, with five sites partially in County Westmeath to the east. Each bog area further comprises a range of habitats from bare milled peat former production areas to re-colonising cutaway to workshops areas and transport infrastructure. Industrial peat extraction from these sites mainly supplied ESB power stations at Lanesborough (LRP) or for horticultural peat products.

Industrial peat extraction in the Mount Dillon Bog Group finally ceased in 2021. Peat stockpiles which were harvested within the Bog Group continued to be delivered to Lough Ree Power Station until its closure in 2020. The removal of harvested peat stocks from the Mount Dillon Bog Group to supply other customers finally ceased in 2024. Intensive decommissioning and rehabilitation for the Mount Dillon Bog Group started in 2020/2021.

One bog site, Cloonmore, was never used for industrial peat production. Several bogs in the Mostrim group were drained but never fully developed and still retain typical high bog characteristics. These include Clonwhelan, Glenlough and a section of Mostrim. These sites have been zoned for biodiversity and a high bog drain blocking has been used to re-wet the high bog and encourage restoration of the raised bog habitat. Several sites (Glenlough, Mostrim, Clonwhelan and Clynan) were assessed by consultants for NPWS as part of the review of the raised bog Natural Heritage Area network (NPWS, 2014).

The rehabilitation plan for the Mount Dillon Bog Group encompasses all areas involved in industrial peat production including former industrial production areas and associated facilities. It also includes rehabilitation measures for those bogs that were initially drained but not fully developed.

A breakdown of the component bog areas for the Mount Dillon Bog Group IPC Licence Ref. P0-504-01 is outlined in Table Ap-1.

Industrial peat production history varies across the Mount Dillon bog group, so there is a wide range of peat depths at present. Bogs close to Lanesborough tend to have shallower peat depths or have been cutaway, while some bogs on the periphery of the group tend to have deeper peat reserves. Several sites such as Mount Dillion and Derrycashel have been mostly cutaway to the fen peat layers or in some cases to expose the underlying gravel/sub-soil. Several bogs in the Mostrim group have only been partially developed or have had no industrial peat production and have relatively deep peat depths.

Table Ap-1: Mount Dillon Bog Group names, area and indicative status (Mount Dillon Energy Peat sub-group)

Bog Name	Area (ha)	Stage of development	Land-Use and History	Peat Production Cessation	Rehab Plan Status
Begnagh	265	Cutover Bog Industrial peat production commenced at Begnagh Bog in 1977 and ceased in 2020. Deep peat reserves remain on much of the former production area. Begnagh is considered a deep peat cutover bog.	Begnagh Bog formerly supplied a range of commercial functions including fuel peat for Lough Ree Power Some areas of cutaway on site are developing pioneer cutaway vegetation communities. A greenway through Begnegh has been proposed as part of an amenity project with Faillte Ireland and Longford County Council (Midlands Trail Network).	2020	Finalised 2022 Rehab started in 2022

Bog Name	Area (ha)	Stage of development	Land-Use and History	Peat Production Cessation	Rehab Plan Status
Clooneeny	358	Cutover Bog Industrial peat production commenced at Clooneeny Bog in 1985 and ceased in 2020. Deep peat reserves remain on much of the former production area. Clooneeny is considered a deep peat cutover bog.	Clooneeny Bog formerly supplied a range of commercial functions including horticultural peat and fuel peat for Lough Ree Power Most of the former production area on site is bare peat. Some areas of cutaway on site are developing pioneer cutaway vegetation communities.	2020	Finalised 2022 Rehab started in 2022
Cloonmore	102	N/A	Never developed for industrial peat production. scattered plots.	N/A	N/A
Moher	494	Cutover Bog Industrial peat production commenced at Moher Bog in 1985 and ceased in 2020. Deep peat reserves remain across the former production area. Moher is considered a deep peat cutover bog.	Moher Bog formerly supplied a range of commercial functions including horticultural peat and fuel peat for Lough Ree Power Restoration work has been carried out on a 38ha section of high bog within Moher Bog. Some of the former production area on site is developing pioneer cutaway vegetation communities, the remainder of the site is bare peat. A greenway through Moher has been proposed as part of an amenity project with Faillte Ireland and Roscommon County Council (Midlands Trail Network).	2020	Finalised 2024 Rehab to start in 2025
Moher Rail Link	28	Moher rail link is a link between sites.	N/A	N/A	N/A
Corlea	163	Cutaway Bog Industrial peat production commenced at Corlea Bog in 1960 and ceased in 2018. Long-term peat extraction has reduced peat reserves on this bog. Corlea is considered a shallow peat cutaway bog.	The former production area at Corlea has already extensively colonised. Pioneer wetland and scrub development has occurred over much of the site. Some wetland and rehabilitation management was undertaken between 2016-2018. Part of site leased to local community development group to develop amenity walkway in association with Longford County Council. This greenway has been constructed.	2018	Finalised in 2023 Rehab started in 2023
Derraghan	289	Cutover Bog Industrial peat production commenced at Derraghan Bog in the 1940's and ceased in 2020. Most of the former production area has shallow peat reserves. Some pockets of deep peat remain. Derraghan is considered a shallow peat cutover bog.	Derraghan Bog formerly supplied a range of commercial functions including fuel peat for Lough Ree Power Much of the former production area at Derraghan has been out of production for some time. These areas have already extensively colonised with pioneer wetland and scrub vegetation communities.	2020	Plan Finalised 2021 Rehab commenced 2022
Derryadd	653	Cutover Bog Industrial peat production commenced at Derryadd Bog in 1964 and ceased in 2019. Long-term peat extraction has reduced peat reserves on this bog. Most of the former production area has shallow peat reserves. Some pockets of deep peat remain. Derryadd is considered a shallow peat cutover bog.	Much of the former production area at Derryadd has been out of production for some time. These areas have already extensively colonised with pioneer wetland and scrub vegetation communities Derryadd Bog will form part of the footprint of the proposed Derryadd Wind Farm Project (in pre-planning). An amenity walkway through part of Derryadd Bog is proposed for the Derryadd Wind Farm project	2019	Draft 2025

Bog Name	Area (ha)	Stage of development	Land-Use and History	Peat Production Cessation	Rehab Plan Status
Derryadd2 (Derryadd East)	328	Cutover Bog Industrial peat production commenced at Derryadd 2 Bog in 1960 and ceased in 2020. Long-term peat extraction has reduced peat reserves on this bog. Most of the former production area has shallow peat reserves. Some pockets of deep peat remain. Derryadd 2 is considered a shallow peat cutover bog.	Much of the former production area at Derryadd 2 has been out of peat production for some time. These areas have already extensively colonised with pioneer wetland and scrub vegetation communities	2020	Finalised 2023 Rehab started 2023
Derryarogue	895	Cutover Bog Industrial peat production commenced at Derryarogue Bog in 1952 and ceased in 2019. Long-term peat extraction has reduced peat reserves on this bog. Most of the former production area has shallow peat reserves. Some pockets of deep peat remain. Derryarogue is considered a shallow peat cutover bog.	Much of the former production area at Derryarogue has been out of production for some time. These areas have already extensively colonised with pioneer wetland, cutaway and scrub vegetation communities. Derryarogue Bog will form part of the footprint of the proposed Derryadd Wind Farm project (in pre-planning). An amenity walkway through part of Derryarogue is proposed for the Derryadd Wind Farm project. Additional greenway through Derryarogue is in construction as part of an amenity project with Longford County Council. A further section of greenway has been proposed as part of an amenity project with Faillte Ireland and Longford County Council (Midlands Trail Network).	2019	Derryarogue West Finalised in 2023 Rehab started in 2023 Derryarogue Draft 2024 (remainder of site)
Derrycashel	388	Cutover Bog Industrial peat production commenced at Derrycashel Bog in 1951 and ceased in 2018. Long-term peat extraction has reduced peat reserves on this bog. Most of the former production area has shallow peat reserves. Some pockets of deep peat remain. Derrycashel is considered a shallow peat cutover bog.	Derrycashel Bog formerly supplied a range of commercial functions including fuel peat for Lough Ree Power Much of the former production area at Derryarogue has been out of production for some time. These areas have already extensively colonised with pioneer wetland and scrub vegetation communities. Some wetland and rehabilitation management was undertaken (c.60ha) between 2014-2015.	2018	Finalised 2021 Rehab started in 2021
Derrycolumb	454	Cutover Bog Industrial peat production commenced at Derrycolumb Bog in the 1980's and ceased in 2019. Most of the former production area still has deep peat reserves. Derrycolumb is considered a deep peat cutover bog.	Derrycolumb Bog formerly supplied a range of commercial functions including fuel peat for Lough Ree Power Much of the former production area at Derrycolumb has been out of production for some time. These areas have already extensively colonised with pioneer wetland and scrub vegetation communities. A greenway through Derrycolumb has been constructed as part of an amenity project with Longford County Council.	2018	Finalised 2021 Rehab started in 2021
Derrymoylin	356	Cutover Bog Industrial peat production commenced at Derrymoylin Bog in 1985 and ceased in 2020. Long-term peat extraction has reduced peat reserves on this bog. Derrymoylin is considered a shallow peat cutover bog.	Derrymoylin Bog formerly supplied a range of commercial functions including fuel peat for Lough Ree Power. Most of the former production area on site is bare peat. A greenway through Derrymoylin has been proposed as part of an amenity project with Faillte Ireland and Roscommon County Council (Midlands Trail Network).	2020	Finalised 2024 Rehab to start in 2025

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Bog Name	Area (ha)	Stage of development	Land-Use and History	Peat Production Cessation	Rehab Plan Status
Derryshannoge	452	Cutover Bog Industrial peat production commenced at Derryshannoge Bog in 1985 and ceased in 2020. Deep peat reserves remain across most of the site. Derryshannoge is considered a deep peat cutover bog.	Derryshannoge Bog formerly supplied a range of commercial functions including fuel peat for Lough Ree Power. Much of the former production area at Derryshannoge has been out of production for some time. These areas have already extensively colonised with pioneer cutaway and scrub vegetation communities.	2020	Finalised 2023 Rehab started in 2024
Edera	281	Cutover Bog Development for industrial peat production commenced at Edera Bog in 1990's. Active extraction from Edera began in 2003 and ceased in 2018. Edera is considered a deep peat cutover bog.	Edera Bog formerly supplied a range of commercial functions including fuel peat for Lough Ree Power. The majority of Edera Bog former production area is bare peat.	2020	Finalised 2021 Rehab started in 2021
Erenagh	93	Cutover Bog Development for industrial peat production commenced at Erenagh Bog in 1970's. Erenagh is considered a deep peat cutover bog.	Erenagh Bog formerly supplied a range of commercial functions including fuel peat for Lough Ree Power. Much of the former production area at Erenagh has been out of production for some time. These areas have already extensively colonised with pioneer cutaway and scrub vegetation communities.	2020	To be finalised in 2025
Granaghan	212	Cutover Bog Development for industrial peat production commenced at Granaghan Bog in 1980's. Long-term peat extraction has reduced peat reserves on this bog but deep peat reserves remain on site. Granaghan is considered a deep peat cutover bog.	Granaghan Bog formerly supplied a range of commercial functions including horticultural peat and fuel peat for Lough Ree Power. The majority of Granaghan Bog former production area is bare peat.	2020	Finalised 2023 Rehab to start in 2025
Killashee	110	Cutover Bog Development for industrial peat production commenced at Killashee Bog in 1985. Killashee is considered a deep peat cutover bog.	Killashee Bog formerly supplied a range of commercial functions including horticultural peat and fuel peat for Lough Ree Power. The majority of Killashee Bog former production area is bare peat. Some areas have colonised with pioneer cutaway and scrub vegetation communities.	2020	Finalised 2023 Rehab started in 2024
Knappoge	313	Cutaway Bog Peat Production at Knappoge bog commenced in 1963 and finished in 2018. Peat depths on the former production area are generally shallow. There are some pockets of deeper peat. Knappoge is considered a shallow peat cutaway bog.	Knappoge Bog formerly supplied a range of commercial functions including fuel peat for Lough Ree Power. The majority of Knappoge Bog former production area is bare peat. Some areas have colonised with pioneer cutaway and scrub vegetation communities. A greenway through Knappoge has been constructed as part of an amenity project with Longford County Council. An additional section has been proposed as part of an amenity project with Faillte Ireland and Longford County Council (Midlands Trail Network).	2018	Finalised 2021 Rehab started in 2022
Lough Bannow	739	Cutaway Bog	Much of the former production area at Lough Bannow has been out of production for some	2019	Draft 2025

Bog Name	Area (ha)	Stage of development	Land-Use and History	Peat Production Cessation	Rehab Plan Status
		Peat Production at Lough Bannow bog commenced in 1964 and finished in 2019. Peat depths on the former production area are generally shallow. There are some pockets of deeper peat. Lough Bannow is considered a shallow peat cutaway bog.	time. These areas have already extensively colonised with pioneer cutaway and scrub vegetation communities. A small (35ha) conifer plantation was established in 1980's. Lough Bannow will form part of the footprint of proposed Derryadd Wind Farm Project (in pre-planning). An amenity walkway through part of Lough Bannow is proposed for the Derryadd Wind Farm project		
Moher	483	Cutover Bog Peat Production at Moher Bog commenced in the 1960's and finished in 2020. Peat depths on the former production area remain relatively deep. Moher is considered a deep peat cutover bog.	Moher Bog formerly supplied a range of commercial functions including fuel peat for Lough Ree Power. Much of the former production area at Moher has been out of production for some time. These areas have already extensively colonised with pioneer cutaway and scrub vegetation communities.	2020	To be finalised 2025 Rehab to start 2025
Mount Dillon	592	Cutaway Bog Peat Production at Mount Dillon bog commenced in the 1940's and finished in 2020. Peat depths on the former production largely shallow and the peat is considered cutaway. Some deep peat remains on the west of the site. Mount Dillon is considered a shallow peat cutaway bog.	Mount Dillon Bog formerly supplied a range of commercial functions including fuel peat for Lough Ree Power. Much of the former production area at Mount Dillon has been out of production for some time. These areas have already extensively colonised with pioneer cutaway, wetland and scrub vegetation communities.	2020	To be finalised 2025 Rehab to start 2025

See Drawing number BNM-ECO-23-27-24 titled **Mount Dillon Bog Group**, included in the accompanying Mapbook which illustrates the location of Lough Bannow bog and the Mount Dillon Bog Group in context to the surrounding area.

APPENDIX II: ECOLOGICAL SURVEY REPORT

Ecological Survey Report

Note: This report outlines an ecological survey of the bog. This report should not be taken as a management plan for the site as other land-uses may still be considered. Information within this report may inform the development of other land-uses and identify areas with particular biodiversity value.

Bog Name:	**Lough Bannow**	**Area (ha):**	743ha
Works Name:	Mount Dillon	**County:**	Longford
Recorder(s):	BnM Ecology Section	**Survey/ monitoring Date(s):**	27th and 29th July 2010 Habitats re-surveyed 2012.

Habitats present (in order of dominance)

The most common habitats present at this site include:

- Poor fen (pEang, pJeff, pTyp, pPhrag and pTrig)
- Bare peat (BP)
- gCal
- DisCf
- pCamp
- Rip - riparian areas (streams/drains with fringing habitats)
- Birch dominated scrub (ebir, oBir and cBir) (Codes refer BnM classification of pioneer habitats of production bog. See Appendix II).
- Exposed gravel
- dHeath
- Temporary open water (tow)
- Conifer plantation (WD4)
- Transition mire and quaking bog (PF3)
- Birch woodland (WN7)
- Raised bog (PB1) remnant
- Oak-Ash-Hazel woodland (WN2)
- Possible calcareous springs (FP1)
- Dense Bracken (HD1)
- Wet grassland (GS4) along the fringes of the bog

Description of site

Lough Bannow Bog is situated approximately seven kilometres south east of Lanesborough, Co. Longford along the R392 Road. The R398 public road runs along the north of the site while a secondary road (Keenagh road) runs along part of the southern section of the bog. The Royal Canal passes within 500 metres of eastern edge of the site. Two large mineral islands are located within the site boundaries but are not under BnM ownership. This site has been harvested for milled peat since

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the late 1960's. A large section of failed conifer plantation is located on the site. Overall this site varies greatly from areas that are re-vegetating rapidly since they came out of production to areas that are currently under production (Bare peat). Topographically, the site undulates and has regular small hills of gravel that are exposed between areas of low lying peat, the latter areas being still in production. A rail line crosses the site in an east west direction, dissecting the site into a much larger northern section and a smaller southern section.

Small hills and ridges of gravel are being exposed, these hills and ridges are becoming revegetated with Dry grassland mosaic (DisCf, gCal and gAn-H-Eq). Areas between these hills are revegetating with plant species that are indicative of poor fen habitats such as pEang, pTyp and pJeff. Birch scrub is also becoming established on many of the habitats that have been out of production for longer periods of time, particularly the drier areas.

A conifer plantation was planted in 1995 and is comprised of Sitka and Norway spruce. Some sections of this plantation had trees of medium quality and were in need of thinning and fertilisation, however the majority of the area was extremely poor, with dead or dying trees throughout. The most logical reason for the widespread loss of trees in this plantation was the presence of Heather throughout these areas. Heather is extremely well suited to savaging nitrogen from poor soils and will deprive trees such as Sitka Spruce of nitrogen, causing then to go into check followed by eventual death. Birch and Scots Pine had become established in areas of the plantation and appeared to be doing much better than the spruce.

Immediately to the east of the conifer plantation a large area of the site was largely revegetated with a mixture of cBir, oBir, dHeath, BP and pEang. Much of the cBir was dense and was developing into Birch woodland. Other areas beyond the cBir were younger and were a mosaic of wet and dry habitats (depending on the topography of the site), intermixed with areas of bare peat. To the southeast of the conifer plantation a row of three small hills were at different levels of development, mainly Birch scrub, but the notable feature of these areas was the presence of Oak and Hazel.

A large mineral island is located within the site boundaries in the centre of the site. This "Island" is connected to the public road that runs close to the northern boundary of the site via a small track. This area is not owned by BnM and is managed as agricultural grassland. To the south of the mineral island the site is a mixture of pioneer habitats including DisCf, BP, eBir, pJeff and gCal. To the south of the re-vegetating areas the site is still in production.

The central-eastern part of the site is largely a mixture of dry grassland mosaics and wet grassland mosaics (gCal, DisCf, eBir, oBir, pJeff, pEang, pPhrag, pTyp), with areas of bare peat scattered throughout, some of the areas of bare peat were large but some areas were much smaller and were comprised of a couple of short fields between gravel ridges.

A small works area is located along the railway line close to the eastern end of the line. This works area is comprised of a large tea centre with large amounts of machinery stored around it. Immediately to the north of the works area an area of scrub (cBir) that was developing some of the components of Oak Ash Hazel woodland. This woodland is young and is still developing with Birch, Oak, Rowan, Holly, Hawthorn, Hazel, Guelder Rose, Bramble, Raspberry, Herb-Robert, Meadow-sweet, Honey-suckle, Tufted Sedge, Purple Moor-grass and Male Fern. Paths through this are of the site were in regular use by BnM machinery and relatively large areas of Meadow-sweet dominated wet grassland was located along the access routes. A large rectangular shaped area had been excavated in this area and was filled with water resulting in the presence of an artificial pond. This pond did not contain many macrophytes apart from Reedmace, Floating Sweet Grass with some Water Crow's-foot also. The wet grassland areas contained Meadow Sweet, Knapweed, Willow, Plantain, Vetch, Sweet Vernal-grass, Devil's Bit-Scabious, Hogweed, Horsetails, Red Clover and Creeping Bent Grass. A small wet hollow was also located close to this area and further investigations may be needed in order to determine if this is an actual spring. Although this spot was damp with no standing or flowing water at the time of the ecological survey it did contain tufa which may indicate the presence of springs in this area.

Moving north from this area towards the north eastern corner of the site, the bog again comprises a mosaic of habitats including pJeff, pEang, eBir, gCal, pEqus and DisCf, the largest single habitat consists of a large area of pJeff and oBir along the western edge of the north east corner of the site. An old, disused, railway line is located close to the eastern edge of the site and has been colonised with gMol, dHeath and eGor, several old railway carriages are still located on the track.

Draft

The north eastern corner of the site also contains two small mineral islands that contain Birch, Oak, Blackthorn, Ash and Hazel along with Male fern, Bramble, Lords and Ladies, Hogweed, Harts Tongue Fern, Honeysuckle, Wood Anemone and Herb Robert. Sections of these mounds contain large mature Oak (older than 100 years).

Moving westwards from the mire onto sections of cutover, the site again becomes a mosaic of habitats, mainly pJeff, oBir and bare peat before encountering a mineral island. This mineral island is similar to the one that has already been described to the north of the railway line.

Moving west a large area of bare peat is located before the site again becomes a mosaic of pioneer poor fen and pioneer grassland habitats.

The south west corner of the site is mainly bare peat with pTrig, pRos and pTyp becoming established along the drains, this area is marked on the 2nd edition OSI 6 inch map as a small lake called Lough Anpastia. This lake no longer exists and there is no evidence of it ever having been present on the ground. A pump was in operation close to this area.

Some of the drains in the east of the site have been excavated down to limestone bedrock, Otter spraint were found in one of these drains in the northern section of the site, this drainage ditch is connected to the nearby Royal Canal.

Lough Bawn pNHA 001819

This area is located along the eastern edge of the site. It is bordered by remnant raised bog to the south, west and north while an area of woodland on mineral soil borders Lough Bawn to the east. The south eastern corner of the site is bordered by conifer plantation, part of which was clear felled in the past few years and replanted. The majority of the Lough is in Bord na Mona ownership with a small section owned by Coillte.

The sections of raised bog that surround part of the Lough were in moderate to poor condition overall and the most westerly sections had been ditched many years ago. The ditched sections were dominated by Heather; however the most southerly section of raised bog were in somewhat better condition with a more varied flora.

Lough Bawn is fringed with woodland throughout. This woodland varies from wet bog woodland (WN7) to dry Oak Ash Hazel woodland (WN2) along its eastern side. The woodland that fringes the Lough to the west, north and south is bog woodland (WN7) that varies from sparse cover to denser cover; these sections of bog woodland were quaking and had a high cover of Sphagnum moss in general. These sections of woodland are classed as Annex I habitats (91D0) and are considered to be a rare habitat in Ireland with an estimated nationwide land cover of 150ha approximately (NPWS - Bog woodland (91D0) Conservation Status Assessment report).

The areas of bog woodland ranged to thick, dense areas of woodland to areas that had a lesser density of trees. The main tree species were Birch and Scot's Pine along with Alder, Eared Willow and some gorse. There was extensive evidence that the water levels fluctuate throughout these areas, with some areas being permanently water logged with a quaking feel throughout. Species within the areas of bog woodland included Bog Myrtle, Devil's-bit Scabious, Bog Bean, Honeysuckle, Soft Rush, Sphagnum palustre, Ivy, Bramble, Sweet Vernal Grass, Heather, Star Sedge, Wood Horsetail, Grey Willow, Holly, Broad Buckler Fern, Cow wheat, mint, Water Horsetail, Hogweed, Calliergon sp., Ragged Robin, Lesser Spearwort, Lousewort, *Aulacomnium palustre*, Spotted Marsh Orchid, Marsh Bedstraw. Yorkshire Fog, Heath Wood-Rush and *Epilobium obscurum*.

A section of mature Oak-Ash-Hazel (WN2) is located on the eastern side of Lough Bawn, this woodland was relatively dry and was located on mineral soil. Species here included Birch, Scot's Pine, Ash, Alder, Willow, Hazel, herb Robert, Spindle, Enchanter's nightshade, Ivy, Honeysuckle, Wood False Broome, Hypnum sp., Bramble, Viola sp., Blackthorn, Rowan, Wavy hair Grass, Meadow Sweet, Wood horsetail, Wild strawberry, Holly, hawthorn, Blackthorn, Gorse, Glaucous Sedge, Sycamore, Bush Vetch, Cock's foot, Beech, Rough meadow Grass, Spear Thistle, Wood dock, Wood Sanicle, wood Sedge, Primrose, Lady Fern, Sorrell, Male Fern, Hart's Tongue Fern, Yew, Wytch Elm, *Polytrichum commune*, Yellow rattle, Cep, Bay Bolete, Common Puffball and Trooping Funnel Cap.

A section to the east of this woodland has been fenced off and is grazed, the grazed area ran along the entire eastern edge of the woodland.

The Coillte owned woodland to the south east of Lough Bawn is a mixture of recently felled conifer plantation and mature plantation with sitka Spruce, Norway Spruce and Lodgepole Pine, the edge of these sections were a mixture of species such as Oak, Birch and Hazel with some Yew also.

Lough Bawn had been a lake up until 1964 when drainage of the lake begun, after this initial drainage the water levels shrink until the lake was mostly terristrailized by the late 1960's. This area is classed as transition mire and quaking bog (PF3) according to Fossitt, 2000.

At present the lough has filled in with very small amounts of open water remaining and the entire area has a quaking feel to it. The Lough is covered with a mat of vegetation containing hummocks of vegetation interspersed with shallow water. The Lough is dominated with mosses and sedges and individual trees have spread across the surface of the Lough. Plant species in the area of the lough include Purple Moor Grass, Eared Willow, Birch, Bog Asphodel, Bog Bean, Devil's-bit Scabious, Star Sedge, Purple Loosestrife, Greater Tussock Sedge, Bottle Sedge, Sphagnum palustre (tussock forming) S. subnitens, Heather, Lesser tussock Sedge, Marsh cinquefoil, *Aulacomnium palustre* (tussock forming), marsh Pennywort, Round-leaved Sundew, Wild Angelica, Marsh Thistle, Ragged Robin, Reedmace, Alder, Mint, Water Horsetail, Creeping Bent-grass, Eriophorum angustifolium and Lousewort. *Usnea* sp. lichen was growing on the branches of many of the trees.

One of the BnM employees on the site reported the presence of springs at locations around the site.

There are records of Black Headed Gull, Snipe and Lapwing using this site.

Designated areas on site (cSAC, NHA, pNHA, SPA other)

Lough Bawn is situated in the south eastern corner of the site and was formally a lake until the late 1960's. The lake dried out after intensive drainage works and is now classified as a 'Transition mire and quaking bog' pNHA 001819.

Adjacent habitats and land-use

Adjacent habitats include improved agricultural grassland (GA1), wet grassland (GS4), conifer plantation (WD4), raised bog (PB1), recently planted woodland (WS2) and cutover bog (PB4). The Royal Canal (FW3) is located approximately 0.5km to the east of the site.

Watercourses (major water features on/off site)

- The Bilberry River begins at the southern boundary of the site, this river flows southwards before flowing into Lough Ree
- A tributary of the Bilberry River begins in the south western corner of the site.
- A tributary of the River Shannon starts in the north of the site before flowing northwards.
- All of the watercourses are part of the Shannon catchment.
- The Royal Canal flows within 0.5km of the eastern edge of the site.

Peat type and sub-soils

Gravel ridges and hills are exposed, these hills are composed of Limestone gravel.

Fauna biodiversity (2010)

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Several bird species were noted on the site during the survey.

- Raven (2)
- Sky Lark
- Sand marten
- Common Gull
- Snipe (3)
- Swans are reported to be using the flooded areas during the winter.
- Other more common species include Meadow Pipits, Swallow, Dunnock, Blackbird, Chaffinch, Wood Pigeon, Pheasant and Magpie.

Mammals

- Otter spraint found in a drainage ditch in the north east of the site, this drain is connected to the nearby Royal Canal.
- Pine Marten
- Badger
- Fox
- Hare
- Rabbit

Invertebrates

- Silver-washed Fritillary Butterfly
- Peacock Butterfly
- Green-veined White Butterfly
- Large Heath Butterfly
- Large White Butterfly
- Small Heath Butterfly
- Small Copper Butterfly
- Painted Lady Butterfly

Fish

- Stickleback in the drains

Fungal biodiversity

The Oak-Ash-Hazel woodland along the eastern boundary of the site is rich in fungal diversity with Ceps, Bay Bolete, Razor Strop and Trooping Funnel Cap observed.

Draft

APPENDIX III. ENVIRONMENTAL CONTROL MEASURES TO BE APPLIED TO BOG REHABILITATION

- Bog restoration/rehabilitation measures will be restricted to within the footprint of the proposed rehabilitation area.
- The proposed rehabilitation will have due regard to noise limits and hours of operation (i.e. dusk and dawn) to minimise any potential disturbance on resident and local fauna that utilise the site and immediate environs.
- All plant and equipment for use will comply with the Construction Plant and Equipment Permissible Noise Levels Regulations (SI 359/1996).
- The proposed activities will be restricted to daylight hours and there will be no requirement for artificial lighting.
- Silt ponds will be inspected and maintained as per the IPC Licence.
- During periods of heavy precipitation and run-off, activities will be halted.
- Measures will be carried out using a suitably sized machine and, in all circumstances,, excavation depths and volumes will be minimised where possible.
- All machines will be regularly checked and maintained prior to arrival at the site to prevent hydrocarbon leakage.
- Hoses and valves will be checked regularly for signs of wear and will be closed and securely locked when not in use.
- Fuelling and lubrication of equipment shall only be carried out in designated areas away from surface water drainage features and ecologically sensitive areas.
- Waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the site for disposal or re-cycling.
- Vehicles will never be left unattended during refuelling.
- No direct discharges to waters will be made. No washings from vehicles, plant or equipment will be carried out on site.
- All plant refuelling will take place using mobile fuel bowsers. Only dedicated trained and competent personnel will carry out refuelling operations.
- Mobile storage such as fuel bowsers will be bunded to 110% capacity to prevent spills. Tanks for bowsers and generators shall be double skinned. When not in use, all valves and fuel trigger guns from fuel storage containers will be locked. All pumps using fuel or containing oil will be locally and securely bunded where there is the possibility of discharge to waters.
- Potential impacts caused by spillages etc. during rehabilitation will be reduced by keeping spill kits and other appropriate equipment on-site.
- Site activities will be carried out in accordance with 'best practice'. In order to ensure compliance and implementation of 'best practice', these measures will be communicated to relevant Bord na Móna staff and updated as required.

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APPENDIX IV. BIOSECURITY

The potential for importation or introduction of non-native plant species (such as Japanese Knotweed, Himalayan Balsam, etc.) during future rehabilitation management, such as drain-blocking using excavators, has the potential to result in the establishment of invasive species within the site. Section 49 of the European Communities (Birds and Natural Habitats) Regulations 2011 prohibits the introduction and dispersal of invasive alien species (particularly plant species) listed on Part 1 (third column) of the 'Third Schedule'.

This section aims to reduce the risk from, and impacts of, invasive species and protecting biodiversity on lands under Bord na Móna ownership. Rehabilitation and decommissioning in the bog will have due regard to the relevant biosecurity measures outlined below:

- Records of problematic invasive species within the various bog units will be marked out with signs to highlight areas of infestation to personnel.
- All plant machinery will be restricted from disturbing known colonies of invasive species.
- All plant machinery will avoid unnecessary crossings to adjoining lands.
- Good site hygiene will be employed to prevent the introduction and spread of problematic invasive alien plant species (i.e. Japanese Knotweed (*Fallopia japonica*), Himalayan Balsam (*Impatiens glandulifera*), Himalayan Knotweed (*Persicaria wallichii*), etc.) by thoroughly washing vehicles prior to entering the area.

The biosecurity measures outlined above are in line with best practice guidelines issued by the National Roads Authority (NRA, 2010) – The Management of Noxious Weeds and Non-native Invasive Plant Species on National Roads and broadly based on the Environment Agency's (2013) – The Knotweed Code of Practice: Managing Japanese Knotweed on Development Sites (Version 3, amended in 2013, accessed on the Environment Agency's website on the 11th of July 2016).

In addition to the above, Best Practice measures around the prevention and spread of Crayfish plague[5] will be adhered with throughout all rehabilitation measures and activities.

[5] https://www.biodiversityireland.ie/projects/invasive-species/crayfish-plague/

APPENDIX V. POLICY AND REGULATORY FRAMEWORK

Bord na Móna Plc is a publicly owned company, originally established in 1934 to develop some of Ireland's extensive peat resources for the purposes of economic development and to support energy security. In the decades since its establishment the company has employed tens of thousands of people in its fuel, energy, and horticultural growing media businesses. For much of its history the company's support of important national policy aims has been enabled and encouraged in a variety of ways by Government.

Today, Bord na Móna is undertaking a number of highly significant actions in support of climate policy. These actions involve a radical transformation and decarbonisation of nearly the entire Bord na Móna business. This transformation will be driven by unlocking the full potential of our land and creating significant value for Ireland and the Midlands in particular.

Bord na Móna is an integral part of the economic, social, and environmental fabric of Ireland and Irish life. As a key employer in the Midlands, the company is conscious that its obligations go beyond purely commercial and environmental – there is also a social responsibility to employees and the communities served by Bord na Móna. It is the company's role and absolute priority to ensure that its long-term strategy delivers on all of these important areas in a robust and balanced way.

There are a wide range of policies, plans, legislation and land designations that inform the development of this Bord na Móna peatland rehabilitation plan. Bord na Móna have also developed and operate various policies and strategies that also inform the development of this rehabilitation plan.

1 EPA IPC Licence

Bord na Móna operates under IPC Licence issued and administered by the EPA to extract peat within the Mount Dillon bog group (Ref. PO-504-01). As part of Condition 10.2 of this licence, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. The bog is part of the Mount Dillon group. This regulatory requirement is the main driver of the development of this rehabilitation plan.

2 The Peatlands Climate Action Scheme (PCAS)

Bord na Móna (BnM) understand that it is the Minister's (DECC) intention to impose an obligation on Bord na Móna to develop a programme of measures, 'the Scheme', for the enhanced decommissioning, rehabilitation and restoration of boglands previously used to supply peat for electricity generation within the State. The enhanced decommissioning, rehabilitation and restoration of the peatlands funded by the Scheme (PCAS) will deliver benefits across climate action (GHG mitigation through reduced carbon emissions and acceleration towards carbon sequestration), enrich the State's natural capital, increase eco-system services, strengthen biodiversity, improve water quality and storage attenuation as well as developing the amenity potential of the peatlands.

It is envisaged that Bord na Móna carry out an enhanced decommissioning, rehabilitation and restoration, under the Scheme (PCAS), and supported by the Climate Action Fund and Ireland's National Recovery and Resilience Plan across a footprint of 33,000 ha. This scheme will significantly go beyond what is required to meet rehabilitation and decommissioning obligations under existing EPA IPC licence conditions. Interventions and measures supported by the Scheme will ensure that environmental stabilisation is achieved (meaning IPC obligations are met), and importantly, significant additional benefits, particularly relating to climate action and other ecosystem services, will also be delivered. However, only the additional costs associated with the additional

and enhanced rehabilitation, i.e., those activities which go beyond the existing decommissioning and rehabilitation requirements arising from Condition 10 will be eligible for support under the Scheme.

3 National and EU Climate and Biodiversity Policy

The National Policy Position establishes the fundamental national objective of achieving a transition to a competitive, low carbon, climate-resilient and environmentally sustainable economy by 2050. It sets out:

- the context for the objective;
- clarifies the level of GHG mitigation ambition envisaged; and
- establishes the process to pursue and achieve the overall objective.

The evolution of climate policy in Ireland will be an iterative process based on the adoption by government of a series of national plans over the period to 2050. GHG mitigation and adaptation to the impacts of climate change are to be addressed in parallel national plans – respectively through the National Climate Action Plan. The plans will be continually updated, as well as being reviewed on a structured basis at appropriate intervals and, at a minimum, every five years. This will include early identification and ongoing updating of possible transition pathways to 2050 to inform sectoral strategic choices.

Bord na Móna is following a decarbonisation programme aimed at reducing the carbon emissions from its activities. Industrial peat production has now ceased, and several other decarbonisation measures are being implemented. The company aims to further develop renewable energy and resource recovery markets with a key objective of reducing the carbon intensity of all products. In addition, the carbon emission mitigation benefits associated with the post-peat extraction rehabilitated peatland following re-wetting, revegetation and colonisation of significant areas with native woodland will make a significant contribution to achieving the State's carbon emission reduction targets.

Peatlands rehabilitation and restoration is referenced in Section 17.3.3 of the Land Use, Land Use Change, Forestry and Marine Chapter of the National Climate Action Plan 2021 as follows:

"The rehabilitation of degraded peatlands to a condition in which they regain their ability to deliver specific ecosystem services has considerable potential for initial mitigation gains, and future carbon sequestration. Additional benefits of peatland restoration include positive socio-economic outcomes for the Midlands, increased natural capital, enriched biodiversity, improved water quality, and flood attenuation."

The scheme is included as Action 33 in the Climate Action Plan 2021 Annex of Actions - Deliver the Enhanced Decommissioning, Rehabilitation and Restoration (EDRR) Scheme for Bord na Mona Peatlands.

EDRRS is also referenced in the Climate Action Plan 2021 as a measure to deliver a Just Transition in the Midlands.

International research and scientific understanding of peatlands is now reflected in key Irish national policy and strategy documents such as the National Raised Bog Special Areas of Conservation (SACs) Management Plan 2017 - 2022 (Department of Arts, Heritage and the Gaeltacht 2017), The National Peatland Strategy (Department of Arts, Heritage and the Gaeltacht 2015), The National Biodiversity Action Plan (National Parks and Wildlife Service 2017), The River Basin Management Plan for Ireland 2024 (Department of Housing, Local Government and Heritage 2024), and the Biodiversity – Climate Change Sectoral Action Plan (Department of Arts, Heritage and the Gaeltacht 2019). Each of the national plans, which are also complemented with the recently published EU Green Deal communication on Biodiversity Strategy for 2030 (COM 2020) have overlapping objectives and actions

that focus on the restoration of peatlands damaged by turf-cutting, drainage and other impacts, as well as the re-wetting of Bord na Móna industrial peat extraction bogs.

While not specifically identified as a restoration implementor, EDRRS objectives are in line with those of the United Nations Decade on Ecosystem Restoration 2021-2030 of Preventing, Halting and Reversing the Degradation of Ecosystems worldwide.

EDRRS is also in line with the EU Commission proposal for a Nature Restoration Law which will apply legally binding targets for nature restoration in different eco-systems to every Member State. The aim is to cover at least 20% of the EU's land and sea areas by 2030 with nature restoration measures and eventually extend these to all ecosystems in need of restoration by 2050.

4 National Peatlands Strategy

The National Peatlands Strategy (2015) contains a comprehensive list of actions, necessary to ensure that Ireland's peatlands are preserved, nurtured and become living assets within the communities that live beside them. It sets out a cross-governmental approach to managing issues that relate to peatlands, including compliance with EU environmental law, climate change, forestry, flood control, energy, nature conservation, planning, and agriculture. The Strategy has been developed in partnership between relevant Government Departments/State bodies and key stakeholders through the Peatlands Council.

The strategy recognises that Ireland's peatlands will continue to contribute to a wide variety of human needs and to be put to many uses. It aims to ensure that Ireland's peatlands are sustainably managed so that their benefits can be enjoyed responsibly. It aims to inform appropriate regulatory systems to facilitate good decision making in support of responsible use. It also aims to inform the provision of appropriate incentives, financial supports and disincentives where required. The strategy attempts to strike an appropriate balance between different needs, including local stakeholders like turf-cutters and semi-state bodies such as Bord na Móna.

In line with a National Peatlands Strategy recommendation, a Peatlands Strategy Implementation Group (PSIG), was established, assisted in the finalisation of the Strategy, is overseeing subsequent implementation and will report to Government on an annual basis on the implementation of the actions and principles contained within the Strategy.

Bord na Móna is a key stakeholder in the National Peatlands Strategy and the Peatlands Strategy Implementation Group. The strategy recognises the potential for some Bord na Móna sites to be restored and to contribute to the national SAC and NHA network of protected raised bog sites. The strategy (agreed in 2015) also recognises the various different values of cutaway bog and developed six key principles (with Bord na Móna) for the after-use of cutaway bog.

- Bord na Móna will continue to assess and evaluate the potential of the company's land bank, using a land use review system. The assessment will help prepare a set of evidence-based management plans for the various areas of peatland. These plans will also inform its cutaway bog rehabilitation.
- The policy of Bord na Móna is not to open up any undrained new bogs for peat production.
- Lands identified by Bord na Móna as having high biodiversity value and/or priority habitats will be reserved for these purposes as the principal future land use.
- Generally, Bord na Móna cutaway bogs that flood naturally will be permitted to flood unless there is a clear environmental and/or economic case to maintain pumped drainage.

- In deciding on the most appropriate afteruse of cutaway peatlands, consideration shall be given to encouraging, where possible, the return to a natural functioning peatland ecosystem.
- This will require re-wetting of the cutaway peatlands which may lead in time to the restoration of the peatland ecosystem.
- Environmentally, socially and economically viable options should be analysed to plan the future use of industrial cutaway peatlands, in conjunction with limiting factors as outlined in Bord na Móna's Strategic Framework for the Future Use of Peatlands.

The National Peatlands Strategy highlights the importance and value of developing peatland rehabilitation plans for Bord na Móna cutaway sites and implementing this peatland rehabilitation. Some of these principles have now been superseded by the company's decision to cease industrial peat extraction. The National Peatlands Strategy is currently being reviewed by Government.

5 Draft National River Basin Management Plan 2022-2027 (Water Framework Directive)

The National River Basin Management Plan (Department of Housing, Planning, Community and Local Government 2017) is the key national plan for Ireland to achieve the objectives of the Water Framework Directive (WFD). In broad terms, the objectives of the WFD are (1) to prevent the deterioration of water bodies and to protect, enhance and restore them with the aim of achieving at least good status and (2) to achieve compliance with the requirements for designated protected areas.

The NRBMP 2018-2021 outlined how peat extraction can be a potentially significant pressure on various water quality parameters. Peatland rehabilitation of Bord na Móna cutaway (in addition to other measures) was part of the WFD (2018-2021) programme of measures. The NRBMP 2018-2021 takes account of the fact that Bord na Móna was in the process of phasing out the extraction of peat for energy production, that it set a target to rehabilitate 9,000 ha of cutaway bogs (covering 25 peatlands) by 2021 (in 2018) and will look to implement best-available mitigation measures to further reduce water quality impacts caused by peat extraction while the phasing-out process is taking place. This NRBMP 2018-2021 rehabilitation target was superseded by the acceleration of the Bord na Móna de-carbonisation programme and the Scheme **(PCAS)**.

The development of site rehabilitation plans and the delivery of peatland rehabilitation by Bord na Móna was expected to have a positive impact on water quality and will help the NRBMP 2018-2021 deliver its objectives in relation to the Water Framework Directive and is one of the five key principle actions.

The NWBMP 2022-2027 (DHLGH 2024) describes how the number of waterbodies impacted by peat, industry and forestry have decreased by 10, 10 and 5 waterbodies, respectively since the second cycle. Impacts on water quality and river habitat arising from peat and peat extraction and associated drainage include the release of ammonium and fine-grained suspended sediments, and physical alteration of aquatic habitats. Drainage of peatlands also results in changes to the hydromorphological condition of rivers.

The NWBMP 2022-2027 (DHLGH 2024) outlines how maintaining and restoring Irish bogs will lead to a decrease in waterborne carbon leaching to levels comparable with intact bogs as well as reducing losses of peat silt and ammonia. Vegetation on the surface of the peat can also slow the flow of water over the land surface. Based on the EPA's most recent reports, peat extraction and drainage is impacting on 106 water bodies across the country, with peat the single pressure on 28 of these water bodies. However, compared to the data in the second-cycle plan, the number of water bodies impacted by peat has decreased.

The cessation of industrial peat extraction by Bord na Móna in 2021 was expected to have a significant positive impact on water quality of receiving water courses by reducing the impact of peat extraction as a key pressure on particular water courses. This is now being supported by the results and conclusions of the draft NWBMP 2022-2027.

6 4th National Biodiversity Action Plan 2023-2030

Ireland's 4th National Biodiversity Action Plan (NBAP) sets the national biodiversity agenda for the period 2023-2030 and aims to deliver the transformative changes required to the ways in which we value and protect nature. The 4th NBAP has been developed with the support, advice and input of the interdepartmental Biodiversity Working Group and the independent Biodiversity Forum. Ireland's 2nd National Biodiversity Conference was held to gather insights and recommendations for the development of the NBAP and a public consultation process was held to provide further opportunities to engage with the Plan.

The 4th NBAP strives for a "whole of government, whole of society" approach to the governance and conservation of biodiversity. The aim is to ensure that every citizen, community, business, local authority, semi-state and state agency has an awareness of biodiversity and its importance, and of the implications of its loss, while also understanding how they can act to address the biodiversity emergency as part of a renewed national effort to "act for nature".

The delivery of rehabilitation via PCAS is expected to significantly contribute in the future to actions and targets of the 4th National Biodiversity Action Plan 2023-2030, particularly in relation to peatland restoration, nature restoration and creation of new habitats such as wetlands and woodlands.

7 EU Nature Restoration Law

The EU Nature Restoration Law is a key element of the EU Biodiversity Strategy, which sets binding targets to restore degraded ecosystems, in particular those with the most potential to capture and store carbon and to prevent and reduce the impact of natural disasters. The regulation combines an overarching restoration objective for the long-term recovery of nature in the EU's land and sea areas with binding restoration targets for specific habitats and species. These measures should cover at least 20% of the EU's land and sea areas by 2030, and ultimately all ecosystems in need of restoration by 2050.

This regulation has now been adapted and it is expected that all Member States will be required to produce a National Restoration Plan within two years of adoption. This will be led by the National Parks and Wildlife Service and will comprise a broad and deep public participation process, informed by robust ecological and socio-economic impact assessments. Bord na Móna are working with NPWS to identify bog restoration and other re-wetted cutaway sites that can contribute towards Irelands targets for the Nature Restoration Law.

8 National Conservation Designations

Bord na Móna operates in a wider landscape that also includes a network of European and National nature conservation sites (Special Areas of Conservation (SACs), Special Protection Areas (SPAs), National Heritage Areas (NHAs, cNHAs) and National Nature Reserves). Bord na Móna will take account of this network of conservation objectives and their conservation objectives when developing these rehabilitation plans. It is expected that

peatland rehabilitation will, in general, benefit the conservation objectives of this network of nature conservation sites.

9 National Raised Bog Special Area of Conservation Management Plan 2017-2022.

The National Raised Bog Special Area of Conservation Management Plan 2017-2022 sets out a roadmap for the long-term management, restoration and conservation of protected raised bogs in Ireland. The Plan strikes an appropriate balance between the need to conserve and restore Ireland's raised bog network as part of Ireland's commitments towards the EU Habitats Directive, and the needs of stakeholders and gives recognition to the important role that communities have to play in the conservation and restoration of raised bogs. The National Raised Bog Special Areas of Conservation (SACs) Management Plan 2017-2022 is part of the measures being implemented in response to the on-going infringement action against Ireland in relation to the implementation of the EU Habitats Directive, with regard to the regulation of turf cutting on the Special Areas of Conservation (SACs). The then Minister for Arts, Heritage and the Gaeltacht, also published a **Review of Raised Bog Natural Heritage Area Network** in 2014.

Bord na Móna has played a key role in the development of the National Raised Bog Special Area of Conservation Management Plan 2017-2022 and the Review of the Raised Bog Natural Heritage Area Network. Several Bord na Móna sites were assessed by the National Parks and Wildlife Service as part of the above Plan and Review and there is an expectation that several Bord na Móna sites will be designated as SACs and NHAs in the future. This will reinforce the network of protected raised bog sites and replace in part sites that will be de-designated as they have been deemed to be significantly damaged and are deemed to have no raised bog restoration prospects. PCAS is expected to restore several sites that will contribute to The National Raised Bog Special Areas of Conservation (SACs) Management Plan 2017-2022 targets in relation to the restoration of raised bog habitat.

Bord na Móna has also responded to the needs of the NRBMP and provided several sites to the government for the relocation of turf-cutters from SACs. This is part of a suite of ongoing bog conservation measures in the NRBMP to manage turf-cutting in protected sites. Bord na Móna and the National Parks and Wildlife Service continues to engage regarding the ongoing relocation of turf-cutters from protected raised bog sites.

10 All-Ireland Pollinator Plan 2021-2025

The All-Ireland Pollinator Plan 2021-2025 outlines key objectives and actions to protect and support pollinating insects and the habitats they rely on. A Bord na Móna specific action in this plan includes the adoption of pollinator-friendly management within the Bord na Móna network of sites. One action to help achieve this objective is habitat rehabilitation and restoration, where possible, of pollinator-friendly habitats, including peatland habitats.

11 Land-use Planning Policies

As Bord na Móna operates in many counties across Ireland, it is important to note the respective development plans in these counties. Many of the existing development plans recognise the potential that exists in the after-use of cutover/cutaway peatlands. Bord na Móna seeks to work with all of the relevant local authorities to ensure that the most appropriate after-uses are reflected in local planning policy. The following areas of consistent

importance are of both direct and indirect relevance to Bord na Móna: heritage, tourism, biodiversity/conservation, landscape, renewable energy, and economy/enterprise.

12 National Archaeology Code of Practice

Bord na Móna operates under an agreed Code of Practice regarding archaeology with the Department of Arts, Heritage and the Gaeltacht and the National Museum of Ireland which provides a framework to enable the Company to progress peat extraction whilst carrying out archaeological mitigation. (https://www.archaeology.ie/sites/default/files/media/publications/cop-bord-na-mona-en.pdf

The Code replaced a set of Principles agreed with the Department of Arts, Heritage and the Gaeltacht in the 1990s. Under the Code Bord na Móna, the Minister and Director work together to ensure that appropriate archaeological mitigation is carried out in advance of peat extraction.

- BNM must ensure that any monuments or archaeological objects discovered during peat extraction are protected in an appropriate manner by following the Archaeological Protection Procedures.
- BNM must ensure that any newly discovered monuments on Bord na Móna lands are reported in a timely manner to the National Monuments Service of the Department of Arts, Heritage and the Gaeltacht.
- BNM must ensure that any archaeological objects discovered on Bord na Móna lands are reported immediately to the Duty Officer of the National Museum of Ireland.
- Bord na Móna will adhere to the Archaeology Code of Practice relating to management of any archaeological finds that may arise during cutaway peatland rehabilitation and decommissioning.

13 Bord na Móna Biodiversity Action Plan 2016-2021

Rehabilitation of industrial peatlands is a key objective of the Bord na Móna Biodiversity Action Plan 2016-2021. This action plan outlines the main objectives and actions around biodiversity on Bord na Móna lands. The Bord na Móna Biodiversity Action Plan also outlines key International and European policy in relation to biodiversity. This includes the **United Nations Convention on Biodiversity 2011-2020 (CBD)** and **European Biodiversity Strategy to 2020**. Further details of these policies and Bord na Móna s responses can be found in the Bord na Móna Biodiversity Action Plan (Bord na Móna, 2016). Both policy documents highlight targets such as reducing pressure on biodiversity, promoting sustainability, habitat restoration and benefits of ecosystem services.

One example of a key CBD target is:

- *"Restore at least 15% of degraded areas through conservation and restoration activities."*

The EUs headline target for progress by 2020 is to:

- *"halt the loss of biodiversity and the degradation of ecosystems in the EU by 2020, restore them as far as feasible, while stepping up the EU contribution to averting global biodiversity loss."*

This rehabilitation plan is aligned to the CBD target and the EU Biodiversity Strategy target and will help Ireland meet its commitment to these international Biodiversity polices.

14 Bord na Móna Commitments

Bord na Móna made the commitment in 2009 not to develop any new peatland sites for industrial peat production. The company has continued to work with different stakeholders.

The company announced that industrial peat production would be cut by over 50 percent in 2019 and would entirely cease over most of its lands by the mid-2020s. Rehabilitation measures would continue to be carried out with the focus on re-wetting and rehabilitation of cutover and cutaway areas in line with national policies (such as the National Peatland Strategy, the National Biodiversity Action Plan, the Climate Action Plan 2019, the Water Framework Directive, etc.) and rehabilitation guidelines set down by the Environmental Protection Agency. To date, 15,000 hectares of cutaway and cutover bog have been rehabilitated using this approach with 5,000 hectares in active rehabilitation.

In line with Bord na Móna's accelerated decarbonisation programme, the company made a further commitment to a significantly larger rehabilitation target. This was reflected in our plans to rehabilitate a further 20,000 hectares of cutaway and cutover bog to wetland and woodland mosaics by 2025. In addition, we planned to restore a further 1,000 hectares of raised bog habitat by 2025.

The above commitments have now been followed by the decision by the company to cease industrial peat extraction and rehabilitate a target of 33,000 ha between 2021-2025.

These commitments outline the importance of peatland rehabilitation to Bord na Móna. The company will continue to demonstrate environmental responsibility and continue to deliver on these commitments in relation to peatland rehabilitation and in relation to the future management of these lands to maximise their benefits, particularly their ecosystem service benefits, along with the sustainable development of a portion of the land bank for other uses, such as renewable energy.

15 Bord na Móna Strategic Framework for the future use of cutaway peatlands 2020 (Draft)

The general after-use strategy of Bord na Móna is outlined in the Bord na Móna Strategic Framework for Future-Use of Cutaway Bogs 2020 (draft document). This document outlines how Bord na Móna's cutover peatland estate is complex in nature with great variability in terms of peat depths, peat types, drainage, subsoil condition and environmental value. Thus, future options require consideration on a site-specific basis, also bearing in mind the considerable internal variation within bogs. The development of the land-bank will also take account of national needs, while also taking account of the various national legislation, policies and plans related to the management of peatlands. In general, Bord na Móna will seek to balance and optimise commercial, social, and environmental value of these sites, and develop integrated land-uses, while taking account of the need for sustainability and their biodiversity value.

Any consideration of other future after-uses for Bord na Móna land such as development or other mixed uses will be conducted following the relevant planning guidelines and consultation with relevant authorities and will be considered within the framework of this peatland rehabilitation plan.

Draft

APPENDIX VI. DECOMMISSIONING

1. Condition 10 Decommissioning

This is a requirement of the applicable Integrated Pollution Control Licence issued by the Environmental Protection Agency. This condition 10.1 requires the following:

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

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

The main success criteria pertaining to successfully complying with this condition is ensuring that no environmental liability remains from this infrastructure and material and that the bog can be deemed suitable for surrender of the licence under section 95 of the EPA Acts. This is achieved by Bord na Móna identifying and quantifying any mechanical and infrastructural resources that were installed in the bog to enable the development and production operation at the site. This list is then refined to identify any items that would be deemed as possibly resulting in environmental pollution, should they not be removed.

Typically, these items/infrastructures would be any remaining, unconsolidated plant, equipment and attachments, waste materials, unused raw materials such as land drainage pipes, remaining peat stockpiles, stock pile covering, pumps, septic tanks and fuel tanks.

In relation to this bog, the list and tasks would be as follows:

Item	Description	Lough Bannow Decommissioning Plan
1	Clean-up of remaining or unconsolidated waste or materials located in Bogs, Yards, Buildings and Offices	Where relevant
2	Cleaning Silt Ponds	Cleaning Silt Ponds
3	Decommissioning Peat Stockpiles	Where relevant
4	Decommissioning or Removal of Buildings and Compounds	Where relevant
5	Decommissioning Fuel Tanks and associated facilities	Where relevant
6	Decommissioning and Removal of Bog Pump Sites	Where relevant
7	Decommissioning or Removal of Septic Tanks	Where required

In addition, condition 7 of the licence requires these now defined waste items to be disposed of or recovered as follows:

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

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

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

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

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

7.3.3 The ultimate destination of the waste.

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

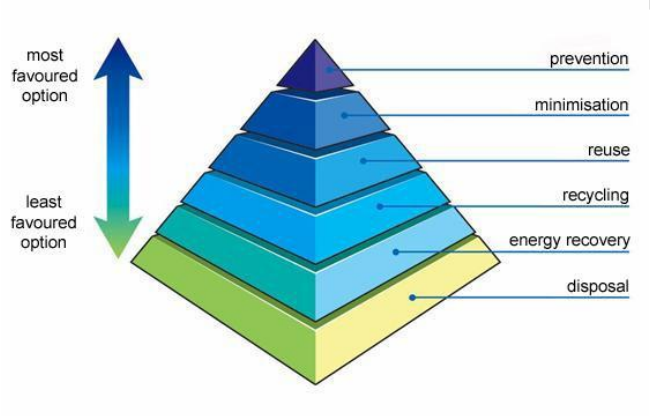
7.3.5 The tonnages and EWC Code for the waste materials listed in *Schedule 2(i) Hazardous Wastes for Disposal/Recovery* and *Schedule 2(ii) Other Wastes for Disposal/Recovery* sent off-site for disposal/recovery.

7.3.6 Details of any rejected consignments.

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

As required by the licence, these waste items will be removed for recycling or disposal, using external contractors with the required waste collection permits, approved under 7.2, with waste records maintained as required under 7.3.

Where possible, Bord na Móna will utilize the appropriate waste hierarchy to identify waste that can reused or recycled ahead of disposal.



The validation of the success of condition 10.1 is carried out through an Independent Closure Audit (ICA), followed by and EPA Exit Audit (EA) and the eventual partial or full surrender of the licence.

APPENDIX VII. GLOSSARY

Cutaway Bog: A Bord na Móna site generally becomes cutaway when it is economically unviable to continue industrial peat extraction or when the majority of peat has been removed.

Deep peat cutover bog. Deep peat cutover bog is defined as former raised bogs that have been in industrial peat production, where production has ceased but the residual peat depth is typically in excess of 2m. *Sphagnum* mosses are key species of raised bogs and the majority of the peat mass is formed from these mosses. *Sphagnum* species and other raised bog species are a key part of raised bog habitat function and prefer more acidic, nutrient poor, water-logged conditions. Typical raised bog *Sphagnum* mosses and other bog species do not thrive with the more typical alkaline water chemistry of cutaway bog but do grow well in these more acidic conditions where peat has been re-wetted. There is potential to re-develop embryonic *Sphagnum*-rich plant communities in these conditions if the peat can be re-wetted. This brings the opportunity of re-developing embryonic *Sphagnum*-rich vegetation communities that are considered Carbon sinks or peat-forming habitats and restoring the carbon sequestration function of these sites.

Dry cutaway bog: Cutaway bog is categorised as dry cutaway where it is not practical or feasible to re-wet these areas completely. It is inevitable that some areas of cutaway will remain relatively dry due to the heterogenous topography of the cutaway, as well as requirements for continued drainage on site for identified after-uses, or off site in relation to neighbouring lands or other infrastructure. Ridges and mounds of glacial deposits can become exposed during peat extraction and form a heterogenous topographical mosaic separated by basins. Dry cutaway may have very thin or no residual peat where ridges and mounds have been exposed. The exposed sub-soils are a mix of glacial gravels, muds and tills that can be quite free-draining. Dry cutaway may also have deeper residual peat but in a location (i.e. at the margin) where the peat cannot be re-wetted due to boundary constraints. Dry cutaway may also develop in situations where there a relatively steep slope that inhibits re-wetting. The majority of dry cutaway will develop towards grassland, heath, scrub and dry woodland habitats.

Environmental stabilisation: The key objective of peatland rehabilitation is environmental stabilisation. This means developing habitats and vegetation back onto the bare peat, slowing water movement across the bog, minimising effects to downstream waterbodies and meeting the conditions of the IPC Licence. This is achieved by a combination of re-wetting, where possible, and natural colonisation of the former cutaway, with or without intervention**.** Habitats will develop that reflect the underlying environmental conditions. Other after-use development may also serve to act as environmental stabilisation.

Marginal land. Marginal land is defined as land around the margin of the industrial peat production area. This margin generally contains a range of habitats including scrub, Birch woodland, cutover bog and raised bog remnants. It has a variety of land-uses including turf-cutting (private turbary).

Rehabilitation: Rehabilitation is defined in general by Bord na Móna as environmental stabilisation of the former cutaway. This is generally achieved via re-wetting, where possible, and natural colonisation of the former cutaway, with or without intervention. It is not possible to restore raised bog habitats on BnM cutaway in general in the short-term. In general, most of the peat mass has been removed from many BnM cutaway sites and the environmental characteristics of these areas have therefore changed radically (peat depths, hydrology, water chemistry, substrate type, nutrient status. This means there will therefore be different habitat outcomes (wetlands, fen, heathland, grassland and Birch woodland). Other after-use development may also serve to act as rehabilitation.

Restoration: Ecological restoration to defined as the process of re-establishing to the extent possible the structure, function and integrity of indigenous ecosystems and the sustaining habitats they provide" (SER 2004).

Defined in this way, restoration encompasses the repair of ecosystems (Whisenant 1999) and the **improvement of ecological conditions in damaged wildlands** through the **reinstatement of ecological processes**. In general, Bord na Móna cutaway peatlands cannot be restored back to raised bog in a reasonable timeframe as their environmental conditions has changed so radically (with the removal of the acrotelem – the living layer and much of the peat mass). However, they can be returned to a **trajectory** towards a naturally functioning peatland system (Renou-Wilson 2012). **Raised bog restoration** is an objective of some BnM sites where there is residual natural raised bog vegetation and where the majority of the peat is still intact.

Standard rehabilitation: This is defined as rehabilitation that is designed to meet the conditions of the EPA IPC Licence. The key objective of rehabilitation is environmental stabilisation. This is achieved by a combination of re-wetting, where possible, and natural colonisation of the former cutaway, with or without intervention**.** Other after-use development may also serve to act as rehabilitation.

Standard decommissioning: This is defined as decommissioning that is designed to meet the conditions of the EPA IPC Licence. This is defined as to render safe or remove for disposal/recovery, any soil, subsoils, buildings, plant or equipment, or any waste, materials or substances or other matter contained therein or thereon, that may result in environmental pollution.

Draft

APPENDIX VIII. EXTRACTIVE WASTE MANAGEMENT PLAN

(Minimisation, treatment, recovery and disposal)

Objective:
The objective of this generic plan is to comply with the requirements of regulation 5 of the Waste Management (Management of Waste from Extractive Industries) Regulations, and to prevent or reduce waste production and its harmfulness.

Scope:
This plan covers IPPC Licence's Ref P0504-01, Mountdillon Group of Bogs located in Co. Longford.

1.0 Extractive Waste:
Waste classified as extractive waste from peat extraction operations arise from three operations associated with this activity.

1.1 Silt Pond excavations and maintenance.
All peat extraction activities in the Mountdillon bog group are serviced by silt lagoons/ponds. During the excavation of these silt ponds, pre IPPC Licensing in 1999 and since licensing, the excavated material is stored adjacent to the silt pond, where it either remains in situ ores levelled out. As required by condition 6.6, these silt lagoons are cleaned twice per annum or more often if inspections dictate. These silt cleanings are also deposited on the same location, adjacent to the silt pond, where they may be levelled periodically to allow room for subsequent cleanings. These mounds of silt pond excavation material and cleanings are generally no higher that 2-3 metres.

1.2 Power Station screenings:
Lough Ree Power Station screens the peat from the bogs prior to processing. This screening removes oversized peat, stones and bogs timbers. Schedule 3 (ii) of the IPPC licence permits disposal of these peat screenings back to the bog, where it is levelled and graded into the surrounding peat landscape. These locations have been agreed with the Agency as per condition 7.4 of the IPPC Licence, and as per the attached locations.

1.3 Bog Timbers:
During peat extraction operations, bog timbers often arise in the bog surface and are required to be cleared. These timbers consist of bog pine, oak and some yew. Some of these timbers, such as the oak and yew are removed for use in the wood craft industry, with the remaining bog pine stockpiled in locations at the opposite end of each bog, where it generally becomes a habitat for flora and fauna. These piles of timber are generally no higher than 1-2 metres.

2.0 P0504-01 IPPC Licence Extractive Waste Conditions

2.1 Condition 7.5 Extractive Waste Management
The licensee shall draw up a Waste Management Plan (to be known as an Extractive Waste Management Plan) for the minimisation, treatment, recovery and disposal of extractive waste. This Plan shall meet the requirements of regulation 5 of the Waste Management (Management of Waste from the Extractive Industries) Regulations,2009. The Plan shall be submitted for agreement by the Agency by the 31' December 2012. The Plan shall be reviewed at least once every five years thereafter in a manner agreeable to the Agency and amended in the event of substantial changes to the operation of a waste facility or to the waste deposited. Any amendments shall be notified to the Agency.
All extractive waste shall be managed in accordance with the Extractive Waste Management Plan. A report on the implementation of the Extractive Waste Management Plan shall be provided in the AER.

2.2 Condition 7.6 Waste Facility

(i) No new waste facility may be developed or an existing waste facility modified unless agreed by the Agency.
(ii) The licensee shall ensure that all existing waste facilities are managed and maintained to ensure their physical stability and to prevent pollution or contamination of soil, air, surface water or groundwater.
(iii) The licensee shall ensure that all new waste facilities are constructed, managed and maintained to ensure their physical stability and to prevent pollution or contamination of soil, air, surface water or groundwater.
(iv) Operational measures shall be continuously employed to prevent damage to waste facilities from personnel, plant or equipment.
(v) The licensee shall establish and maintain a system for regular monitoring and inspection of waste facilities.
(vi) All records of monitoring and inspection of waste facilities, as required under the licence, shall be maintained on-site in order to ensure the appropriate handover of information in the event of a change of operator or relevant personnel.

2.3 Condition 7.7 Excavation Voids
7.7.1 Unless otherwise agreed by the Agency, only extractive waste shall be placed in excavation voids.
7.7.2 When placing extractive waste into excavation voids for rehabilitation and construction purposes, the licensee shall, in accordance with regulation 10 of the Waste Management (Management of Waste from the Extractive Industries) Regulations, 2009, and the Extractive Waste Management Plan:

- Secure the stability of the waste
- Put in place measures to prevent pollution of soil, surface water and ground water.
- Carry out monitoring of the extractive waste and excavation void.

Condition 7.5. Extractive Waste Management Plan. 5 (1)

3.0 Minimisation.
3.1 Silt pond excavation material and cleanings.
IPPC Licence conditions require all production areas to be serviced by an appropriately designed silt pond based on storage volume and retention time. Condition 6.6 requires all ponds to be cleaned bi-annually and more often if inspections dictate, so the only opportunity for minimisation of same is through Standard Operating Procedures. These are required under condition 2.2.2 (i) regarding minimisation of suspended solids, and are in-place to minimise the generation of silt, which in-turn will minimise the generation of silt pond waste.

3.2 Power Station Screenings.
These screenings cannot be minimised as they are a consequence of peat production, stones, timbers and oversize peat materials are naturally occurring on the bog, and are required to be removed prior to processing.

3.3 Bog Timbers.
Bog timbers are also naturally occurring materials within a bog and are required to be removed prior for production. The volume of these bog timbers varies from bog to bog and as such their minimisation is not controllable or quantifiable.

4.0 Treatment
4.1 Silt pond excavation material and cleanings.
The silt pond excavation material and silt cleanings do not require any treatment for its end use which will be either backfilling these silt pond voids as per condition 7.7.1 above as part of the Bog Rehabilitation Plan, or reincorporated into the surrounding peatlands.

4.2 Power Station Screenings.
The factory screenings are permitted to be returned to the bog as they were naturally occurring materials from the bog, and as such do not require any treatment to serve this purpose.

4.3 Bog Timbers

As per 1.3 above, these timbers are stockpiled at two locations in each bog, as per the attached list of sites and become habitats for various flora and fauna.

5.0 Recovery

5.1 Silt pond excavation material and cleanings.

Condition 2.2.2 (vi) requires the reuse of silt pond waste to be examined. This was undertaken in 2006, the outcome of which was that this waste peat silt material, as a fuel, was contaminated with sub-soils, rendering it unsuitable for combustion. In addition, volumes are small compared to overall peat production volumes.

5.2 Power Station Screenings.

Given the nature of these screenings as outlined in 1.2 above, there is no further use identified and they are permitted to be disposed of back to the bog.

5.3 Bog Timbers

Investigations into processing these materials into smaller fractions for potential heating purposes did not yield any viable results. In addition, these older stockpiles are now classified as habitats and as such would not be considered for reuse as a fuel.

6.0 Disposal

6.1 Silt pond excavation material and cleanings.

Schedule 3 (ii) permits the disposal of silt pond cleanings (Lagoon Sediments) to the bog and these locations, adjacent to the silt pond site, are presented in the attached spreadsheet, with associated grid coordinates.

6.2 Power Station Screenings.

Schedule 3 (ii) permits the disposal of screenings (Peat Screenings) to the bog at designated locations agreed under Condition 7.4, and these locations, are presented in the attached spreadsheet, with associated grid coordinates.

6.3 Bog Timbers

These naturally occurring bog timbers are stockpiled at locations in each bog, grid coordinates attached.

7.0 Extractive Waste Management Plan

5 (2a)(i)

The vast majority of peat extraction bogs were all designed and drained for production prior to the 1960's and as such the production fields layout cannot' be altered. Under our Cleaner Reduction Procedures, various design changes have been implemented to the production machines and process to reduce lost peat which eventually is captured in the silt ponds and requires removal as waste peat silt. This along with training and ongoing research and development will continuously reduce waste peat and subsequently waste silt pond cleanings. Bog timbers are present naturally in various volumes and quantities in different bogs and as peat production involves stripping peat in layers, the exposure, generation and removal of these timbers is unavoidable. Work has been undertaken recently into project looking at grinding of these bog timbers in situ using a timber miller, and if this project becomes viable it will contribute to the reduction of bog timbers.

5 (2a)(ii)

Given the nature and expanse of peat bogs, the stockpiling and storage of these waste materials do not present a visual, storage or stability problem. As required under Condition 10 of the IPPC Licence, the silt pond excavations and screenings will be utilised to backfill the silt pond voids once the bogs have finished and stabilised in accordance with out Bog Rehabilitation Plan. Storage of these wastes in the interim, open to the elements does not present a change on the nature of these wastes that will threaten the environment or prevent their reuse during the bog rehabilitation process.

5 (2a)(iii)
Under Condition 10 of the IPPC Licence, all silt ponds will be decommissioned once the bog surface has stabilised, in agreement with the Agency. This will involve the removal of weirs and flow controls, returning the silt pond back to its original drain or removing the silt pond from the drainage system. Both of these activities will involve placing the silt pond extraction and cleaning material back into the excavation void.

5 (2a)(iv)
The peat bogs do not contain any topsoil, so this is not required.

5 (2a)(v)
Peat mineral resources do not undergo any treatment.

5 (2b)
These three extractive waste are all being reused and recovered back to their original extraction points and have not undergone any physical, chemical, or biological change.

5 (2c)(i, ii & iii)
These three extractive wastes, stored on the bog for reuse or recovery during the bog rehabilitation phase, do not require any management or monitoring during the operation of these bogs. Silt pond excavations and cleanings are stored adjacent to the silt pond and quickly revegetated and stabilise, the screenings are graded back into the bog at the agreed locations upon disposal and the bog timbers do not prevent any water or airborne danger to the environment.

5 (3)
The three extractive wastes arising from peat extraction operations at this site are classified wastes from mineral non-metalliferous excavation, with an EWC code of 0101 02. The materials are not classified as hazardous under Directive 91/689/EEC20, and do not contain substances or preparations classified as dangerous under Directives 67/548/EEC5 or 1999/45/EC6 above a certain threshold.
The peat excavations and cleanings are stored in locations and in a manner that they could not collapse, and are remote in their nature. The stockpiles are located adjacent to silt ponds that are cleaned regularly and as such these stockpiles are managed and levelled to facilitate further cleanings.
Therefore the material stored at these waste facilities would not be considered to be a Category A waste facility.

Classification in accordance Annex II.

Waste Material	Description	Classification	Chemical Process treatment	Deposition description	Transport System
Silt Pond Excavations and cleanings	Peat and mineral soils associated with peatlands. Stored for reuse during bog rehabilitation, with no displacement of overburden	01 01 02	None	Excavated from silt ponds by excavator and deposited adjacent to the silt pond.	Excavator
Peat Screenings	Stones, timbers and oversized peat particles, reincorporated into low areas, agreed with the Agency, and stabilized under	01 01 02	None	Removed by screen at the factory and transported by tractor and trailer	Tractor and trailer.

Waste Material	Description	Classification	Chemical Process treatment	Deposition description	Transport System
	normal natural bog conditions			to the designated and agreed locations	
Bog Timbers	Pine, Oak and Yew species, stored at locations in each bog. Not subject to any stability issues due to exposure to atmospheric/meteorological conditions.	01 01 02	None	Removed from the bog surface by excavator and transported by tractor and trailer to the agreed locations	Tractor and Trailer

Description of operations.
Silt pond excavations arise from the requirement to have silt ponds treating all peat extraction sites. Silt pond cleanings arise from the removal of peat silt from silt ponds as required under IPPC Licence. Bog timbers arise from preparation of the bogs surface for peat production. Estimated quantities of materials are below:

Closure plan. (Bog Rehabilitation Plan).
Condition 10.1 – 10.3 of the IPPC Licence requires the following:

- 10.1 Following termination of use or involvement of all or part of the site in the licensed activity, the licensee shall:
- 10.1.1 Decommission, render safe or remove for disposal/recovery, any soil, subsoils, buildings, plant or equipment, or any waste, materials or substances or other matter contained therein or thereon, that may result in environmental pollution.
- 10.1.2 Implement the agreed cutaway bog rehabilitation plan (refer Condition 10.2).

10.2 Cutaway Bog Rehabilitation Plan:

- 10.2.1 The licensee shall prepare, to the satisfaction of the Agency, a fully detailed and costed plan for permanent rehabilitation of the cutaway boglands within the licensed area. This plan shall be submitted to the Agency for agreement within eighteen months of the date of grant of this licence.
- 10.2.2 The plan shall be reviewed every two years and proposed amendments thereto notified to the Agency for agreement as part of the AER. No amendments may be implemented without the written agreement of the Agency.

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

- 10.3.1 A scope statement for the plan; to include outcome of consultations with relevant Agencies, Authorities and affected parties (to be identified by the licensee).
- 10.3.2 The criteria which define the successful rehabilitation of the activity or part thereof, which ensures minimum impact to the environment.
- 10.3.3 A programme to achieve the stated criteria.
- 10.3.4 Where relevant, a test programme to demonstrate the successful implementation of the rehabilitation plan.
- 10.3.5 A programme for aftercare and maintenance.

10.4 A final validation report to include a certificate of completion for the Rehabilitation Plan, for all or part of the site as necessary, shall be submitted to the Agency within six months of execution of the plan. The licensee shall carry out such tests, investigations or submit certification, as requested by the Agency, to confirm that there

is no continuing risk to the environment. This plan including maps and ecological classifications are available on file at the Mountdillon IPPC Licence Coordinators office.
The location in relation to the silt pond excavations and cleanings are adjacent to the silt ponds, which are considered under the Shannon River Basin Management Plan in accordance with the requirements of Directive 2000/60/EC.
Screenings and bog timbers are all naturally occurring elements of peatland and there placement back to the bog in smaller concentrated designated waste facilities does not constitute a risk to the prevention of water compliance.
The lands under where these materials are deposited are peatlands and are un-effected by the placing of this material.

Review.
This plan will be reviewed every five years, the first review to take place in September 2017. This review will entail an inspection of these waste facilities to ensure their placing, management, maintenance and stability comply with the requirements of the Extractive Waste Management requirements and condition 7.5, 7.6 and 7.7 of the Mountdillon IPPC Licence P0504-01.

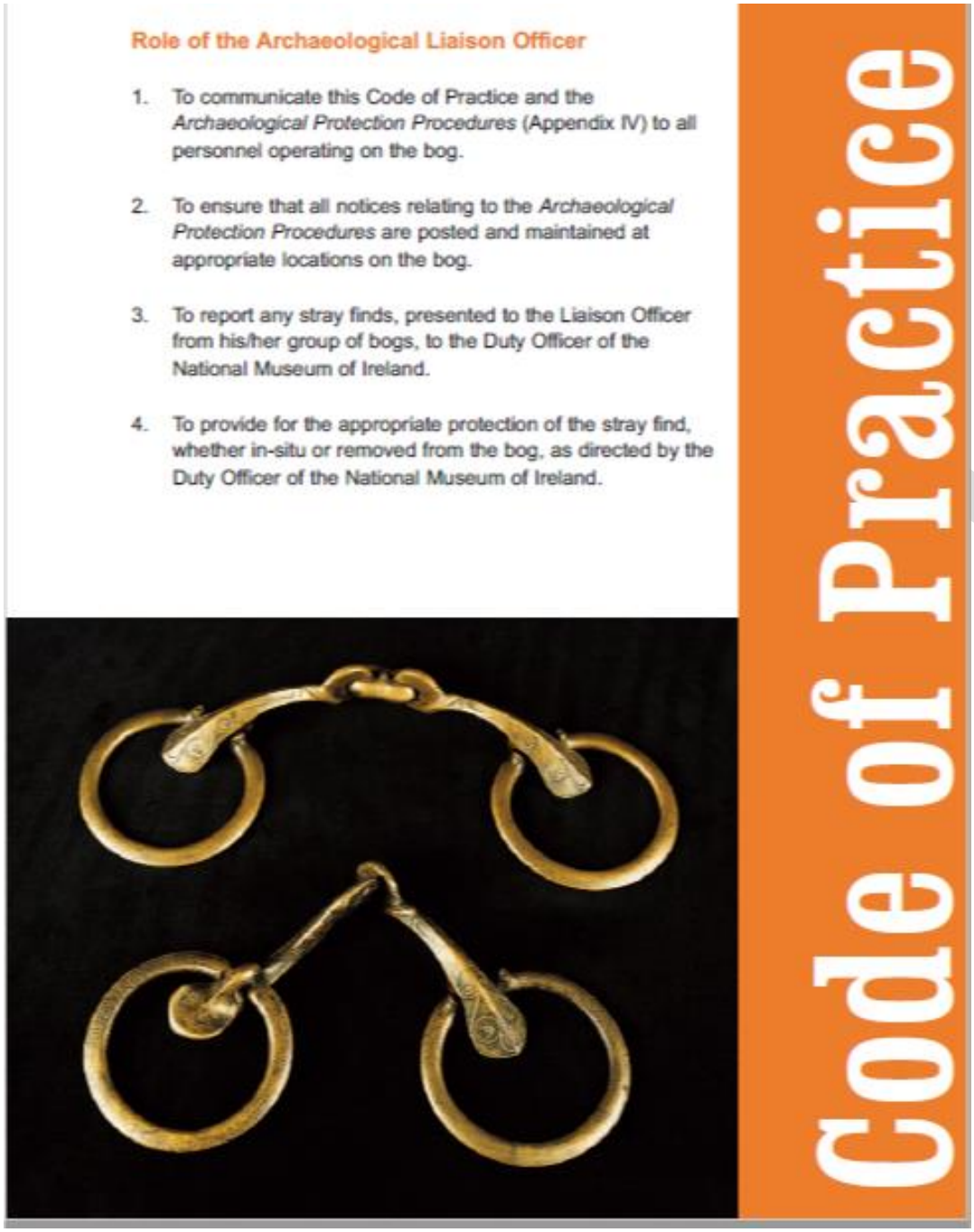
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APPENDIX IX. MITIGATION MEASURES FOR THE APPLICATION OF FERTILISER

- Any fertiliser used will be Rock Phosphate and will not be applied in the following conditions:
    1. The land is waterlogged;
    2. The land is flooded, or it is likely to flood;
    3. The land is frozen, or covered with snow;
    4. Heavy rain is forecast within 48 hours (forecasts will be checked from Met Éireann).
    5. The ground slopes steeply and there is a risk of water pollution, when factors such as surface run-off pathways, the presence of land drains, the absence of hedgerows to mitigate surface flow, soil condition and ground cover are taken into account.
- No fertiliser will be spread on land within 2 metres of a surface watercourse.
- Buffer zones in respect of fertilisation near waterbodies, as specified on FAQ Listing | Environmental Protection Agency will be adhered with at all times with regard to fertiliser application. Reproduced as follows:

Water body / Feature	Buffer zone
Any water supply source providing 100m^3 or more of water per day, or serving 500 or more people	200 metres (or as little as 30 metres where a local authority allows)
Any water supply source providing 10m^3 or more of water per day, or serving 50 or more people	100 metres (or as little as 30 metres where a local authority allows)
Any other water supply for human consumption	25 metres (or as little as 30 metres where a local authority allows)
Lake shoreline	20 metres
Exposed cavernous or karstified limestone features (such as swallow holes or collapse features)	15 metres
Any surface watercourse where the slope towards the watercourse exceeds 10%	10 metres
Any other surface waters	5 metres*

APPENDIX X. ARCHAEOLOGY



22

Code of Practice

5. To arrange for the delivery or collection of the stray find, as directed by the Duty Officer of the National Museum of Ireland.

6. To complete the Report of Discovery of Archaeological Object(s) in Bogs (Appendix V), as directed by the Duty Officer of the National Museum of Ireland.

7. To maintain a file of all stray finds and associated documentation and provide copies to the Project Archaeologist.

8. To provide assistance, where required, to the Department during archaeological surveys.

9. To provide assistance, where required, to Bord na Móna's Consultant Archaeologists, during investigation and mitigation of monuments.

10. To report to the Bord na Móna members on the Archaeology Management Liaison Committee any planned developments or new activities on cutaway peatland areas within his/her group of bogs.



Bord na Móna	**Procedure: ENV017**	**Rev: 1**
Title: Archaeological Findings	**Approved: EM**	**Date:**

1) Purpose

The purpose of this procedure is to describe the arrangements in Bord na Móna for findings of Archaeological material (Stray Finds).

All objects, sites or monuments, no matter how fragmentary, are important elements of our heritage.

2) Procedure

1. Check whether there are any known archaeological monuments in your area.
2. Be vigilant at all times - objects or traces of structures can be found on the field surfaces, in the drain faces, on the bog margins or caught within the mechanics of machinery.
3. If an object is found leave it in place, if it is safe to do so, note its position and immediately contact your Archaeological Liaison Officer who will assess the situation and contact the Duty Officer of the National Museum of Ireland.
4. Resist the temptation to investigate the find spot as this may disturb fragile archaeological deposits.
5. If the object is already dislodged or is in imminent danger, remove it carefully, mark its find spot and report it immediately to your Archaeological Liaison Officer.
6. Objects made of wood, leather or textile, which are removed from peat should be kept in conditions similar to those in which they are found. This can be done by packing them in peat or, if waterlogged, placing them in a clean basin of water and sealing the container. Resist the temptation to clean or remove peat from the object.
7. If timbers or other materials, such as gravel or stones, which could be part of a man-made structure are noted on the bog, mark the location and report it immediately to your Archaeological Liaison Officer. If you suspect the find is of archaeological importance, resist the temptation to expose it any further as this could result in damage to the structure.
8. Report anything that looks unnatural in the bog – your Archaeological Liaison Officer will decide whether it should be referred to the appropriate authorities.

NOTE: Our archaeological heritage is a finite, non-renewable resource. Once a site is destroyed its information is lost forever and we have lost the chance to understand a little more about our past, where we have come from and perhaps the opportunity to learn for the future.

Your Archaeological Liaison Officer is ……

3) Records

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Revision	Date	Description of change	Approved
1			
2			

Draft

Draft

Bord na Móna

Lough Bannow Bog
Draft Rehab Plan
GIS Map Book
2025

Document Control Sheet

Document Name:	Lough Bannow Bog Draft Rehab Plan GIS Map Book 2025
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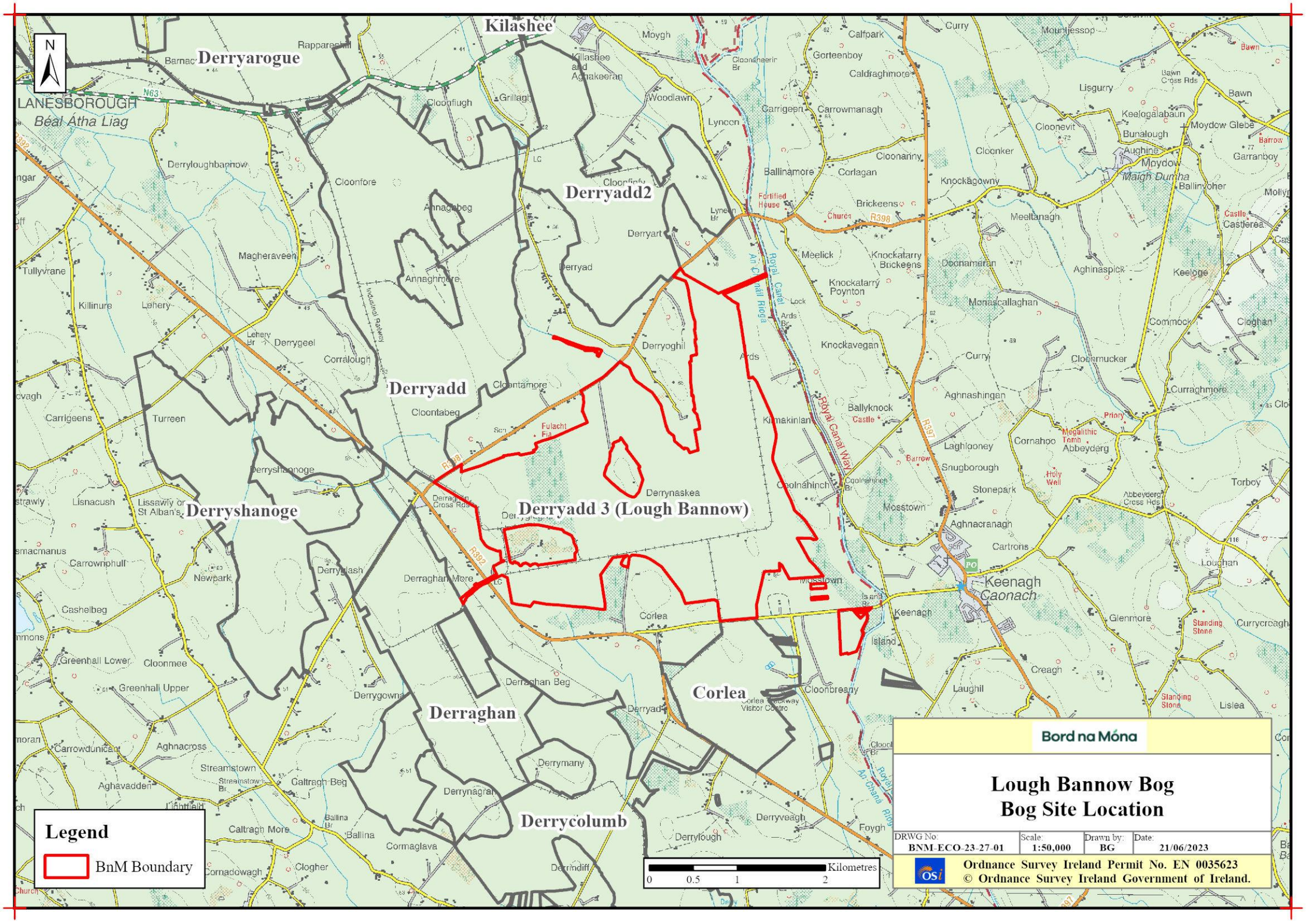
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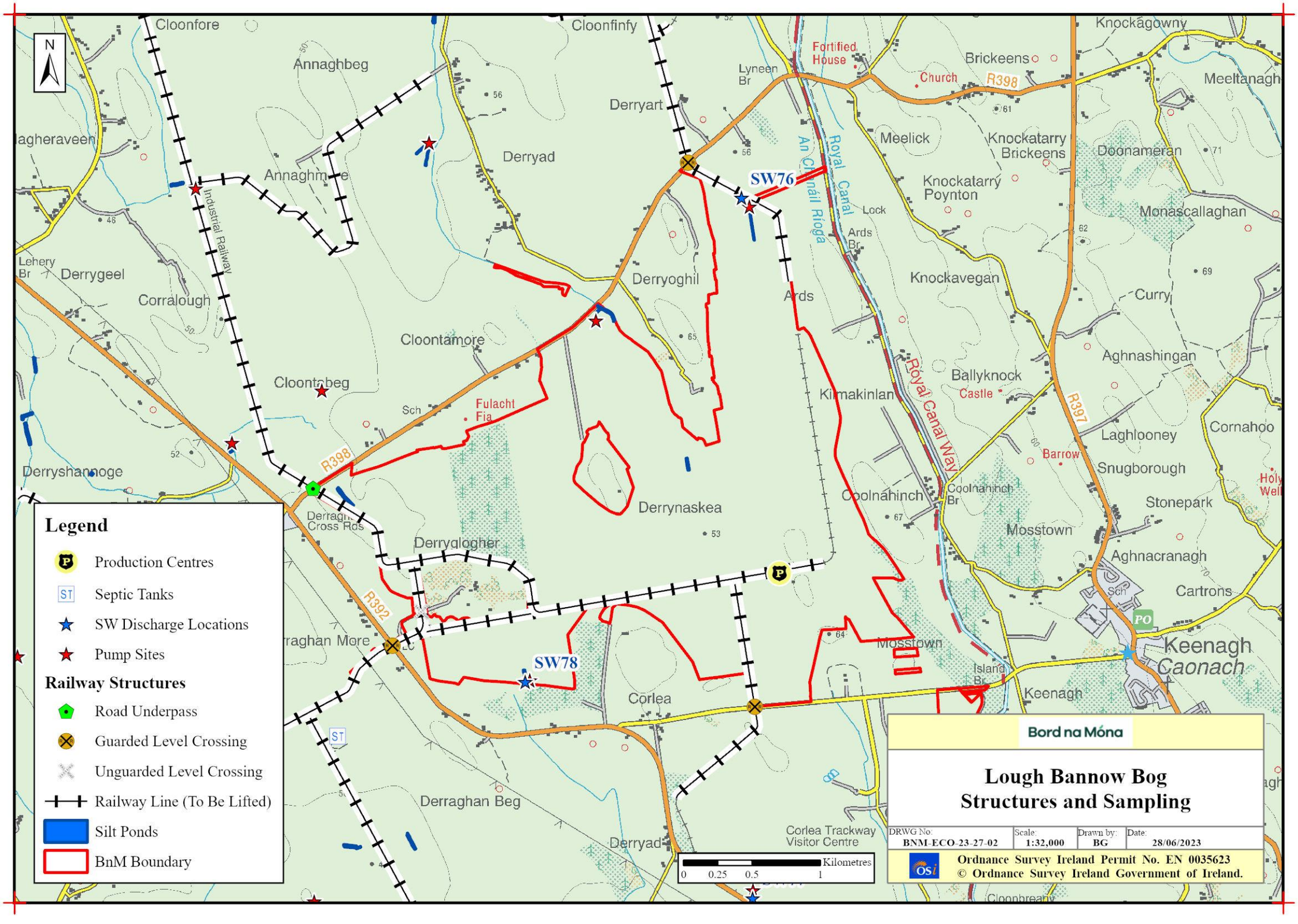
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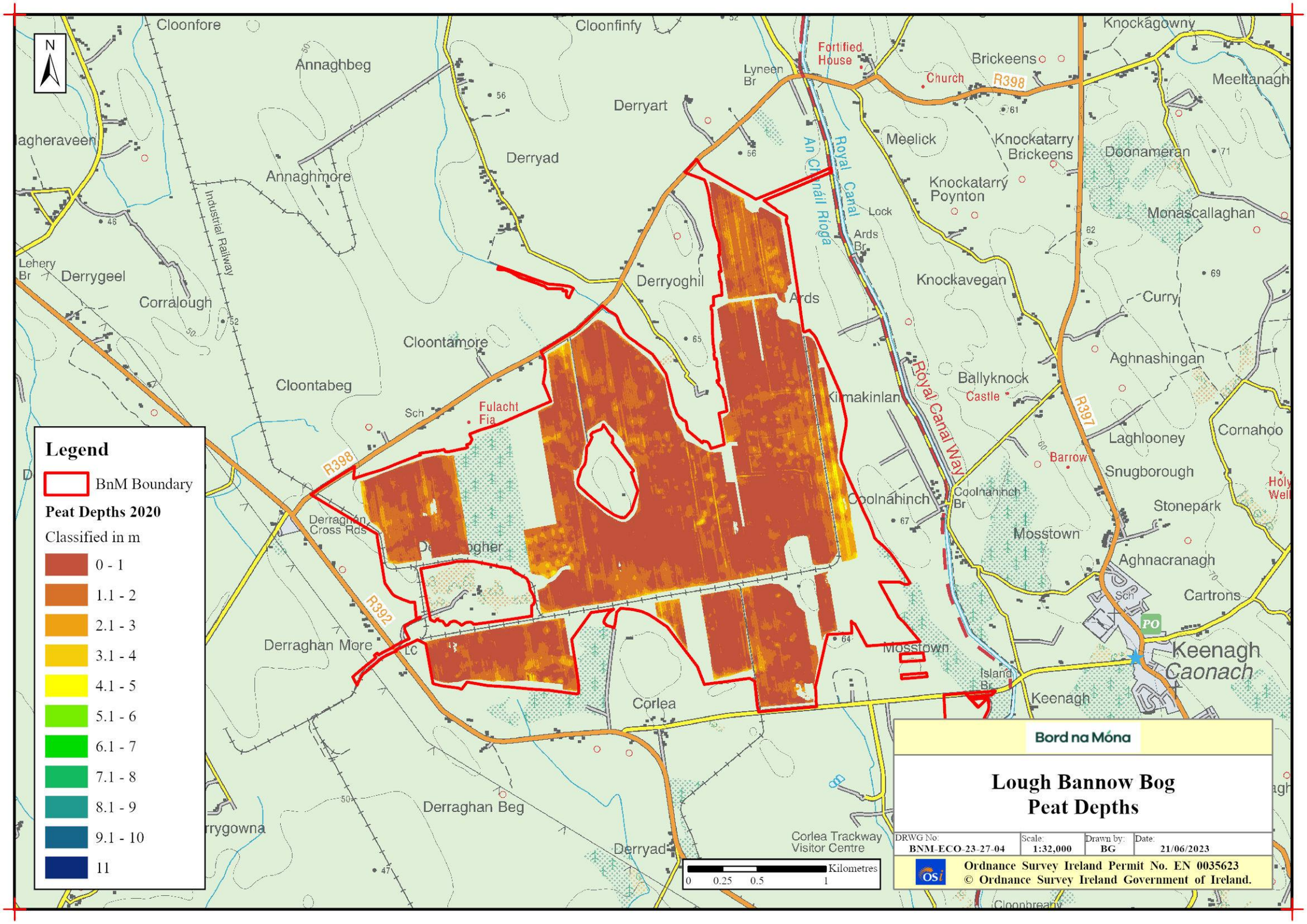
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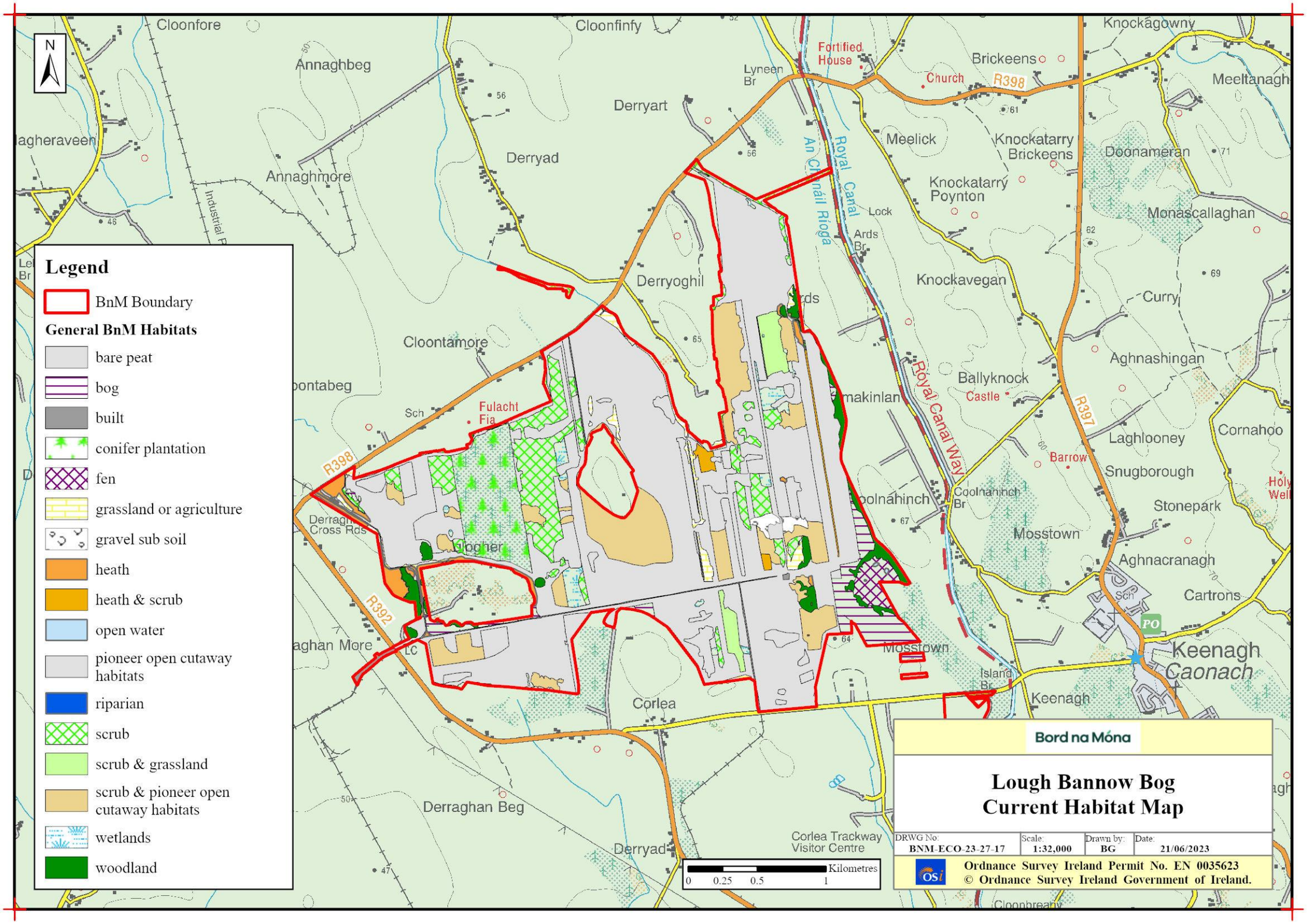
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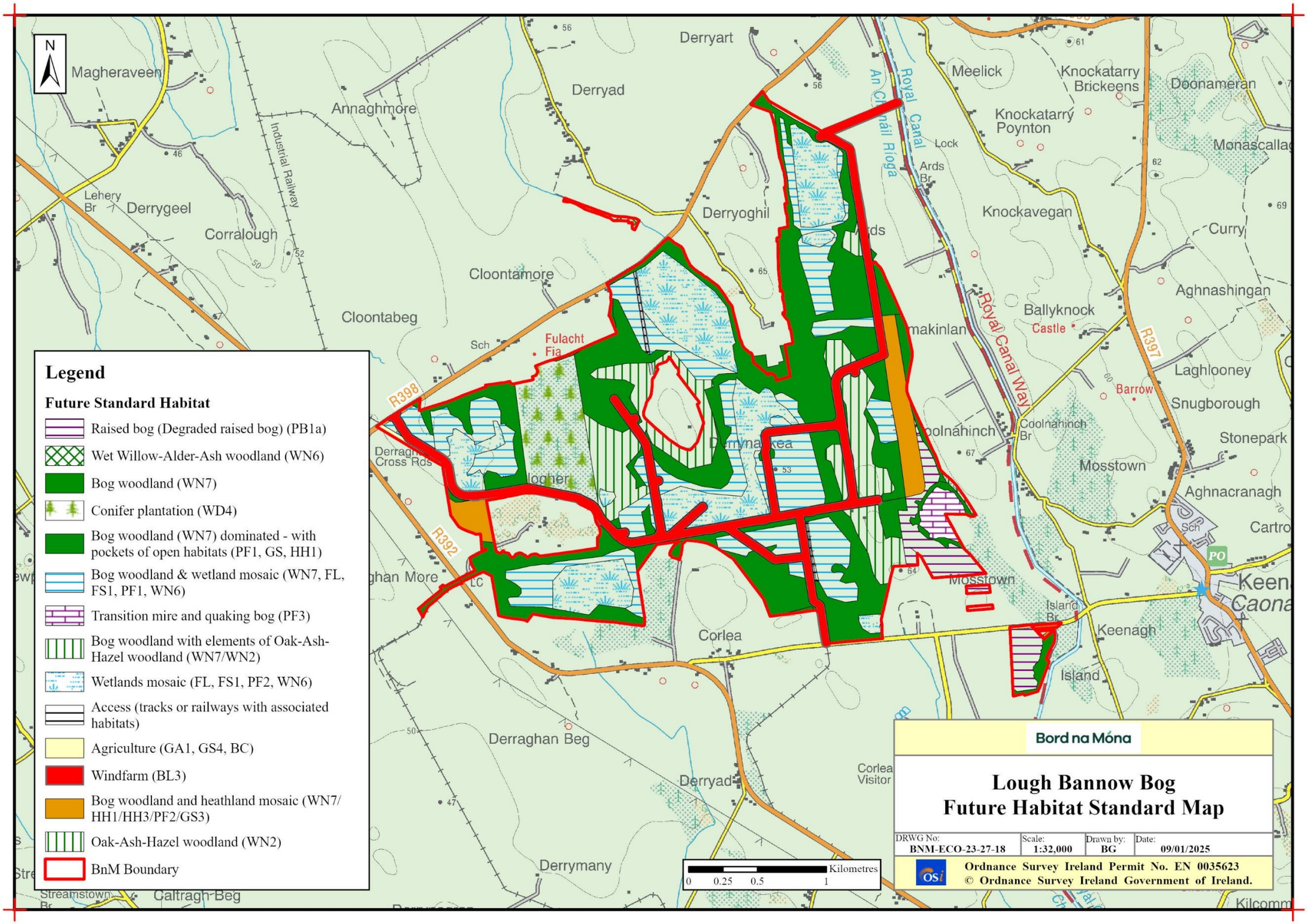
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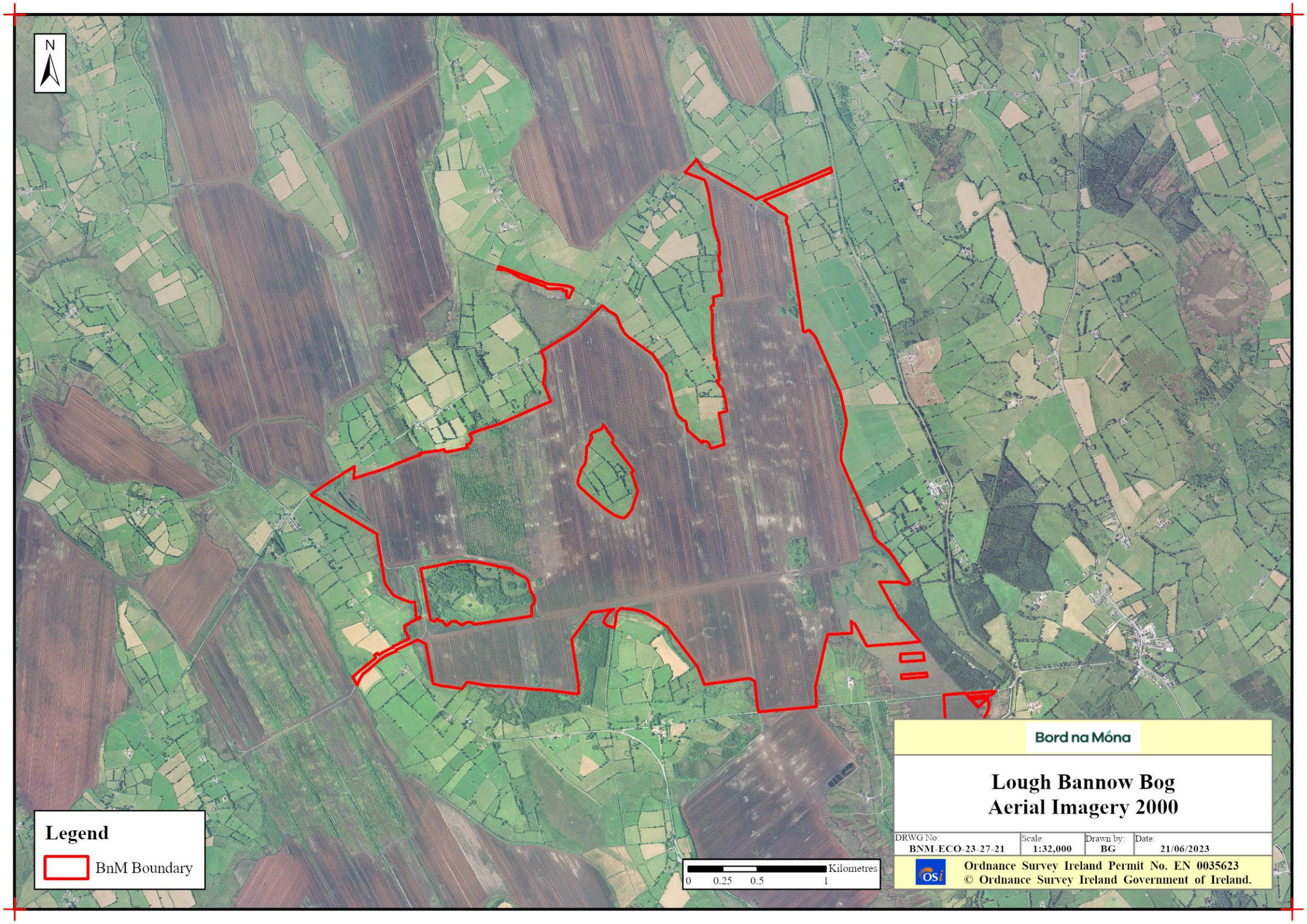
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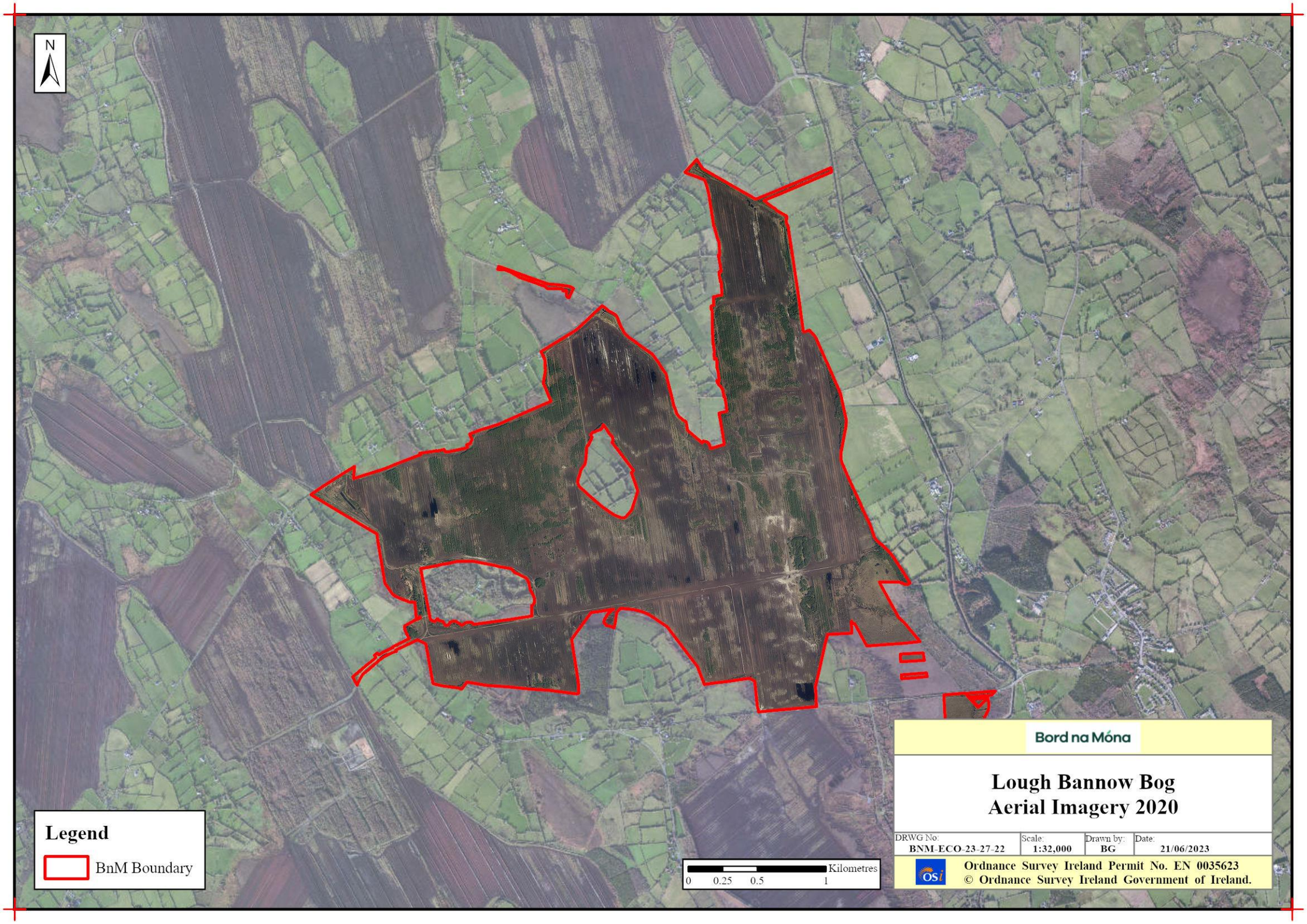
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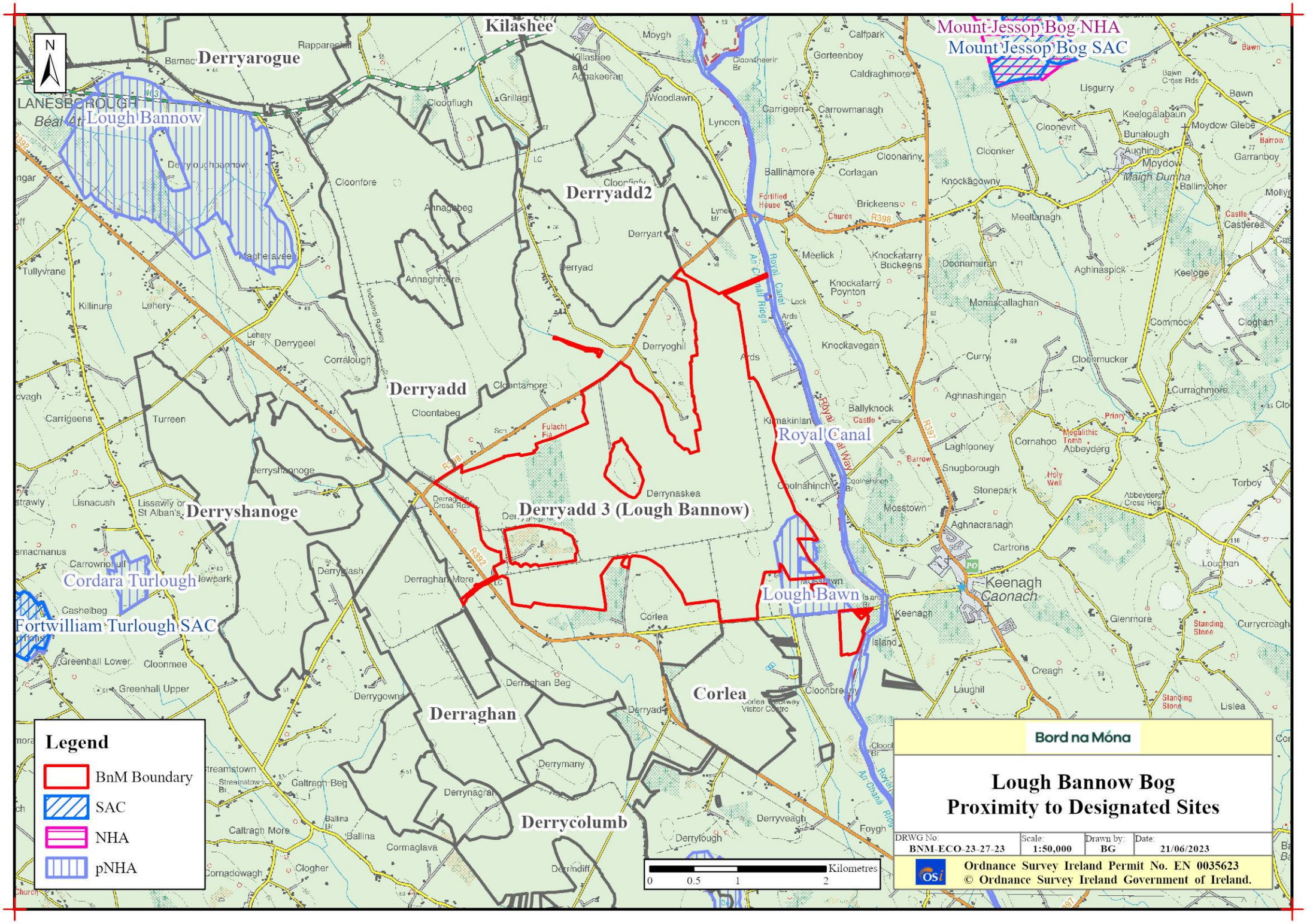
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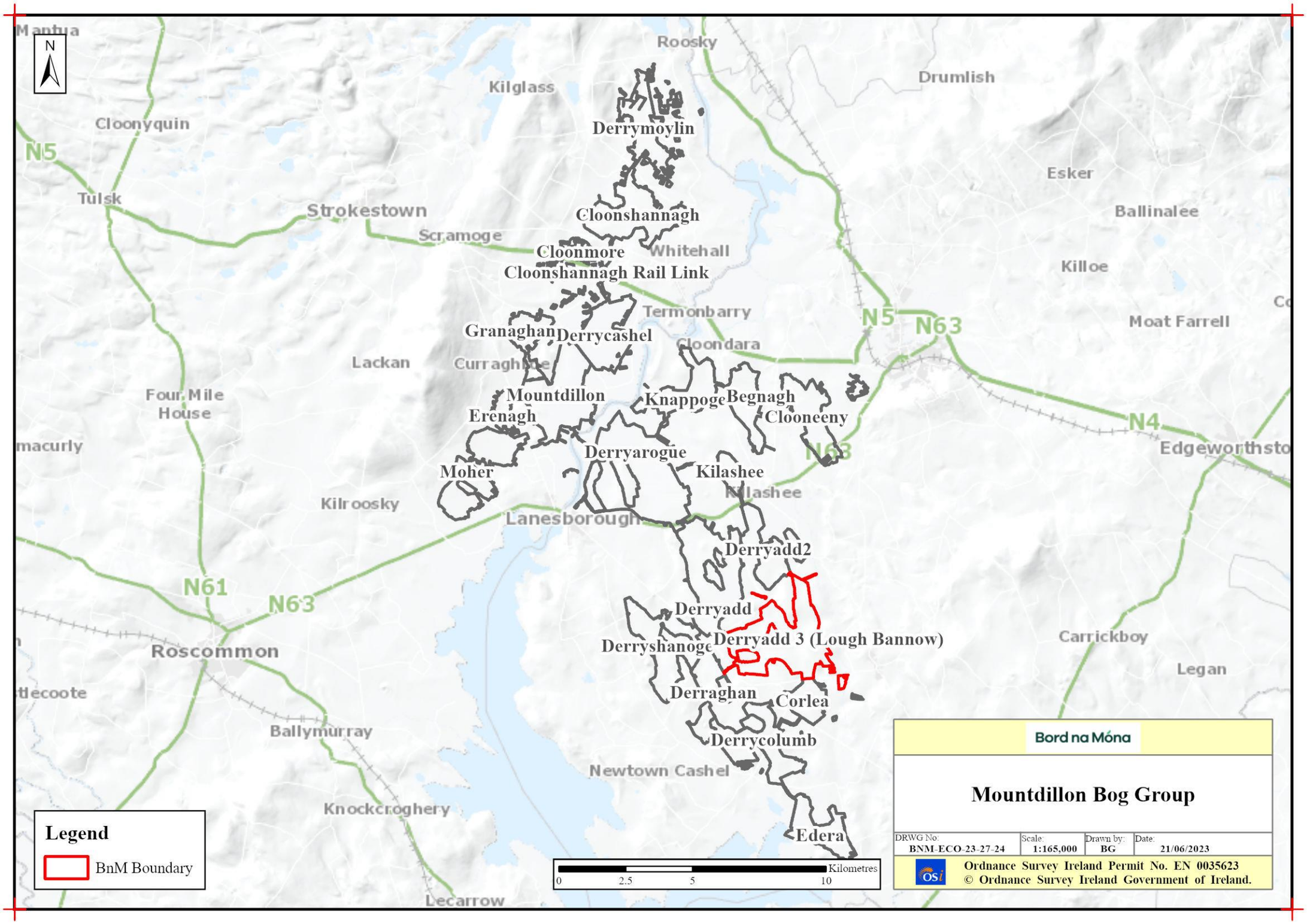
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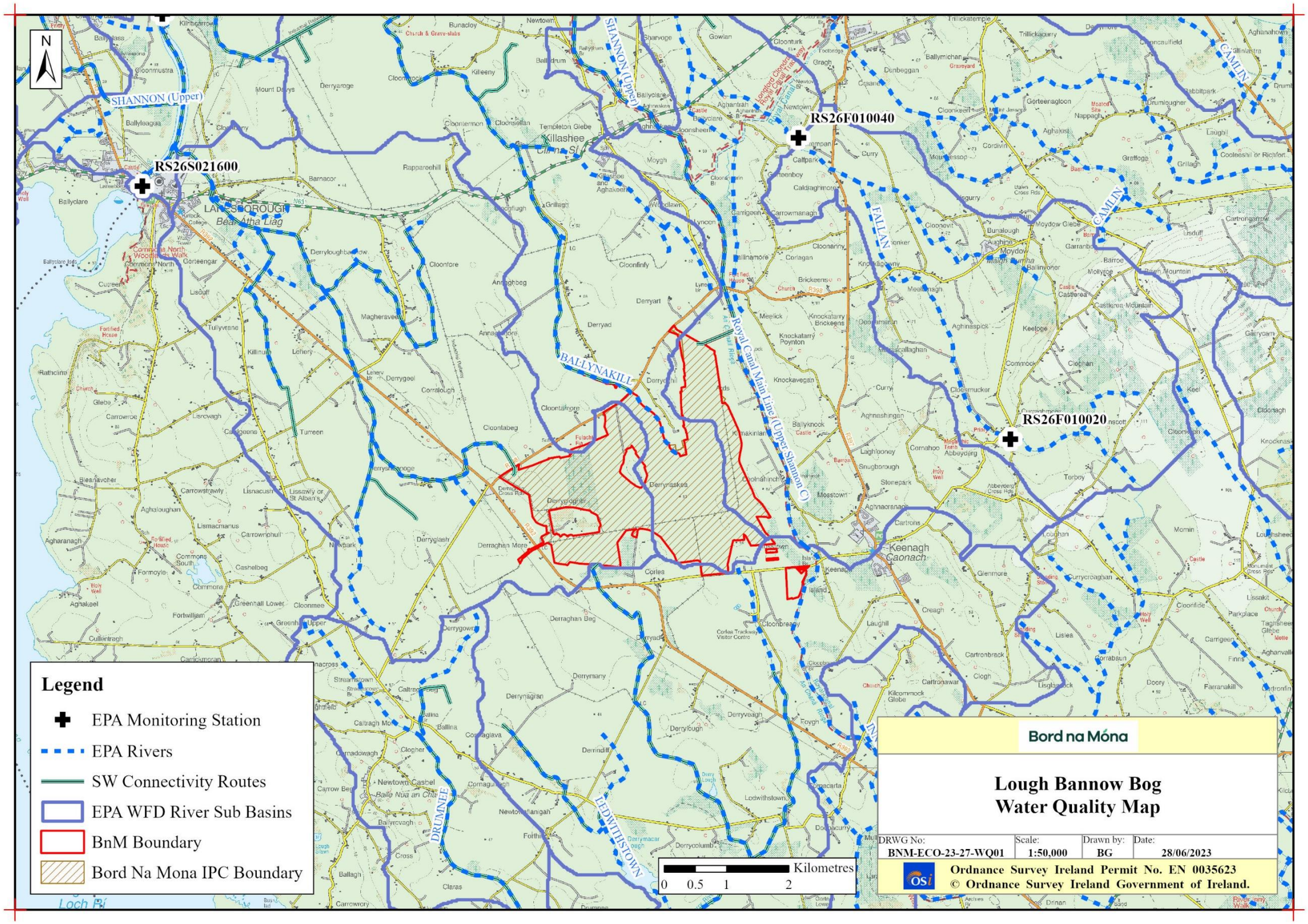
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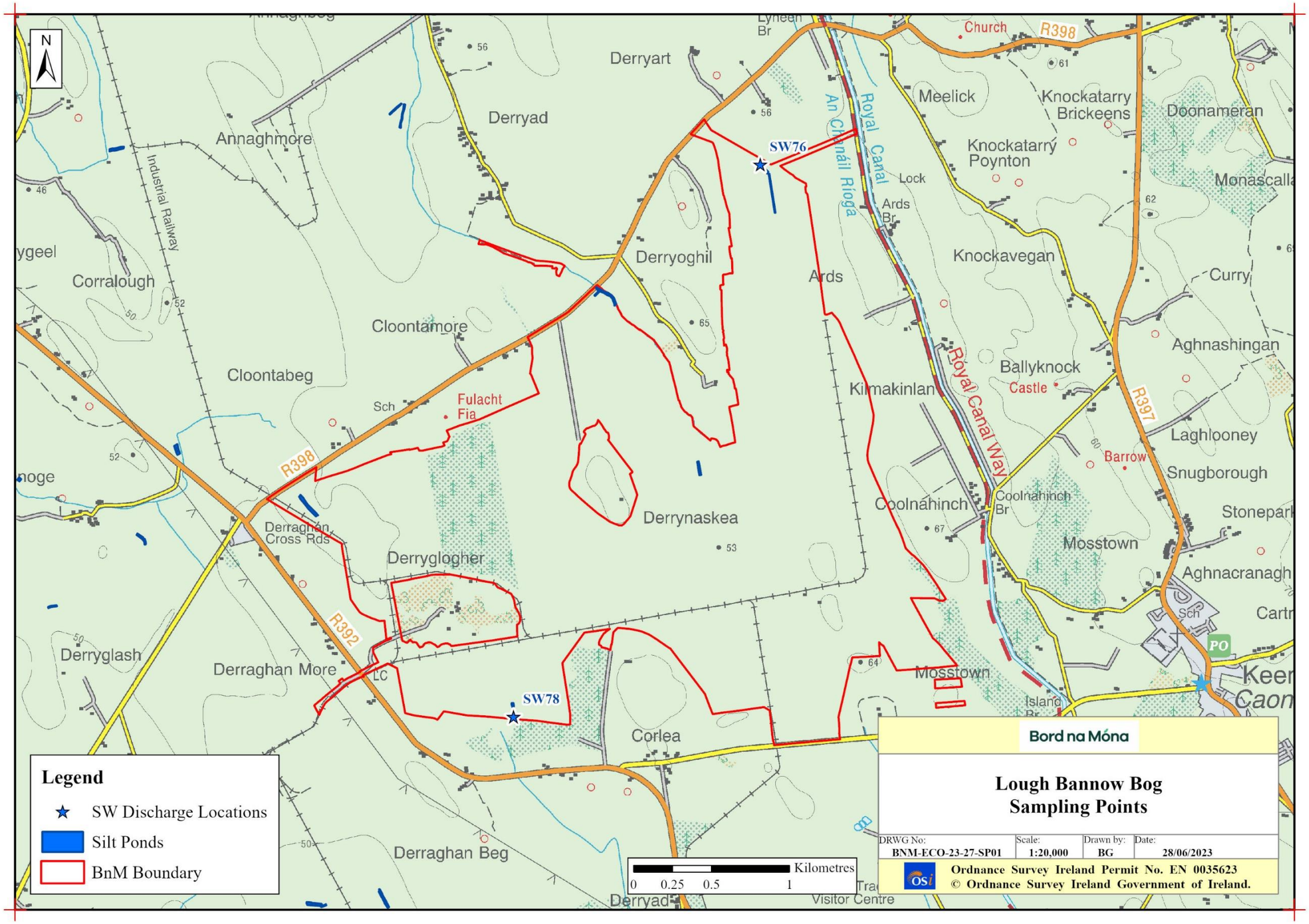
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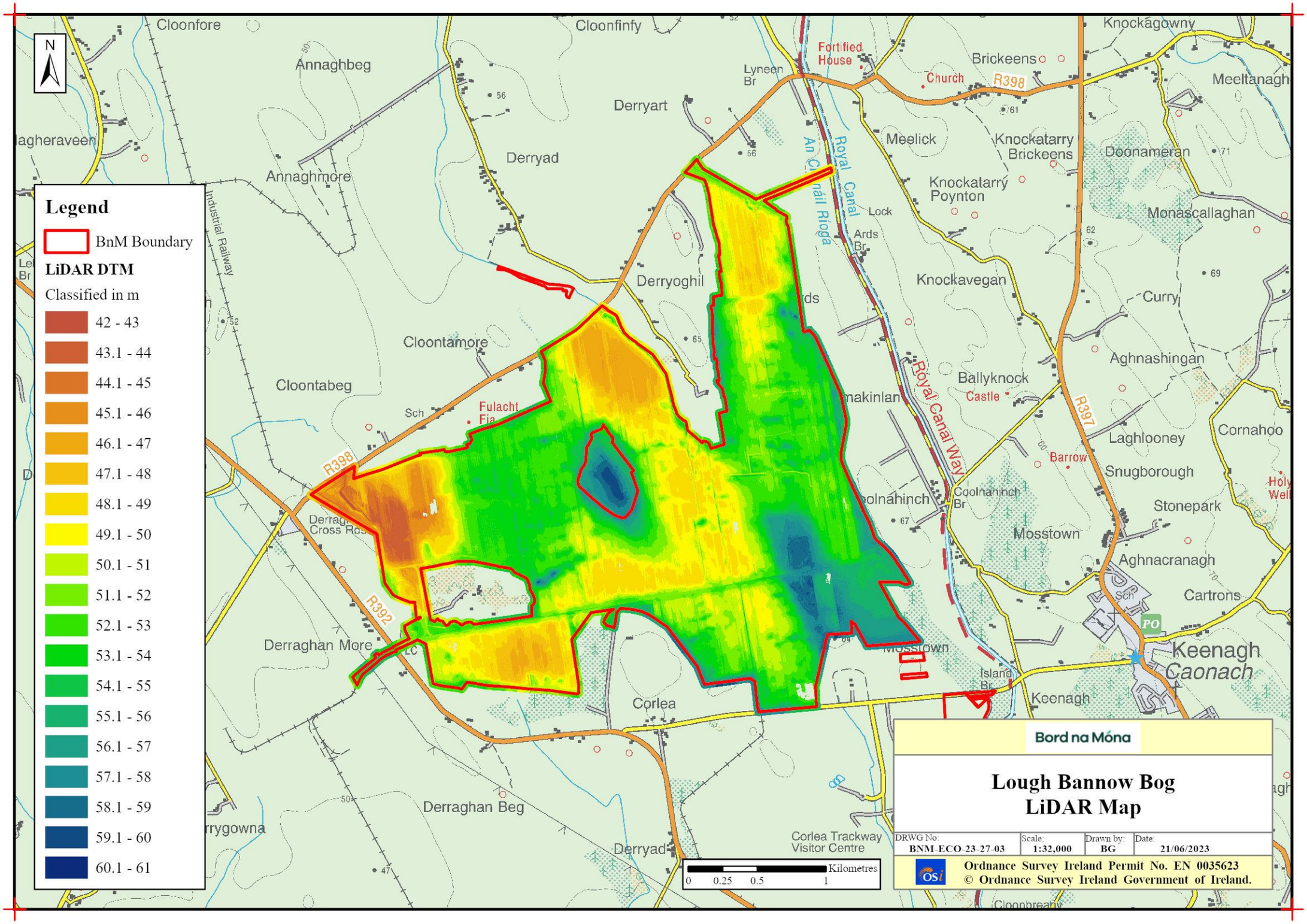
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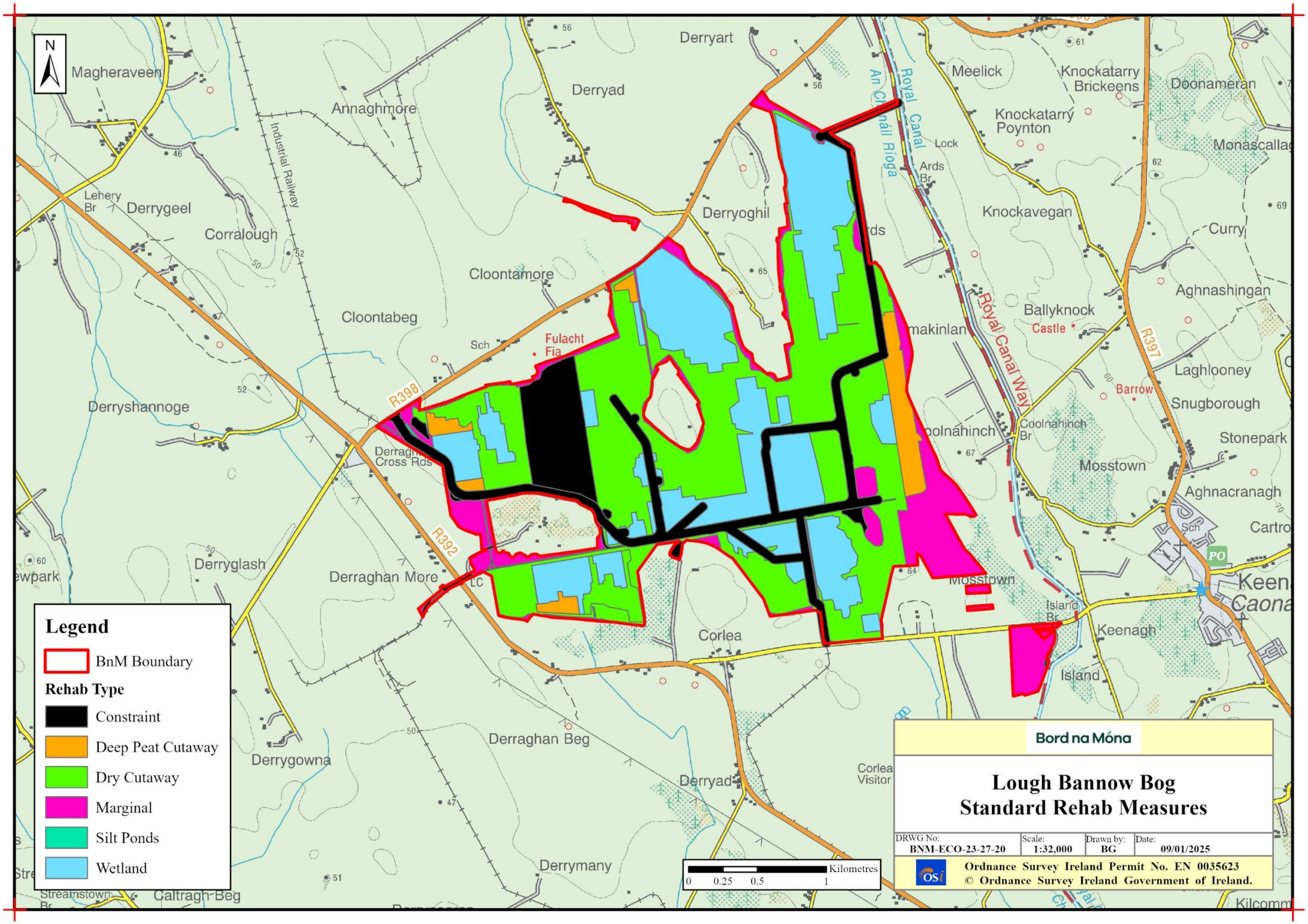
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APPENDIX F DERRYADD WIND FARM – DRAINAGE DESIGN & FLOOD RISK ASSESSMENT (NICHOLAS O'DWYER, 2024)

BORD NA MÓNA

DERRYADD WIND FARM

FLOOD RISK ASSESSMENT

Nicholas O'Dwyer Ltd
Consulting Engineers
Nutgrove Office Park
Nutgrove Avenue
Dublin 14

April 2025

PROJECT NO. 20852					
Revision	**Reason for Revision**	**Prepared by**	**Reviewed by**	**Approved by**	**Issue Date**
-	Draft	M.Islam	K. O'Connell	B. Dunphy	07/06/2023
A	Incorporated Comments	F. Fuso	K. O'Connell	B. Dunphy	24/08/2023
B	Incorporated Comments	K. O'Connell	K. O'Connell	B. Dunphy	12/04/2024
C	Updated Boundary	K. O'Connell	K. O'Connell	B. Dunphy	29/04/2025
D					

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1 INTRODUCTION

1.1 Background

Nicholas O'Dwyer Ltd (NOD) were appointed by Bord na Móna in February 2021 to conduct drainage design, pumping station reviews and flood risk assessment for the redevelopment of no. 3 peatland bogs for Derryadd Wind Farm.

Bord na Móna plans to redevelop no.3 peatland bogs (Derryarogue Bog, Derryadd Bog, and Lough Bannow Bog) as Derryadd Wind Farm as a result of the company's transition to become a major supplier of renewable energy

1.2 Study Context

The scope of this study is described as to:

- to complete a flood risk assessment at the locations where redevelopment is proposed and identify where flooding risks are present,
- to design a new drainage system for redevelopment
- to review the pumping stations

1.3 Location

The study area for the project runs across three bogs in the Mount Dillon bog complex. From north to south, the bogs are the Derryarogue Bog, the Derryadd Bog, and the Lough Bannow Bog. The location is shown in Figure 1-1 and Figure 1-2 below.

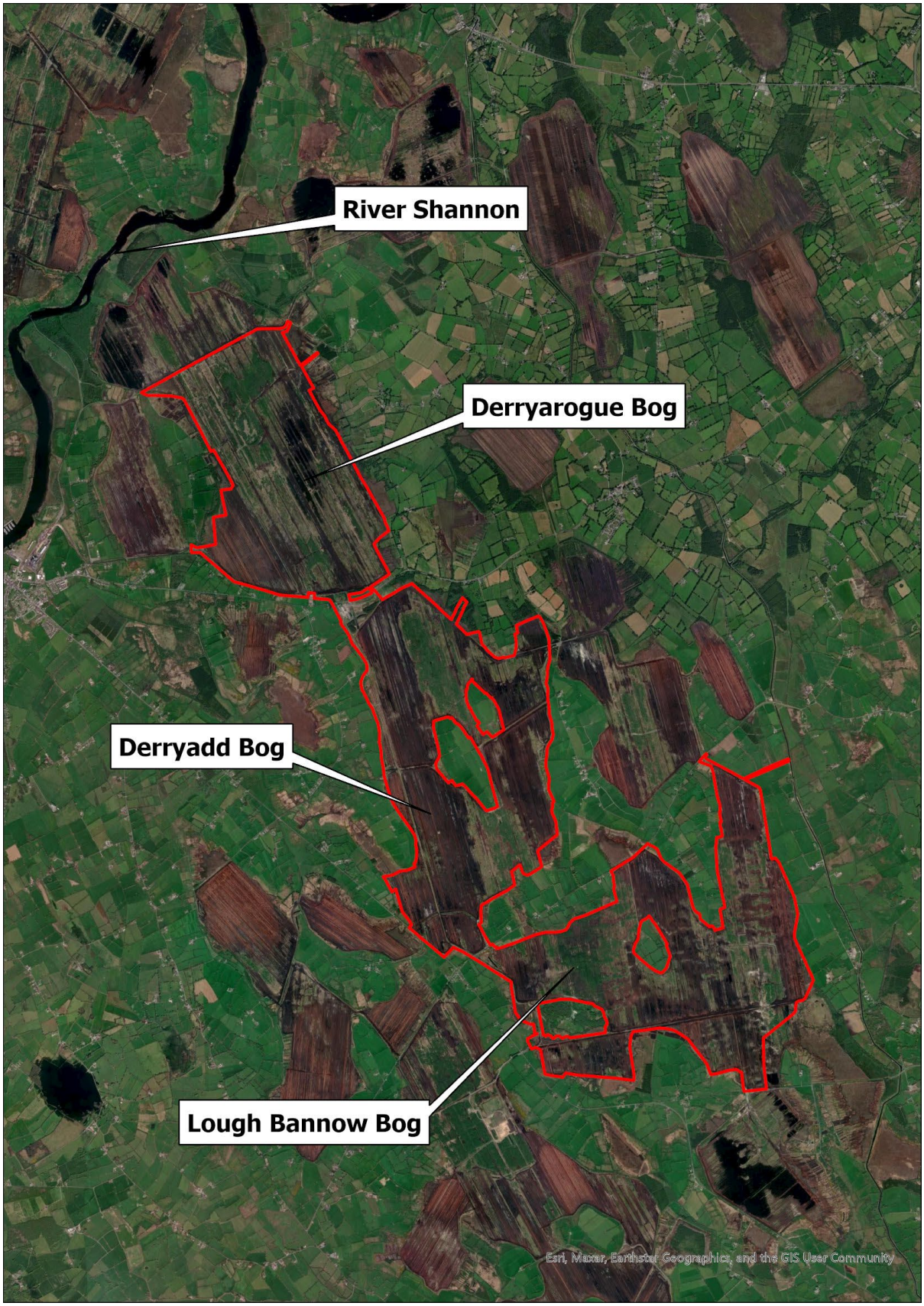
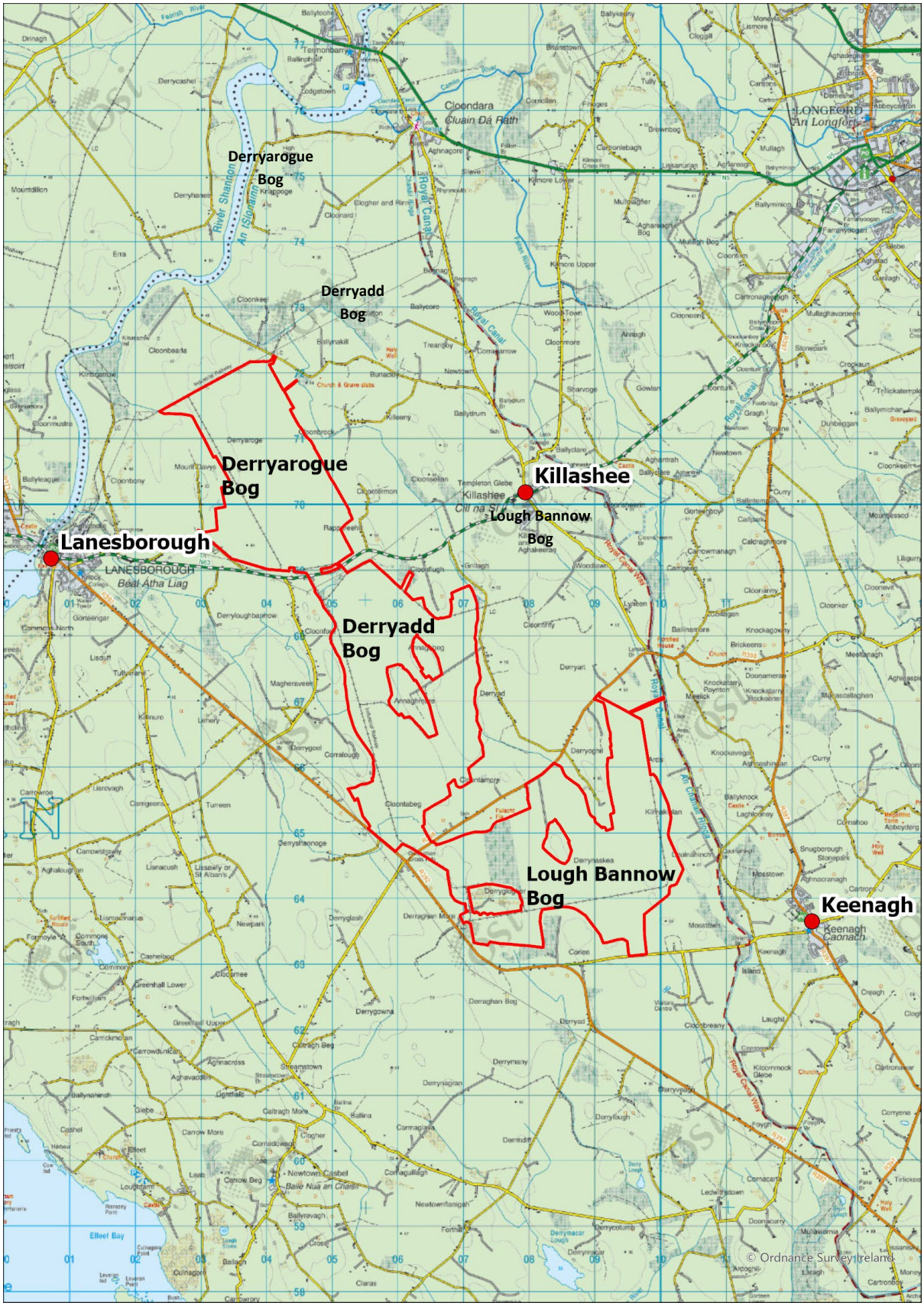


Figure 1-1: Study area


Derryarogue Bog
Derryadd Bog
Derryarogue Bog
Killashee
Lough Bannow Bog
Lanesborough
Derryadd Bog
Lough Bannow Bog
Keenagh
Cloondara
Cluain Dá Rath
LONGFORD
An Longfort
Killashee
Cill na Sí
LANESBOROUGH
Béal Átha Liag
Keenagh
Caonach
Royal Canal
River Shannon
An tSionainn
Camlin River
Inny River
Tang
Athlone
Edgeworthstown
Ballymahon
Clonmellon
Rathowen
Multyfarnham
Mullingar
Kilbeggan
Tullamore
Rochfortbridge
Kinnegad
Enfield
Maynooth
Leixlip
Celbridge
Naas
Kilcullen
Kildare
Monasterevin
Portarlington
Edenderry
Rhode
Clara
Ferbane
Daingean
Philipstown
Tullamore
Ballycumber
Moate
Athlone
Ballinahown
Glasson
Castlepollard
Mullingar
Delvin
Clonmellon
Dunboyne
Trim
Navan
Kells
Oldcastle
Kinnegad
Enfield
Rathowen
Multyfarnham
Ballymahon
Edgeworthstown
Longford
Granard
Ballinalee
Ballymahon
Lanesborough
Ballyleague
Roosky
Tarmonbarry
Termonbarry
Lough Ree
Elfet Bay
Shannonbridge
Ballycumber
Clonmacnoise
Ferbane
Cloghan
Banagher
Shannon Harbour
Pollagh
Cadamstown
Rahan
Tullamore
Daingean
Philipstown
Edenderry
Rhode
Clara
Kilbeggan
Moate
Ballinahown
Glasson
Athlone

The bogs have previously been used for extraction of peat but this activity has now ceased. Parts of the bogs which have not been worked in recent years have become overgrown with grass and bushes.

1.3.1 Topography

The topography of the land generally falls from south east towards the Shannon in the north west. Lough Bannow is at highest elevation and Derryarogue is at the lowest elevation. The bogs are generally lower than the surrounding land as can be seen in Figure 1-3 below.

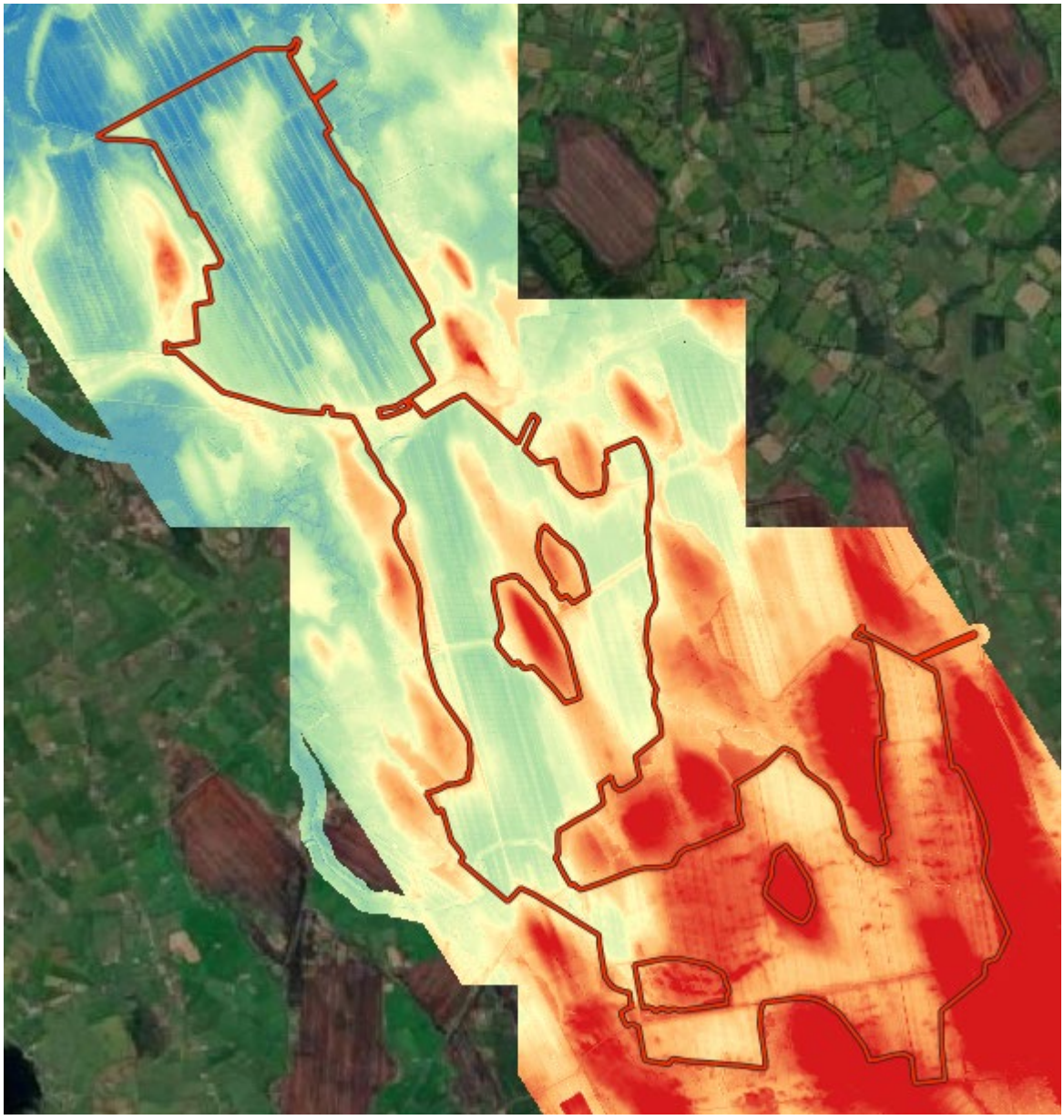


Figure 1-3: Topography based on LiDAR and Satellite DEMs. (Source: BnM)

1.3.2 Land Use

The satellite photography as shown in Figure 1-4 shows bare earth areas of worked bog, together with agricultural land surrounding the bogs and some green areas on the bogs where vegetation has become re-established.

The town of Lanesboro is located approximately 2.5km to the west of the Derryarogue bog. The N63 road between Lanesboro and Longford Town runs across the windfarm site south of Derryarogue bog and North of Derryadd bog.

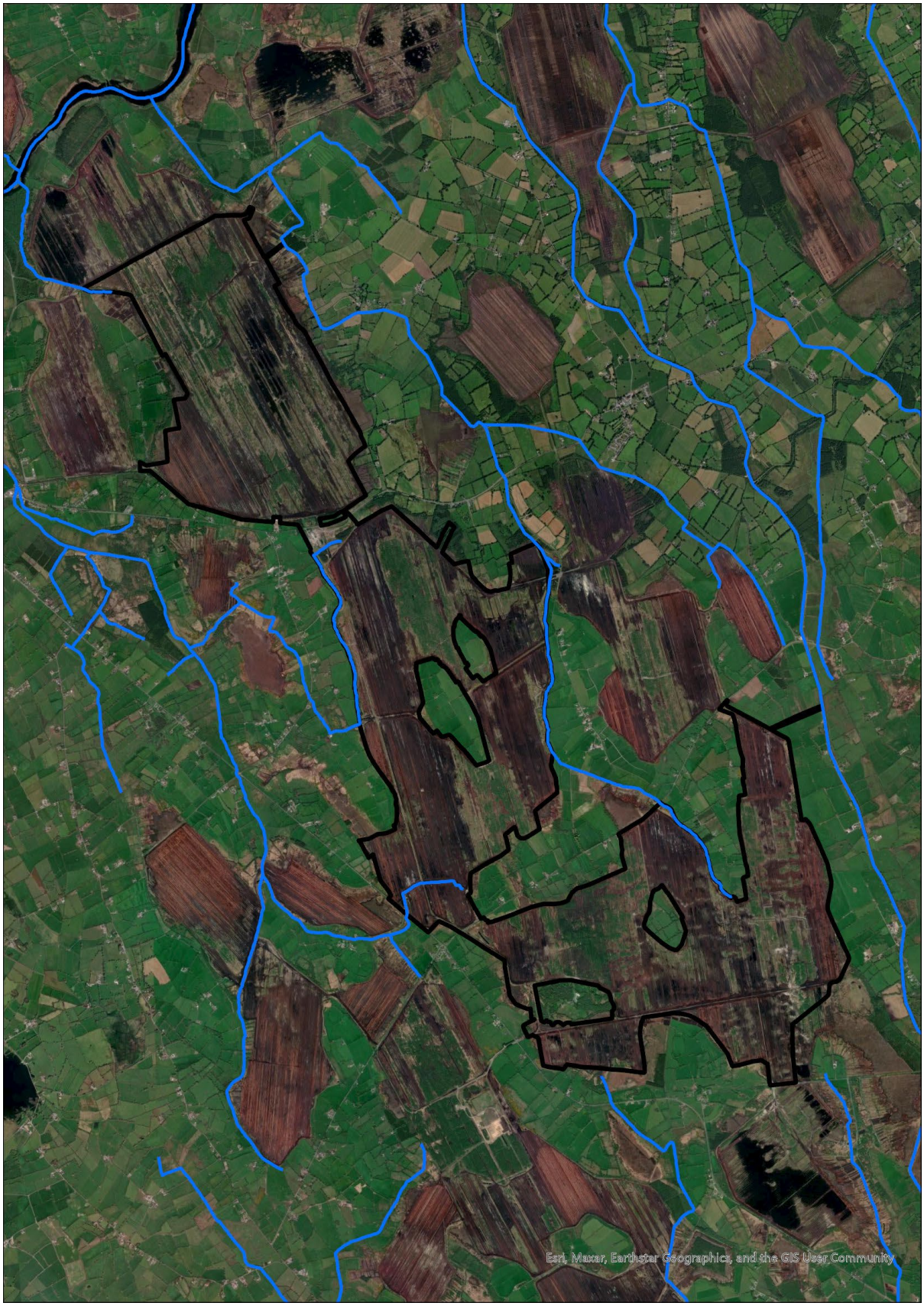


Figure 1-4: Satellite photograph of the area

1.3.3 Soils

The GSI map viewer shows the area to be predominantly cut over peat and glacial till

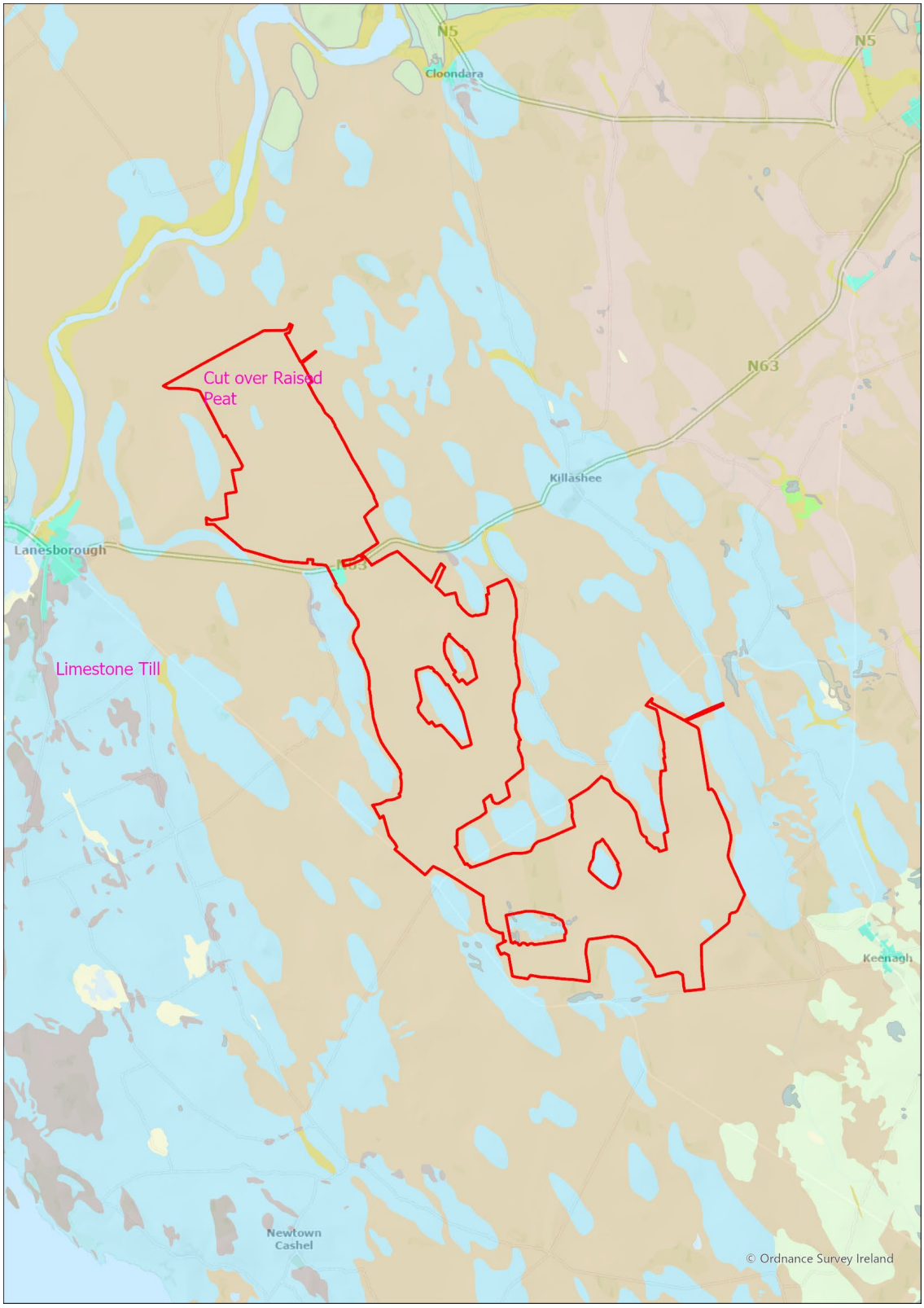


Figure 1-5: GSI Subsoil Map (source: https://dcenr.maps.arcgis.com/)

2 THE PLANNING SYSTEM AND FLOOD RISK MANAGEMENT GUIDELINES

2.1 Flood risk assessment

As set out in "*The Planning System and Flood Risk Management Guidelines for Planning Authorities*", it is a requirement for development proposals in areas where there is a flood risk to carry out a detailed study exercise to ensure that the development will not be affected by flooding (including an allowance for climate change) or does not increase flood risk elsewhere, or if it does measures are in place to mitigate/manage the risk.

The OPW uses the Source-pathway-receptor model to assess the flood risk. The sources are rainfall and normal sea levels. Pathways are rivers, drains, sewers and overland flow. Receptors are people, their property, and the environment.

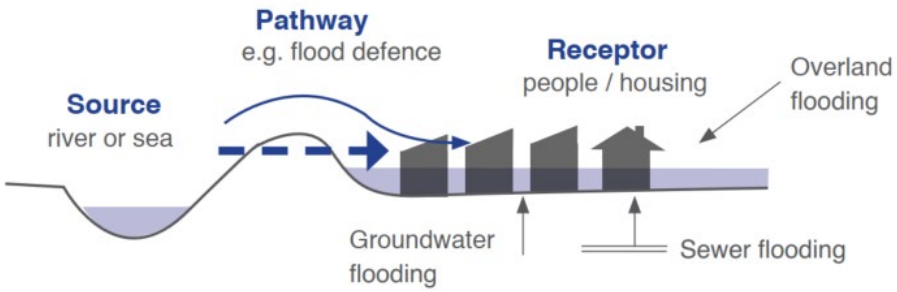


Figure 2-1: Source-pathway-receptor model for assessing flood risk by OPW

A staged approach should be adopted, carrying out the assessment to the level of detail needed for the purpose of decision making. Depending on the risk at a particular site not all stages will be required. The stages of appraisal and assessment are:

- Stage 1 Flood risk identification
- Stage 2 Initial flood risk assessment
- Stage 3 Detailed flood risk assessment

2.2 Flood zones

Here, initial flood risk shall be done using indicative flood zone maps. According to the guidelines: "Flood zones are geographical areas within which the likelihood of flooding is in a particular range and they are a key tool in flood risk management within the planning process as well as in flood warning and emergency planning."



Figure 2-2: Indicative Flood zone map extract

Flood Zone A – where the probability of flooding from rivers and the sea is highest (greater than 1% or 1 in 100 for river flooding or 0.5% or 1 in 200 for coastal flooding);

Flood Zone B – where the probability of flooding from rivers and the sea is moderate (between 0.1% or 1 in 1000 and 1% or 1 in 100 for river flooding and between 0.1% or 1 in 1000 year and 0.5% or 1 in 200 for coastal flooding);

Flood Zone C – where the probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding). Flood Zone C covers all areas of the plan which are not in zones A or B

2.3 Vulnerability assessment of an infrastructure or site

After checking the risk zone of flood risk, the vulnerability level of the development being proposed should be checked. The table below is used for checking the vulnerability type of a development:

Vulnerability class	Land uses and types of development which include*:
Highly vulnerable development (including essential infrastructure)	Garda, ambulance and fire stations and command centres required to be operational during flooding; Hospitals; Emergency access and egress points; Schools; Dwelling houses, student halls of residence and hostels; Residential institutions such as residential care homes, children's homes and social services homes; Caravans and mobile home parks; Dwelling houses designed, constructed or adapted for the elderly or, other people with impaired mobility; and Essential infrastructure, such as primary transport and utilities distribution, including electricity generating power stations and sub-stations, water and sewage treatment, and potential significant sources of pollution (SEVESO sites, IPPC sites, etc.) in the event of flooding.
Less vulnerable development	Buildings used for: retail, leisure, warehousing, commercial, industrial and non-residential institutions; Land and buildings used for holiday or short-let caravans and camping, subject to specific warning and evacuation plans; Land and buildings used for agriculture and forestry; Waste treatment (except landfill and hazardous waste); Mineral working and processing; and Local transport infrastructure.
Water-compatible development	Flood control infrastructure; Docks, marinas and wharves; Navigation facilities; Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location; Water-based recreation and tourism (excluding sleeping accommodation); Lifeguard and coastguard stations; Amenity open space, outdoor sports and recreation and essential facilities such as changing rooms; and Essential ancillary sleeping or residential accommodation for staff required by uses in this category (subject to a specific warning and evacuation plan).
*Uses not listed here should be considered on their own merits	

Figure 2-3: Classification of vulnerability of different types of development

Based on the flood zone and vulnerability class of the development, the suitability of the development can be assessed with the matrix shown in Figure 2-4. If it is deemed inappropriate by the matrix, then justification test has to be performed.

	Flood Zone A	Flood Zone B	Flood Zone C
High Vulnerability	Justification Test	Justification Test	Appropriate
Low Vulnerability	Justification Test	Appropriate	Appropriate
Water Compatible	Appropriate	Appropriate	Appropriate

Figure 2-4: vulnerability versus flood zone matrix from the guidelines

2.3.1 Justification test

If a development falls in the justification test category then the test must demonstrate that the development meets the following criteria:

1. *The subject lands have been zoned or otherwise designated for the particular use or form of development in an operative development plan, which has been adopted or varied taking account of these Guidelines.*

2. *The proposal has been subject to an appropriate flood risk assessment that demonstrates:*
   - i. *The development proposed will not increase flood risk elsewhere and, if practicable, will reduce overall flood risk;*
   - ii. *The development proposal includes measures to minimise flood risk to people, property, the economy, and the environment as far as reasonably possible;*
   - iii. *The development proposed includes measures to ensure that residual risks to the area and/or development can be managed to an acceptable level as regards the adequacy of existing flood protection measures or the design, implementation and funding of any future flood risk management measures and provisions for emergency services access; and*
   - iv. *The development proposed addresses the above in a manner that is also compatible with the achievement of wider planning objectives in relation to development of good urban design and vibrant and active streetscapes.*

   The acceptability or otherwise of levels of residual risk should be made with consideration of the type and foreseen use of the development and the local development context.

The overall approach to flood risk assessment should be as shown in Figure 2-5 below:

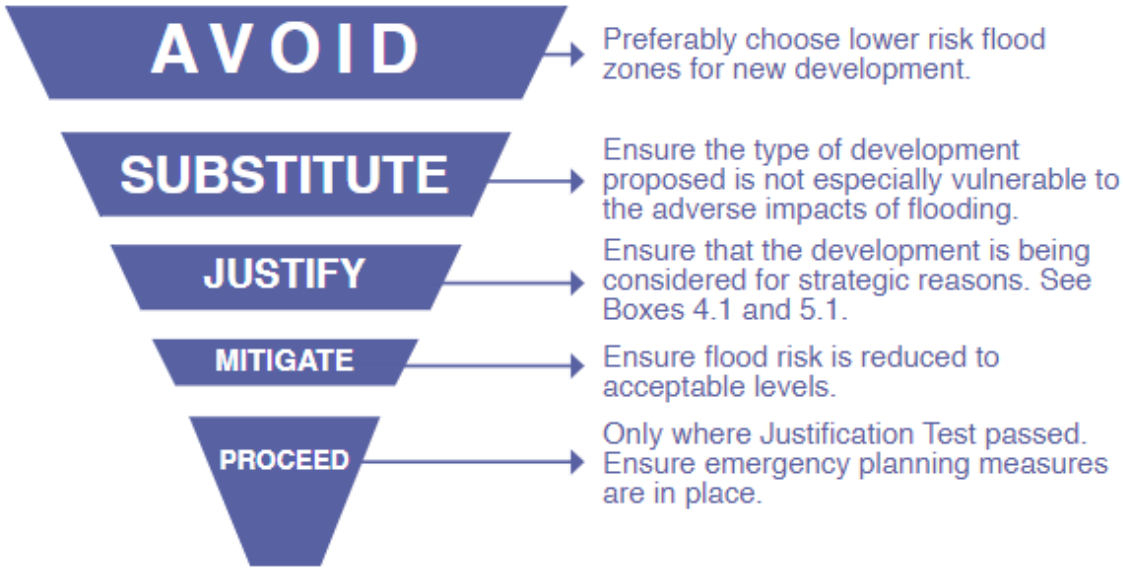


Figure 2-5: Sequential approach principle in flood risk management

2.4 Longford County Development Plan 2021-2027

The Longford County Development Plan 2021 to 2027 includes the following Longford County Policy objective CPO 5.152:

> Encourage proposals for commercial wind energy developments to be located on cutaway peatlands in those areas identified as having wind potential within the county, as defined in Appendix 2, subject to environmental, landscape, habitat and wildlife protection requirements being addressed.

It also includes the following Development Management Standard DMS 16.182:

> Ensure that proposals for the development of wind farms are not located within areas identified as being within Flood zones A or B as per the Planning System and Flood Risk Management Guidelines 2009 for Planning Authorities (or any updated guidelines).

The majority of the proposed site is located within a Preferred Area for windfarm development as shown in "Appendix 2 – Areas of wind farm potential" in the development plan. An extract from this appendix with the proposed site overlaid on it is shown in Figure 2-6.

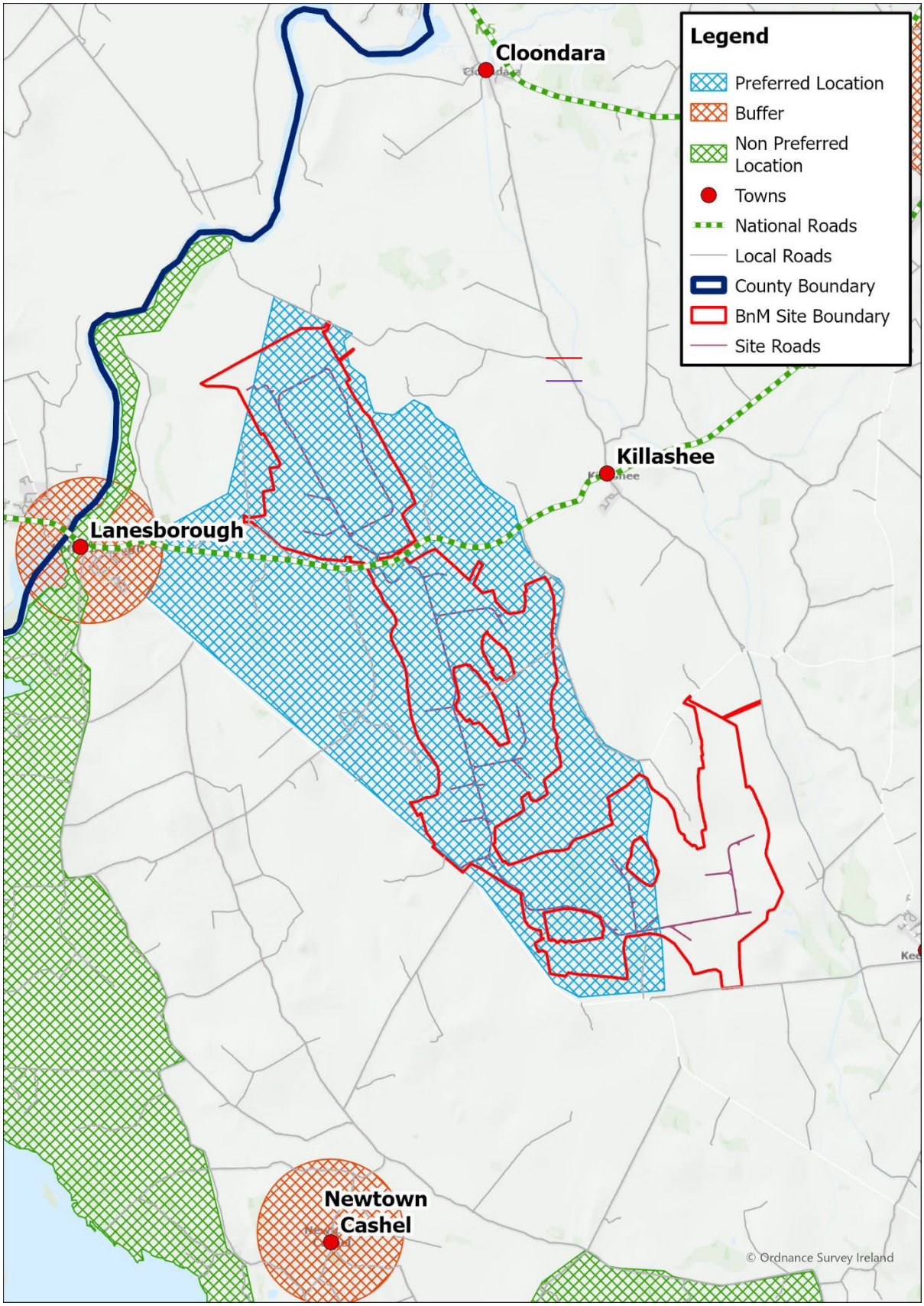


Figure 2-6: Longford County Development Plan Appendix 2 extract showing site location.

3 FLOOD RISK ASSESSMENT

3.1 Sources of Flooding

Flood risk assessment to a development site involves flood risk identification, i.e., confirmation of all sources of flooding and surface water management issues, quantification of the associated risks and proposal of mitigation measures. A review of all recorded and historical flooding incidents in the area is carried out followed by qualitative appraisal of the identified risks and their impact on the proposed development and associated risks elsewhere.

The potential sources of flooding to the development site may include: -

1. Fluvial Flooding;
2. Surface water Runoff;
3. Groundwater Flooding; and
4. Coastal Flooding.

3.2 Brief Appraisal of Flood Sources

A brief appraisal of the potential sources of flooding and their potential impact on the proposed development is summarized in Table 3-1 below.

Table 3-1: Appraisal of Flood Risk Sources

Source	Pathway	Receptor	Likelihood	Consequence	Risk= Likelihood x consequence
Coastal	Overtop/ breach	People/ property	Remote	High	Low
Fluvial	Overbank	People/ property	Possible	Medium	Medium
Surface	Blockage/overflow	People/ property	Likely	Medium	High
Groundwater	Rising water level	People/ property	Possible	Low	Low

3.3 Site Drainage

3.3.1 Existing Site Drainage

Walkover surveys were carried out in January and Febraury 2021 to understand the drainage patterns on the existing bogs. Additional topographic surveys were carried out in March and April 2021 to gather further detail on the drainage systems.

When the bogs were in production, peat was harvested from “fields” along which the harvesting machinery travelled. A thin layer of peat was removed from the top surface with each pass of the machinery. To dry the top surface for harvesting, all three bogs which make up the Derryadd Windfarm site were provided with a series of parallel open field drains approximately 1.5m deep oriented in a south-southeast to north-northwest direction with an approximately 15m spacing between drains. The field drains are connected together at their low points with pipes or open drains which lead towards external discharge points.

Over the lifetime of the working bog as the top surface was harvested the elevation of the bog was reduced to below the elevation of the surrounding land and external streams so that now much of the bog drainage must be pumped from the bogs up to the level of the surrounding streams. When the pumps are switched off localised flooding can occur on the bogs. There are currently 18 pumping stations on the three bogs pumping water between internal drainage systems and to the external streams. As required by the IPC Licence REF P0504-1 there are settlement ponds upstream or downstream of the external pumping stations to allow sediment to settle out of the water before it is discharged to the external streams.

Derryarogue bog (Figure 3-1) has deep collector drains approximately every 300m running north south, with smaller field drains running parallel at approximately 15m centres. The field drains are connected by pipes at the low points, and these pipes are connected to the deep collector drains. Pumps (P07, P08, & P09) lift water from the central collector drains to collector drains nearer to the periphery of the bog, and pumps on these peripheral drains (P01-P06) lift the water for discharge to surrounding watercourses. Pumps 01, 02, 03, and 04 are outside of the proposed development area.

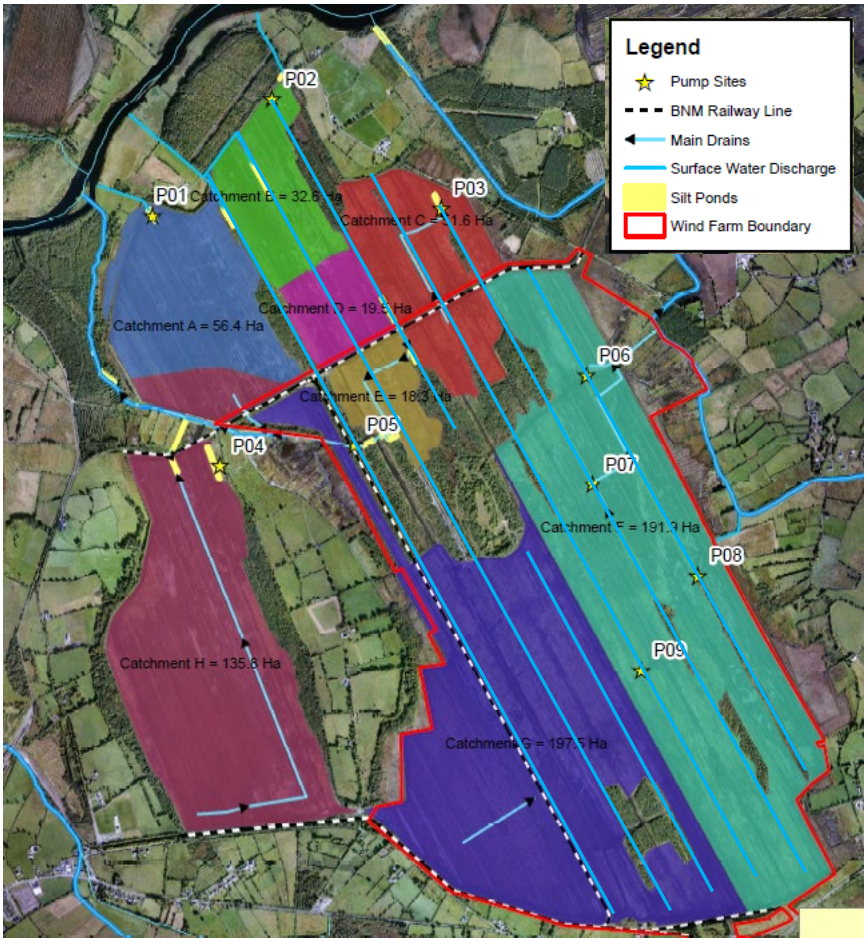


Figure 3-1: Derryarogue Bog existing drainage catchments

Derryadd bog (Figure 3-2) and Lough Bannow bog (Figure 3-3) have field drains at 15m centres but they do not have the same extent of deep drains as Derryarogue bog. The field drains are connected by pipes at the low points, and these pipes are connected to the external drainage systems.

Derryadd bog has 6 pump station locations, P10-P15, however pump station P13 is not commissioned and discharge is via a gravity outfall north of the pump station site.

Lough Bannow bog has 3 pump station locations, P16-P18.

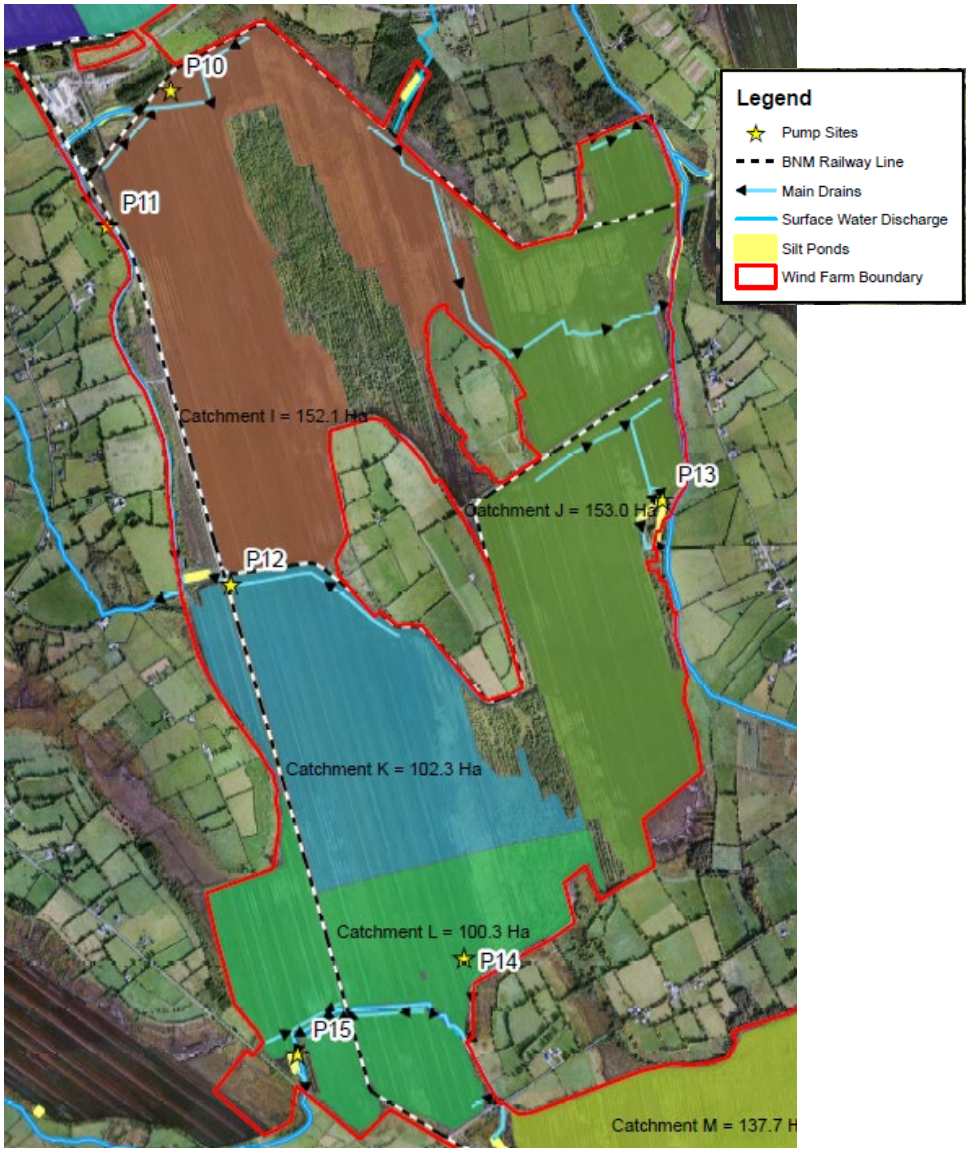


Figure 3-2: Derryadd Bog existing drainage catchments

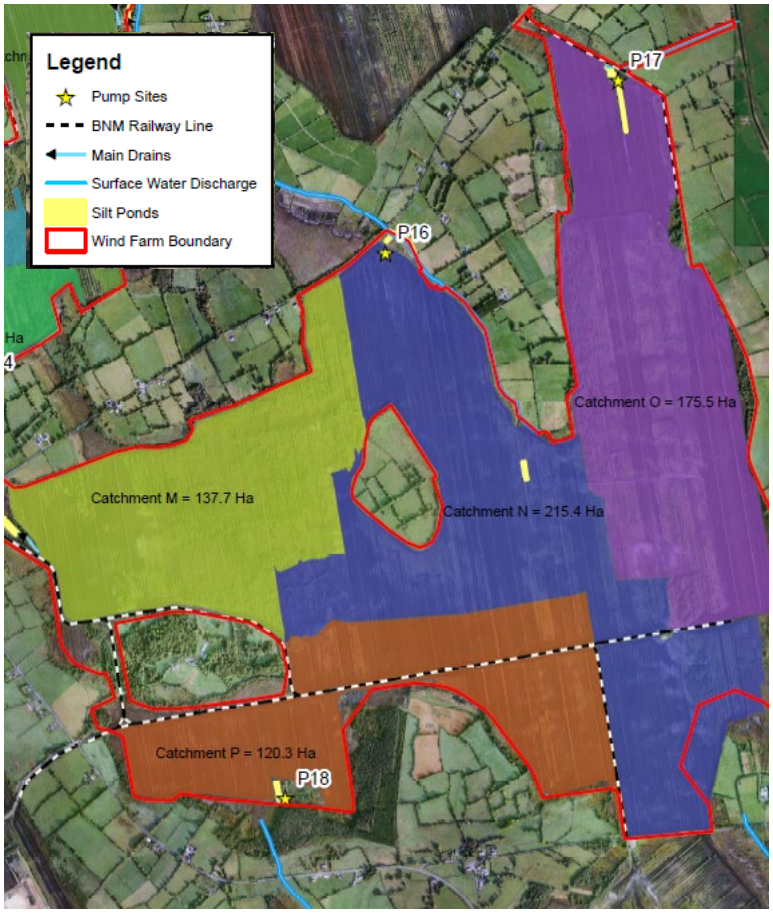


Figure 3-3: Lough Bannow Bog existing drainage catchments

3.3.2 Proposed Site Drainage

The proposed drainage system within the site will be designed so as not alter the exiting drainage philosophy at the site. The existing site drainage catchments will not be changed and that drainage will be discharged at the same locations and flow rates as it is currently discharged.

Where field drains would be cut by roads the bog runoff in the field drains will be collected on the upgradient side of the road and discharged via culverts to field drains running to the same ultimate drainage outfall.

To avoid changing the drainage patterns on the bog, runoff from the gravel roads and turbine hardstandings will be allowed to runoff over the edge through a grassed filter strip to enter the bog drainage systems as close as possible to where it fell. This will minimise any change to the hydrological regime on site.

The pump stations will be upgraded for health and safety purposes but will not have their flow rates significantly changed. It is likely that pumps will be standardised to two models across the site to allow for efficient operation and maintenance. The pump configuration to be installed in each pump station will be selected based on the existing installed capacities to avoid significant changes in the maximum outflow from the site. The existing sedimentation ponds upstream of the external discharge will remain in use. During construction of the upgraded pump stations discharging to the site boundaries the flow rates of any temporary pumping facilities provided should not exceed the design flow rates at those sites.

Central parts of the Derryarogue bog could be allowed to flood by decommissioning pump stations 7 and 9 without any impact on windfarm infrastructure provided additional culverts are provided below the road. This could be considered in the rehabilitation plans being produced for the bogs. Similarly during rehabilitation the pump stations on the Lough Bannow bog could be replaced with gravity connections provided the gravity connections (particularly at P18) take account of the elevations of windfarm infrastructure. Providing gravity connections in place of the currently proposed pumps may however allow increased runoff from the bog during flood periods compared to flow rates controlled by pumps.

3.4 Fluvial Flood Risk

The streams around the subject site are too small to have been included in the CFRAM project flood mapping. The National Indicative Flood Mapping (NIFM) covers rivers such as these which have not been subject of detailed studies. The predictive flood mapping from Floodinfo.ie is shown in Figure 3-4 below. The flood outline along the River Shannon in the top left is from the CFRAM (blue = zone A, grey = Zone B), while the other flood outlines are from the NIFM (dark grey = zone A, light grey = zone B). The triangles on the map represent locations of past reported flooding. Two of these reported locations are on the road to the east of Derryadd bog.

As noted above, the predicted flood extents derive from two different sources. The CFRAM extents were calculated using site specific models based on surveyed and calibrated data, while the NIFM was calculated using a larger scale Digital Terrain Model and assuming that the existing channels have capacity for approximately the 2 year flow. The NIFM indicates areas which might be prone to flooding but in its guidance notes it states that “The maps only provide an indication of areas that may be prone to flooding. They are not necessarily locally accurate, and should not be used as the sole basis for defining the Flood Zones nor for making decisions on planning applications.”

The CFRAM mapping does not show any expected impact inside the site boundary. The NIFM indicates two areas potentially at risk on Derryadd bog in the 1% and 0.1% AEP events, and a further location potentially at risk on Derryarogue bog in the 0.1% AEP event.

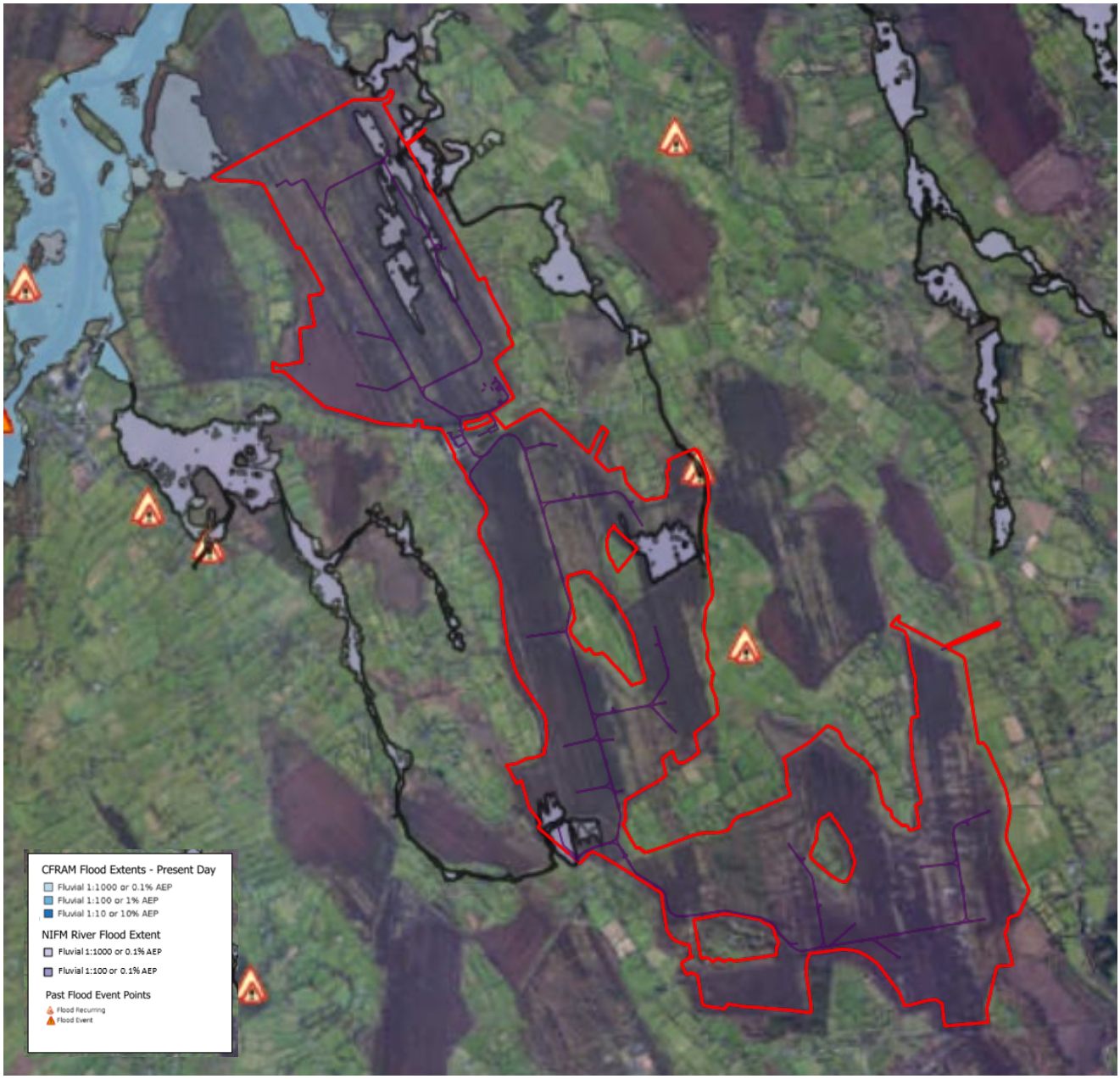


Figure 3-4: Existing flood risk data (source: https://floodinfo.ie/)

The fluvial flooding shown in the NIFM represents flooding of the site due to high water levels in the surrounding rivers. It should be noted that since the drainage from the southern part of Derryadd bog is pumped over the surrounding bank it is unlikely that river water can flood over the bank and into

the bog. The presence of pumping would not have been known or incorporated in the preparation of the NIFM.

The historical flooding reports from Floodinfo.ie are included in Appendix A.

3.5 Coastal Flood Risk

The CFRAM coastal flood maps do not indicate any coastal flood risk at the site. The development site is located in the centre of Ireland, approximately 80km from Galway Bay, 90km from Sligo Bay, and 105 km from the Irish Sea. The site is above 36mOD Malin. The development site it is not considered to be at risk of coastal flooding.

3.6 Pluvial Flood Risk

The risk of flooding from surface water would arise from accumulation of runoff across the site and surrounding areas. The site is a worked bog and is wet in many places. When pumps are switched off for any period runoff accumulates across the lower elevations of the site. In long rainfall events and during the winter time flooding has been observed to occur across parts of all three bogs. The GSI gives maps of the extent of historical flooding seen in 2015. These maps show areas seen to have been wet during winter 2015-2016 and this is shown in Figure 3-5. The precise date of the maximum flooding extent is not known so it cannot be linked to any particular AEP event.

Although there is frequent accumulation of water on the site, the layout has been designed to avoid these wet areas as far as possible. Culverts will be provided at intervals beneath the road to maintain connectivity of the exiting field drains.

There is an existing drainage system on the site which prevents ponding on the site when the pumps are running. The drainage system relies on a network of pump stations to lift the gathered drainage water from the site into the surrounding watercourses. The development does not propose to change the pump rates at these sites. In the event that the pumps were not running for an extended period of time, rainfall would accumulate in the low areas of the bog until it reached a level which would allow it to flow to the external drains.

The proposed development will not change the relationship between the bogs and the surrounding areas so there is not expected to be any additional flood risk outside of the site caused by this development. The development will be designed to ensure that sensitive equipment is located above the flood levels and that any other infrastructure in areas which may be subject to flooding will be designed to accommodate occasional flooding.

Therefore the risk of pluvial flooding can be considered low.

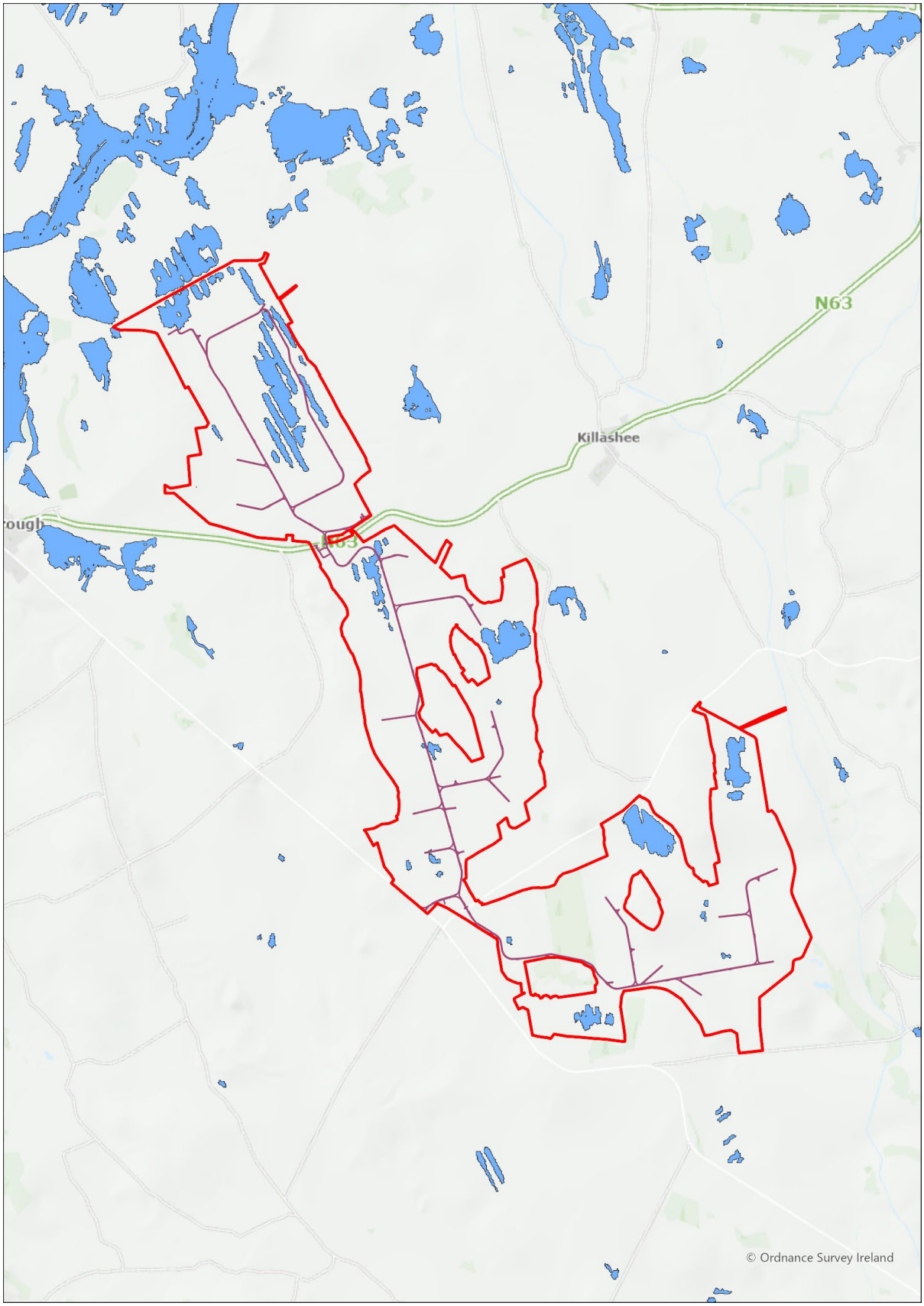


Figure 3-5: Extent of winter 2015-2016 wetted areas (source: GSI)

3.7 Groundwater Flooding

The Geological Survey Groundwater Flooding Probability Maps (Figure 3-6) do not predict groundwater flooding within the site.

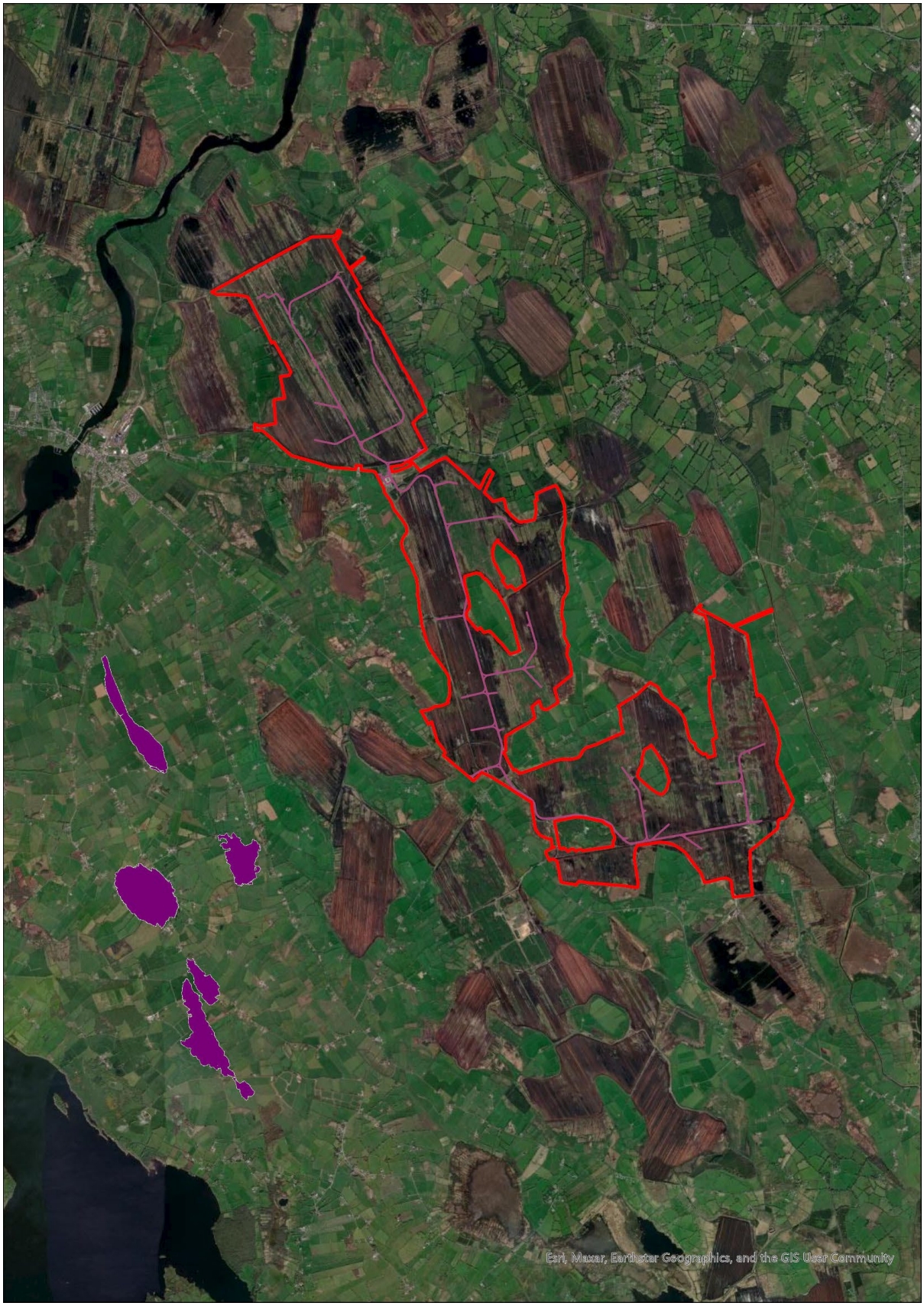


Figure 3-6: GSI Groundwater Flooding Probability Map (Floodmaps.ie)

3.8 Identification of Development Vulnerability

The proposed development type is a mix of essential infrastructure and amenity open space. The substation is classified as "*Highly Vulnerable"* as per the definition given in *"The Planning System and Flood Risk Management: Guidelines for Planning Authorities",* as shown in Table 3-2. and the turbine locations are typically "*Less Vulnerable"* as can be seen by the increase in offshore windfarms operating in wet environments. The remaining site access roads and walking routes are considered to fall under the categories of local transport infrastructure which is categorised as *"Less Vulnerable".*

Table 3-2: Type of Development or Vulnerability Class (see source for full list)

Vulnerability Class	Land uses and types of development which include*:
Highly Vulnerable	Garda, ambulance and fire stations and command centres required to be operational during flooding; Hospitals; Emergency access and egress points; Schools; Dwelling houses, student halls of residence and hostels; Residential institutions such as residential care homes, children's homes and social services homes; Caravans and mobile home parks; Dwelling houses designed, constructed or adapted for the elderly or, other people with impaired mobility; and Essential infrastructure, such as primary transport and utilities distribution, including electricity generating power stations and sub-stations, water and sewage treatment, and potential significant sources of pollution (SEVESO sites, IPPC sites, etc.) in the event of flooding.
Less Vulnerable	Buildings used for: retail, leisure, warehousing, commercial, industrial and non-residential institutions; Land and buildings used for holiday or short-let caravans and camping, subject to specific warning and evacuation plans; Land and buildings used for agriculture and forestry; Waste treatment (except landfill and hazardous waste); Mineral working and processing; and

Vulnerability Class	Land uses and types of development which include*:
	Local transport infrastructure.
Water-compatible development	Flood control infrastructure; Docks, marinas and wharves; Navigation facilities; Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location; Water-based recreation and tourism (excluding sleeping accommodation); Lifeguard and coastguard stations; Amenity open space, outdoor sports and recreation and essential facilities such as changing rooms; and Essential ancillary sleeping or residential accommodation for staff required by uses in this category (subject to a specific warning and evacuation plan).
***Uses not listed here should be considered on their own merits**	

3.9 Requirement for Detailed Flood Risk Assessment

Table 3-3 illustrates the circumstances in which the Justification Test is required for a proposed development, depending on the Flood Zone where the development is located and the vulnerability classification of the development.

The substation and wind turbine locations are all situated within Flood Zone C so the development is appropriate.

The site access roads in Derryarogue bog cross through an area identified on the flood maps as Flood Zone B so the development is appropriate. However, these have also been identified as areas of flooding on the GSI Winter 15/16 maps, and are known to flood each winter without pumping. The road is to pass along a high field alongside these flooded areas, but they will nonetheless be considered in the justification test. Similarly the access roads in Derryadd bog and in Lough Bannow bog pass close to areas shown as flooding in the GSI mapping, so these will also be included in the justification test.

In the southeast of Derryadd bog the site entrance and the access road for Pump Station 15 crosses through an area of Flood Zone A. A justification test is required for this development. There is an embankment between the bog and the river which prevents fluvial flooding at this location so the inundation noted in the NIFM has not been experienced to date.

Table 3-3: Requirement for Justification Test

	Flood Zone A	Flood Zone B	Flood Zone C
High Vulnerability	Justification Test	Justification Test	Appropriate (Substation)
Low Vulnerability	Justification Test (Some site Roads – Derryarogue, Derryadd, Lough Bannow)	Appropriate (Some site roads – Derryarogue)	Appropriate (Turbines)
Water Compatible	Appropriate	Appropriate	Appropriate

4 JUSTIFICATION TEST

The Planning System and Flood Risk Management Guidelines requires that where a planning authority is considering proposals for new development in areas at a high or moderate risk of flooding that include types of development that are potentially vulnerable to flooding and that require additional consideration as set out in Table 3-3, the planning authority must be satisfied that the development satisfies all of the criteria of the Justification Test listed in Section 2.3.1 of this report.

The justification test was considered against the Longford County Development Plan 2021 – 2027 as published on the Longford County Council website and the answers in each section are given in Box 4-1 below.

Box 4-1: Justification Test for Development Management

Justification Test for Development Management
1. The subject lands have been zoned or otherwise designated for the particular use or form of development in an operative development plan, which has been adopted or varied taking account of these Guidelines.
In the 2021 to 2027 development plan there is the Longford County Policy Objective 5.152: Encourage proposals for commercial wind energy developments to be located on cutaway peatlands in those areas identified as having wind potential within the county, as defined in Appendix 2, subject to environmental, landscape, habitat and wildlife protection requirements being addressed. **In Appendix 2 of the development plan (see Fig 2.6 of this report), the map of Areas of Wind Farm Potential, the majority of the site including the area is within an area shown as a preferred location for windfarms.**
2. The proposal has been subject to an appropriate flood risk assessment that demonstrates: i. The development proposed will not increase flood risk elsewhere and, if practicable, will reduce overall flood risk;
Yes, the site was subjected to appropriate flood risk assessment. The footprint of the development within the flood risk areas is made up of access roads. The access roads will be set below the 100 year flood level so will not obstruct the flooding or prevent areas from flooding. This will avoid any loss of flood plain. Culverts below the road will ensure hydraulic

connectivity for lower return period floods. Currently pump station 15 drains the south eastern part of Derryadd bog where the windfarm infrastructures is in Flood Zone A, and this is expected to continue for the lifetime of the windfarm.
ii. The development proposal includes measures to minimise flood risk to people, property, the economy, and the environment as far as reasonably possible;
The development does not propose to significantly change the pumped outflows from the site. The flow rates from the refurbished pump stations will be matched as far as possible with the flow rates of the existing pump stations. Surface runoff from the development will be discharged as close as possible to the original location.
iii. The development proposed includes measures to ensure that residual risks to the area and/or development can be managed to an acceptable level as regards the adequacy of existing flood protection measures or the design, implementation and funding of any future flood risk management measures and provisions for emergency services access; and
The site access roads are generally situated on higher ground and have multiple possible directions of access, so that in the event of a site road being inundated it is expected that the remainder of the site will remain accessible.
iv. The development proposed addresses the above in a manner that is also compatible with the achievement of wider planning objectives in relation to development of good urban design and vibrant and active streetscapes.
Not applicable
Conclusion: The proposed development site passes the Justification Test

5 CONCLUSIONS AND RECOMMENDATIONS

A Flood Risk Assessment has been undertaken for the Derryadd Wind Farm site owned by Bord na Móna.

There are areas of flooding known to occur on the sites when the pumps are not in operation, together with areas which the National Indicative Flood Mapping shows as being at risk of fluvial flooding during extreme events.

If there is any reduction in the existing pump operations it is likely that there would be additional areas flooded beyond those considered above. This could impact the windfarm infrastructure and may have stability implications for infrastructure on newly saturated areas.

The proposed use of the site includes high vulnerability use (energy infrastructure –substations), low vulnerability uses (wind turbines and site access roads), and water compatible uses (amenity tracks).

The developer will locate sensitive equipment above the 1000 year flood levels.

Vegetation has already started to reestablish on parts of the cutaway bog and this is expected to cover the entire extent of cutaway bog over time. As the vegetation establishes it will help to slow the runoff from the existing bog and will also increase evapotranspiration from the bog, further reducing the speed of runoff from the site.

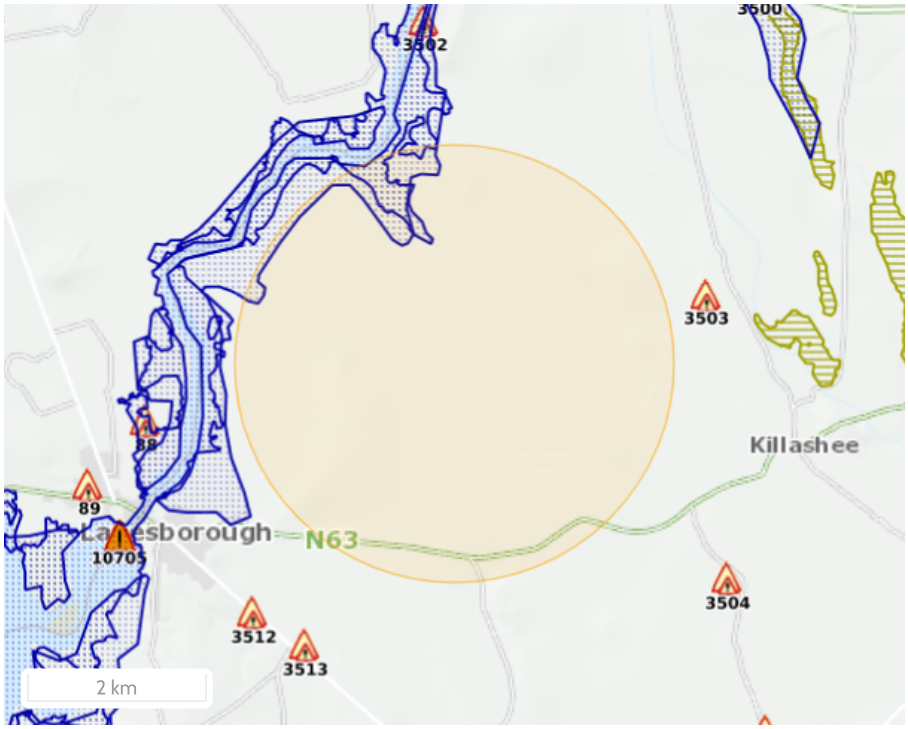
APPENDIX A – Historical Flooding Reports

Past Flood Event Local Area Summary Report

Report Produced: **29/5/2023 17:28**

This Past Flood Event Summary Report summarises all past flood events within 2.5 kilometres of the map centre.

This report has been downloaded from www.floodinfo.ie (the "**Website**"). The users should take account of the restrictions and limitations relating to the content and use of the Website that are explained in the Terms and Conditions. It is a condition of use of the Website that you agree to be bound by the disclaimer and other terms and conditions set out on the Website and to the privacy policy on the Website.



Map Legend

- Single Flood Event
- Recurring Flood Event
- Past Flood Event Extents
- Drainage Districts Benefited Lands*
- Land Commission Benefited Lands*
- Arterial Drainage Schemes Benefited Lands*

* Important: These maps do not indicate flood hazard or flood extent. Their purpose and scope is explained on Floodinfo.ie

2 Results

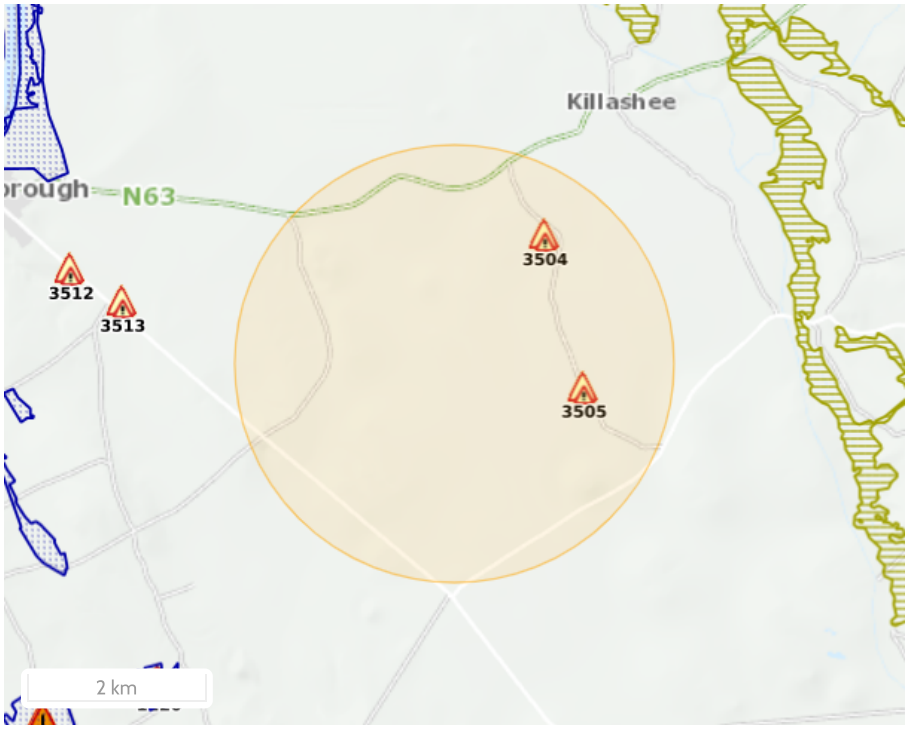
	Name (Flood_ID)	Start Date	Event Location
1.	Shannon Winter 1999/2000 (ID-2)	30/11/1999	Area
	Additional Information: Reports (26) Press Archive (19)		
2.	Shannon December 1954 (ID-3)	01/12/1954	Area
	Additional Information: Reports (4) Press Archive (16)		

Past Flood Event Local Area Summary Report

Report Produced: **29/5/2023 17:29**

This Past Flood Event Summary Report summarises all past flood events within 2.5 kilometres of the map centre.

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Map Legend

- Single Flood Event
- Recurring Flood Event
- Past Flood Event Extents
- Drainage Districts Benefited Lands*
- Land Commission Benefited Lands*
- Arterial Drainage Schemes Benefited Lands*

* Important: These maps do not indicate flood hazard or flood extent. Their purpose and scope is explained on Floodinfo.ie

2 Results

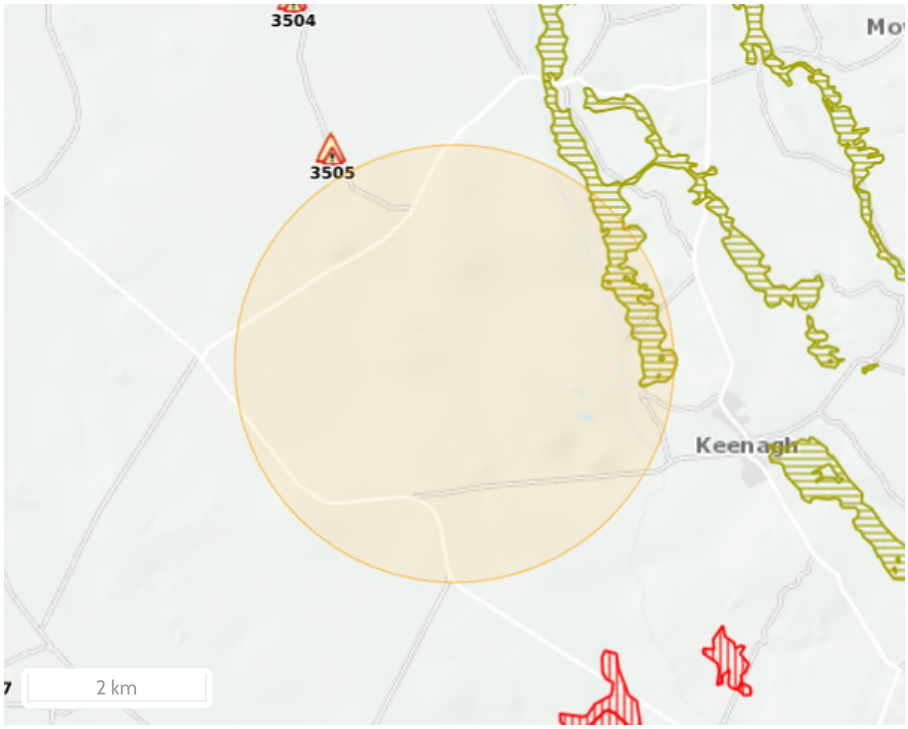
	Name (Flood_ID)	Start Date	Event Location
1.	Grillagh Recurring (ID-3504)	n/a	Approximate Point
	Additional Information: Reports (1) Press Archive (0)		
2.	Derryad Recurring (ID-3505)	n/a	Approximate Point
	Additional Information: Reports (1) Press Archive (0)		

Past Flood Event Local Area Summary Report

Report Produced: **29/5/2023 17:30**

This Past Flood Event Summary Report summarises all past flood events within 2.5 kilometres of the map centre.

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Map Legend

- Single Flood Event
- Recurring Flood Event
- Past Flood Event Extents
- Drainage Districts Benefited Lands*
- Land Commission Benefited Lands*
- Arterial Drainage Schemes Benefited Lands*

* Important: These maps do not indicate flood hazard or flood extent. Their purpose and scope is explained on Floodinfo.ie

0 Results

Name (Flood_ID)	Start Date	Event Location

APPENDIX G ABNORMAL INDIVISIBLE LOAD ROUTE SURVEY (PELL FRISCHMANN, 2023)

Pell Frischmann

Derryadd Wind Farm

Abnormal Indivisible Load Route Survey

December 2023

This report is to be regarded as confidential to our Client and is intended for their use only and may not be assigned except in accordance with the contract. Consequently, and in accordance with current practice, any liability to any third party in respect of the whole or any part of its contents is hereby expressly excluded, except to the extent that the report has been assigned in accordance with the contract. Before the report or any part of it is reproduced or referred to in any document, circular or statement and before its contents or the contents of any part of it are disclosed orally to any third party, our written approval as to the form and context of such a publication or disclosure must be obtained.

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03		Issue	09-May-23	T Lockett	G Buchan	G Buchan
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Ref. reference. Rev revision. Suit suitability.

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Appendix A 81m Swept Path Assessment Drawings
Appendix B Proposed future road upgrade works as part of Part 8 Application by Roscommon County Council

1 Introduction

1.1 Purpose of the Report

Pell Frischmann (PF) has been commissioned by Bord na Móna PowerGen (Bord na Móna) to undertake a study of the delivery route for wind turbine Abnormal Indivisible Loads (AIL) associated with the construction and development of Derryadd Wind Farm, located to the east and southeast of Lanesborough in County Longford.

The Route Survey Report (RSR) has been prepared to help inform Bord na Móna on the likely issues associated with the development of the site with regards to off-site transport and access for AIL traffic. This report is based upon a desk top review of topographical surveys and identifies the key issues associated with AIL deliveries and notes that remedial works, either in the form of physical works or as traffic management interventions will be required to accommodate the predicted loads. A detailed site visit would still be required to fully assess the impact on the study area road network.

The detailed assessment and subsequent designs of any remedial works are beyond the agreed scope of works between PF and Bord na Móna at this point in time.

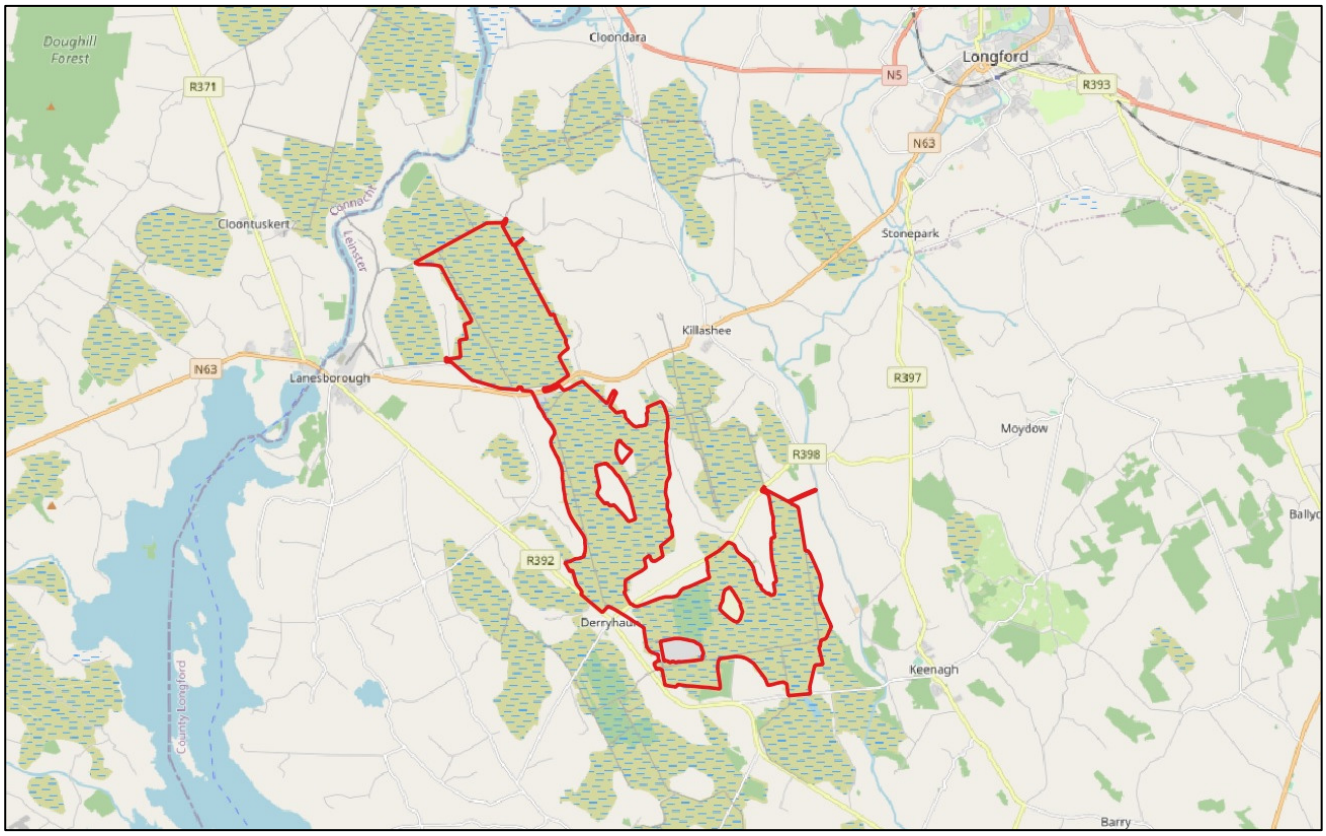
It is the responsibility of the wind turbine supplier to ensure that the entirety of the proposed access route is suitable and meets with their satisfaction. The turbine supplier will be responsible for ensuring that the finalised proposals meet with the appropriate levels of health and safety consideration for all road users and in accordance with the relevant legislation at the time of delivery.

2 Site Background

2.1 Site Location

The development site is located to the east and southeast of Lanesborough. Figure 1 illustrates the general site location.

Figure 1: Site Location Plan



2.2 Candidate Turbine

The turbine model used will be subject to a competitive procurement process so exact dimensions are as such unknown. However, Bord na Mona are applying for planning permission for a turbine with a rotor diameter of 165m. Examining similar turbine types in this range an 81m turbine blade length is assumed. The following dimensions have been used for this assessment as listed in Table 1 below. Details of these are included in Table 1 below.

Table 1: Turbine Size Summary

Component	Length (m)	Width (m)	Height / Min Diameter (m)
Blade	81.100	4.500	4.000
Tower	28.560	4.794	4.102

2.3 Proposed Delivery Equipment

To provide a robust assessment scenario based upon the known issues along the access route, it has been assumed that all blades would be carried on a Superwing Carrier trailer to reduce the need for mitigation in constrained sections of the route.

The base and mid towers would be carried on a 4+7 clamp trailer. The hub, nacelle housing, and top towers would be carried on a six-axle step frame trailer. The worst case loads for these sections will be considered in a further study.

Figure 2: Superwing Carrier Trailer



Figure 3: Tower Trailer



3 Access Route Review

3.1 Proposed Access Route

This study has focussed on five locations identified by Bord na Móna for the proposed loads. The locations under consideration are as follows and are illustrated in the attached plans below.

- N6, Junction 12 Eastbound Slip Road;
- N6 / N61 Roundabout at Athlone;
- N61 / N63 Roundabout at Roscommon;
- N61 Roscommon Arts Centre Roundabout;
- N61 / N63 Roundabout, Northeast of Roscommon; and
- Site Entrance on R392.

The proposed northern access option is illustrated in Figure 4.

Figure 4: Points of Interest (POI) at Athlone

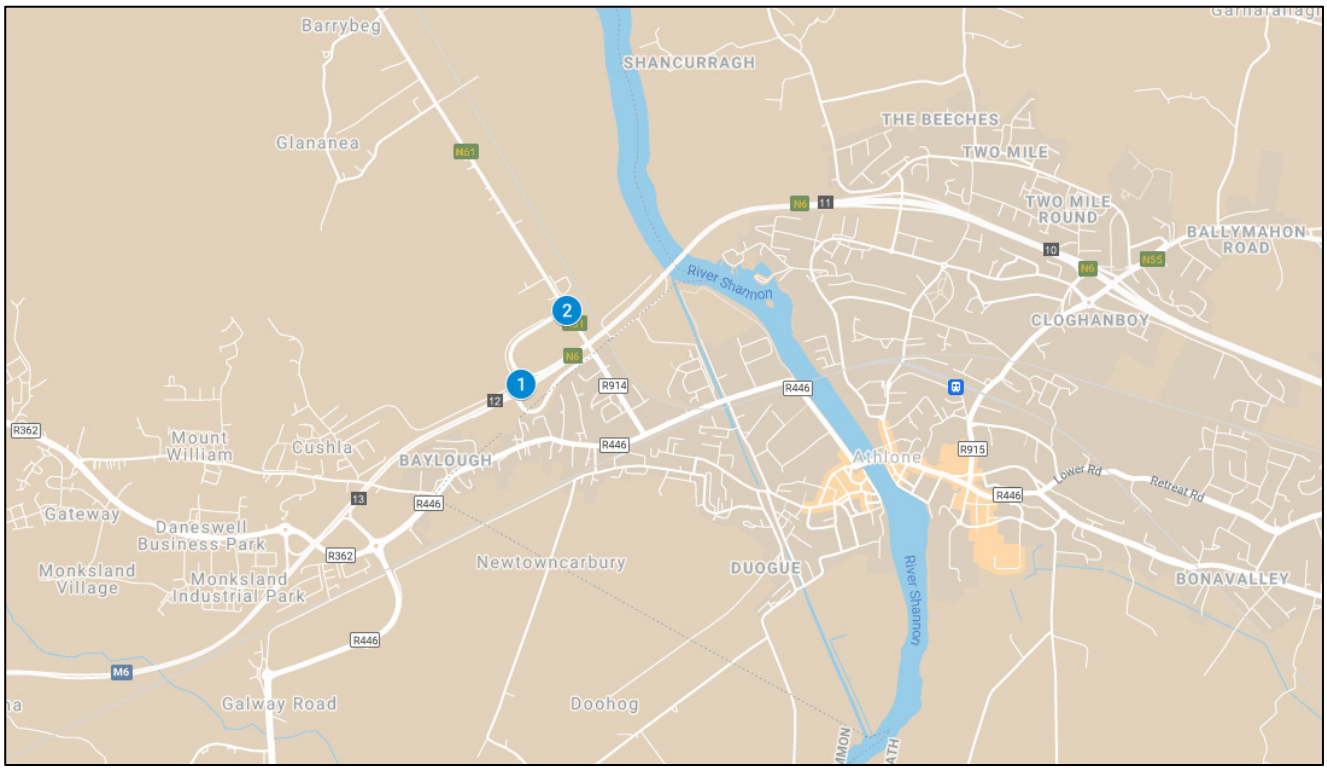


Figure 5: Points of Interest (POI) at Roscommon

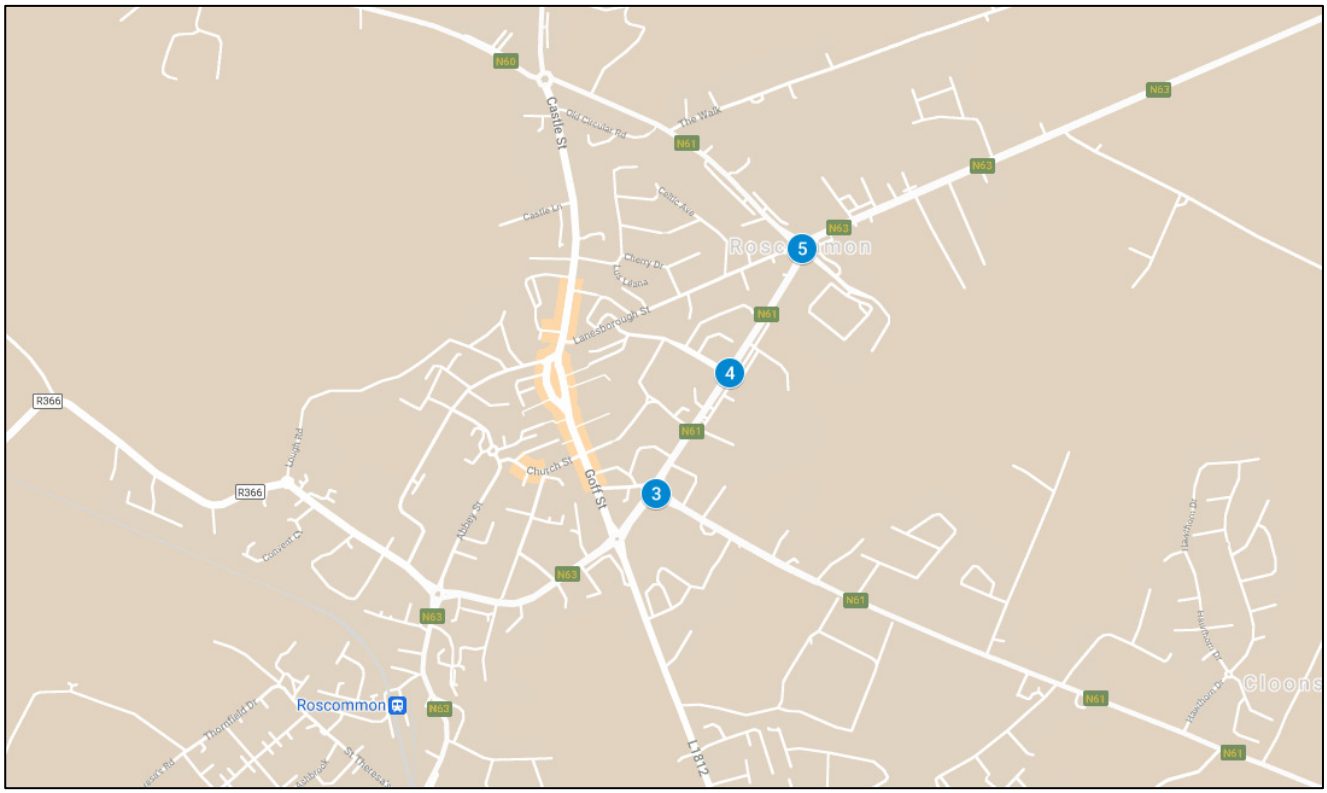
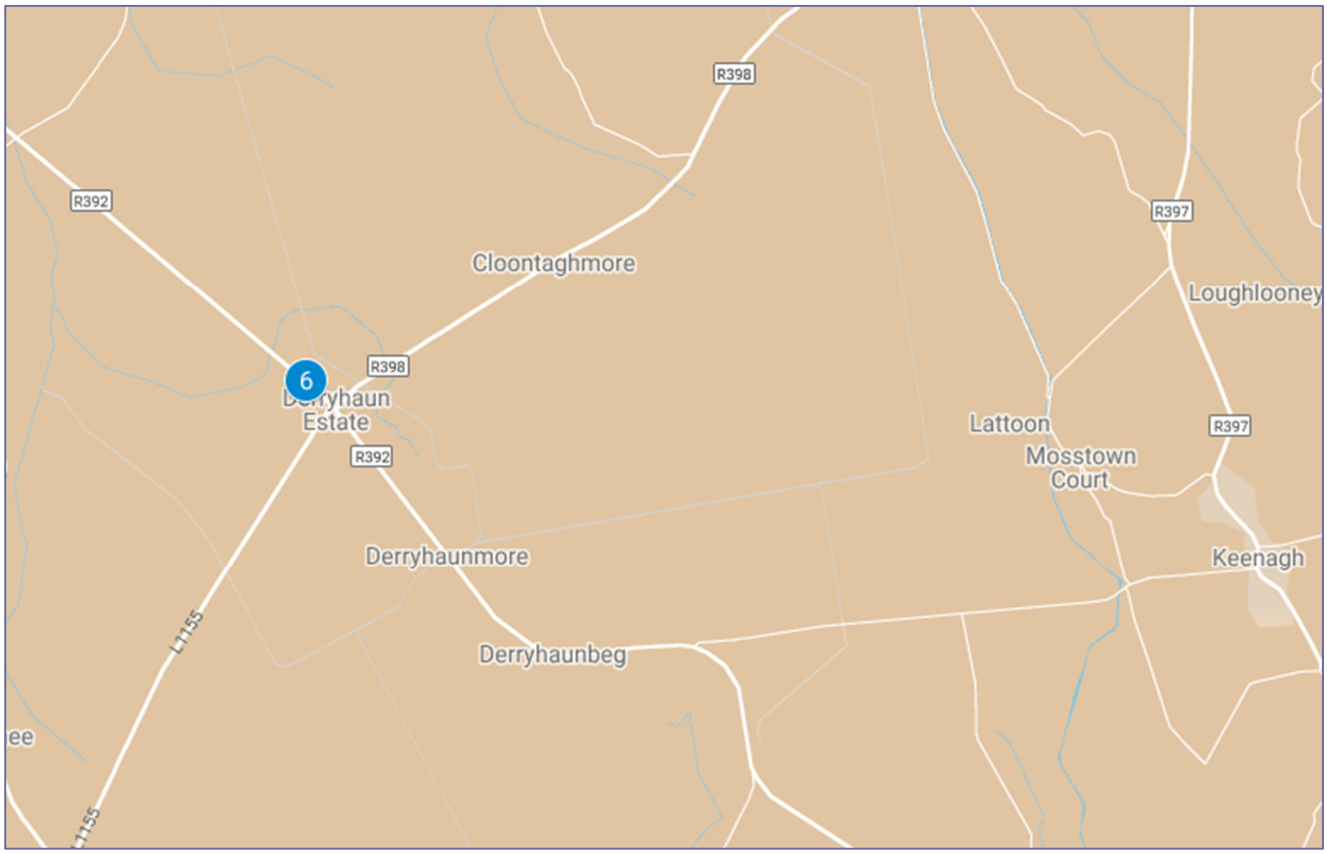


Figure 6: Points of Interest (POI) Site Entrance



3.2 Route Constraints

The POI junctions are detailed in Table 2 with a summary of the swept path assessments. Copies of the swept path assessment drawings for the 81m blade are attached in Appendix A.

Table 2: Constraint Points and Details

POI	Constraint	Details
1	**N6 Eastbound Slip Road**  	Loads would depart the N6 at Junction 12 Eastbound. The swept path assessment indicates that load bearing surfaces will be required on both sides of the slip road. On the inside of the bend, one road sign and one tree should be removed and third party land may be necessary. On the outside of the bend, six chevron signs, bollard posts, one speed sign and one direction sign will need to be removed. The blade tip will oversail the central reserve of the N6, however the blade tip will not cross into incoming traffic. Loads will straddle the centre the centre line of the slip road and all marker post bollards will need to be removed. This should be done up to POI 2.
2	**N6 / N61 Roundabout at Athlone** 	Loads will take the first exit at the roundabout, turning left onto the N61. Loads will oversail the southern verge where one road sign and one lighting column should be removed. On the inside of the turn at the junction, five road signs, one lighting column and two posts should be removed. A review of land ownership boundaries should be undertaken. The splitter island on the approach arm should have an oversail surface provided and two road signs removed. The splitter island on the exit arm will also require an overrunning surface provided and two signs removed. One chevron sign should be removed from the central island of the junction.

POI	Constraint	Details
3	**N61 / N63 Roundabout at Roscommon** 	Loads will take the third exit at the roundabout, turning onto the N61. Loads will require third party land to the southern verge, with loads oversailing the car park of the retail park. This will require the removal two utility poles and one lighting column. Loads will then take a contraflow transit of the junction. This will require the provision of a load bearing surface on the entry splitter island and the central island of the junction. Two road signs and one bollard on the splitter island and the removal of one sign and trees on the central island will be necessary. The ground level of the central island will need to be lowered over the overrun area. On the exit arm, two road signs and one utility pole should be removed and an overrun surface required. A load bearing surface should be laid in the north western kerb and the kerb should be protected. All parking should be suspended. An additional set of drawings is provided in Appendix B which shows the proposed future road upgrade works as part of Part 8 Application by Roscommon County Council

POI	Constraint	Details
4	**N61 Roscommon Arts Centre Roundabout**  	Loads will proceed through ahead on the N61, passing the physical central reserve and then taking the second exit at the Arts Centre roundabout. Loads will oversail the central island where two road signs should be removed. Loads will oversail the western verge on approach to the roundabout where two road signs should be removed. Loads will oversail the north western edge of the roundabout island where two road signs and two trees should be removed. On exiting the roundabout, loads will oversail the splitter island where one road sign should be removed. An additional set of drawings is provided in Appendix B which shows the proposed future road upgrade works as part of Part 8 Application by Roscommon County Council
5	**N61 / N63 Roundabout, Northeast of Roscommon** 	Loads would take the third exit at the roundabout, continuing onto the N63. To reduce the scale of the mitigation works, a contraflow transit of the junction would be undertaken. Loads will overrun the entry splitter island where two signs and one bollard should be removed and a load bearing surface provided. Loads will overrun the central island of the junction, where the ground level should be lowered and two signs and one tree removed. A load bearing overrun surface will be required. Loads will oversail the exit splitter island where two road signs and one bollard should be removed. The tree canopy of the northern verge should be trimmed back. An additional set of drawings is provided in Appendix B which shows the proposed future road upgrade works as part of Part 8 Application by Roscommon County Council

POI	Constraint	Details
6	**Proposed R392 Site Entrance** 	Loads will turn left into a new access junction from the R392. The junction should be constructed to meet turbine manufacturer and road authority standards.

3.3 N6 Westbound Slip Road Option

A sensitivity review has been undertaken for the possibility of loads departing the N6 westbound. This option is considered theoretical as access from the east of Ireland is constrained due to the Port of Dublin having a moratorium on the delivery of turbine sections through the port.

The only other available ports within the Republic of Ireland on the east coast are Greenore or Rosslaire, neither of which are considered suitable for the proposed size of turbine. It is therefore assumed that the port of entry will be either Foynes or Galway on the west coast, both of which have experience of accommodating similar turbine sizes.

The exit from the N6 westbound requires a constrained turn from the N6 and then a right angle turn onto the R914. Loads would then need to turn underneath the N6, where the N6 overbridge abutments are located in close proximity to the slip road junction.

The slip road and left turn onto the N914 are illustrated in Figure 6.

Figure 7: Slip Road and R914 Junction



The junction is highly constrained and would require significant areas of third party land to form a load bearing surface on the southern verge and into residential gardens. A high level swept path assessment has been undertaken at this location for the 81m blade and is illustrated in Figure 7. The manoeuvre is not considered feasible given the over-run areas required on the north and the significant oversail areas required.

Figure 8: Slip Road and R914 Junction Swept Path Assessment



No further assessment of this set of manoeuvres has been undertaken and no further assessment or consideration of this option are recommended.

3.4 Swept Path Assessment Results and Summary

The detailed swept path drawings for the locations assessed are provided in Appendix A for review. The drawings illustrate tracking undertaken for the worst case loads at each location.

The colours illustrated on the swept paths are:

- Grey / Black – OS / Topographical Base Mapping;
- Green – Vehicle body outline (body swept path);
- Red – Tracked pathway of the wheels (wheel swept path); and
- Purple – The over-sail tracked path of the load where it encroaches outwith the trailer (load swept path).

Where mitigation works are required, the extents of over-run and over-sail areas are illustrated on the swept path drawings.

Where provided by the client, topographical data has been utilised. Please note that PF cannot accept liability for errors on the data source, be that OSI base mapping or client supplied data.

3.5 Land Ownership

The limits of road adoption can vary depending upon the location of the site and the history of the road agencies involved. The adopted area is generally defined as land contained within a defined boundary where the road agency holds the maintenance rights for the land. In urban areas, this usually defined as the area from the edge of the footway across the road to the opposing footway back edge.

In rural areas the area of adoption can be open to greater interpretation as defined boundaries may not be readily visible.

3.6 Summary Issues

It is strongly suggested that following a review of the RSR, Bord na Móna should undertake the following prior to the delivery of the first abnormal loads, to ensure load and road user safety:

- Undertake a detailed site visit to confirm the desk top survey details;
- A review of axle loading on structures along the entire access route with the various road agencies is undertaken immediately prior to the loads being transported in case of last minute changes to structures;
- A review of clear heights with utility providers and the transport agencies along the route to ensure that there is sufficient space to allow for loads plus sufficient flashover protection (to electrical installations);
- That any verge vegetation and tree canopies which may foul loads is trimmed prior to loads moving;
- That a review of potential roadworks and or closures is undertaken once the delivery schedule is established in draft form;
- That a test run is completed to confirm the route and review any vertical clearance issues; and
- That a condition survey is undertaken to ascertain the extents of road defects prior to loads commencing to protect the developer from spurious damage claims.

4 Summary

4.1 Summary of Access Review

PF has been commissioned by Bord na Móna to prepare a desktop Route Survey Report to examine the issues associated with the transport of AIL turbine components to Derryadd Wind Farm at six points of interest.

This report identifies the key points and issues associated with the selected junctions and outlines the issues that will need to be considered for successful delivery of components.

The report is presented for consideration to Bord na Móna. Various road modifications, structural reviews and interventions are required to successfully access the site. If these are undertaken, access to the proposed wind farm site is considered feasible.

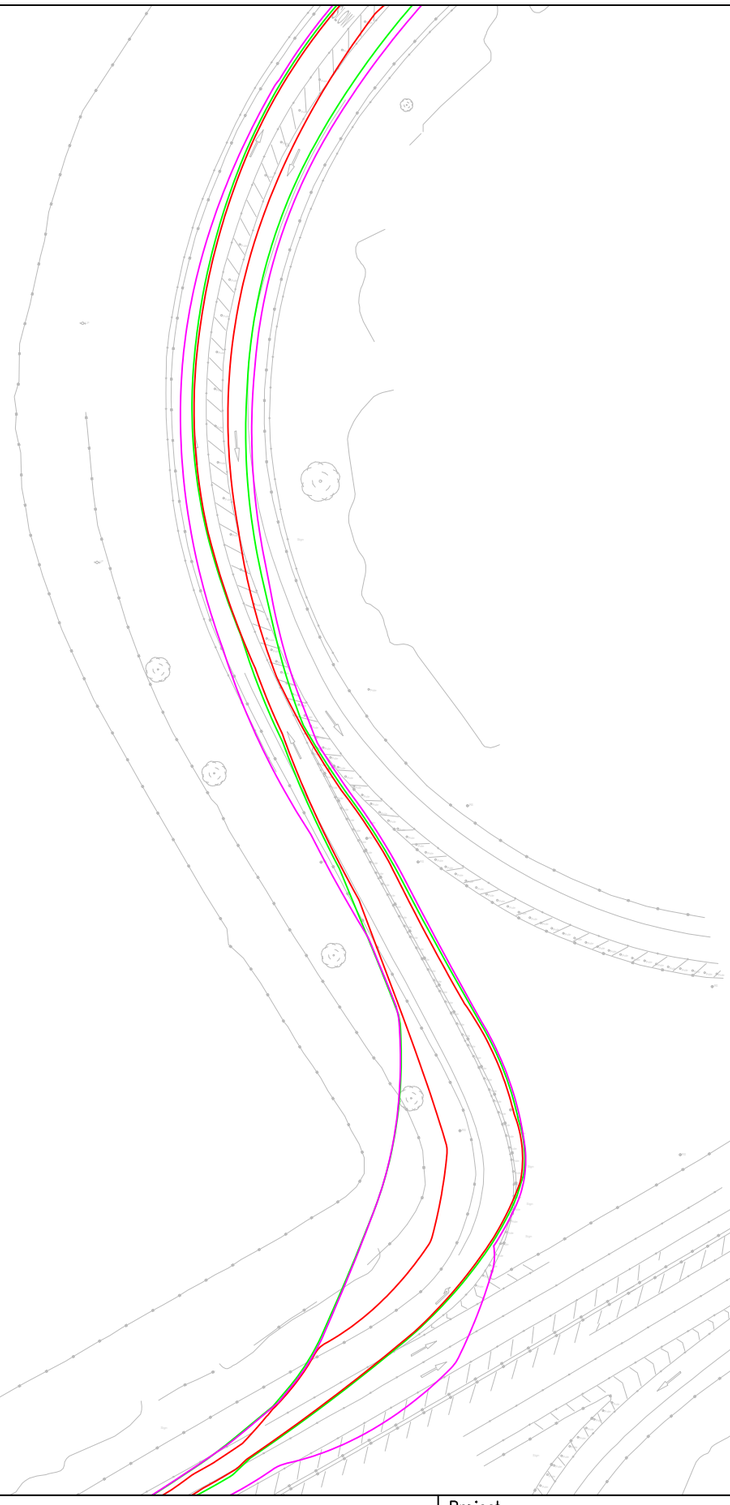
4.2 Further Actions

The following actions are recommended to pursue the transport and access issues further:

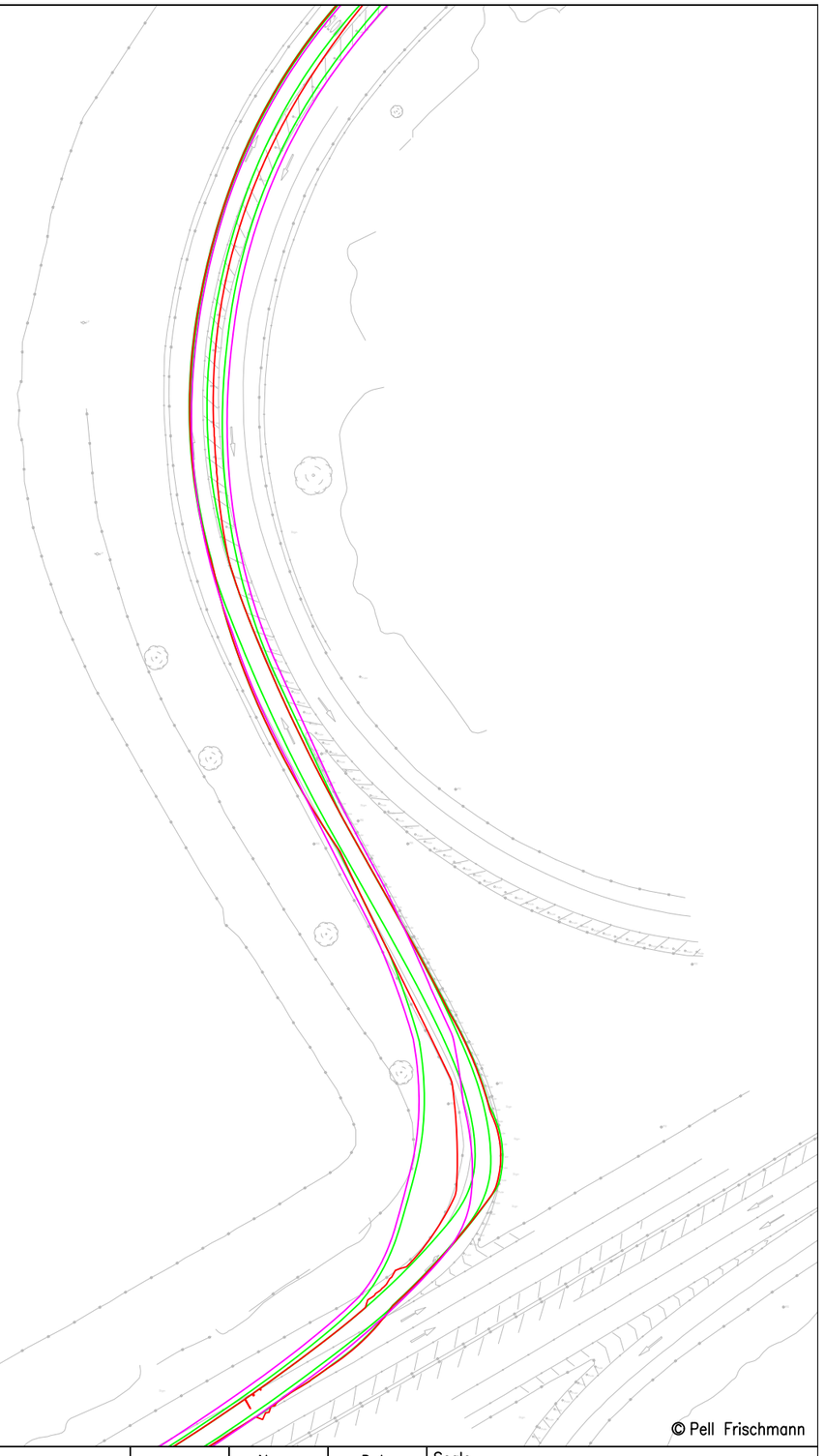
- Prepare detailed mitigation design proposals to help inform the land option / consultee discussions;
- Obtain the necessary land options;
- Undertake discussion with the affected utility providers and roads agencies;
- Obtain the necessary statutory licences to enable the mitigation measures; and
- Develop a detailed operational Transport Management Plan to assist in transporting the proposed loads.

Appendix A 81m Swept Path Assessment Drawings

Blade



Tower



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Client: Bord na Mona

Project: Derryadd Wind Farm

Drawing Title: 81m Blade & Tower Section

SPA Location: N6 Junction 12 (Eastbound)

Key

Wheel SPA	Body SPA	Load SPA	Indicative	Over-run	Over-sail

	Name	Date
Drawn	GB	09/05/2023
Designed	TL	09/05/2023
Checked	GB	28/05/2021
Point of Interest		1

Scale: 1:1_1 @ A3

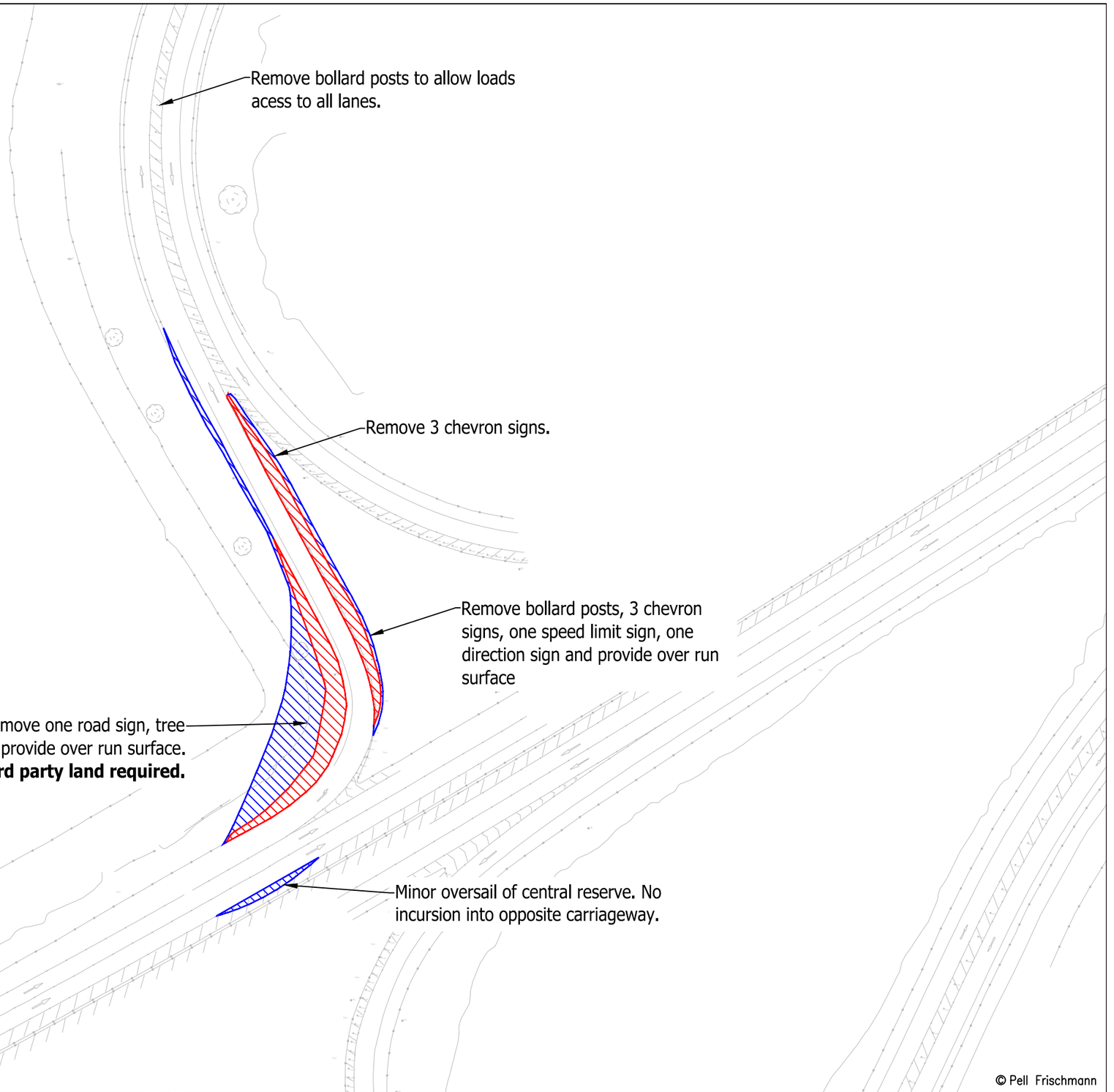
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Drawing Status: Draft

Drawing No. SK01

Notes:
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Client: Bord na Mona

Key

Wheel SPA	Body SPA	Load SPA	Indicative	Over-run	Over-sail

Project: Derryadd Wind Farm

Drawing Title: 81m Blade & Tower Section

SPA Location: N6 Junction 12 (Eastbound)

	Name	Date
Drawn	GB	09/05/2023
Designed	TL	09/05/2023
Checked	GB	28/05/2021
Point of Interest		1

Scale: 1:1_1 @ A3

File No.: 09052023 BnM Derryadd v3.dwg

Drawing Status: Draft

Drawing No.: SK01A

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Blade



Tower



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Client: Bord na Mona

Key

Wheel SPA	Body SPA	Load SPA	Indicative	Over-run	Over-sail

Project: Derryadd Wind Farm

Drawing Title: 81m Blade & Tower Section

SPA Location: N6 Junction 12/ N61 Roundabout

	Name	Date
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Designed	TL	09/05/2023
Checked	GB	28/05/2021
Point of Interest		2

Scale: 1:1_1 @ A3

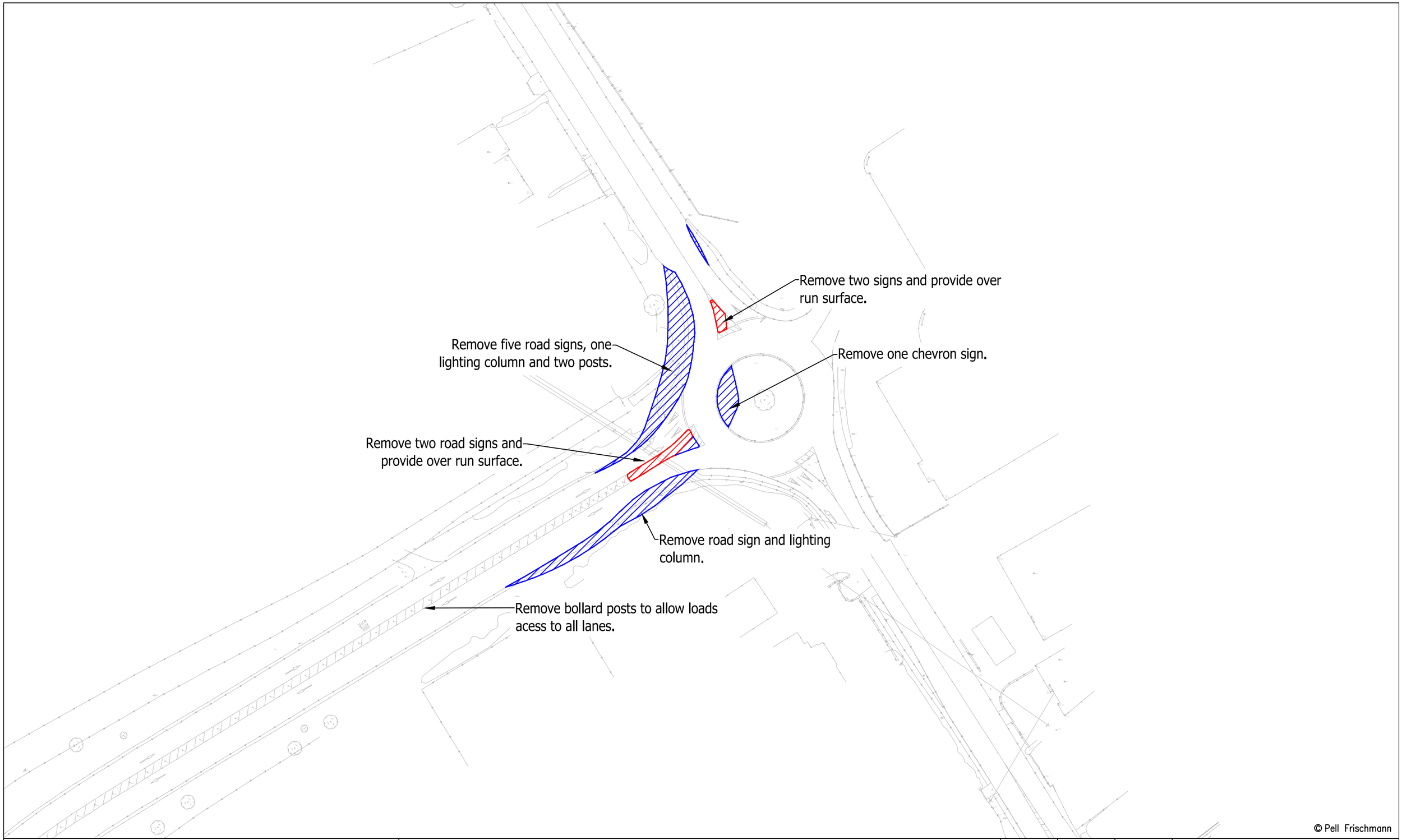
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Drawing No.: SK02

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Client: Bord na Mona

Key

Wheel SPA	Body SPA	Load SPA	Indicative	Over-run	Over-sail

Project: Derryadd Wind Farm

Drawing Title: 81m Blade & Tower Section

SPA Location: N6 Junction 12/ N61 Roundabout

	Name	Date
Drawn	GB	09/05/2023
Designed	TL	09/05/2023
Checked	GB	28/05/2021
Point of Interest		2

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Drawing Status: Draft

Drawing No.: SK02A

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Blade
Option 2



Tower
Option 2



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Key

Wheel SPA	Body SPA	Load SPA	Indicative	Over-run	Over-sail

Project: Derryadd Wind Farm

Drawing Title: 81m Blade & Tower Section

SPA Location: N61 / N63 Roundabout

	Name	Date
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Designed	TL	09/05/2023
Checked	GB	28/05/2021
Point of Interest		3

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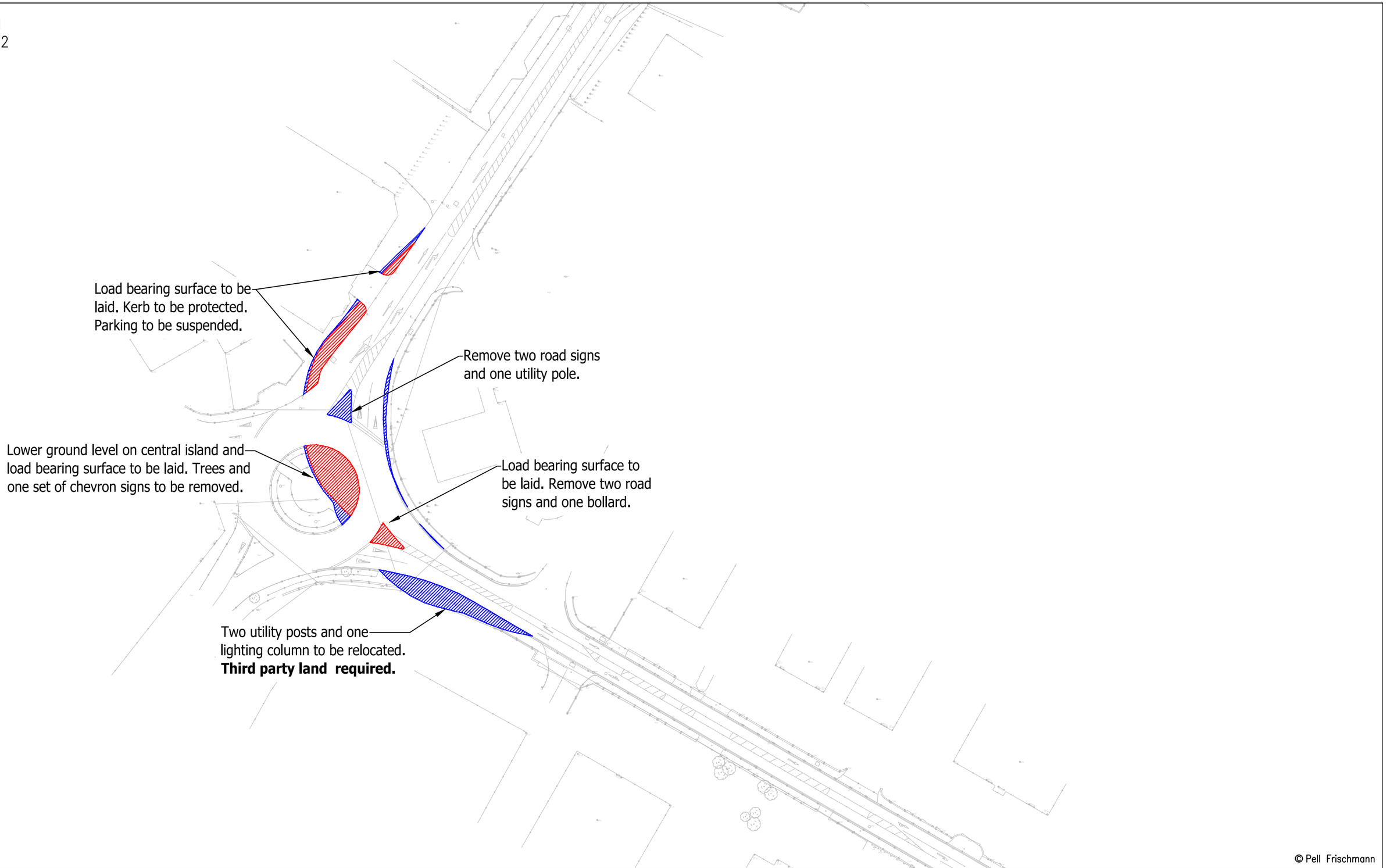
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Oversail
Option 2



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Key

Wheel SPA	Body SPA	Load SPA	Indicative	Over-run	Over-sail

Project: Derryadd Wind Farm

Drawing Title: 81m Blade & Tower Section

SPA Location: N61 / N63 Roundabout

	Name	Date
Drawn	GB	09/05/2023
Designed	TL	09/05/2023
Checked	GB	28/05/2021
Point of Interest		3

Scale: 1:1_1 @ A3

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Drawing No.: SK03C

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Blade



Tower



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Key

Wheel SPA	Body SPA	Load SPA	Indicative	Over-run	Over-sail

Project: Derryadd Wind Farm

Drawing Title: 81m Blade & Tower Section

SPA Location: N61 Roscommon Arts Centre Roundabout

	Name	Date
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Designed	TL	09/05/2023
Checked	GB	28/05/2021
Point of Interest		4

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Drawing No.: SK04

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Key

Wheel SPA	Body SPA	Load SPA	Indicative	Over-run	Over-sail

Project: Derryadd Wind Farm

Drawing Title: 81m Blade & Tower Section

SPA Location: N61 Roscommon Arts Centre Roundabout

	Name	Date
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Designed	TL	09/05/2023
Checked	GB	28/05/2021
Point of Interest		4

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Drawing Status: Draft

Drawing No. SK04A

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Blade



Tower



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Client: Bord na Mona

Key

Wheel SPA	Body SPA	Load SPA	Indicative	Over-run	Over-sail

Project: Derryadd Wind Farm

Drawing Title: 81m Blade & Tower Section

SPA Location: N61 / N63 Roundabout

	Name	Date
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Designed	TL	09/05/2023
Checked	GB	28/05/2021
Point of Interest		4

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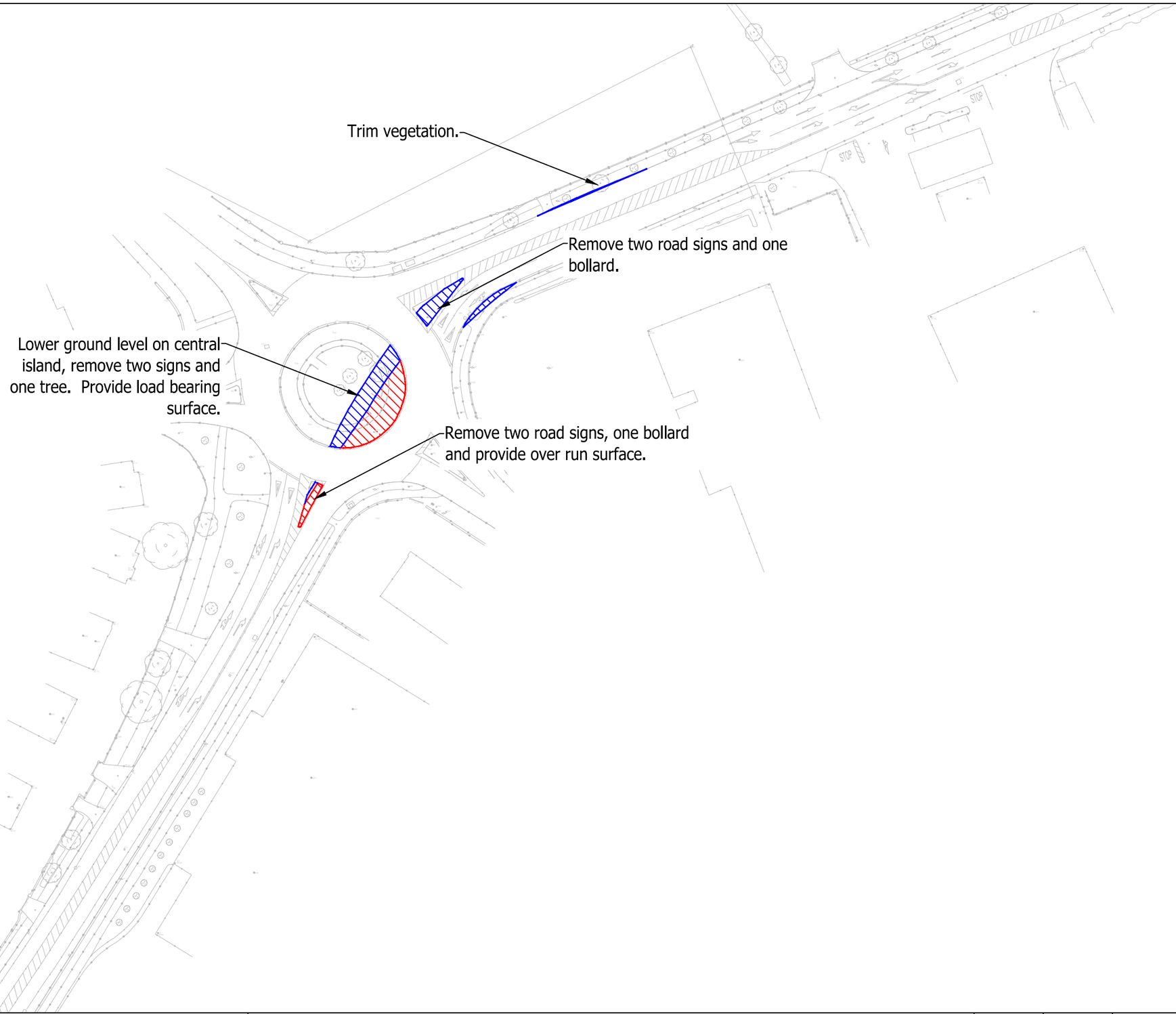
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Drawing No.: SK05

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Client: Bord na Mona

Key

Wheel SPA	Body SPA	Load SPA	Indicative	Over-run	Over-sail

Project: Derryadd Wind Farm

Drawing Title: 81m Blade & Tower Section

SPA Location: N61 / N63 Roundabout

	Name	Date
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Designed	TL	09/05/2023
Checked	GB	28/05/2021
Point of Interest		5

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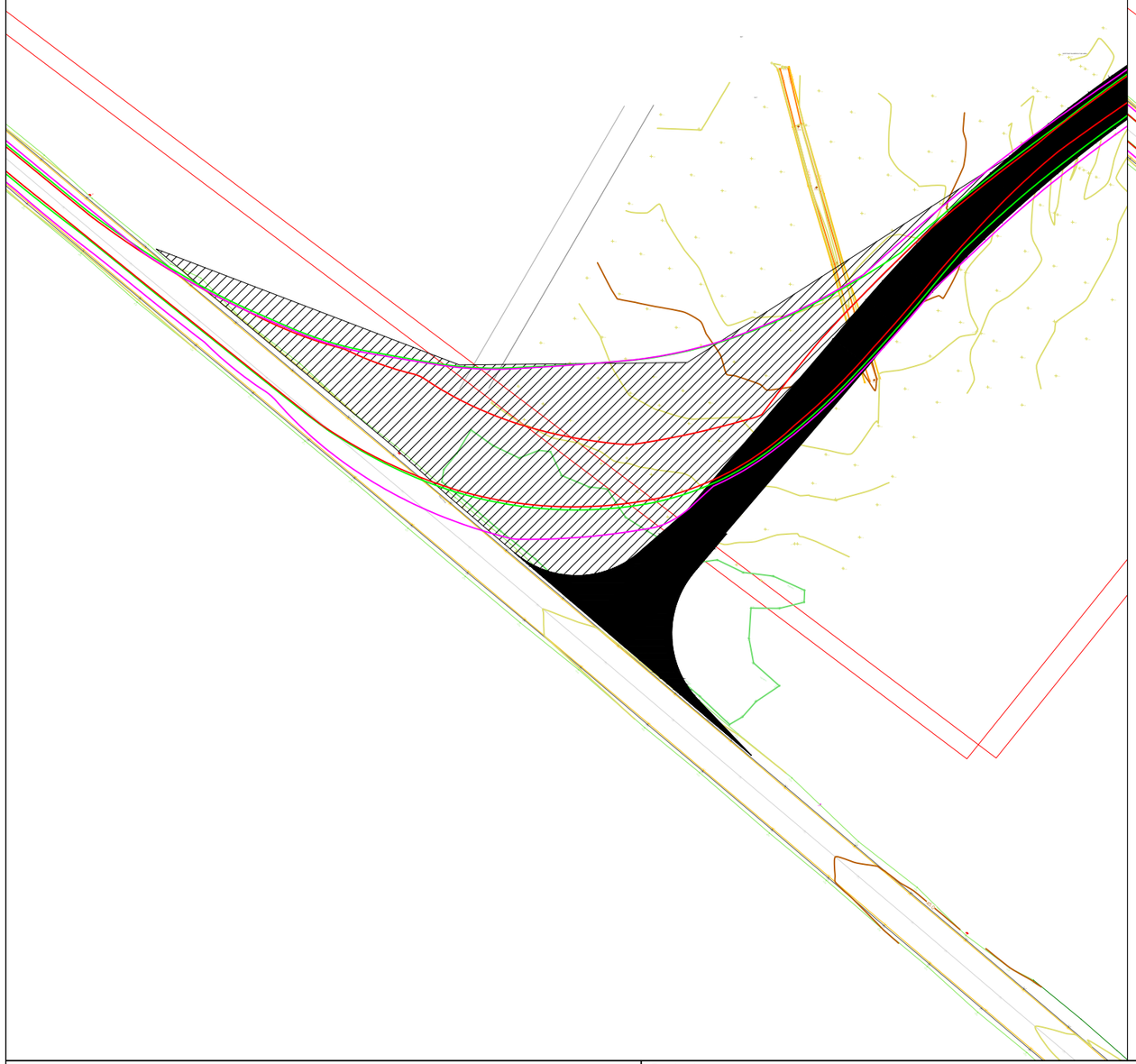
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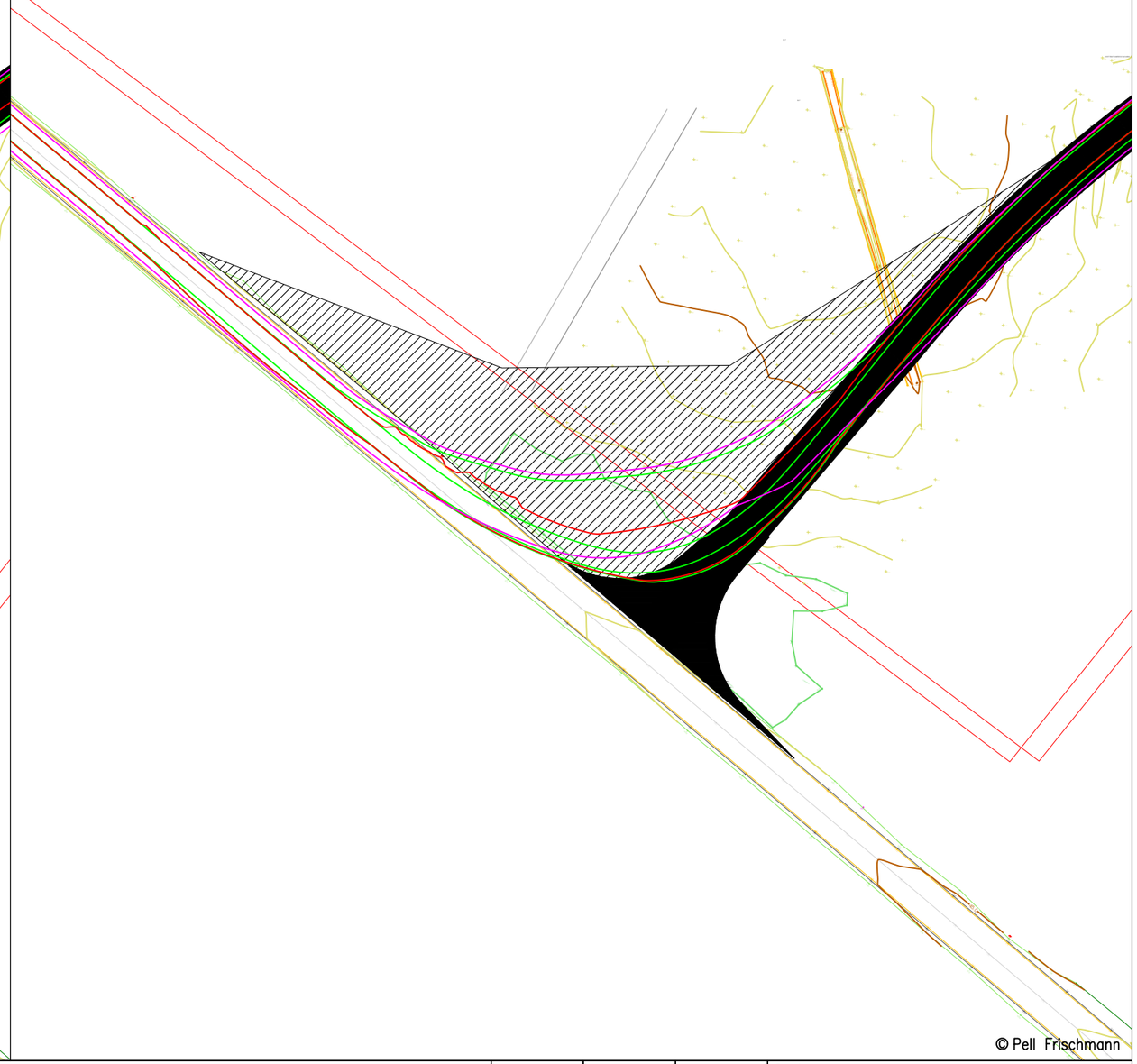
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Blade



Tower



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Client: Bord na Mona

Key

Wheel SPA	Body SPA	Load SPA	Indicative	Over-run	Over-sail

Project: Derryadd Wind Farm

Drawing Title: 81m Blade & Tower Section

SPA Location: Proposed Site Access

	Name	Date
Drawn	GB	09/05/2023
Designed	TL	09/05/2023
Checked	GB	28/05/2021
Point of Interest		6

Scale: 1:750 @ A3

File No.: 09052023 BnM Derryadd v3.dwg

Drawing Status: Draft

Drawing No.: SK06

Notes:
1. All mitigation is subject to confirmation through a test run.
2. This is not a construction drawing and is intended for illustration purposes only.
3. Where indicative road edges are provided, mitigation should be confirmed through a test run or topographical survey.

Revision: 1

Detailed design required for site access junction. Load bearing surface to be laid. Trees and vegetation to be cleared. Utility posts to be relocated. Land under control of the developer.

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Client: Bord na Mona

Key

Wheel SPA	Body SPA	Load SPA	Indicative	Over-run	Over-sail

Project: Derryadd Wind Farm

Drawing Title: 81m Blade & Tower Section

SPA Location: Proposed Site Access

	Name	Date
Drawn	GB	09/05/2023
Designed	TL	09/05/2023
Checked	GB	28/05/2021
Point of Interest		6

Scale: 1:750 @ A3

File No. 09052023 BnM Derryadd v3.dwg

Drawing Status: Draft

Drawing No. SK06A

Notes:
1. All mitigation is subject to confirmation through a test run.
2. This is not a construction drawing and is intended for illustration purposes only.
3. Where indicative road edges are provided, mitigation should be confirmed through a test run or topographical survey.

Revision: 1

Appendix B Proposed future road upgrade works as part of Part 8 Application by Roscommon County Council

Blade
Option 2



Tower
Option 2



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Client: Bord na Mona

Key

Wheel SPA	Body SPA	Load SPA	Indicative	Over-run	Over-sail

Project: Derryadd Wind Farm

Drawing Title: 81m Blade & Tower Section

SPA Location: N61 / N63 Roundabout – Potential Future Road Layout

	Name	Date
Drawn	GB	14/12/2023
Designed	TL	14/12/2023
Checked	GB	28/05/2021
Point of Interest		3

Scale: 1:1_1 @ A3

File No.: 231023 BnM Derryadd v4.dwg

Drawing Status: Draft

Drawing No.: SK03D

Notes:
1. All mitigation is subject to confirmation through a test run.
2. This is not a construction drawing and is intended for illustration purposes only.
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Revision: 2



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Client: Bord na Mona

Key

Wheel SPA	Body SPA	Load SPA	Indicative	Over-run	Over-sail

Project: Derryadd Wind Farm

Drawing Title: 81m Blade & Tower Section

SPA Location: N61 / N63 Roundabout – Potential Future Road Layout

	Name	Date
Drawn	GB	14/12/2023
Designed	TL	14/12/2023
Checked	GB	28/05/2021
Point of Interest		3

Scale: 1:1_1 @ A3

File No.: 231023 BnM Derryadd v4.dwg

Drawing Status: Draft

Drawing No.: SK03E

Notes:
1. All mitigation is subject to confirmation through a test run.
2. This is not a construction drawing and is intended for illustration purposes only.
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Revision: 2

Blade
Option 2



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Client: Bord na Mona

Key

Wheel SPA	Body SPA	Load SPA	Indicative	Over-run	Over-sail

Project: Derryadd Wind Farm

Drawing Title: 81m Blade & Tower Section

SPA Location: N61 Roscommon Arts Centre Roundabout – Potential Future Road Layout

	Name	Date
Drawn	GB	14/12/2023
Designed	TL	14/12/2023
Checked	GB	28/05/2021
Point of Interest		4

Scale: 1:1_1 @ A3

File No.: 231023 BnM Derryadd v4.dwg

Drawing Status: Draft

Drawing No.: SK04B

Notes:
1. All mitigation is subject to confirmation through a test run.
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Revision: 2

Tower
Option 2



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Client: Bord na Mona

Key

Wheel SPA	Body SPA	Load SPA	Indicative	Over-run	Over-sail

Project: Derryadd Wind Farm

Drawing Title: 81m Blade & Tower Section

SPA Location: N61 Roscommon Arts Centre Roundabout – Potential Future Road Layout

	Name	Date
Drawn	GB	14/12/2023
Designed	TL	14/12/2023
Checked	GB	28/05/2021
Point of Interest		4

Scale: 1:1_1 @ A3

File No.: 231023 BnM Derryadd v4.dwg

Drawing Status: Draft

Drawing No.: SK04C

Notes:
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Revision: 2



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Client: Bord na Mona

Key

Wheel SPA	Body SPA	Load SPA	Indicative	Over-run	Over-sail

Project: Derryadd Wind Farm

Drawing Title: 81m Blade & Tower Section

SPA Location: N61 Roscommon Arts Centre Roundabout – Potential Future Road Layout

	Name	Date
Drawn	GB	14/12/2023
Designed	TL	14/12/2023
Checked	GB	28/05/2021
Point of Interest		4

Scale: 1:1_1 @ A3

File No.: 231023 BnM Derryadd v4.dwg

Drawing Status: Draft

Drawing No.: SK04D

Notes:
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Revision: 2

Blade
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Key

Wheel SPA	Body SPA	Load SPA	Indicative	Over-run	Over-sail

Project: Derryadd Wind Farm

Drawing Title: 81m Blade & Tower Section

SPA Location: N61 / N63 Roundabout – Potential Future Road Layout

	Name	Date
Drawn	GB	14/12/2023
Designed	TL	14/12/2023
Checked	GB	28/05/2021
Point of Interest		5

Scale: 1:1_1 @ A3

File No.: 231023 BnM Derryadd v4.dwg

Drawing Status: Draft

Drawing No.: SK05B

Notes:
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Revision: 2

Tower
Option 2



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Client: Bord na Mona

Key

Wheel SPA	Body SPA	Load SPA	Indicative	Over-run	Over-sail

Project: Derryadd Wind Farm

Drawing Title: 81m Blade & Tower Section

SPA Location: N61 / N63 Roundabout – Potential Future Road Layout

	Name	Date
Drawn	GB	14/12/2023
Designed	TL	14/12/2023
Checked	GB	28/05/2021
Point of Interest		5

Scale: 1:1_1 @ A3

File No.: 231023 BnM Derryadd v4.dwg

Drawing Status: Draft

Drawing No.: SK05C

Notes:
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Revision: 2



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Client: Bord na Mona

Key

Wheel SPA	Body SPA	Load SPA	Indicative	Over-run	Over-sail

Project: Derryadd Wind Farm

Drawing Title: 81m Blade & Tower Section

SPA Location: N61 / N63 Roundabout – Potential Future Road Layout

	Name	Date
Drawn	GB	14/12/2023
Designed	TL	14/12/2023
Checked	GB	28/05/2021
Point of Interest		5

Scale: 1:1_1 @ A3

File No.: 231023 BnM Derryadd v4.dwg

Drawing Status: Draft

Drawing No.: SK05D

Notes:
1. All mitigation is subject to confirmation through a test run.
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Revision: 2

APPENDIX H HABITAT SURVEY – PLANT SPECIES LIST

* Representative plant species on each habitat type, identified during the multidisciplinary walkover survey in August 2022; Habitats with no plant species listed were not significantly vegetated at the time of the survey (e.g. BL3) or were not surveyed in August 2022– see Section 5.7.6.1.

Code (Fossitt, 2000)	Habitat Name	Common Name	Scientific Name
PB4	Cutover bog	Soft Rush	*Juncus effusus*
		Purple Moor-grass	*Molinia caerulea*
		Ling	*Calluna vulgaris*
		Marsh Arrowgrass	*Triglochin palustris*
		Sharp-flowered Rush	*Juncus acutiflorus*
		Downy Birch	*Betula pubescens*
		Butterbur	*Petasites hybridus*
		Willow	*Salix* spp.
		Horsetail	*Equisetum* spp.
		Silverweed	*Potentilla anserina*
		Rosebay Willowherb	*Chamaenerion angustifolium*
		Timothy-grass	*Phleum pratense*
		Perennial Sowthistle	*Sonchus arvensis*
		Creeping Thistle	*Cirsium arvense*
		Clover	*Trifolium* spp.
		Black Medick	*Medicago lupulina*
		Lesser Hawkbit	*Leontodon saxatilis*
		Marsh Woundwort	*Stachys palustris*
		Wild Carrot	*Daucus carota*
		Slender St. John's-wort	*Hypericum pulchrum*
		Redshank	*Persicaria maculosa*
		Tormentil	*Potentilla erecta*
		Bulbous Rush	*Juncus bulbosus*
		Common Cottongrass	*Eriophorum angustifolium*
		Deergrass	*Trichophorum germanicum*
		Hogweed	*Heracleum sphondylium*
		Marsh Pennywort	*Hydrocotyle vulgaris*
		Common Chickweed	*Stellaria media*

Code (Fossitt, 2000)	Habitat Name	Common Name	Scientific Name
		Devil's-bit Scabious	*Succisa pratensis*
		Yellow-rattle	*Rhinanthus minor*
		Birch	*Betula* spp.
		Common Knapweed	*Centaurea nigra*
		Common Alder	*Alnus glutinosa*
		Common Milkwort	*Polygala vulgaris*
		Gorse	*Ulex europaeus*
		Bramble	*Rubus fruticosus* agg.
		Lodgepole Pine	*Pinus contorta*
		Sitka Spruce	*Picea sitchensis*
		Spear Thistle	*Cirsium vulgare*
		Cross-leaved Heath	*Erica tetralix*
		Bulrush	*Typha latifolia*
		Cocksfoot	*Dactylis glomerata*
		Yorkshire Fog	*Holcus lanatus*
		Ribwort Plantain	*Plantago lanceolata*
		Cat's-ear	*Hypochaeris radicata*
		Bell Heather	*Erica cinerea*
		Dock	*Rumex* spp.
		Noble Fir	*Abies procera*
		Red Fescue	*Festuca rubra* agg.
		Meadowsweet	*Filipendula ulmaria*
		Gypsywort	*Lycopus europaeus*
		Scots Pine	*Pinus sylvestris*
		Sowthistle	*Sochus* spp.
		Self-heal	*Prunella vulgaris*
		Greater Plantain	*Plantago major*
		Sweet Vernal-grass	*Anthoxanthum odoratum*
		Water Mint	*Mentha aquatica*
		Marsh Thistle	*Cirsium palustre*
		Sphagnum	*Sphagnum* spp.
		Common Centaury	*Centaurium erythraea*
		Lesser Centaury	*Centaurium pulchellum*

Code (Fossitt, 2000)	Habitat Name	Common Name	Scientific Name
		Rowan	*Sorbus aucuparia*
WN7	Bog woodland	Downy Birch	*Betula pubescens*
		Willow	*Salix* spp.
		Soft Rush	*Juncus effusus*
		Ling	*Calluna vulgaris*
		Bramble	*Rubus fruticosus* agg.
		Common Cottongrass	*Eriophorum angustifolium*
		Gorse	*Ulex europaeus*
		Purple Moor-grass	*Molinia caerulea*
		Wild Carrot	*Daucus carota*
		Cat's-ear	*Hypochaeris radicata*
		Silverweed	*Potentilla anserina*
		Bulbous Rush	*Juncus bulbosus*
		Butterbur	*Petasites hybridus*
		Marsh Arrowgrass	*Triglochin palustris*
		Ash	*Fraxinus excelsior*
		Goat Willow	*Salix caprea*
		Bracken	*Pteridium aquilinum*
		Dog-rose	*Rosa canina*
		Ivy	*Hedera hibernica*
		Scots Pine	*Pinus sylvestris*
		Sitka Spruce	*Picea sitchensis*
		Rowan	*Sorbus aucuparia*
		Cross-leaved Heath	*Erica tetralix*
		Marsh Thistle	*Cirsium palustre*
		Guelder-rose	*Viburnum opulus*
		Tormentil	*Potentilla erecta*
		Common Centaury	*Centaurium erythraea*
		Devil's-bit Scabious	*Succisa pratensis*
		Self-heal	*Prunella vulgaris*
		Horsetail	*Equisetum* spp.
		Water Mint	*Mentha aquatica*
		Noble Fir	*Abies procera*

Code (Fossitt, 2000)	Habitat Name	Common Name	Scientific Name
		Unspecified Conifer	
		Hawthorn	*Crataegus monogyna*
		Common Reed	*Phragmites australis*
		Meadowsweet	*Filipendula ulmaria*
		Slender Sowthistle	*Sonchus tenerrimus*
		Common Knapweed	*Centaurea nigra*
		Birch	*Betula* spp.
		Rosebay Willowherb	*Chamaenerion angustifolium*
		Thistle	*Cirsium* spp.
		Lodgepole Pine	*Pinus contorta*
		Field Bindweed	*Convolvulus arvensis*
		Perennial Sowthistle	*Sonchus arvensis*
		Creeping Buttercup	*Ranunculus repens*
		Common Milkwort	*Polygala vulgaris*
		Cocksfoot	*Dactylis glomerata*
		Bulrush	*Typha latifolia*
		Yellow-wort	*Blackstonia perfoliata*
		Eyebright	*Euphrasia officinalis*
		Lesser Centaury	*Centaurium pulchellum*
FL8	Other artificial lakes and ponds	Bulrush	*Typha latifolia*
		Horsetail	*Equisetum* spp.
		Marsh Pennywort	*Hydrocotyle vulgaris*
		Redshank	*Persicaria maculosa*
		Water-plantain	*Alisma plantago-aquatica*
		Purple Moor-grass	*Molinia caerulea*
		Sharp-flowered Rush	*Juncus acutiflorus*
		Willow	*Salix* spp.
		Gypsywort	*Lycopus europaeus*
		Water Mint	*Mentha aquatica*
		Nodding Bur-marigold	*Bidens cernua*
		Green Algae	
		Lesser Hawkbit	*Leontodon saxatilis*
		Common Reed	*Phragmites australis*

Code (Fossitt, 2000)	Habitat Name	Common Name	Scientific Name
		Soft Rush	*Juncus effusus*
		Jointed Rush	*Juncus articulates*
		Marsh Arrowgrass	*Triglochin palustris*
		Bog Pondweed	*Potamogeton polygonifolius*
		Spiked Water-milfoil	*Myriophyllum spicatum*
		Mare's-tail	*Hippuris vulgaris*
		Common Alder	*Alnus glutinosa*
		Bracken	*Pteridium aquilinum*
		Ling	*Calluna vulgaris*
		Gorse	*Ulex europaeus*
		Bramble	*Rubus fruticosus* agg.
		Common Cottongrass	*Eriophorum angustifolium*
		Tormentil	*Potentilla erecta*
		Reed Canary-grass	*Phalaris arundinaceae*
		Downy Birch	*Betula pubescens*
		Water-milfoil	*Myriophyllum* spp.
		Common Duckweed	*Lemna minor*
		Meadowsweet	*Filipendula ulmaria*
		Small-fruited Yellow-sedge	*Carex viridula* ssp. *viridula*
		Lesser Bladderwort	*Utricularia minor*
		Bladderwort	*Urticularia* spp.
		Bogbean	*Menyanthes trifoliata*
		Birch	*Betula* spp.
		Yarrow	*Achillea millefolium*
		Cat's-ear	*Hypochaeris radicata*
		Bindweed	*Calystegia* spp.
		Rosebay Willowherb	*Chamaenerion angustifolium*
		Butterbur	*Petasites hybridus*
		Yellow-rattle	*Rhinanthus minor*
		Hogweed	*Heracleum sphondylium*
		Branched Bur-reed	*Sparganium erectum*
PB1	Raised bog	Ling	*Calluna vulgaris*
		Cross-leaved Heath	*Erica tetralix*

Code (Fossitt, 2000)	Habitat Name	Common Name	Scientific Name
		Round-leaved Sundew	*Drosera rotundifolia*
		White Beak-sedge	*Rhynchospora alba*
		Sphagnum	*Sphagnum* spp.
		Bog Asphodel	*Narthecium ossifragum*
		Bog-myrtle	*Myrica gale*
		Reindeer Moss	*Cladonia rangiferina*
		Purple Moor-grass	*Molinia caerulea*
		Common Cottongrass	*Eriophorum angustifolium*
		Gorse	*Ulex europaeus*
		Rowan	*Sorbus aucuparia*
		Downy Birch	*Betula pubescens*
		Willow	*Salix* spp.
		Sundew	*Drosera* spp.
		Devil's-bit Scabious	*Succisa pratensis*
		Bracken	*Pteridium aquilinum*
		Sitka Spruce	*Picea sitchensis*
		Tormentil	*Potentilla erecta*
		Scots Pine	*Pinus sylvestris*
		Slender St. John's-wort	*Hypericum pulchrum*
		Common Spotted-orchid	*Dactylorhiza fuchsii*
		Bell Heather	*Erica cinerea*
		Yarrow	*Achillea millefolium*
		Deergrass	*Trichophorum germanicum*
		Common Alder	*Alnus glutinosa*
		Soft Rush	*Juncus effusus*
		Common Milkwort	*Polygala vulgaris*
		Lodgepole Pine	*Pinus contorta*
		Ribwort Plantain	*Plantago lanceolata*
		Hare's-tail Cottongrass	*Eriophorum vaginatum*
		Holly	*Ilex aquifolium*
		Sphagnum	*Shagnum* spp.
WD4	Conifer plantation	Lodgepole Pine	*Pinus contorta*
		Larch	*Larix* spp.

Code (Fossitt, 2000)	Habitat Name	Common Name	Scientific Name
		Scots Pine	*Pinus sylvestris*
		Downy Birch	*Betula pubescens*
		Ling	*Calluna vulgaris*
		Reindeer Moss	*Cladonia rangiferina*
		Fir Clubmoss	*Huperzia selago*
		Sitka Spruce	*Picea sitchensis*
		Willow	*Salix* spp.
		Common Alder	*Alnus glutinosa*
		Beech	*Fagus sylvatica*
		Elder	*Sambucus nigra*
		Ivy	*Hedera hibernica*
		Holly	*Ilex aquifolium*
		Bramble	*Rubus fruticosus* agg.
FS1	Reed and large sedge swamps	Common Reed	*Phragmites australis*
		Bulrush	*Typha latifolia*
		Nodding Burr-marigold	*Bidens cernua*
		Water Mint	*Mentha aquatica*
		Willow	*Salix* spp.
		Downy Birch	*Betula pubescens*
		Soft Rush	*Juncus effusus*
		Water-plantain	*Alisma plantago-aquatica*
		Gypsywort	*Lycopus europaeus*
		Redshank	*Persicaria maculosa*
		White Beak-sedge	*Rhynchospora alba*
		Horsetail	*Equisetum* spp.
		Marsh Arrowgrass	*Triglochin palustris*
		Butterbur	*Petasites hybridus*
		Common Cottongrass	*Eriophorum angustifolium*
		Cat's-ear	*Hypochaeris radicata*
		Great Willowherb	*Epilobium hirsutum*
		Silverweed	*Potentilla anserina*
WS1	Scrub	Bramble	*Rubus fruticosus* agg.
		Gorse	*Ulex europaeus*

Code (Fossitt, 2000)	Habitat Name	Common Name	Scientific Name
		Willow	*Salix* spp.
		Bracken	*Pteridium aquilinum*
		Hard Rush	*Juncus inflexus*
		Hogweed	*Heracleum sphondylium*
		Meadowsweet	*Filipendula ulmaria*
		Silverweed	*Potentilla anserina*
		Marsh Thistle	*Cirsium palustre*
		Poplar	*Populus* spp.
		Hawthorn	*Crataegus monogyna*
		Tufted Vetch	*Vicia cracca*
		Bush Vetch	*Vicia sepium*
		Bulrush	*Typha latifolia*
		Marsh Woundwort	*Stachys palustris*
		Ling	*Calluna vulgaris*
		Cross-leaved Heath	*Erica tetralix*
		Downy Birch	*Betula pubescens*
		Lodgepole Pine	*Pinus contorta*
		Rowan	*Sorbus aucuparia*
		Purple Moor-grass	*Molinia caerulea*
		Bog-myrtle	*Myrica gale*
		Devil's-bit Scabious	*Succisa pratensis*
		Common Bird's-foot-trefoil	*Lotus corniculatus*
		Blackthorn	*Prunus spinosa*
		Cocksfoot	*Dactylis glomerata*
		Water Mint	*Mentha aquatica*
		Birch	*Betula* spp.
		Rosebay Willowherb	*Chamaenerion angustifolium*
		Bindweed	*Calystegia* spp.
		Yorkshire Fog	*Holcus lanatus*
		Slender Sowthistle	*Sonchus tenerrimus*
		Common Ragwort	*Jacobaea vulgaris*
		Cat's-ear	*Hypochaeris radicata*
		Tormentil	*Potentilla erecta*

Code (Fossitt, 2000)	Habitat Name	Common Name	Scientific Name
		Common Spotted-orchid	*Dactylorhiza fuchsii*
		Spear Thistle	*Cirsium vulgare*
		False Oat-grass	*Arrhenatherum elatius*
		Perennial Rye-grass	*Lolium perenne*
		Soft Rush	*Juncus effusus*
		Self-heal	*Prunella vulgaris*
		Wild Carrot	*Daucus carota*
		Slender St. John's-wort	*Hypericum pulchrum*
		Dock	*Rumex* spp.
		Ribwort Plantain	*Plantago lanceolata*
		Common Alder	*Alnus glutinosa*
		Common Knapweed	*Centaurea nigra*
		Cleavers	*Galium aparine*
		Vetch	*Vicia* spp.
		Ivy	*Hedera hibernica*
		Horsetail	*Equisetum* spp.
		Butterbur	*Petasites hybridus*
		Field Bindweed	*Convolvulus arvensis*
		Red Fescue	*Festuca rubra* agg.
		Leyland Cypress	*Cupressus x leylandii*
		Common Reed	*Phragmites australis*
		Yellow-wort	*Blackstonia perfoliata*
		Noble Fir	*Abies procera*
		Common Cottongrass	*Eriophorum angustifolium*
BL3	Buildings and artificial surfaces	-	-
WS2	Immature woodland	Birch	*Betula* spp.
		Willow	*Salix* spp.
		Scots Pine	*Pinus sylvestris*
		Soft Rush	*Juncus effusus*
		Gorse	*Ulex europaeus*
		Purple Moor-grass	*Molinia caerulea*
		Marsh Arrowgrass	*Triglochin palustris*
		Horsetail	*Equisetum* spp.

Code (Fossitt, 2000)	Habitat Name	Common Name	Scientific Name
		Rosebay Willowherb	*Chamaenerion angustifolium*
		Bramble	*Rubus fruticosus* agg.
		Marsh Helleborine	*Epipactis palustris*
		Deergrass	*Trichophorum germanicum*
		Downy Birch	*Betula pubescens*
		Lodgepole Pine	*Pinus contorta*
		Rowan	*Sorbus aucuparia*
		Bracken	*Pteridium aquilinum*
		Meadowsweet	*Filipendula ulmaria*
		Greater Knapweed	*Centaurea scabiosa*
		Silverweed	*Potentilla anserina*
ED2	Spoil and bare ground	Soft Rush	*Juncus effusus*
		Greater Plantain	*Plantago major*
		Jointed Rush	*Juncus articulates*
		Sharp-flowered Rush	*Juncus acutiflorus*
		Gorse	*Ulex europaeus*
		Bramble	*Rubus fruticosus* agg.
GS4	Wet grassland	Purple Moor-grass	*Molinia caerulea*
		Water Mint	*Mentha aquatica*
		Glaucous Sedge	*Carex flacca*
		Silverweed	*Potentilla anserina*
		Yorkshire Fog	*Holcus lanatus*
		Timothy-grass	*Phleum pratense*
		Perennial Sowthistle	*Sonchus arvensis*
		Common Knapweed	*Centaurea nigra*
		Bramble	*Rubus fruticosus* agg.
		Yellow-wort	*Blackstonia perfoliata*
		Lesser Centaury	*Centaurium pulchellum*
		Soft Rush	*Juncus effusus*
		Hard Rush	*Juncus inflexus*
		Common Bent	*Agrostis capillaris*
		Red Fescue	*Festuca rubra* agg.
		Horsetail	*Equisetum* spp.

Code (Fossitt, 2000)	Habitat Name	Common Name	Scientific Name
		Red Clover	*Trifolium pratense*
		White Clover	*Trifolium repens*
		Soft Rush	*Juncus effusus*
		Meadowsweet	*Filipendula ulmaria*
		Common Nettle	*Urtica dioica*
		Field Bindweed	*Convolvulus arvensis*
		False Oat-grass	*Arrhenatherum elatius*
		Thistle	*Cirsium* spp.
		Silverweed	*Potentilla anserina*
		Clover	*Trifolium* spp.
		Common Bird's-foot-trefoil	*Lotus corniculatus*
		Buttercup	*Ranunculus* spp.
		Meadow Vetchling	*Lathyrus pratensis*
		Great Willowherb	*Epilobium hirsutum*
		Sharp-flowered Rush	*Juncus acutiflorus*
		Common Cottongrass	*Eriophorum angustifolium*
		Willow	*Salix* spp.
		Meadowsweet	*Filipendula ulmaria*
		Dock	*Rumex* spp.
		Self-heal	*Prunella vulgaris*
PF2	Poor fen and flush	Common Reed	*Phragmites australis*
		Bulrush	*Typha latifolia*
		Common Cottongrass	*Eriophorum angustifolium*
		Soft Rush	*Juncus effusus*
		Jointed Rush	*Juncus articulatus*
		Rosebay Willowherb	*Chamaenerion angustifolium*
		Downy Birch	*Betula pubescens*
		Marsh Arrowgrass	*Triglochin palustris*
		Sharp-flowered Rush	*Juncus acutiflorus*
		Colt's-foot	*Tussilago farfara*
		Water Mint	*Mentha aquatica*
		Cat's-ear	*Hypochaeris radicata*
		Water Forget-me-not	*Myosotis scorpioides*

Code (Fossitt, 2000)	Habitat Name	Common Name	Scientific Name
		Common Centaury	*Centaurium erythraea*
		Common Spotted-orchid	*Dactylorhiza fuchsii*
		Willow	*Salix* spp.
		Spear Thistle	*Cirsium vulgare*
		Hard Rush	*Juncus inflexus*
		Sundew	*Drosera* spp.
		Hogweed	*Heracleum sphondylium*
		Bracken	*Pteridium aquilinum*
		Butterbur	*Petasites hybridus*
		Yellow-rattle	*Rhinanthus minor*
		Nodding Bur-marigold	*Bidens cernua*
		Horsetail	*Equisetum* spp.
		Gypsywort	*Lycopus europaeus*
		Nodding-moss	*Pohlia* spp.
HH1	Dry siliceous heath	Ling	*Calluna vulgaris*
		Cross-leaved Heath	*Erica tetralix*
		Gorse	*Ulex europaeus*
		Purple Moor-grass	*Molinia caerulea*
		Willow	*Salix* spp.
		Sitka Spruce	*Picea sitchensis*
HD1	Dense bracken	Bracken	*Pteridium aquilinum*
		Bindweed	*Calystegia* spp.
		Rosebay Willowherb	*Chamaenerion angustifolium*
GS3	Dry humid acid grassland	Cocksfoot	*Dactylis glomerata*
		Meadowsweet	*Filipendula ulmaria*
		Horsetail	*Equisetum* spp.
		Yarrow	*Achillea millefolium*
		Lousewort	*Pedicularis sylvatica*
		False Oat-grass	*Arrhenatherum elatius*
		Water Mint	*Mentha aquatica*
		Cleavers	*Galium aparine*
		Ribwort Plantain	*Plantago lanceolata*
		Bramble	*Rubus fruticosus* agg.

Code (Fossitt, 2000)	Habitat Name	Common Name	Scientific Name
		Willow	*Salix* spp.
		Bracken	*Pteridium aquilinum*
		Purple Moor-grass	*Molinia caerulea*
		Marsh Arrowgrass	*Triglochin palustris*
		Butterbur	*Petasites hybridus*
		Red Fescue	*Festuca rubra* agg.
		Common Knapweed	*Centaurea nigra*
		Sheep's Sorrel	*Rumex acetosella*
		Silverweed	*Potentilla anserina*
		Gorse	*Ulex europaeus*
		Mat-grass	*Nardus stricta*
		Bindweed	*Calystegia* spp.
		Sowthistle	*Sochus* spp.
		Marsh Lousewort	*Pedicularis palustris*
		Eyebright	*Euphrasia officinalis*
		Devil's-bit Scabious	*Succisa pratensis*
ED1	Exposed sand, gravel or till	-	-
WD1	(Mixed) broadleaved woodland	Ash	*Fraxinus excelsior*
		Willow	*Salix* spp.
		Birch	*Betula* spp.
		Rowan	*Sorbus aucuparia*
		Pedunculate Oak	*Quercus robur*
		Bramble	*Rubus fruticosus* agg.
		Hazel	*Corylus avellana*
		Bracken	*Pteridium aquilinum*
		Elder	*Sambucus nigra*
		Blackthorn	*Prunus Spinosa*
		Hawthorn	*Crataegus monogyna*
		Gorse	*Ulex europaeus*
		Downy Birch	*Betula pubescens*
		Common Alder	*Alnus glutinosa*
ED3	Recolonising bare ground	Oxeye Daisy	*Leucanthemum vulgare*
		Ribwort Plantain	*Plantago lanceolata*

Code (Fossitt, 2000)	Habitat Name	Common Name	Scientific Name
		Colt's-foot	*Tussilago farfara*
		Rosebay Willowherb	*Chamaenerion angustifolium*
		Silverweed	*Potentilla anserina*
		White Clover	*Trifolium repens*
		Red Clover	*Trifolium pratense*
		Creeping Cinquefoil	*Potentilla reptans*
GS2	Dry meadows and grassy verges	Annual Meadow-grass	*Poa annua*
		Daisy	*Bellis perennis*
		Clover	*Trifolium* spp.
		Dandelion	*Taraxacum vulgaria*
		Perennial Rye-grass	*Lolium perenne*
		Ribwort Plantain	*Plantago lanceolata*
		Common Bird's-foot-trefoil	*Lotus corniculatus*
		Buttercup	*Ranunculus* spp.
		Silver Birch	*Betula pendula*
		Box	*Buxus sempervirens*
		Honeysuckle	*Lonicera periclymenum*
		Meadowsweet	*Filipendula ulmaria*
		Yarrow	*Achillea millefolium*
		Hazel	*Corylus avellana*
		Creeping Buttercup	*Ranunculus repens*
		Bramble	*Rubus fruticosus* agg.
		Field Scabious	*Knautia arvensis*
		Common Ragwort	*Jacobaea vulgaris*
		Marjoram	*Origanum vulgare*
		Gorse	*Ulex europaeus*
		Willow	*Salix* spp.
		Field Bindweed	*Convolvulus arvensis*
		Ivy	*Hedera hibernica*
		Bent grasses	*Agrostis* spp.
		Slender St. John's-wort	*Hypericum pulchrum*
		Yorkshire Fog	*Holcus lanatus*
		Thistle	*Cirsium* spp.

Code (Fossitt, 2000)	Habitat Name	Common Name	Scientific Name
		Sycamore	*Acer pseudoplatanus*
		Ash	*Fraxinus excelsior*
		Hogweed	*Heracleum sphondylium*
		False Oat-grass	*Arrhenatherum elatius*
		Common Knapweed	*Centaurea nigra*
		Common Nettle	*Urtica dioica*
		Plantain	*Plantago* spp.
		Field Forget-me-not	*Myosotis arvensis*
		Lesser Celandine	*Ficaria verna* ssp. *verna*
		Cocksfoot	*Dactylis glomerata*
		Silverweed	*Potentilla anserina*
		Common Nettle	*Urtica dioica*
		Broad-leaved Dock	*Rumex obtusifolius*
		Bracken	*Pteridium aquilinum*
		Tufted Hair-grass	*Deschampsia cespitosa*
		Rosebay Willowherb	*Chamaenerion angustifolium*
		Greater Stitchwort	*Stellaria holostea*
		Bramble	*Rubus fruticosus* agg.
		Marsh Lousewort	*Pedicularis palustris*
WN6	Wet Willow-Alder-Ash woodland	Common Alder	*Alnus glutinosa*
		Horsetail	*Equisetum* spp.
		Willow	*Salix* spp.
		Gorse	*Ulex europaeus*
		Bramble	*Rubus fruticosus* agg.
		Rowan	*Sorbus aucuparia*
		Cat's-ear	*Hypochaeris radicata*
		Broom	*Cytisus scoparius*
		Downy Birch	*Betula pubescens*
		Bracken	*Pteridium aquilinum*
WD3	(Mixed) conifer woodland	Lodgepole Pine	*Pinus contorta*
		Downy Birch	*Betula pubescens*
		Common Alder	*Alnus glutinosa*
		Willow	*Salix* spp.

Code (Fossitt, 2000)	Habitat Name	Common Name	Scientific Name
		Rowan	*Sorbus aucuparia*
		Bramble	*Rubus fruticosus* agg.
		Ivy	*Hedera hibernica*
		Holly	*Ilex aquifolium*
		Hawthorn	*Crataegus monogyna*
BL2	Earth banks	Willow	*Salix* spp.
		Bracken	*Pteridium aquilinum*
		Bindweed	*Calystegia* spp.
		Horsetail	*Equisetum* spp.
		Perennial Rye-grass	*Lolium perenne*
		Colt's-foot	*Tussilago farfara*
		Bramble	*Rubus fruticosus* agg.
		Rosebay Willowherb	*Chamaenerion angustifolium*
		Common Reed	*Phragmites australis*
WD2	Mixed broadleaved/conifer woodland	Lodgepole Pine	*Pinus contorta*
		Larch	*Larix* spp.
		Willow	*Salix* spp.
		Ivy	*Hedera hibernica*
		Bramble	*Rubus fruticosus* agg.
		Hogweed	*Heracleum sphondylium*
		Hawthorn	*Crataegus monogyna*
		Rosebay Willowherb	*Chamaenerion angustifolium*
		Downy Birch	*Betula pubescens*
GA2	Amenity grassland (improved)	Perennial Rye-grass	*Lolium perenne*
		Cocksfoot	*Dactylis glomerata*
		Rosebay Willowherb	*Chamaenerion angustifolium*
		Willow	*Salix* spp.
		Thistle	*Cirsium* spp.
		Common Nettle	*Urtica dioica*
		Horsetail	*Equisetum* spp.
		False Oat-grass	*Arrhenatherum elatius*
FW4	Drainage ditches	Soft Rush	*Juncus effusus*
		Common Alder	*Alnus glutinosa*

Code (Fossitt, 2000)	Habitat Name	Common Name	Scientific Name
		Willow	*Salix* spp.
		Common Duckweed	*Lemna minor*
		Bog Pondweed	*Potamogeton polygonifolius*
		Bracken	*Pteridium aquilinum*
		Rosebay Willowherb	*Chamaenerion angustifolium*
		Sowthistle	*Sochus* spp.
		Field Bindweed	*Convolvulus arvensis*
		Creeping Thistle	*Cirsium arvense*
FW2	Depositing/ lowland rivers	-	-
FW4	Drainage ditches	Ling	*Calluna vulgaris*
		Cross-leaved Heath	*Erica tetralix*
		Purple Moor-grass	*Molinia caerulea*
		Bog Pondweed	*Potamogeton polygonifolius*
		White Beak-sedge	*Rhynchospora alba*
		Nodding Burr-marigold	*Bidens cernua*
		Birch	*Betula* spp.
		Common Cottongrass	*Eriophorum angustifolium*
		Willow	*Salix* spp.
		Soft Rush	*Juncus effusus*
		Gypsywort	*Lycopus europaeus*
		Marsh Pennywort	*Hydrocotyle vulgaris*
		Sharp-flowered Rush	*Juncus acutiflorus*
		Bulrush	*Typha latifolia*
		Water Mint	*Mentha aquatica*
		Silverweed	*Potentilla anserina*
		Lesser Bladderwort	*Utricularia minor*
		Redshank	*Persicaria maculosa*
		Devil's-bit Scabious	*Succisa pratensis*
		Water-plantain	*Alisma plantago-aquatica*
		Common Alder	*Alnus glutinosa*
		Downy Birch	*Betula pubescens*
		Bramble	*Rubus fruticosus* agg.
		Lodgepole Pine	*Pinus contorta*

Code (Fossitt, 2000)	Habitat Name	Common Name	Scientific Name
		Common Ragwort	*Jacobaea vulgaris*
		Lesser Hawkbit	*Leontodon saxatilis*
		Gorse	*Ulex europaeus*
		Rowan	*Sorbus aucuparia*
		Marsh Arrowgrass	*Triglochin palustris*
		Rosebay Willowherb	*Chamaenerion angustifolium*
		Common Reed	*Phragmites australis*
		Common Knapweed	*Centaurea nigra*
		Yellow-rattle	*Rhinanthus minor*
		Great Willowherb	*Epilobium hirsutum*
		Tufted Vetch	*Vicia cracca*
		Butterbur	*Petasites hybridus*
		Yellow Iris	*Iris pseudacorus*
		Bladderwort	*Urticularia* spp.
		Bracken	*Pteridium aquilinum*
		Water-cress	*Nasturtium officinale*
		Fool's-water-cress	*Apium nodiflorum*
		Brooklime	*Veronica beccabunga*
		Hogweed	*Heracleum sphondylium*
		Heath Spotted-orchid	*Dactylorhiza maculata*
		Hawthorn	*Crataegus monogyna*
		Elder	*Sambucus nigra*
		Silver Birch	*Betula pendula*
		Sundew	*Drosera* spp.
		Field Bindweed	*Convolvulus arvensis*
		Yarrow	*Achillea millefolium*
		Red Clover	*Trifolium pratense*
		Common Spotted-Orchid	*Dactylorhiza fuchsii* ssp. *fuchsii*
		Greater Knapweed	*Centaurea scabiosa*
		Slender St. John's-wort	*Hypericum pulchrum*
		Self-heal	*Prunella vulgaris*
		Common Duckweed	*Lemna minor*
		Ling	*Calluna vulgaris*

Code (Fossitt, 2000)	Habitat Name	Common Name	Scientific Name
		Cross-leaved Heath	*Erica tetralix*
		Purple Moor-grass	*Molinia caerulea*
		Bog Pondweed	*Potamogeton polygonifolius*
		White Beak-sedge	*Rhynchospora alba*
		Nodding Burr-marigold	*Bidens cernua*
		Birch	*Betula* spp.
		Common Cottongrass	*Eriophorum angustifolium*
		Willow	*Salix* spp.
		Soft Rush	*Juncus effusus*
		Gypsywort	*Lycopus europaeus*
		Marsh Pennywort	*Hydrocotyle vulgaris*
		Sharp-flowered Rush	*Juncus acutiflorus*
		Bulrush	*Typha latifolia*
		Water Mint	*Mentha aquatica*
		Silverweed	*Potentilla anserina*
		Lesser Bladderwort	*Utricularia minor*
		Redshank	*Persicaria maculosa*
		Devil's-bit Scabious	*Succisa pratensis*
		Water-plantain	*Alisma plantago-aquatica*
		Common Alder	*Alnus glutinosa*
		Downy Birch	*Betula pubescens*
		Bramble	*Rubus fruticosus* agg.
		Lodgepole Pine	*Pinus contorta*
		Common Ragwort	*Jacobaea vulgaris*
		Lesser Hawkbit	*Leontodon saxatilis*
		Gorse	*Ulex europaeus*
		Rowan	*Sorbus aucuparia*
		Marsh Arrowgrass	*Triglochin palustris*
		Rosebay Willowherb	*Chamaenerion angustifolium*
		Common Reed	*Phragmites australis*
		Common Knapweed	*Centaurea nigra*
		Yellow-rattle	*Rhinanthus minor*
		Great Willowherb	*Epilobium hirsutum*

Code (Fossitt, 2000)	Habitat Name	Common Name	Scientific Name
		Tufted Vetch	*Vicia cracca*
		Butterbur	*Petasites hybridus*
		Yellow Iris	*Iris pseudacorus*
		Bladderwort	*Urticularia* spp.
		Bracken	*Pteridium aquilinum*
		Water-cress	*Nasturtium officinale*
		Fool's-water-cress	*Apium nodiflorum*
		Brooklime	*Veronica beccabunga*
		Hogweed	*Heracleum sphondylium*
		Heath Spotted-orchid	*Dactylorhiza maculata*
		Hawthorn	*Crataegus monogyna*
		Elder	*Sambucus nigra*
		Silver Birch	*Betula pendula*
		Sundew	*Drosera* spp.
		Field Bindweed	*Convolvulus arvensis*
		Yarrow	*Achillea millefolium*
		Red Clover	*Trifolium pratense*
		Common Spotted-Orchid	*Dactylorhiza fuchsii* ssp. *fuchsii*
		Greater Knapweed	*Centaurea scabiosa*
		Slender St. John's-wort	*Hypericum pulchrum*
		Self-heal	*Prunella vulgaris*
		Common Duckweed	*Lemna minor*
WL1	Hedgerows	Common Nettle	*Urtica dioica*
		Rhododendron	*Rhododendron ponticum*
		Oxeye Daisy	*Leucanthemum vulgare*
		Bindweed	*Calystegia* spp.
		Blackthorn	*Prunus spinosa*
		Vetch	*Vicia* spp.
		Sycamore	*Acer pseudoplatanus*
		False Oat-grass	*Arrhenatherum elatius*
WL2	Treelines	Leyland Cypress	*Cupressus x leylandii*
		Ash	*Fraxinus excelsior*
		Scots Pine	*Pinus sylvestris*

Code (Fossitt, 2000)	Habitat Name	Common Name	Scientific Name
		Ivy	*Hedera hibernica*
		Grey Alder	*Alnus incana*
		Beech	*Fagus sylvatica*
		Wych Elm	*Ulmus glabra*
		Hornbeam	*Carpinus betulus*

APPENDIX I AQUATIC SURVEYS

Appendix I.1 River Habitat Survey (Site Visit on 29th and 30th of June 2022)

Sampling site	Reach extent (m)	Riparian Vegetation	Left Bank Features	Left Bank Features	Channel shading	Left Bank Height (m)	Right Bank Height (m)	Bank Width (m)			Wet Width (m)			Water Level	Velocity	Macrophytes	Left Bank Land Use	Right Bank Land Use
								Start	Middle	End	Start	Middle	End					
1	30	Gorse (*Ulex europaeus*) Alder (*Alnus glutinosa*) Willow (*Salix* sp.) Field Horsetail (*Equisetum arvense*) Field Bindweed (*Convolvulus arvensis*) Oxeye Daisy (*Leucanthemum vulgare*) Rough Hawkbit (*Leontodon hispidus*) Sweet Vernal-grass (*Anthoxanthum odoratum*)	Scrub	None	Light (<25%)	4	4	2.5	2.5	2.5	2	2	2	Normal	Moderate	Yellow Iris (*Iris pseudacorus*) Water Mint (*Mentha aquatica*) Bulrush (*Typha latifolia*) Common Water-crowfoot (*Ranunculus aquatilis*)	Cutaway Bog	Cutaway Bog

Sampling site	Reach extent (m)	Riparian Vegetation	Left Bank Features	Left Bank Features	Channel shading	Left Bank Height (m)	Right Bank Height (m)	Bank Width (m)			Wet Width (m)			Water Level	Velocity	Macrophytes	Left Bank Land Use	Right Bank Land Use
								Start	Middle	End	Start	Middle	End					
		Tall Fescue (*Schedonorus arundinaceus*)																
12	50	Silver birch (*Betula pendula*) Bracken (*Pteridium aquilinum*) Reed Canary-grass (*Phalaris arundinaceae*) Bramble (*Rubus fruticosus* agg.) Nettle (*Urtica dioica*) Gorse (*Ulex europaeus*) Meadowsweet (*Filipendula ulmaria*) Field Bindweed (*Convolvulus arvensis*) Tall Fescue (*Schedonorus arundinaceus*)	Treeline	Grass verge	Heavy (<75%)	4	4	3.5	3.5	3.5	1.5	1.5	1.5	Normal	Slow	None	Cutaway Bog	Cutaway Bog

Sampling site	Reach extent (m)	Riparian Vegetation	Left Bank Features	Left Bank Features	Channel shading	Left Bank Height (m)	Right Bank Height (m)	Bank Width (m)			Wet Width (m)			Water Level	Velocity	Macrophytes	Left Bank Land Use	Right Bank Land Use
								Start	Middle	End	Start	Middle	End					
		Cocksfoot (*Dactylis glomerata*)																
6	35	Willow (*Salix* sp.)	N/A	N/A	Medium (<50%)	2.5	2.5	4	4	4	3.5	3.5	3.5	Normal	Moderate	Branched Bur-reed (*Sparganium erectum*)	Other	Other
		Bracken (*Pteridium aquilinum*)														Duckweed (*Lemna* spp.)		
		Meadowsweet (*Filipendula ulmaria*)														Common Water-crowfoot (*Ranunculus aquatilis*)		
		Great Willowherb (*Epilobium hirsutum*)																
		Nettle (*Urtica dioica*)																
		Marsh Thistle (*Cirsium palustre*)																
		Tall Fescue (*Schedonorus arundinaceus*)																
		Cocksfoot (*Dactylis glomerata*)																

Sampling site	Reach extent (m)	Riparian Vegetation	Left Bank Features	Left Bank Features	Channel shading	Left Bank Height (m)	Right Bank Height (m)	Bank Width (m)			Wet Width (m)			Water Level	Velocity	Macrophytes	Left Bank Land Use	Right Bank Land Use
								Start	Middle	End	Start	Middle	End					
		Perennial Rye-grass (*Lolium perenne*)																
7	15	Field Bindweed (*Convolvulus arvensis*) Nettle (*Urtica dioica*) Bramble (*Rubus fruticosus* agg.) Great Willowherb (*Epilobium hirsutum*) Willow (*Salix* ssp.) Marsh Valerian (*Valeriana dioica*)	Treeline	Scrub	Light (<25%)	0.75	0.75	7	7	7	5	5	5	Flood	Slow	Water Mint (*Mentha aquatica*) Common Reed (*Phragmites australis*)	Pasture	Other
2	25	Reed Canary-grass (*Phalaris arundinaceae*) Ash (*Fraxinus excelsior*) Great Willowherb (*Epilobium hirsutum*) Bramble (*Rubus fruticosus* agg.) Nettle (*Urtica dioica*)	Fence	Fence	Light (<25%)	2	1	7	7	7	6	6	6	Flood	Slow	None	Woodland D.M.C	Other

Sampling site	Reach extent (m)	Riparian Vegetation	Left Bank Features	Left Bank Features	Channel shading	Left Bank Height (m)	Right Bank Height (m)	Bank Width (m)			Wet Width (m)			Water Level	Velocity	Macrophytes	Left Bank Land Use	Right Bank Land Use
								Start	Middle	End	Start	Middle	End					
		Field Bindweed (*Convolvulus arvensis*)																
		Meadowsweet (*Filipendula ulmaria*)																
		Marsh Hawk's-beard (*Crepis paludosa*)																
8	15	Alder (*Alnus glutinosa*)	Treeline	Treeline	Full (>75%)	2.5	2.5	7	7	7	5	5	5	Normal	Very Slow	None	Cutaway Bog	Pasture
		Willow (*Salix* sp.)																
		Blackthorn (*Prunus Spinosa*)																
		Sycamore (*Acer pseudoplatanus*)																
		Ash (*Fraxinus excelsior*)																
		Bramble (*Rubus fruticosus* agg.)																
		Creeping Thistle (*Cirsium arvense*)																

Sampling site	Reach extent (m)	Riparian Vegetation	Left Bank Features	Left Bank Features	Channel shading	Left Bank Height (m)	Right Bank Height (m)	Bank Width (m)			Wet Width (m)			Water Level	Velocity	Macrophytes	Left Bank Land Use	Right Bank Land Use
								Start	Middle	End	Start	Middle	End					
		Field Bindweed (*Convolvulus arvensis*)																
4	15 m	Hawthorn (*Crataegus monogyna*)	None	Treeline	Light (<25%)	3.5	3.5	7	7	7	5.5	5.5	5.5	Flood	Moderate	Branched Bur-reed (*Sparganium erectum*)	Pasture	Pasture
		Ash (*Fraxinus excelsior*)																
		Ivy (*Hedera hibernica*)																
		Creeping Thistle (*Cirsium arvense*)																
		Bramble (*Rubus fruticosus* agg.)																
		Hart's-tongue (*Asplenium scolopendrium*)																
		Creeping Buttercup (*Ranunculus repens*)																
		Cleavers (*Galium aparine*)																

Sampling site	Reach extent (m)	Riparian Vegetation	Left Bank Features	Left Bank Features	Channel shading	Left Bank Height (m)	Right Bank Height (m)	Bank Width (m)			Wet Width (m)			Water Level	Velocity	Macrophytes	Left Bank Land Use	Right Bank Land Use
								Start	Middle	End	Start	Middle	End					
		Blackthorn (*Prunus Spinosa*)																
5	15	Dock (*Rumex* spp.) Hawthorn (*Crataegus monogyna*) Nettle (*Urtica dioica*) Yorkshire Fog (*Holcus lanatus*) Great Willowherb (*Epilobium hirsutum*) Spear Thistle (*Cirsium vulgare*) Reed Canary-grass (*Phalaris arundinaceae*) Field Bindweed (*Convolvulus arvensis*)	Hedgerow	Electric fence	Light (<25%)	1	1	5	5	5	5	5	5	Flood	Moderate	Common Water-crowfoot (*Ranunculus aquatilis*) Water Mint (*Metha aquatica*)	Pasture	Pasture
11	15	Cypress (*Cupressus* spp.) Ivy (*Hedera hibernica*)	Treeline	None	Heavy (>75%)	8	5	6	6	6	5	5	5	Normal	Slow	None	Cutaway Bog	Pasture

Sampling site	Reach extent (m)	Riparian Vegetation	Left Bank Features	Left Bank Features	Channel shading	Left Bank Height (m)	Right Bank Height (m)	Bank Width (m)			Wet Width (m)			Water Level	Velocity	Macrophytes	Left Bank Land Use	Right Bank Land Use
								Start	Middle	End	Start	Middle	End					
		Goat Willow (*Salix* caprea)																
		Reed Canary-grass (*Phalaris arundinaceae*)																
		Bramble (*Rubus fruticosus* agg.)																
		Gorse (*Ulex europaeus*)																
		Dog-rose (*Rosa canina*)																
3	15	Marsh Valerian (*Valeriana dioica*)	None	Fenced	Light (<25%)	2.5	2	6	6	6	5	5	5	Flood	Slow	Duckweed (*Lemna* spp.)	Cutaway Bog	Pasture
		Meadowsweet (*Filipendula ulmaria*)														Branched Bur-reed (*Sparganium erectum*)		
		Willow (*Salix* sp.)														Water Mint (*Metha aquatica*)		
		Marsh Thistle (*Cirsium palustre*)														Yellow Water-lily (*Nuphar lutea*)		
		Bracken (*Pteridium aquilinum*)																

Sampling site	Reach extent (m)	Riparian Vegetation	Left Bank Features	Left Bank Features	Channel shading	Left Bank Height (m)	Right Bank Height (m)	Bank Width (m)			Wet Width (m)			Water Level	Velocity	Macrophytes	Left Bank Land Use	Right Bank Land Use
								Start	Middle	End	Start	Middle	End					
		Bramble (*Rubus fruticosus* agg.)																
		Dock (*Rumex* spp.)																
		Field Bindweed (*Convolvulus arvensis*)																
		Great Willowherb (*Epilobium hirsutum*)																
		Nettle (*Urtica dioica*)																
10	10	Hawthorn (*Crataegus monogyna*)	Woodland	Woodland	Heavy (<75%)	1.5	1.5	6	6	6	5	5	5	Flood	Moderate	None	Woodland D.M.C	Woodland D.M.C
		Willow (*Salix* sp.)																
		Alder (*Alnus glutinosa*)																
		Bramble (*Rubus fruticosus* agg.)																
		Meadowsweet (*Filipendula ulmaria*)																

Sampling site	Reach extent (m)	Riparian Vegetation	Left Bank Features	Left Bank Features	Channel shading	Left Bank Height (m)	Right Bank Height (m)	Bank Width (m)			Wet Width (m)			Water Level	Velocity	Macrophytes	Left Bank Land Use	Right Bank Land Use
								Start	Middle	End	Start	Middle	End					
		Field Bindweed (*Convolvulus arvensis*)																
9	50	Willow (*Salix* sp.)	No	No	Light (<25%)	3	3	6	6	6	5.5	5.5	5.5	Flood	Moderate	Common Reed (*Phragmites australis*)	Cutaway Bog	Cutaway Bog
		Bramble (*Rubus fruticosus* agg.)																
		Bracken (*Pteridium aquilinum*)																
		Gorse (*Ulex europaeus*)																
		Meadowsweet (*Filipendula ulmaria*)																
		Foxglove (*Digitalis purpurea*)																
		Nettle (*Urtica dioica*)																

Appendix I.2 SAMPLING SITES PHOTOS

Sampling Site	River Name (EPA)	Photos	
3	Ballynakill_26		

Sampling Site	River Name (EPA)	Photos		
4	Ballynakill_26			

Sampling Site	River Name (EPA)	Photos	
			

Sampling Site	River Name (EPA)	Photos	
10	Ballynakill_26		

Sampling Site	River Name (EPA)	Photos		
11	Ballynakill_26			
2	Lough Bannow Stream			

Sampling Site	River Name (EPA)	Photos
7	Lough Bannow Stream	   

Sampling Site	River Name (EPA)	Photos	
6	Derrygeel		

Sampling Site	River Name (EPA)	Photos
8	Rappareehill	   

Sampling Site	River Name (EPA)	Photos
12	Ledwithstown_26	
5	Trib Fallan West	  

Sampling Site	River Name (EPA)	Photos		
9	Kilnacarrow			

Appendix I.3 Electrofishing and Macroinvertebrate Surveys on River Sites in the Derryadd Area, Co. Longford (Still Waters Consultancy)

ELECTRO-FISHING AND MACROINVERTEBRATE SURVEYS ON RIVER SITES

IN THE DERRYADD AREA CO.LONGFORD

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Appendix A Macroinvertebrate samples from Sites 1-12

Appendix B Fish taken by electro-fishing at Site 5

Appendix C Certificate of Authorisation

1. INTRODUCTION

Stillwaters Consultancy was commissioned by Tobin Engineering Consultants to carry out:

1) An electro-fishing survey on 12 sites previously chosen by Tobin for a macroinvertebrate survey.
2) Observations on the Fishery Value of these streams at the chosen sites.
3) Macroinvertebrate samples from these sites.
4) The status of Otters from observations at the sites.

The sites covered 5 rivers or streams, see Figure 1.1

The Lough Bannow Stream and the Ballynakill River are not marked on the Ordnance Survey Ireland (OSI), Discovery Series, No. 40 but are designated on the EPA database.

- The Ballynakill (sites 3, 4, 10 and 11) runs North entering the River Shannon above Lanesborough.
- The Loughbannow Stream, (sites 2, 7, 6 and 8) is a similar sized stream flowing North and enters the River Shannon just above Lough Ree.
- Survey sites 1 and 12 are near the source of the Ledwithstown River to the South.

Downstream the river is designated as the Bilberry River on the OSI map, No.40.

- Survey site 5, is a tributary of the Fallan river which flows North to join the Camlin River.
- Site 9 is on an unnamed stream draining the bog north of Lanesborough and enters the Shannon through Kilnacarrow wood.

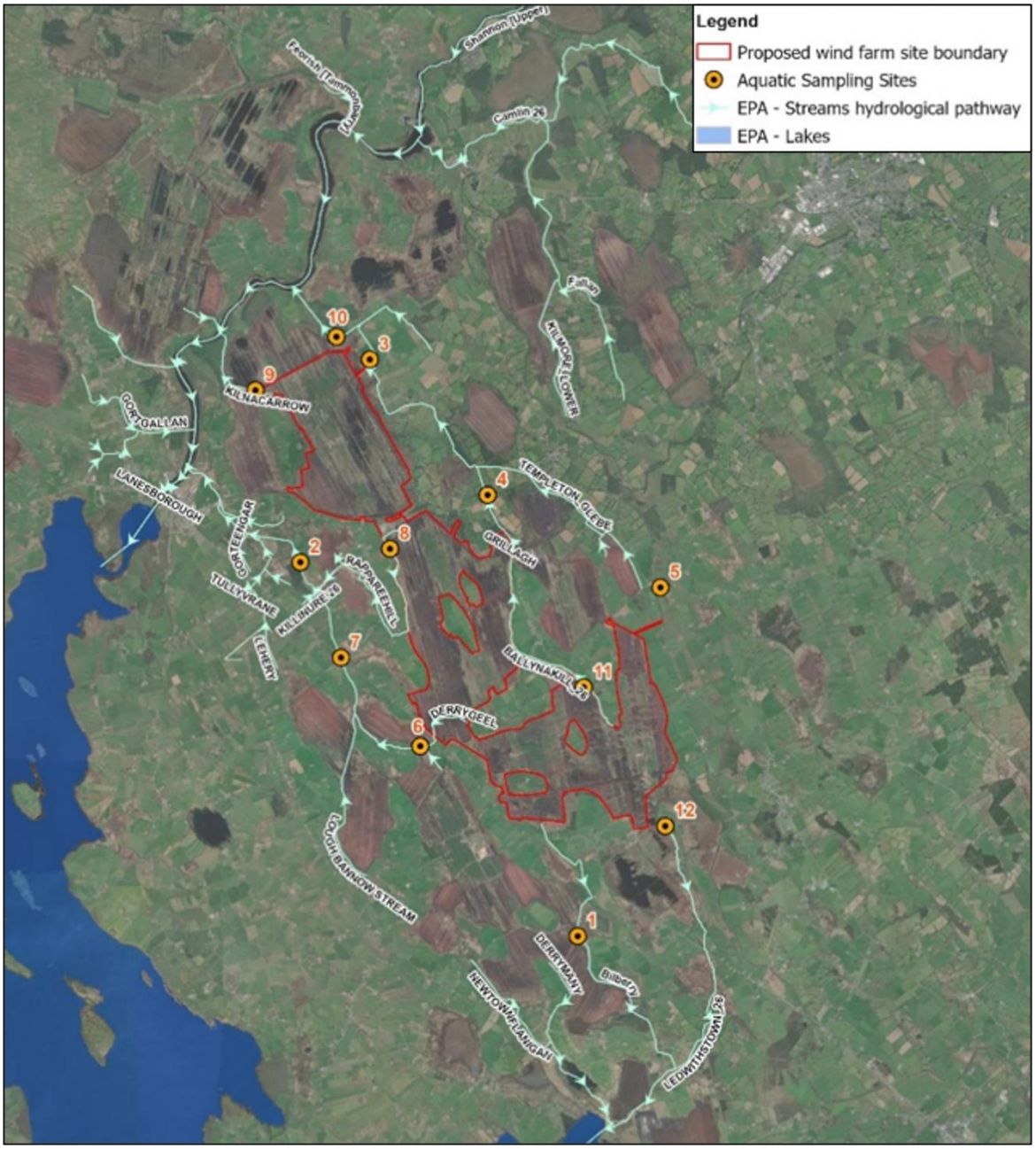


Figure 1.1: Sampling Sites

2. MATERIALS AND METHODS

Where possible the sites were electro-fished and assessments of the fishery value of the sites were made. A macroinvertebrate sample taken, and the area around each site was examined for signs of otter activity.

2.1 Electro-fishing

A timed (10 minute) electro-fishing method (Matson et al., 2017) was used. Timed surveys were carried out at sites 2, 3, 4, 5 and 10. It did not prove possible to provide timed surveys at other sites because of their physical nature.

Sites 1, 6, 7, 8 and 12 were unsuitable because there was no open water and/or little flow due to excessive instream vegetation, but spot fishing was carried out in isolated pockets. There was excessive depth over a soft substrate at site 11, so wading was not possible. Site 9 had no areas suitable for electro-fishing.

The electro-fishing equipment used was a Smith-root LR-24 portable electro-fisher backpack. The settings used were 40 Hertz @250volts with a 18% duty cycle. Fishing was carried out moving upstream.

2.2 Fishery value

The fishery value of the sites was assessed based on results from electro-fishing, the substrate, depths, flows and bank configuration. The sequences of riffle and deep flow and the presence of instream vegetation was a major consideration.

2.3 macroinvertebrate fauna.

Aquatic invertebrates provide information on the quality of the river water. Aquatic invertebrates are divided into 5 'Indicator Groups' based on their sensitivity to pollution:

- Group A- Very Sensitive
- Group B -Sensitive
- Group C- Tolerant
- Group D -Very Tolerant
- Group E -Most Tolerant

Macro-invertebrate samples were converted to Q-ratings as per Toner et al. (2005). All riverine samples were taken with a standard kick sampling hand net (250mm width, 500µm mesh size) from areas of riffle/glide utilising a three-minute sampling effort. This included the washing of large cobble and or small boulder at each survey site.

Kick samples were taken at the 12 sites and Q values determined. The samples were live sorted and identified to family level, Appendix A.

2.4 Otters

Otters[1] maintain territories and will defend their stretches of riverbank or lake shore from other otters. In lowland rivers otters only need to maintain small territories (1- 2km), but on smaller or less productive rivers where food tends to be less abundant, otter territories need to be larger.

An otter usually maintains numerous couches and holts within its territory. Couches hidden in extensive reed beds, or in dense scrub. Holts can be found underground among rocks or caves but can be excavated in peat banks. In general, otters exploit a narrow strip of habitat along a river or stream.

The otter is an opportunistic feeder with a varied diet. Fish are the most important food, but crayfish can be important locally.
Signs of otter activity including spraints and bank slides were searched for at the sites surveyed. Areas where couches or holts were likely were examined.

[1] Otter are listed in Appendix II of the Bern Convention (1982) And protected under the EU Habitats Directive

3. SURVEY

The sites 1-12, surveyed over three days, 16-18 September 2022, are shown in Figure 1.1.
The species recorded were:

- 3-spined stickleback (*Gasterosteus aculeatus*)
- Trout (*Salmo trutta*)
- Pike (*Esox Lucius*)
- Stone loach (*Barbatula barbatula*)
- Roach (*Rutilus rutilus*)
- Tench (*Tinca tinca*)
- Gudgeon (*Gobio gobio*)
- Brook/River Lamprey amnocoete (*Lampetra* sp.)[2]
- White clawed crayfish (*Austropotamobius pallipes*)[3]

Lengths are given in centimetres (cm). Fork lengths are recorded for trout and full lengths for other species. The carapace length is given for crayfish.

The survey complied with the Certificate of Authorisation provided by the Department of Communications, Climate Action & Environment, see Appendix C. The Department of Housing, Local Government and Heritage was informed of the survey.

[2] protected under both Irish law (Wildlife Act 1976) and the EU Habitats Directive Annexes II and V. It is classified as endangered in the (IUCN) Red List. It is listed in Appendix III of the Bern Convention

[3] Brook and river Lamprey are listed in Annex II of the Habitats Directive and in Appendix III of the Bern Convention

3.1 Site 1, Ledwithstown Stream

Site Description: This Site is in the upper reaches of the Ledwithstown. It is a deep canalised (trapezoidal shaped) lowland depositing stream, 1.5m wide with 4-5m high banks. Photo 3.1.1. The stream had 0.2-0.3m deep peat-stained water. The flow profile was dominated by slow moving glide with very localised riffle, Photo 3.1.2.

The bed comprised of gravels with heavy peat sedimentation. The channel was heavily overgrown with macrophytes including branched bur reed (*Sparganium erectum*), reedmace (*Typha latifolia*) and water mint (*Mentha aquatica*). The riparian areas were comprised of dense gorse, hedge bindweed, great willowherb and grey willow bordering cutover lowland blanket bog.

Fisheries Value: It was only possible to carryout spot electro-fishing at this site and no fish were recorded. The channel was not of value to fish or crayfish due to heavy sedimentation, limited flows, and dense vegetation growth.

Macroinvertebrates: Kick sampling analysis assessed this site as having a Q rating of 3, Appendix A. The absence of clean water along with EPA indicator groups A and B and the dominance of Group C and D pollution indicators resulted in the Q3 poor status biological water quality rating recorded.

Otter: No evidence of otters was recorded.



Photo 3.1.1 showing overgrown nature of Site 1



Photo 3.1.2 Downstream view of Site 1

3.2 Site 2, Lough Bannow Stream

Site Description: This was a trapezoidal heavily modified lowland river channel that was artificially deepened and straightened as part of historical drainage, Photo 3.2.1.

The channel was 2.5-3m wide with bank heights of 2.5-3m and 0.5-1m deep with a bed of gravel and soft silt. The steep banks supported bramble, great willowherb, wild angelica, rank grasses and willow scrub. The channel was bordered by mature sitka spruce plantation and dry grassy meadows. The channel had heavy cover of fool's watercress, water plantain with (*Potamogeton lucens*) and (*Callitriche stagnalis*) locally. The duckweed species (*Lemna trisulca*) and (*Lemna minor*) were abundant in the channel indicating enrichment, Photo 3.2.2.

Fisheries Value: A timed electro-fishing was undertaken but only a single pike 29.5cm was detected. There was no fisheries value for salmonids but was considered of value for coarse fish, as it was deep and slow flowing.

Given the time of year, autumn these species are likely localised in the channel.

Macroinvertebrates. The absence of clear water, and the dominance of group C and D pollution indicators resulted in the Q3 poor status biological water quality rating recorded at Site 2, Appendix A

Otter: Poor bank and river quality for otter and no visible signs found.



Photo 3.2.1 Showing U shaped banks.

3.3 Site 3, Ballynakill River

Site Description: This was a highly modified lowland depositing watercourse that has been deepened and straightened historically (evident dredge berms and elevated banks). The site was dominated by glide habitat with very localised riffle upstream of the culvert at the road crossing, Photo 3.3.1.

Bank height was 2-4m and river width of 3-4m with depth of between 0.2m to 0.5m. The channel had very localised branched bur-reed, yellow water lily and common duckweed species, often found in channelised peatland rivers. The riparian zone comprised of hawthorn, blackthorn and grey willow with bramble, bracken, bindweed, and bittersweet scrub. Downstream of the culvert reed sweet grass was common in riparian areas.

Fisheries Value: Considered of some value to coarse fish and salmonids given there was areas of glides and gravel substrate with moderate flow. A timed survey was carried out but no fish were recorded. Spawning and nursery value is diminished given historical drainage maintenance and absence of shallower riffle zones. The channel was not considered of value to crayfish given historical drainage and a substrata with heavy siltation. This also diminished the spawning and nursery value for brown trout and none recorded in the current survey. Downstream of the culvert crossing the water was stagnant with very deep peat-stained water and was only of value for coarse fish, Photo 3.3.2

Macroinvertebrates: Site 3 had EPA group A and B clean water indicator taxa present, Appendix A. However, the sample composition was dominated by group C moderate water quality indicator species with smaller numbers of group D taxa. This accounted for the moderate (Q3-4) biological water quality status recorded.

Otters: There were no signs of otter at this site.



Photo 3.3.1 The overgrown nature of site



Photo 3.3.2 Canal like aspect of Site 3

3.4 Site 4, Ballynakill River

Site Description: This is a lowland depositing watercourse exhibiting deepened and straightened with a U- shaped channel profile, Photo 3.4.1. The channel was 2-3m wide with bank height of 4-5m and water depths between 0.2m and 0.4m. The bed comprised of gravel but was heavily silted. The flow profile was dominated by glide habitat with very localised riffle.

The channel supported frequent branched bur-reed, common water starwort and small patches of (*Potamogeton berchtoldii*). The riparian zone comprised of grey willow, blackthorn, hedge bindweed, great willowherb, and bramble. The bordering land was predominantly grassland. The channel downstream of culvert improves as it changes to a V shape flowing through mixed broadleaved woodland. Here the channel was predominantly glide with cobble and gravel improving the salmonid nursery and spawning value.

Fisheries Value: There was moderate nursery area upstream of the culvert at the road crossing, improving to good nursery and spawning downstream given a better river profile with more riffle with associated cobble and gravels. The site was of no value for lamprey, despite some soft sediment because of the compacted bed, and none were recorded.

One crayfish was taken during electro-fishing 2.5cm but small numbers were observed escaping in the sediment.

Two three spined sticklebacks, (4.6, 4.1cm) were recorded.

Trout were present in low numbers (13) but both 0+ and older were recorded, Table 3.4.1. The channel was considered a moderate quality trout nursery and spawning area, but its potential is reduced due to historical drainage and heavy siltation.

The site is also moderately suitable for crayfish and sticklebacks.

Macroinvertebrates: Despite the relative open nature of the stream and the presence of fish the Q value was 3 suggesting poor status, Appendix A. The absence of clean water EPA group A and B indicators and the dominance of Group C and D pollution indicators resulted in the Q3 poor status biological water quality rating recorded.

Otter: Remains of crayfish were evident in regular otter spraints in the culvert. Here both latrine sites in mud and spraint sites on concrete ledges were observed.

Table 3.4.1		
No.	Species	Length
1	Brown Trout	16.2
2	Brown Trout	22.3
3	Brown Trout	14.0
4	Brown Trout	7.5
5	Brown Trout	7.0
6	Brown Trout	6.6
7	Brown Trout	8.4
8	Brown Trout	7.3
9	Brown Trout	7.4
10	Brown Trout	8.7
11	Brown Trout	6.9
12	Brown Trout	4.6
13	Brown Trout	4.1



Photo 3.4.1 Showing relatively open water.

3.5 Site 5, Fallan River

Site Description: The channel was representative of a lowland depositing watercourse that was deepened and straightened historically but retained a semi-natural profile with glide and riffle sequences, Photo 3.5.1. The bank heights were 1.5m and the river width was 2.5m with an average depth of 0.4m. Instream there was abundant fool's watercress, branched bur reed macrophyte beds with frequent common duckweed. The riparian zone comprised of great willowherb, bramble and wild angelica with rank grasses. The bed comprised of mixed coarse gravels with pockets of soft silt in the margins, albeit these were predominantly superficial shallow bands. The channel was bordered by grassland. A kingfisher was observed over the site.

Fishery Value. The channel had good spawning and nursery value and good holding habitat for salmonids with glide and riffle sequences but also loose coarse and medium gravels. A timed 10-minute survey yielded the trout numbers (65) in Table 3.5.1, in Appendix B. From the size range profile shown in Table 3.5.2, this is a natural population structure with likely 3 age groups represented. Size range 4.5-8.9, (0+), 10.0-15.9, (1+) and one trout greater than 1+. A single lamprey was recovered. There was light to moderate siltation with most siltation near the box culvert, Photo 3.5.2. There was moderate value lamprey habitat given the low numbers recorded despite good ammocoete habitat (burial areas in silt and nearby fine gravels for spawning). The channel was suitable for crayfish albeit none were recorded.

Macroinvertebrates. The site had clean water indicator group B species present. However, the sample was dominated by EPA group C taxa, Appendix A. The absence of group A clean water indicator species and the dominance of group C, moderate water quality indicator species, accounted for the Q3 poor status, biological water quality recorded at the site.

Otter. The channel offered good foraging value for otter given the river was a good salmonid nursery, but no otter signs were recorded.



Photo 3.5.1. Showing open channel at Site 5



Photo 3.5.2 Showing the culvert area where there are silt deposits suitable for lamprey

3.6 Site 6, Lough Bannow Stream

Site Description: This was a deep canalised lowland depositing river channel, that was trapezoidal shaped following deepening and straightening, as shown in Photo 3.6.1. The channel was 3m wide with 0.5-0.8 depth. The flow profile was of deeper very slow-moving glide. The bank heights were 3m and dominated by bramble, bracken, hedge bindweed and willow scrub. The macrophytes included abundant branched bur reed (Sparganium erectum), common water starwort (Callitriche stagnalis), water plantain (Alisma plantago aquatica) and (Potamogeton berchtoldii). The channel had a gravel and peat base. A foraging kingfisher was observed in flight over the channel.

An area some 200m downstream was also surveyed. This was a deep canalised lowland depositing section that was 3-4m wide and deepened and straightened historically. The channel was very deep both upstream and downstream of the culvert at the road crossing with 5-10m on either side being shallower.

Approximately 10m upstream of the culvert a steep shelf exists in the peat where the channel dropped off to circa 2m. The channel was 1.5m deep c. 5m downstream of the box culvert. The main fishable area was in the vicinity of the box culvert where 0.1m to 0.4m deep water was present. The bank heights were 3m. The flow profile was of deep glide with a small area of riffle adjoining the culvert. The bed included soft peat with gravels in the footprint of the culvert. Macrophytes were localised near the culvert and included water mint, fool's watercress and watercress. The steep riverbanks have dense bramble, bracken and grey willow scrub. Land use was lowland blanket bog.

Fisheries Value: The site was difficult to electro-fish, given the instream vegetation and the overgrown banks, however spot fishing was possible for small areas, but no fish were recorded. Two three-spined stickleback which were taken with the macroinvertebrate kick sample. The first section fished was of little value to salmonids but may hold coarse fish at times of high water. The area downstream had some clear water and spot electro-fishing was also possible. This section had value as a holding area for coarse fish. A single tench was recorded. No crayfish remains were detected in the single otter spraint recorded at the culvert.

Macroinvertebrates: Macroinvertebrate samples were taken at both parts of this site. The Q value at the upstream section was 2-3, Appendix A, (Site 6) suggesting a bad status. This is confirmed by the lack of fish despite having relatively good substrate although with heavy peat loads. The site was dominated by EPA group C moderate water quality indicator species but also had significant numbers of pollution indicator group D taxa, that supported the Q2-3 poor status biological water quality recorded at the site.

The downstream section although with slightly clearer water had a Q value of 3 with corresponding poor status, Table 1, (Site 6A). Clean water indicator group B species were present. However, the sample was dominated by group C moderate water quality indicator taxa and also supported group D pollution tolerant species. The absence of group A clean water indicator species and dominance of group C moderate water quality indicator species accounted for the Q3 poor status.

Otter. The channel has some foraging value for otter as a single spraint was observed at the downstream area of the site.



Photo 3.6.1 Showing the overgrown nature of Site 6.

3.7 Site 7, Lough Bannow Stream

Site Description: This was a deep canalised U-shaped lowland depositing river 3-4m wide and was deepened and straightened historically, Photo 3.7.1 The water depth was between 0.5-1.0m but deepening downstream of a culvert at the road crossing to 1.5m. The bank heights were 3-4m and the channel flow profile was dominated by deeper glide. The bed comprised of mixed gravels and soft silt. The riparian areas comprised of dense scrub, bramble, gorse, nettle, hedge bindweed with mature grey willow, osier and ash trees. The land use was agricultural grassland.

Macrophyte were abundant in the channel and included water horsetail (*Equisetum fluviatilis*), water lily (*Nuphar lutea*), water mint (*Mentha aquatica*) and common reed (*Phragmites australis*).

Fishery Value: The channel was not of value to salmonids given slow flows, extensive instream vegetation and heavy siltation but likely supports coarse fish seasonally. There was some value in the channel as a crayfish nursery given the presence of gravels and sufficient depth, but heavy siltation and enrichment reduced suitability and no fish were recorded during the electro-fishing survey. One stone loach measuring 4cm was recorded while kick-sampling. No crayfish were recorded at the site.

Macroinvertebrates: This site had a Q3 rating poor quality, Appendix A. The absence of clean water EPA group A and B indicator groups and the dominance of Group C with Group D pollution indicators resulted in the Q3 poor status biological water quality rating recorded at the site.

Otter. The channel had some foraging value and as a commuting route for otter albeit no signs were recorded.



Photo 3.7.1 Enclosed nature of site 7

3.8 Site 8, Lough Bannow Stream Tributary

Site Description: This is a small tributary of the Lough Bannow Stream. It is a U-shaped channel 4-5m wide and 0.5-1.3m deep, and was deepened and straightened historically. It had with abundant macrophytes, broad-leaved pondweed, fool's watercress and occasional water mint in deeper peat- stained water. The substrate is compacted peat. The bank height was 3m with riparian areas supporting mature grey willow, alder, ash, poplar and bramble scrub. Land use was predominantly lowland blanket bog and grassland.

Fishery Value. The channel was of no fisheries value due to stagnant water and only considered of value perhaps to three-spined stickleback. No fish were recorded either during spot electro-fishing or in subsequent kick sampling. The channel was not suitable for crayfish or lamprey given stagnant water and none were recorded.

Macroinvertebrates. Site 8 was situated in a stagnant peat drain and was not suitable for biological water quality sampling. The sample supported species common in watercourses of this nature, i.e., Gerridae, Asellidae and Corixidae.

Otter: The channel had some foraging value and as a commuting.

3.9 Site 9, Un-named Stream

Site Description: The channel was a very heavily modified lowland depositing watercourse. The channel was 1.5m wide, very deep U-shaped in character with vertical 3m high peat banks Photo 3.9.1. The water depth varied between 0.5m and 1.5m with a deep peat base and stagnant water. The channel supported only dense growths of common reed (*Phragmites australis*). The riparian zone comprised of dense bramble, bracken, nettle, and grey willow scrub. The bordering land was cutover peatland, Photo 3.9.2.

Fishery Value: The site was unsuitable for electro-fishing as it comprised a series of small pools with minimum flow through the dense reed growth. The channel had low value for fish and crayfish, and none were recorded during kick sampling. Based on the nature of this stream, its substrate and low flows it has low spawning and nursery value for fish, but the habitat may improve downstream as it approaches the River Shannon.

Macroinvertebrates: The site was dominated by group C moderate water quality indicator species, Appendix A, but also pollution indicator, group D taxa that suggested the Q3 poor status biological water quality recorded.

Otter: There was low foraging value for otter and no signs were recorded during the survey.



Photo 3.9.1 Overgrown nature of site



Photo 3.9.2 Landscape surrounding site

3.10 Site 10, Ballynakill River

Site Description: The channel was a heavily modified lowland depositing watercourse in a U-shaped channel. The bank height was 1-2m and the depth was between 0.3m and 0.5m. Despite historical deepening the channel had semi-natural characteristics with glide sequences with some riffle areas. The bed comprised mainly of coarse gravel and fibrous peat material. It had boulder, cobble and gravel bedded with heavy siltation. The channel supported no macrophytes apart from fool's watercress. The riparian zone comprising bramble and dense willow scrub. The bordering land uses were of mixed broadleaved plantation ash woodland.

Fisheries Value: The site had low spawning and nursery value but moderate holding habitat for salmonids and coarse fish given its deep U shape profile (channelised) with moderate flow but no broken flow pattern. The channel was a moderate quality brown trout nursery given the presence of broken glide habitat and a hard bottom. The substrate was of moderate value at best and heavy sedimentation reduced the spawning value as reflected by the absence of 0+ brown trout, Table 3.10.1. The spawning and nursery value was therefore diminished due to the small amount of shallower oxygenated riffle zones. Three fish species were recorded during the timed electro-fishing survey at this site, a total of 11 brown trout, two gudgeon and one roach, Table 3.10.1. The channel had moderately suitable for crayfish, but none were recorded. There were some small pockets of gravel and silt suitable for lamprey, but none were recorded.

Macroinvertebrates: The site had a small number of clean water indicator taxa but was dominated by group C moderate water quality invertebrates, Appendix A. The community composition supported the Q3 poor status biological water quality assessment.

Otter: There was good foraging value for otter, but no signs were recorded during the survey

Table 3.10.1

No.	Species	Length (cm)
1	Brown Trout	18.0
2	Brown Trout	19.5
3	Brown Trout	14.3
4	Brown Trout	18.4
5	Brown Trout	18.0
6	Brown Trout	15.6
7	Brown Trout	17.7
8	Brown Trout	14.2
9	Brown Trout	15.3
10	Brown Trout	15.0
11	Brown Trout	13.2
12	Gudgeon	11.0
13	Gudgeon	8.0
14	Roach	4.2

3.11 Site 11, Ballynakill River

Site Description: This is a deep canalised and trapezoidal shaped lowland depositing river. The channel was deep, 1.2-1.5m with a peat base and peat-stained water. The channel supported occasional spiked water milfloil, floating sweet grass and water plantain. The very steep 8m high banks were densely vegetated with grey willow, birch, ash, bramble, hogweed and great willow herb. The bordering land was grassland.

Fisheries Value There was limited, or no salmonid value given the depth, peat-substrate and the lack of flow but the site may have some holding value for coarse fish at times. It was not suitable for crayfish or lamprey.

Macroinvertebrates: Site 11 was dominated by group C moderate water quality indicator species but also had small numbers of pollution indicator group D taxa present, Appendix A. The community composition recorded supported the Q3 poor status biological water quality recorded.

Otter. The channel may have some value as a foraging and commuting habitat for otter albeit no signs were recorded.



Photo 3.11.1 Deep canal like section at Site 11.

3.12 Site 12, Ledwithstown Stream

Site Description. The survey area was characterised by a historical straightened and deepened, providing a U- shaped stream channel that was 1m wide with 2.5m bank heights. The stream was 0.05m deep with slow flowing water over a bed of gravel, peat and silt. The channel was heavily overgrown with common reed (*Phragmites australis*). The channel was heavily shaded with mature birch, grey willow, gorse and bracken, Photo 3.12.2. The bordering land use was of cutover blanket bog.

Fisheries Value: The stream was not of value to fish or crayfish given the very shallow depth and low flows leading to stagnant water.

Macroinvertebrates: Clean water indicator group B species were present. However, the sample was dominated by EPA group C taxa (i.e., moderate water quality indicators) with smaller numbers of pollution indicator Group D taxa, Appendix A. The absence of group A clean water indicator species and the dominance of EPA group C moderate water quality indicator species accounted for the Q3 poor status, biological water quality recorded at the site.

Otters. No evidence of otters but activity unlikely due to lack of fish



Photo 3.12.1 Showing overgrown banks at Site 12

4. SUMMARY BY RIVER

There were 5 streams surveyed all flowing into Lough Ree. The Fallon river joins the Camlin river before entering the Shannon near Clondara. The Ballynakill River enters the Shannon just north of Cloonkeel. The Loughbannow River enter the Shannon just North of Lanesborough before its entry to Lough Ree. The stream marked unnamed drains the bog area north of Lanesborough. The Ledwithstown Stream River flows south before entering Lough Ree near Drumnee.

Weather conditions and water flows were ideal for electro-fishing, and it is expected that the results reflect an accurate picture of the status of these rivers at the time of the survey, where electrofishing was possible. The rivers have all had major drainage works carried out to varying extents. This has reduced the fisheries value of these streams by imposing U or V shaped channels and generally steep high banks. The substrates have been degraded by deposition of peat silt. The natural sinuosity has in general been removed and many stretches are canal like with slow deep flows. The reduction of riffle areas has seriously reduced the habitat for salmonids but the canal like stretches may provide holding areas for coarse fish species at specific times or conditions.

The biological quality of the rivers showed uniform values over all the sites sampled Appendix A. All had low values at Q3 except for Site 3 on the Ballynakill River which had Q3-4. These values were in keeping with the silt deposits in the substrate and the general condition of the streams.

4.1 Fallan River, Site 5

Site 5, Table 4.1, below is in the upper reaches of the Fallen River a tributary of the Camlin River. This is a good salmonid stream. It has a mix of riffle and glide areas. It flows through agricultural land and is likely to have salmonids throughout its length. It has a normal brown trout population structure, being composed of 3 age groups. One lamprey (ammoecete) was recovered in silt at the road conduit. There are small quantities of suitable lamprey habitat in that area.

The river at this point has poor biological quality. it was assessed as having a Q value of 3. It is expected that this will improve further downstream as silt loads decrease.

Despite suitable habitat particularly at the road conduit and a good population of fish no signs of otter were observed in the area sampled.

4.2 Unnamed stream, Site 9

Site 9, Table 4.1 is a U-shaped stream with high banks, draining extensive previously worked bog. The substrate is peat and flows are restricted due to the dense growth of common reed, so that the water is stagnant. It has little fishery value at this point but may improve further downstream as it approaches the Shannon. The biological river quality was assessed as poor. There were no otter signs around this site.

4.3 Ballynakill River, Sites 3, 4, 10, 11

The Ballynakill stream Table 4.1, has areas suitable for salmonids throughout its length. The densities are low, but brown trout were observed at Sites 4 and 10. The brown trout population

structure at Site 10 is not ideal given there were no 0+ trout present. Site 3 had relatively good salmonid habitat including glide and some riffle areas, but no fish were recovered during electro-fishing. Site 11 was deep and slow flowing and not suitable for salmonids. These deeper more canalised areas are suitable as holding-areas for coarse fish.

The water quality throughout is poor as determined by its Q values. Site 3 was rated as Q3-4

Although otter traces were observed on only one site, many of the other sites had some possibilities as foraging and commuting habitats, and it is possible that otter range throughout this tributary.

4.4 Lough Bannow Stream Sites 2, 6, 7, 8

The Lough Bannow Stream, Table 4.1, is mainly confined to coarse fish and may be used as holding areas throughout its length at different times of the year, river flows and depths. One pike was recovered at site 2. In the upstream part of site 6 no fish were taken by electro-fishing but two 3 spined stickleback were found in the kick samples. There was extensive in river vegetative growth which made electro-fishing extremely difficult. A single tench was recovered in the more open area downstream. No fish were recovered from spot fishing at sites 7 and 8.

The biological river quality was poor throughout.

Some of the sites were of foraging and commuting value for otter although signs were found only at one site. Otters use at least parts of this stream.

4.5 Ledwithstown Stream, Sites 1, 12

These sites Table 4.1, are at the upper reaches of the Ledwithstown Stream. They have no fishery value at this point. The sites were heavily overgrown and there was substantial peat sedimentation. The streams are shallow with low flows. The water quality is poor. No evidence of otters was found during the survey, but this is very much the upper reaches of the system

Table 4.1 Electro-fishing sites- Physical attributes

Site	River	Longitude	Latitude	Width	Depth	Bank Height	Fishing Method	Observation
1	Ledwithstown	53.59989	-7.87311	1.5m	0.2-0.3m	4-5m	Spot	no fish
2	Lough Bannow	53.64565	-7.93975	2.5-3m	0.05-1m	2.5-3m	Timed	1 pike
3	Ballynakill	53.69795	-7.93235	3-4m	0.2-0.5m	2-4m	Timed	no fish
4	Ballynakill	53.67458	-7.89824	2-3m	.2 -0.4m	4-5m	Timed	13 Trout
5	Fallon_02	53.65891	-7.84905	2.5m	0.4-0.6m	1.5m	Timed	65 trout
6	Lough Bannow	53.63212	-7.91662	3m	0.5m	3m	Spot	1 Stickleback
6Ext	Lough Bannow	53.63419	-7.91393	3-4m	0.4-2M	3m	Spot	1 Tench
7	Lough Bannow	53.64748	-7.94073	3-4m	0.5-1.0	3-4m	Spot	1 Stone loach
8	Lough Bannow	53.66912	-7.92959	4-5m	0.5m	3m	Spot	no Fish
9	Lough Bannow	53.69257	-7.96504	1.5m	0.5-1.5m	3m	-	Macroinvertebrates only
10	Ballynakill 010	53.70195	-7.94199	5m	0.3-0.5	1-2m	Timed	11 Trout, Gudgeon, Roach
11	Ballynakill 011	53.64307	-7.87296	4m	1.2-1.5	8m	-	-
12	Ledwithstown	53.61855	-7.84791	1m	0.05m	2.5m	Spot	no Fish

5. REFERENCES

Matson, R., Delanty, K., Shephard, S., Coghlan, B., and Kelly, F. (2017) Moving from multiple pass depletion to single pass timed Electro-fishing for fish community assessment in wadeable streams. Fisheries Research, 198, 99-108

Toner, P., Bowman, K., Clabby, K., Lucey, J., McGarrigle, M, Concannon, C., Clenaghan, C., Cunningham, P., Delaney, J., O'Boyle, S., MaCarthaigh, M., Craig, M., and Quinn, R. 2005. Water Quality in Ireland 2001-2003. Environmental Protection Agency, Wexford

Appendix A MACROINVERTEBRATE SAMPLES FROM SITES 1-12

Site 1

Family	Abundance	EPA Group
Baetidae (Baetis rhodani)	11	C
Polycentropodidae	8	C
Hydrobiidae	6	C
Gammaridae	26	C
Planorbiidae	1	C
Gyrinidae	5	C
Dytiscidae	2	C
Elmidae	5	C
Tipulidae	1	C
Asellidae	7	D
Lymnaeidae	5	D
Site 1		
Q Rating	3	
Water Quality Status	Poor	

Site 2

Family	Abundance	EPA Group
Ephermeridae	3	A
Polycentropodidae	6	C
Hydrobiidae	18	C
Sphaeriidae	21	D
Gammaridae	26	C
Planorbiidae	6	C
Calopterygidae	2	B
Asellidae	13	D
Glossiphoniidae	1	D
Site 2		
Q Rating	3 (Tentative)	
Water Quality Status	Poor	

Site 3

Family	No.	EPA Group
Chloroperlidae	2	A
Sericostomatidae	8	B
Gammaridae	11	C
Elmidae	1	C
Sphaeriidae	11	D
Hydrobiidae	6	C
Simuliidae	5	C
Chironomidae (ex Chironomus sp.)	5	C
Ancylidae	14	C
Asellidae	4	D
Site 3		
Q Rating	Q3-4	
Water Quality Status	Moderate	

Site 4

Family	No.	EPA Group
Baetidae (Baetis rhodani)	9	C
Corixidae	6	C
Gammaridae	11	C
Dytiscidae	8	C
Gyrinidae	2	C
Elmidae	3	C
Sphaeriidae	19	D
Hydrobiidae	21	C
Simuliidae	16	C
Ceratopogonidae	1	C
Chironomidae (excl. Chironomus sp.)	2	C
Asellidae	9	D
Tubificidae	1	E
Site 4		
Q Rating	Q3	
Water Quality Status	Poor	

Site 5

Family	Abundance	EPA Group
Baetidae (other)	2	B
Ephemerellidae	5	C
Limnephilidae	1	B
Lepidostomatidae	3	B
Baetidae (Baetis rhodani)	31	C
Gammaridae	29	C
Hydropsychidae	11	C
Elmidae	6	C
Dytiscidae	4	C
Hydrobiidae	31	C
Chironomidae	6	C
Simuliidae	5	C
Asellidae		D
Site 5		
Q Rating	3	
Water Quality Status	Poor	

Site 6

Family	Abundance	EPA Group
Gammaridae	11	C
Notonectidae	6	C
Asellidae	32	D
Chironomidae (Chironomus sp.)	8	E
Glossiphonidae	6	D
Lymnaeidae	1	D
Site 6		
Q Rating	2-3	
Water Quality Status	Bad	tentative Q

Site 6 (Downstream)

Family	Abundance	EPA Group
Sericostomatidae	1	B
Baetidae (Baetis rhodani)	3	C
Gammarus	28	C
Elmidae	1	C
Asellidae	14	D
Lymnaeidae	2	D
Site 6A		
Q Rating	3	
Water Quality Status	Poor	

Site 7

Family	Abundance	EPA Group
Elmidae	14	C
Hydropsychidae	6	C
Polycentropodidae	5	C
Gammaridae	11	C
Ancylidae	4	C
Hydrobiidae	9	C
Sphaeriidae	12	C
Chironomidae (non-chir)	2	C
Asellidae	21	D
Glossiphonidae	3	D
Site 7		
Q Rating	**3**	
Water Quality Status	Poor	

Site 8. Not suitable for assessment. Families Gerridae, Asellidae and Corixidae present.

Site 9

Family	Abundance	EPA Group
Corixidae	11	C
Notonectidae	4	C
Chironomus sp.	3	E
Asellus aquaticus	19	D
Site 9		
Q Rating	**3**	
Water Quality Status	Poor (Tentative Q)	

Site 10

Family	Abundance	EPA Group
Ephemerellidae	3	C
Baetidae (Baetis rhodani)	16	C
Limnephilidae	2	B
Lepidostomatidae	2	B
Polcentropodidae	6	C
Gammaridae	5	C
Sphaeriidae	3	D
Site 10		
Q Rating	**3**	
Water Quality Status	Poor	

Site 11

Family	Abundance	EPA Group
Coenagrioniidae	1	B
Gammaridae	5	C
Corixidae	16	C
Dytisicidae	2	C
Planorbiidae	3	C
Valvatidae	2	C
Sphaeriidae	8	D
Lymnaeidae	2	D
Site 11		
Q Rating	**Q3 (n/a)**	tentative Q
Water Quality Status	**n/a**	

Site 12

Family	Abundance	EPA Group
Baetidae (Baetis rhiodani)	11	C
Leptoceridae	6	B
Limnephilidae	2	B
Gammaridae	26	C
Hydraenidae	2	C
Elmidae	4	C
Dytiscidae	2	C
Chironomidae (non-chironomus sp.)	2	C
Tipulidae	3	C
Asellidae	14	D
Glossiphonidae	3	D
Site 12		
Q Rating	**Q3**	
Water Quality Status	**Poor**	

Appendix B FISH TAKEN BY ELECTRO-FISHING AT SITE 5

Fish taken by electro-fishing at Site 5

Table 3.5.1 Fish taken by electro-fishing at Site 5

No	Species	Length Cm		No	Species	Length cm		No	Species	Length cm
1	Brown Trout	18.8		23	Brown Trout	12.4		45	Brown Trout	7.5
2	Brown Trout	14.2		24	Brown Trout	7.0		46	Brown Trout	7.7
3	Brown Trout	15.1		25	Brown Trout	7.0		47	Brown Trout	6.7
4	Brown Trout	13.5		26	Brown Trout	8.3		48	Brown Trout	7.0
5	Brown Trout	13.9		27	Brown Trout	11.4		49	Brown Trout	7.3
6	Brown Trout	12.4		28	Brown Trout	7.4		50	Brown Trout	7.4
7	Brown Trout	12.2		29	Brown Trout	6.7		51	Brown Trout	7.1
8	Brown Trout	6.4		30	Brown Trout	6.4		52	Brown Trout	7.0
9	Brown Trout	12.5		31	Brown Trout	6.5		53	Brown Trout	8.1
10	Brown Trout	13.2		32	Brown Trout	7.0		54	Brown Trout	7.8
11	Brown Trout	8.0		33	Brown Trout	7.2		55	Brown Trout	7.7
12	Brown Trout	14.4		34	Brown Trout	10.1		56	Brown Trout	7.1
13	Brown Trout	13.4		35	Brown Trout	8.9		57	Brown Trout	6.9
14	Brown Trout	13.2		36	Brown Trout	8.5		58	Brown Trout	6.1
15	Brown Trout	11.6		37	Brown Trout	6.4		59	Brown Trout	6.2
16	Brown Trout	8.0		38	Brown Trout	7.7		60	Brown Trout	6.9
17	Brown Trout	11.3		39	Brown Trout	7.9		61	Brown Trout	7.1
18	Brown Trout	12.0		40	Brown Trout	6.8		62	Brown Trout	6.2
19	Brown Trout	14.2		41	Brown Trout	7.2		63	Brown Trout	5.6
20	Brown Trout	11.3		42	Brown Trout	8.4		64	Brown Trout	4.9
21	Brown Trout	12.5		43	Brown Trout	7.1		65	Brown Trout	6.2
22	Brown Trout	11.8		44	Brown Trout	8.6		66	Lamprey	10.1

Appendix C CERTIFICATE OF AUTHORISATION

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

CERTIFICATE OF AUTHORISATION UNDER SECTION 14 OF THE FISHERIES (CONSOLIDATION) ACT, 1959 AS SUBSTITUTED BY SECTION 4 OF THE FISHERIES (AMENDMENT) ACT, 1962

The Minister for the Environment, Climate and Communications in exercise of the powers conferred on him by Section 14 of the Fisheries (Consolidation) Act, 1959 as substituted by Section 4 of the Fisheries (Amendment) Act, 1962 hereby authorises: John Browne, Stillwaters Consultancy, 24 Thorncliffe Park, Churchtown, Dublin. D14DD80, and or person(s) nominated by him to carry out an electrofishing survey within selected sections of the Shannon catchment. The purpose of the requested licence is to assess fish populations in the vicinity of a proposed Wind Farm site near Lanesborough in Longford.

This authorisation is granted subject to the following conditions:

1. This authorisation shall not confer on the holder thereof, independently of the conditions therein,

   (a) any rights or title which the holder would not have had if this Authorisation had not been given, or

   (b) any authority in any way to interfere with or infringe the lawful rights of any other person.

2. This authorisation is issued to and valid for use by Mr. John Browne and or person(s) nominated by him.

3. This authorisation is valid until 30th September 2022.

4. The Director of the Shannon River Basin District and the appropriate Fisheries Inspector (as indicated by the Director) should be informed at least five days prior to the intended start date of the work providing the exact date(s), location and scope of the planned electro-fishing work. Contact details are as follows:

   IFI Limerick,
   Ashbourne Business Park,
   Dock Road,
   Co. Limerick.
   V94 NPE0

   Email: limerick@fisheriesireland.ie;
   Phone: 061 300238

Teach Leamháin, Bóthar Ghleann an Iarla, An Cabhán, H12 A8H7
Elm House, Earlsvale Road, Cavan, H12 A8H7
T +353 1 678 2000 | 1890 44 99 00
www.gov.ie/decc

5. As Lough Ree is a Special Area of Conservation (SAC), IFI request that National Parks and Wildlife Service (NPWS) are made aware of the proposed operation prior to commencement.

6. Acknowledging the applicant has indicated that there is no intention to kill any fish, the number of inadvertent fish mortalities resulting from the electro-fishing is to be kept to an absolute minimum and IFI inspectors are to be informed of any fish mortalities that occur immediately after the work concludes.

7. IFI request that all lamprey captured in the survey be identified to species level if feasible and measured (total length in mm is standard). This information should also be included on the IFI reporting template.

8. If invasive species are encountered, the field operatives should record their presence, indicate their abundance and extent of occurrence, along with a geo-reference in their report material submitted to IFI.

9. The names of the personnel undertaking the electro-fishing operations are required for the Section 14 authorisation.

10. Electro-fishing should, if possible, be carried out between July 1st and September 30th when juvenile salmon (if present) are of a sufficiently large size to be caught by electro-fishing, to minimize damage and for them to be distinguished from similar species (refer to CEN (2001) and CFB (2008) 'Electric Fishing in Wadeable Reaches' manual).

11. The applicant and agents should desist, to the greatest extent possible, from walking in the general instream area and to avoid walking on instream gravelled areas if present, thereby limiting adverse impact to intra-gravel life stages of salmonids and other species.

12. IFI insists upon strict adherence to the Biosecurity Protocol for Field Survey Work, whereby equipment must be disinfected prior to and after use to prevent the spread of disease, parasites or invasive species (http://www.fisheriesireland.ie/Biosecurity/biosecurity-protocol-for-field-survey-work.html) (and as directed by an officer of IFI). The applicant should be mindful of the potential occurrence of invasive alien species, either in the watercourse being surveyed or in the adjoining riparian zone. Extra care should be taken to ensure that plant fragments and seeds of invasive balsam and knotweed species are not



inadvertently transported on clothing, footwear or equipment. It would be very helpful if the applicant could record presence of such species, along with geo-reference and indication of extent of occurrence, in report material submitted to IFI. If possible, surveying should commence at the uppermost site and proceed sequentially downstream to reduce the risk of carrying invasive species upstream.

13. In the event that the proposed electrofishing operation is cancelled IFI should be notified and an indication of the proposed re-commencement date of the electrofishing operation should also be advised.

14. **No electric fishing should be undertaken at this site when water temperatures exceed 20°C due to the risk to fish. Where water temperatures approach this threshold and fish are obviously stressed electric fishing should cease.**

15. The fishing gear when not in use shall be kept in a secure place known to an officer of the Shannon River Basin District of IFI and the local Garda Siochána. All equipment must be available for inspection by an IFI officer during the survey.

16. IFI recommends that the applicant seeks permission from fishery owners and informs local angling clubs of their plans for the surveys where relevant. The applicant must also seek permission from landowners to cross land, where relevant.

17. No fish of any species should be sacrificed during the surveys. The number of fish killed (if any) is to be kept to an absolute minimum and IFI Ballina and Citywest are to be informed of any fish mortalities immediately after the survey.

18. The surveyor should be mindful of other species, e.g. white-clawed crayfish, which might be encountered during the electro-fishing exercise.

19. IFI request that any larval lamprey captured in the survey (refer to Maitland, P.S. (2003) *Ecology of the river, brook and sea lamprey.* Conserving Natura 2000 Rivers. Ecology Series No. 5, English Nature, Peterborough) be measured (total length in mm is standard). This information should also be included on the IFI reporting template.

20. The operators should be cognisant of the increased risk of mortalities occurring during warmer periods of weather or prolonged containment of fish and such fish should be regularly monitored for signs of stress and released in a timely manner to mitigate for any mortality risk. **Expected species groups, e.g., salmonids, eel and lamprey, should be noted, with references to standard sampling and welfare approaches.**

21. A standard template for reporting survey data to IFI is attached. IFI request that a survey report and qualitative/quantitative data (in the attached standard IFI format) be provided, within 30 days of completion of the survey, in electronic format to Sandra Doyle (Sandra.Doyle@fisheriesireland.ie). The report must include mortality data and a full account of qualitative/quantitative results. This data will not be made publically available, for a period of three years, without the permission of the applicant.

22. Failure to comply with any of the conditions of this Authorisation may result in revocation of this Authorisation.

23. The holder of this Authorisation shall indemnify and keep indemnified the State, the Minister for the Environment, Climate and Communications and the Minister for Finance against any claims, arising in any manner whatsoever in connection with the user of the fishing gear or in the exercise of the permission hereby granted.

24. Notwithstanding the foregoing, this Authorisation may be revoked or amended by the Minister for the Environment, Climate and Communications without the payment of compensation to the holder on giving one week's notice in writing to the holder if he considers it necessary in the public interest to do so.

Dated the 29 August 2022

For the Minister of the Environment, Climate and Communications

Una Ward

An officer authorised on that behalf by the said Minister

APPENDIX J HABITAT SURVEY AT DERRYADD PROPOSED WIND FARM SUBSITE, LANESBOROUGH, CO. LONGFORD (ALEXIS FITZGERALD, FITZGERALD ECOLOGY)

Habitat Survey at Derryadd Proposed Wind Farm Subsite, Lanesborough, Co. Longford

Report for Bord na Móna

By Alexis FitzGerald, *FitzGerald Ecology*

May 2023

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1. INTRODUCTION

TOBIN Consulting Engineers commissioned FitzGerald Ecology to produce a habitat study of a subsite within a proposed wind farm site in Derryadd, near Lanesborough, Co. Longford, in April 2023. This study will inform ecological impact and appropriate assessments being carried out on the proposed development.

A full habitat mapping and assessment study of the habitats (including EU Habitats Directive Annex I habitats, if present) on site was conducted, along with a detailed summary report outlining and describing the various habitats present on the subsite, including detailed habitat maps and species lists. This report is presented herein.

The study area for this habitat survey is displayed in Figure 1.1. The subsite encompasses a c. 12 hectare area of cutover raised bog, which has been gradually recolonised by areas of scrub, (immature) woodland, grassland and wetlands, including fen. The proposed wind farm site is generally flat in aspect.



Figure 1.1: Subsite Study Area (in yellow)

2. SURVEY METHODOLOGY

The habitat/plant walkover surveys were carried out by Alexis FitzGerald B.A. M.Sc. on the 14th April 2023. All of the habitats within the subsite were mapped on GIS according to Fossitt (2000) Level 3 classification, and with reference to Smith *et al.* (2011). The abundance of each vascular plant species (and also some relevant bryophyte indicator species) present in each habitat was recorded using the Domin scale[1]. EU Habitats Directive Annex I habitats were classified as per the European Commission (2013), also with reference to the corresponding national habitat survey reports and descriptions, particularly NPWS (2019) and Perrin *et al.* (2014). The nomenclature for the Annex I habitats also follows the European Commission (2013), with any abbreviated names for the habitats following NPWS (2019). Vascular plant taxonomy and nomenclature follows Stace (2019), whilst bryophyte taxonomy and nomenclature follow Atherton *et al.* (2010). Ecological evaluations were made according to the criteria as set out by the National Roads Authority (2009) (Appendix II). All of the relevant data were recorded within the shapefile metadata.

[1] The Domin scale is used to estimate the abundance of a particular species in a particular area of vegetation. The scale utilised here is from + to 10, each stage representing a range of percentage values from + = cover of <1% and a single individual, to 10 = cover of 91-100%.

3. SURVEY RESULTS

Legally Protected and Rare Flora

No plant species listed on the *Flora (Protection) Order 2022* were recorded during the field survey in 2023. One locally rare native species was recorded just outside the study area to the south and southeast, namely, *Juncus subnodulosus*. It was found in exposed peat and scrub habitats. According to the plant distribution maps of Botanical Society of Britain and Ireland (2023), this species should be considered rare in Co. Longford. This species is listed as Least Concern (LC) by Wyse Jackson *et al.* (2016).

Non-native (Invasive) Flora

No plant species listed on the Third Schedule of the *European Communities (Birds and Natural Habitats) Regulations, 2011* were recorded during the field survey in 2023. Furthermore, no (nonlisted) non-native/introduced plant species were recorded.

Habitats

The habitat types (and/or mosaics) recorded within the study area according to the Heritage Council classification system (Fossitt, 2000) are described in detail in section 3.1 (and are also mapped in Figure 2). Full plant species lists (with Domin abundance estimates for each species) for each recorded habitat are also presented in Appendix I of this report. Any EU Habitats Directive Annex I habitats recorded on the study area are presented in Figure 3.

The following 12 habitat types (and/or mosaics) were recorded within the study area during the field survey in 2023:

- Other artificial lakes and ponds (FL8)
- Dry calcareous and neutral grassland (GS1)
- Recolonising bare ground (ED3)
- Scrub (WS1)
- Wet grassland (GS4)
- Dense bracken (HD1)
- Oak-ash-hazel woodland (WN2)
- Cutover bog (PB4)
- Immature woodland (WS2)
- Buildings and artificial surfaces (BL3)
- Rich fen and flush (PF1)
- Calcareous springs (FP1)

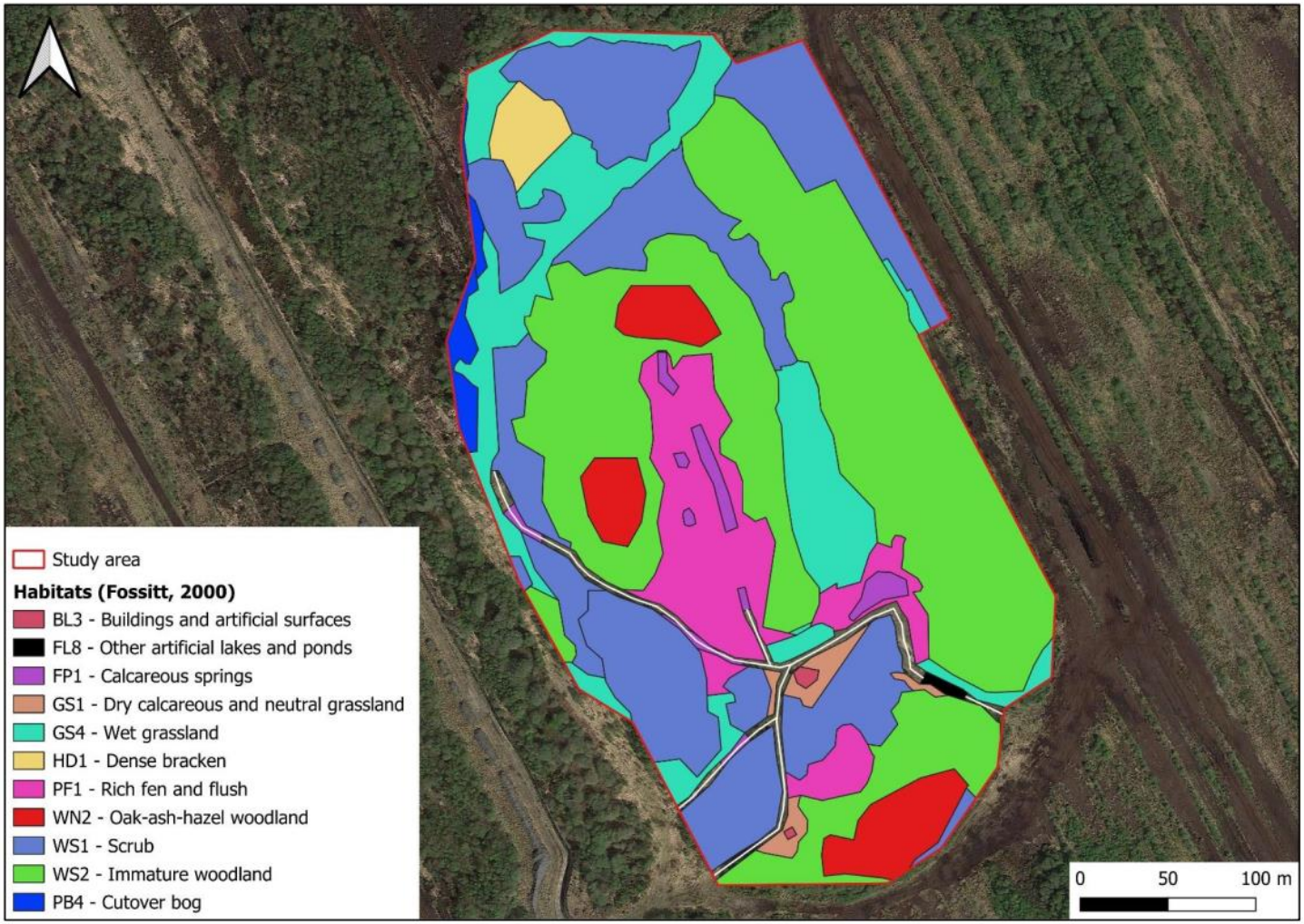


Figure 3.1: All Fossitt (2000) habitats recorded within the study area during the field survey in 2023 – the dominant habitat in each polygon is displayed here (habitat mosaics do occur but are not displayed for ease of viewing) – background mapping is © Google Satellite



Figure 3.2: All EU Habitats Directive Annex I habitats recorded within the study area during the field survey in 2023 – background mapping is © Google Satellite

3.1 HABITAT DESCRIPTIONS

Other artificial lakes and ponds (FL8)

Other artificial lakes and ponds (FL8) (see Plate 1) habitat occurs as one narrow ponding of rainwater in low-lying ground in the south-east of the study area. The water was likely calcareous in nature, as indicated by the presence of the charophyte species *Chara vulgaris*. However, no marl was noted here, which would indicate calcareous springs (FP1) habitat. The pond also contains *Juncus articulatus,* with lesser quantities of *Juncus effusus, Glyceria* sp., *Alisma plantago-aquatica, Juncus inflexus, Agrostis stolonifera* and *Typha latifolia*.

This habitat is considered to be of **Local importance (higher value)**, due to the relatively high species diversity present here and its habitat potential (petrifying spring (FP1) habitat may form here over time.



Plate 1. Other artificial lakes and ponds (FL8) habitat in the south-east of the study area

Dry calcareous and neutral grassland (GS1)

Dry calcareous and neutral grassland (GS1) (see Plate 2) habitat is scattered by pathways and beside old buildings in the south of the study area. The substrate here is likely to be neutral to calcareous, given the plant species composition here. This habitat has a relatively high level of plant species diversity, including such grass species as *Festuca rubra* agg. and *Agrostis capillaris,* and herbaceous species such as *Plantago lanceolata*, *Trifolium pratense* and *Succisa pratensis.*

The grassland on the study area does not correspond with the EU Habitats Directive Annex I habitat [6210] Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometea). This is because there were no positive indicator species for this habitat recorded within the study area, as shown by the recorded species list for the habitat in Appendix I.

This habitat is considered to be of **Local importance (higher value)**, due to the relatively high species diversity present here.



Plate 2. Dry calcareous and neutral grassland (GS1) habitat in the south of the study area

Recolonising bare ground (ED3)

Recolonising bare ground (ED3) habitat can be found along old trackways throughout the south of the study area. These trackways have been gradually recolonised by vegetation over time. Some of the ED3 habitat here has even become partly re-vegetated (in a mosaic) with wet grassland (GS4), and in one location in the south of the study area, with rich fen and flush (PF1) (see separate habitat accounts below, also see Figure 3). The exposed gravel material has been recolonised by a number of plant species, namely, *Juncus effusus, Taraxacum* agg., *Ranunculus repens, Potentilla anserina, Equisetum arvense, Carex flacca, Juncus articulatus* and *Calliergonella cuspidata*.

This habitat is considered to be of **Local importance (higher value)**, due to the relatively high species diversity present here.

Scrub (WS1)

Scrub (WS1) (see Plate 3) habitat was recorded widely across the study area and constitutes one of the more dominant habitat types by area. This habitat is characterised by the dominance of such shrub species as *Rubus fruticosus* agg., *Ulex europaeus, Salix cinerea* subsp. *oleifolia* and *Betula pubescens*. In the ground layer of these shrubs, some tall and/or shade-tolerant, perennial grass species occur, including *Arrhenatherum elatius,* as well as creeping herbaceous species like *Galium aparine* and low woody shrubs like *Hedera helix*.

This habitat is considered to be of Local importance (higher value), due to the relatively high species diversity present here and its broad habitat potential.



Plate 3. Scrub (WS1) habitat in the south of the study area

Wet grassland (GS4)

Wet grassland (GS4) habitat was recorded widely across the study area, however, it was often recorded in vegetation mosaics with scrub (WS1) and dense bracken (HD1). Both of these latter habitats are beginning to overcome many areas of wet grassland on the study area over time due to encroachment. This habitat is characterised by having an increased influx of freshwater near the soil surface relative to GS2/GS1 grassland, which allows this grassland type to support some wetland plant species. As a result, the habitat within the study area is dominated by such grass species as *Agrostis stolonifera* and *Molinia caerulea*, alongside such bryophyte species as *Calliergonella cuspidata*. Occasional species in this habitat include *Ranunculus repens* and *Succisa pratensis*.

This habitat is considered to be of **Local importance (higher value)**, due to the relatively high species diversity present here.

Dense bracken (HD1)

Dense bracken (HD1) habitat is present across the study area, however, it is rarely the dominant habitat in the vegetation mosaics here, frequently being recorded in mosaics with larger quantities of scrub (WS1) and wet grassland (GS4). A dominant area of HD1 does occur, however, in the north of the study area (see Figure 2). This habitat is indeed dominated by the characteristic fern *Pteridium aquilinum*, which establishes extensive rooting systems in the deeper soils. However, a few other shrub species are competing with this dominant species here, including *Rubus fruticosus* agg., and

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underneath the cover of these species, a few herbaceous species occur, including *Agrostis stolonifera* and *Chamerion angustifolium.*

This habitat is considered to be of **Local importance (lower value),** due to its low species diversity.

Oak-ash-hazel woodland (WN2)

Oak-ash-hazel woodland (WN2) (see Plate 4) habitat occurs in three patches, surrounded by younger immature woodland (WS2), in both the south and north of the study area. These woodlands appear to be substantially older than the surrounding immature woodland, as indicated by the size and girth of trees here. This dry semi-natural woodland habitat is dominated by the tall canopy species *Fraxinus excelsior*. The understorey of the woodland here is very densely vegetated by *Rubus fruticosus* agg. and *Hedera helix,* with lesser quantities of *Polystichum setiferum, Lonicera periclymenum* and *Asplenium scolopendrium.* The bryophyte layer contains *Kindbergia praelonga* and *Eurhynchium striatum*.

Some areas of WN2 habitat correspond with the EU Habitats Directive Annex I habitat [91A0] Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles. However, the area of WN2 habitat within the study area is not classified as such due to the lack of sufficient key indicator species for this habitat type, including *Quercus* species. This habitat is considered to be of **County importance**, due to its relatively well-developed woodland vegetation, which is locally scarce.



Plate 4. Oak-ash-hazel woodland (WN2) vegetation within the south of the study area

Cutover bog (PB4)

Cutover bog (PB4) habitat occurs as two narrow isolated strips of cutover raised bog in the north-west of the study area and grades into scrub (WS1) habitat immediately to the east. This habitat generally occurs on deep peat substrate. *Calluna vulgaris*, *Erica tetralix* and *Molinia caerulea* were all recorded within the vegetation, the former species being dominant. The herbaceous species *Carex panicea* and the bryophyte species *Pseudoscleropodium purum* and *Hypnum jutlandicum* were also recorded. This vegetation type has close affinities with the 'Calluna vulgaris cutover bog (LS1)' habitat type of Smith & Crowley (2020).

Some areas of PB4 habitat correspond with the EU Habitats Directive Annex I habitat [7150] Depressions on peat substrates of the Rhynchosporion. However, the areas of PB4 habitat within the study area are not classified as such due to the lack of sufficient key indicator species for this habitat type, including *Rhynchospora alba*. Despite its cutover state, this habitat is considered to be of **County importance**, given the scarcity of the habitat within the county.

Immature woodland (WS2)

Immature woodland (WS2) (see Plate 5) habitat occurs widely across the study area, and is the most dominant habitat on the study area, along with scrub (WS1). This immature woodland appears to have formed by natural means from scrub habitat in this under-managed area and is currently dominated by the canopy species *Betula pubescens* and *Salix cinerea* subsp. *oleifolia*. *Rubus fruticosus* agg., *Hedera helix, Ulex europaeus* and *Arrhenatherum elatius* occur within the undergrowth. This habitat is considered to be of **Local importance (higher value),** due to its broad habitat potential to form mature woodland over time, despite its current immature status.



Plate 5. Immature woodland (WS2) vegetation within the south of the study area

Buildings and artificial surfaces (BL3)

Buildings and artificial surfaces (BL3) habitat within the study area is represented by a few old farm buildings and other built structures located in the south of the study area. This habitat is devoid of plant species and so is considered to be of **Negligible importance**.

Rich fen and flush (PF1)

Rich fen and flush (PF1) (see Plate 6) habitat was recorded in three-four separate extensive patches in the south of the study area. These areas of flush habitat adjoin mostly immature woodland (WS2) and scrub (WS1) on the drier areas adjacent to the wetter fen. This habitat is wet and highly mineral-rich and calcareous in nature, being as it is directly adjacent to a number of calcareous springs (FP1). Grass, rush and sedge species are the dominant vascular plants in this vegetation, with *Juncus inflexus, Carex nigra, Carex flacca* and *Molinia caerulea* all being widespread. The herbaceous and bryophyte species *Succisa pratensis, Ranunculus flammula, Carex panicea, Campylium stellatum, Scorpidium cossonii* and the orchid *Dactylorhiza* species are all occasional, whilst the bryophyte species *Fissidens adianthoides, Didymodon tophaceus* and *Bryum pseudotriquetrum* all occur as rarities in the vegetation. Scattered tufa accumulation was observed around these brown mosses in parts of the vegetation, however, the petrifying spring (FP1) habitat (see below) represents the highest accumulation of this tufa.

Of the species recorded within this vegetation, the following 11 are considered to be positive indicator species for the Annex I habitat [7230] Alkaline fens, according to NPWS (2019): *Succisa pratensis, Campylium stellatum, Scorpidium cossonii, Molinia caerulea, Carex flacca, Carex panicea, Ctenidium molluscum, Ranunculus flammula, Galium palustre, Fissidens adianthoides* and *Carex nigra.* Therefore, given the abundance of positive indicator species for this Annex I habitat within the vegetation on the study area, and the accordance of the vegetation composition with its description in NPWS (2019) and Perrin *et al.* (2014), all of the rich fen and flush habitat within the study area has been classified as [7230] Alkaline fen.

This habitat is considered to be of **National importance**, given the scarcity of such wetland features on a national scale, their decreasing area nationally, and the fact that the examples on the study area occur within the favourable reference range for this EU Annex I habitat in Ireland (NPWS, 2019).



Plate 6. Rich fen and flush (PF1) vegetation within the south of the study area

Calcareous springs (FP1)

Calcareous springs (FP1) (see Plates 7 and 8) habitat was recorded in scattered patches across the south of the study area, adjoining rich fen and flush (PF1) habitat. No spring heads were observed, and the tufa accumulation here appears to be diffuse and widespread across the habitat. The habitat appears to have formed in low-lying former access trackways, hence their apparent linear distribution in most areas (see Figure 3). Brown moss species were recorded widely growing out of the tufa deposits. These include *Bryum pseudotriquetrum* and *Campylium stellatum*. The herbaceous species *Mentha aquatica* was also found to be widespread.

All of the spring habitats within the study area have been classified as the Priority EU Annex I Habitat [*7220] Petrifying springs with tufa formation (Cratoneurion), as per its definition within the *Interpretation Manual of European Union Habitats* (CEC, 2013), and the description of the habitat in the Irish context within Perrin *et al.* (2014) and NPWS (2019). Work on the classification of Irish petrifying spring vegetation communities was undertaken by Lyons & Kelly (2016), however the authors acknowledge that many of the sites described in their report do not conform strictly to the EU Annex I habitat type. NPWS (2019) has adapted a list of positive indicator species for the EU Annex I habitat from Lyons and Kelly (2016), however the definition of the habitat in the Irish context remains poorly defined. Perrin *et al.* (2014) stress the importance of certain brown moss and tufa presence, in conjunction with low quantities of sedges.

Indeed, all of the petrifying spring habitat recorded on the study area contained abundant tufa, as well as brown moss representation and low sedge cover. Furthermore, seven positive indicator species of this EU Annex I habitat (as outlined within NPWS (2019)) were recorded at calcareous

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springs within the study area, namely *Aneura pinguis, Campylium stellatum, Bryum pseudotriquetrum, Carex panicea, Mentha aquatica, Juncus articulatus* and *Anagallis tenella*.

This habitat is considered to be of **National importance**, given the scarcity of such wetland features on a national scale and their current "*inadequate*" conservation status in Ireland (NPWS, 2019).



Plate 7. Calcareous springs (FP1) habitat within the south of the study area



Plate 8. Calcareous springs (FP1) habitat within the south of the study area, showing the abundant deposited tufa and some inundated bryophytes, including scattered plants of Bryum pseudotriquetrum

4. SUMMARY

This report presents a summary of findings from a habitat field survey in the spring of 2023 at Derryadd, near Lanesborough, Co. Longford. A total of twelve separate habitat types were recorded across the study area, including two EU Habitats Directive Annex I habitats, namely, [7230] Alkaline fen, and the Priority habitat [*7220] Petrifying springs with tufa formation (Cratoneurion). Protecting the quality and integrity of the Annex I habitats and their associated plant species on site will be an important focus going forward. These issues will be assessed in detail in ecological impact and appropriate assessments to be completed for the proposed development.

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APPENDIX K ORNITHOLOGICAL FIELD STUDY

Appendix K.1 BASELINE ORNITHOLOGICAL SURVEYS – DERRYADD WIND FARM, SUMMER 2021 (FEHILY TIMONEY, 2022B)

FEHILY TIMONEY

CONSULTANTS IN ENGINEERING, ENVIRONMENTAL SCIENCE & PLANNING

DERRYADD, CO. LONGFORD WIND FARM ORNITHOLOGICAL SURVEY

BASELINE ORNITHOLOGICAL SURVEYS – DERRYADD WIND FARM, SUMMER 2021

Prepared for: Bord na Móna

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BASELINE ORNITHOLOGICAL SURVEYS – DERRYADD WIND FARM, SUMMER 2021

REVISION CONTROL TABLE, CLIENT, KEYWORDS AND ABSTRACT
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Client: Bord na Móna

Keywords: Baseline, Ornithological Surveys, Wind Farm, Derryadd, Co. Longford

Abstract: This document outlines a baseline ornithological survey during summer 2021 at the potential Derryadd Wind Farm, Co. Longford. This ornithology report is required to assess the impacts of the proposed development on bird species within and surrounding the site.

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EXECUTIVE SUMMARY

Ornithological surveys for the summer 2021 season at Derryadd Wind Farm searched for and recorded all bird species, focusing primarily on the wind farm site but also taking in the surrounding hinterland.

The methodology for the 2021 vantage point surveys at Derryadd adhered to Scottish Natural Heritage guidance (SNH, 2017) for assessing the impact of proposed wind farm developments on target species' breeding and wintering populations. Two timed watches of three hours duration were carried out from each VP every month from April to September 2021 inclusive, totalling 36 hours of observation time at each VP over the survey period. Breeding bird transect surveys, hinterland surveys and wader surveys were also undertaken during this period.

During vantage point surveys a total of 60 bird species were recorded. Of these species, eight are of Red-list status under the Birds of Conservation Concern in Ireland (BoCCI) (Gilbert et al., 2021): black-tailed godwit, curlew, grey wagtail, kestrel, lapwing, meadow pipit, snipe and swift. A total of 18 are Amber-listed and the remaining 34 are Green-listed. Of the species noted, four are protected under Annex I of the EU Birds Directive: common tern, kingfisher, little egret and peregrine.

During hinterland surveys surrounding the proposed site a total of 31 species were noted. Of these species, five are of Red-list status under the BoCCI (Gilbert et al., 2021): grey wagtail, lapwing, oystercatcher, pochard and snipe. A further 16 Amber-listed species were observed: common tern, kingfisher, black-headed gull, common gull, common sandpiper, coot, cormorant, gadwall, great crested grebe, lesser black-backed gull, mallard, mute swan, greylag goose, teal, tufted duck and wigeon. A total of three Annex I species were recorded during hinterland surveys: common tern, kingfisher and little egret.

During breeding wader surveys, four wader species were found to be breeding on site. Of these species, three are Red-listed (lapwing, snipe and woodcock). The fourth species (ringed plover) is Amber-listed.

During general breeding transects a total of 58 species were detected. Of these, four species are Red listed: lapwing, meadow pipit, snipe and swift. A total of 15 amber-listed species were recorded.

1. INTRODUCTION

Fehily Timoney & Company (FT) was appointed by Bord na Móna to undertake summer ornithological surveys at the proposed Derryadd Wind Farm in 2021. This report presents the results of these ornithological surveys and summarises the activity of specific target bird species during summer survey period in 2021. The study area of the proposed Derryadd Wind Farm is near Lanesborough, Co. Longford.

This ornithological assessment for surveys completed during summer 2021 includes the assessment of bird species occurring within the proposed site boundary, and surveys of surrounding habitats of value to birds. Surveys adhered to Scottish Natural Heritage guidance (SNH, 2017). The following surveys were carried out:

- Vantage Point survey
- Hinterland survey
- Breeding wader survey
- Breeding bird transect survey
- Barn Owl Surveys

1.1 Study Area

The proposed Derryadd wind farm is located c. 3 km east of Lanesborough, Co. Longford, 4km west of Killashee, Co. Longford and 8km north of Newtowncashel, Co. Longford. The proposed wind farm is located on the Mountdillon group of peat extraction bogs in Co. Longford (Figure 1.1).

Habitats on the proposed site consist of cutover bog, recolonising cutover bog, remnant raised bog, colonising birch woodland and large ponds/lakes on cutover bog. Surrounding habitats and land uses are described by Corine 2018[1] as: Peat bogs (412), Pastures (code 231), Mixed Forests (313), Coniferous Forests (312), Transitional woodland scrub (324), Broad-leaved forests (311), and Discontinuous urban fabric (112).

Designated Sites within a 15km radius of the proposed wind farm are detailed in Table 1.1.

1 https://gis.epa.ie/EPAMaps/. Accessed 06/12/21

Table 1.1: Designated sites within a 15km radius of the proposed Derryadd Wind Farm.

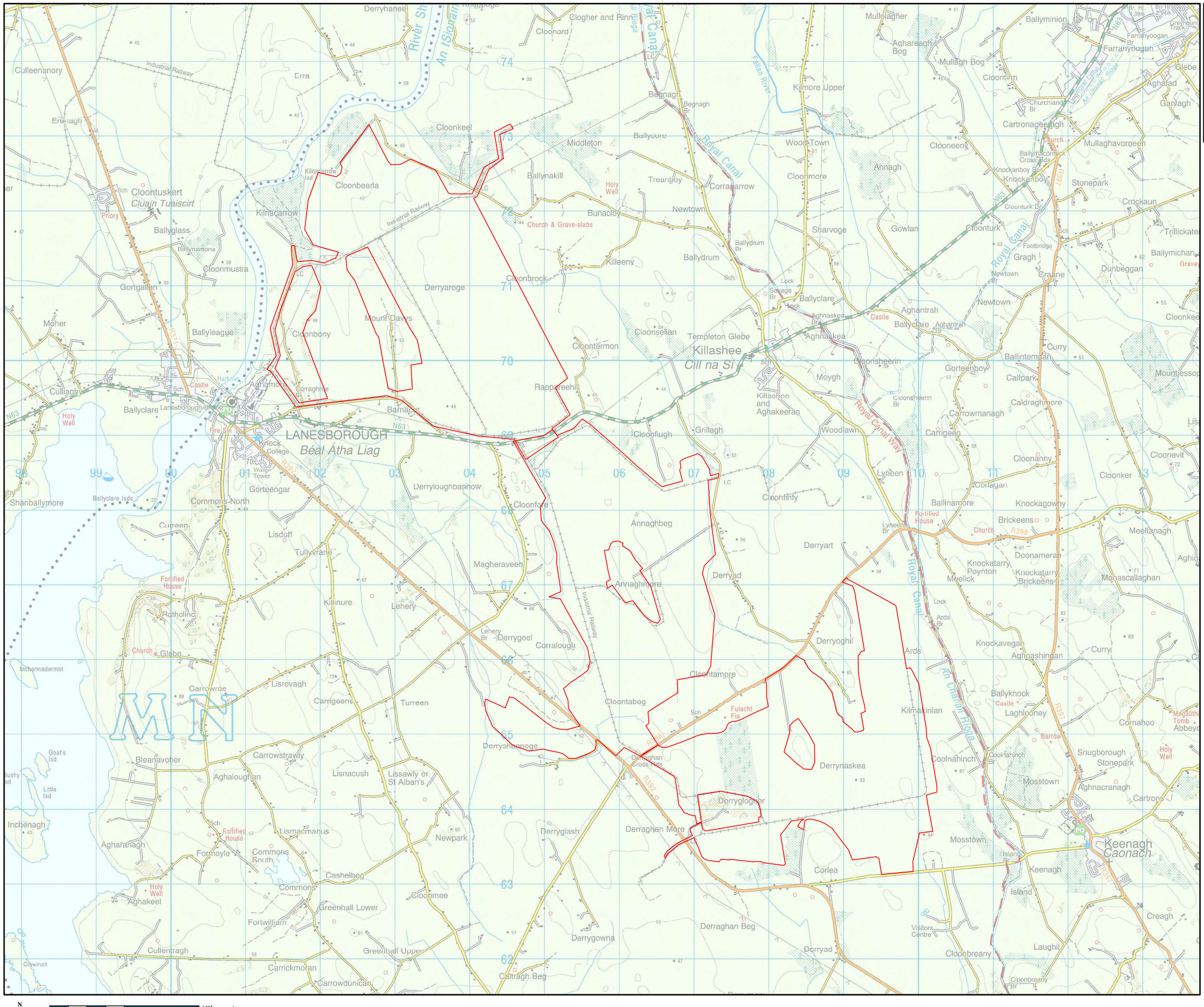
Site	Site Code	Type
Lough Ree	004064/000440/000440	SPA/SAC/pNHA
Fortwilliam Turlough	000448/000448	SAC/pNHA
Ballykenny-Fisherstown Bog	004101	SPA
Lough Forbes Complex	001818/001818	SAC/pNHA
Brown Bog	002346/000442	SAC/pNHA
Corbo Bog	002349/000602	SAC/pNHA
Annaghmore Lough	001626	SAC
Clooneen Bog	002348/000445	SAC/pNHA
Mount Jessop Bog	001450	SAC/NHA
Forthill Bog	001448	NHA
Derrycanan Bog	000605	NHA
Aghnamona Bog	000422	NHA
Cloonageeher Bog	001423	NHA
Lisnanarriagh Bog	002072	NHA
River Finn	002301	NHA
Lough Bawn	001819	pNHA
Lough Bannow	00449	pNHA
Royal Canal	002103	pNHA
Cordara Turlough	001821	pNHA
Derry Lough	001444	pNHA
Lough Slawn	001443	pNHA
Kilglass and Grange Loughs	000608	pNHA
Carrickglass Demesne	001822	pNHA

Site	Site Code	Type
Lough Boderg and Lough Bofin	001642	pNHA
Annaghmore Lough (Roscommon)	001626	pNHA
Ardnakilla Lough	001617	pNHA

Note: *SPA = Special Protected Area (European site), SAC = Special Area of Conservation (European site), NHA = Natural Heritage Area (Nationally Designated Site), pNHA = proposed Natural Heritage Area

Path: R:\Map Production\2021\P21-119\workspace\Flightlines\P20-119_GIS_SiteLayout_Flightlines_A3.mxd

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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LANESBOROUGH
Béal Átha Liag
Killashee
Cill na Sí
Keenagh
Caonach
Templeton Glebe
Derryaroge
Mount Davys
Cloonbearla
Cloonkeel
Middleton
Ballynakill
Treanboy
Bunacloy
Killeeny
Cloonbrock
Cloontermon
Cloonsellan
Rappareehill
Barnacor
Cloonfiugh
Grillagh
Derryloughbannow
Cloonfore
Annaghbeg
Annaghmore
Derryad
Derryart
Derryghil
Cloontamore
Cloontabeg
Derryshannoge
Derryglogher
Derraghan More
Derraghan Beg
Derrygowna
Derrynaskea
Corlea
Cloonfinny
Cloonmore
Sharvoge
Gowlan
Aghantrah
Aghnaskea
Cloonsheerin
Moygh
Killaanoo and Aghakeeran
Woodlawn
Lyneen
Carrigeen
Carrowmanagh
Gorteenbow
Ballintemple
Curry
Calfpark
Caldraghmore
Cloonanny
Conagan
Ballinamore
Knockagowny
Brickeens
Cloonbreany
Laughil
Cloonker
Cloonevit
Meeltanagh
Doonameran
Knockatarry
Poynton
Meelick
Monascallaghan
Knockavegan
Aghnashingan
Ballyknock
Laghlooney
Kilmaxinlan
Coolnahinch
Mosstown
Snugborough
Stonepark
Aghnacranagh
Cartrons
Cornahoo
Megalithic Tomb
Abbeyc
Crockaun
Trillickate
Ballymichan
Dunbeggan
Graigh
Craane
Newtown
Footbridge
Cloonturk
Cloonturk Dr
Knockanboy
Knockanboy Br
Ballymacormick Cross Rds
Church
Mullaghavorneen
Cloooneeny
Cartronageeragh
Churchland Br
Cloontirm
Mullagh Bog
Aghareagh Bog
Farranyoogan
Farranyoogan Br
Ballyminion
Mullolagher
Glebe
Aghafad
Garvagh
Cloonkee
Lisl
Mountjessop
Ballyclare
Ballyclare Aghantrah
Aghnaskea Br
Aghnaskea Castle
Ballydrum
Ballydrum Br
Lock
Savage Br
Ballyclare Lock
Royal Canal
Royal Canal Way
Ard Chanáil Rioga
Ballyclare Br
Cloonsheerin Br
Lyneen Br
Ards
Ards Br
Lock
Fortified House
Church
Glebe
Holy Well
Castle
Harbour
Aghamore
Carraghroe Br
Lanesborough-Ballyleague Br
Fire Stn
Knock College
Water Tower
Ballyleague
Cloonbony
Cloonmustra
Ballynamona
Ballyglass
Gortgallen
Moher
Culliagh
Ballyclare
Cloontuskert
Cluain Tuaiscirt
Priory
Kilnacarrow
Kilnacarrow Ind Est
Industrial Railway
Erra
Culleenanory
Eroniagh
Derryhanee
Cloghar and Rinn
Cloonard
River Shannon
An tSionainn
Royal Canal
Feallan River
Begnagh
Begnagh Br
Ballycore
Woodtown
Church & Grave-slabs
Holy Well
Ballydrum
Lock
Footbridge
Aghnaskea Br
Castle
Templeton Glebe
Cloonsheerin Br
Lyneen Br
Fortified House
Church
Ard Chanáil Rioga
Royal Canal
Royal Canal Way
Lock
Ards Br
Ards
Fulacht Fia
Derraghan Cross Rds
Barrow
Coolnahinch Br
Coolnahinch
Ballyknock Castle
Megalithic Tomb
Holy Well
Island Br
Island
Keenagh
Visitors Centre
Fortified House
Church
Lehery Br
Lehery
Derrygeel
Corralough
Industrial Railway
Annaghmore
Derryad
Derryart
Derryghil
Cloontamore
Cloontabeg
Derraghan Cross Rds
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Derraghan More
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Aghnaskea
Cloonsheerin
Moygh
Killaanoo and Aghakeeran
Woodlawn
Lyneen
Carrigeen
Carrowmanagh
Gorteenbow
Ballintemple
Curry
Calfpark
Caldraghmore
Cloonanny
Conagan
Ballinamore
Knockagowny
Brickeens
Cloonbreany
Laughil
Cloonker
Cloonevit
Meeltanagh
Doonameran
Knockatarry
Poynton
Meelick
Monascallaghan
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Kilmaxinlan
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Snugborough
Stonepark
Aghnacranagh
Cartrons
Cornahoo
Megalithic Tomb
Abbeyc
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Trillickate
Ballymichan
Dunbeggan
Graigh
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Knockanboy
Knockanboy Br
Ballymacormick Cross Rds
Church
Mullaghavorneen
Cloooneeny
Cartronageeragh
Churchland Br
Cloontirm
Mullagh Bog
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Farranyoogan
Farranyoogan Br
Ballyminion
Mullolagher
Glebe
Aghafad
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Fortified House
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Harbour
Aghamore
Carraghroe Br
Lanesborough-Ballyleague Br
Fire Stn
Knock College
Water Tower
Ballyleague
Cloonbony
Cloonmustra
Ballynamona
Ballyglass
Gortgallen
Moher
Culliagh
Ballyclare
Cloontuskert
Cluain Tuaiscirt
Priory
Kilnacarrow
Kilnacarrow Ind Est
Industrial Railway
Erra
Culleenanory
Eroniagh
Derryhanee
Cloghar and Rinn
Cloonard
River Shannon
An tSionainn
Royal Canal
Feallan River
Begnagh
Begnagh Br
Ballycore
Woodtown
Church & Grave-slabs
Holy Well
Ballydrum
Lock
Footbridge
Aghnaskea Br
Aghnaskea

2. SURVEY METHODOLOGY

The following surveys were carried out:

- Vantage point survey (breeding and non-breeding season)
- Hinterland survey
- Breeding wader survey
- Breeding bird transect survey
- Barn owl Survey

Methodologies for these surveys are detailed under the following headings:

2.1 Vantage Point Surveys

The main purposes of vantage point survey watches are to collect data on *target species* that will enable estimates to be made of:

a. The time spent flying over the defined survey area
b. The relative use of different parts of the defined survey area
c. The proportion of flying time spent within the upper and lower height limits as determined by the rotor diameter and rotor hub height

Vantage Point (VP) surveys were carried out at the proposed Derryadd Wind Farm site from April 2021 to September 2021 (covering the breeding season), in accordance with the Scottish Natural Heritage Methodology for assessing onshore wind farms (SNH, 2017). A total of 11 fixed VP locations overlooking the study area were used during the VP surveys (see Figure 2.1 for VP locations), each with specific viewsheds chosen to provide coverage of the proposed Wind Farm in addition to a 500m buffer around the site boundary.

Vantage point locations were based on observations from walkover/reconnaissance surveys, viewshed analysis (using GIS) and collated information on known feeding and roosting sites from both desktop review and consultation. The number and location of vantage points was selected to achieve visibility of the entire study area and important features for birds in close proximity to the site (e.g., lakes, wetlands).

In line with recommended best practice (SNH, 2017 and Band *et al*. 2007), viewshed analysis was undertaken using ARCMAP 10.4.1, to calculate a theoretical zone of visibility from each vantage point. Visibility is calculated from each vantage point along an invisible layer suspended at the predicted lowermost height passed through by the rotor blade tips, using an observer height of 1.5 m. We note the following from SNH guidance in respect of priority areas for viewshed analysis (emphasis added):

> *"Where the key purpose is to estimate the risk of collision with turbines,* ***it is the visibility of the airspace to be occupied by the turbine rotors (the collision risk volume) that is of prime importance****. Therefore, it is recommended that visibility be calculated using the least visible part of this airspace, i.e. an imaginary layer suspended at the lowermost height passed through by the rotor blade tips (typically about 20-30m above ground level). Predicting visibility at this level is a simple task using GIS, however it should be noted that the baseline should take account of any forestry or other features that will potentially obstruct the view. For example, forestry may be 10-30m high and if viewshed height is taken as 20-30m ground level the visible area could be overestimated if there is forestry within the viewshed. Being able to view all or most of the site to ground level can be helpful in gauging overall bird activity and usage of the site but is not as important as being able to view the collision risk volume"*

Following SNH guidance (2017), watches were conducted to sample diurnal activity of target species, fulfilling the required effort from SNH. Vantage Point (VP) surveys involved carrying out 2 x 3-hour VPs at each VP every month. As per SNH guidance (2017), 36 hours of vantage point effort was carried out at each vantage point during the breeding period.

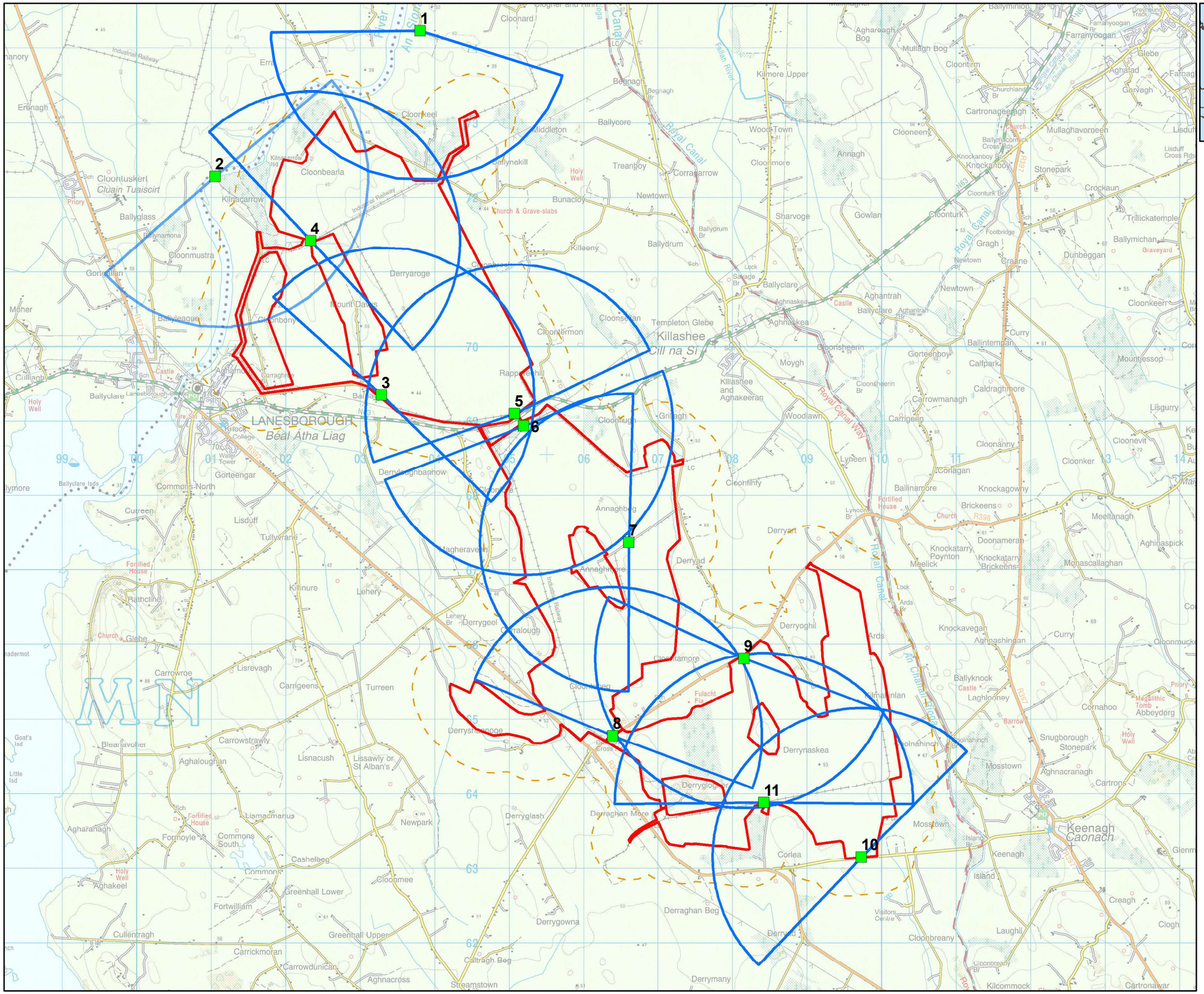
Data recorded included flight activity of target species (flight height, duration, directionality) in addition to metrics such as flock size (per recorded transit) and relative time of observation. Detailed notes of each observation of a target bird species were recorded including behaviour, sex (where possible), numbers, flight height, associated habitat and the period spent within the study area. Successful foraging events were also noted if they arose. Other bird species seen or heard during the VP surveys were also recorded and were considered separately in the analysis as additional species. Flight activity was annotated onto field maps. Total numbers of birds present both on arrival at the VP and on departure is noted. Details of each flight-path observation are provided in Section 3. Binoculars were used to scan for target species. Dictaphones were utilised to dictate bird heights whilst tracking flight events.

Flight heights are estimated visually as allowed for in SNH (2017) guidance. Flight height estimation using a clinometer or rangefinder is accepted as an *alternative* means of determining flight height however this is often not practicable (equipment may be clumsy and birds may be lost from view whilst trying to focus additional equipment on a target species rapidly moving out of sight); it should be noted that in practice many flocks of swans do not fly close enough to a surveyor for a rangefinder to be used, resulting in most flights heights being estimated in any case. As is often the case an experienced observer will be able to record accurate observations at a higher frequency.

The proportion of survey time that activity was recorded inside and outside the 500m turbine buffer was used as part of the overall analysis and assessment of target species usage of the study area. All surveys were conducted during suitable weather conditions.

Path: \\FTC-FS01\MapInfoShare\Map Production\2021\P21-119\workspace\P21-119_GIS_Fig1_ViewshedAnalysis_A3.mxd

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LANESBOROUGH
Béal Atha Liag
Killashee
Cill na Sí
Cloonkeel
Cloonbearla
Kilnacarrow
Ballyglass
Cloonmustra
Derryaroge
Mount Davis
Templeton Glebe
Cloonsellan
Cloonlermon
Rappareehill
Cloonlugh
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Derryloughbannow
Annaghbeg
Annaghmore
Derryart
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Derryoghil
Cloontamore
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Derryglogy
Derraghan More
Derryglash
Derryshannage
Derrygeel
Derrygowna
Derraghan Beg
Derrymany
Corlea
Keenagh
Caonach
Mosstown
Ballinamore
Cloonbreany
Kilcommock
Cartronawar
Knockagowny
Brickeens
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Poynton
Meelick
Monascallaghan
Aghinaspick
Creagh
Clogh
Laughil
Island
Keenagh
Lisgurry
Mountessop
Cloonkeen
Trillickatemple
Ballymichan
Dunbeggan
Graveyard
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Stonepark
Mullaghavorneen
Cloonturk
Gragh
Craane
Newtown
Footbridge
Knockanboy
Ballymacormick Cross Rds
Cloonmore
Cloonee
Annagh
Gowlan
Sharvoge
Aghantrah
Ballyclare
Aghnaskea
Castle
Curry
Ballintemple
Calfpark
Caldraghmore
Carrowmanagh
Carrigeen
Cloonanny
Corlagan
Lynceen
Woodlawn
Moygh
Gloonsheerin
Gorteenboy
Killashee and Aghakeeran
Cloonsheerin Br
Royal Canal Way
Royal Canal
Ballydrum
Ballydrum Br
Killeeny
Bunacloy
Church & Grave-slabs
Newtown
Corracarrow
Treanboy
Ballycoore
Middleton
Woodtown
Beagnagh
Beagnagh Br
Kilmore Upper
Aghareagh Bog
Mullagh Bog
Cloontirm
Churchland Br
Cartronageeragh
Aghatad
Garvagh
Glebe
Farranyoogan
Farranyoogan Br
Greyhound Track
Ballyminton
Fallan River
Ballyclare
Aghantrah
Castle
Aghnaskea
Aghnaskea Br
Ballyclare Br
Lock
Savage Br
Ballydrum Br
Ballyclare
Ballyleague
Cloonbony
Moher
Cullaghy
Castle
Aghamore
Carraghroe
Ballyclare
Lanesborough Bog
Holy Well
Fire Stn
Knock College
Water Tower
Gorteengar
Commons North
Ballyclare Isds
Curreen
Lisduff
Tullyvrane
Fortified House
Rathcline
Killinure
Lehery
Church
Glebe
Carrowroe
Lisrevagh
Carrigeens
Turreen
Goat's Isd
Little Isd
Bleanavoher
Aghaloughan
Carrowstrawly
Lisnacush
Lissawly or St Alban's
Agharanagh
Formoyle
Lismacmanus
Commons South
Cashelbeg
Commons
Aghakeel
Holy Well
Greenhall Lower
Fortwilliam
Cullentragh
Greenhall Upper
Carrickmoran
Carrowdunican
Aghnacross
Streamstown
Caltragh Beg
Visitors Centre
Fortified House
Lynches Br
Ards
Ards Br
Lock
Fulacht Fia
Holnahinch
Holnahinch Br
Derryglogy Cross
Industrial Railway
Royal Canal
An Chanáil Ríoga
Fallan River
Beagnagh Br
Lehery Br
Cloonturk Br
Knockanboy Br
Footbridge
Church
Priory
Megalithic Tomb
Graveyard
Holy Well
Barrow
Island Br
Island
Visitors Centre
Fortified House
Church

2.2 Hinterland Surveys

The methodology used for wetland sites during hinterland surveys followed I-WeBS (Irish Wetland Bird Survey) methodology (Lewis *et al*, 2019), whereby each location was surveyed for the duration necessary to identify and obtain a count for all target species present. The same approach was adapted for non-wetland sites. A hinterland survey for raptors was conducted in accordance with Hardey *et al*. (2013) to assess hen harrier and other raptor activity over the winter and breeding periods in the greater surroundings.

The surveys were carried out in suitable woodland and wetland habitats in the area surrounding the proposed wind farm site. This comprised of 25 sites within 10 km from the proposed wind farm site. These sites were chosen as they had suitable habitat for the following target species: raptors, waders, waterfowl and barn owl. Surveys were carried out between April and September 2021. The sites detailed in Table 2.2 were checked regularly across this period:

Table 2.1: Hinterland survey locations

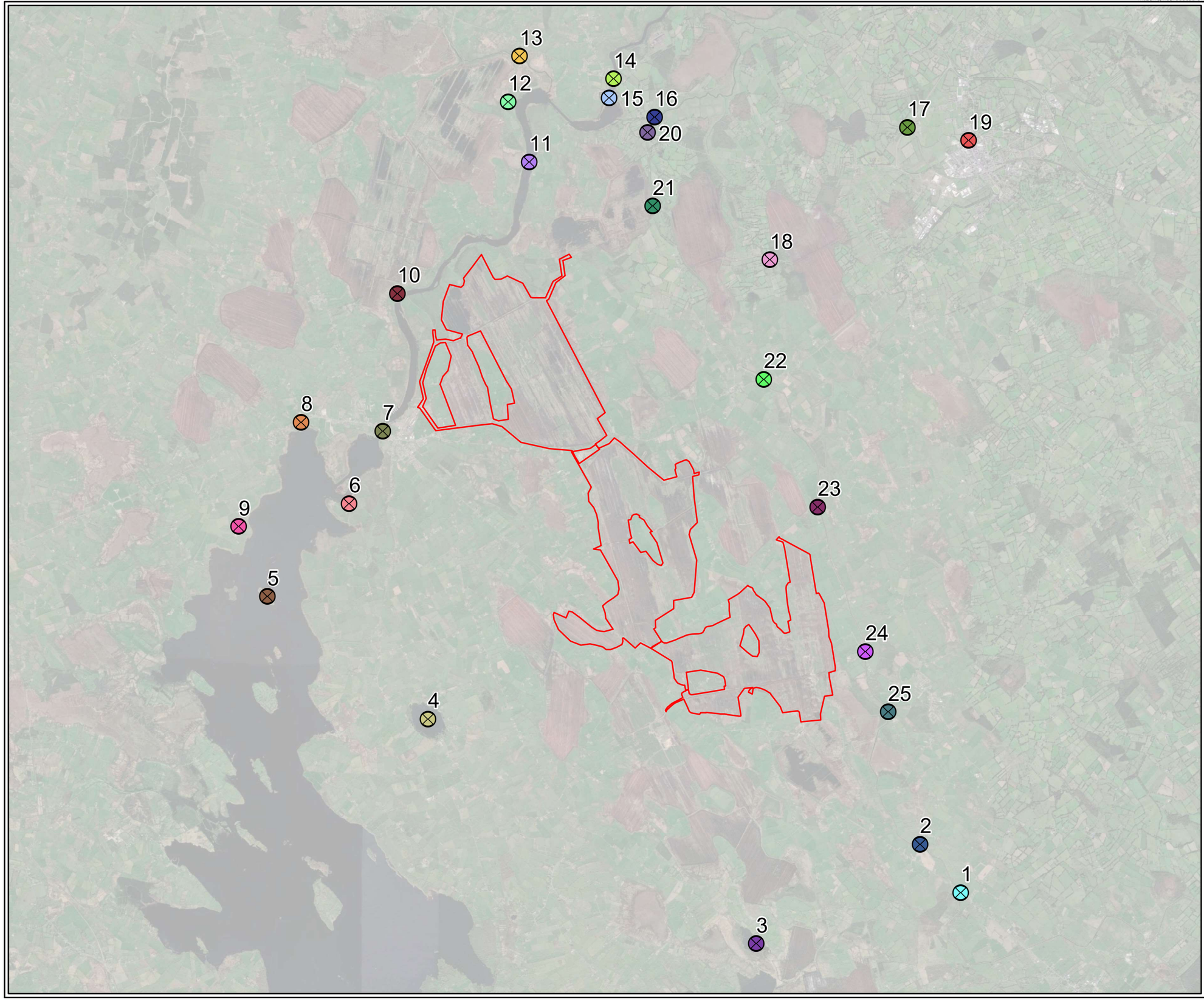
Code	Location	ITM Coordinates		Dates Visited
		Easting	Northing	
HVP1	*Pake Bridge, Royal Canal*	612898.185	759486.712	12/06/2021, 17/07/2021, 05/08/2021, 14/08/2021, 09/09/2021
HVP2	*Foygh Bridge, Royal Canal*	612023.763	760522.067	12/05/2021, 12/06/2021, 17/07/2021, 05/08/2021, 09/09/2021
HVP3	*Derrymacar Lough*	608506.111	758389.783	12/05/2021, 12/06/2021,
HVP4	*Fortwilliam Turlough*	601465.614	763206.551	12/05/2021, 12/06/2021, 17/07/2021, 05/08/2021, 14/08/2021, 09/09/2021
HVP5	*Incharmadermot Island, Lough Ree*	598015.731	765839.47	12/05/2021, 12/06/2021, 17/07/2021, 05/08/2021, 14/08/2021, 09/09/2021
HVP6	*Cureen, Lough Ree*	599770.446	767832.499	12/05/2021, 12/06/2021, 17/07/2021, 05/08/2021,

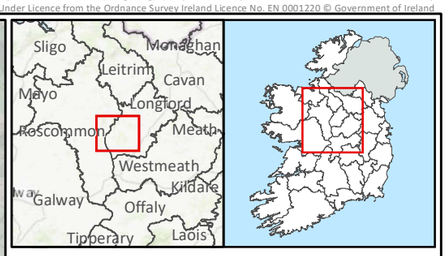
Code	Location	ITM Coordinates		Dates Visited
		Easting	Northing	
				14/08/2021, 09/09/2021
HVP7	*Lanesborough Bridge, Lough Ree*	600495.231	769387.084	12/05/2021, 12/06/2021, 17/07/2021, 14/08/2021, 09/09/2021
HVP8	*Cullaghy, Lough Ree*	598739.475	769573.953	14/05/2021, 12/06/2021, 17/07/2021, 5/08/2021, 14/08/2021, 09/09/2021
HVP9	*Gardenstown, Lough Ree*	597396.711	767345.703	14/05/2021, 12/06/2021, 17/07/2021, 5/08/2021, 14/08/2021, 09/09/2021
HVP10	*Cloonmustra, River Shannon*	600807.323	772340.698	12/05/2021, 12/06/2021, 17/07/2021, 5/08/2021, 14/08/2021, 9/09/2021
HVP11	*Erra & Derryhanee, River Shannon*	603635.518	7.944911	13/05/2021, 11/06/2021, 17/07/2021, 5/08/2021, 14/08/2021, 9/09/2021
HVP12	*Derrycashel, River Shannon*	603185.029	776452.94	13/05/2021, 11/06/2021, 17/07/2021, 5/08/2021, 14/08/2021, 9/09/2021
HVP13	*Feorish River*	603428.885	777430.82	13/05/2021, 11/06/2021, 17/07/2021, 9/09/2021
HVP14	*Tarmonbarry Bridge*	605449.722	776948.108	13/05/2021, 11/06/2021, 17/07/2021, 5/08/2021, 14/08/2021, 9/09/2021

Code	Location	ITM Coordinates		Dates Visited
		Easting	Northing	
HVP15	*Tarmonbarry Lock*	605352.886	776538.819	13/05/2021, 11/06/2021, 17/07/2021, 5/08/2021, 14/08/2021, 9/09/2021
HVP16	*Camlin River Complex*	606330.588, -	776126.409	13/05/2021, 11/06/2021, 17/07/2021, 9/09/2021
HVP17	*N5 Bridge over Camlin Park*	611752.094	775901.951	13/05/2021, 11/06/2021, 17/07/2021, 14/08/2021
HVP18	*Fallan Bridge*	608801.086	773065.52	14/05/2021, 11/06/2021, 14/07/2021, 5/08/2021
HVP19	*Richmond Bridge*	613068.179	775627.344	14/05/2021, 11/06/2021, 14/07/2021, 9/09/2021
HVP20	*Cloondara, Royal Canal*	606176.505	775790.583	14/05/2021, 11/06/2021, 14/07/2021, 5/08/2021
HVP21	*Begnagh Bridge, Royal Canal*	606287.094	774216.229	14/05/2021, 11/06/2021, 14/07/2021
HVP22	*Aghnaskea Bridge, Royal Canal*	608672.728	770495.836	14/05/2021, 11/06/2021, 14/07/2021, 14/08/2021, 9/09/2021
HVP23	*Lyneen Bridge, Royal Canal*	609831.385	767761.094	14/05/2021, 11/06/2021, 14/07/2021
HVP24	*Coolnahinch Bridge, Royal Canal*	610855.924	764658.67	14/05/2021, 11/06/2021, 14/07/2021
HVP25	*Island Bridge, Royal Canal*	611337.847	763361.965	14/05/2021, 11/06/2021, 14/07/2021, 05/08/2021

Path: R:\Map Production\2021\P21-119\workspace\Flightlines\P20-113_GIS_Flightlines_DerryaddWindFarm_A3.mxd

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Legend

Site Boundary

ID, Location

1, Park Bridge Royal Canal
2, Foygh Bridge Royal Canal
3, Derrymacar Lough
4, Fortwilliam Turlough
5, Incharmadermot Island Lough Ree
6, Cureen Lough Ree
7, Lanesborough Bridge Lough Ree
8, Cullaghy Lough Ree
9, Gardenstown Lough Ree
10, Cloonmustra River Shannon
11, Erra & Derryhanee River Shannon
12, Derrycashe River Shannon
13, Feorish River
14, Tarmonbarry Bridge
15, Tarmonbarry Lock
16, Camlin River Complex
17, N5 Bridge over Camplin Park
18, Fallan Bridge
19, Richmond Bridge
20, Cloondara Royal Canal
21, Begnagh Bridge Royal Canal
22, Aghnaskea Bridge Royal Canal
23, Lyneen Bridge Royal Canal
24, Coolnahinch Bridge Royal Canal
25, Island Bridge Royal Canal

TITLE:	Hinterland Sites		
PROJECT:	Derryadd, Co. Longford		
FIGURE NO:	2-2		
CLIENT:	Bord na Móna		
SCALE:	1:80000	**REVISION:**	0
DATE:	05/01/2022	**PAGE SIZE:**	A3

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2.3 Breeding Waders Survey

Survey transects to assess the presence of breeding wader populations were completed during the months of May and June 2021. A number of methods were combined from published literature including Bibby *et al*, (2000), Gilbert *et al*, (1998), O'Brien & Wilson (2011) and SNH (2017) to estimate numbers of target species breeding within this envelope.

Methods utilised were grouped into two categories; those for breeding lapwing *Vanellus vanellus* and those for other species such as curlew *Numenius arquata*, common snipe *Gallinago gallinago*, redshank *Tringa totanus*, woodcock *Scolopax rusticola*, common sandpiper *Actitis hypoleucos* and ringed plover *Charadrius hiaticula*. For each species, a pre-defined matrix of suitable habitats was created and used to select target habitats for survey (Table 2.3).

Table 2.2: Target Species and Associated Suitable Breeding Habitat

Target Species	Suitable Breeding Habitat
Lapwing	Lowland wet grassland, arable farmland, cutover bog with pools and wet grassland
Snipe	Wet pastures, marsh, bogs (intact and cutover) and fens
Redshank	Bog
Curlew	Bog
Common Sandpiper	Streams/rivers in bog
Woodcock	Woodland, bog woodland
Ringed Plover	Cutover bog, milled peat with exposed gravel

Survey methods for lapwing followed those in Bibby *et al*. (2000) where the primary count unit for breeding birds is defined as an incubating female. In addition, displaying birds, birds standing guard near nests or distraction displays were also recorded as indications of occupied territories. Extensive areas of open ground were covered from roads, farm tracks or roadsides (where possible); larger areas of open ground not visible from easily accessible vantage points were walked using transects.

Surveys were carried out during the time periods recommended in Bibby *et al*. (2000) although territorial behaviour noted outside these periods was also utilised in the assessment. For all additional species of wader, the employed method was the same and utilised transects walked through suitable habitat within three hours of dawn or dusk. Count units (Table 2.4) were predefined for each target species and included in the method statement provided to surveyors.

Table 2.3: Count units for each wading species

Species	Count Unit
Lapwing	Incubating Bird
Common Snipe	Drumming or Chipping Bird
Redshank	Alarming Bird
Woodcock	Displaying Male
Ringed Plover	Presence or Absence/ Fledged Young late in season
Common Sandpiper	Presence or Absence/ Fledged young late in season
Curlew	Territorial Activity

All suitable habitats for waders were visited, during the months of May and June 2021. Observations from each visit were annotated onto maps (locations of territories or breeding attempts) and a final, summary map produced at the end of the survey season using ARCMAP 10.4.1. Breeding wader summary sheets were also compiled at the end of the breeding season, indicating in each case the minimum number of breeding pairs/occupied territories known to occur.

All species encountered (seen or heard) were recorded and their abundance, behaviour, sex/age and breeding status noted. Any species occurring more than 100 m from the observer, or flying over the site and not using it, were recorded as 'additional' species to further inform the baseline survey. Table 2.5 details the survey dates and weather conditions.

Table 2.4: Breeding waders survey details

Date	Cloud (Okta)	Precipitation	Visibility	Wind
21/05/2021	7/8	Very light showers	Very good	F1
19/05/2021	6/8	Dry	Very good	F1
01/06/2021	7/8	Dry	Very good	F1
03/06/2021	6/8	Dry	Very good	F1
16/06/2021	7/8	Dry	Very good	F1
17/06/2021	8/8	Dry	Very good	F1

2.4 Breeding Bird Surveys

For general breeding birds the method utilised was based on the existing British Trust for Ornithology (BTO) Breeding Bird Survey (BBS or CBS; Bibby *et al*. 2000). The study area for this survey comprised a total of 21 no. c. 1 km transects which were selected and centred on different habitats present within the subject sites (See Table 2-5). Birds were counted over two visits, each timed to coincide with the early part of the breeding season (April to mid-May 2021) and later part of the season (mid-May to late June 2021) with visits at least four weeks apart. Surveyors recorded all birds seen or heard as they walked methodically along the transect routes.

Birds were noted in three distance categories, measured at right angles to the transect line (within 25 m, between 25 m-100 m and over 100 m from the transect line) and those seen in flight only. Recording birds in distance bands gives a measure of bird detectability and allows relative population densities to be estimated if required (BTO, 2018).

SNH guidance on recommended bird survey methods to inform impact assessment of onshore wind farms states:

> *"Surveys of farmland passerines especially on more intensive arable habitat are generally not required"* (SNH, 2017).

The summer breeding bird transect schedule is detailed in Table 2.6, with further details including weather and survey times indicated in Appendix 5.

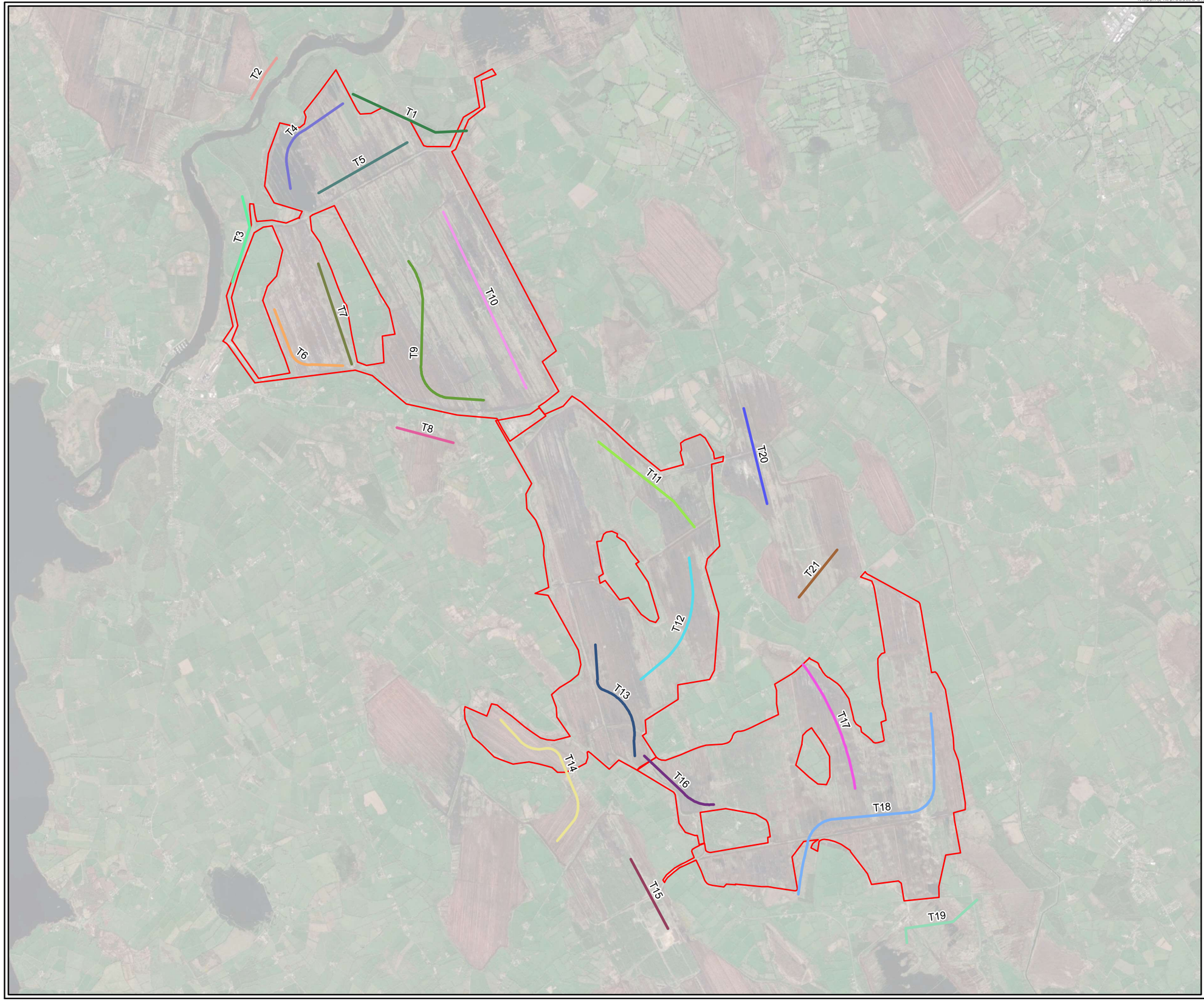
Table 2.5: Breeding bird summer transect survey details

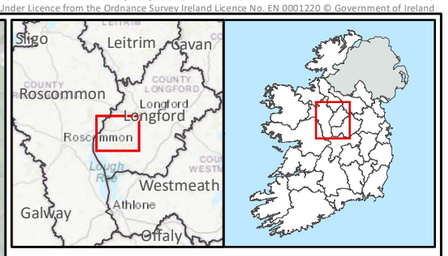
Transect	Month	
	May	June
1	12/05/2021	11/06/2021
2	13/05/2021	13/06/2021
3	12/05/2021	11/06/2021
4	12/05/2021	11/06/2021
5	12/05/2021	11/06/2021
6	12/05/2021	11/06/2021
7	12/05/2021	11/06/2021
8	12/05/2021	11/06/2021
9	12/05/2021	11/06/2021
10	12/05/2021	11/06/2021
11	14/05/2021	12/06/2021
12	14/05/2021	12/06/2021

Transect	Month	
	May	June
13	13/05/2021	12/06/2021
14	13/05/2021	12/06/2021
15	13/05/2021	12/06/2021
16	13/05/2021	12/06/2021
17	13/05/2021	13/06/2021
18	14/05/2021	13/06/2021
19	14/05/2021	13/06/2021
20	14/05/2021	13/06/2021
21	14/05/2021	13/06/2021

Path: R:\Map Production\2021\P21-119\workspace\Flightlines\P20-119_GIS_Hinterland_A3.mxd

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Legend

Site Boundary

Transect

- T1
- T2
- T3
- T4
- T5
- T6
- T7
- T8
- T9
- T10
- T11
- T12
- T13
- T14
- T15
- T16
- T17
- T18
- T19
- T20
- T21

TITLE: Bird Survey Transects			
PROJECT: Derryadd, Co. Longford			
FIGURE NO:	2-3		
CLIENT:	Bord na Móna		
SCALE:	1:45000	**REVISION:**	0
DATE:	05/01/2022	**PAGE SIZE:**	A3

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2.5 Barn Owl Surveys

The barn owl survey focused on visiting all old structures within 2km of the site with potential suitability for barn owls. The surveyor also remained vigilant for barn owl activity when travelling to/from and between the survey sites. Enquiries were also made with local birdwatchers to confirm any nest sites in the area.

The TII guidance document 'Survey and Mitigation Standards for Barn Owls to inform the Planning, Instruction and Operation of National Road Projects' (TII, 2021) was considered in determining Barn Owl survey Methodology; however, the methodology selected aligned with Shawyer (2012) 'Barn Owl *Tyto alba* Survey Methodology and Techniques for use in Ecological Assessment'.

3. RESULTS

3.1 Avian usage of the Study Area – Vantage point

A total of two timed watches of three hours duration each were carried out at each of the 11 vantage points on a monthly basis from April 2021 to September 2021 inclusive. This surveying effort totals 36 hours of observation time at each VP over the survey period (Appendix 2). Bird activity was recorded from the VPs during each survey. Table 3-1 shows all the species recorded during surveys. In total there were 1,187 individual flight lines of 21 target species observed during the survey period.

In total, 60 species of bird were noted. Of these species, eight are of Red-list status under the BoCCI (Gilbert *et al*., 2021): black-tailed godwit, curlew, grey wagtail, kestrel, lapwing, meadow pipit, snipe and swift. A total of 18 are Amber-listed and the remaining 34 are Green-listed. Of the species noted, four are protected under Annex I of the EU Birds Directive: common tern, kingfisher, little egret and peregrine. Table 3.1 details the conservation status of all 60 species.

3.1.1 Summary Results Summer 2021

Target species observed during this survey period at Derryadd were black-headed gull, black-tailed godwit, buzzard, common gull, common tern, cormorant, curlew, grey heron, kestrel, lapwing, lesser black-backed gull, little egret, mallard, moorhen, mute swan, peregrine, snipe, sparrowhawk, teal, whimbrel and wigeon.

Table 3.1 Bird species recorded during VP surveys 2021[2]

Common name (BTO code)	Scientific name	*BoCCI status	**Annex I status
Blackcap	*Sylvia atricapilla*	Green	No
Black-headed Gull	*Chroicocephalus ridibundus*	Amber	No
Black-tailed Godwit	*Limosa limosa*	Red	No
Blue Tit	*Cyanistes caeruleus*	Green	No
Bullfinch	*Pyrrhula pyrrhula*	Green	No
Buzzard	*Buteo buteo*	Green	No
Chaffinch	*Fringilla coelebs*	Green	No
Chiffchaff	*Phylloscopus collybita*	Green	No
Common Gull	*Larus canus*	Amber	No
Common Tern	*Sterna hirundo*	Amber	**Yes**
Cormorant	*Phalacrocorax carbo*	Amber	No
Cuckoo	*Cuculus canorus*	Green	No
Curlew	*Numenius arquata*	Red	No
Dunnock	*Prunella modularis*	Green	No
Goldcrest	*Regulus regulus*	Amber	No
Goldfinch	*Carduelis carduelis*	Green	No
Great Tit	*Parus major*	Green	No
Green Sandpiper	*Tringa ochropus*	Green	No
Grey Heron	*Ardea cinerea*	Green	No
Grey Wagtail	*Motacilla cinerea*	Red	No
Hooded Crow	*Corvus cornix*	Green	No
House Martin	*Delichon urbicum*	Amber	No
Jackdaw	*Corvus monedula*	Green	No
Kestrel	*Falco tinnunculus*	Red	No
Kingfisher	*Alcedo atthis*	Amber	**Yes**
Lapwing	*Vanellus vanellus*	Red	No
Lesser Black-backed Gull	*Larus fuscus*	Amber	No
Lesser Redpoll	*Carduelis cabaret*	Green	No
Linnet	*Carduelis cannabina*	Amber	No
Little Egret	*Egretta garzetta*	Green	**Yes**
Little Grebe	*Tachybaptus ruficollis*	Green	No
Long-tailed Tit	*Aegithalos caudatus*	Green	No
Mallard	*Anas platyrhynchos*	Amber	No
Meadow Pipit	*Anthus pratensis*	Red	No
Mistle Thrush	*Turdus viscivorus*	Green	No
Moorhen	*Gallinula chloropus*	Green	No
Mute Swan	*Cygnus olor*	Amber	No
Peregrine	*Falco peregrinus*	Green	**Yes**

[2] Colours refer to the conservation status of the species according to Birds of Conservation Concern in Ireland.

Common name (BTO code)	Scientific name	*BoCCI status	**Annex I status
Pheasant	*Phasianus colchicus*	Green	No
Raven	*Corvus corax*	Green	No
Reed Bunting	*Emberiza schoeniclus*	Green	No
Robin	*Erithacus rubecula*	Green	No
Sand Martin	*Riparia riparia*	Amber	No
Siskin	*Carduelis spinus*	Green	No
Snipe	*Gallinago gallinago*	Red	No
Sparrowhawk	*Accipiter nisus*	Green	No
Spotted Flycatcher	*Muscicapa striata*	Amber	No
Starling	*Sturnus vulgaris*	Amber	No
Stonechat	*Saxicola torquatus*	Green	No
Swallow	*Hirundo rustica*	Amber	No
Swift	*Apus apus*	Red	No
Teal	*Anas crecca*	Amber	No
Treecreeper	*Certhia familiaris*	Green	No
Water Rail	*Rallus aquaticus*	Green	No
Whimbrel	*Numenius phaeopus*	Green	No
Whitethroat	*Sylvia communis*	Green	No
Wigeon	*Anas penelope*	Amber	No
Willow Warbler	*Phylloscopus trochilus*	Amber	No
Woodpigeon	*Columba palumbus*	Green	No
Wren	*Troglodytes troglodytes*	Green	No

* Refers to the conservation status of the species according to Birds of Conservation Concern in Ireland

**refers to species listed on Annex I of the EU Birds Directive.

3.2 Target species observations during VP surveys

3.2.1 Black-Headed Gull

The Amber-listed black-headed gull was recorded 71 times during the summer VP surveys. This species was observed 22 times in May, 28 times in June, 20 times in July and once in September, and was observed at all 11 VP locations. This species was recorded in all height bands, with the exception of >185m. Quantities observed ranged from a minimum of one to a maximum of 51. The average quantity of black-headed gulls observed was five birds.

3.2.2 Black-Tailed Godwit

Black-tailed godwit, a Red listed species was recorded once, at VP2 on the 29th of April 2021. A total of five birds were recorded during this observation. This group flew at a height of 30-50m for 109 seconds.

3.2.3 Buzzard

Green-listed buzzard was observed on 281 occasions. Observations were distributed across all VPs and months. Buzzard was observed flying through all height bands, most frequently at the 30-50m band. Observations were usually of individual birds, but up to five individuals were recorded on occasion.

3.2.4 Common Gull

Common gull, an Amber-listed Species, was observed once from VP2 on the 29th of April 2021. This observation was of a single bird flying in the 50-185m height band.

3.2.5 Common tern

Common tern, an Amber-listed, Annex I species was recorded twice during the summer survey period, on the 7th of July 2021. Both observations were of a single individual, observed flying in the 0-30m height band at VP2. Common tern may breed on inland lakes, and breeding may occur in this area. However, no evidence of breeding onsite was recorded.

3.2.6 Cormorant

The Amber-listed cormorant was observed on 67 occasions. Observations occurred in all months. Cormorant was observed at VPs 1, 2, 3, 4, 5, 6, 8, and 11. This species was observed flying at all height bands, but most frequently at 50-185m. Activity of cormorants was concentrated along the River Shannon and to the northern part of the proposed site.

3.2.7 Curlew

Red-listed Curlew was observed four times, flying in the 50-185m height band on all occasions. At VP1, individual curlews were observed on 18th August and 6th September. A single individual flew through VP4 with four whimbrel on the 13th of August 2021. A single individual was also observed at VP6 on the 19th of August 2021. No evidence was noted of curlew breeding on site.

3.2.8 Grey Heron

The Green-listed Grey Heron was observed 94 times during the summer surveys. Observations of this species were made during all surveyed months. This species generally flew at the 0-30m height band and was observed at higher bands on 18 occasions. This species was observed at all VP locations. Observations were generally of single birds, but two individuals were noted on four occasions and three individuals on another occasion.

3.2.9 Kestrel

Kestrel (Red-listed) was observed 91 times during the summer survey period. This species was observed at all VPs except for VP1. Kestrel was observed in all months except April. Observations were made at all height bands, most frequently between 30-50m, and least frequently above 185m. Generally, only one bird was noted per observation, but two to three birds were occasionally observed.

3.2.10 Lapwing

A total of 28 observations were made of Red-listed lapwing at VP1, VP3, VP4, VP5, VP6 and VP10. Lapwing were recorded in all months except April, and only single observations were made in both August and September. This species most frequently flew at the lower height band (0-30m) and was not observed flying above 185m. An average of five birds were recorded during each observation, ranging from one individual to a flock of 63 birds. The majority of flight activity was concentrated over the bog at the north of the site.

3.2.11 Lesser Black-Backed Gull

Amber-listed lesser black-backed gull was the most frequently recorded species, with 355 flightlines mapped across all VPs. 6 observations across all VPs This species was observed in all months except April. Most observations were in July and August (116 and 111 respectively) with fewer in May, June and September (73, 46 and 8 observations respectively). The number of individuals observed ranged from one to 74, with an average of four birds per observation.

3.2.12 Little Egret

A total of 61 observations of Green-listed/Annex I little egret were recorded. This species was recorded from all VPs except VP11. Observations were made in all months but were most frequent in May (30 observations). This species was most frequently observed flying within the 0-30m height band and was not observed flying above 185m. The numbers of individuals per observation ranged from one to twelve, but most frequently a single bird was observed.

3.2.13 Mallard

Amber-listed mallard was recorded on 51 occasions. It was observed at VP1, VP2, VP3, VP4, VP5, VP9 and VP11 and observations occurred during all months surveyed. Mallard was observed flying most frequently between 0-30m and was not observed above 185m. The numbers of individuals recorded ranged from one to eight, with an average of two per observation.

3.2.14 Moorhen

A single observation of two Green-listed moorhen was made from VP2 on 29th of April 2021. These individuals were observed flying for 11 seconds within the 0-30m height band.

3.2.15 Mute Swan

Mute swan (Amber-listed) was recorded five times. Four of these observations were from VP1 (May, June and August), each of one individual bird within the 0-30m height band. An observation from VP2 (29th of April 2021) recorded two birds flying in the 0-30m and 30-50m height bands. Mute swan activity did not occur on site, with all observed flightlines associated with the River Shannon.

3.2.16 Peregrine

Peregrine (Green-listed, Annex I) was observed three times during the summer VP surveys. On 5th of May a single individual was observed from VP4, flying in height bands 30-50m, 50-185m and >185m. On 1st June, a single individual was observed flying between 0-30m. The final observation was on the 6th of July, with a single individual observed flying in height bands 30-50m, 50-185m and >185m. Each of these observations occurred on the proposed site, with two observations involving birds circling over the site.

3.2.17 Snipe

Red-listed snipe was observed 23 times. This species was observed from VP1, VP3, VP4, VP5, VP6 and VP8. Observations were made in June, July and September. This species was recorded flying at height bands 0-30m, 30-50m and 50-185m. There were 18 observations of single individuals, and five observations of two individuals.

3.2.18 Sparrowhawk

Sparrowhawk (Green-listed) was observed 38 times during the summer survey season. This species was observed from all VPs except VP8. Observations of sparrowhawk were made in all months. Sparrowhawk was observed in all height bands, but most frequently between 0-30m. The number of individuals per observation ranged from one to three, with a one individual per sighting being the most frequent.

3.2.19 Teal

Amber-listed teal was observed twice during VP surveys. The first observation occurred from VP3 on the 4th of May. On this occasion, one female was observed flying for 23 seconds in the 0-30m height band. The second observation occurred from VP1 on the 6th of July. On this occasion, four birds were observed flying for 119s in the 50-185m height band.

3.2.20 Whimbrel

Whimbrel, a Green-listed species was observed four times flying at the 50-185m height band on all occasions. Two observations were made in May, from VP4 and VP8, of 41 and 147 individuals respectively. From VP4, on the 13th of August, 4 individuals were recorded. Finally, on the 6th of September three individuals (one flightline) was made from VP8. Whimbrel is a passage migrant, moving through Ireland to Iceland from the African continent via Europe in spring and back again in autumn.

3.2.21 Wigeon

Two observations were made of wigeon (Amber-listed) from VP1. The first observation occurred on 6th May, with one male observed flying along a drain at a height of 0-30m for seven seconds. The second observation, again of a male, occurred on the 1st of June for 10 seconds at a height of 0-30m. Wigeon are considered to breed in Ireland in small numbers (< 10 pairs).

3.3 Hinterland Survey

Hinterland surveys to establish breeding occupancy within a 10 km radius of the site were carried out over ten dates across summer 2021. The survey schedule and locations of the Hinterland watches are shown in Table 2-1.

For site-specific Hinterland survey results see Appendix 4 of this report.

A total of three Annex I species were recorded during hinterland surveys: common tern, kingfisher, and little egret. A total of five Red-listed species were observed: grey wagtail, lapwing, oystercatcher, pochard and snipe. A further 16 Amber-listed species were observed: common tern, kingfisher, black-headed gull, common gull, common sandpiper, coot, cormorant, gadwall, great crested grebe, lesser black-backed gull, mallard, mute swan, greylag goose, teal, tufted duck and wigeon. All observed species, including green listed species are included in Table 3-2.

For site-specific Hinterland survey results see Appendix 4 of this report.

Species of conservation concern that are known to be potentially vulnerable to wind farm developments will be discussed in more detail in this section. Species have been selected for detailed discussion based on conservation status, vulnerability to wind farm developments and if species sightings have been confirmed on or near the proposed Wind Farm site, which will indicate potential links between species recorded at the proposed site and the surrounding environment.

3.3.1 Black-Headed Gull

This Amber-listed species was seen 35 times during hinterland surveys, with observations made during all survey months. Observations were made from the following hinterland vantage points (HVPs): HVP4 (Fortwilliam Turlough, 3.4km west), HVP5 (Incharmadermot Island, Lough Ree, 5.1km west), HVP6 (Cureen, Lough Ree, 2.4km west), HVP7 (Lanesborough Bridge, Lough Ree, 0.9 km west), HVP8 (Cullaghy, Lough Ree, 2.5km west), HVP9 (Gardenstown, Lough Ree, 4.6km west), HVP11 (Erra & Derryhanee, River Shannon, 2.2km north), , HVP10 (Cloonmustra, River Shannon, 1km north-west), HVP 11 (Erra and Derryhanee, River Shannon, 2.2km north), HVP12 (Derrycashel, River Shannon, 3.3km north), HVP15 (Tarmonbarry Lock, 3.5km north), HVP16 (Camlin River Complex, 3.5km north), and HVP20 (Cloondara, Royal Canal, 3.1km north). These HVPs are to the west, north and northeast of the proposed site, in the vicinity of Lough Ree and the River Shannon. The quantity of birds counted in these observations ranged from one to 290, with an average of 22.

3.3.2 Buzzard

Buzzard (Green-listed) was observed on eight occasions during the hinterland surveys. In May 2021, buzzard was observed from HVP21 (Begnagh Bridge, Royal Canal), c. 2.1 km north of the site. Buzzard was observed in June from HVP13 (Feorish River, 3.4km north) and HVP18 (Fallan Bridge, 4.3km north-east), in July from HVP4 (Fortwilliam Turlough, 3.4 km west), in August from HVP18 (Fallan Bridge, 4.3km north-east), HVP6 (Cureen, Lough Ree 2.4 km west) and HVP8 (Cullaghy, Lough Ree, 0.9km west), and again in September from HVP4. All observations were of individuals, except for the sighting at HVP4 on the 17th of July, where six buzzards were seen together.

3.3.3 Common Gull

There were six observations of common gull (Amber-listed) through the hinterland surveys. In May, this species was observed at HVP6 (Incharmadermot Island, Lough Ree, 5.1km W), HVP8 (Cullaghy, Lough Ree, 0.9km west) and HVP12 (Derrycashel, River Shannon, 3.3km north). In July, common gull was observed at HVP9 (Gardenstown, Lough Ree, 4.6km west) and HVP14 (Tarmonbarry Bridge, 3.9km north). Common gull was also observed at HVP9 in August. The quantity of this species observed ranged from one to nine.

3.3.4 Common Sandpiper

One observation was noted of a single common sandpiper (Amber-listed species). This record occurred on 14th August 2021 from HVP8 (Cullagh, Lough Ree, 0.9km north), located 2.5km to the west of the proposed site.

3.3.5 Common Tern

Common tern (Amber-listed, Annex I) was observed on four occasions. In May and June, two individuals were observed on each occasion from HVP5 (Incharmadermot Island, Lough Ree, 5.1km west). In June and July, individuals were observed from HVP8 (Cullaghy, Lough Ree, 2.5km west) and HVP9 (Gardenstown, Lough Ree, 4.6km west) respectively. These HVPs all surround Lough Ree SPA (004064), which is a protected site for common tern.

3.3.6 Curlew

Curlew (Red-listed) was observed on one occasion during the hinterland surveys. On the 9th of September 2021, two curlew were observed from HVP8 (Cullaghy, Lough Ree SPA (004064).

3.3.7 Common Coot

Coot (Amber-listed) was observed 16 times during the hinterland surveys. Quantities ranged from 2 to 20, averaging 16 individuals. Observations of coot occurred from May to September, and were recorded from HVP4 (Fortwilliam Turlough, 3.4km W), HVP5 (Incharmadermot Island, Lough Ree, 5.1km west), HVP8 (Cullaghy, Lough Ree, 2.5km west), and HVP9 (Gardenstown, Lough Ree, 4.6km west). These Hinterland Vantage Points (HVPs) all surround Lough Ree SPA (004064), which is a protected site for coot

3.3.8 Cormorant

Cormorant (Amber-listed) were recorded 22 times during the hinterland surveys, with groups ranging from 24 to 114 individuals, noted especially from HVP5 (Incharmadermot Island, Lough Ree, 5.1 km west). Smaller groups and individual birds were more frequently recorded. This species was observed during all survey months. Sighting occurred at the following hinterland vantage points: HVP5, HVP6 (Cureen, Lough Ree, 2.4km west), HVP7 (Lanesborough Bridge, Lough Ree, 0.9km west), HVP8 (Cullaghy, Lough Ree, 2.5km west), HVP9 (Gardenstown, Lough Ree, 4.6 km west), HVP10 (Cloonmustra, River Shannon, 1km north-west), HVP11 (Erra and Derryhanee, River Shannon, 2.2km north), HVP12(Derrycash, River Shannon 3.3km north) and HVP15 (Tarmonbarry Lock, 3.5km north). These hinterland sites are in the vicinity
of either Lough Ree or the River Shannon

3.3.9 Gadwall

Amber-listed gadwall was observed on five occasions. In May (2 birds), June (1 bird) and July (2 birds) were observed at HVP 5 (Incharmadermot Island, Lough Ree, 5.1 km west). In July, 31 gadwall were observed at HVP8 (Cullaghy, Lough Ree, 2.5km west). Additionally, eight gadwall were observed at HVP9 in July 2021.

3.3.10 Great Black-Backed Gull

One observation of great black-backed gull (Green-listed) was made from HVP8 (Cullaghy, Lough Ree, 2.5km west) on the 9th of September. A single bird was observed.

3.3.11 Great Crested Grebe

Over the survey period, 20 observations were made of great-crested grebe. Sightings of this species occurred in all months and numbers per observation ranged from 1 to 12 (average = 5). These observations were made from HVP5 (Incharmadermot Island, Lough Ree, 5.1km west), HVP8 (Cullaghy, Lough Ree, 2.5km west), HVP9 (Gardenstown, Lough Ree, 4.6km west), HVP11 (Erra & Derryhanee, River Shannon, 2.2km north), and HVP12 (Derrycashel, River Shannon, 3.3km north).

3.3.12 Great White Egret

A single observation of great white egret was made on 13th May 2021. This observation occurred from HVP11 (Erra & Derryhanee, River Shannon, 2.2km north). The observed bird was a non-breeding bird with winter plumage.

3.3.13 Grey Heron

During hinterland surveys, grey heron (Green-listed) was observed 23 times. The observations occurred in all months. Observations of this species were made from HVP1 (Pake Bridge, Royal Canal, 4.8km south-east), HVP2 (Foygh Bridge, Royal Canal, 3.4km south-east), HVP4 (Fortwilliam Turlough, 3.4km west), HVP5 (Incharmadermot Island, Lough Ree, 5.1km west), HVP7 (Lanesborough Bridge, Lough Ree, 0.9 km west), HVP8 (Cullaghy, Lough Ree, 2.5km west), HVP9 (Gardenstown, Lough Ree, 4.6km west), HVP10 (Cloonmustra, River Shannon, 1km north-west), HVP11 (Erra & Derryhanee, River Shannon, 2.2km north), HVP12 (Derrycashel, River Shannon, 3.3km N), HVP15 (Tarmonbarry Lock, 3.5km N), HVP16 (Camlin River Complex, 3.5kmnorth), HVP19 (Richmond Bridge, 8.9km north-east) and HVP21 (Begnagh Bridge, Royal Canal, 2.1km north). The majority of observations (17) were of individuals, but groups of 2-9 were also observed.

3.3.14 Grey Wagtail

Red-listed grey wagtail was observed on 12 occasions during VP surveys. This species was sighted in all months (May to September). Quantities observed ranged from one to 3 (average=1.3). Sightings occurred at HVP1 (Pake Bridge, Royal Canal, 4.8km south-east), HVP7 (Lanesborough Bridge, Lough Ree, 0.9 km west), HVP8 (Cullaghy, Lough Ree, 2.5km west), HVP15 (Tarmonbarry Lock, 3.5km north), HVP16 (Camlin River Complex, 3.5km north), HVP19 (Richmond Bridge, 8.9km north-east), HVP20 (Cloondara, Royal Canal, 3.1km north), HVP23 (Lyneen Bridge, Royal Canal, 1km east) and HVP25 (Island Bridge, Royal Canal, 1.2km east).

3.3.15 Greylag Goose

On the 12th of May2021, two Amber-Listed greylag geese were observed from HVP5 (Incharmadermot Island, Lough Ree, 5.1km west).

3.3.16 Kingfisher

During the hinterland surveys, kingfisher (Amber-listed, Annex I) was observed on three occasions. A single individual was seen on each occasion. Sightings occurred in May, August and September from HVP8 (Cullaghy, Lough Ree, 2.5km west), HVP20 (Cloondara, Royal Canal, 3.1km north) and HVP2 (Foygh Bridge, Royal Canal, 3.4km south-east) respectively.

3.3.17 Lapwing

Overall, six sightings of Red-listed lapwing were made during the hinterland surveys. In May and July, single birds were observed at HVP12 (Derrycashel, River Shannon, 3.3km north) and HVP4 (Fortwilliam Turlough, 3.4km west). Groups ranging from 16 to 38 (mean=22) were observed from HVP8 (Cullaghy, Lough Ree, 2.5km west) during July, August and September. This Hinterland sites is at Lough Ree SPA (004064), which is a protected site for lapwing.

3.3.18 Lesser Black-Backed Gull

During the hinterland surveys, 44 observations were made of lesser black-backed gull (Amber-listed). Counts ranged from one individual to 1400 (mean=145). Sightings occurred during all surveyed months. Observations occurred at all HVP sites with the exception of HVP2 (Foygh Bridge, Royal Canal, 3.4km south-east), HVP3 (Derrymacar Lough, 4.9km south), HVP13 (Feorish River, 4.3km north), HVP16 (Camlin River Complex, 3.5km north), HVP10 (Cloonmustra, River Shannon, 1km north-west), HVP20 (Cloondara, Royal Canal, 3.1km north) and HVP24 (Coolnahinch Bridge, Royal Canal, 0.7km east).

3.3.19 Little Egret

Little egret (Green-listed, Annex I) was recorded 18 times. Observations occurred during all survey months from the following hinterland sites: HVP4 (Fortwilliam Turlough, 3.4km west), HVP5 (Incharmadermot Island, Lough Ree, 5.1km west), HVP6 (Cureen, Lough Ree, 2.4km west), HVP8 (Cullaghy, Lough Ree, 2.5km west), HVP9 (Gardenstown, Lough Ree, 4.6km west), HVP11 (Erra & Derryhanee, River Shannon, 2.2km north), and HVP15 (Tarmonbarry Lock, 3.5km north).

3.3.20 Little Grebe

Little grebe (Green-listed) was observed 8 times, in quantities of 2-12 (mean=5). This species was observed in May, August and September, and observations occurred from HVP4 (Fortwilliam Turlough, 3.4km west), HVP5 (Incharmadermot Island, Lough Ree, 5.1km west), HVP8 (Cullaghy, Lough Ree, 2.5km west), and HVP9 (Gardenstown, Lough Ree, 4.6km west). These hinterland sites are all in the vicinity of Lough Ree SPA, which lists little grebe as a Special Conservation Interest.

3.3.21 Mallard

Mallard (Amber-listed) was observed on 39 occasions. Sightings were made during all surveyed months. Mallard was observed from HVP1 (Pake Bridge, Royal Canal, 4.8km south-east), HVP2 (Foygh Bridge, Royal Canal, 3.4km SE), HVP4 (Fortwilliam Turlough, 3.4km west), HVP5 (Incharmadermot Island, Lough Ree, 5.1km west), HVP6 (Cureen, Lough Ree, 2.4km west), HVP7 (Lanesborough Bridge, Lough Ree, 0.9 km west), HVP8 (Cullaghy, Lough Ree, 2.5km west),HVP9 (Gardenstown, Lough Ree, 4.6km west), HVP10 (Cloonmustra, River Shannon, 1km north-west), HVP11 (Erra & Derryhanee, River Shannon, 2.2km north), HVP12 (Derrycashel, River Shannon, 3.3km north), HVP13 (Feorish River, 4.3km north), HVP15 (Tarmonbarry Lock, 3.5km north), and HVP20 (Cloondara, Royal Canal, 3.1km north). A number of these HVPs are located on the shores of Lough Ree SPA, which is designated for mallard. Counts of this species ranged from 1 to 44, with an average count of 7.5.

3.3.22 Moorhen

Moorhen (Green-listed) was observed 18 times, from June to September. Sightings occurred from HVP1 (Pake Bridge, Royal Canal, 4.8km south-east), HVP4 (Fortwilliam Turlough, 3.4km west), HVP5 (Incharmadermot Island, Lough Ree, 5.1km west), HVP8 (Cullaghy, Lough Ree, 2.5km west), HVP9 (Gardenstown, Lough Ree, 4.6km west), HVP 11 (Erra & Derryhanee, River Shannon, 2.2km north), HVP12 (Derrycashel, River Shannon, 3.3km north), and HVP15 (Tarmonbarry Lock, 3.5km north). Counts ranged from 1 to 10, with an average count of 2 birds per observation.

3.3.23 Mute Swan

Mute swan (Amber-listed) was the most frequently observed species, noted 49 times during the hinterland surveys. Observations occurred in all months and were evenly distributed across those months. Counts ranged from 1 to 66, with an average count of 11 per observation. Sightings occurred at the following HVPs: HVP3 (Derrymacar Lough, 4.9km south), HVP4 (Fortwilliam Turlough, 3.4km W), HVP5 (Incharmadermot Island, Lough Ree, 5.1km west), HVP6 (Cureen, Lough Ree, 2.4km west), HVP7 (Lanesborough Bridge, Lough Ree, 0.9 km west), HVP8 (Cullaghy, Lough Ree, 2.5km west), HVP9 (Gardenstown, Lough Ree, 4.6km west), HVP10 (Cloonmustra, River Shannon, 1km north west), HVP11 (Erra & Derryhanee, River Shannon, 2.2km N), HVP12 (Derrycashel, River Shannon, 3.3km north), HVP13 (Feorish River, 4.3km north), HVP14 (Tarmonbarry Bridge, 3.9km north) and HVP15 (Tarmonbarry Lock, 3.5km north). No sightings were observed from the southeast of the proposed wind farm.

3.3.24 Oystercatcher

A single observation of Red-listed oystercatcher was made from HVP8 (Cullaghy, Lough Ree, 2.5km west) on the 12th of June. This sighting involved a single individual.

3.3.25 Pink-footed Goose

A single observation of the Green-listed pink-footed goose was made from HVP8 (Cullaghy, Lough Ree, 2.5km west) on the 14th of May. This sighting involved a single individual.

3.3.26 Pochard

A single observation of the Red-Listed pochard was made from HVP8 (Cullaghy, Lough Ree, 2.5km west) on the 17th of July. This sighting involved a single individual.

3.3.27 Snipe

Snipe (Red-listed) was recorded on four occasions during the hinterland surveys. Each observation consisted of one individual. Two observations occurred from HVP4 (Fortwilliam Turlough, 3.4km west), on 12th June and 7th July. A sighting occurred from HVP 11 (Erra & Derryhanee, River Shannon, 2.2km north) on 13th May and from HVP 13 (Feorish River, 4.3km north) on the 9th of September.

3.3.28 Teal

Amber-listed teal was observed once from HVP8 (Cullaghy, Lough Ree, 2.5km west) on the 9th of September 2021. This HVP site is within the Lough Ree SPA, which lists teal as a Special Conservation Interest. A single bird was recorded on this occasion.

3.3.29 Tufted Duck

A total of 15 observations were made of the Amber-listed tufted duck. Observations were made at the following HVPs, which are in the vicinity of Lough Ree SPA, which is designated for tufted duck: HVP4 (Fortwilliam Turlough, 3.4km west), HVP5 (Incharmadermot Island, Lough Ree, 5.1km west), HVP8 (Cullaghy, Lough Ree, 2.5km west) and HVP9 (Gardenstown, Lough Ree, 4.6km west). Counts for this species ranged from 2 to 124 individuals, averaging at 21 birds. Observations occurred from May to August.

3.3.30 Water Rail

Green-listed water rail was observed six times. Four times from HVP4 (Fortwilliam Turlough, 3.4km west) and twice from HVP12 (Derrycashel, River Shannon, 3.3km north). Each observation consisted of a single individual, and observations occurred from July to September.

3.3.31 Whimbrel

Whimbrel (Green-listed) was observed twice, with each observation involving a single individual. The first observation was on the 13th of May from HVP12 (Derrycashel, River Shannon, 3.3km N). The second observation occurred the following day (14th of May) from HVP8 (Cullaghy, Lough Ree, 2.5km W). This species occurs as a passage migrant in Ireland.

3.3.32 Wigeon

There were two observations of single wigeon (Red-listed) during the hinterland surveys. The first observation was on the 6th of June from HVP4 (Fortwilliam Turlough, 3.4km west). The second observation occurred on the 14th of August from HVP5 (Incharmadermot Island, Lough Ree, 5.1km west). These hinterland vantage points are near or within Lough Ree SPA, which lists wigeon as a Special Conservation Interest.

Table 3.2: Bird species recorded during hinterland surveys in summer 2021[3]

Common Name	Scientific Name	Conservation Status	
		BoCCI*	Annex I**
Black-headed Gull	*Chroicocephalus ridibundus*	Amber	No
Buzzard	*Buteo buteo*	Green	No
Common Gull	*Larus canus*	Amber	No
Common Sandpiper	*Actitis hypoleucos*	Amber	No
Common Tern	*Sterna hirundo*	Amber	**Yes**
Coot	*Fulica atra*	Amber	No
Cormorant	*Phalacrocorax carbo*	Amber	No
Gadwall	*Anas strepera*	Amber	No
Great Black-backed Gull	*Larus marinus*	Green	No
Great Crested Grebe	*Podiceps cristatus*	Amber	No
Great White Egret	*Ardea alba*	Green	Yes
Grey Heron	*Ardea cinerea*	Green	No
Grey Wagtail	*Motacilla cinerea*	Red	No
Greylag Goose	*Anser anser*	Amber	No
Kingfisher	*Alcedo atthis*	Amber	**Yes**
Lapwing	*Vanellus vanellus*	Red	No
Lesser Black-backed Gull	*Larus fuscus*	Amber	No
Little Egret	*Egretta garzetta*	Green	**Yes**
Little Grebe	*Tachybaptus ruficollis*	Green	No
Mallard	*Anas platyrhynchos*	Amber	No
Moorhen	*Gallinula chloropus*	Green	No
Mute Swan	*Cygnus olor*	Amber	No
Oystercatcher	*Haematopus ostralegus*	Red	No
Pink-footed Goose	*Anser brachyrhynchus*	Green	No
Pochard	*Aythya ferina*	Red	No
Snipe	*Gallinago gallinago*	Red	No
Teal	*Anas crecca*	Amber	No
Tufted Duck	*Aythya fuligula*	Amber	No
Water Rail	*Rallus aquaticus*	Green	No
Whimbrel	*Numenius phaeopus*	Green	No
Wigeon	*Anas penelope*	Amber	No

* refers to the conservation status of the species according to Birds of Conservation Concern in Ireland

**refers to species listed on Annex I of the EU Birds Directive

[3] Colours refers to the conservation status of the species according to Birds of Conservation Concern in Ireland. Species in bold refers to species listed on Annex I of the EU Birds Directive.

3.4 Breeding Waders Survey

A total of four wader species were observed during the Breeding Waders survey, with all observed waders detailed in Table 3.3. Of the observed wading species, three are Red-listed (lapwing, snipe and woodcock). The remaining species, ringed plover, is Amber-listed. Details of their breeding status are included under the subheadings below.

Other species were also recorded during the breeding wader survey. Amber-listed lesser black-backed gull and mallard were observed. Additionally, the following Green-listed species were noted: long-eared owl, little egret and grey heron. Long eared owl was not observed in the other surveys.

Table 3.3: Bird species recorded during breeding wader surveys in summer 2021 [4]

Common Name	Scientific Name	Conservation Status	
		BoCCI*	Annex I**
Lapwing	*Vanellus vanellus*	Red	No
Ringed Plover	*Charadrius hiaticula*	Amber	No
Snipe	*Gallinago gallinago*	Red	No
Woodcock	*Scolopax rusticola*	Red	No

* refers to the conservation status of the species according to Birds of Conservation Concern in Ireland

**refers to species listed on Annex I of the EU Birds Directive

3.4.1 Lapwing

Observations of breeding lapwing (occupied territory) occurred on 12 occasions between May and June 2021 (separate observations to the VP surveys) Quantities ranged from two to 14 lapwing. Confirmed breeding was noted twice. On 16th May, an adult was observed with recently fledged young. On the 17th of May, within a group of 14 lapwing, adults were observed with at least two recently fledged young. Lapwing breeding activity was concentrated on peat bog in the north of the site.

3.4.2 Ringed Plover

Occupied territories for breeding ringed plover were noted eight times during May and June 2021. Counts of birds ranged from one to two. Breeding was recorded on peat bog in the north of the site, and the middle section of the site.

3.4.3 Snipe

Snipe was the most frequently observed wader recorded during breeding wader surveys, with 14 observations in total. Breeding records of snipe were distributed across the entire site. Each of these observations were of occupied territories, and snipe were observed drumming on several occasions. Counts of snipe ranged from one to three.

4 Wading species are underlined and species in bold indicate a species is listed on Annex 1 of the EU Birds Directive

3.4.4 Woodcock

Woodcock was observed roding in occupied territory on seven occasions in June 2021. All observations were of individual birds, with the exception of two individuals noted on the 1st of June, in the north-west of the site. The remainder of observations originated from mixed woodland in the south-west of the site. A woodcock was also observed in flight on 1st June but its breeding status was not determined.

3.5 General Breeding Bird Survey

For the summer (breeding) season 2021, a total of 21 transects were chosen (Table 2.6). The results of the summer breeding bird transect survey at Derryadd are shown in Table 3.4 and Table 3.5. A total of 58 species were recorded along the transects over the summer season.

A total of four Red-listed species were recorded: lapwing, meadow pipit, snipe and swift.

Lapwing were recorded in both May (15 records) and June (14 records). In May, it was observed from Transect TR5, TR9, TR10, TR11, and TR20. In June this species was observed from TR3, TR5, TR9, TR10, TR11 and TR20.

In May, 46 meadow pipit records were observed from all transects with the exception of TR1, TR9, TR10 and TR21. In June, 102 meadow pipit records were observed from all transects except TR1, TR6, TR9, TR16 and TR21. Of these observations, 70 originated from the 0-25m distant band, indicating that breeding is occurring onsite. Note, due to the high number of transects, it was not possible to include distance bands in Table 3.4 and Table 3.5.

Snipe were observed twice in May, with a single individual each observed at TR1 and TR14. In June, a total of 12 observations of snipe occurred from TR3, TR5, TR9, TR10. TR16, TR19 AND TR20.

Swift was recorded once in June from TR7. No structures are available within the site boundary that are suitable for swift breeding.

A total of 15 Amber-listed species were recorded: black-headed gull, cormorant, goldcrest, great crested grebe, house martin, lesser black-backed gull, linnet, mallard, ringed plover, sand martin, skylark, starling, swallow, willow warbler and wheatear. Skylark and goldcrest are considered to be breeding onsite.

3.6 Barn Owl Surveys

Searches for barn owl within 2km of the site boundary concluded that there is no evidence of barn owl in the area. No known nest sites were identified in the area.

Table 3.4: Results of breeding bird transects surveys at Derryadd (TR1- TR21) in May 2021[5]

Species	TR1	TR2	TR3	TR4	TR5	TR6	TR7	TR8	TR9	TR10	TR11	TR12	TR13	TR14	TR15	TR16	TR17	TR18	TR19	TR20	TR21
Blackbird	4	3	10	2	3	3	5	2	5	3	1	5	3	4	7	3	3	6	2	5	4
Blackcap	3	5	2	2	2	2	0	2	1	3	0	3	0	3	0	3	1	2	0	0	3
Black-headed Gull	1	3	3	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
Blue Tit	0	0	0	0	0	1	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0
Bullfinch	3	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Buzzard	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2
Chaffinch	2	1	7	1	1	2	1	4	2	7	1	2	3	2	1	4	4	2	3	1	4
Chiffchaff	4	0	2	0	0	0	3	0	1	1	0	0	0	0	1	1	2	0	1	0	1
Coal Tit	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cormorant	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cuckoo	4	0	2	0	1	1	4	0	2	4	1	0	1	4	1	0	2	4	1	0	0
Dunnock	0	1	1	0	0	0	0	0	0	0	0	1	0	1	1	0	1	1	0	1	1
Goldcrest	2	0	5	0	0	1	0	0	1	0	0	0	0	0	0	1	0	4	1	0	3
Goldfinch	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Grasshopper Warbler	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Crested Grebe	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Great Tit	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grey Heron	0	0	0	0	0	0	0	0	3	1	0	0	0	0	0	0	0	0	0	0	0
Hooded Crow	2	0	1	4	0	2	1	2	1	5	1	0	0	0	0	2	2	2	0	3	1
Jackdaw	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Lapwing	0	0	0	0	1	0	0	0	1	6	5	0	0	0	0	0	0	0	0	2	0
Lesser Black-backed Gull	0	0	0	1	0	0	1	0	0	1	1	0	0	0	0	1	0	3	1	1	0
Lesser Redpoll	3	4	0	0	1	0	3	5	1	4	2	3	3	4	2	6	2	4	3	1	1
Linnet	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Little Egret	0	0	0	0	0	0	0	0	1	2	3	0	0	0	0	0	0	0	1	0	0
Little Grebe	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0

[5] Colours refers to the conservation status of the species according to Birds of Conservation Concern in Ireland. Species in bold refers to species listed on Annex I of the EU Birds Directive

Species	TR1	TR2	TR3	TR4	TR5	TR6	TR7	TR8	TR9	TR10	TR11	TR12	TR13	TR14	TR15	TR16	TR17	TR18	TR19	TR20	TR21
Magpie	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Mallard	1	1	0	3	1	1	0	0	0	3	2	0	1	0	0	0	0	1	0	0	0
Meadow Pipit	0	2	1	6	1	1	1	3	0	0	2	2	2	8	5	0	2	5	2	2	0
Mistle Thrush	1	3	1	0	1	2	0	2	1	0	0	0	0	2	0	0	0	2	0	1	2
Moorhen	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0
Pheasant	3	1	1	2	2	2	5	0	2	5	3	1	1	0	0	0	3	3	1	0	1
Pied/White Wagtail	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	2	0	1
Raven	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Reed Bunting	0	3	0	0	0	3	3	1	2	5	0	0	1	5	0	2	1	2	4	1	2
Ringed Plover	0	0	0	1	0	0	0	0	0	0	2	0	0	0	0	0	0	1	0	0	0
Robin	5	5	10	4	4	4	0	4	1	1	2	3	1	2	5	4	5	6	3	5	8
Rook	1	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sand Martin	0	6	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2	0	0
Sedge Warbler	0	1	0	0	1	0	0	0	3	8	2	0	0	0	0	0	0	0	0	1	0
Siskin	0	0	2	0	2	0	0	0	0	1	0	0	0	0	0	0	0	1	0	2	0
Skylark	0	0	0	0	4	2	3	0	0	1	0	3	2	1	0	1	0	6	0	2	0
Snipe	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Song Thrush	2	5	1	0	1	6	4	2	2	2	2	6	0	5	4	5	7	3	2	3	3
Starling	1	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Stonechat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	0	0	0	0
Swallow	1	0	1	2	1	0	0	3	0	1	0	0	0	1	0	1	1	3	0	2	3
Treecreeper	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water Rail	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Wheatear	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Whitethroat	2	6	0	1	4	1	7	2	6	5	6	5	3	7	3	7	2	7	5	4	3
Willow Warbler	4	0	1	7	5	6	4	3	9	4	7	4	3	4	5	3	3	6	5	9	6
Woodpigeon	1	0	1	1	0	2	1	1	0	0	1	0	1	0	0	2	1	2	0	3	3
Wren	6	8	5	4	8	5	6	4	4	4	3	4	2	1	2	8	7	6	4	3	6

Table 3.5: Results of breeding bird transects surveys at Derryadd (TR1- TR21) in June 2021[6]

Species	TR1	TR2	TR3	TR4	TR5	TR6	TR7	TR8	TR9	TR10	TR11	TR12	TR13	TR14	TR15	TR16	TR17	TR18	TR19	TR20	TR21
Blackbird	7	3	11	9	11	1	5	5	3	1	3	3	4	2	4	5	5	8	2	4	6
Blackcap	5	7	5	7	5	1	2	0	1	2	0	3	0	1	1	2	1	0	0	3	5
Black-headed Gull	1	2	0	1	0	0	0	0	0	4	0	1	0	0	0	1	0	2	1	0	0
Blue Tit	1	0	1	1	1	2	0	0	1	0	0	1	0	0	0	0	0	0	0	0	1
Bullfinch	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
Buzzard	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Chaffinch	3	0	0	5	0	1	0	1	2	1	0	2	1	0	1	1	2	5	0	0	0
Chiffchaff	1	0	0	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	1
Cormorant	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cuckoo	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Dunnock	1	0	0	1	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0
Goldcrest	1	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Great Crested Grebe	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Grey Heron	0	0	0	1	0	0	0	0	1	1	0	0	1	0	0	0	0	0	0	2	0
Hooded Crow	2	0	1	1	1	0	1	0	0	2	2	0	0	0	0	0	0	3	0	0	1
House Martin	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jackdaw	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Jay	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lapwing	0	0	1	0	1	0	0	0	1	4	5	0	0	0	0	0	0	0	0	2	0
Lesser Black-backed Gull	2	3	7	4	7	0	2	0	0	2	3	1	0	0	2	1	1	5	0	2	1
Lesser Redpoll	1	2	7	1	7	0	4	5	1	5	4	7	7	4	6	6	3	6	7	3	1
Linnet	0	0	1	0	1	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0

[6] Colours refers to the conservation status of the species according to Birds of Conservation Concern in Ireland. Species in bold refers to species listed on Annex I of the EU Birds Directive

Species	TR1	TR2	TR3	TR4	TR5	TR6	TR7	TR8	TR9	TR10	TR11	TR12	TR13	TR14	TR15	TR16	TR17	TR18	TR19	TR20	TR21
Little Egret	0	1	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
Little Grebe	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Long-tailed Tit	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Magpie	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mallard	1	1	0	1	0	0	0	0	0	5	3	0	1	0	0	0	0	0	0	0	0
Meadow Pipit	0	1	6	2	6	0	4	3	0	2	1	2	3	7	2	0	5	6	5	2	0
Mistle Thrush	1	1	2	1	2	3	0	2	1	0	0	0	0	1	1	0	0	2	0	2	1
Moorhen	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pheasant	3	0	4	2	4	0	1	0	0	0	1	0	1	0	0	0	2	0	1	0	0
Pied/White Wagtail	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Reed Bunting	0	4	1	1	1	2	6	2	3	4	0	0	0	1	0	4	0	3	6	1	2
Ringed Plover	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Robin	2	2	0	3	0	1	1	1	1	1	0	1	1	3	2	3	1	5	2	1	5
Sand Martin	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	5	0	0
Sedge Warbler	0	1	0	2	0	0	0	0	2	2	1	0	0	0	0	0	0	0	0	0	0
Siskin	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0	1	0
Skylark	0	0	1	1	1	1	4	0	0	4	0	3	1	1	0	2	0	6	1	2	0
Snipe	0	0	2	0	2	0	0	0	1	4	0	0	0	0	0	1	0	0	1	1	0
Song Thrush	5	3	4	3	4	2	1	1	3	0	1	0	1	5	4	3	4	3	0	3	2
Starling	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stonechat	0	0	0	1	0	2	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0
Swallow	8	2	2	0	2	0	2	2	0	4	0	0	0	0	0	0	0	2	0	2	1
Swift	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water Rail	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Whitethroat	3	5	8	1	7	2	5	2	5	4	5	4	2	3	4	4	0	5	3	3	4
Willow Warbler	0	0	7	5	7	5	6	4	8	4	3	5	1	4	5	2	2	6	5	4	6
Woodpigeon	1	0	1	2	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0

Species	TR1	TR2	TR3	TR4	TR5	TR6	TR7	TR8	TR9	TR10	TR11	TR12	TR13	TR14	TR15	TR16	TR17	TR18	TR19	TR20	TR21
Wren	13	6	5	10	5	4	6	5	6	3	2	4	2	4	5	4	4	5	6	2	9

4. DISCUSSION

In conclusion, FT carried out ornithological surveys at the proposed Derryadd Windfarm during summer 2021. Surveys took place between May and September inclusive. The following surveys were undertaken: vantage point surveys, breeding bird transect surveys, hinterland surveys, and breeding wader surveys.

In total 84 species of bird were noted across all surveys. Of these species 11 are of Red-list status under the BoCCI (Gilbert et al., 2021). A further 27 are Amber-listed and the remaining 46 are Green-listed. Of these species, four are protected under Annex I of the EU Birds Directive: little egret, peregrine, common tern and kingfisher.

Of these species, 74 were recorded as part of Vantage Point (VP) and transect surveys and can therefore be presumed as directly using or regularly transiting the site. Of these, four are protected under Annex 1 of the EU Birds directive: little egret, peregrine, common tern and kingfisher. Of the species recorded, nine are Red-listed in Ireland: meadow pipit, swift, grey wagtail, kestrel, lapwing, snipe, black-tailed godwit, curlew and woodcock. A further 22 of the recorded species are Amber-listed with the remaining 43 being Green-listed.

During vantage point surveys, there were 1,187 individual flight lines of 21 target species observed during the survey period.

Breeding was confirmed onsite for lapwing, ringed plover, snipe, woodcock, long-eared owl, mistle thrush, song thrush, robin, dunnock, stonechat, blackbird. A number of species are also suspected to be breeding on site, including, sedge warbler, wren, redpoll, reed bunting, grasshopper warbler, blackcap, blue tit, coal tit, great tit, chaffinch, cuckoo, meadow pipit, hooded crow, goldcrest, goldfinch skylark, woodpigeon and whitethroat. Additionally, the surveyor noted the possibility of reed warbler breeding onsite.

During hinterland surveys, 31 species of bird were noted. Of these, three species are protected under Annex I of the EU Birds directive: common tern, kingfisher and little egret. Five of the hinterland species are Red-listed: grey wagtail, lapwing, oystercatcher, pochard and snipe. Additionally, 16 of the hinterland species are Amber-listed with the remaining species being Green-listed.

The most important sites for wetland bird species of interest were HVP4 (Fortwilliam Turlough, 3.4km west), HVP5 (Incharmadermot Island, Lough Ree, 5.1km west), HVP8 (Cullaghy, Lough Ree, 2.5km west) and HVP9 (Gardenstown, Lough Ree, 4.6km west). These hinterland vantage points are near or within the Lough Ree SPA (004064). This SPA lists several Special Conservation Interests that were observed during on site during VP and transect surveys: little grebe, wigeon, teal, mallard, tufted duck, coot, lapwing and common tern.

Other hinterland sites which support a variety of species of conservation interest are: HVP11 (Erra & Derryhanee, River Shannon, 2.2km north), HVP12 (Derrycashel, River Shannon, 3.3km north), HVP15 (Tarmonbarry Lock, 3.5km north), HVP6 (Cureen, Lough Ree, 2.4km west) and HVP7 (Lanesborough Bridge, Lough Ree, 0.9 km west).

Ornithological surveys are ongoing at the site.

5. REFERENCES

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FEHILY TIMONEY

CONSULTANTS IN ENGINEERING,
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APPENDIX 1

VP Survey Details
Summer 2021

VP	Date	Start Time	End Time	Cloud (Oktas)	Visibility	Rain	Survey Details
2	29/04/2021	09:38	12:38	5	Very Good	Dry	F1 E
2	29/04/2021	13:32	16:32	6	Very Good	Dry	F1 E
3	04/05/2021	07:26	10:26	5	Good	Heavy Showers	F2-3 WNW
3	04/05/2021	15:15	18:15	4	Good	Heavy Showers	F2 WNW
4	05/05/2021	08:15	11:15	4	Very Good	Light Showers	F2 SSE
4	05/05/2021	12:47	15:47	4	Very Good	Light Showers	F2 SSE
5	05/05/2021	16:35	19:35	7	Very Good	Dry	F1 NW
1	06/05/2021	12:33	15:33	7	Very Good	Dry	F2 NNW
1	06/05/2021	16:04	19:04	7	Very Good	Dry	F2 NNW
5	06/05/2021	08:25	11:25	7	Very Good	Dry	F2 WNW/NW
6	07/05/2021	09:42	12:42	5	Very Good	Dry	F1 SE
6	07/05/2021	13:16	16:16	6	Very Good	Dry	F1 SE
7	07/05/2021	16:50	19:50	5	Very Good	Dry	F1 SSE
7	11/05/2021	07:09	10:09	5	Very Good	Dry	F2 S
8	11/05/2021	17:02	20:02	7	Very Good	Dry	F1 SSE
8	19/05/2021	10:30	13:30	6	Very Good	Dry	F3 WNW
9	21/05/2021	09:15	12:15	8	Very Good	Dry	F2 NW
9	22/05/2021	10:31	13:31	5	Good	Heavy Showers	F2 NW
10	22/05/2021	14:05	17:05	5	Good	Dry	F2 W
10	27/05/2021	11:03	14:03	8	Good-Poor	Drizzle	F1 SE
11	28/05/2021	12:45	15:45	8	Very Good	Light Showers	F1 SSW
11	28/05/2021	16:22	19:22	8	Good	Light Showers	F1 SSW
2	31/05/2021	08:45	11:45	4	Very Good	Dry	F3 SSE
2	31/05/2021	17:31	20:31	4	Very Good	Dry	F3 SSE
1	01/06/2021	09:16	12:16	7	Very Good	Dry	F2 NNE
1	01/06/2021	12:57	15:57	8	Very Good	Dry	F1 ENE
3	01/06/2021	17:05	20:05	4	Good (Hazy)	Dry	F1 NW
3	02/06/2021	13:07	16:07	6	Very Good	Heavy Showers	F2 NE
4	10/06/2021	13:09	16:09	7	Very Good	Dry	F4 SW
4	10/06/2021	17:02	20:02	7	Very Good	Dry	F4 SW
5	16/06/2021	13:32	16:32	6	Very Good	Dry	F3 SW
5	16/06/2021	17:06	20:06	3	Very Good	Dry	F3 SW

VP	Date	Start Time	End Time	Cloud (Oktas)	Visibility	Rain	Survey Details
6	17/06/2021	10:45	13:45	6	Good (Hazy)	Dry	F3 NW
6	17/06/2021	14:30	17:30	7	Very Good	Light Showers	F3 NW
7	18/06/2021	09:05	12:05	7	Good (Hazy)	Dry	F1-2 N
7	18/06/2021	13:04	16:04	7	Good (Hazy)	Dry	F1-2 N
8	23/06/2021	10:05	13:05	8	Very Good	Dry	F2 WNW
8	23/06/2021	14:10	17:10	8	Very Good	Dry	F2 WNW
9	23/06/2021	18:10	21:10	7	Very Good	Dry	F2 WNW
9	24/06/2021	10:15	13:15	8	Good	Light Showers	F3 SW
10	24/06/2021	14:00	17:00	8	Poor	Heavy Showers	F3 W
10	24/06/2021	17:35	20:35	8	Poor	Constant Light Rain	F3 W
11	25/06/2021	11:00	14:00	7	Very Good	Dry	F4 N
11	25/06/2021	14:40	17:40	8	Very Good	Dry	F4 N
3	05/07/2021	16:05	19:05	8	Very Good	Very Light Showers	F2 W
1	06/07/2021	09:05	12:05	8	Good	Light Showers	F2 W
1	06/07/2021	13:00	16:00	8	Good	Showers	F3 NW
2	06/07/2021	14:45	17:45	8	Very Good	Dry	F3 WNW
3	06/07/2021	08:40	11:40	7	Very Good	Very Light Showers	F2 W
5	06/07/2021	16:55	19:55	8	Good-Poor	Light Showers	F3 WNW
2	07/07/2021	11:02	14:02	8	Very Good	Light Showers	F2-3 WNW
2	07/07/2021	14:45	17:45	8	Very Good	Dry	F3 WNW
4	07/07/2021	18:30	21:30	7	Very Good	Dry	F3 WNW
6	08/07/2021	11:10	14:10	8	Very Good	Dry	F2 WSW
6	08/07/2021	15:05	18:05	8	Very Good	Dry	F2 WSW
7	08/07/2021	18:45	21:45	8	Very Good	Dry	F1-2 WSW
4	09/07/2021	14:50	17:50	7	Very Good	Dry	F2 S
5	09/07/2021	18:30	21:30	7	Very Good	Dry	F2 S
7	09/07/2021	11:15	14:15	8	Very Good	Dry	F2 S
8	13/07/2021	07:35	10:35	5	Very Good	Dry	F1 WNW
8	13/07/2021	15:00	18:00	6	Very Good	Dry	F1 WNW
9	14/07/2021	07:50	10:50	4	Very Good	Dry	F1 W
9	15/07/2021	08:10	11:10	2	Very Good	Dry	F1 NW
10	15/07/2021	12:05	15:05	3	Very Good	Dry	F1 WNW

VP	Date	Start Time	End Time	Cloud (Oktas)	Visibility	Rain	Survey Details
10	15/07/2021	16:10	19:10	5	Very Good	Dry	F1 WNW
11	16/07/2021	08:30	11:30	3	Very Good	Dry	F1 W
11	16/07/2021	12:30	15:30	2	Very Good	Dry	F1 W
5	27/07/2021	09:05	12:05	6-8	Good	Light Showers	F1-2 WNW
5	27/07/2021	16:00	19:00	7	Good	Heavy Showers	F1-2 WNW
2	28/07/2021	09:17	12:17	7	Very Good	Dry	F3 W
2	28/07/2021	09:17	12:17	7	Very Good	Dry	F3 W
2	28/07/2021	13:05	16:05	8	Very Good	Light Showers	F3 W
3	28/07/2021	17:00	20:00	8	Good	Light Showers	F3-4 WNW
1	29/07/2021	10:10	13:10	8	Very Good	Dry	F3 W
1	29/07/2021	14:00	17:00	8	Very Good	Dry	F2-3 W
3	29/07/2021	17:40	20:40	8	Very Good	Dry	F1-2 NW
4	30/07/2021	10:45	13:45	8	Good-Poor	Heavy Showers	F2 WNW
4	30/07/2021	14:30	17:30	8	Good	Showers	F2-3 WNW
7	02/08/2021	09:35	12:35	7	Very Good	Showers	F1-2 SSW
7	02/08/2021	15:05	18:05	6	Very Good	Dry	F1-2 SSW
8	03/08/2021	17:30	20:30	5	Very Good	Dry	F1-2 S
9	03/08/2021	09:45	12:45	8	Very Good	Dry	F1 SSW
9	03/08/2021	13:45	16:45	6	Good (Hazy)	Dry	F2 S
6	04/08/2021	10:00	13:00	7-8	Good-Poor	Heavy Showers	F2-3 S
6	04/08/2021	13:50	16:50	8	Good	Showers	F2-3 S
8	04/08/2021	17:30	20:30	8	Good-Poor	Heavy Showers	F1 S/SE
10	05/08/2021	11:06	14:06	8	Poor	Heavy Showers	F2-3 S
10	11/08/2021	09:15	12:15	8	Good-Very Good	Showers	F3 W
11	11/08/2021	12:55	15:55	6	Very Good	Dry	F3-4 WSW
11	11/08/2021	16:40	19:40	2	Very Good	Dry	F3 SW
5	12/08/2021	10:25	13:25	8	Very Good	Showers	F4 S
5	12/08/2021	14:05	17:05	4	Very Good	Light Showers	F4-5 WSW
7	12/08/2021	17:45	20:45	3	Very Good	Dry	F3 SW
4	13/08/2021	10:31	13:01	6	Very Good	Light Showers	F4 SW
4	13/08/2021	14:05	17:05	7	Very Good	Very Light Showers	F4 SW
7	13/08/2021	17:40	20:40	7	Good	Showers	F3 SW

VP	Date	Start Time	End Time	Cloud (Oktas)	Visibility	Rain	Survey Details
8	14/08/2021	10:35	13:35	8	Good	Showers	F1 SSE
3	16/08/2021	08:47	11:47	8	Very Good	Dry	F3W
3	16/08/2021	12:30	15:30	8	Very Good	Very Light Showers	F3W
8	16/08/2021	16:20	19:20	8	Good-Poor	Very Light Showers	F3 W
2	17/08/2021	08:50	11:50	8	Very Good	Dry	F3-4WNW
2	17/08/2021	12:30	15:30	8	Very Good	Dry	F3-4WNW
9	17/08/2021	16:20	19:20	8	Good	Very Light Showers	F3 W
1	18/08/2021	08:56	11:56	8	Very Good	Dry	F3W
1	18/08/2021	12:42	15:42	8	Very Good	Dry	F2W
9	18/08/2021	16:18	19:18	8	Very Good	Dry	F2W
9	18/08/2021	16:18	19:18	8	Very Good	Dry	F2W
6	19/08/2021	09:10	12:10	8	Very Good	Dry	F1 E
6	19/08/2021	12:55	15:55	7	Very Good	Dry	F1 SW
10	19/08/2021	16:40	19:40	7	Very Good	Light Showers	F2 SW
10	20/08/2021	09:17	12:17	8	Very Good	Showers	F3 SE
11	20/08/2021	12:55	15:55	8	Good-Poor	Heavy Showers	F2 SE
11	20/08/2021	16:33	19:33	8	Good-Poor	Heavy Showers	F2 S/SE
3	02/09/2021	08:45	11:45	8	Very Good	Dry	F3 ENE
3	02/09/2021	12:24	15:24	8	Very Good	Dry	F3 ENE
5	02/09/2021	16:00	19:00	8	Good	Dry	F1-2 ENE
5	03/09/2021	08:53	11:53	8	Good	Dry	F2 E
7	03/09/2021	12:30	15:30	8	Good	Dry	F2 E
7	03/09/2021	16:05	19:05	8	Good	Dry	F2 E
1	06/09/2021	08:25	11:25	2	Very Good	Dry	F1 S
1	06/09/2021	12:00	15:00	3	Very Good	Dry	F1 S
8	06/09/2021	16:00	19:00	3	Very Good	Dry	F1SSW
4	07/09/2021	12:15	15:15	3	Very Good	Dry	F1 ESE/E
4	07/09/2021	15:55	18:55	3	Very Good	Dry	F1 E/ENE
8	07/09/2021	08:30	11:30	3	Very Good	Dry	F1 ESE
6	09/09/2021	08:35	11:35	6	Good	Showers	F2 SSE
2	12/09/2021	11:55	14:55	7	Very Good	Dry	F1 NNE
2	12/09/2021	15:30	18:30	7	Very Good	Dry	F1 NNE

VP	Date	Start Time	End Time	Cloud (Oktas)	Visibility	Rain	Survey Details
6	12/09/2021	08:20	11:20	6	Very Good	Dry	F1 N
9	13/09/2021	08:30	11:30	8	Very Good	Dry	F1 NE
9	13/09/2021	12:15	15:15	8	Very Good	Dry	F1 N
10	13/09/2021	16:00	19:00	8	Very Good	Light Showers	F1 SSE
10	14/09/2021	08:35	11:35	5	Very Good	Very Light Showers	F1 SE
11	14/09/2021	12:15	15:15	4	Very Good	Very Light Showers	F1 SE
11	14/09/2021	15:55	18:55	5	Very Good	Dry	F1 SE

FEHILY TIMONEY

CONSULTANTS IN ENGINEERING,
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& PLANNING

APPENDIX 2

Vantage Point Observations
Summer 2021

VP No.	Date	Time	Species	Duration (s)	Flightline No	Flightline Map Title
2	29/04/2021	09:40	Cormorant	44	1	Cormorant 1
2	29/04/2021	09:53	Mute Swan	28	1	Mute Swan
2	29/04/2021	10:02	Mallard	12	1	Mallard 1
2	29/04/2021	10:11	Grey Heron	30	1	Grey Heron 1
2	29/04/2021	10:17	Buzzard	22	1	Buzzard 1
2	29/04/2021	10:24	Cormorant	45	2	Cormorant 1
2	29/04/2021	10:33	Grey Heron	9	2	Grey Heron 1
2	29/04/2021	10:46	Moorhen	11	1	Moorhen
2	29/04/2021	11:00	Mallard	17	2	Mallard 1
2	29/04/2021	11:14	Cormorant	47	3	Cormorant 1
2	29/04/2021	11:20	Little Egret	32	1	Little Egret 1
2	29/04/2021	11:34	Buzzard	139	2	Buzzard 1
2	29/04/2021	11:45	Little Egret	38	2	Little Egret 1
2	29/04/2021	11:56	Buzzard	189	3	Buzzard 1
2	29/04/2021	12:11	Black-tailed Godwit	76	72	Black-Tailed Godwit
2	29/04/2021	12:32	Buzzard	59	4	Buzzard 1
2	29/04/2021	13:39	Cormorant	45	4	Cormorant 1
2	29/04/2021	14:00	Cormorant	45	5	Cormorant 1
2	29/04/2021	14:26	Buzzard	229	5	Buzzard 1
2	29/04/2021	14:41	Mallard	18	3	Mallard 1
2	29/04/2021	14:49	Cormorant	27	6	Cormorant 1
2	29/04/2021	15:09	Buzzard	248	6	Buzzard 1
2	29/04/2021	15:13	Cormorant	23	7	Cormorant 1
2	29/04/2021	15:24	Buzzard	96	7	Buzzard 1
2	29/04/2021	15:45	Grey Heron	17	3	Grey Heron 1
2	29/04/2021	15:58	Little Egret	33	3	Little Egret 1
2	29/04/2021	16:14	Sparrowhawk	317	1	Sparrowhawk 1
2	29/04/2021	16:26	Common Gull	20	1	Common Gull
3	04/05/2021	07:31	Little Egret	190	4	Little Egret 1
3	04/05/2021	07:53	Black-headed Gull	114	1	Black Headed Gull 1
3	04/05/2021	08:07	Sparrowhawk	28	2	Sparrowhawk 1
3	04/05/2021	08:08	Little Egret	7	5	Little Egret 1
3	04/05/2021	08:20	Kestrel	78	1	Kestrel 1
3	04/05/2021	08:27	Mallard	210	4	Mallard 1
3	04/05/2021	08:36	Grey Heron	53	4	Grey Heron 1
3	04/05/2021	08:54	Lesser Black-backed Gull	183	1	Lesser Black-Backed Gull 1
3	04/05/2021	09:18	Sparrowhawk	16	3	Sparrowhawk 1
3	04/05/2021	09:40	Mallard	65	5	Mallard 1
3	04/05/2021	09:48	Kestrel	294	2	Kestrel 1
3	04/05/2021	10:15	Grey Heron	12	5	Grey Heron 1
3	04/05/2021	15:20	Grey Heron	32	6	Grey Heron 1
3	04/05/2021	15:22	Lapwing	95	1	Lapwing
3	04/05/2021	15:49	Little Egret	3	6	Little Egret 1

VP No.	Date	Time	Species	Duration (s)	Flightline No	Flightline Map Title
3	04/05/2021	16:07	Little Egret	24	7	Little Egret 1
3	04/05/2021	16:09	Mallard	187	6	Mallard 1
3	04/05/2021	16:23	Teal	23	1	Teal
3	04/05/2021	16:39	Mallard	133	7	Mallard 1
3	04/05/2021	16:49	Buzzard	34	8	Buzzard 1
3	04/05/2021	17:01	Black-headed Gull	54	2	Black Headed Gull 1
3	04/05/2021	17:15	Lesser Black-backed Gull	172	2	Lesser Black-Backed Gull 1
3	04/05/2021	17:23	Little Egret	2	8	Little Egret 1
3	04/05/2021	17:45	Lapwing	27	2	Lapwing
3	04/05/2021	17:59	Little Egret	223	9	Little Egret 1
3	04/05/2021	18:10	Buzzard	76	9	Buzzard 1
4	05/05/2021	08:21	Peregrine	427	1	Peregrine
4	05/05/2021	08:34	Little Egret	12	10	Little Egret 1
4	05/05/2021	08:44	Lesser Black-backed Gull	163	3	Lesser Black-Backed Gull 1
4	05/05/2021	08:50	Buzzard	319	10	Buzzard 1
4	05/05/2021	08:55	Little Egret	40	11	Little Egret 1
4	05/05/2021	09:03	Buzzard	410	11	Buzzard 1
4	05/05/2021	09:11	Black-headed Gull	43	3	Black Headed Gull 1
4	05/05/2021	09:22	Little Egret	28	12	Little Egret 1
4	05/05/2021	09:37	Grey Heron	124	7	Grey Heron 1
4	05/05/2021	09:46	Buzzard	414	12	Buzzard 1
4	05/05/2021	09:59	Little Egret	70	13	Little Egret 1
4	05/05/2021	10:10	Sparrowhawk	156	4	Sparrowhawk 1
4	05/05/2021	10:23	Lesser Black-backed Gull	15	4	Lesser Black-Backed Gull 1
4	05/05/2021	10:44	Buzzard	306	13	Buzzard 1
4	05/05/2021	10:52	Buzzard	96	14	Buzzard 1
4	05/05/2021	11:00	Buzzard	404	15	Buzzard 1
4	05/05/2021	11:11	Lapwing	14	3	Lapwing
4	05/05/2021	12:59	Little Egret	33	14	Little Egret 1
4	05/05/2021	13:06	Lesser Black-backed Gull	45	5	Lesser Black-Backed Gull 1
4	05/05/2021	13:19	Lesser Black-backed Gull	61	6	Lesser Black-Backed Gull 1
4	05/05/2021	13:34	Buzzard	642	16	Buzzard 1
4	05/05/2021	13:55	Grey Heron	2	8	Grey Heron 1
4	05/05/2021	14:01	Little Egret	34	15	Little Egret 1
4	05/05/2021	14:10	Buzzard	56	17	Buzzard 1
4	05/05/2021	14:22	Cormorant	136	8	Cormorant 1
4	05/05/2021	14:36	Mallard	16	8	Mallard 1
4	05/05/2021	14:44	Lesser Black-backed Gull	124	7	Lesser Black-Backed Gull 1
4	05/05/2021	14:53	Whimbrel	175	1	Whimbrel
4	05/05/2021	15:17	Little Egret	128	16	Little Egret 1
4	05/05/2021	15:20	Buzzard	271	18	Buzzard 1
4	05/05/2021	15:30	Kestrel	880	3	Kestrel 1
4	05/05/2021	15:45	Buzzard	45	19	Buzzard 1

VP No.	Date	Time	Species	Duration (s)	Flightline No	Flightline Map Title
5	05/05/2021	16:43	Buzzard	24	20	Buzzard 1
5	05/05/2021	16:49	Little Egret	17	17	Little Egret 1
5	05/05/2021	17:06	Cormorant	55	9	Cormorant 1
5	05/05/2021	17:17	Lapwing	3	4	Lapwing
5	05/05/2021	17:23	Black-headed Gull	65	4	Black Headed Gull 1
5	05/05/2021	17:30	Grey Heron	12	9	Grey Heron 1
5	05/05/2021	17:46	Little Egret	88	18	Little Egret 1
5	05/05/2021	17:55	Cormorant	81	10	Cormorant 1
5	05/05/2021	18:02	Buzzard	105	21	Buzzard 1
5	05/05/2021	18:06	Kestrel	421	4	Kestrel 1
5	05/05/2021	18:18	Lapwing	17	5	Lapwing
5	05/05/2021	18:25	Little Egret	125	19	Little Egret 1
5	05/05/2021	18:34	Mallard	10	9	Mallard 1
5	05/05/2021	18:54	Cormorant	86	11	Cormorant 1
5	05/05/2021	19:13	Lapwing	13	6	Lapwing
5	05/05/2021	19:27	Mallard	72	10	Mallard 1
5	06/05/2021	08:36	Lapwing	4	7	Lapwing
5	06/05/2021	08:51	Grey Heron	3	10	Grey Heron 1
5	06/05/2021	08:57	Cormorant	88	12	Cormorant 1
5	06/05/2021	09:05	Little Egret	24	20	Little Egret 1
5	06/05/2021	09:16	Lesser Black-backed Gull	125	8	Lesser Black-Backed Gull 1
5	06/05/2021	09:24	Black-headed Gull	42	5	Black Headed Gull 1
5	06/05/2021	09:30	Buzzard	427	22	Buzzard 1
5	06/05/2021	09:42	Sparrowhawk	272	5	Sparrowhawk 1
5	06/05/2021	09:51	Mallard	15	11	Mallard 1
5	06/05/2021	10:06	Buzzard	65	23	Buzzard 1
5	06/05/2021	10:38	Little Egret	23	21	Little Egret 1
5	06/05/2021	10:57	Buzzard	227	24	Buzzard 1
5	06/05/2021	11:15	Buzzard	22	25	Buzzard 1
1	06/05/2021	12:55	Wigeon	7	1	Wigeon
1	06/05/2021	13:10	Cormorant	96	13	Cormorant 1
1	06/05/2021	13:20	Buzzard	114	26	Buzzard 1
1	06/05/2021	13:42	Grey Heron	15	11	Grey Heron 1
1	06/05/2021	14:03	Cormorant	57	14	Cormorant 1
1	06/05/2021	14:18	Grey Heron	12	12	Grey Heron 1
1	06/05/2021	14:29	Buzzard	345	27	Buzzard 1
1	06/05/2021	14:40	Sparrowhawk	42	6	Sparrowhawk 1
1	06/05/2021	14:57	Mute Swan	8	2	Mute Swan
1	06/05/2021	15:21	Buzzard	134	28	Buzzard 1
1	06/05/2021	16:05	Cormorant	49	15	Cormorant 1
1	06/05/2021	16:17	Lesser Black-backed Gull	107	9	Lesser Black-Backed Gull 1
1	06/05/2021	16:33	Mallard	39	12	Mallard 1
1	06/05/2021	16:45	Buzzard	375	29	Buzzard 1

VP No.	Date	Time	Species	Duration (s)	Flightline No	Flightline Map Title
1	06/05/2021	17:18	Grey Heron	355	13	Grey Heron 1
1	06/05/2021	17:30	Mallard	24	13	Mallard 1
1	06/05/2021	17:42	Buzzard	36	30	Buzzard 1
1	06/05/2021	17:44	Sparrowhawk	44	7	Sparrowhawk 1
1	06/05/2021	17:49	Mallard	10	14	Mallard 1
1	06/05/2021	18:10	Buzzard	247	31	Buzzard 2
1	06/05/2021	18:32	Black-headed Gull	103	6	Black Headed Gull 1
6	07/05/2021	10:12	Black-headed Gull	22	7	Black Headed Gull 1
6	07/05/2021	10:30	Buzzard	26	32	Buzzard 2
6	07/05/2021	10:34	Little Egret	81	22	Little Egret 1
6	07/05/2021	10:43	Grey Heron	52	14	Grey Heron 1
6	07/05/2021	10:56	Little Egret	225	23	Little Egret 1
6	07/05/2021	11:02	Sparrowhawk	4	8	Sparrowhawk 1
6	07/05/2021	11:08	Kestrel	1076	5	Kestrel 1
6	07/05/2021	11:30	Buzzard	184	33	Buzzard 2
6	07/05/2021	11:35	Lesser Black-backed Gull	345	10	Lesser Black-Backed Gull 1
6	07/05/2021	11:45	Sparrowhawk	3	9	Sparrowhawk 1
6	07/05/2021	12:13	Buzzard	545	34	Buzzard 2
6	07/05/2021	13:20	Buzzard	123	35	Buzzard 2
6	07/05/2021	13:27	Lapwing	45	8	Lapwing
6	07/05/2021	13:30	Grey Heron	19	15	Grey Heron 1
6	07/05/2021	13:48	Buzzard	437	36	Buzzard 2
6	07/05/2021	14:13	Lesser Black-backed Gull	67	11	Lesser Black-Backed Gull 1
6	07/05/2021	14:22	Little Egret	17	24	Little Egret 1
6	07/05/2021	14:35	Kestrel	45	6	Kestrel 1
6	07/05/2021	14:50	Lesser Black-backed Gull	124	12	Lesser Black-Backed Gull 1
6	07/05/2021	14:59	Black-headed Gull	143	8	Black Headed Gull 1
6	07/05/2021	15:28	Little Egret	73	25	Little Egret 1
6	07/05/2021	15:42	Sparrowhawk	24	10	Sparrowhawk 1
7	07/05/2021	17:00	Black-headed Gull	42	9	Black Headed Gull 1
7	07/05/2021	17:23	Black-headed Gull	14	10	Black Headed Gull 1
7	07/05/2021	17:45	Buzzard	50	37	Buzzard 2
7	07/05/2021	17:49	Lesser Black-backed Gull	63	13	Lesser Black-Backed Gull 1
7	07/05/2021	18:10	Buzzard	245	38	Buzzard 2
7	07/05/2021	18:19	Grey Heron	128	16	Grey Heron 1
7	07/05/2021	18:31	Buzzard	33	39	Buzzard 2
7	07/05/2021	18:43	Kestrel	72	7	Kestrel 1
7	07/05/2021	19:01	Kestrel	628	8	Kestrel 1
7	07/05/2021	19:25	Black-headed Gull	74	11	Black Headed Gull 1
7	07/05/2021	19:44	Lesser Black-backed Gull	37	14	Lesser Black-Backed Gull 1
7	11/05/2021	13:09	Buzzard	895	40	Buzzard 2
7	11/05/2021	13:21	Grey Heron	122	17	Grey Heron 1
7	11/05/2021	13:28	Buzzard	127	41	Buzzard 2

VP No.	Date	Time	Species	Duration (s)	Flightline No	Flightline Map Title
7	11/05/2021	13:52	Sparrowhawk	138	11	Sparrowhawk 1
7	11/05/2021	14:12	Lesser Black-backed Gull	45	15	Lesser Black-Backed Gull 1
7	11/05/2021	14:30	Lesser Black-backed Gull	33	16	Lesser Black-Backed Gull 1
7	11/05/2021	14:44	Black-headed Gull	28	12	Black Headed Gull 1
7	11/05/2021	14:58	Lesser Black-backed Gull	103	17	Lesser Black-Backed Gull 1
7	11/05/2021	15:11	Lesser Black-backed Gull	141	18	Lesser Black-Backed Gull 1
7	11/05/2021	15:15	Buzzard	32	42	Buzzard 2
7	11/05/2021	15:23	Lesser Black-backed Gull	73	19	Lesser Black-Backed Gull 1
7	11/05/2021	15:44	Lesser Black-backed Gull	44	20	Lesser Black-Backed Gull 1
7	11/05/2021	16:03	Buzzard	55	43	Buzzard 2
7	11/05/2021	16:08	Little Egret	6	26	Little Egret 1
8	11/05/2021	17:13	Lesser Black-backed Gull	187	21	Lesser Black-Backed Gull 1
8	11/05/2021	17:32	Buzzard	360	44	Buzzard 2
8	11/05/2021	17:55	Whimbrel	543	2	Whimbrel
8	11/05/2021	18:08	Lesser Black-backed Gull	610	22	Lesser Black-Backed Gull 1
8	11/05/2021	18:20	Lesser Black-backed Gull	184	23	Lesser Black-Backed Gull 1
8	11/05/2021	18:39	Cormorant	284	16	Cormorant 1
8	11/05/2021	18:51	Buzzard	33	45	Buzzard 2
8	11/05/2021	19:06	Grey Heron	102	18	Grey Heron 1
8	11/05/2021	19:15	Grey Heron	30	19	Grey Heron 1
8	11/05/2021	19:22	Lesser Black-backed Gull	24	24	Lesser Black-Backed Gull 1
8	11/05/2021	19:25	Black-headed Gull	128	13	Black Headed Gull 1
8	11/05/2021	19:41	Little Egret	122	27	Little Egret 1
8	11/05/2021	19:53	Lesser Black-backed Gull	106	25	Lesser Black-Backed Gull 1
8	19/05/2021	10:43	Grey Heron	53	20	Grey Heron 1
8	19/05/2021	10:54	Lesser Black-backed Gull	124	26	Lesser Black-Backed Gull 1
8	19/05/2021	11:02	Black-headed Gull	40	14	Black Headed Gull 1
8	19/05/2021	11:21	Buzzard	144	46	Buzzard 2
8	19/05/2021	11:33	Black-headed Gull	182	15	Black Headed Gull 1
8	19/05/2021	11:45	Lesser Black-backed Gull	23	27	Lesser Black-Backed Gull 1
8	19/05/2021	12:00	Cormorant	295	17	Cormorant 1
8	19/05/2021	12:06	Buzzard	149	47	Buzzard 2
8	19/05/2021	12:29	Buzzard	240	48	Buzzard 2
8	19/05/2021	12:47	Little Egret	189	28	Little Egret 1
8	19/05/2021	13:02	Lesser Black-backed Gull	84	28	Lesser Black-Backed Gull 1
8	19/05/2021	13:09	Little Egret	44	29	Little Egret 1
8	19/05/2021	13:16	Lesser Black-backed Gull	62	29	Lesser Black-Backed Gull 1
9	21/05/2021	09:23	Lesser Black-backed Gull	48	30	Lesser Black-Backed Gull 1
9	21/05/2021	09:35	Lesser Black-backed Gull	72	31	Lesser Black-Backed Gull 2
9	21/05/2021	09:44	Lesser Black-backed Gull	24	32	Lesser Black-Backed Gull 2
9	21/05/2021	09:57	Buzzard	28	49	Buzzard 2
9	21/05/2021	10:16	Buzzard	107	50	Buzzard 2
9	21/05/2021	10:30	Lesser Black-backed Gull	189	33	Lesser Black-Backed Gull 2

VP No.	Date	Time	Species	Duration (s)	Flightline No	Flightline Map Title
9	21/05/2021	10:38	Sparrowhawk	3	12	Sparrowhawk 1
9	21/05/2021	10:44	Little Egret	136	30	Little Egret 1
9	21/05/2021	10:59	Buzzard	245	51	Buzzard 2
9	21/05/2021	11:01	Sparrowhawk	180	13	Sparrowhawk 1
9	21/05/2021	11:12	Lesser Black-backed Gull	74	34	Lesser Black-Backed Gull 2
9	21/05/2021	11:22	Buzzard	435	52	Buzzard 2
9	21/05/2021	11:28	Mallard	15	15	Mallard 1
9	21/05/2021	11:43	Black-headed Gull	62	16	Black Headed Gull 1
9	21/05/2021	12:06	Lesser Black-backed Gull	53	35	Lesser Black-Backed Gull 2
9	21/05/2021	12:10	Lesser Black-backed Gull	40	36	Lesser Black-Backed Gull 2
9	22/05/2021	10:53	Buzzard	424	53	Buzzard 2
9	22/05/2021	11:15	Lesser Black-backed Gull	83	37	Lesser Black-Backed Gull 2
9	22/05/2021	11:29	Kestrel	105	9	Kestrel 1
9	22/05/2021	11:42	Lesser Black-backed Gull	187	38	Lesser Black-Backed Gull 2
9	22/05/2021	12:00	Buzzard	15	54	Buzzard 2
9	22/05/2021	12:07	Lesser Black-backed Gull	44	39	Lesser Black-Backed Gull 2
9	22/05/2021	12:21	Lesser Black-backed Gull	60	40	Lesser Black-Backed Gull 2
9	22/05/2021	13:02	Buzzard	242	55	Buzzard 2
9	22/05/2021	13:23	Buzzard	186	56	Buzzard 2
10	22/05/2021	14:23	Lesser Black-backed Gull	87	41	Lesser Black-Backed Gull 2
10	22/05/2021	14:48	Lesser Black-backed Gull	72	42	Lesser Black-Backed Gull 2
10	22/05/2021	15:01	Buzzard	370	57	Buzzard 2
10	22/05/2021	15:09	Buzzard	18	58	Buzzard 2
10	22/05/2021	15:17	Lesser Black-backed Gull	64	43	Lesser Black-Backed Gull 2
10	22/05/2021	15:24	Lesser Black-backed Gull	103	44	Lesser Black-Backed Gull 2
10	22/05/2021	15:41	Buzzard	249	59	Buzzard 2
10	22/05/2021	15:50	Sparrowhawk	184	14	Sparrowhawk 1
10	22/05/2021	15:59	Lesser Black-backed Gull	173	45	Lesser Black-Backed Gull 2
10	22/05/2021	16:10	Little Egret	12	31	Little Egret 2
10	22/05/2021	16:22	Buzzard	543	60	Buzzard 2
10	22/05/2021	16:32	Lesser Black-backed Gull	21	46	Lesser Black-Backed Gull 2
10	22/05/2021	16:51	Buzzard	242	61	Buzzard 3
10	27/05/2021	11:20	Kestrel	122	10	Kestrel 1
10	27/05/2021	11:29	Lesser Black-backed Gull	108	47	Lesser Black-Backed Gull 2
10	27/05/2021	11:41	Black-headed Gull	41	17	Black Headed Gull 1
10	27/05/2021	12:05	Kestrel	256	11	Kestrel 1
10	27/05/2021	12:49	Lesser Black-backed Gull	77	48	Lesser Black-Backed Gull 2
10	27/05/2021	13:16	Lesser Black-backed Gull	110	49	Lesser Black-Backed Gull 2
10	27/05/2021	13:52	Grey Heron	18	21	Grey Heron 1
11	28/05/2021	13:02	Buzzard	289	62	Buzzard 3
11	28/05/2021	13:10	Lesser Black-backed Gull	45	50	Lesser Black-Backed Gull 2
11	28/05/2021	13:23	Cormorant	184	18	Cormorant 1
11	28/05/2021	13:32	Buzzard	120	63	Buzzard 3

VP No.	Date	Time	Species	Duration (s)	Flightline No	Flightline Map Title
11	28/05/2021	13:41	Lesser Black-backed Gull	74	51	Lesser Black-Backed Gull 2
11	28/05/2021	13:55	Lesser Black-backed Gull	192	52	Lesser Black-Backed Gull 2
11	28/05/2021	14:09	Lesser Black-backed Gull	33	53	Lesser Black-Backed Gull 2
11	28/05/2021	14:16	Buzzard	48	64	Buzzard 3
11	28/05/2021	14:40	Lesser Black-backed Gull	87	54	Lesser Black-Backed Gull 2
11	28/05/2021	14:56	Buzzard	63	65	Buzzard 3
11	28/05/2021	15:03	Lesser Black-backed Gull	101	55	Lesser Black-Backed Gull 2
11	28/05/2021	15:29	Lesser Black-backed Gull	44	56	Lesser Black-Backed Gull 2
11	28/05/2021	16:40	Lesser Black-backed Gull	82	57	Lesser Black-Backed Gull 2
11	28/05/2021	16:51	Lesser Black-backed Gull	96	58	Lesser Black-Backed Gull 2
11	28/05/2021	17:08	Lesser Black-backed Gull	109	59	Lesser Black-Backed Gull 2
11	28/05/2021	17:16	Lesser Black-backed Gull	77	60	Lesser Black-Backed Gull 2
11	28/05/2021	17:29	Lesser Black-backed Gull	122	61	Lesser Black-Backed Gull 2
11	28/05/2021	17:45	Mallard	48	16	Mallard 1
11	28/05/2021	18:07	Kestrel	129	12	Kestrel 1
11	28/05/2021	18:23	Lesser Black-backed Gull	87	62	Lesser Black-Backed Gull 2
11	28/05/2021	18:44	Lesser Black-backed Gull	138	63	Lesser Black-Backed Gull 2
11	28/05/2021	19:00	Mallard	7	17	Mallard 1
11	28/05/2021	19:08	Lesser Black-backed Gull	46	64	Lesser Black-Backed Gull 2
11	28/05/2021	19:10	Lesser Black-backed Gull	84	65	Lesser Black-Backed Gull 2
11	28/05/2021	19:19	Black-headed Gull	15	18	Black Headed Gull 1
2	31/05/2021	09:00	Mallard	31	18	Mallard 1
2	31/05/2021	09:03	Lesser Black-backed Gull	59	66	Lesser Black-Backed Gull 2
2	31/05/2021	09:16	Little Egret	45	32	Little Egret 2
2	31/05/2021	09:28	Buzzard	15	66	Buzzard 3
2	31/05/2021	09:39	Buzzard	103	67	Buzzard 3
2	31/05/2021	09:52	Lesser Black-backed Gull	37	67	Lesser Black-Backed Gull 2
2	31/05/2021	09:56	Buzzard	62	68	Buzzard 3
2	31/05/2021	10:04	Sparrowhawk	102	15	Sparrowhawk 1
2	31/05/2021	10:27	Buzzard	36	69	Buzzard 3
2	31/05/2021	10:43	Cormorant	98	19	Cormorant 1
2	31/05/2021	10:59	Cormorant	26	20	Cormorant 1
2	31/05/2021	11:11	Buzzard	131	70	Buzzard 3
2	31/05/2021	11:18	Little Egret	42	33	Little Egret 2
2	31/05/2021	11:30	Lesser Black-backed Gull	46	68	Lesser Black-Backed Gull 2
2	31/05/2021	11:35	Mallard	7	19	Mallard 1
2	31/05/2021	11:43	Lesser Black-backed Gull	29	69	Lesser Black-Backed Gull 2
2	31/05/2021	17:38	Cormorant	23	21	Cormorant 1
2	31/05/2021	17:55	Buzzard	189	71	Buzzard 3
2	31/05/2021	18:06	Black-headed Gull	127	19	Black Headed Gull 1
2	31/05/2021	18:17	Lesser Black-backed Gull	42	70	Lesser Black-Backed Gull 2
2	31/05/2021	18:22	Lesser Black-backed Gull	29	71	Lesser Black-Backed Gull 2
2	31/05/2021	18:40	Black-headed Gull	22	20	Black Headed Gull 1

VP No.	Date	Time	Species	Duration (s)	Flightline No	Flightline Map Title
2	31/05/2021	19:00	Lesser Black-backed Gull	100	72	Lesser Black-Backed Gull 2
2	31/05/2021	19:12	Buzzard	45	72	Buzzard 3
2	31/05/2021	19:21	Black-headed Gull	154	21	Black Headed Gull 1
2	31/05/2021	19:35	Buzzard	6	73	Buzzard 3
2	31/05/2021	19:52	Lesser Black-backed Gull	102	73	Lesser Black-Backed Gull 2
2	31/05/2021	20:02	Buzzard	73	74	Buzzard 3
2	31/05/2021	20:15	Mallard	27	20	Mallard 1
2	31/05/2021	20:27	Black-headed Gull	63	22	Black Headed Gull 1
1	01/06/2021	09:27	Cormorant	39	22	Cormorant 1
1	01/06/2021	09:43	Wigeon	10	2	Wigeon
1	01/06/2021	09:52	Lesser Black-backed Gull	124	74	Lesser Black-Backed Gull 2
1	01/06/2021	10:07	Buzzard	141	75	Buzzard 3
1	01/06/2021	10:14	Black-headed Gull	63	23	Black Headed Gull 1
1	01/06/2021	10:32	Mallard	35	21	Mallard 1
1	01/06/2021	10:53	Buzzard	413	76	Buzzard 3
1	01/06/2021	11:06	Lesser Black-backed Gull	96	75	Lesser Black-Backed Gull 2
1	01/06/2021	11:15	Lesser Black-backed Gull	48	76	Lesser Black-Backed Gull 2
1	01/06/2021	11:38	Cormorant	33	23	Cormorant 1
1	01/06/2021	11:39	Cormorant	97	24	Cormorant 1
1	01/06/2021	12:10	Little Egret	64	34	Little Egret 2
1	01/06/2021	13:11	Buzzard	189	77	Buzzard 3
1	01/06/2021	13:23	Cormorant	62	25	Cormorant 1
1	01/06/2021	13:30	Lesser Black-backed Gull	110	77	Lesser Black-Backed Gull 2
1	01/06/2021	13:48	Black-headed Gull	72	24	Black Headed Gull 1
1	01/06/2021	14:06	Mallard	51	22	Mallard 1
1	01/06/2021	14:22	Mute Swan	16	3	Mute Swan
1	01/06/2021	14:31	Cormorant	102	26	Cormorant 1
1	01/06/2021	14:44	Lesser Black-backed Gull	111	78	Lesser Black-Backed Gull 2
1	01/06/2021	15:00	Mallard	45	23	Mallard 1
1	01/06/2021	15:13	Grey Heron	33	22	Grey Heron 1
1	01/06/2021	15:20	Lesser Black-backed Gull	122	79	Lesser Black-Backed Gull 2
1	01/06/2021	15:33	Lesser Black-backed Gull	67	80	Lesser Black-Backed Gull 2
1	01/06/2021	15:51	Buzzard	106	78	Buzzard 3
3	01/06/2021	17:22	Buzzard	342	79	Buzzard 3
3	01/06/2021	17:31	Sparrowhawk	257	16	Sparrowhawk 1
3	01/06/2021	17:39	Buzzard	58	80	Buzzard 3
3	01/06/2021	17:55	Buzzard	62	81	Buzzard 3
3	01/06/2021	18:06	Grey Heron	154	23	Grey Heron 1
3	01/06/2021	18:23	Lesser Black-backed Gull	212	81	Lesser Black-Backed Gull 2
3	01/06/2021	18:35	Lesser Black-backed Gull	65	82	Lesser Black-Backed Gull 2
3	01/06/2021	18:42	Black-headed Gull	203	25	Black Headed Gull 1
3	01/06/2021	18:50	Black-headed Gull	127	26	Black Headed Gull 1
3	01/06/2021	19:07	Peregrine	6	2	Peregrine

VP No.	Date	Time	Species	Duration (s)	Flightline No	Flightline Map Title
3	01/06/2021	19:25	Little Egret	24	35	Little Egret 2
3	01/06/2021	19:41	Buzzard	60	82	Buzzard 3
3	02/06/2021	13:20	Kestrel	64	13	Kestrel 1
3	02/06/2021	13:32	Lapwing	135	9	Lapwing
3	02/06/2021	13:39	Buzzard	112	83	Buzzard 3
3	02/06/2021	13:55	Cormorant	191	27	Cormorant 1
3	02/06/2021	14:00	Lesser Black-backed Gull	245	83	Lesser Black-Backed Gull 2
3	02/06/2021	14:09	Black-headed Gull	107	27	Black Headed Gull 1
3	02/06/2021	14:21	Lesser Black-backed Gull	34	84	Lesser Black-Backed Gull 2
3	02/06/2021	14:42	Cormorant	208	28	Cormorant 1
3	02/06/2021	15:10	Black-headed Gull	50	28	Black Headed Gull 1
3	02/06/2021	15:23	Lesser Black-backed Gull	44	85	Lesser Black-Backed Gull 2
3	02/06/2021	15:35	Little Egret	94	36	Little Egret 2
3	02/06/2021	15:55	Snipe	155	1	Snipe
4	10/06/2021	13:21	Buzzard	63	84	Buzzard 3
4	10/06/2021	13:30	Lesser Black-backed Gull	257	86	Lesser Black-Backed Gull 2
4	10/06/2021	13:46	Buzzard	134	85	Buzzard 3
4	10/06/2021	13:52	Black-headed Gull	55	29	Black Headed Gull 1
4	10/06/2021	14:07	Lapwing	27	10	Lapwing
4	10/06/2021	14:15	Lesser Black-backed Gull	35	87	Lesser Black-Backed Gull 2
4	10/06/2021	14:23	Black-headed Gull	44	30	Black Headed Gull 1
4	10/06/2021	14:39	Cormorant	26	29	Cormorant 1
4	10/06/2021	15:00	Buzzard	189	86	Buzzard 3
4	10/06/2021	15:11	Buzzard	69	87	Buzzard 3
4	10/06/2021	15:25	Lapwing	45	11	Lapwing
4	10/06/2021	15:48	Lesser Black-backed Gull	82	88	Lesser Black-Backed Gull 2
4	10/06/2021	16:02	Black-headed Gull	20	31	Black Headed Gull 2
4	10/06/2021	17:21	Lapwing	34	12	Lapwing
4	10/06/2021	17:34	Buzzard	163	88	Buzzard 3
4	10/06/2021	17:49	Lesser Black-backed Gull	129	89	Lesser Black-Backed Gull 2
4	10/06/2021	17:55	Lapwing	12	13	Lapwing
4	10/06/2021	18:10	Lesser Black-backed Gull	144	90	Lesser Black-Backed Gull 2
4	10/06/2021	18:22	Black-headed Gull	56	32	Black Headed Gull 2
4	10/06/2021	18:33	Black-headed Gull	99	33	Black Headed Gull 2
4	10/06/2021	18:53	Buzzard	106	89	Buzzard 3
4	10/06/2021	19:06	Lapwing	25	14	Lapwing
4	10/06/2021	19:15	Buzzard	68	90	Buzzard 3
4	10/06/2021	19:34	Grey Heron	29	24	Grey Heron 1
4	10/06/2021	19:51	Little Egret	133	37	Little Egret 2
5	16/06/2021	13:48	Kestrel	114	14	Kestrel 1
5	16/06/2021	14:06	Buzzard	248	91	Buzzard 4
5	16/06/2021	14:15	Little Egret	4	38	Little Egret 2
5	16/06/2021	14:29	Buzzard	54	92	Buzzard 4

VP No.	Date	Time	Species	Duration (s)	Flightline No	Flightline Map Title
5	16/06/2021	14:52	Kestrel	44	15	Kestrel 1
5	16/06/2021	15:14	Little Egret	110	39	Little Egret 2
5	16/06/2021	15:22	Buzzard	128	93	Buzzard 4
5	16/06/2021	15:38	Lesser Black-backed Gull	67	91	Lesser Black-Backed Gull 3
5	16/06/2021	15:57	Buzzard	29	94	Buzzard 4
5	16/06/2021	16:12	Black-headed Gull	77	34	Black Headed Gull 2
5	16/06/2021	16:24	Cormorant	104	30	Cormorant 1
5	16/06/2021	16:30	Grey Heron	40	25	Grey Heron 1
5	16/06/2021	17:22	Cormorant	122	31	Cormorant 2
5	16/06/2021	17:31	Lapwing	16	15	Lapwing
5	16/06/2021	17:44	Buzzard	109	95	Buzzard 4
5	16/06/2021	17:58	Lesser Black-backed Gull	47	92	Lesser Black-Backed Gull 3
5	16/06/2021	18:10	Buzzard	54	96	Buzzard 4
5	16/06/2021	18:17	Black-headed Gull	113	35	Black Headed Gull 2
5	16/06/2021	18:34	Snipe	66	2	Snipe
5	16/06/2021	18:43	Kestrel	224	16	Kestrel 1
5	16/06/2021	18:50	Buzzard	22	97	Buzzard 4
5	16/06/2021	19:09	Kestrel	97	17	Kestrel 1
5	16/06/2021	19:24	Buzzard	49	98	Buzzard 4
5	16/06/2021	19:45	Grey Heron	15	26	Grey Heron 1
5	16/06/2021	20:00	Little Egret	10	40	Little Egret 2
6	17/06/2021	10:53	Buzzard	22	99	Buzzard 4
6	17/06/2021	11:22	Buzzard	210	100	Buzzard 4
6	17/06/2021	11:30	Lesser Black-backed Gull	79	93	Lesser Black-Backed Gull 3
6	17/06/2021	11:49	Buzzard	65	101	Buzzard 4
6	17/06/2021	12:02	Snipe	72	3	Snipe
6	17/06/2021	12:09	Black-headed Gull	109	36	Black Headed Gull 2
6	17/06/2021	12:24	Snipe	227	4	Snipe
6	17/06/2021	12:48	Buzzard	42	102	Buzzard 4
6	17/06/2021	13:10	Lapwing	86	16	Lapwing
6	17/06/2021	13:27	Kestrel	177	18	Kestrel 1
6	17/06/2021	13:40	Cormorant	94	32	Cormorant 2
6	17/06/2021	14:55	Snipe	83	5	Snipe
6	17/06/2021	15:06	Buzzard	40	103	Buzzard 4
6	17/06/2021	15:19	Buzzard	104	104	Buzzard 4
6	17/06/2021	15:38	Lesser Black-backed Gull	85	94	Lesser Black-Backed Gull 3
6	17/06/2021	15:44	Black-headed Gull	99	37	Black Headed Gull 2
6	17/06/2021	16:03	Grey Heron	34	27	Grey Heron 1
6	17/06/2021	16:27	Buzzard	133	105	Buzzard 4
6	17/06/2021	16:49	Lesser Black-backed Gull	166	95	Lesser Black-Backed Gull 3
6	17/06/2021	17:23	Kestrel	222	19	Kestrel 1
6	17/06/2021	17:28	Cormorant	66	33	Cormorant 2
7	18/06/2021	09:29	Lesser Black-backed Gull	86	96	Lesser Black-Backed Gull 3

VP No.	Date	Time	Species	Duration (s)	Flightline No	Flightline Map Title
7	18/06/2021	09:54	Buzzard	124	106	Buzzard 4
7	18/06/2021	10:15	Black-headed Gull	60	38	Black Headed Gull 2
7	18/06/2021	10:48	Kestrel	178	20	Kestrel 1
7	18/06/2021	11:07	Buzzard	192	107	Buzzard 4
7	18/06/2021	11:36	Kestrel	56	21	Kestrel 1
7	18/06/2021	11:53	Black-headed Gull	201	39	Black Headed Gull 2
7	18/06/2021	12:01	Grey Heron	15	28	Grey Heron 1
7	18/06/2021	13:42	Lesser Black-backed Gull	77	97	Lesser Black-Backed Gull 3
7	18/06/2021	13:56	Buzzard	89	108	Buzzard 4
7	18/06/2021	14:20	Kestrel	122	22	Kestrel 1
7	18/06/2021	14:37	Buzzard	145	109	Buzzard 4
7	18/06/2021	15:15	Buzzard	209	110	Buzzard 4
7	18/06/2021	15:54	Black-headed Gull	80	40	Black Headed Gull 2
8	23/06/2021	10:37	Buzzard	193	111	Buzzard 4
8	23/06/2021	10:57	Lesser Black-backed Gull	88	98	Lesser Black-Backed Gull 3
8	23/06/2021	11:22	Black-headed Gull	124	41	Black Headed Gull 2
8	23/06/2021	11:45	Little Egret	73	41	Little Egret 2
8	23/06/2021	12:03	Black-headed Gull	204	42	Black Headed Gull 2
8	23/06/2021	12:14	Lesser Black-backed Gull	157	99	Lesser Black-Backed Gull 3
8	23/06/2021	12:29	Lesser Black-backed Gull	58	100	Lesser Black-Backed Gull 3
8	23/06/2021	12:48	Black-headed Gull	83	43	Black Headed Gull 2
8	23/06/2021	14:32	Buzzard	213	112	Buzzard 4
8	23/06/2021	14:44	Buzzard	149	113	Buzzard 4
8	23/06/2021	15:02	Lesser Black-backed Gull	94	101	Lesser Black-Backed Gull 3
8	23/06/2021	15:27	Kestrel	168	23	Kestrel 1
8	23/06/2021	15:38	Lesser Black-backed Gull	100	102	Lesser Black-Backed Gull 3
8	23/06/2021	15:55	Black-headed Gull	66	44	Black Headed Gull 2
8	23/06/2021	16:31	Buzzard	82	114	Buzzard 4
8	23/06/2021	16:52	Grey Heron	78	29	Grey Heron 1
9	23/06/2021	18:34	Lesser Black-backed Gull	122	103	Lesser Black-Backed Gull 3
9	23/06/2021	18:57	Lesser Black-backed Gull	39	104	Lesser Black-Backed Gull 3
9	23/06/2021	19:11	Buzzard	200	115	Buzzard 4
9	23/06/2021	19:26	Black-headed Gull	111	45	Black Headed Gull 2
9	23/06/2021	19:39	Kestrel	309	24	Kestrel 1
9	23/06/2021	20:14	Buzzard	45	116	Buzzard 4
9	23/06/2021	20:48	Lesser Black-backed Gull	66	105	Lesser Black-Backed Gull 3
9	24/06/2021	10:33	Lesser Black-backed Gull	102	106	Lesser Black-Backed Gull 3
9	24/06/2021	10:49	Buzzard	327	117	Buzzard 4
9	24/06/2021	11:10	Lesser Black-backed Gull	91	107	Lesser Black-Backed Gull 3
9	24/06/2021	11:22	Black-headed Gull	55	46	Black Headed Gull 2
9	24/06/2021	11:37	Kestrel	310	25	Kestrel 1
9	24/06/2021	12:04	Buzzard	228	118	Buzzard 4
9	24/06/2021	12:12	Buzzard	73	119	Buzzard 4

VP No.	Date	Time	Species	Duration (s)	Flightline No	Flightline Map Title
9	24/06/2021	12:41	Grey Heron	22	30	Grey Heron 1
9	24/06/2021	13:00	Mallard	12	24	Mallard 1
10	24/06/2021	14:36	Lesser Black-backed Gull	47	108	Lesser Black-Backed Gull 3
10	24/06/2021	14:45	Black-headed Gull	69	47	Black Headed Gull 2
10	24/06/2021	15:06	Lesser Black-backed Gull	125	109	Lesser Black-Backed Gull 3
10	24/06/2021	15:33	Buzzard	34	120	Buzzard 4
10	24/06/2021	15:50	Lapwing	63	17	Lapwing
10	24/06/2021	16:09	Lapwing	36	18	Lapwing
10	24/06/2021	16:44	Lesser Black-backed Gull	110	110	Lesser Black-Backed Gull 3
10	24/06/2021	16:57	Grey Heron	10	31	Gery Heron 2
10	24/06/2021	18:06	Lesser Black-backed Gull	50	111	Lesser Black-Backed Gull 3
10	24/06/2021	18:15	Black-headed Gull	66	48	Black Headed Gull 2
10	24/06/2021	18:43	Lapwing	25	19	Lapwing
10	24/06/2021	18:59	Lesser Black-backed Gull	102	112	Lesser Black-Backed Gull 3
10	24/06/2021	19:37	Lesser Black-backed Gull	33	113	Lesser Black-Backed Gull 3
10	24/06/2021	20:03	Lesser Black-backed Gull	37	114	Lesser Black-Backed Gull 3
10	24/06/2021	20:20	Kestrel	184	26	Kestrel 1
11	25/06/2021	11:09	Lesser Black-backed Gull	77	115	Lesser Black-Backed Gull 3
11	25/06/2021	11:21	Black-headed Gull	55	49	Black Headed Gull 2
11	25/06/2021	11:33	Buzzard	128	121	Buzzard 5
11	25/06/2021	11:47	Lesser Black-backed Gull	22	116	Lesser Black-Backed Gull 3
11	25/06/2021	12:14	Buzzard	229	122	Buzzard 5
11	25/06/2021	12:30	Lesser Black-backed Gull	90	117	Lesser Black-Backed Gull 3
11	25/06/2021	12:52	Mallard	5	25	Mallard 1
11	25/06/2021	13:06	Buzzard	57	123	Buzzard 5
11	25/06/2021	13:23	Kestrel	155	27	Kestrel 1
11	25/06/2021	13:40	Lesser Black-backed Gull	66	118	Lesser Black-Backed Gull 3
11	25/06/2021	13:56	Lesser Black-backed Gull	100	119	Lesser Black-Backed Gull 3
11	25/06/2021	15:02	Kestrel	105	28	Kestrel 1
11	25/06/2021	15:20	Buzzard	225	124	Buzzard 5
11	25/06/2021	15:35	Buzzard	50	125	Buzzard 5
11	25/06/2021	15:43	Lesser Black-backed Gull	111	120	Lesser Black-Backed Gull 3
11	25/06/2021	16:27	Black-headed Gull	63	50	Black Headed Gull 2
11	25/06/2021	16:48	Lesser Black-backed Gull	28	121	Lesser Black-Backed Gull 4
11	25/06/2021	17:09	Kestrel	77	29	Kestrel 1
11	25/06/2021	17:32	Buzzard	10	126	Buzzard 5
3	05/07/2021	09:44	Snipe	197	6	Snipe
3	05/07/2021	10:00	Snipe	99	7	Snipe
3	05/07/2021	10:03	Lesser Black-backed Gull	66	122	Lesser Black-Backed Gull 4
3	05/07/2021	10:17	Black-headed Gull	40	51	Black Headed Gull 2
3	05/07/2021	11:20	Black-headed Gull	110	52	Black Headed Gull 2
3	05/07/2021	11:33	Lesser Black-backed Gull	130	123	Lesser Black-Backed Gull 4
3	05/07/2021	11:37	Buzzard	36	127	Buzzard 5

VP No.	Date	Time	Species	Duration (s)	Flightline No	Flightline Map Title
3	05/07/2021	16:20	Lesser Black-backed Gull	73	124	Lesser Black-Backed Gull 4
3	05/07/2021	16:34	Buzzard	108	128	Buzzard 5
3	05/07/2021	16:45	Kestrel	47	30	Kestrel 1
3	05/07/2021	16:53	Lapwing	13	20	Lapwing
3	05/07/2021	17:07	Lesser Black-backed Gull	94	125	Lesser Black-Backed Gull 4
3	05/07/2021	17:31	Black-headed Gull	112	53	Black Headed Gull 2
3	05/07/2021	17:52	Buzzard	37	129	Buzzard 5
3	05/07/2021	18:06	Grey Heron	30	32	Grey Heron 2
3	05/07/2021	18:27	Cormorant	182	34	Cormorant 2
3	05/07/2021	18:52	Kestrel	50	31	Kestrel 2
3	06/07/2021	08:52	Kestrel	44	32	Kestrel 2
3	06/07/2021	09:12	Snipe	222	8	Snipe
1	06/07/2021	09:19	Snipe	111	9	Snipe
3	06/07/2021	09:19	Buzzard	148	130	Buzzard 5
1	06/07/2021	09:30	Lapwing	208	21	Lapwing
1	06/07/2021	09:44	Lesser Black-backed Gull	75	126	Lesser Black-Backed Gull 4
1	06/07/2021	09:49	Snipe	97	10	Snipe
1	06/07/2021	10:11	Cormorant	195	35	Cormorant 2
1	06/07/2021	10:23	Mallard	60	26	Mallard 1
3	06/07/2021	10:38	Lesser Black-backed Gull	179	127	Lesser Black-Backed Gull 4
1	06/07/2021	10:49	Sparrowhawk	11	17	Sparrowhawk 1
3	06/07/2021	10:55	Peregrine	576	3	Peregrine
1	06/07/2021	11:03	Lapwing	36	22	Lapwing
3	06/07/2021	11:15	Snipe	73	11	Snipe
1	06/07/2021	11:20	Black-headed Gull	62	54	Black Headed Gull 2
1	06/07/2021	11:30	Buzzard	144	131	Buzzard 5
1	06/07/2021	11:47	Snipe	68	12	Snipe
1	06/07/2021	12:01	Lesser Black-backed Gull	15	128	Lesser Black-Backed Gull 4
1	06/07/2021	13:11	Lesser Black-backed Gull	92	129	Lesser Black-Backed Gull 4
1	06/07/2021	13:30	Buzzard	75	132	Buzzard 5
1	06/07/2021	13:46	Snipe	86	13	Snipe
1	06/07/2021	13:58	Lesser Black-backed Gull	50	130	Lesser Black-Backed Gull 4
1	06/07/2021	14:07	Mallard	42	27	Mallard 1
1	06/07/2021	14:29	Black-headed Gull	67	55	Black Headed Gull 2
1	06/07/2021	14:55	Cormorant	45	36	Cormorant 2
1	06/07/2021	15:06	Teal	119	2	Teal
1	06/07/2021	15:34	Lapwing	79	23	Lapwing
1	06/07/2021	15:50	Buzzard	128	133	Buzzard 5
2	06/07/2021	16:00	Common Tern	93	2	Common Tern
5	06/07/2021	17:06	Lesser Black-backed Gull	247	131	Lesser Black-Backed Gull 4
5	06/07/2021	17:15	Kestrel	116	33	Kestrel 2
5	06/07/2021	17:23	Snipe	322	14	Snipe
5	06/07/2021	17:39	Buzzard	145	134	Buzzard 5

VP No.	Date	Time	Species	Duration (s)	Flightline No	Flightline Map Title
5	06/07/2021	17:58	Cormorant	21	37	Cormorant 2
5	06/07/2021	18:24	Grey Heron	84	33	Grey Heron 2
5	06/07/2021	18:44	Kestrel	109	34	Kestrel 2
5	06/07/2021	18:55	Kestrel	144	35	Kestrel 2
5	06/07/2021	18:58	Kestrel	32	36	Kestrel 2
5	06/07/2021	19:43	Black-headed Gull	117	56	Black Headed Gull 2
5	06/07/2021	19:50	Lesser Black-backed Gull	74	132	Lesser Black-Backed Gull 4
5	06/07/2021	20:03	Lesser Black-backed Gull	94	133	Lesser Black-Backed Gull 4
2	07/07/2021	11:21	Lesser Black-backed Gull	38	134	Lesser Black-Backed Gull 4
2	07/07/2021	11:40	Cormorant	108	38	Cormorant 2
2	07/07/2021	12:19	Black-headed Gull	124	57	Black Headed Gull 2
2	07/07/2021	12:36	Lesser Black-backed Gull	229	135	Lesser Black-Backed Gull 4
2	07/07/2021	12:55	Buzzard	43	135	Buzzard 5
2	07/07/2021	13:02	Cormorant	111	39	Cormorant 2
2	07/07/2021	13:16	Cormorant	11	40	Cormorant 2
2	07/07/2021	13:20	Grey Heron	201	34	Grey Heron 2
2	07/07/2021	13:31	Lesser Black-backed Gull	57	136	Lesser Black-Backed Gull 4
2	07/07/2021	13:45	Black-headed Gull	55	58	Black Headed Gull 2
2	07/07/2021	13:59	Cormorant	124	41	Cormorant 2
2	07/07/2021	15:01	Buzzard	45	136	Buzzard 5
2	07/07/2021	15:15	Lesser Black-backed Gull	70	137	Lesser Black-Backed Gull 4
2	07/07/2021	15:28	Cormorant	33	42	Cormorant 2
2	07/07/2021	15:50	Mallard	51	28	Mallard 1
2	07/07/2021	16:22	Cormorant	20	43	Cormorant 2
2	07/07/2021	16:38	Buzzard	115	137	Buzzard 5
2	07/07/2021	16:47	Buzzard	96	138	Buzzard 5
2	07/07/2021	16:57	Lesser Black-backed Gull	88	138	Lesser Black-Backed Gull 4
2	07/07/2021	17:23	Grey Heron	27	35	Grey Heron 2
2	07/07/2021	17:38	Black-headed Gull	185	59	Black Headed Gull 2
2	07/07/2021	17:43	Common Tern	25	3	Common Tern
4	07/07/2021	18:50	Buzzard	90	139	Buzzard 5
4	07/07/2021	19:02	Lesser Black-backed Gull	87	139	Lesser Black-Backed Gull 4
4	07/07/2021	19:11	Black-headed Gull	78	60	Black Headed Gull 2
4	07/07/2021	19:28	Lesser Black-backed Gull	255	140	Lesser Black-Backed Gull 4
4	07/07/2021	19:53	Buzzard	313	140	Buzzard 5
4	07/07/2021	20:15	Grey Heron	17	36	Grey Heron 2
4	07/07/2021	20:26	Mallard	33	29	Mallard 1
4	07/07/2021	20:49	Buzzard	162	141	Buzzard 5
4	07/07/2021	20:58	Lesser Black-backed Gull	70	141	Lesser Black-Backed Gull 4
4	07/07/2021	21:08	Cormorant	69	44	Cormorant 2
4	07/07/2021	21:25	Lesser Black-backed Gull	88	142	Lesser Black-Backed Gull 4
6	08/07/2021	11:33	Lesser Black-backed Gull	83	143	Lesser Black-Backed Gull 4
6	08/07/2021	11:50	Buzzard	165	142	Buzzard 5

VP No.	Date	Time	Species	Duration (s)	Flightline No	Flightline Map Title
6	08/07/2021	12:07	Black-headed Gull	70	61	Black Headed Gull 3
6	08/07/2021	12:29	Sparrowhawk	224	18	Sparrowhawk 1
6	08/07/2021	12:45	Buzzard	49	143	Buzzard 5
6	08/07/2021	13:11	Lesser Black-backed Gull	111	144	Lesser Black-Backed Gull 4
6	08/07/2021	13:42	Lesser Black-backed Gull	84	145	Lesser Black-Backed Gull 4
6	08/07/2021	13:50	Kestrel	37	37	Kestrel 2
6	08/07/2021	14:03	Black-headed Gull	92	62	Black Headed Gull 3
6	08/07/2021	15:09	Lesser Black-backed Gull	80	146	Lesser Black-Backed Gull 4
6	08/07/2021	15:20	Kestrel	1763	38	Kestrel 2
6	08/07/2021	16:05	Buzzard	107	144	Buzzard 5
6	08/07/2021	16:12	Black-headed Gull	74	63	Black Headed Gull 3
6	08/07/2021	16:28	Lesser Black-backed Gull	110	147	Lesser Black-Backed Gull 4
6	08/07/2021	16:51	Buzzard	15	145	Buzzard 5
6	08/07/2021	16:59	Grey Heron	22	37	Grey Heron 2
6	08/07/2021	17:10	Lesser Black-backed Gull	99	148	Lesser Black-Backed Gull 4
6	08/07/2021	17:33	Grey Heron	55	38	Grey Heron 2
6	08/07/2021	17:46	Lesser Black-backed Gull	106	149	Lesser Black-Backed Gull 4
6	08/07/2021	18:00	Lesser Black-backed Gull	23	150	Lesser Black-Backed Gull 4
7	08/07/2021	19:03	Lesser Black-backed Gull	94	151	Lesser Black-Backed Gull 5
7	08/07/2021	19:23	Buzzard	147	146	Buzzard 5
7	08/07/2021	19:47	Lesser Black-backed Gull	42	152	Lesser Black-Backed Gull 5
7	08/07/2021	20:30	Kestrel	90	39	Kestrel 2
7	08/07/2021	20:55	Lesser Black-backed Gull	75	153	Lesser Black-Backed Gull 5
7	08/07/2021	21:09	Buzzard	63	147	Buzzard 5
7	08/07/2021	21:22	Grey Heron	18	39	Grey Heron 2
7	08/07/2021	21:40	Black-headed Gull	100	64	Black Headed Gull 3
7	09/07/2021	11:20	Black-headed Gull	96	65	Black Headed Gull 3
7	09/07/2021	11:37	Buzzard	174	148	Buzzard 5
7	09/07/2021	11:52	Lesser Black-backed Gull	73	154	Lesser Black-Backed Gull 5
7	09/07/2021	12:23	Grey Heron	25	40	Grey Heron 2
7	09/07/2021	12:46	Lesser Black-backed Gull	183	155	Lesser Black-Backed Gull 5
7	09/07/2021	13:00	Lesser Black-backed Gull	55	156	Lesser Black-Backed Gull 5
7	09/07/2021	13:17	Lesser Black-backed Gull	33	157	Lesser Black-Backed Gull 5
7	09/07/2021	13:44	Lesser Black-backed Gull	70	158	Lesser Black-Backed Gull 5
7	09/07/2021	14:06	Lesser Black-backed Gull	66	159	Lesser Black-Backed Gull 5
4	09/07/2021	15:00	Buzzard	124	149	Buzzard 5
4	09/07/2021	15:17	Cormorant	95	45	Cormorant 2
4	09/07/2021	15:36	Lesser Black-backed Gull	147	160	Lesser Black-Backed Gull 5
4	09/07/2021	15:43	Lesser Black-backed Gull	67	161	Lesser Black-Backed Gull 5
4	09/07/2021	16:08	Buzzard	34	150	Buzzard 5
4	09/07/2021	16:30	Mallard	20	30	Mallard 1
4	09/07/2021	16:49	Black-headed Gull	73	66	Black Headed Gull 3
4	09/07/2021	17:02	Buzzard	100	151	Buzzard 6

VP No.	Date	Time	Species	Duration (s)	Flightline No	Flightline Map Title
4	09/07/2021	17:15	Grey Heron	29	41	Grey Heron 2
4	09/07/2021	17:35	Lesser Black-backed Gull	92	162	Lesser Black-Backed Gull 5
4	09/07/2021	17:48	Lesser Black-backed Gull	36	163	Lesser Black-Backed Gull 5
5	09/07/2021	18:47	Buzzard	110	152	Buzzard 6
5	09/07/2021	19:20	Lesser Black-backed Gull	93	164	Lesser Black-Backed Gull 5
5	09/07/2021	19:36	Snipe	50	15	Snipe
5	09/07/2021	20:19	Grey Heron	15	42	Grey Heron 2
5	09/07/2021	20:45	Lesser Black-backed Gull	66	165	Lesser Black-Backed Gull 5
5	09/07/2021	20:55	Lesser Black-backed Gull	118	166	Lesser Black-Backed Gull 5
5	09/07/2021	21:14	Buzzard	97	153	Buzzard 6
5	09/07/2021	21:23	Cormorant	106	46	Cormorant 2
8	13/07/2021	08:03	Buzzard	135	154	Buzzard 6
8	13/07/2021	08:27	Lesser Black-backed Gull	120	167	Lesser Black-Backed Gull 5
8	13/07/2021	08:35	Buzzard	73	155	Buzzard 6
8	13/07/2021	09:02	Buzzard	66	156	Buzzard 6
8	13/07/2021	09:18	Black-headed Gull	96	67	Black Headed Gull 3
8	13/07/2021	09:46	Lesser Black-backed Gull	102	168	Lesser Black-Backed Gull 5
8	13/07/2021	10:10	Cormorant	103	47	Cormorant 2
8	13/07/2021	10:22	Lesser Black-backed Gull	29	169	Lesser Black-Backed Gull 5
8	13/07/2021	15:05	Lesser Black-backed Gull	100	170	Lesser Black-Backed Gull 5
8	13/07/2021	15:31	Buzzard	73	157	Buzzard 6
8	13/07/2021	15:40	Buzzard	62	158	Buzzard 6
8	13/07/2021	15:58	Black-headed Gull	112	68	Black Headed Gull 3
8	13/07/2021	16:27	Lesser Black-backed Gull	53	171	Lesser Black-Backed Gull 5
8	13/07/2021	16:43	Buzzard	97	159	Buzzard 6
8	13/07/2021	17:02	Lesser Black-backed Gull	112	172	Lesser Black-Backed Gull 5
8	13/07/2021	17:18	Lesser Black-backed Gull	68	173	Lesser Black-Backed Gull 5
8	13/07/2021	17:39	Lesser Black-backed Gull	70	174	Lesser Black-Backed Gull 5
9	14/07/2021	08:12	Buzzard	79	160	Buzzard 6
9	14/07/2021	08:27	Lesser Black-backed Gull	103	175	Lesser Black-Backed Gull 5
9	14/07/2021	09:00	Grey Heron	26	43	Grey Heron 2
9	14/07/2021	09:53	Kestrel	206	40	Kestrel 2
9	14/07/2021	10:15	Buzzard	110	161	Buzzard 6
9	14/07/2021	10:27	Lesser Black-backed Gull	48	176	Lesser Black-Backed Gull 5
9	14/07/2021	10:44	Kestrel	72	41	Kestrel 2
9	15/07/2021	08:27	Buzzard	79	162	Buzzard 6
9	15/07/2021	08:46	Lesser Black-backed Gull	113	177	Lesser Black-Backed Gull 5
9	15/07/2021	08:55	Buzzard	100	163	Buzzard 6
9	15/07/2021	09:23	Buzzard	93	164	Buzzard 6
9	15/07/2021	09:40	Black-headed Gull	36	69	Black Headed Gull 3
9	15/07/2021	10:17	Lesser Black-backed Gull	69	178	Lesser Black-Backed Gull 5
9	15/07/2021	10:48	Lesser Black-backed Gull	124	179	Lesser Black-Backed Gull 5
9	15/07/2021	11:00	Lesser Black-backed Gull	148	180	Lesser Black-Backed Gull 5

VP No.	Date	Time	Species	Duration (s)	Flightline No	Flightline Map Title
10	15/07/2021	12:47	Buzzard	147	165	Buzzard 6
10	15/07/2021	13:06	Lesser Black-backed Gull	65	181	Lesser Black-Backed Gull 6
10	15/07/2021	13:33	Sparrowhawk	32	19	Sparrowhawk 1
10	15/07/2021	13:59	Kestrel	323	42	Kestrel 2
10	15/07/2021	14:40	Lesser Black-backed Gull	104	182	Lesser Black-Backed Gull 6
10	15/07/2021	14:52	Buzzard	91	166	Buzzard 6
10	15/07/2021	16:30	Lesser Black-backed Gull	98	183	Lesser Black-Backed Gull 6
10	15/07/2021	16:47	Buzzard	77	167	Buzzard 6
10	15/07/2021	17:15	Kestrel	202	43	Kestrel 2
10	15/07/2021	17:52	Buzzard	60	168	Buzzard 6
10	15/07/2021	18:13	Lesser Black-backed Gull	91	184	Lesser Black-Backed Gull 6
10	15/07/2021	18:43	Sparrowhawk	43	20	Sparrowhawk 1
10	15/07/2021	19:00	Lesser Black-backed Gull	144	185	Lesser Black-Backed Gull 6
10	15/07/2021	19:08	Grey Heron	27	44	Grey Heron 2
11	16/07/2021	09:06	Buzzard	37	169	Buzzard 6
11	16/07/2021	09:43	Lesser Black-backed Gull	64	186	Lesser Black-Backed Gull 6
11	16/07/2021	10:09	Kestrel	304	44	Kestrel 2
11	16/07/2021	10:54	Buzzard	105	170	Buzzard 6
11	16/07/2021	11:11	Lesser Black-backed Gull	90	187	Lesser Black-Backed Gull 6
11	16/07/2021	11:26	Lesser Black-backed Gull	177	188	Lesser Black-Backed Gull 6
11	16/07/2021	13:02	Kestrel	207	45	Kestrel 2
11	16/07/2021	13:28	Buzzard	120	171	Buzzard 6
11	16/07/2021	13:46	Buzzard	73	172	Buzzard 6
11	16/07/2021	14:24	Lesser Black-backed Gull	113	189	Lesser Black-Backed Gull 6
11	16/07/2021	15:00	Lesser Black-backed Gull	84	190	Lesser Black-Backed Gull 6
11	16/07/2021	15:07	Black-headed Gull	39	70	Black Headed Gull 3
11	16/07/2021	15:23	Lesser Black-backed Gull	209	191	Lesser Black-Backed Gull 6
5	27/07/2021	09:22	Lesser Black-backed Gull	109	192	Lesser Black-Backed Gull 6
5	27/07/2021	09:45	Buzzard	208	173	Buzzard 6
5	27/07/2021	09:57	Lesser Black-backed Gull	54	193	Lesser Black-Backed Gull 6
5	27/07/2021	10:10	Lesser Black-backed Gull	91	194	Lesser Black-Backed Gull 6
5	27/07/2021	10:33	Buzzard	34	174	Buzzard 6
5	27/07/2021	10:49	Lesser Black-backed Gull	119	195	Lesser Black-Backed Gull 6
5	27/07/2021	11:00	Lapwing	263	24	Lapwing
5	27/07/2021	11:12	Little Egret	78	42	Little Egret 2
5	27/07/2021	11:48	Lesser Black-backed Gull	24	196	Lesser Black-Backed Gull 6
5	27/07/2021	11:59	Buzzard	205	175	Buzzard 6
5	27/07/2021	16:06	Buzzard	205	176	Buzzard 6
5	27/07/2021	16:30	Lesser Black-backed Gull	108	197	Lesser Black-Backed Gull 6
5	27/07/2021	16:49	Lesser Black-backed Gull	93	198	Lesser Black-Backed Gull 6
5	27/07/2021	17:11	Little Egret	44	43	Little Egret 2
5	27/07/2021	17:42	Buzzard	129	177	Buzzard 6
5	27/07/2021	18:02	Lesser Black-backed Gull	50	199	Lesser Black-Backed Gull 6

VP No.	Date	Time	Species	Duration (s)	Flightline No	Flightline Map Title
5	27/07/2021	18:14	Lapwing	72	25	Lapwing
5	27/07/2021	18:33	Buzzard	87	178	Buzzard 6
5	27/07/2021	18:55	Lesser Black-backed Gull	26	200	Lesser Black-Backed Gull 6
2	28/07/2021	09:33	Lesser Black-backed Gull	58	201	Lesser Black-Backed Gull 6
2	28/07/2021	09:43	Cormorant	67	48	Cormorant 2
2	28/07/2021	10:06	Lesser Black-backed Gull	42	202	Lesser Black-Backed Gull 6
2	28/07/2021	10:47	Grey Heron	14	45	Grey Heron 2
2	28/07/2021	10:58	Lesser Black-backed Gull	196	203	Lesser Black-Backed Gull 6
2	28/07/2021	11:09	Little Egret	53	44	Little Egret 2
2	28/07/2021	11:26	Kestrel	75	46	Kestrel 2
2	28/07/2021	11:55	Buzzard	49	179	Buzzard 6
2	28/07/2021	11:59	Lesser Black-backed Gull	77	204	Lesser Black-Backed Gull 6
2	28/07/2021	12:10	Buzzard	48	180	Buzzard 6
2	28/07/2021	12:14	Lesser Black-backed Gull	19	205	Lesser Black-Backed Gull 6
2	28/07/2021	13:30	Cormorant	97	49	Cormorant 2
2	28/07/2021	13:44	Lesser Black-backed Gull	66	206	Lesser Black-Backed Gull 6
2	28/07/2021	14:02	Lesser Black-backed Gull	88	207	Lesser Black-Backed Gull 6
2	28/07/2021	14:16	Kestrel	248	47	Kestrel 2
2	28/07/2021	14:57	Lesser Black-backed Gull	111	208	Lesser Black-Backed Gull 6
2	28/07/2021	15:19	Little Egret	21	45	Little Egret 2
2	28/07/2021	15:42	Lesser Black-backed Gull	163	209	Lesser Black-Backed Gull 6
2	28/07/2021	16:03	Lesser Black-backed Gull	36	210	Lesser Black-Backed Gull 6
3	28/07/2021	17:07	Sparrowhawk	12	21	Sparrowhawk 1
3	28/07/2021	17:32	Lesser Black-backed Gull	63	211	Lesser Black-Backed Gull 7
3	28/07/2021	17:38	Buzzard	28	181	Buzzard 7
3	28/07/2021	17:51	Sparrowhawk	546	22	Sparrowhawk 1
3	28/07/2021	18:20	Lesser Black-backed Gull	72	212	Lesser Black-Backed Gull 7
3	28/07/2021	18:40	Buzzard	200	182	Buzzard 7
3	28/07/2021	18:58	Lesser Black-backed Gull	27	213	Lesser Black-Backed Gull 7
3	28/07/2021	19:03	Grey Heron	14	46	Grey Heron 2
3	28/07/2021	19:15	Lesser Black-backed Gull	111	214	Lesser Black-Backed Gull 7
3	28/07/2021	19:29	Buzzard	50	183	Buzzard 7
3	28/07/2021	19:50	Lesser Black-backed Gull	25	215	Lesser Black-Backed Gull 7
1	29/07/2021	10:15	Cormorant	48	50	Cormorant 2
1	29/07/2021	10:29	Cormorant	107	51	Cormorant 2
1	29/07/2021	10:47	Mallard	50	31	Mallard 2
1	29/07/2021	11:04	Buzzard	208	184	Buzzard 7
1	29/07/2021	11:32	Lesser Black-backed Gull	143	216	Lesser Black-Backed Gull 7
1	29/07/2021	11:50	Lesser Black-backed Gull	40	217	Lesser Black-Backed Gull 7
1	29/07/2021	12:03	Mallard	33	32	Mallard 2
1	29/07/2021	12:22	Lapwing	37	26	Lapwing
1	29/07/2021	12:42	Lesser Black-backed Gull	41	218	Lesser Black-Backed Gull 7
1	29/07/2021	13:01	Buzzard	97	185	Buzzard 7

VP No.	Date	Time	Species	Duration (s)	Flightline No	Flightline Map Title
1	29/07/2021	14:05	Lesser Black-backed Gull	83	219	Lesser Black-Backed Gull 7
1	29/07/2021	14:11	Cormorant	44	52	Cormorant 2
1	29/07/2021	14:28	Buzzard	122	186	Buzzard 7
1	29/07/2021	15:02	Lesser Black-backed Gull	93	220	Lesser Black-Backed Gull 7
1	29/07/2021	15:41	Sparrowhawk	37	23	Sparrowhawk 1
1	29/07/2021	15:51	Lesser Black-backed Gull	78	221	Lesser Black-Backed Gull 7
1	29/07/2021	16:00	Mallard	55	33	Mallard 2
1	29/07/2021	16:14	Cormorant	33	53	Cormorant 2
1	29/07/2021	16:43	Buzzard	117	187	Buzzard 7
3	29/07/2021	17:52	Lesser Black-backed Gull	164	222	Lesser Black-Backed Gull 7
3	29/07/2021	17:59	Snipe	180	16	Snipe
3	29/07/2021	18:27	Grey Heron	93	47	Grey Heron 2
3	29/07/2021	18:45	Lesser Black-backed Gull	205	223	Lesser Black-Backed Gull 7
3	29/07/2021	19:03	Lesser Black-backed Gull	47	224	Lesser Black-Backed Gull 7
3	29/07/2021	19:14	Buzzard	88	188	Buzzard 7
3	29/07/2021	19:29	Lesser Black-backed Gull	55	225	Lesser Black-Backed Gull 7
3	29/07/2021	19:50	Buzzard	33	189	Buzzard 7
3	29/07/2021	20:00	Sparrowhawk	242	24	Sparrowhawk 1
3	29/07/2021	20:11	Lesser Black-backed Gull	28	226	Lesser Black-Backed Gull 7
3	29/07/2021	20:32	Cormorant	100	54	Cormorant 2
3	29/07/2021	20:37	Lesser Black-backed Gull	202	227	Lesser Black-Backed Gull 7
4	30/07/2021	11:00	Grey Heron	23	48	Grey Heron 2
4	30/07/2021	11:17	Lesser Black-backed Gull	142	228	Lesser Black-Backed Gull 7
4	30/07/2021	11:22	Lesser Black-backed Gull	33	229	Lesser Black-Backed Gull 7
4	30/07/2021	11:48	Lesser Black-backed Gull	79	230	Lesser Black-Backed Gull 7
4	30/07/2021	12:12	Mallard	48	34	Mallard 2
4	30/07/2021	12:30	Lesser Black-backed Gull	262	231	Lesser Black-Backed Gull 7
4	30/07/2021	12:52	Buzzard	113	190	Buzzard 7
4	30/07/2021	12:59	Snipe	3	17	Snipe
4	30/07/2021	13:08	Cormorant	109	55	Cormorant 2
4	30/07/2021	13:13	Cormorant	83	56	Cormorant 2
4	30/07/2021	13:30	Grey Heron	15	49	Grey Heron 2
4	30/07/2021	13:41	Buzzard	12	191	Buzzard 7
4	30/07/2021	14:52	Lesser Black-backed Gull	133	232	Lesser Black-Backed Gull 7
4	30/07/2021	15:07	Mallard	155	35	Mallard 2
4	30/07/2021	15:23	Grey Heron	34	50	Grey Heron 2
4	30/07/2021	15:40	Lesser Black-backed Gull	21	233	Lesser Black-Backed Gull 7
4	30/07/2021	15:58	Buzzard	77	192	Buzzard 7
4	30/07/2021	16:10	Lesser Black-backed Gull	96	234	Lesser Black-Backed Gull 7
4	30/07/2021	16:24	Lesser Black-backed Gull	47	235	Lesser Black-Backed Gull 7
4	30/07/2021	16:53	Grey Heron	143	51	Grey Heron 2
4	30/07/2021	17:01	Mallard	7	36	Mallard 2
4	30/07/2021	17:15	Lesser Black-backed Gull	11	236	Lesser Black-Backed Gull 7

VP No.	Date	Time	Species	Duration (s)	Flightline No	Flightline Map Title
4	30/07/2021	17:23	Lesser Black-backed Gull	123	237	Lesser Black-Backed Gull 7
7	02/08/2021	10:02	Lesser Black-backed Gull	15	238	Lesser Black-Backed Gull 7
7	02/08/2021	10:15	Lesser Black-backed Gull	177	239	Lesser Black-Backed Gull 7
7	02/08/2021	10:41	Kestrel	190	48	Kestrel 2
7	02/08/2021	10:58	Lesser Black-backed Gull	28	240	Lesser Black-Backed Gull 7
7	02/08/2021	11:22	Lesser Black-backed Gull	149	241	Lesser Black-Backed Gull 8
7	02/08/2021	11:50	Sparrowhawk	72	25	Sparrowhawk 1
7	02/08/2021	12:05	Lesser Black-backed Gull	22	242	Lesser Black-Backed Gull 8
7	02/08/2021	12:28	Buzzard	212	193	Buzzard 7
7	02/08/2021	15:20	Lesser Black-backed Gull	50	243	Lesser Black-Backed Gull 8
7	02/08/2021	15:43	Lesser Black-backed Gull	180	244	Lesser Black-Backed Gull 8
7	02/08/2021	15:56	Lesser Black-backed Gull	48	245	Lesser Black-Backed Gull 8
7	02/08/2021	16:45	Sparrowhawk	57	26	Sparrowhawk 1
7	02/08/2021	17:19	Lesser Black-backed Gull	10	246	Lesser Black-Backed Gull 8
7	02/08/2021	17:34	Grey Heron	97	52	Grey Heron 2
7	02/08/2021	17:58	Lesser Black-backed Gull	15	247	Lesser Black-Backed Gull 8
9	03/08/2021	09:55	Kestrel	155	49	Kestrel 2
9	03/08/2021	10:05	Grey Heron	27	53	Grey Heron 2
9	03/08/2021	10:19	Grey Heron	39	54	Grey Heron 2
9	03/08/2021	10:42	Lesser Black-backed Gull	96	248	Lesser Black-Backed Gull 8
9	03/08/2021	10:59	Buzzard	405	194	Buzzard 7
9	03/08/2021	11:14	Kestrel	14	50	Kestrel 2
9	03/08/2021	11:27	Little Egret	59	46	Little Egret 2
9	03/08/2021	11:38	Sparrowhawk	78	27	Sparrowhawk 1
9	03/08/2021	11:54	Kestrel	110	51	Kestrel 2
9	03/08/2021	12:09	Kestrel	297	52	Kestrel 2
9	03/08/2021	12:30	Buzzard	480	195	Buzzard 7
9	03/08/2021	14:02	Kestrel	122	53	Kestrel 2
9	03/08/2021	14:35	Kestrel	103	54	Kestrel 2
9	03/08/2021	14:56	Grey Heron	245	55	Grey Heron 2
9	03/08/2021	15:19	Lesser Black-backed Gull	274	249	Lesser Black-Backed Gull 8
9	03/08/2021	15:35	Little Egret	212	47	Little Egret 2
9	03/08/2021	15:47	Buzzard	177	196	Buzzard 7
9	03/08/2021	16:03	Sparrowhawk	133	28	Sparrowhawk 1
9	03/08/2021	16:23	Buzzard	99	197	Buzzard 7
9	03/08/2021	16:37	Lesser Black-backed Gull	27	250	Lesser Black-Backed Gull 8
8	03/08/2021	17:54	Buzzard	209	198	Buzzard 7
8	03/08/2021	18:09	Lesser Black-backed Gull	79	251	Lesser Black-Backed Gull 8
8	03/08/2021	18:27	Lesser Black-backed Gull	179	252	Lesser Black-Backed Gull 8
8	03/08/2021	18:50	Lesser Black-backed Gull	249	253	Lesser Black-Backed Gull 8
8	03/08/2021	19:16	Buzzard	88	199	Buzzard 7
8	03/08/2021	19:25	Lesser Black-backed Gull	134	254	Lesser Black-Backed Gull 8
8	03/08/2021	19:49	Grey Heron	105	56	Grey Heron 2

VP No.	Date	Time	Species	Duration (s)	Flightline No	Flightline Map Title
8	03/08/2021	20:14	Lesser Black-backed Gull	112	255	Lesser Black-Backed Gull 8
6	04/08/2021	10:22	Lesser Black-backed Gull	15	256	Lesser Black-Backed Gull 8
6	04/08/2021	10:50	Lesser Black-backed Gull	101	257	Lesser Black-Backed Gull 8
6	04/08/2021	11:15	Buzzard	128	200	Buzzard 7
6	04/08/2021	11:46	Lesser Black-backed Gull	93	258	Lesser Black-Backed Gull 8
6	04/08/2021	12:03	Grey Heron	55	57	Grey Heron 2
6	04/08/2021	12:30	Buzzard	120	201	Buzzard 7
6	04/08/2021	12:42	Lesser Black-backed Gull	31	259	Lesser Black-Backed Gull 8
6	04/08/2021	12:50	Lesser Black-backed Gull	77	260	Lesser Black-Backed Gull 8
6	04/08/2021	14:02	Lesser Black-backed Gull	109	261	Lesser Black-Backed Gull 8
6	04/08/2021	14:19	Lesser Black-backed Gull	133	262	Lesser Black-Backed Gull 8
6	04/08/2021	14:37	Buzzard	311	202	Buzzard 7
6	04/08/2021	15:00	Lesser Black-backed Gull	204	263	Lesser Black-Backed Gull 8
6	04/08/2021	15:34	Lesser Black-backed Gull	63	264	Lesser Black-Backed Gull 8
6	04/08/2021	15:58	Lesser Black-backed Gull	34	265	Lesser Black-Backed Gull 8
6	04/08/2021	16:22	Lesser Black-backed Gull	164	266	Lesser Black-Backed Gull 8
6	04/08/2021	16:41	Grey Heron	20	58	Grey Heron 2
8	04/08/2021	17:50	Lesser Black-backed Gull	127	267	Lesser Black-Backed Gull 8
8	04/08/2021	18:13	Lesser Black-backed Gull	44	268	Lesser Black-Backed Gull 8
8	04/08/2021	18:42	Buzzard	208	203	Buzzard 7
8	04/08/2021	19:19	Lesser Black-backed Gull	112	269	Lesser Black-Backed Gull 8
8	04/08/2021	19:39	Buzzard	68	204	Buzzard 7
8	04/08/2021	20:00	Lesser Black-backed Gull	74	270	Lesser Black-Backed Gull 8
8	04/08/2021	20:22	Lesser Black-backed Gull	52	271	Lesser Black-Backed Gull 9
10	05/08/2021	11:52	Lesser Black-backed Gull	99	272	Lesser Black-Backed Gull 9
10	05/08/2021	12:34	Lesser Black-backed Gull	354	273	Lesser Black-Backed Gull 9
10	05/08/2021	13:05	Grey Heron	173	59	Grey Heron 2
10	05/08/2021	13:40	Lesser Black-backed Gull	97	274	Lesser Black-Backed Gull 9
10	11/08/2021	09:45	Lesser Black-backed Gull	31	275	Lesser Black-Backed Gull 9
10	11/08/2021	09:59	Grey Heron	200	60	Grey Heron 2
10	11/08/2021	10:06	Kestrel	310	55	Kestrel 2
10	11/08/2021	10:38	Buzzard	10	205	Buzzard 7
10	11/08/2021	11:00	Lesser Black-backed Gull	429	276	Lesser Black-Backed Gull 9
10	11/08/2021	11:22	Buzzard	122	206	Buzzard 7
10	11/08/2021	11:37	Lapwing	143	27	Lapwing
10	11/08/2021	11:44	Buzzard	117	207	Buzzard 7
10	11/08/2021	11:59	Kestrel	98	56	Kestrel 2
10	11/08/2021	12:08	Kestrel	105	57	Kestrel 2
11	11/08/2021	13:09	Sparrowhawk	12	29	Sparrowhawk 1
11	11/08/2021	13:23	Kestrel	217	58	Kestrel 2
11	11/08/2021	13:37	Lesser Black-backed Gull	156	277	Lesser Black-Backed Gull 9
11	11/08/2021	13:56	Buzzard	67	208	Buzzard 7
11	11/08/2021	14:45	Buzzard	333	209	Buzzard 7

VP No.	Date	Time	Species	Duration (s)	Flightline No	Flightline Map Title
11	11/08/2021	15:08	Lesser Black-backed Gull	15	278	Lesser Black-Backed Gull 9
11	11/08/2021	17:24	Lesser Black-backed Gull	75	279	Lesser Black-Backed Gull 9
11	11/08/2021	17:51	Buzzard	204	210	Buzzard 7
11	11/08/2021	18:09	Kestrel	27	59	Kestrel 2
11	11/08/2021	18:43	Buzzard	210	211	Buzzard 8
11	11/08/2021	19:06	Lesser Black-backed Gull	72	280	Lesser Black-Backed Gull 9
11	11/08/2021	19:30	Lesser Black-backed Gull	106	281	Lesser Black-Backed Gull 9
5	12/08/2021	10:40	Buzzard	94	212	Buzzard 8
5	12/08/2021	11:04	Lesser Black-backed Gull	24	282	Lesser Black-Backed Gull 9
5	12/08/2021	11:33	Lesser Black-backed Gull	244	283	Lesser Black-Backed Gull 9
5	12/08/2021	11:56	Buzzard	132	213	Buzzard 8
5	12/08/2021	12:42	Lesser Black-backed Gull	15	284	Lesser Black-Backed Gull 9
5	12/08/2021	13:00	Mallard	197	37	Mallard 2
5	12/08/2021	14:30	Buzzard	53	214	Buzzard 8
5	12/08/2021	14:56	Lesser Black-backed Gull	62	285	Lesser Black-Backed Gull 9
5	12/08/2021	15:27	Lesser Black-backed Gull	16	286	Lesser Black-Backed Gull 9
5	12/08/2021	15:59	Buzzard	203	215	Buzzard 8
5	12/08/2021	16:31	Grey Heron	29	61	Grey Heron 3
5	12/08/2021	16:47	Lesser Black-backed Gull	166	287	Lesser Black-Backed Gull 9
7	12/08/2021	18:40	Lesser Black-backed Gull	77	288	Lesser Black-Backed Gull 9
7	12/08/2021	19:11	Lesser Black-backed Gull	195	289	Lesser Black-Backed Gull 9
7	12/08/2021	19:23	Lesser Black-backed Gull	15	290	Lesser Black-Backed Gull 9
7	12/08/2021	20:02	Kestrel	184	60	Kestrel 2
7	12/08/2021	20:29	Lesser Black-backed Gull	90	291	Lesser Black-Backed Gull 9
4	13/08/2021	10:53	Buzzard	55	216	Buzzard 8
4	13/08/2021	11:09	Lesser Black-backed Gull	184	292	Lesser Black-Backed Gull 9
4	13/08/2021	11:40	Lesser Black-backed Gull	253	293	Lesser Black-Backed Gull 9
4	13/08/2021	11:58	Little Egret	201	48	Little Egret 2
4	13/08/2021	12:22	Mallard	94	38	Mallard 2
4	13/08/2021	12:45	Little Egret	15	49	Little Egret 2
4	13/08/2021	12:50	Cormorant	198	57	Cormorant 2
4	13/08/2021	12:58	Lesser Black-backed Gull	107	294	Lesser Black-Backed Gull 9
4	13/08/2021	14:10	Lesser Black-backed Gull	46	295	Lesser Black-Backed Gull 9
4	13/08/2021	14:42	Curlew	19	1	Curlew
4	13/08/2021	14:42	Whimbrel	49	3	Whimbrel
4	13/08/2021	15:05	Buzzard	183	217	Buzzard 8
4	13/08/2021	15:33	Mallard	177	39	Mallard 2
4	13/08/2021	15:57	Grey Heron	105	62	Grey Heron 3
4	13/08/2021	16:10	Lesser Black-backed Gull	105	296	Lesser Black-Backed Gull 9
4	13/08/2021	16:50	Lesser Black-backed Gull	76	297	Lesser Black-Backed Gull 9
4	13/08/2021	16:54	Little Egret	54	50	Little Egret 2
4	13/08/2021	17:03	Grey Heron	11	63	Grey Heron 3
7	13/08/2021	18:15	Lesser Black-backed Gull	109	298	Lesser Black-Backed Gull 9

VP No.	Date	Time	Species	Duration (s)	Flightline No	Flightline Map Title
7	13/08/2021	18:40	Lesser Black-backed Gull	150	299	Lesser Black-Backed Gull 9
7	13/08/2021	19:12	Lesser Black-backed Gull	10	300	Lesser Black-Backed Gull 9
7	13/08/2021	19:55	Buzzard	5	218	Buzzard 8
7	13/08/2021	20:24	Lesser Black-backed Gull	195	301	Lesser Black-Backed Gull 10
8	14/08/2021	11:17	Lesser Black-backed Gull	62	302	Lesser Black-Backed Gull 10
8	14/08/2021	11:51	Lesser Black-backed Gull	94	303	Lesser Black-Backed Gull 10
8	14/08/2021	12:22	Buzzard	52	219	Buzzard 8
8	14/08/2021	12:46	Lesser Black-backed Gull	210	304	Lesser Black-Backed Gull 10
8	14/08/2021	13:15	Lesser Black-backed Gull	224	305	Lesser Black-Backed Gull 10
3	16/08/2021	09:09	Buzzard	67	220	Buzzard 8
3	16/08/2021	09:29	Lesser Black-backed Gull	15	306	Lesser Black-Backed Gull 10
3	16/08/2021	09:47	Kestrel	193	61	Kestrel 3
3	16/08/2021	10:11	Lesser Black-backed Gull	100	307	Lesser Black-Backed Gull 10
3	16/08/2021	10:34	Buzzard	97	221	Buzzard 8
3	16/08/2021	10:55	Kestrel	222	62	Kestrel 3
3	16/08/2021	11:17	Kestrel	294	63	Kestrel 3
3	16/08/2021	11:39	Buzzard	180	222	Buzzard 8
3	16/08/2021	13:02	Buzzard	110	223	Buzzard 8
3	16/08/2021	13:27	Lesser Black-backed Gull	15	308	Lesser Black-Backed Gull 10
3	16/08/2021	13:48	Lesser Black-backed Gull	93	309	Lesser Black-Backed Gull 10
3	16/08/2021	14:21	Buzzard	47	224	Buzzard 8
3	16/08/2021	14:50	Kestrel	172	64	Kestrel 3
3	16/08/2021	15:00	Grey Heron	160	64	Grey Heron 3
3	16/08/2021	15:16	Lesser Black-backed Gull	256	310	Lesser Black-Backed Gull 10
8	16/08/2021	17:04	Lesser Black-backed Gull	62	311	Lesser Black-Backed Gull 10
8	16/08/2021	17:39	Lesser Black-backed Gull	99	312	Lesser Black-Backed Gull 10
8	16/08/2021	18:14	Lesser Black-backed Gull	10	313	Lesser Black-Backed Gull 10
8	16/08/2021	18:40	Lesser Black-backed Gull	53	314	Lesser Black-Backed Gull 10
8	16/08/2021	19:00	Buzzard	209	225	Buzzard 8
2	17/08/2021	09:14	Lesser Black-backed Gull	187	315	Lesser Black-Backed Gull 10
2	17/08/2021	09:42	Grey Heron	94	65	Grey Heron 3
2	17/08/2021	09:57	Buzzard	226	226	Buzzard 8
2	17/08/2021	10:08	Kestrel	45	65	Kestrel 3
2	17/08/2021	10:20	Grey Heron	110	66	Grey Heron 3
2	17/08/2021	10:34	Buzzard	18	227	Buzzard 8
2	17/08/2021	10:49	Lesser Black-backed Gull	198	316	Lesser Black-Backed Gull 10
2	17/08/2021	11:05	Kestrel	47	66	Kestrel 3
2	17/08/2021	11:26	Mallard	53	40	Mallard 2
2	17/08/2021	11:46	Grey Heron	81	67	Grey Heron 3
2	17/08/2021	12:32	Buzzard	33	228	Buzzard 8
2	17/08/2021	12:45	Lesser Black-backed Gull	122	317	Lesser Black-Backed Gull 10
2	17/08/2021	13:03	Kestrel	8	67	Kestrel 3
2	17/08/2021	13:24	Grey Heron	15	68	Grey Heron 3

VP No.	Date	Time	Species	Duration (s)	Flightline No	Flightline Map Title
2	17/08/2021	13:38	Buzzard	27	229	Buzzard 8
2	17/08/2021	14:09	Mallard	105	41	Mallard 2
2	17/08/2021	14:21	Lesser Black-backed Gull	110	318	Lesser Black-Backed Gull 10
2	17/08/2021	14:50	Grey Heron	11	69	Grey Heron 3
2	17/08/2021	15:00	Cormorant	17	58	Cormorant 2
2	17/08/2021	15:23	Lesser Black-backed Gull	23	319	Lesser Black-Backed Gull 10
9	17/08/2021	16:53	Lesser Black-backed Gull	207	320	Lesser Black-Backed Gull 10
9	17/08/2021	17:25	Lesser Black-backed Gull	193	321	Lesser Black-Backed Gull 10
9	17/08/2021	17:47	Buzzard	44	230	Buzzard 8
9	17/08/2021	18:34	Lesser Black-backed Gull	29	322	Lesser Black-Backed Gull 10
9	17/08/2021	19:01	Lesser Black-backed Gull	87	323	Lesser Black-Backed Gull 10
1	18/08/2021	09:09	Mallard	22	42	Mallard 2
1	18/08/2021	09:33	Curlew	47	2	Curlew
1	18/08/2021	09:48	Lesser Black-backed Gull	75	324	Lesser Black-Backed Gull 10
1	18/08/2021	10:07	Lesser Black-backed Gull	38	325	Lesser Black-Backed Gull 10
1	18/08/2021	10:17	Cormorant	167	59	Cormorant 2
1	18/08/2021	10:33	Lesser Black-backed Gull	194	326	Lesser Black-Backed Gull 10
1	18/08/2021	10:54	Grey Heron	24	70	Grey Heron 3
1	18/08/2021	11:12	Mute Swan	96	4	Mute Swan
1	18/08/2021	11:21	Buzzard	26	231	Buzzard 8
1	18/08/2021	11:40	Lesser Black-backed Gull	200	327	Lesser Black-Backed Gull 10
1	18/08/2021	11:52	Lesser Black-backed Gull	66	328	Lesser Black-Backed Gull 10
1	18/08/2021	13:00	Lesser Black-backed Gull	112	329	Lesser Black-Backed Gull 10
1	18/08/2021	13:14	Grey Heron	18	71	Grey Heron 3
1	18/08/2021	13:38	Lesser Black-backed Gull	35	330	Lesser Black-Backed Gull 10
1	18/08/2021	14:02	Mallard	21	43	Mallard 2
1	18/08/2021	14:22	Cormorant	162	60	Cormorant 2
1	18/08/2021	14:45	Buzzard	64	232	Buzzard 8
1	18/08/2021	14:57	Grey Heron	5	72	Grey Heron 3
1	18/08/2021	15:09	Lesser Black-backed Gull	94	331	Lesser Black-Backed Gull 11
1	18/08/2021	15:20	Cormorant	37	61	Cormorant 3
1	18/08/2021	15:34	Mallard	39	44	Mallard 2
9	18/08/2021	16:35	Buzzard	36	233	Buzzard 8
9	18/08/2021	16:56	Kestrel	17	68	Kestrel 3
9	18/08/2021	17:08	Lesser Black-backed Gull	195	332	Lesser Black-Backed Gull 11
9	18/08/2021	17:17	Lesser Black-backed Gull	143	333	Lesser Black-Backed Gull 11
9	18/08/2021	17:42	Sparrowhawk	384	30	Sparrowhawk 1
9	18/08/2021	18:10	Lesser Black-backed Gull	47	334	Lesser Black-Backed Gull 11
9	18/08/2021	18:39	Buzzard	55	234	Buzzard 8
9	18/08/2021	19:02	Grey Heron	24	73	Grey Heron 3
6	19/08/2021	09:34	Buzzard	15	235	Buzzard 8
6	19/08/2021	09:47	Lesser Black-backed Gull	100	335	Lesser Black-Backed Gull 11
6	19/08/2021	10:15	Lesser Black-backed Gull	186	336	Lesser Black-Backed Gull 11

VP No.	Date	Time	Species	Duration (s)	Flightline No	Flightline Map Title
6	19/08/2021	10:40	Kestrel	49	69	Kestrel 3
6	19/08/2021	11:06	Buzzard	55	236	Buzzard 8
6	19/08/2021	11:22	Curlew	163	3	Curlew
6	19/08/2021	11:35	Buzzard	300	237	Buzzard 8
6	19/08/2021	12:01	Lesser Black-backed Gull	44	337	Lesser Black-Backed Gull 11
6	19/08/2021	13:12	Buzzard	212	238	Buzzard 8
6	19/08/2021	13:27	Sparrowhawk	20	31	Sparrowhawk 2
6	19/08/2021	13:56	Lesser Black-backed Gull	134	338	Lesser Black-Backed Gull 11
6	19/08/2021	14:19	Buzzard	29	239	Buzzard 8
6	19/08/2021	14:45	Sparrowhawk	440	32	Sparrowhawk 2
6	19/08/2021	15:07	Kestrel	34	70	Kestrel 3
6	19/08/2021	15:38	Buzzard	153	240	Buzzard 8
10	19/08/2021	17:04	Buzzard	310	241	Buzzard 9
10	19/08/2021	17:24	Sparrowhawk	193	33	Sparrowhawk 2
10	19/08/2021	17:46	Buzzard	100	242	Buzzard 9
10	19/08/2021	18:15	Lesser Black-backed Gull	86	339	Lesser Black-Backed Gull 11
10	19/08/2021	18:52	Little Egret	77	51	Little Egret 2
10	19/08/2021	19:10	Lesser Black-backed Gull	165	340	Lesser Black-Backed Gull 11
10	19/08/2021	19:31	Buzzard	42	243	Buzzard 9
10	20/08/2021	09:44	Little Egret	15	52	Little Egret 2
10	20/08/2021	09:51	Buzzard	50	244	Buzzard 9
10	20/08/2021	10:30	Lesser Black-backed Gull	118	341	Lesser Black-Backed Gull 11
10	20/08/2021	10:49	Little Egret	43	53	Little Egret 2
10	20/08/2021	11:15	Lesser Black-backed Gull	227	342	Lesser Black-Backed Gull 11
10	20/08/2021	12:02	Grey Heron	25	74	Grey Heron 3
11	20/08/2021	13:40	Grey Heron	26	75	Grey Heron 3
11	20/08/2021	14:00	Lesser Black-backed Gull	211	343	Lesser Black-Backed Gull 11
11	20/08/2021	14:52	Kestrel	49	71	Kestrel 3
11	20/08/2021	15:33	Lesser Black-backed Gull	68	344	Lesser Black-Backed Gull 11
11	20/08/2021	17:16	Lesser Black-backed Gull	165	345	Lesser Black-Backed Gull 11
11	20/08/2021	18:05	Lesser Black-backed Gull	222	346	Lesser Black-Backed Gull 11
11	20/08/2021	18:49	Lesser Black-backed Gull	40	347	Lesser Black-Backed Gull 11
3	02/09/2021	09:12	Buzzard	19	245	Buzzard 9
3	02/09/2021	09:27	Kestrel	208	72	Kestrel 3
3	02/09/2021	09:50	Grey Heron	102	76	Grey Heron 3
3	02/09/2021	10:10	Buzzard	54	246	Buzzard 9
3	02/09/2021	10:22	Snipe	190	18	Snipe
3	02/09/2021	11:03	Kestrel	41	73	Kestrel 3
3	02/09/2021	11:19	Grey Heron	15	77	Grey Heron 3
3	02/09/2021	11:34	Kestrel	83	74	Kestrel 3
3	02/09/2021	12:59	Kestrel	122	75	Kestrel 3
3	02/09/2021	13:26	Buzzard	93	247	Buzzard 9
3	02/09/2021	13:45	Grey Heron	14	78	Grey Heron 3

VP No.	Date	Time	Species	Duration (s)	Flightline No	Flightline Map Title
3	02/09/2021	14:14	Kestrel	41	76	Kestrel 3
3	02/09/2021	15:05	Buzzard	152	248	Buzzard 9
3	02/09/2021	15:17	Lesser Black-backed Gull	74	348	Lesser Black-Backed Gull 11
5	02/09/2021	16:43	Buzzard	87	249	Buzzard 9
5	02/09/2021	16:57	Grey Heron	23	79	Grey Heron 3
5	02/09/2021	17:30	Little Egret	15	54	Little Egret 2
5	02/09/2021	18:05	Buzzard	108	250	Buzzard 9
5	02/09/2021	18:38	Kestrel	234	77	Kestrel 3
5	03/09/2021	09:46	Little Egret	27	55	Little Egret 2
5	03/09/2021	10:17	Buzzard	63	251	Buzzard 9
5	03/09/2021	10:47	Buzzard	15	252	Buzzard 9
5	03/09/2021	11:00	Kestrel	145	78	Kestrel 3
5	03/09/2021	11:22	Buzzard	108	253	Buzzard 9
5	03/09/2021	11:35	Kestrel	20	79	Kestrel 3
7	03/09/2021	13:22	Buzzard	163	254	Buzzard 9
7	03/09/2021	14:02	Grey Heron	17	80	Grey Heron 3
7	03/09/2021	14:47	Buzzard	22	255	Buzzard 9
7	03/09/2021	15:09	Kestrel	218	80	Kestrel 3
7	03/09/2021	17:14	Buzzard	124	256	Buzzard 9
7	03/09/2021	17:53	Kestrel	15	81	Kestrel 3
7	03/09/2021	18:22	Buzzard	166	257	Buzzard 9
1	06/09/2021	08:53	Mallard	15	45	Mallard 2
1	06/09/2021	09:11	Lesser Black-backed Gull	133	349	Lesser Black-Backed Gull 11
1	06/09/2021	09:28	Lapwing	27	28	Lapwing
1	06/09/2021	09:45	Cormorant	61	62	Cormorant 3
1	06/09/2021	10:10	Buzzard	64	258	Buzzard 9
1	06/09/2021	10:19	Lesser Black-backed Gull	107	350	Lesser Black-Backed Gull 11
1	06/09/2021	10:52	Sparrowhawk	10	34	Sparrowhawk 2
1	06/09/2021	11:03	Mute Swan	30	5	Mute Swan
1	06/09/2021	11:23	Grey Heron	12	81	Grey Heron 3
1	06/09/2021	12:15	Buzzard	60	259	Buzzard 9
1	06/09/2021	12:37	Black-headed Gull	22	71	Black Headed Gull 3
1	06/09/2021	13:06	Cormorant	105	63	Cormorant 3
1	06/09/2021	13:22	Mallard	47	46	Mallard 2
1	06/09/2021	13:30	Curlew	33	4	Curlew
1	06/09/2021	14:00	Sparrowhawk	28	35	Sparrowhawk 2
1	06/09/2021	14:19	Mallard	19	47	Mallard 2
1	06/09/2021	14:43	Lesser Black-backed Gull	201	351	Lesser Black-Backed Gull 11
8	06/09/2021	17:10	Lesser Black-backed Gull	166	352	Lesser Black-Backed Gull 11
8	06/09/2021	18:03	Whimbrel	109	4	Whimbrel
8	07/09/2021	09:35	Snipe	15	19	Snipe
8	07/09/2021	11:03	Buzzard	179	260	Buzzard 9
4	07/09/2021	12:40	Snipe	19	20	Snipe

VP No.	Date	Time	Species	Duration (s)	Flightline No	Flightline Map Title
4	07/09/2021	12:53	Grey Heron	12	82	Grey Heron 3
4	07/09/2021	13:06	Little Egret	52	56	Little Egret 2
4	07/09/2021	13:36	Snipe	61	21	Snipe
4	07/09/2021	14:05	Buzzard	102	261	Buzzard 9
4	07/09/2021	14:11	Mallard	32	48	Mallard 2
4	07/09/2021	14:52	Grey Heron	27	83	Grey Heron 3
4	07/09/2021	15:00	Cormorant	111	64	Cormorant 3
4	07/09/2021	16:12	Buzzard	65	262	Buzzard 9
4	07/09/2021	16:31	Snipe	30	22	Snipe
4	07/09/2021	16:47	Snipe	5	23	Snipe
4	07/09/2021	17:23	Grey Heron	17	84	Grey Heron 3
4	07/09/2021	17:55	Mallard	71	49	Mallard 2
4	07/09/2021	18:09	Cormorant	105	65	Cormorant 3
4	07/09/2021	18:41	Little Egret	23	57	Little Egret 2
6	09/09/2021	09:03	Buzzard	97	263	Buzzard 9
6	09/09/2021	09:22	Kestrel	209	82	Kestrel 3
6	09/09/2021	10:10	Lesser Black-backed Gull	173	353	Lesser Black-Backed Gull 11
6	09/09/2021	10:51	Buzzard	258	264	Buzzard 9
6	09/09/2021	11:15	Sparrowhawk	111	36	Sparrowhawk 2
6	12/09/2021	09:08	Buzzard	207	265	Buzzard 9
6	12/09/2021	09:48	Kestrel	310	83	Kestrel 3
6	12/09/2021	10:33	Buzzard	125	266	Buzzard 9
6	12/09/2021	10:59	Kestrel	96	84	Kestrel 3
6	12/09/2021	11:15	Grey Heron	27	85	Grey Heron 3
2	12/09/2021	12:11	Mallard	53	50	Mallard 2
2	12/09/2021	12:27	Cormorant	37	66	Cormorant 3
2	12/09/2021	12:46	Kestrel	207	85	Kestrel 3
2	12/09/2021	13:30	Grey Heron	15	86	Grey Heron 3
2	12/09/2021	13:52	Kestrel	69	86	Kestrel 3
2	12/09/2021	14:12	Buzzard	103	267	Buzzard 9
2	12/09/2021	14:41	Grey Heron	22	87	Grey Heron 3
2	12/09/2021	15:43	Cormorant	65	67	Cormorant 3
2	12/09/2021	16:02	Kestrel	126	87	Kestrel 3
2	12/09/2021	16:30	Buzzard	77	268	Buzzard 9
2	12/09/2021	16:45	Grey Heron	26	88	Grey Heron 3
2	12/09/2021	17:10	Cormorant	104	68	Cormorant 3
2	12/09/2021	17:32	Grey Heron	44	89	Grey Heron 3
2	12/09/2021	18:00	Mallard	32	51	Mallard 2
2	12/09/2021	18:21	Grey Heron	17	90	Grey Heron 3
9	13/09/2021	09:11	Buzzard	112	269	Buzzard 9
9	13/09/2021	09:19	Kestrel	225	88	Kestrel 3
9	13/09/2021	09:55	Buzzard	50	270	Buzzard 9
9	13/09/2021	10:33	Grey Heron	43	91	Grey Heron 4

VP No.	Date	Time	Species	Duration (s)	Flightline No	Flightline Map Title
9	13/09/2021	11:00	Lesser Black-backed Gull	97	354	Lesser Black-Backed Gull 11
9	13/09/2021	13:05	Buzzard	69	271	Buzzard 10
9	13/09/2021	13:44	Kestrel	117	89	Kestrel 3
9	13/09/2021	14:07	Buzzard	44	272	Buzzard 10
9	13/09/2021	14:58	Sparrowhawk	15	37	Sparrowhawk 2
10	13/09/2021	16:40	Little Egret	44	58	Little Egret 2
10	13/09/2021	17:21	Buzzard	219	273	Buzzard 10
10	13/09/2021	17:38	Grey Heron	18	92	Grey Heron 4
10	13/09/2021	18:03	Buzzard	55	274	Buzzard 10
10	13/09/2021	18:44	Little Egret	23	59	Little Egret 2
10	14/09/2021	09:20	Little Egret	24	60	Little Egret 2
10	14/09/2021	09:48	Buzzard	73	275	Buzzard 10
10	14/09/2021	10:22	Kestrel	153	90	Kestrel 3
10	14/09/2021	10:59	Buzzard	122	276	Buzzard 10
11	14/09/2021	13:11	Grey Heron	33	93	Grey Heron 4
11	14/09/2021	13:59	Lesser Black-backed Gull	187	355	Lesser Black-Backed Gull 11
11	14/09/2021	14:22	Buzzard	84	277	Buzzard 10
11	14/09/2021	16:10	Grey Heron	14	94	Grey Heron 4
11	14/09/2021	17:25	Buzzard	102	278	Buzzard 10
11	14/09/2021	18:14	Kestrel	80	91	Kestrel 4

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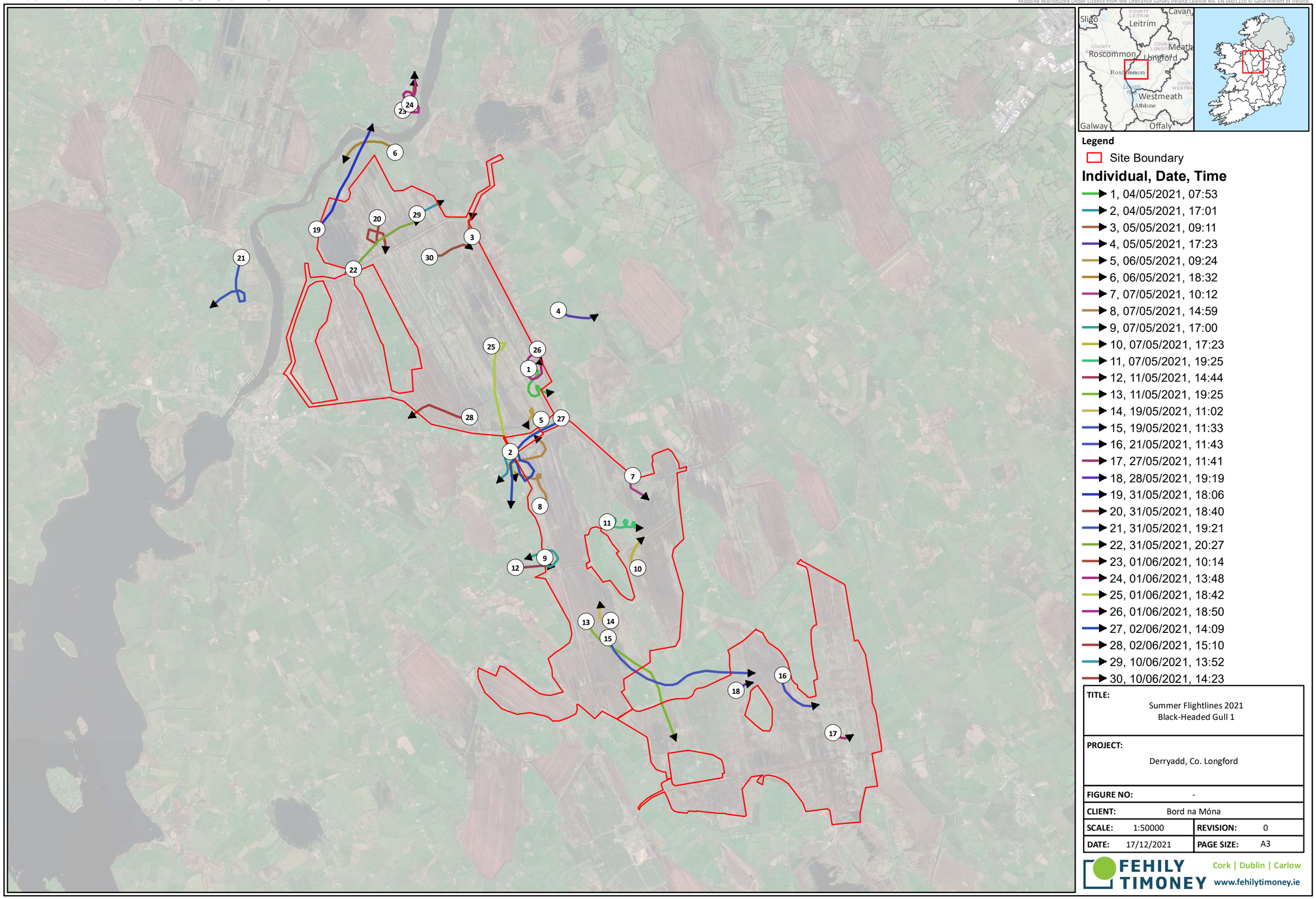
CONSULTANTS IN ENGINEERING,
ENVIRONMENTAL SCIENCE
& PLANNING

APPENDIX 3

Target Species Flight Line Maps

Path: R:\Map Production\2021\P21-119\workspace\Flightlines\P20-113_GIS_Flightlines_DerryaddWindFarm_A3.mxd

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Legend

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- 4, 05/05/2021, 17:23
- 5, 06/05/2021, 09:24
- 6, 06/05/2021, 18:32
- 7, 07/05/2021, 10:12
- 8, 07/05/2021, 14:59
- 9, 07/05/2021, 17:00
- 10, 07/05/2021, 17:23
- 11, 07/05/2021, 19:25
- 12, 11/05/2021, 14:44
- 13, 11/05/2021, 19:25
- 14, 19/05/2021, 11:02
- 15, 19/05/2021, 11:33
- 16, 21/05/2021, 11:43
- 17, 27/05/2021, 11:41
- 18, 28/05/2021, 19:19
- 19, 31/05/2021, 18:06
- 20, 31/05/2021, 18:40
- 21, 31/05/2021, 19:21
- 22, 31/05/2021, 20:27
- 23, 01/06/2021, 10:14
- 24, 01/06/2021, 13:48
- 25, 01/06/2021, 18:42
- 26, 01/06/2021, 18:50
- 27, 02/06/2021, 14:09
- 28, 02/06/2021, 15:10
- 29, 10/06/2021, 13:52
- 30, 10/06/2021, 14:23

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PROJECT:	Derryadd, Co. Longford		
FIGURE NO:	-		
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DATE:	17/12/2021	**PAGE SIZE:**	A3

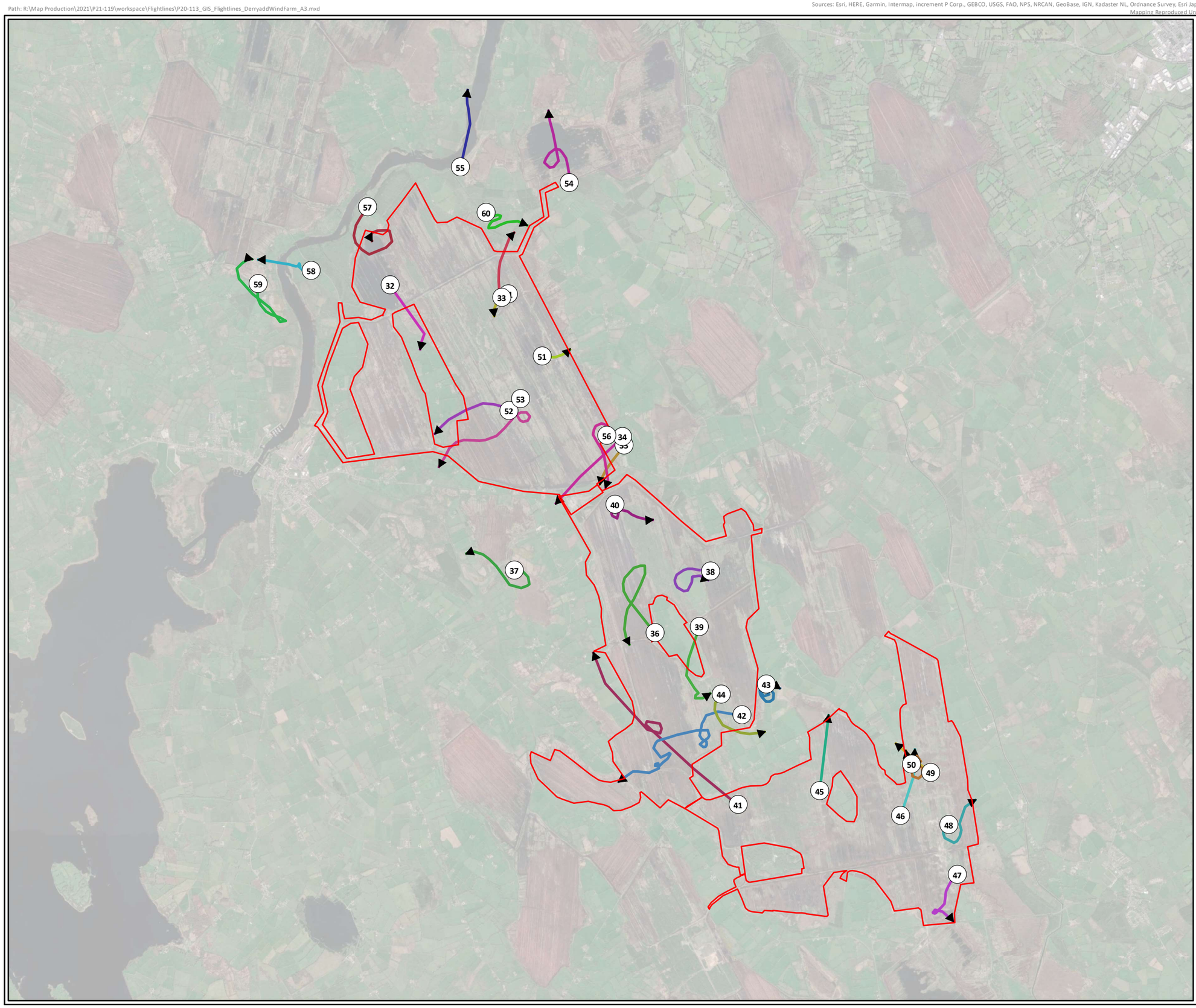
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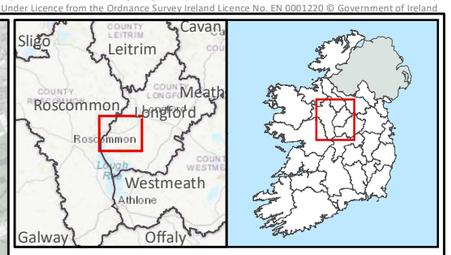
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Kilometers
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Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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- 36, 17/06/2021, 12:09
- 37, 17/06/2021, 15:44
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- 42, 23/06/2021, 12:03
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- 49, 25/06/2021, 11:21
- 50, 25/06/2021, 16:27
- 51, 05/07/2021, 10:17
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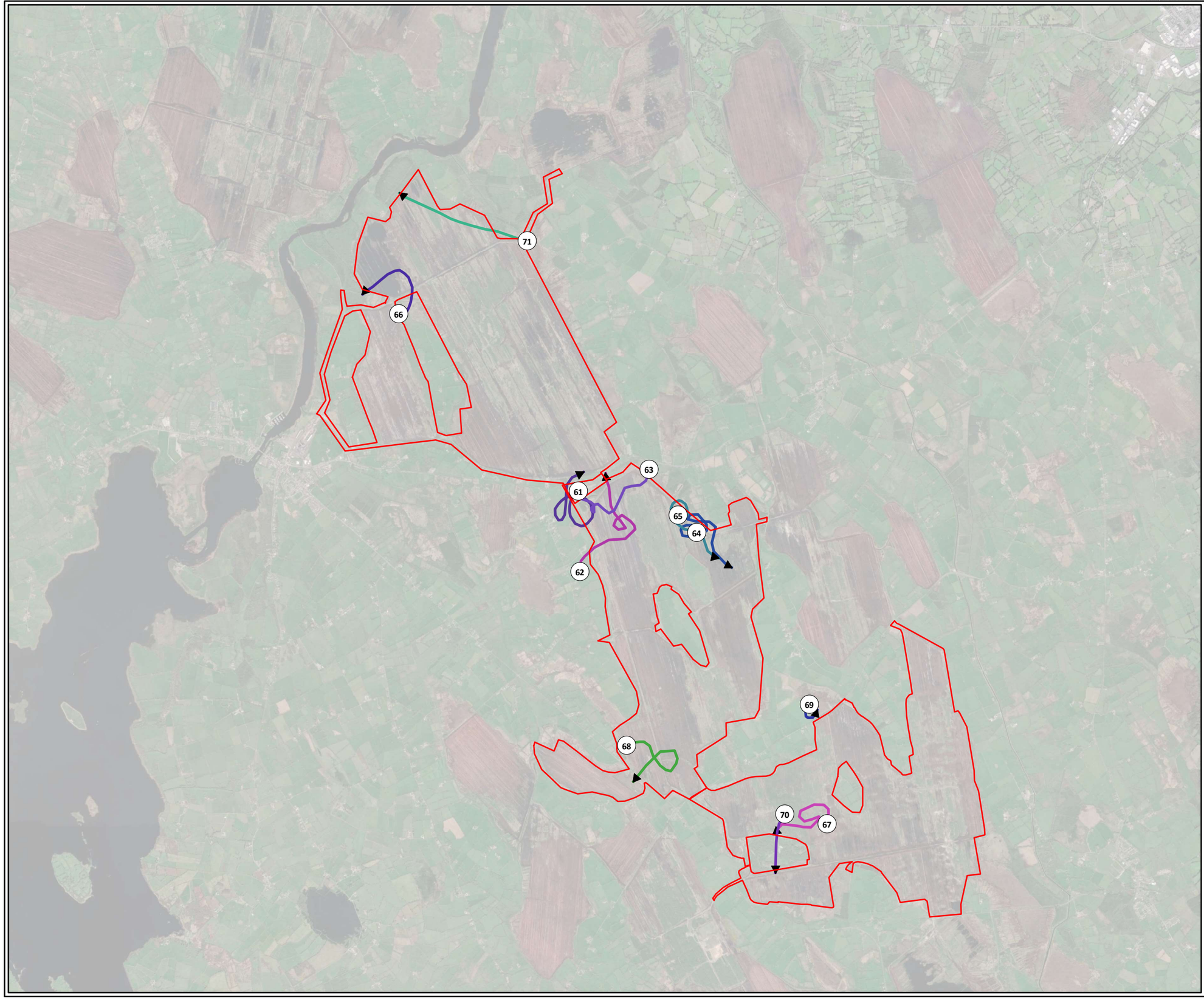
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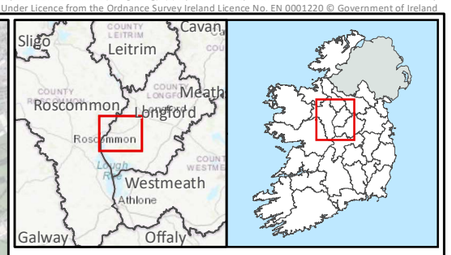
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Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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- 65, 09/07/2021, 11:20
- 66, 09/07/2021, 16:49
- 67, 13/07/2021, 09:18
- 68, 13/07/2021, 15:58
- 69, 15/07/2021, 09:40
- 70, 16/07/2021, 15:07
- 71, 06/09/2021, 12:37

N W E S

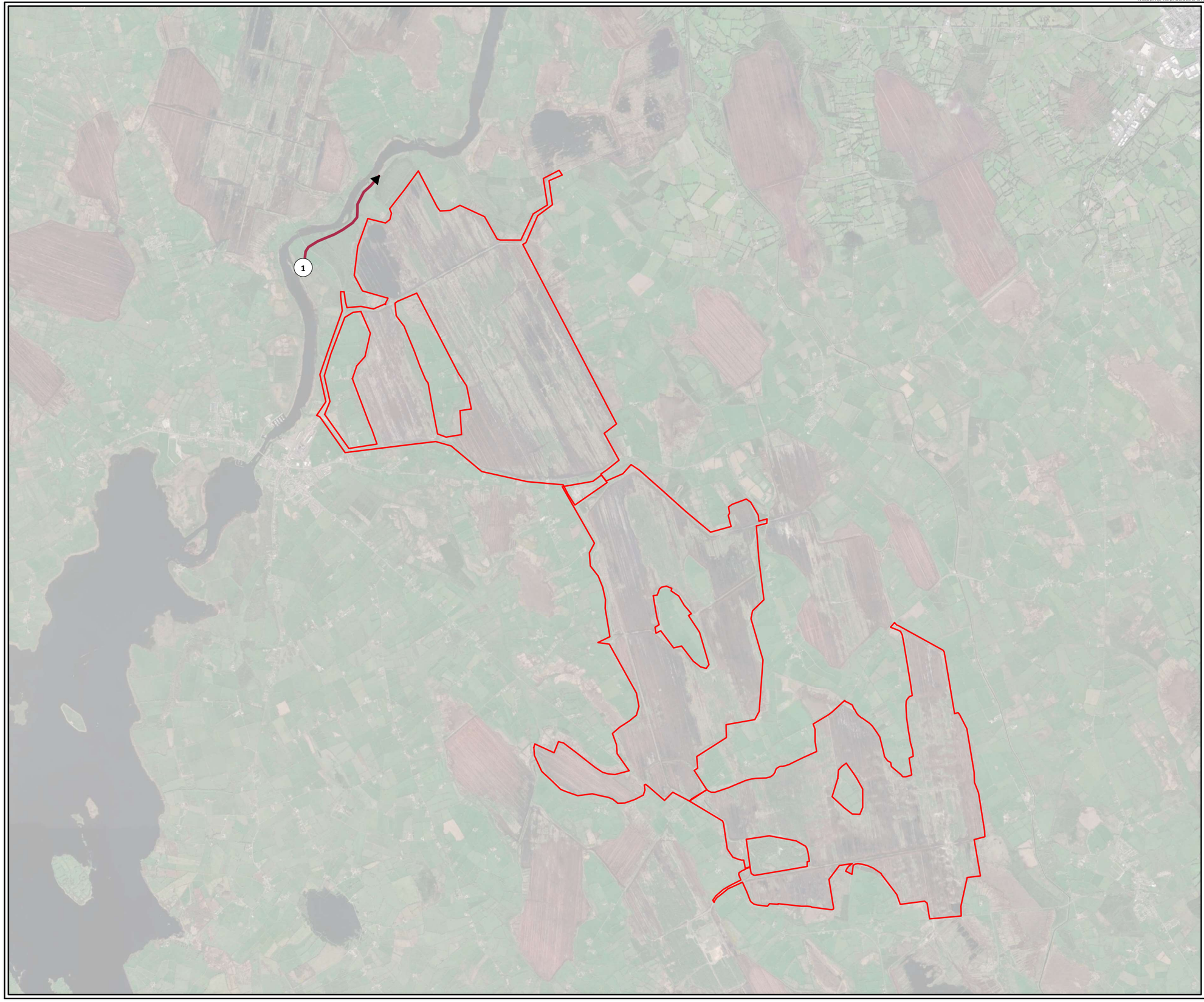
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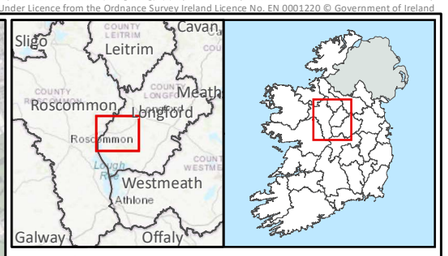
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PROJECT:	Derryadd, Co. Longford		
FIGURE NO:	-		
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SCALE:	1:50000	**REVISION:**	0
DATE:	17/12/2021	**PAGE SIZE:**	A3

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Path: R:\Map Production\2021\P21-119\workspace\Flightlines\P20-113_GIS_Flightlines_DerryaddWindFarm_A3.mxd

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Legend

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Individual, Date, Time

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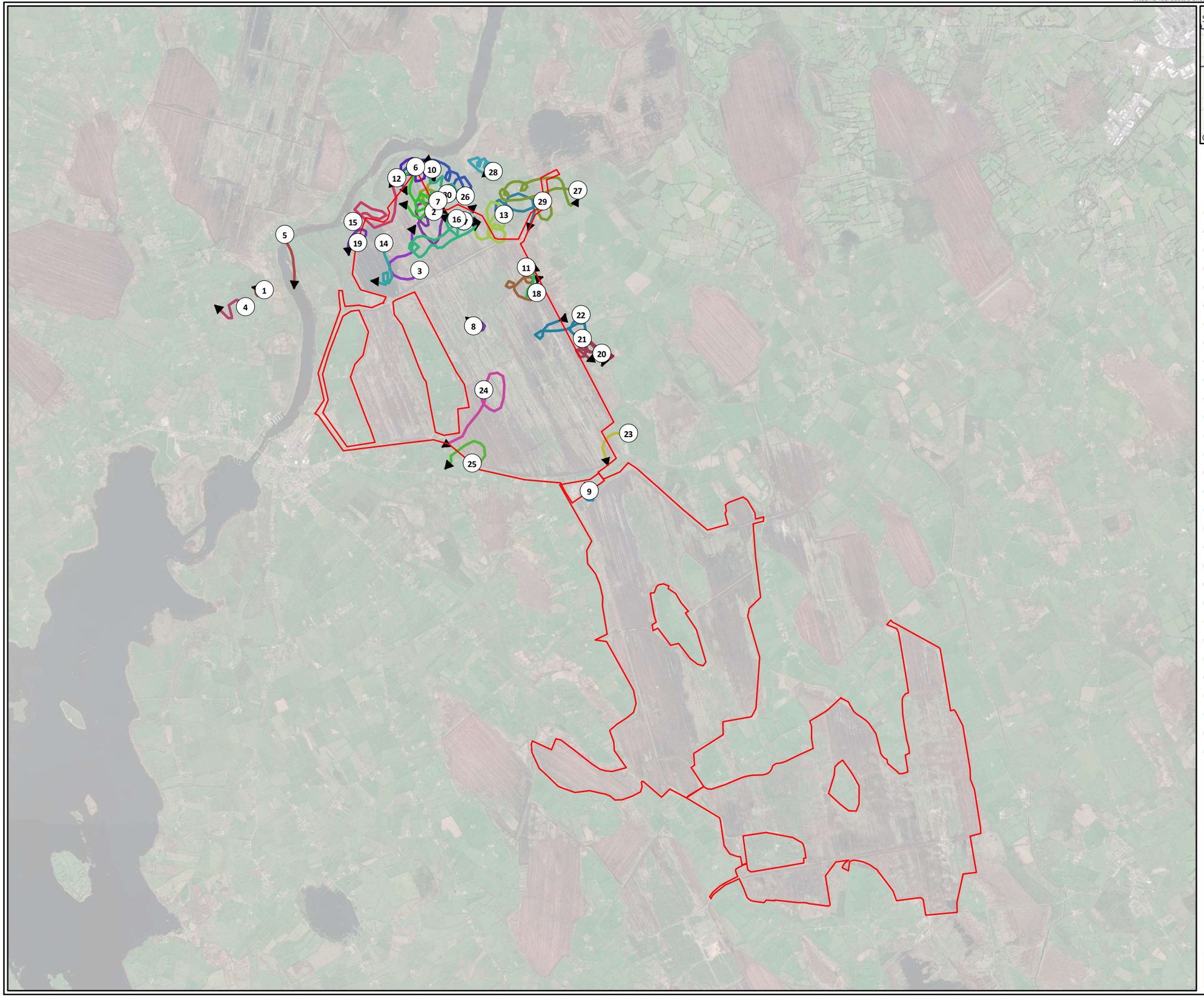
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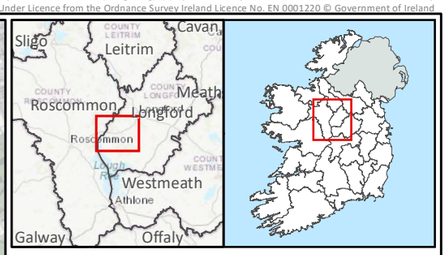
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PROJECT:	Derryadd, Co. Longford		
FIGURE NO:	-		
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DATE:	17/12/2021	**PAGE SIZE:**	A3

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Path: R:\Map Production\2021\P21-119\workspace\Flightlines\P20-113_GIS_Flightlines_DerryaddWindFarm_A3.mxd

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Legend

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- 3, 29/04/2021, 11:56
- 4, 29/04/2021, 12:32
- 5, 29/04/2021, 14:26
- 6, 29/04/2021, 15:09
- 7, 29/04/2021, 15:24
- 8, 04/05/2021, 16:49
- 9, 04/05/2021, 18:10
- 10, 05/05/2021, 08:50
- 11, 05/05/2021, 09:03
- 12, 05/05/2021, 09:46
- 13, 05/05/2021, 10:44
- 14, 05/05/2021, 10:52
- 15, 05/05/2021, 11:00
- 16, 05/05/2021, 13:34
- 17, 05/05/2021, 14:10
- 18, 05/05/2021, 15:20
- 19, 05/05/2021, 15:45
- 20, 05/05/2021, 16:43
- 21, 05/05/2021, 18:02
- 22, 06/05/2021, 09:30
- 23, 06/05/2021, 10:06
- 24, 06/05/2021, 10:57
- 25, 06/05/2021, 11:15
- 26, 06/05/2021, 13:20
- 27, 06/05/2021, 14:29
- 28, 06/05/2021, 15:21
- 29, 06/05/2021, 16:45
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TITLE:	Summer Flightlines 2021 Buzzard 1		
PROJECT:	Derryadd, Co. Longford		
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SCALE:	1:50000	**REVISION:**	0
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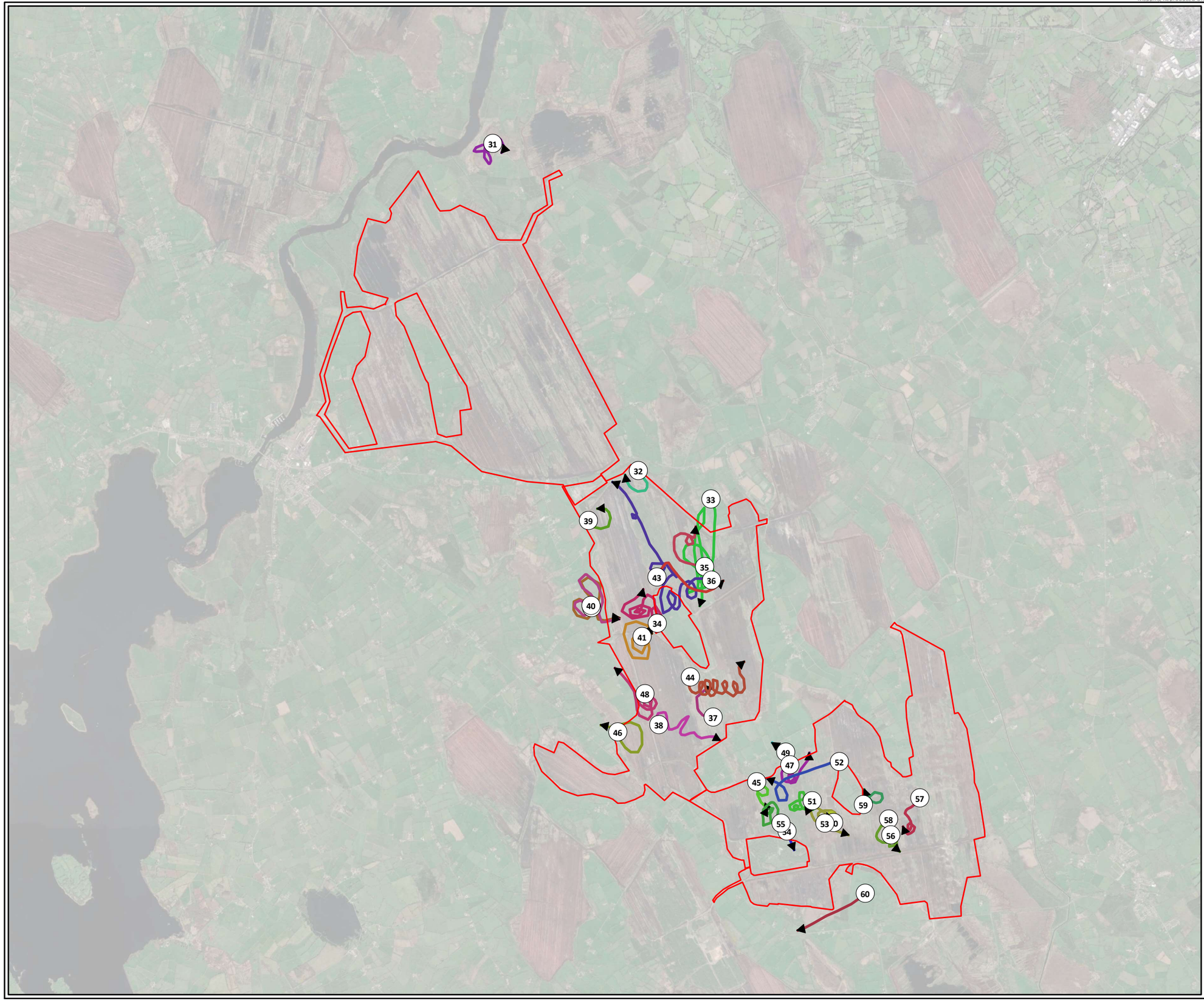
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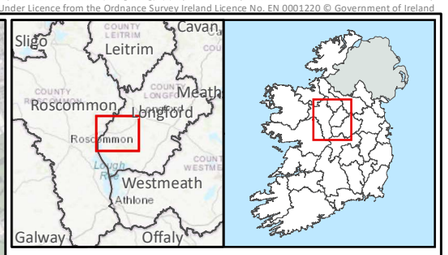
N W E S

Kilometers
0 0.5 1 2

Path: R:\Map Production\2021\P21-119\workspace\Flightlines\P20-113_GIS_Flightlines_DerryaddWindFarm_A3.mxd

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Individual, Date, Time

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- 33, 07/05/2021, 11:30
- 34, 07/05/2021, 12:13
- 35, 07/05/2021, 13:20
- 36, 07/05/2021, 13:48
- 37, 07/05/2021, 17:45
- 38, 07/05/2021, 18:10
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- 41, 11/05/2021, 13:28
- 42, 11/05/2021, 15:15
- 43, 11/05/2021, 16:03
- 44, 11/05/2021, 17:32
- 45, 11/05/2021, 18:51
- 46, 19/05/2021, 11:21
- 47, 19/05/2021, 12:06
- 48, 19/05/2021, 12:29
- 49, 21/05/2021, 09:57
- 50, 21/05/2021, 10:16
- 51, 21/05/2021, 10:59
- 52, 21/05/2021, 11:22
- 53, 22/05/2021, 10:53
- 54, 22/05/2021, 12:00
- 55, 22/05/2021, 13:02
- 56, 22/05/2021, 13:23
- 57, 22/05/2021, 15:01
- 58, 22/05/2021, 15:09
- 59, 22/05/2021, 15:41
- 60, 22/05/2021, 16:22

TITLE:	Summer Flightlines 2021 Buzzard 2		
PROJECT:	Derryadd, Co. Longford		
FIGURE NO:	-		
CLIENT:	Bord na Móna		
SCALE:	1:50000	**REVISION:**	0
DATE:	17/12/2021	**PAGE SIZE:**	A3

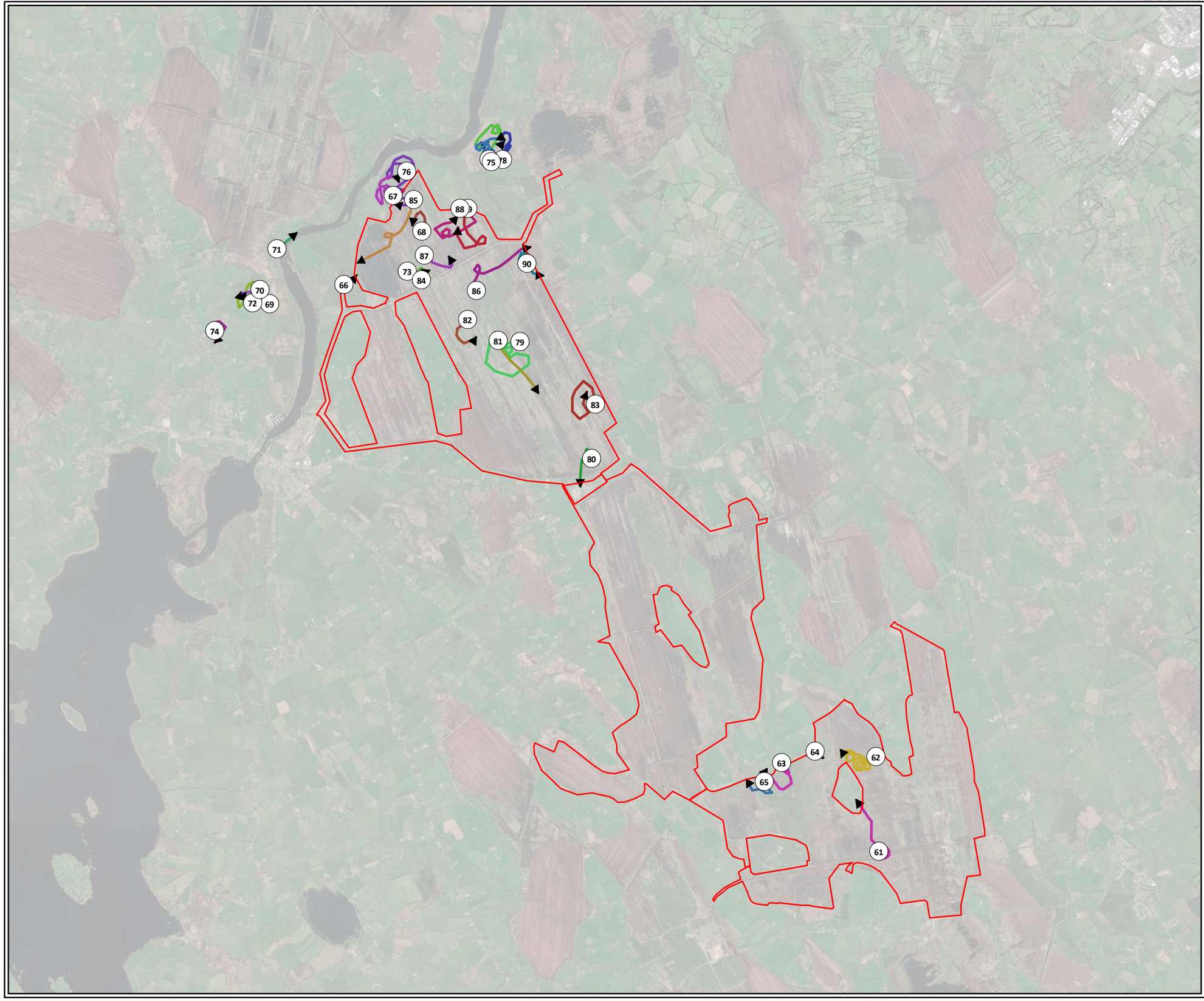
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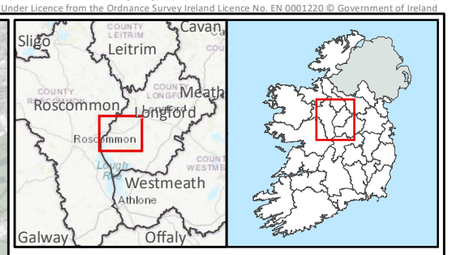
N W E S

0 0.5 1 2 Kilometers

Path: R:\Map Production\2021\P21-119\workspace\Flightlines\P20-113_GIS_Flightlines_DerryaddWindFarm_A3.mxd

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Legend

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- 62, 28/05/2021, 13:02
- 63, 28/05/2021, 13:32
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- 65, 28/05/2021, 14:56
- 66, 31/05/2021, 09:28
- 67, 31/05/2021, 09:39
- 68, 31/05/2021, 09:56
- 69, 31/05/2021, 10:27
- 70, 31/05/2021, 11:11
- 71, 31/05/2021, 17:55
- 72, 31/05/2021, 19:12
- 73, 31/05/2021, 19:35
- 74, 31/05/2021, 20:02
- 75, 01/06/2021, 10:07
- 76, 01/06/2021, 10:53
- 77, 01/06/2021, 13:11
- 78, 01/06/2021, 15:51
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- 81, 01/06/2021, 17:55
- 82, 01/06/2021, 19:41
- 83, 02/06/2021, 13:39
- 84, 10/06/2021, 13:21
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- 88, 10/06/2021, 17:34
- 89, 10/06/2021, 18:53
- 90, 10/06/2021, 19:15

TITLE:	Summer Flightlines 2021 Buzzard 3		
PROJECT:	Derryadd, Co. Longford		
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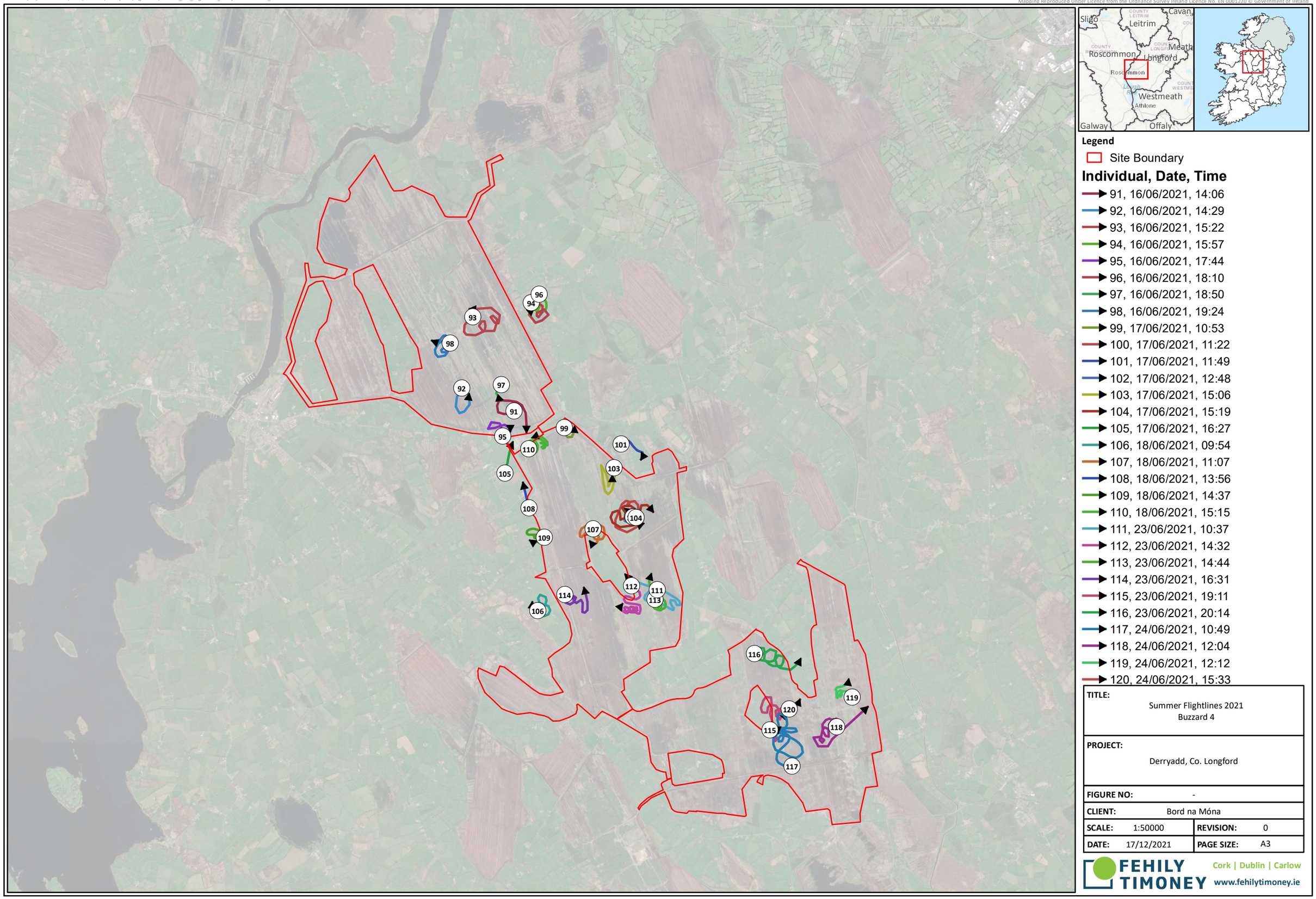
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N W E S

Kilometers
0 0.5 1 2

Path: R:\Map Production\2021\P21-119\workspace\Flightlines\P20-113_GIS_Flightlines_DerryaddWindFarm_A3.mxd

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Legend

Site Boundary

Individual, Date, Time

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- 93, 16/06/2021, 15:22
- 94, 16/06/2021, 15:57
- 95, 16/06/2021, 17:44
- 96, 16/06/2021, 18:10
- 97, 16/06/2021, 18:50
- 98, 16/06/2021, 19:24
- 99, 17/06/2021, 10:53
- 100, 17/06/2021, 11:22
- 101, 17/06/2021, 11:49
- 102, 17/06/2021, 12:48
- 103, 17/06/2021, 15:06
- 104, 17/06/2021, 15:19
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- 106, 18/06/2021, 09:54
- 107, 18/06/2021, 11:07
- 108, 18/06/2021, 13:56
- 109, 18/06/2021, 14:37
- 110, 18/06/2021, 15:15
- 111, 23/06/2021, 10:37
- 112, 23/06/2021, 14:32
- 113, 23/06/2021, 14:44
- 114, 23/06/2021, 16:31
- 115, 23/06/2021, 19:11
- 116, 23/06/2021, 20:14
- 117, 24/06/2021, 10:49
- 118, 24/06/2021, 12:04
- 119, 24/06/2021, 12:12
- 120, 24/06/2021, 15:33

TITLE:	Summer Flightlines 2021 Buzzard 4		
PROJECT:	Derryadd, Co. Longford		
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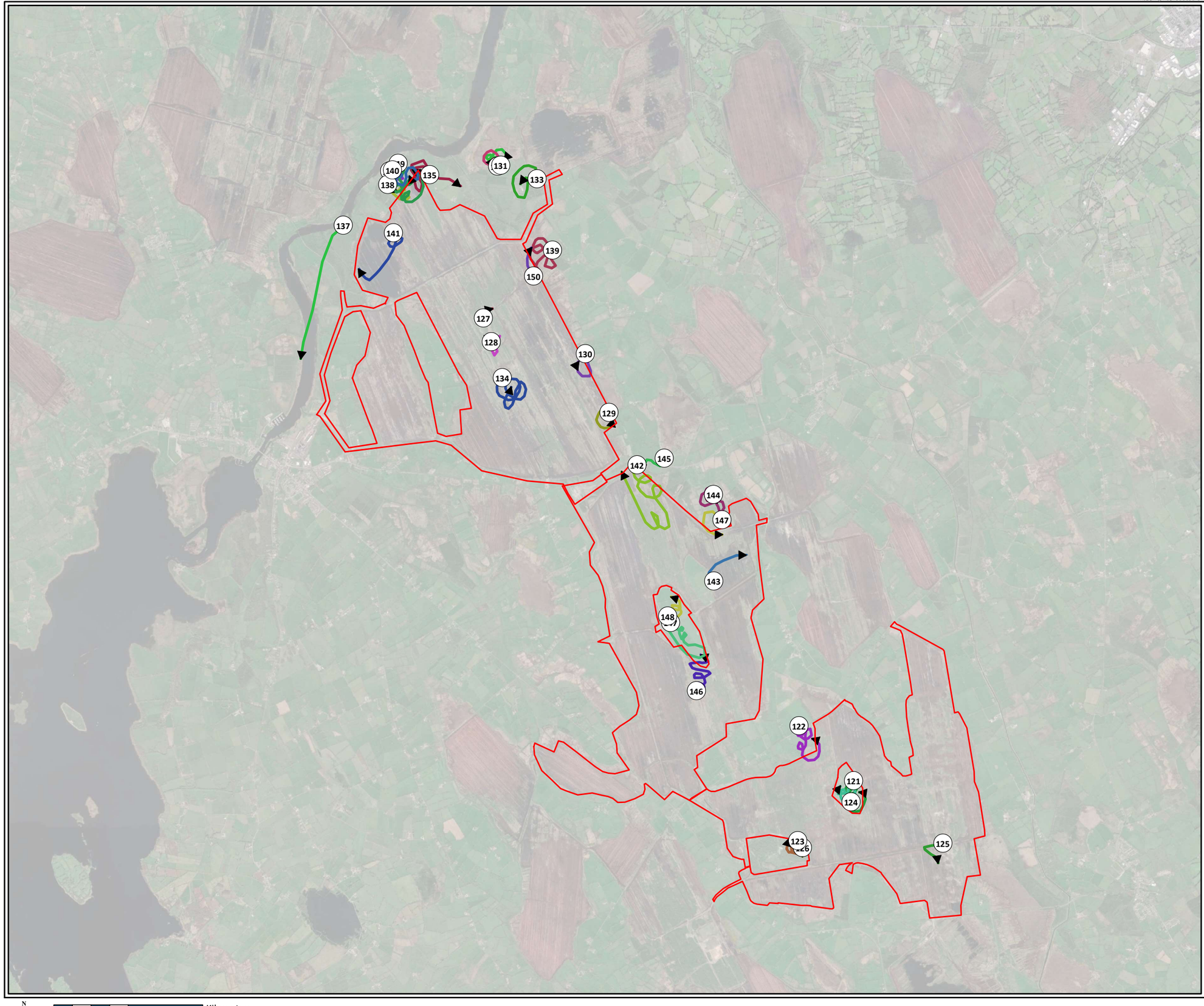
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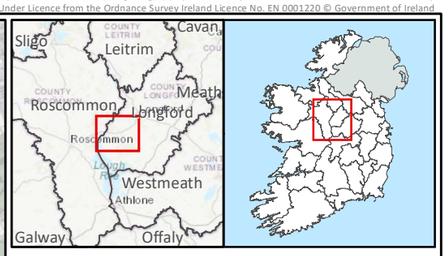
N W E S

0 0.5 1 2 Kilometers

Path: R:\Map Production\2021\P21-119\workspace\Flightlines\P20-113_GIS_Flightlines_DerryaddWindFarm_A3.mxd

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Site Boundary

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- 122, 25/06/2021, 12:14
- 123, 25/06/2021, 13:06
- 124, 25/06/2021, 15:20
- 125, 25/06/2021, 15:35
- 126, 25/06/2021, 17:32
- 127, 05/07/2021, 11:37
- 128, 05/07/2021, 16:34
- 129, 05/07/2021, 17:52
- 130, 06/07/2021, 09:19
- 131, 06/07/2021, 11:30
- 132, 06/07/2021, 13:30
- 133, 06/07/2021, 15:50
- 134, 06/07/2021, 17:39
- 135, 07/07/2021, 12:55
- 136, 07/07/2021, 15:01
- 137, 07/07/2021, 16:38
- 138, 07/07/2021, 16:47
- 139, 07/07/2021, 18:50
- 140, 07/07/2021, 19:53
- 141, 07/07/2021, 20:49
- 142, 08/07/2021, 11:50
- 143, 08/07/2021, 12:45
- 144, 08/07/2021, 16:05
- 145, 08/07/2021, 16:51
- 146, 08/07/2021, 19:23
- 147, 08/07/2021, 21:09
- 148, 09/07/2021, 11:37
- 149, 09/07/2021, 15:00
- 150, 09/07/2021, 16:08

TITLE:	Summer Flightlines 2021 Buzzard 5		
PROJECT:	Derryadd, Co. Longford		
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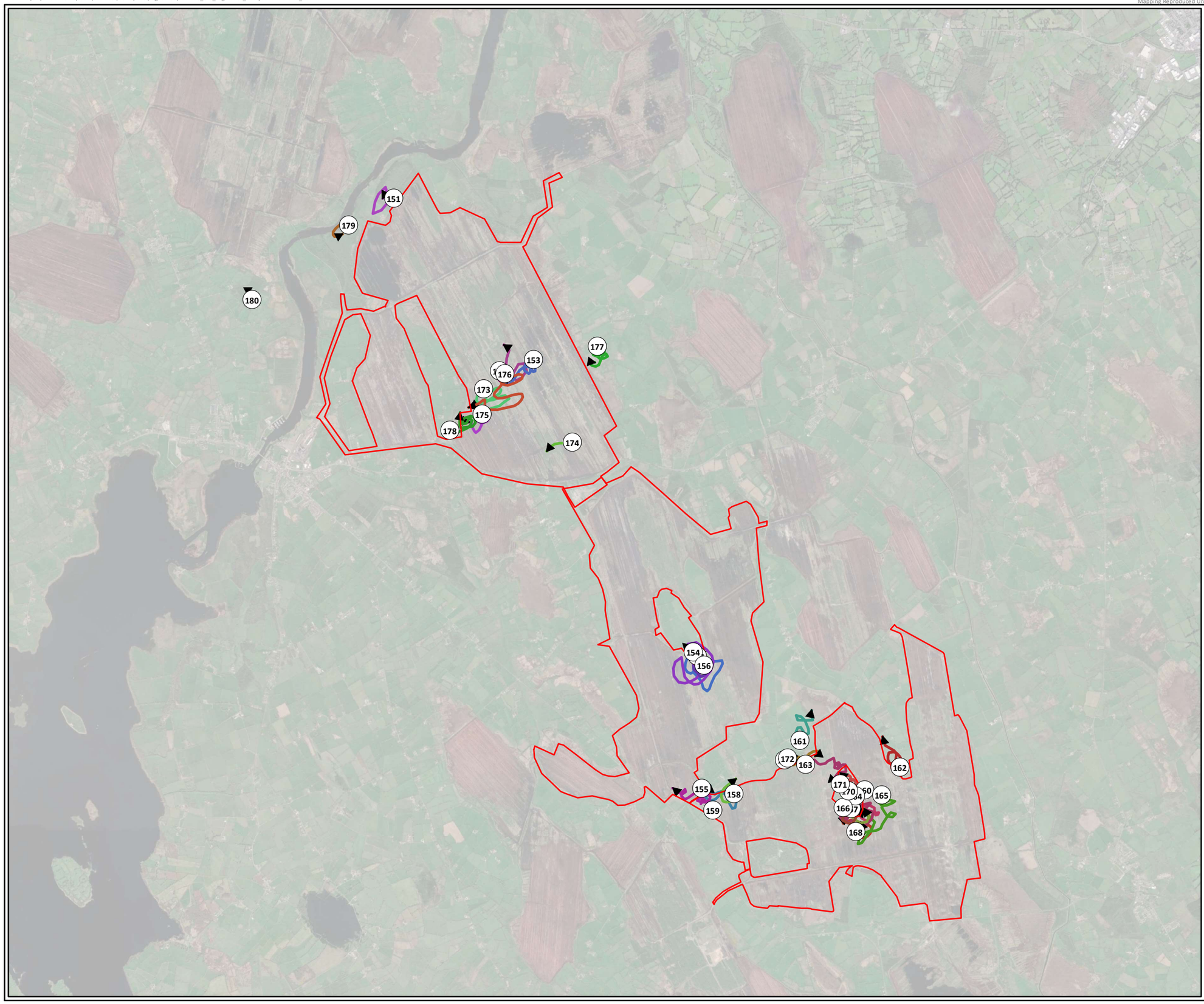
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N W E S

0 0.5 1 2 Kilometers

Path: R:\Map Production\2021\P21-119\workspace\Flightlines\P20-113_GIS_Flightlines_DerryaddWindFarm_A3.mxd

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Legend

Site Boundary

Individual, Date, Time

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- 152, 09/07/2021, 18:47
- 153, 09/07/2021, 21:14
- 154, 13/07/2021, 08:03
- 155, 13/07/2021, 08:35
- 156, 13/07/2021, 09:02
- 157, 13/07/2021, 15:31
- 158, 13/07/2021, 15:40
- 159, 13/07/2021, 16:43
- 160, 14/07/2021, 08:12
- 161, 14/07/2021, 10:15
- 162, 15/07/2021, 08:27
- 163, 15/07/2021, 08:55
- 164, 15/07/2021, 09:23
- 165, 15/07/2021, 12:47
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- 167, 15/07/2021, 16:47
- 168, 15/07/2021, 17:52
- 169, 16/07/2021, 09:06
- 170, 16/07/2021, 10:54
- 171, 16/07/2021, 13:28
- 172, 16/07/2021, 13:46
- 173, 27/07/2021, 09:45
- 174, 27/07/2021, 10:33
- 175, 27/07/2021, 11:59
- 176, 27/07/2021, 16:06
- 177, 27/07/2021, 17:42
- 178, 27/07/2021, 18:33
- 179, 28/07/2021, 11:55
- 180, 28/07/2021, 12:10

TITLE:	Summer Flightlines 2021 Buzzard 6		
PROJECT:	Derryadd, Co. Longford		
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DATE:	17/12/2021	**PAGE SIZE:**	A3

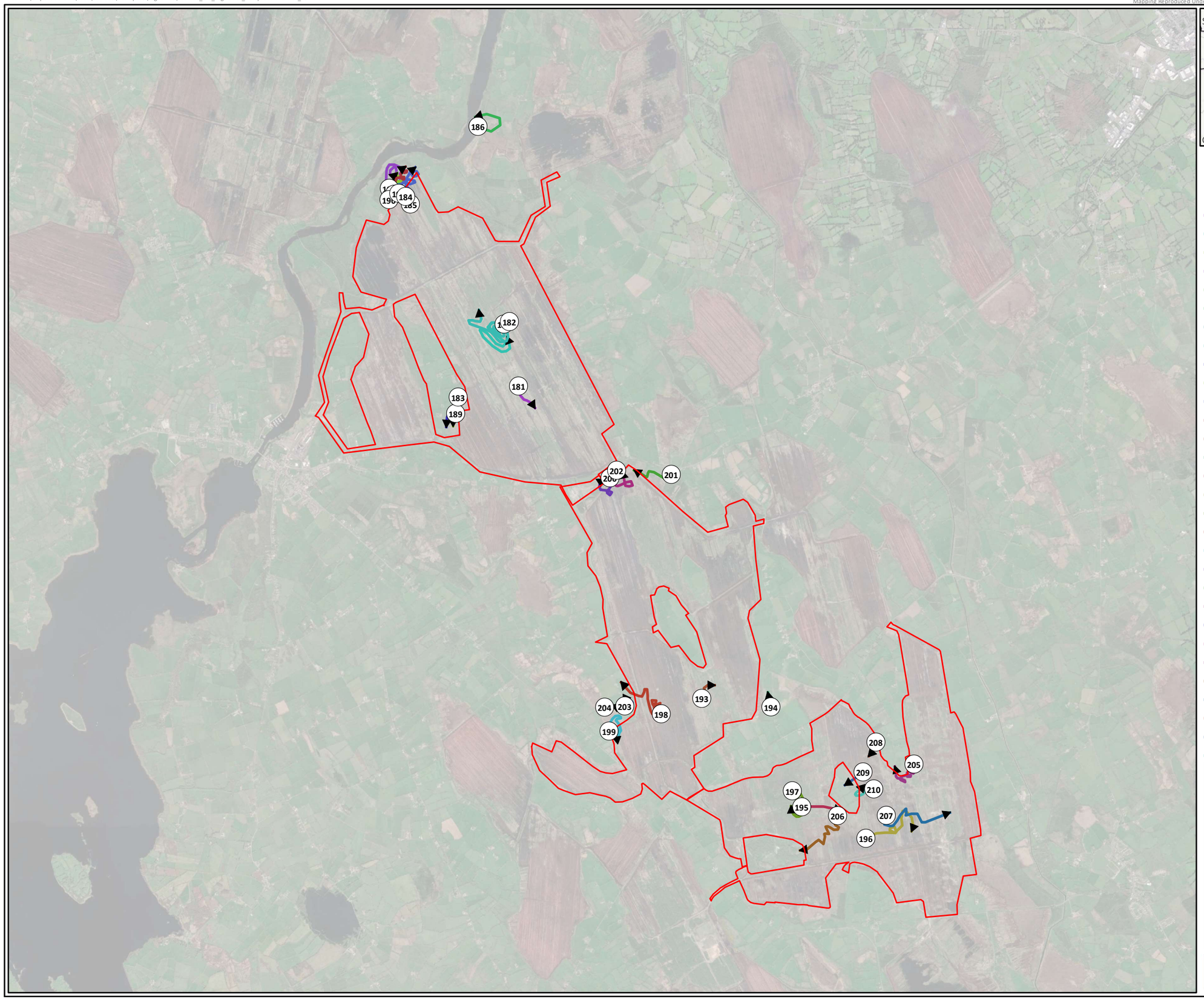
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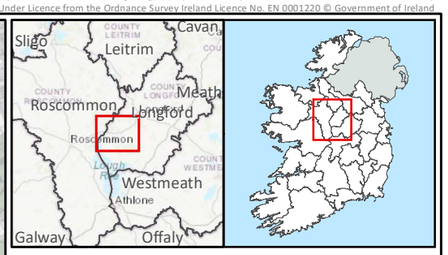
N W E S

0 0.5 1 2 Kilometers

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Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Site Boundary

Individual, Date, Time

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- 182, 28/07/2021, 18:40
- 183, 28/07/2021, 19:29
- 184, 29/07/2021, 11:04
- 185, 29/07/2021, 13:01
- 186, 29/07/2021, 14:28
- 187, 29/07/2021, 16:43
- 188, 29/07/2021, 19:14
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- 191, 30/07/2021, 13:41
- 192, 30/07/2021, 15:58
- 193, 02/08/2021, 12:28
- 194, 03/08/2021, 10:59
- 195, 03/08/2021, 12:30
- 196, 03/08/2021, 15:47
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- 198, 03/08/2021, 17:54
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- 200, 04/08/2021, 11:15
- 201, 04/08/2021, 12:30
- 202, 04/08/2021, 14:37
- 203, 04/08/2021, 18:42
- 204, 04/08/2021, 19:39
- 205, 11/08/2021, 10:38
- 206, 11/08/2021, 11:22
- 207, 11/08/2021, 11:44
- 208, 11/08/2021, 13:56
- 209, 11/08/2021, 14:45
- 210, 11/08/2021, 17:51

TITLE:	Summer Flightlines 2021 Buzzard 7		
PROJECT:	Derryadd, Co. Longford		
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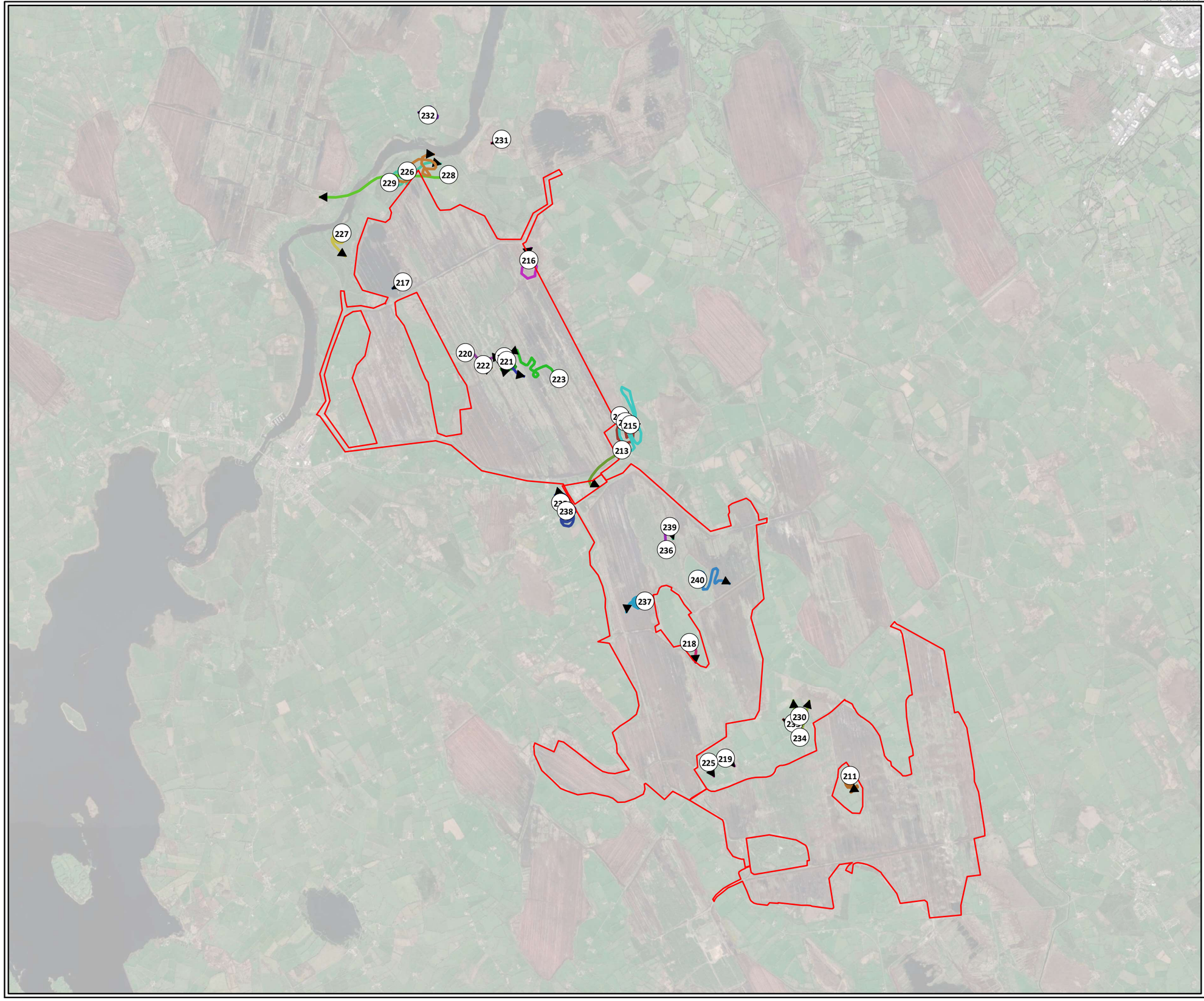
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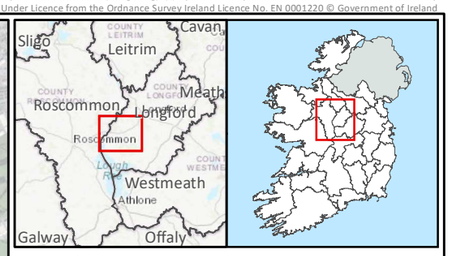
N W E S

0 0.5 1 2 Kilometers

Path: R:\Map Production\2021\P21-119\workspace\Flightlines\P20-113_GIS_Flightlines_DerryaddWindFarm_A3.mxd

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Legend

Site Boundary

Individual, Date, Time

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- 212, 12/08/2021, 10:40
- 213, 12/08/2021, 11:56
- 214, 12/08/2021, 14:30
- 215, 12/08/2021, 15:59
- 216, 13/08/2021, 10:53
- 217, 13/08/2021, 15:05
- 218, 13/08/2021, 19:55
- 219, 14/08/2021, 12:22
- 220, 16/08/2021, 09:09
- 221, 16/08/2021, 10:34
- 222, 16/08/2021, 11:39
- 223, 16/08/2021, 13:02
- 224, 16/08/2021, 14:21
- 225, 16/08/2021, 19:00
- 226, 17/08/2021, 09:57
- 227, 17/08/2021, 10:34
- 228, 17/08/2021, 12:32
- 229, 17/08/2021, 13:38
- 230, 17/08/2021, 17:47
- 231, 18/08/2021, 11:21
- 232, 18/08/2021, 14:45
- 233, 18/08/2021, 16:35
- 234, 18/08/2021, 18:39
- 235, 19/08/2021, 09:34
- 236, 19/08/2021, 11:06
- 237, 19/08/2021, 11:35
- 238, 19/08/2021, 13:12
- 239, 19/08/2021, 14:19
- 240, 19/08/2021, 15:38

TITLE: Summer Flightlines 2021 Buzzard 8			
PROJECT: Derryadd, Co. Longford			
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SCALE:	1:50000	**REVISION:**	0
DATE:	17/12/2021	**PAGE SIZE:**	A3

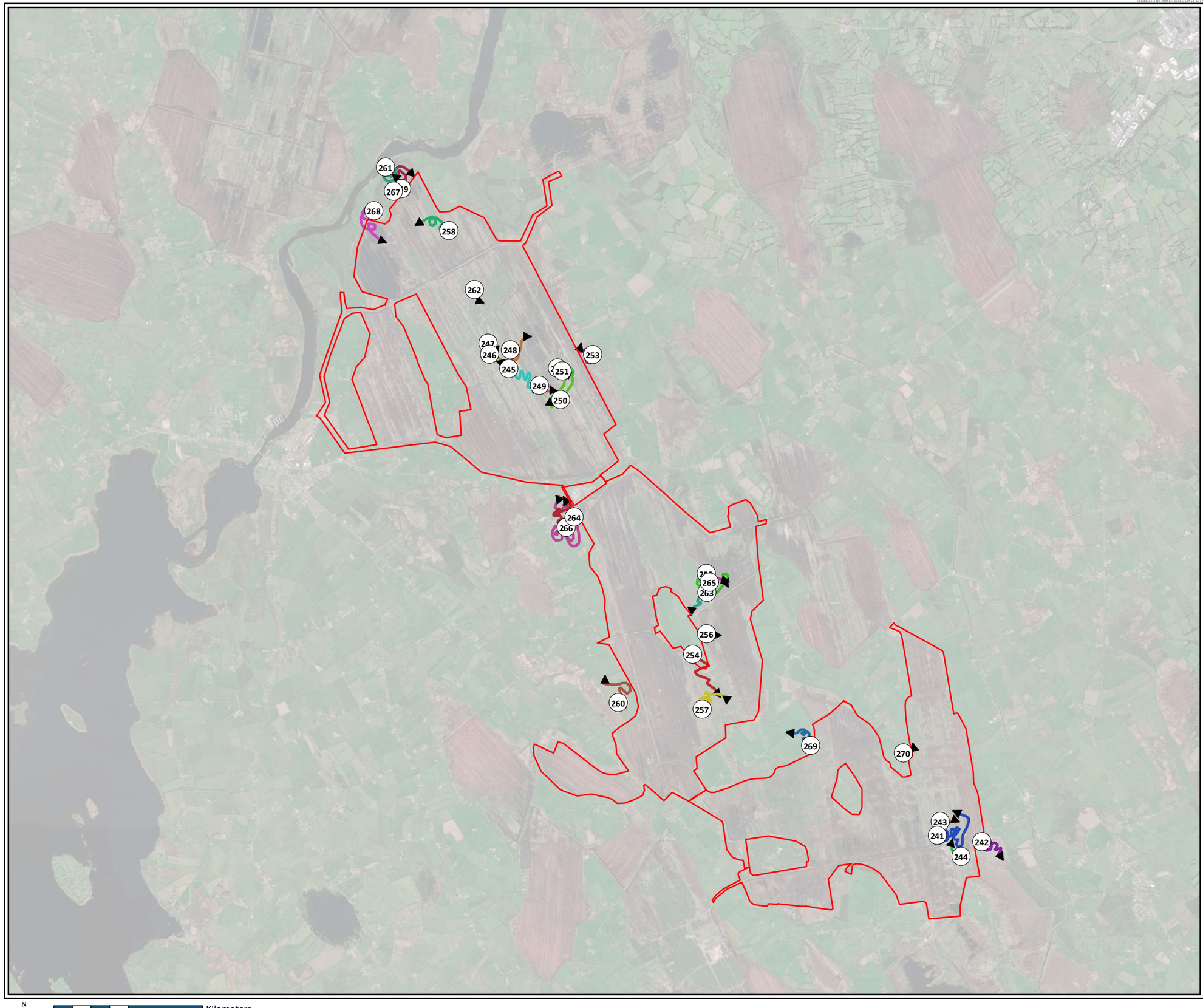
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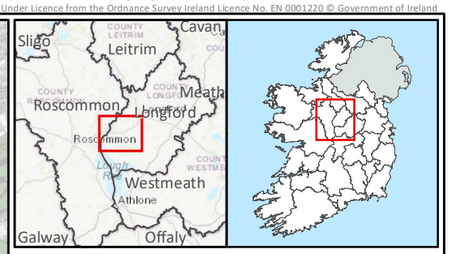
N W E S

Kilometers
0 0.5 1 2

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Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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- 246, 02/09/2021, 10:10
- 247, 02/09/2021, 13:26
- 248, 02/09/2021, 15:05
- 249, 02/09/2021, 16:43
- 250, 02/09/2021, 18:05
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- 252, 03/09/2021, 10:47
- 253, 03/09/2021, 11:22
- 254, 03/09/2021, 13:22
- 255, 03/09/2021, 14:47
- 256, 03/09/2021, 17:14
- 257, 03/09/2021, 18:22
- 258, 06/09/2021, 10:10
- 259, 06/09/2021, 12:15
- 260, 07/09/2021, 11:03
- 261, 07/09/2021, 14:05
- 262, 07/09/2021, 16:12
- 263, 09/09/2021, 09:03
- 264, 09/09/2021, 10:51
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- 266, 12/09/2021, 10:33
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- 268, 12/09/2021, 16:30
- 269, 13/09/2021, 09:11
- 270, 13/09/2021, 09:55

TITLE:	Summer Flightlines 2021 Buzzard 9		
PROJECT:	Derryadd, Co. Longford		
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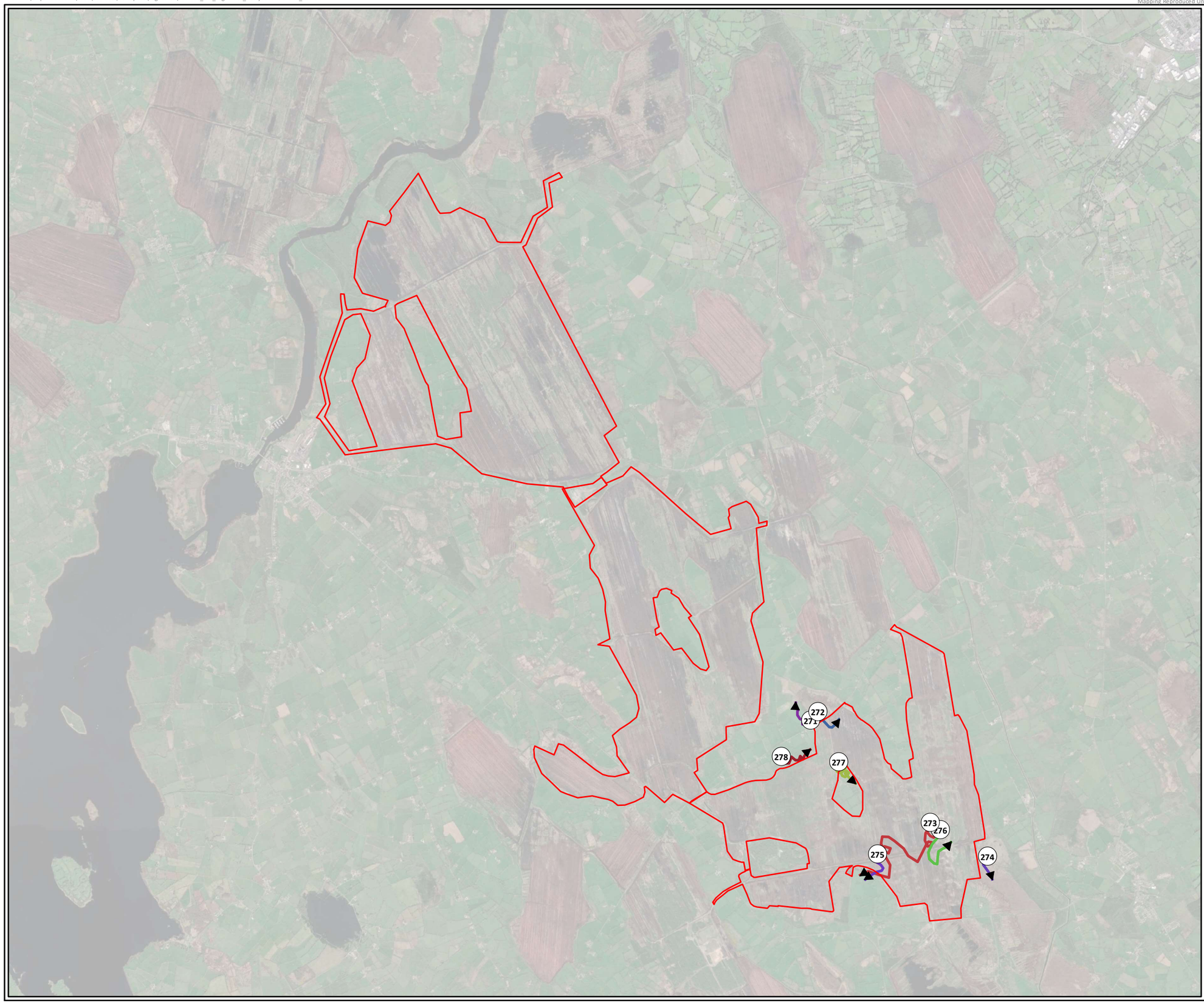
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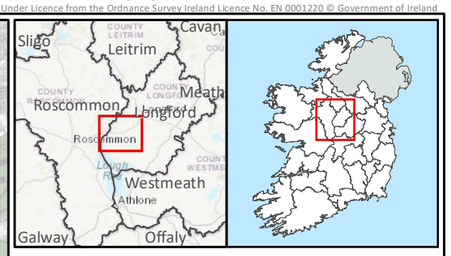
N W E S

0 0.5 1 2 Kilometers

Path: R:\Map Production\2021\P21-119\workspace\Flightlines\P20-113_GIS_Flightlines_DerryaddWindFarm_A3.mxd

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Legend

Site Boundary

Individual, Date, Time

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- 272, 13/09/2021, 14:07
- 273, 13/09/2021, 17:21
- 274, 13/09/2021, 18:03
- 275, 14/09/2021, 09:48
- 276, 14/09/2021, 10:59
- 277, 14/09/2021, 14:22
- 278, 14/09/2021, 17:25

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PROJECT:	Derryadd, Co. Longford		
FIGURE NO:	-		
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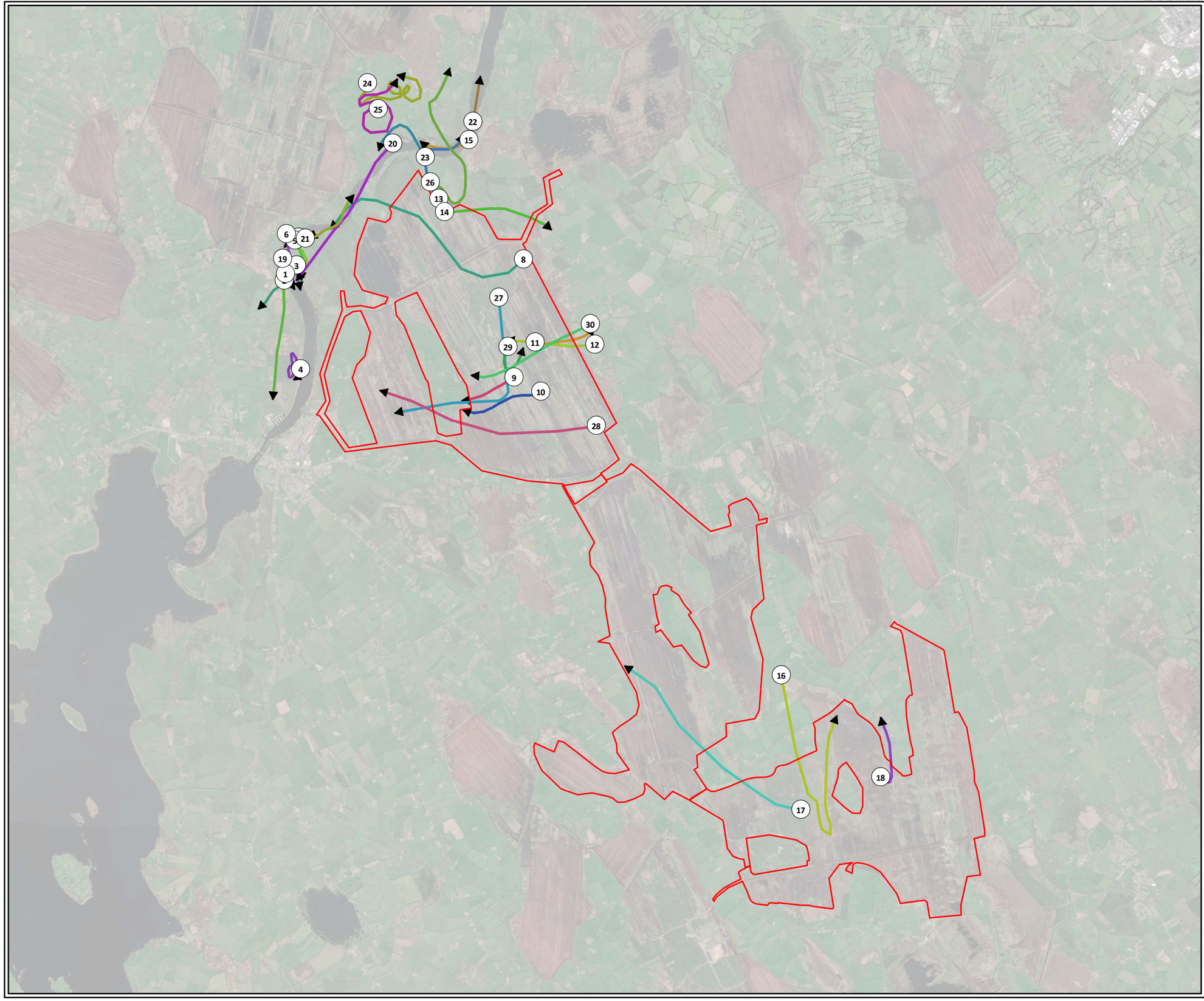
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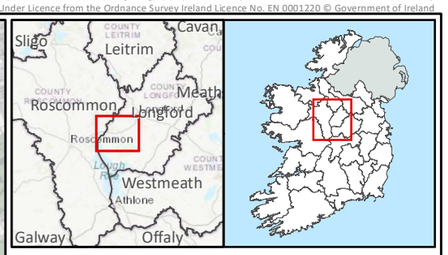
N W E S

0 0.5 1 2 Kilometers

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Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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- 4, 29/04/2021, 13:39
- 5, 29/04/2021, 14:00
- 6, 29/04/2021, 14:49
- 7, 29/04/2021, 15:13
- 8, 05/05/2021, 14:22
- 9, 05/05/2021, 17:06
- 10, 05/05/2021, 17:55
- 11, 05/05/2021, 18:54
- 12, 06/05/2021, 08:57
- 13, 06/05/2021, 13:10
- 14, 06/05/2021, 14:03
- 15, 06/05/2021, 16:05
- 16, 11/05/2021, 18:39
- 17, 19/05/2021, 12:00
- 18, 28/05/2021, 13:23
- 19, 31/05/2021, 10:43
- 20, 31/05/2021, 10:59
- 21, 31/05/2021, 17:38
- 22, 01/06/2021, 09:27
- 23, 01/06/2021, 11:38
- 24, 01/06/2021, 11:39
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- 26, 01/06/2021, 14:31
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- 28, 02/06/2021, 14:42
- 29, 10/06/2021, 14:39
- 30, 16/06/2021, 16:24

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PROJECT:	Derryadd, Co. Longford		
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DATE:	17/12/2021	**PAGE SIZE:**	A3

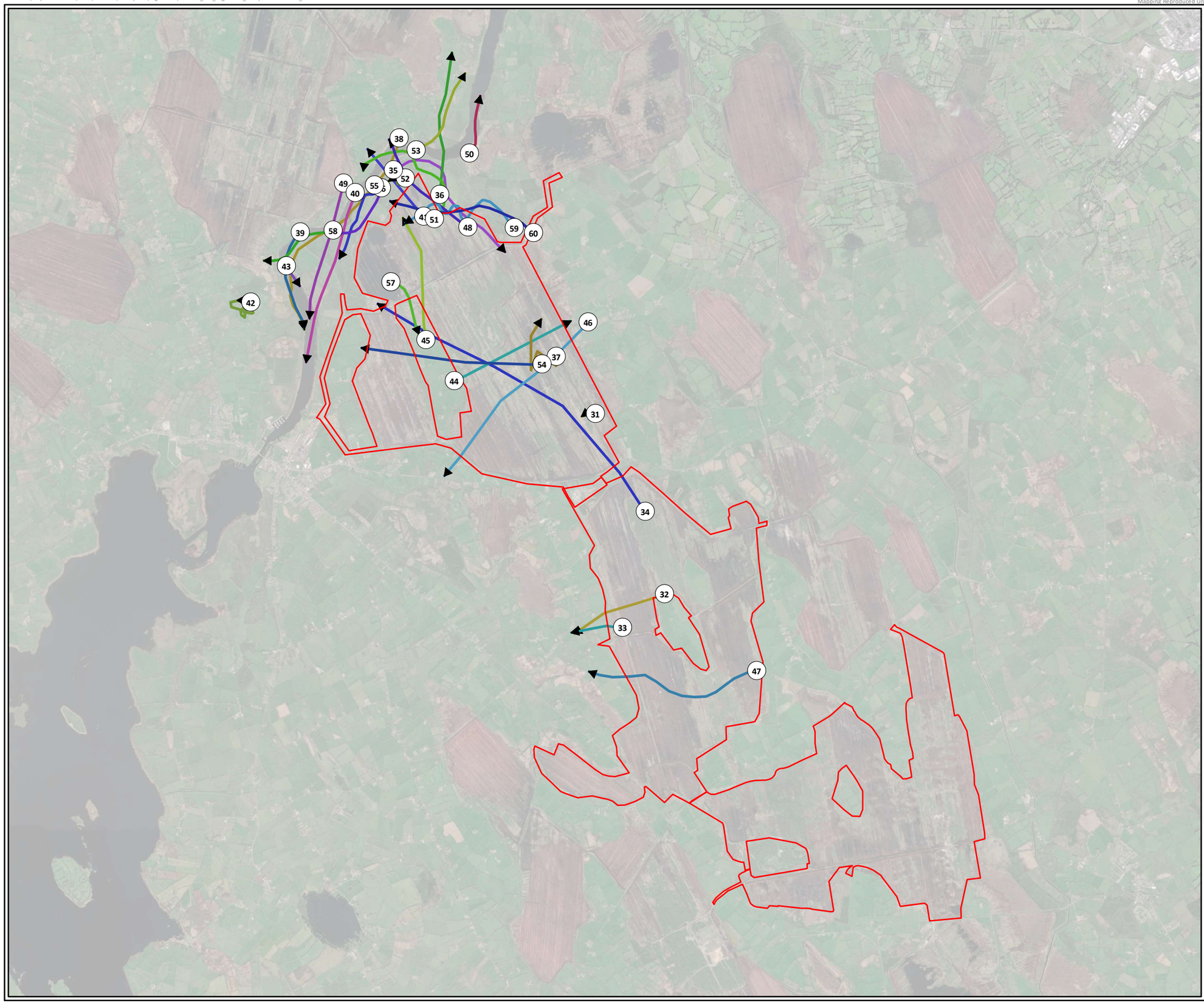
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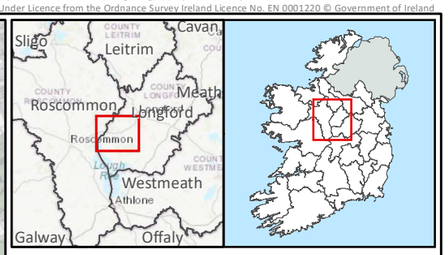
N W E S

0 0.5 1 2 Kilometers

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Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Legend

Site Boundary

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- 35, 06/07/2021, 10:11
- 36, 06/07/2021, 14:55
- 37, 06/07/2021, 17:58
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- 40, 07/07/2021, 13:16
- 41, 07/07/2021, 13:59
- 42, 07/07/2021, 15:28
- 43, 07/07/2021, 16:22
- 44, 07/07/2021, 21:08
- 45, 09/07/2021, 15:17
- 46, 09/07/2021, 21:23
- 47, 13/07/2021, 10:10
- 48, 28/07/2021, 09:43
- 49, 28/07/2021, 13:30
- 50, 29/07/2021, 10:15
- 51, 29/07/2021, 10:29
- 52, 29/07/2021, 14:11
- 53, 29/07/2021, 16:14
- 54, 29/07/2021, 20:32
- 55, 30/07/2021, 13:08
- 56, 30/07/2021, 13:13
- 57, 13/08/2021, 12:50
- 58, 17/08/2021, 15:00
- 59, 18/08/2021, 10:17
- 60, 18/08/2021, 14:22

TITLE:	Summer Flightlines 2021 Cormorant 2		
PROJECT:	Derryadd, Co. Longford		
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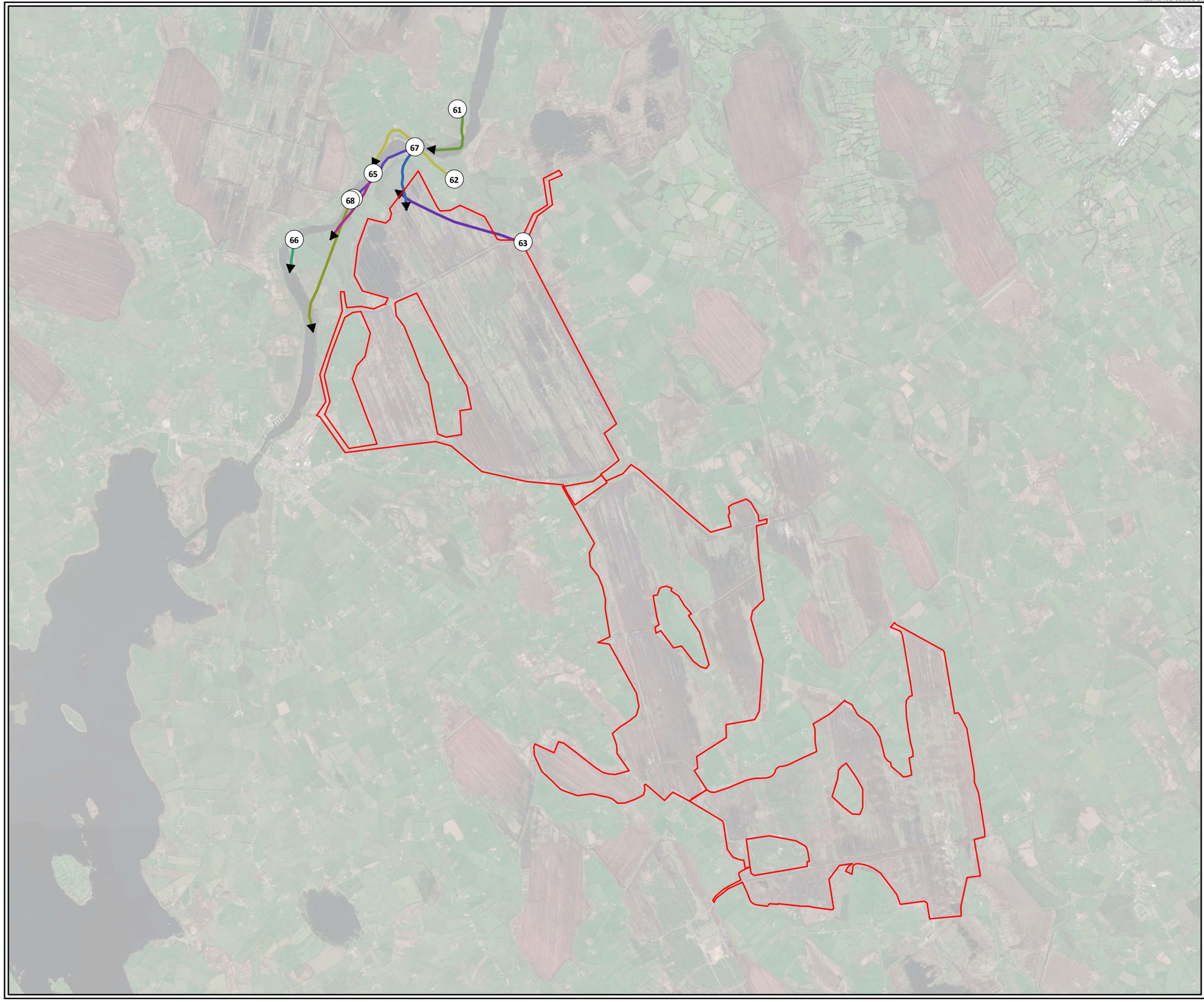
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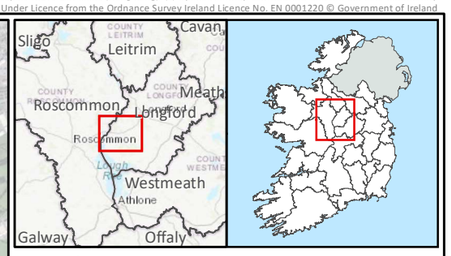
N W E S

Kilometers
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Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Site Boundary

Individual, Date, Time

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- 62, 06/09/2021, 09:45
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- 64, 07/09/2021, 15:00
- 65, 07/09/2021, 18:09
- 66, 12/09/2021, 12:27
- 67, 12/09/2021, 15:43
- 68, 12/09/2021, 17:10

N W E S

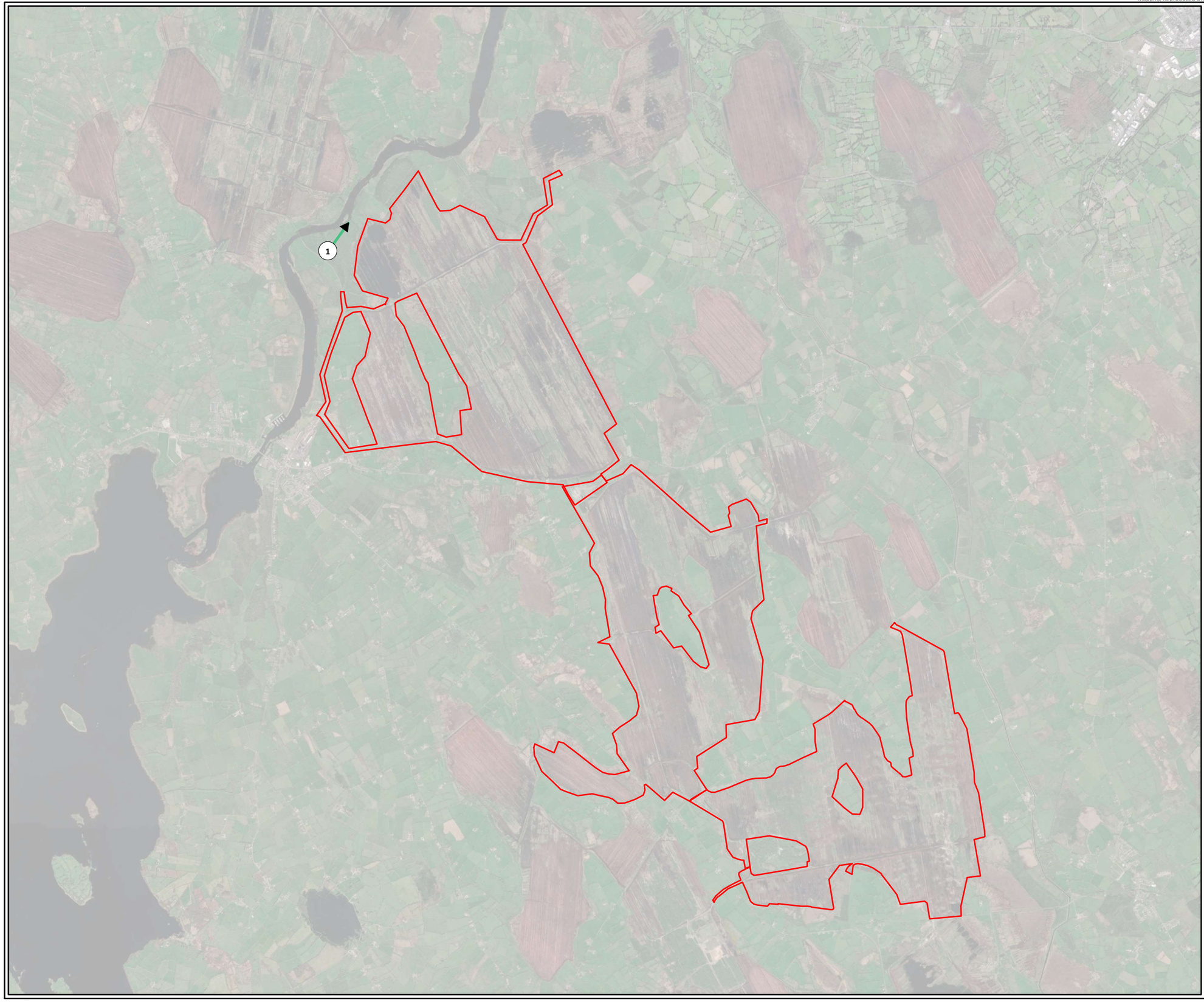
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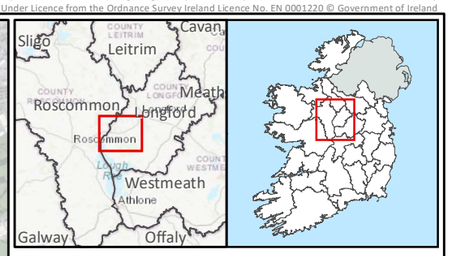
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DATE:	17/12/2021	**PAGE SIZE:**	A3

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Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Site Boundary

Individual, Date, Time

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PROJECT:	Derryadd, Co. Longford		
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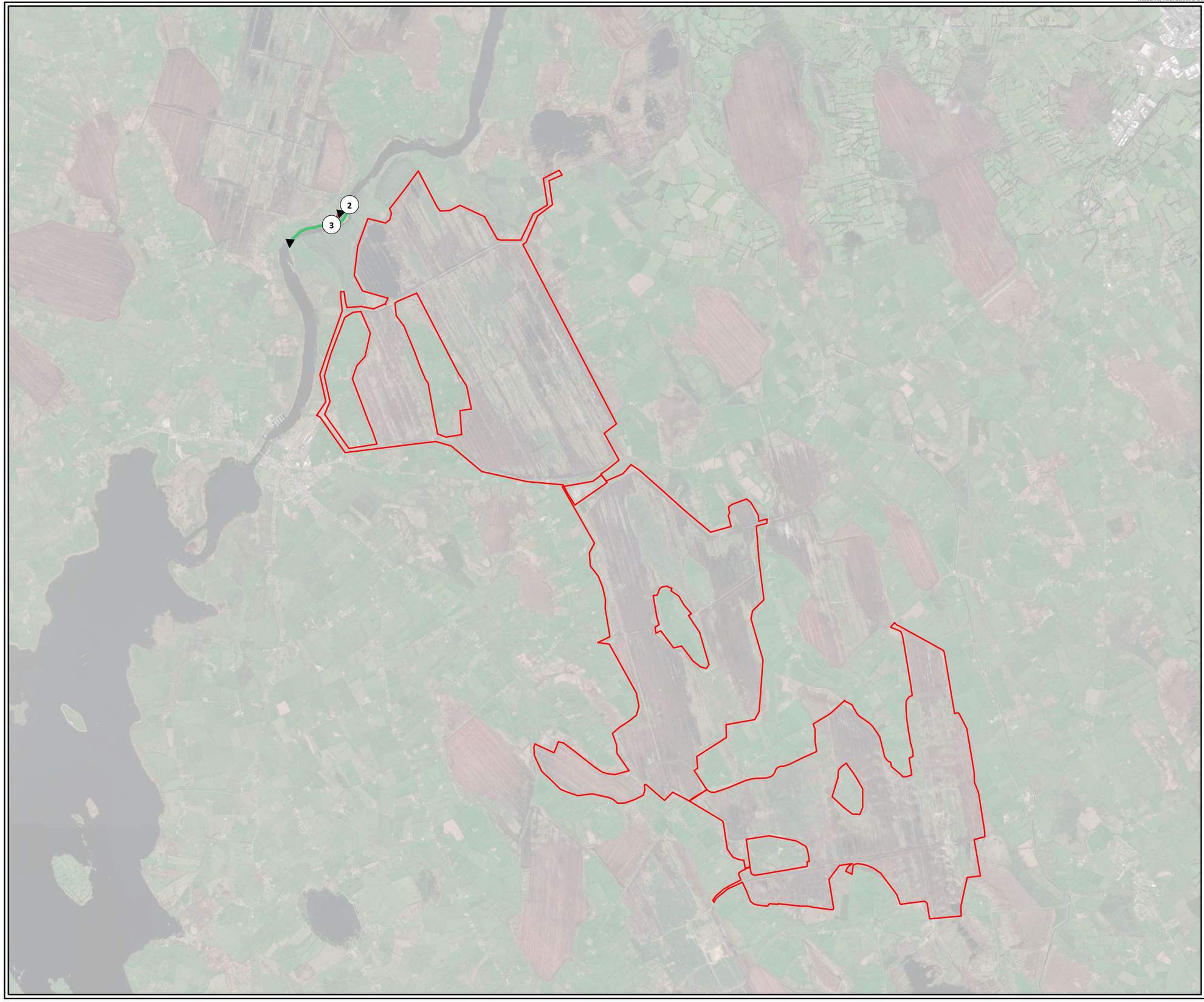
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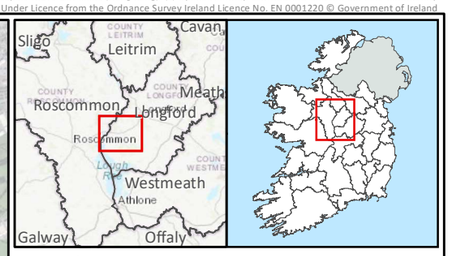
N W E S

0 0.5 1 2 Kilometers

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Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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3, 07/07/2021, 17:43

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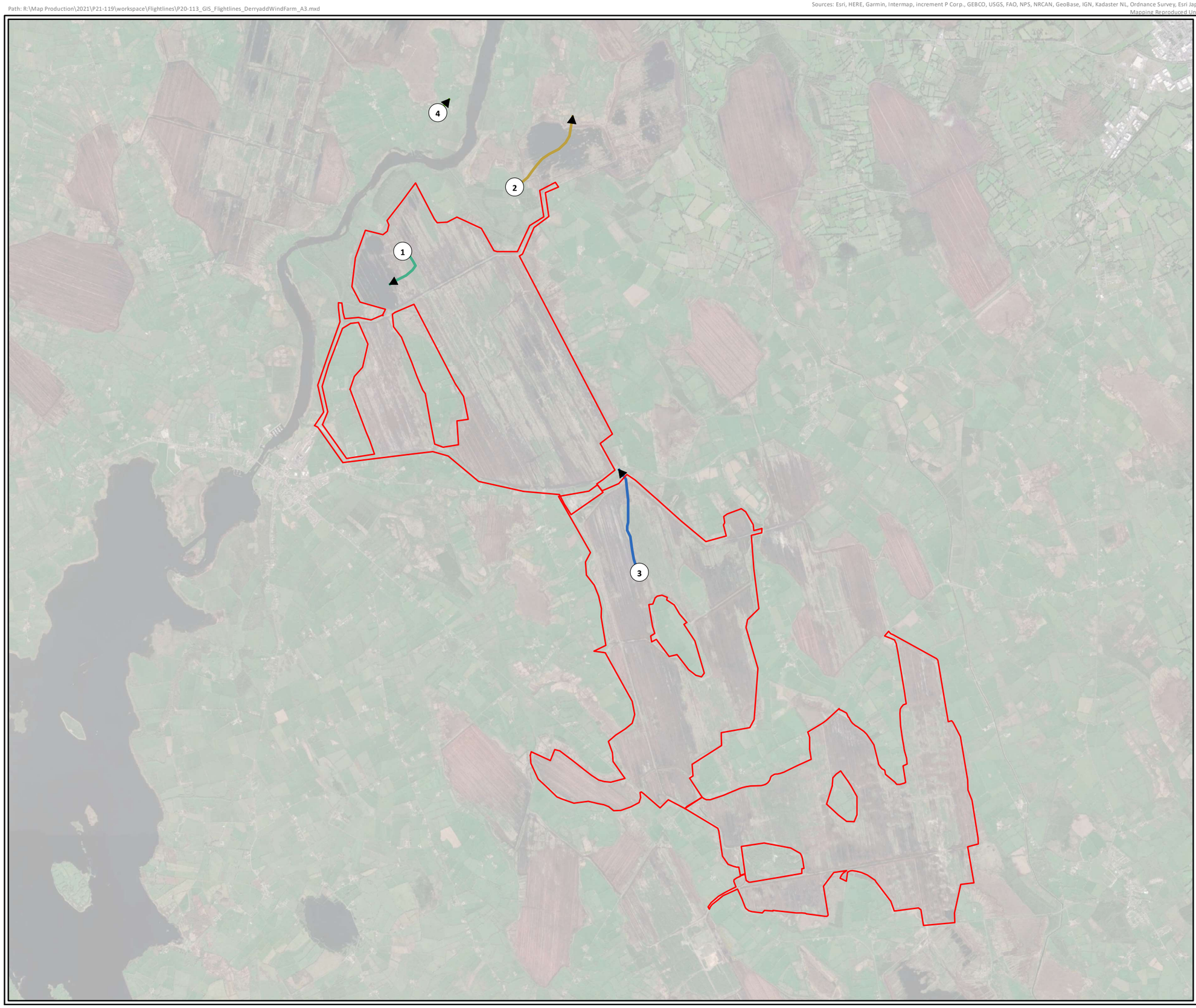
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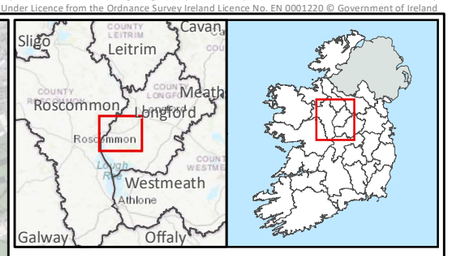
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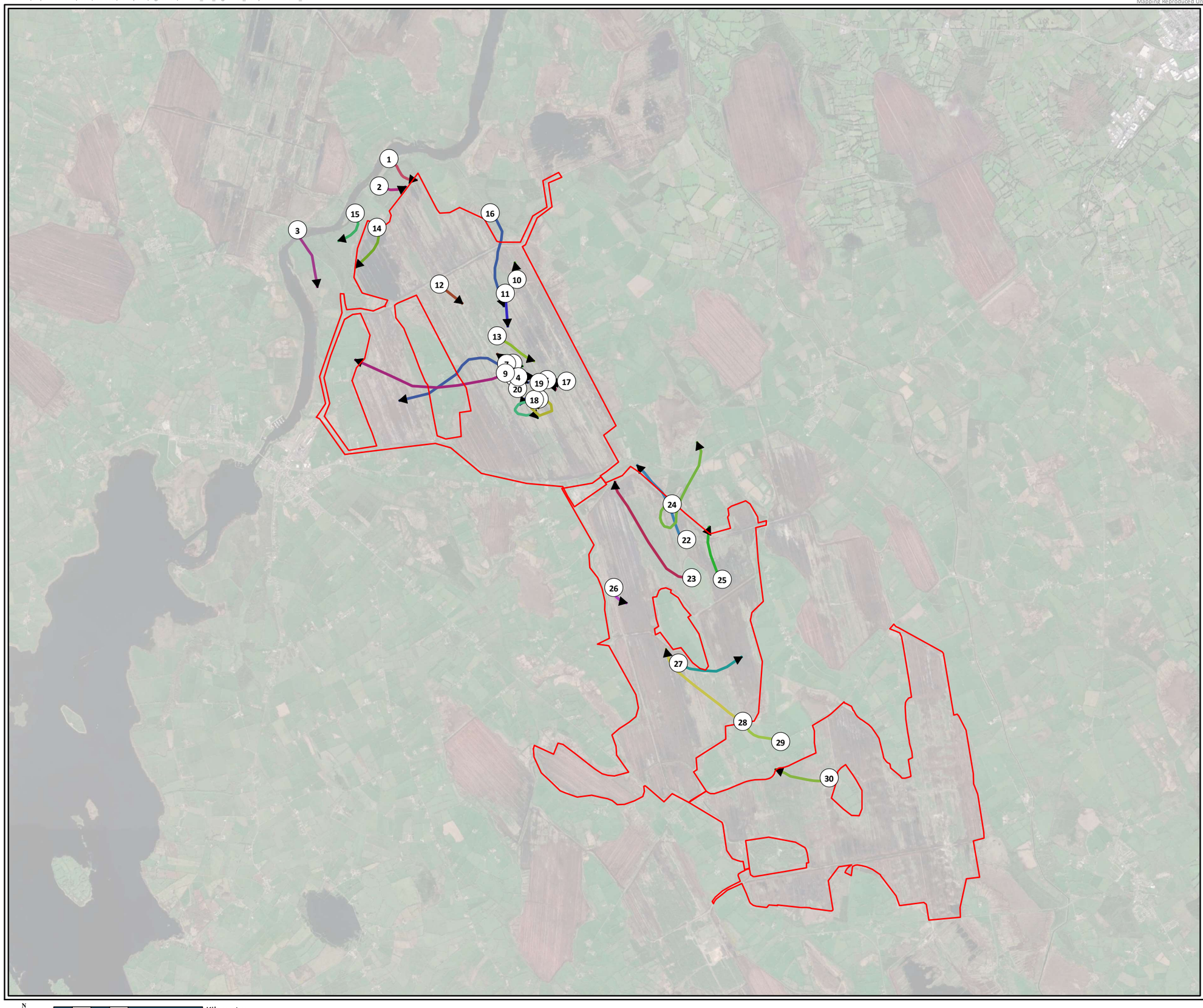
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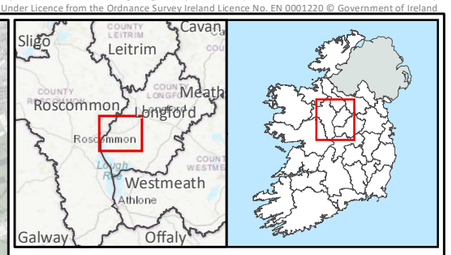
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PROJECT:	Derryadd, Co. Longford		
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DATE:	17/12/2021	**PAGE SIZE:**	A3

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Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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TITLE:	Summer Flightlines 2021 Little Egret 1		
PROJECT:	Derryadd, Co. Longford		
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DATE:	17/12/2021	**PAGE SIZE:**	A3

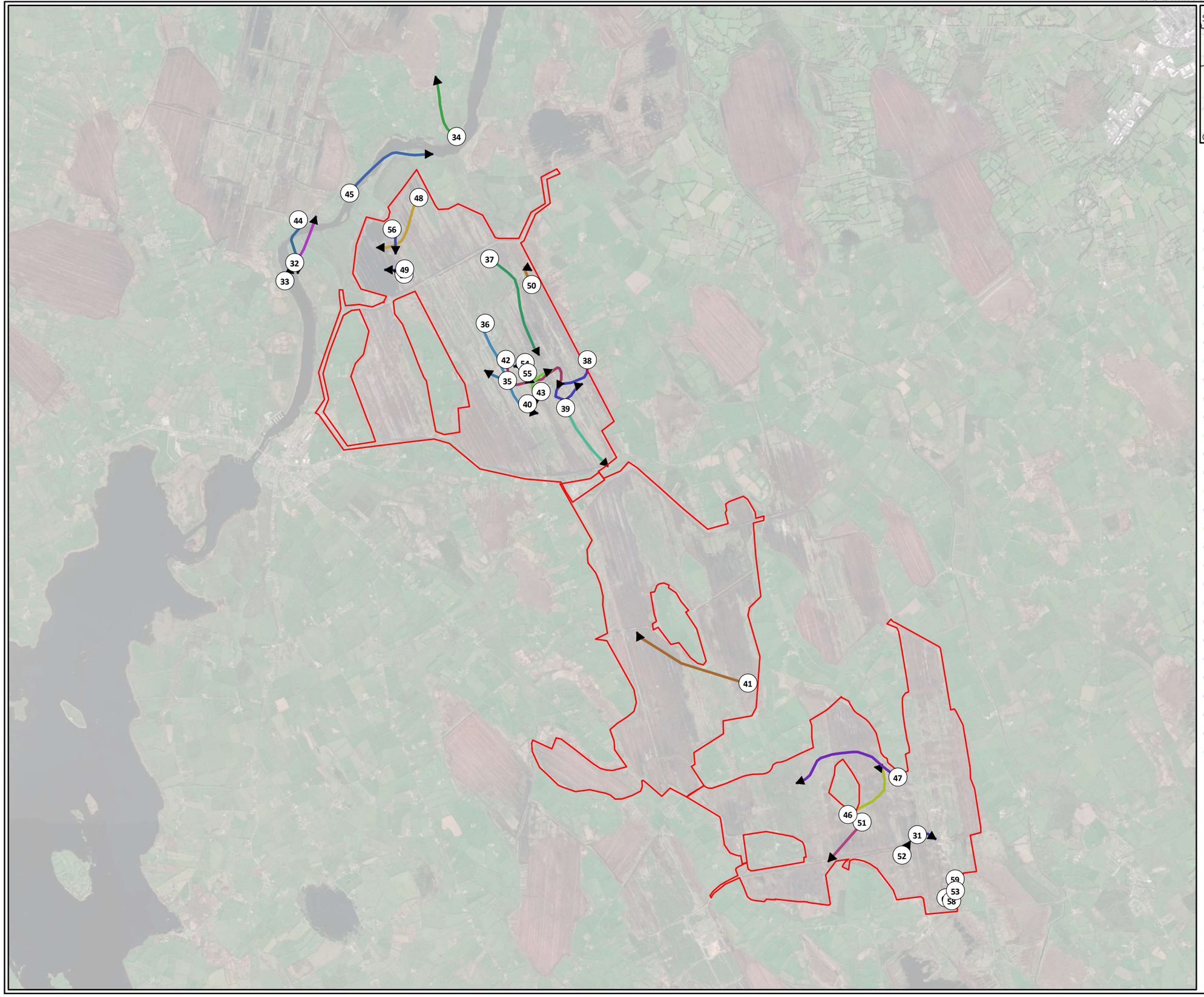
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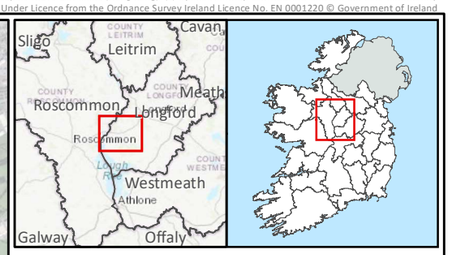
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Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Legend

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- 56, 07/09/2021, 13:06
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- 58, 13/09/2021, 16:40
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TITLE:	Summer Flightlines 2021 Little Egret 2		
PROJECT:	Derryadd, Co. Longford		
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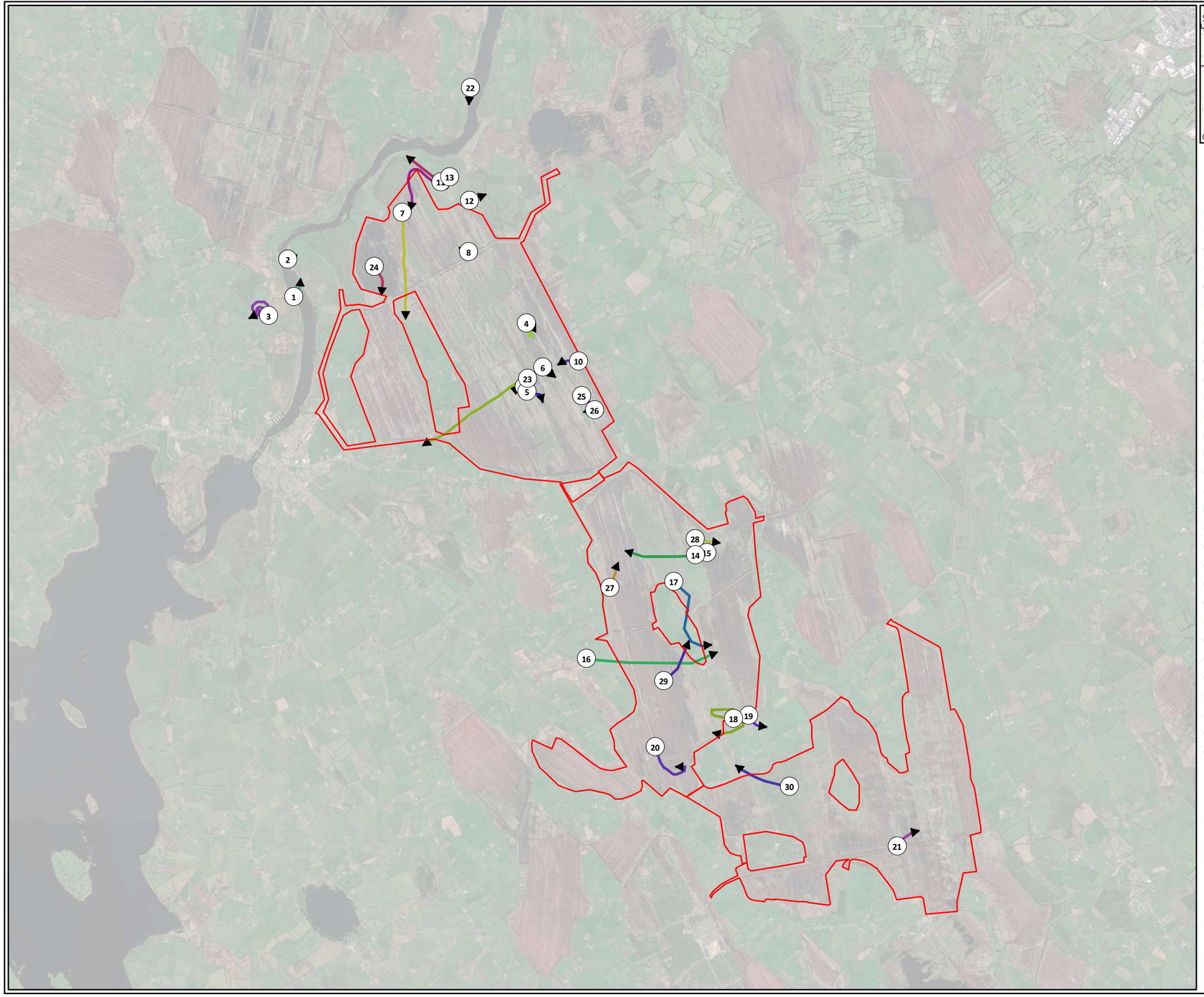
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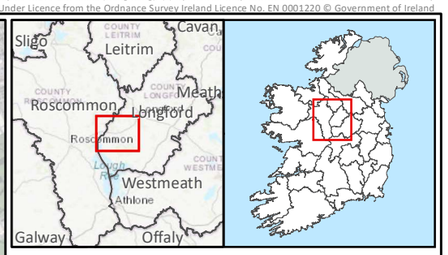
N W E S

Kilometers
0 0.5 1 2

Path: R:\Map Production\2021\P21-119\workspace\Flightlines\P20-113_GIS_Flightlines_DerryaddWindFarm_A3.mxd

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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TITLE:	Summer Flightlines 2021 Grey Heron 1		
PROJECT:	Derryadd, Co. Longford		
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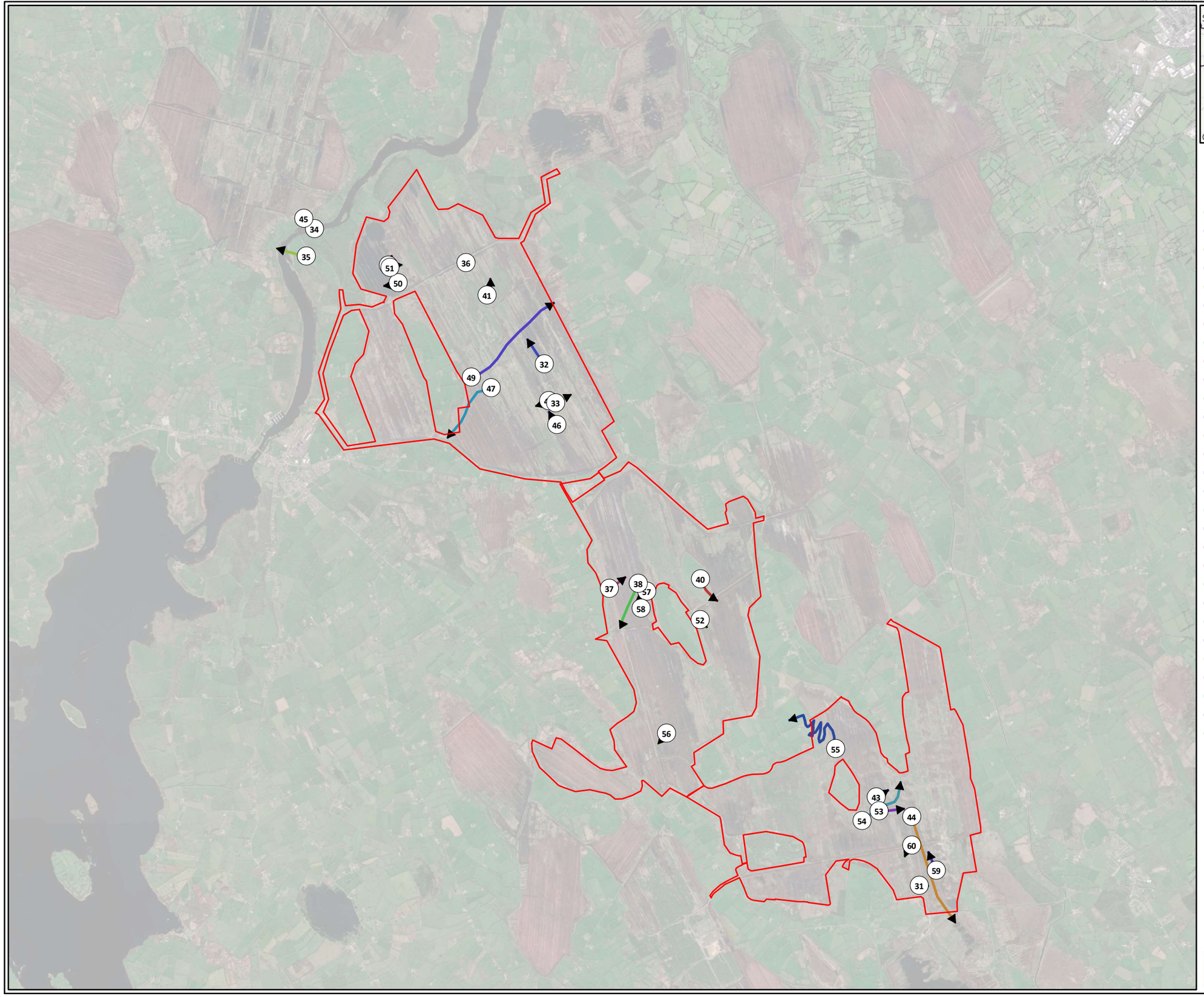
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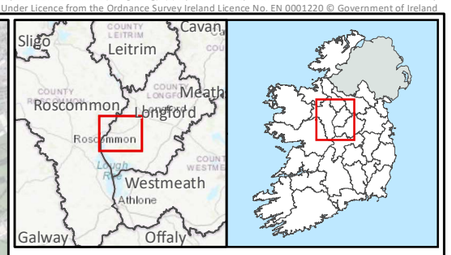
N W E S

0 0.5 1 2 Kilometers

Path: R:\Map Production\2021\P21-119\workspace\Flightlines\P20-113_GIS_Flightlines_DerryaddWindFarm_A3.mxd

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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TITLE:	Summer Flightlines 2021 Grey Heron 2		
PROJECT:	Derryadd, Co. Longford		
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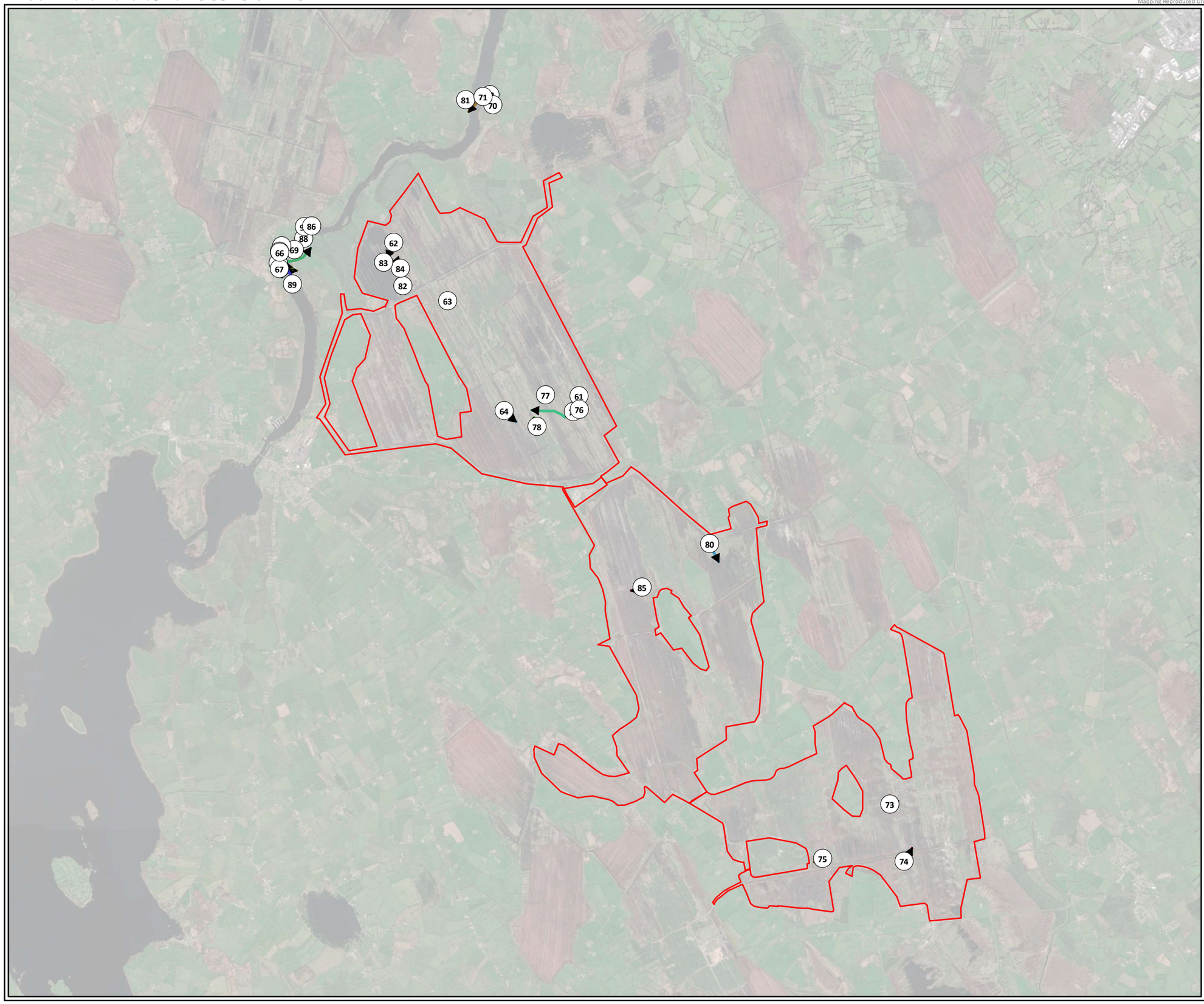
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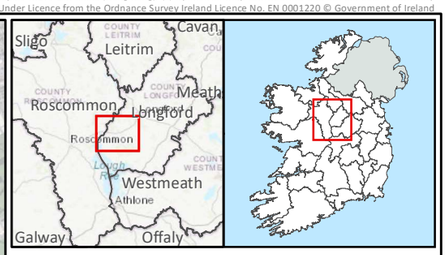
N W E S

0 0.5 1 2 Kilometers

Path: R:\Map Production\2021\P21-119\workspace\Flightlines\P20-113_GIS_Flightlines_DerryaddWindFarm_A3.mxd

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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PROJECT:	Derryadd, Co. Longford		
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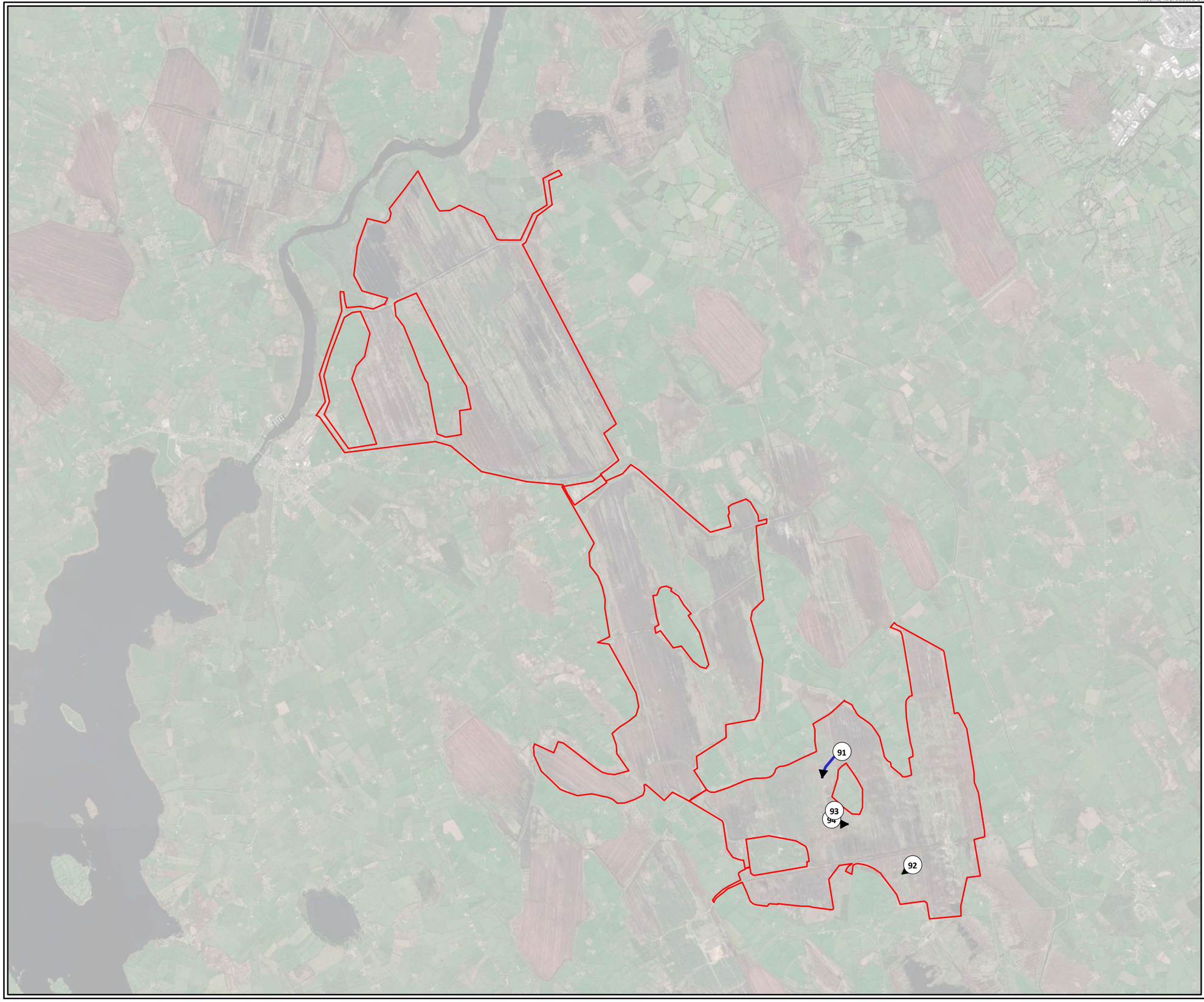
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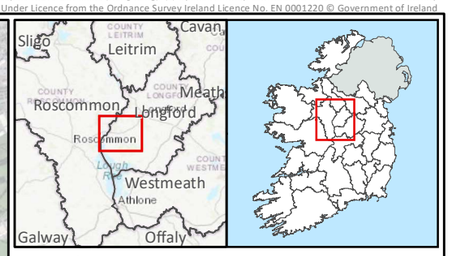
N W E S

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Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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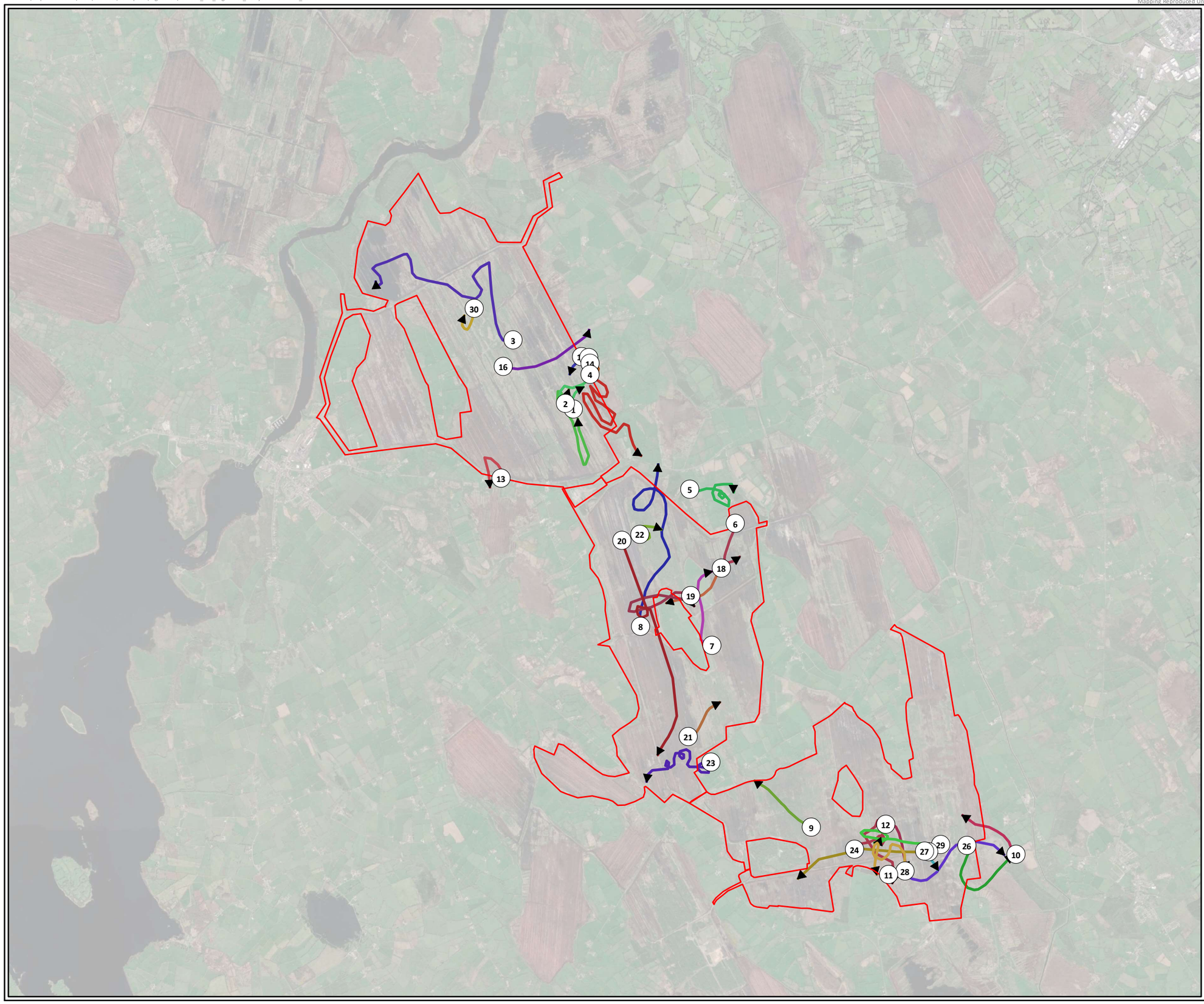
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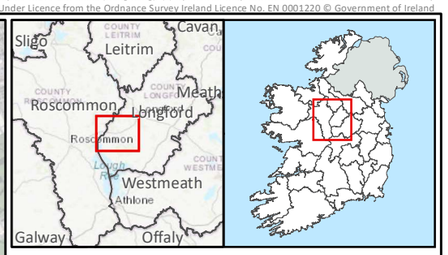
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PROJECT:	Derryadd, Co. Longford		
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DATE:	17/12/2021	**PAGE SIZE:**	A3

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Path: R:\Map Production\2021\P21-119\workspace\Flightlines\P20-113_GIS_Flightlines_DerryaddWindFarm_A3.mxd

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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TITLE:	Summer Flightlines 2021 Kestrel 1		
PROJECT:	Derryadd, Co. Longford		
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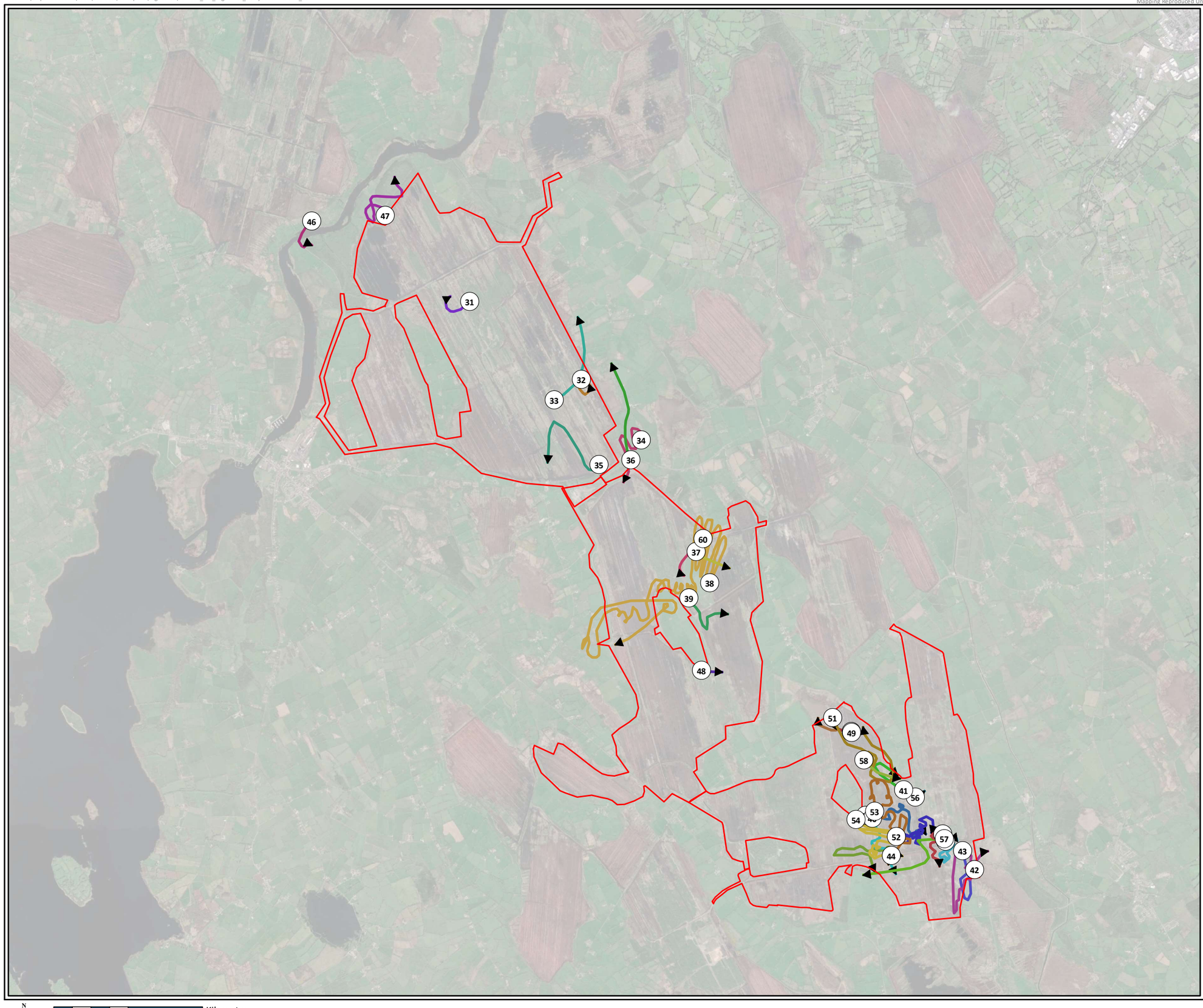
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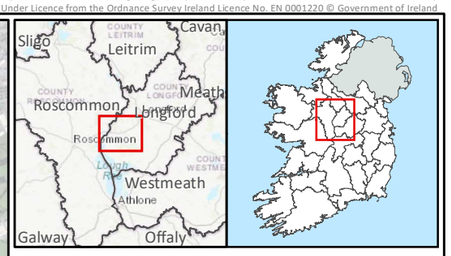
N W E S

Kilometers
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Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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TITLE:	Summer Flightlines 2021 Kestrel 2		
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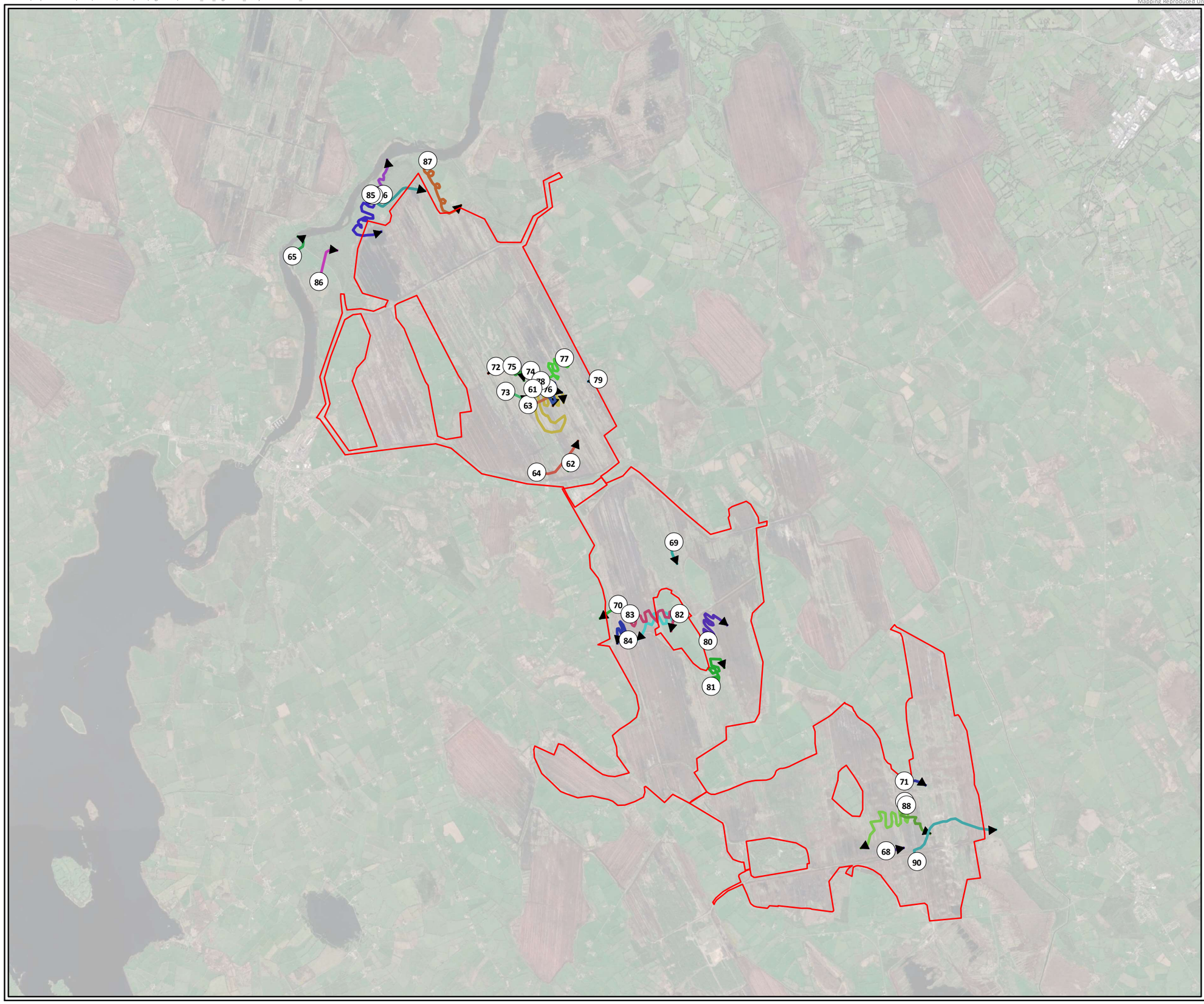
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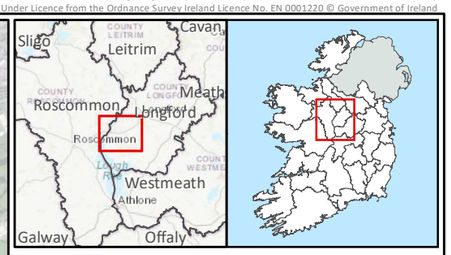
N W E S

0 0.5 1 2 Kilometers

Path: R:\Map Production\2021\P21-119\workspace\Flightlines\P20-113_GIS_Flightlines_DerryaddWindFarm_A3.mxd

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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- 62, 16/08/2021, 10:55
- 63, 16/08/2021, 11:17
- 64, 16/08/2021, 14:50
- 65, 17/08/2021, 10:08
- 66, 17/08/2021, 11:05
- 67, 17/08/2021, 13:03
- 68, 18/08/2021, 16:56
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- 71, 20/08/2021, 14:52
- 72, 02/09/2021, 09:27
- 73, 02/09/2021, 11:03
- 74, 02/09/2021, 11:34
- 75, 02/09/2021, 12:59
- 76, 02/09/2021, 14:14
- 77, 02/09/2021, 18:38
- 78, 03/09/2021, 11:00
- 79, 03/09/2021, 11:35
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- 81, 03/09/2021, 17:53
- 82, 09/09/2021, 09:22
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- 86, 12/09/2021, 13:52
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- 89, 13/09/2021, 13:44
- 90, 14/09/2021, 10:22

TITLE:	Summer Flightlines 2021 Kestrel 3		
PROJECT:	Derryadd, Co. Longford		
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DATE:	17/12/2021	**PAGE SIZE:**	A3

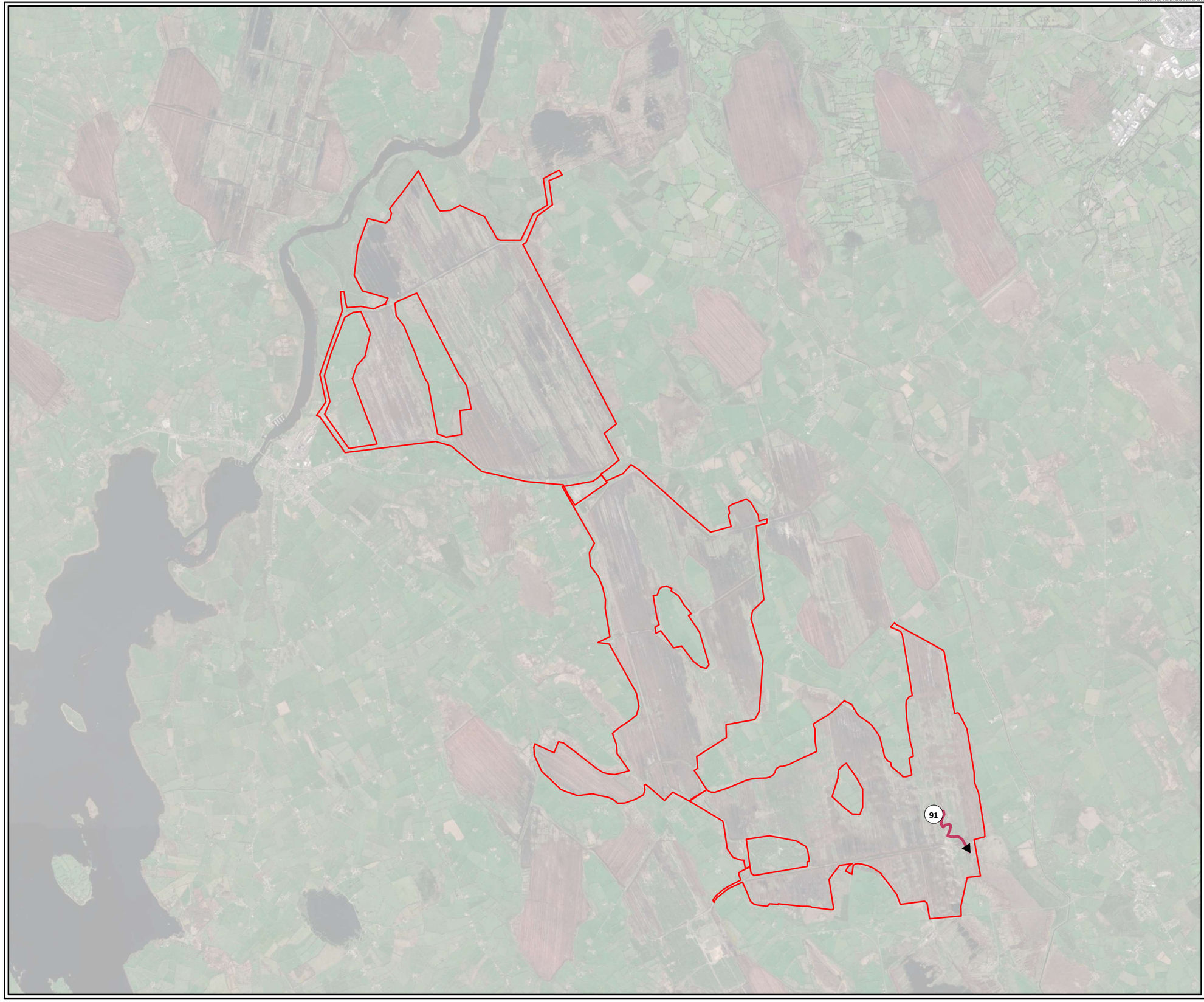
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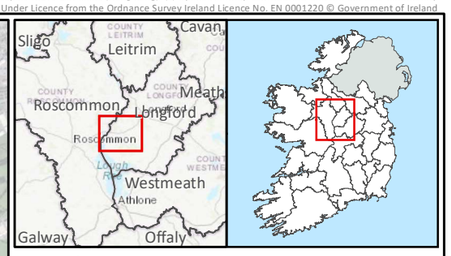
N W E S

Kilometers
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Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Site Boundary

Individual, Date, Time

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W E
S

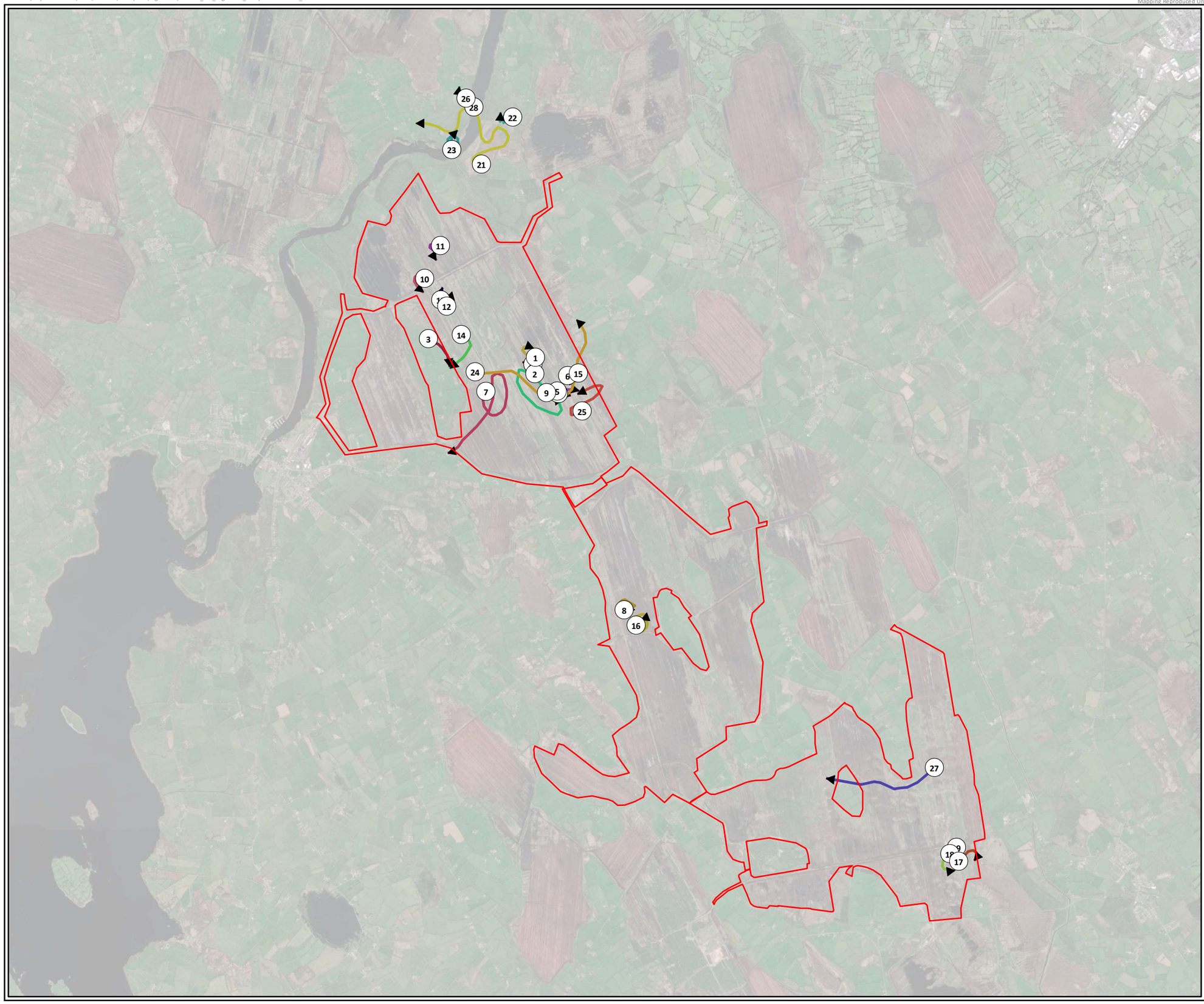
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TITLE:	Summer Flightlines 2021 Kestrel 4		
PROJECT:	Derryadd, Co. Longford		
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Path: R:\Map Production\2021\P21-119\workspace\Flightlines\P20-113_GIS_Flightlines_DerryaddWindFarm_A3.mxd

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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- 7, 06/05/2021, 08:36
- 8, 07/05/2021, 13:27
- 9, 02/06/2021, 13:32
- 10, 10/06/2021, 14:07
- 11, 10/06/2021, 15:25
- 12, 10/06/2021, 17:21
- 13, 10/06/2021, 17:55
- 14, 10/06/2021, 19:06
- 15, 16/06/2021, 17:31
- 16, 17/06/2021, 13:10
- 17, 24/06/2021, 15:50
- 18, 24/06/2021, 16:09
- 19, 24/06/2021, 18:43
- 20, 05/07/2021, 16:53
- 21, 06/07/2021, 09:30
- 22, 06/07/2021, 11:03
- 23, 06/07/2021, 15:34
- 24, 27/07/2021, 11:00
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- 26, 29/07/2021, 12:22
- 27, 11/08/2021, 11:37
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PROJECT:	Derryadd, Co. Longford		
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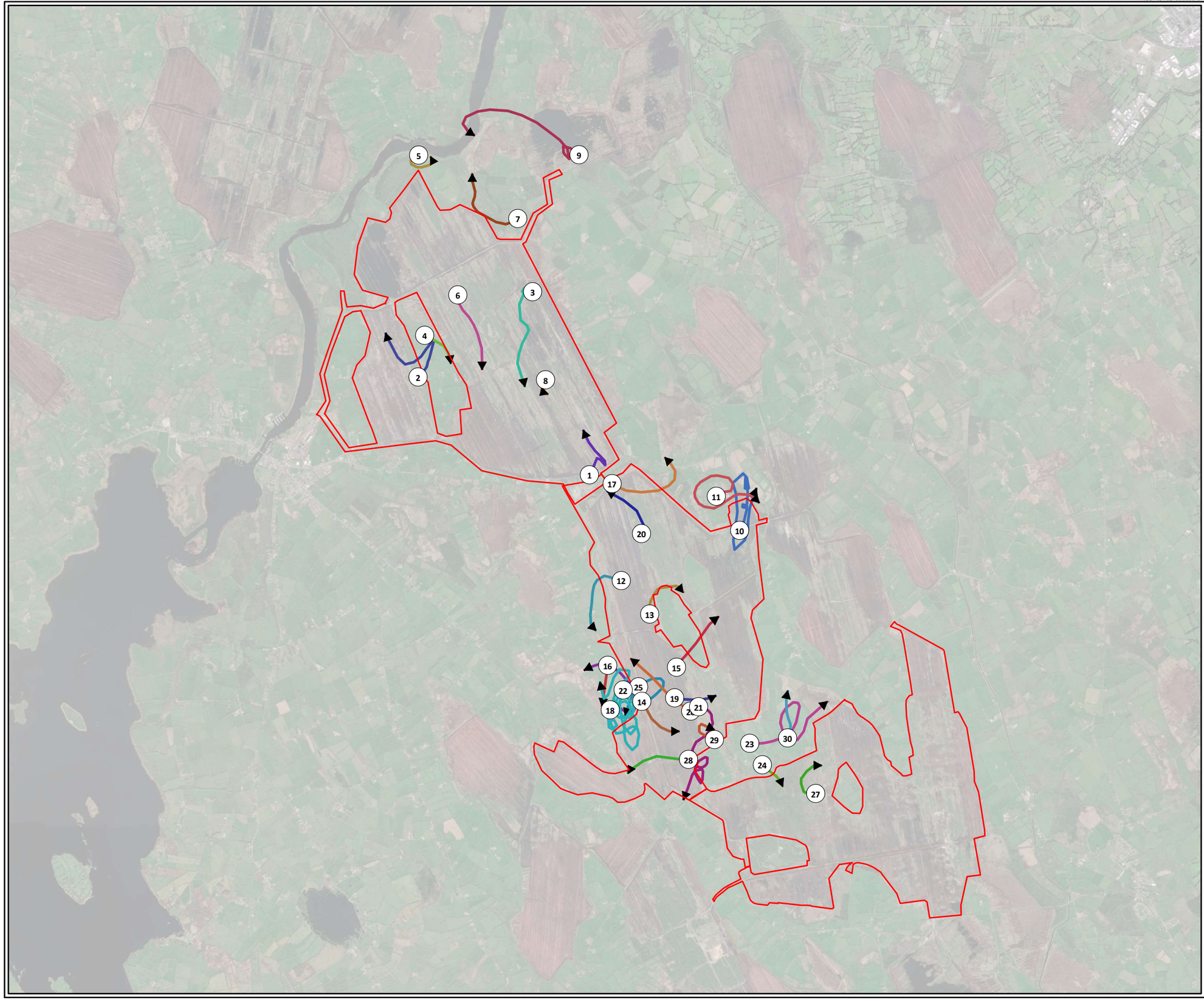
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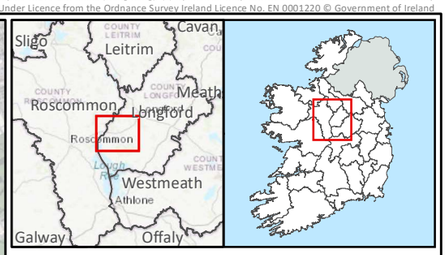
N W E S

Kilometers
0 0.5 1 2

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Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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- 7, 05/05/2021, 14:44
- 8, 06/05/2021, 09:16
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- 13, 07/05/2021, 17:49
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- 16, 11/05/2021, 14:30
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- 18, 11/05/2021, 15:11
- 19, 11/05/2021, 15:23
- 20, 11/05/2021, 15:44
- 21, 11/05/2021, 17:13
- 22, 11/05/2021, 18:08
- 23, 11/05/2021, 18:20
- 24, 11/05/2021, 19:22
- 25, 11/05/2021, 19:53
- 26, 19/05/2021, 10:54
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- 28, 19/05/2021, 13:02
- 29, 19/05/2021, 13:16
- 30, 21/05/2021, 09:23

TITLE:	Summer Flightlines 2021 Lesser Black-Backed Gull 1		
PROJECT:	Derryadd, Co. Longford		
FIGURE NO:	-		
CLIENT:	Bord na Móna		
SCALE:	1:50000	**REVISION:**	0
DATE:	17/12/2021	**PAGE SIZE:**	A3

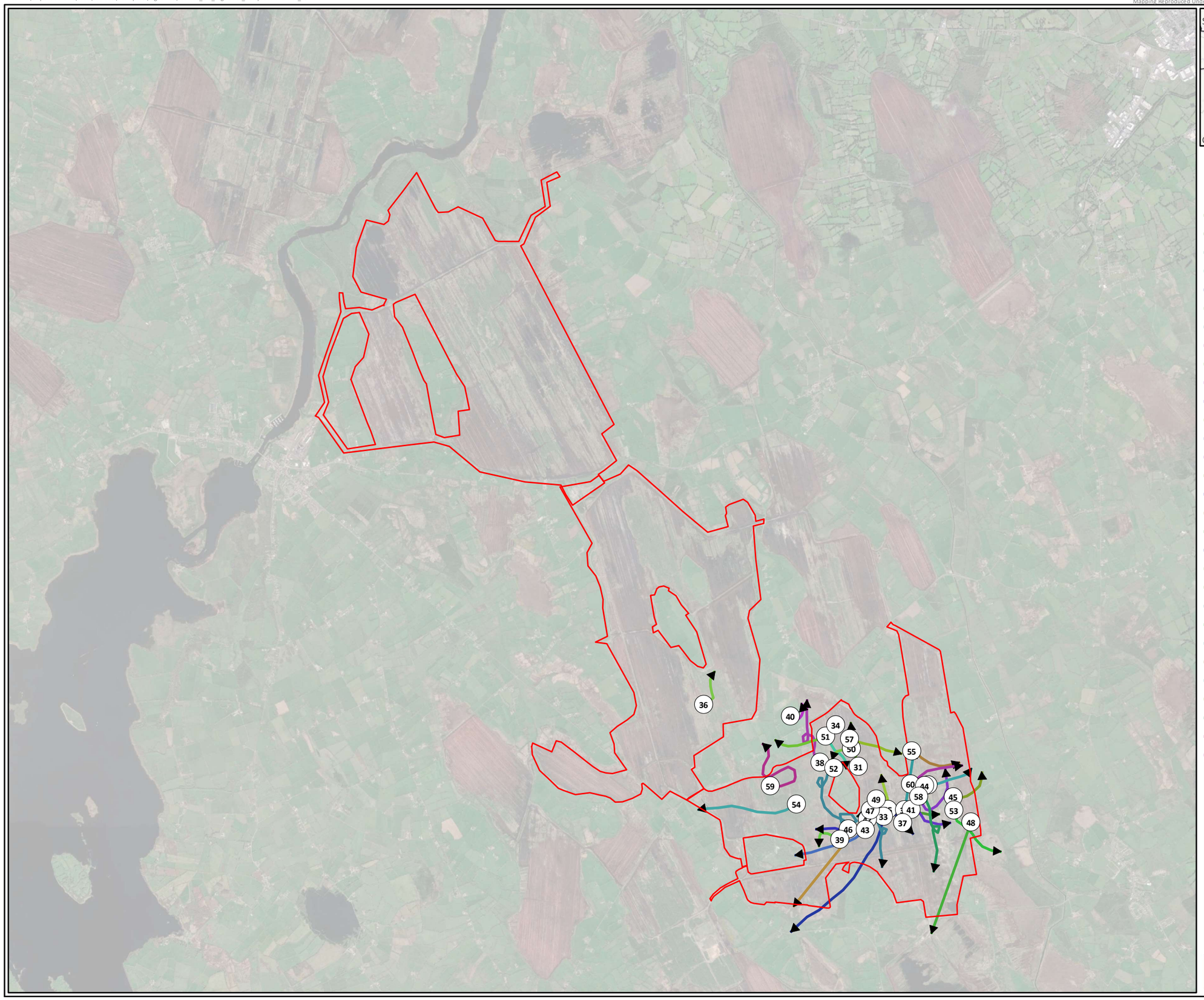
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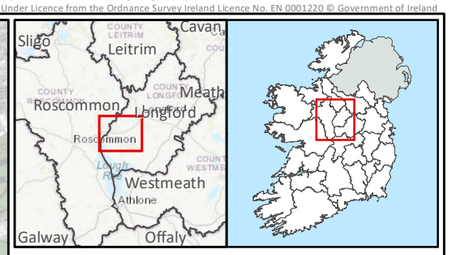
N W E S

Kilometers
0 0.5 1 2

Path: R:\Map Production\2021\P21-119\workspace\Flightlines\P20-113_GIS_Flightlines_DerryaddWindFarm_A3.mxd

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Legend

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- 34, 21/05/2021, 11:12
- 35, 21/05/2021, 12:06
- 36, 21/05/2021, 12:10
- 37, 22/05/2021, 11:15
- 38, 22/05/2021, 11:42
- 39, 22/05/2021, 12:07
- 40, 22/05/2021, 12:21
- 41, 22/05/2021, 14:23
- 42, 22/05/2021, 14:48
- 43, 22/05/2021, 15:17
- 44, 22/05/2021, 15:24
- 45, 22/05/2021, 15:59
- 46, 22/05/2021, 16:32
- 47, 27/05/2021, 11:29
- 48, 27/05/2021, 12:49
- 49, 27/05/2021, 13:16
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- 54, 28/05/2021, 14:40
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TITLE:	Summer Flightlines 2021 Lesser Black-Backed Gull 2		
PROJECT:	Derryadd, Co. Longford		
FIGURE NO:	-		
CLIENT:	Bord na Móna		
SCALE:	1:50000	**REVISION:**	0
DATE:	17/12/2021	**PAGE SIZE:**	A3

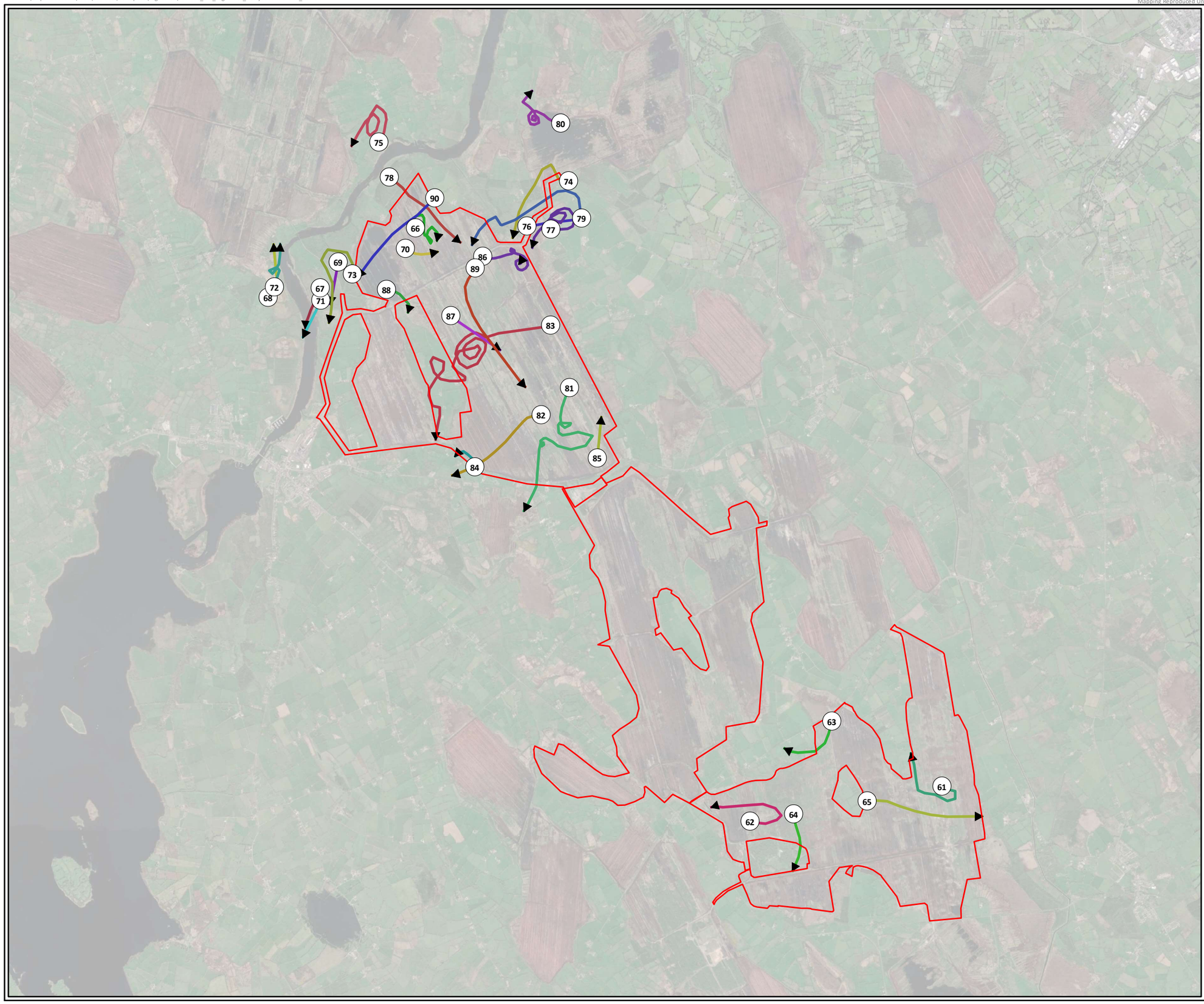
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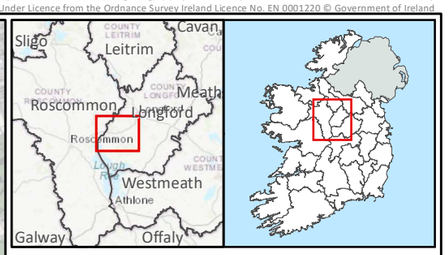
N W E S

0 0.5 1 2 Kilometers

Path: R:\Map Production\2021\P21-119\workspace\Flightlines\P20-113_GIS_Flightlines_DerryaddWindFarm_A3.mxd

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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- 66, 31/05/2021, 09:03
- 67, 31/05/2021, 09:52
- 68, 31/05/2021, 11:30
- 69, 31/05/2021, 11:43
- 70, 31/05/2021, 18:17
- 71, 31/05/2021, 18:22
- 72, 31/05/2021, 19:00
- 73, 31/05/2021, 19:52
- 74, 01/06/2021, 09:52
- 75, 01/06/2021, 11:06
- 76, 01/06/2021, 11:15
- 77, 01/06/2021, 13:30
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- 81, 01/06/2021, 18:23
- 82, 01/06/2021, 18:35
- 83, 02/06/2021, 14:00
- 84, 02/06/2021, 14:21
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- 86, 10/06/2021, 13:30
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- 88, 10/06/2021, 15:48
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- 90, 10/06/2021, 18:10

TITLE:	Summer Flightlines 2021 Lesser Black-Backed Gull 3		
PROJECT:	Derryadd, Co. Longford		
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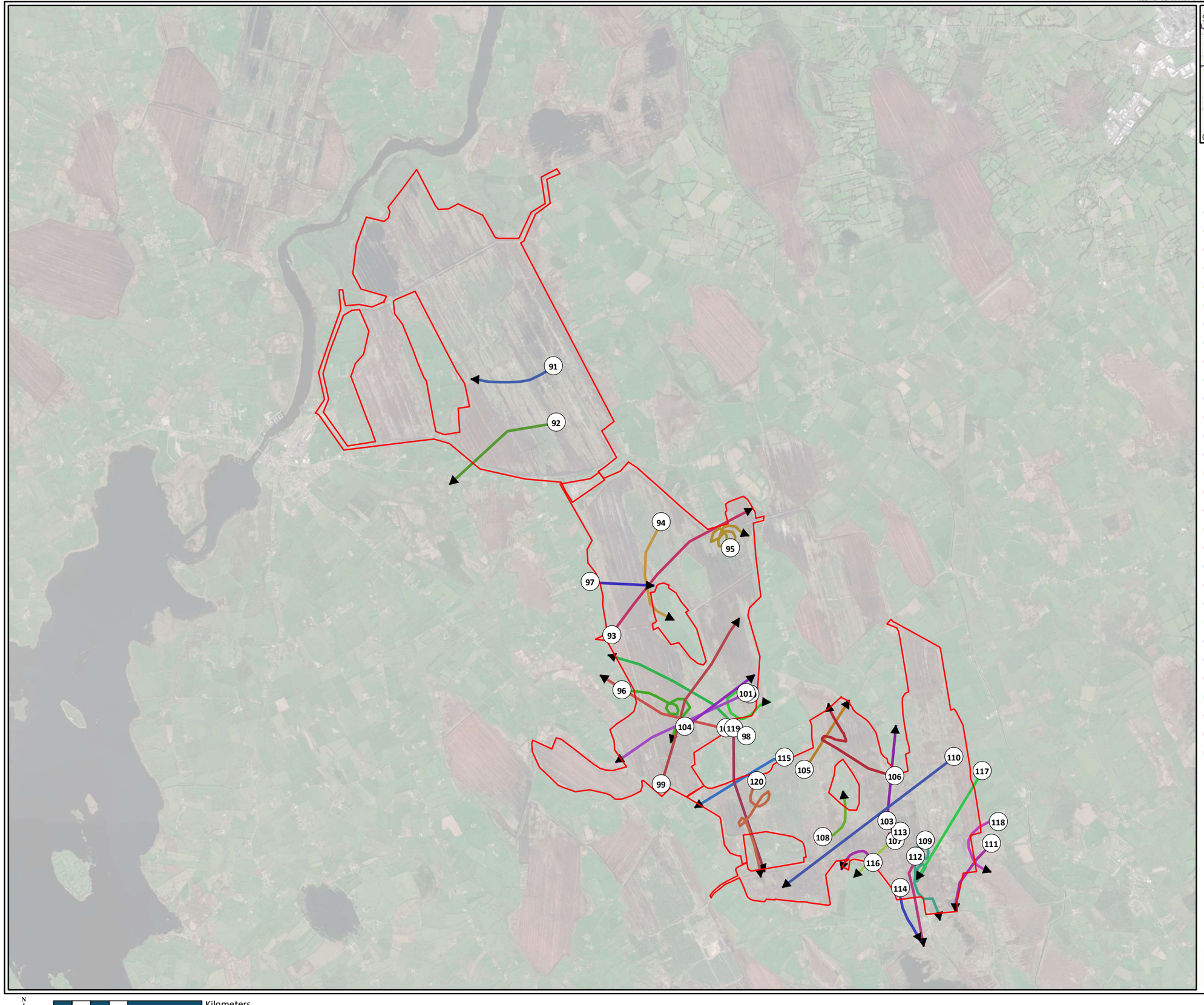
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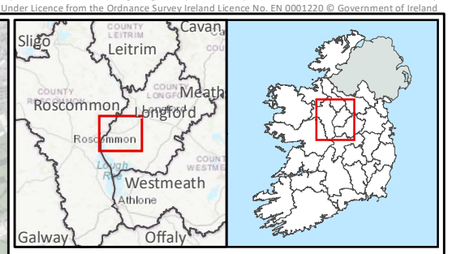
N W E S

0 0.5 1 2 Kilometers

Path: R:\Map Production\2021\P21-119\workspace\Flightlines\P20-113_GIS_Flightlines_DerryaddWindFarm_A3.mxd

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Individual, Date, Time

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- 95, 17/06/2021, 16:49
- 96, 18/06/2021, 09:29
- 97, 18/06/2021, 13:42
- 98, 23/06/2021, 10:57
- 99, 23/06/2021, 12:14
- 100, 23/06/2021, 12:29
- 101, 23/06/2021, 15:02
- 102, 23/06/2021, 15:38
- 103, 23/06/2021, 18:34
- 104, 23/06/2021, 18:57
- 105, 23/06/2021, 20:48
- 106, 24/06/2021, 10:33
- 107, 24/06/2021, 11:10
- 108, 24/06/2021, 14:36
- 109, 24/06/2021, 15:06
- 110, 24/06/2021, 16:44
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- 119, 25/06/2021, 13:56
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TITLE:	Summer Flightlines 2021 Lesser Black-Backed Gull 4		
PROJECT:	Derryadd, Co. Longford		
FIGURE NO:	-		
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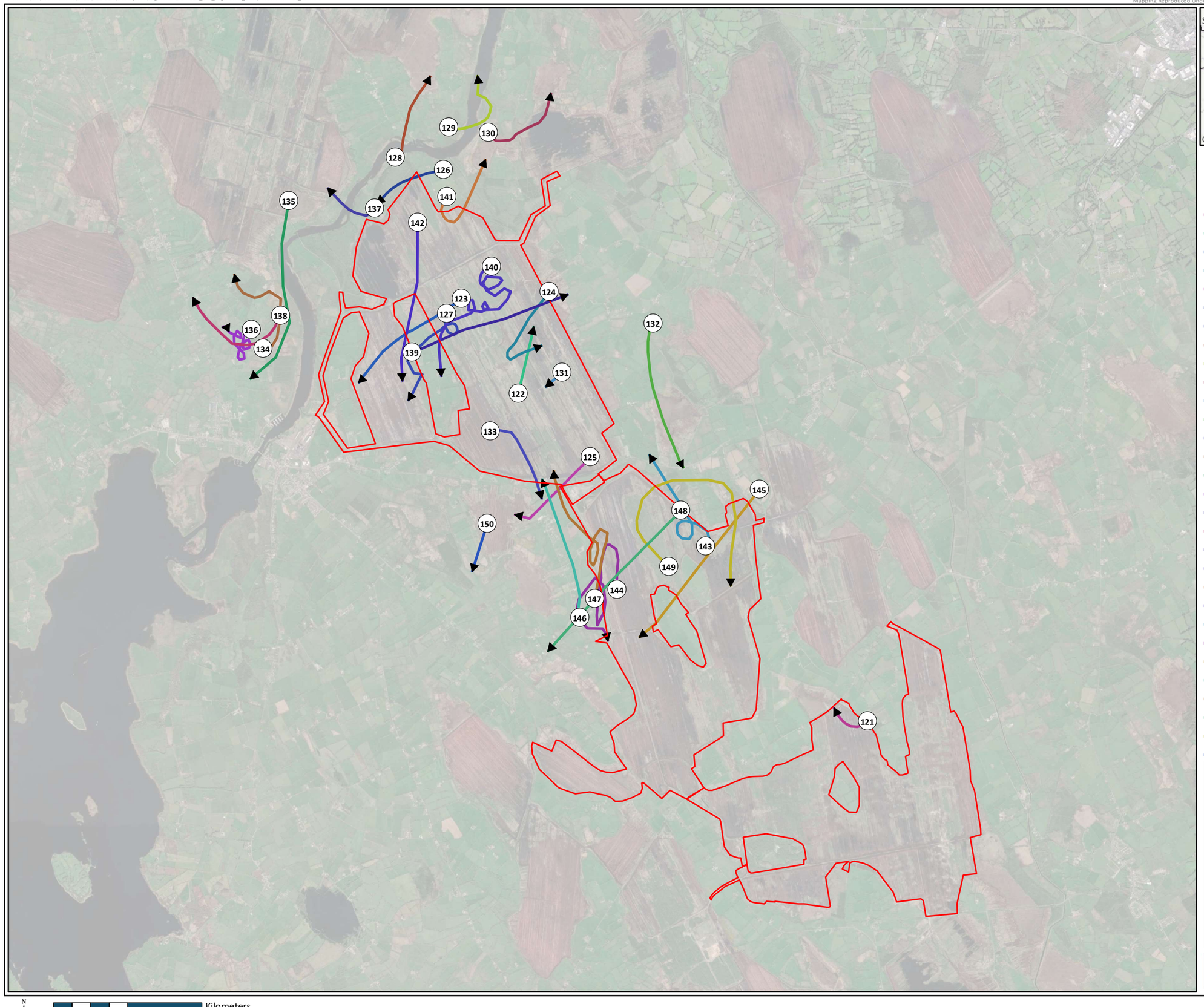
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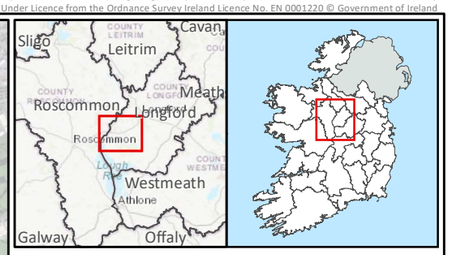
N W E S

0 0.5 1 2 Kilometers

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Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Legend

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Individual, Date, Time

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TITLE:	Summer Flightlines 2021 Lesser Black-Backed Gull 5		
PROJECT:	Derryadd, Co. Longford		
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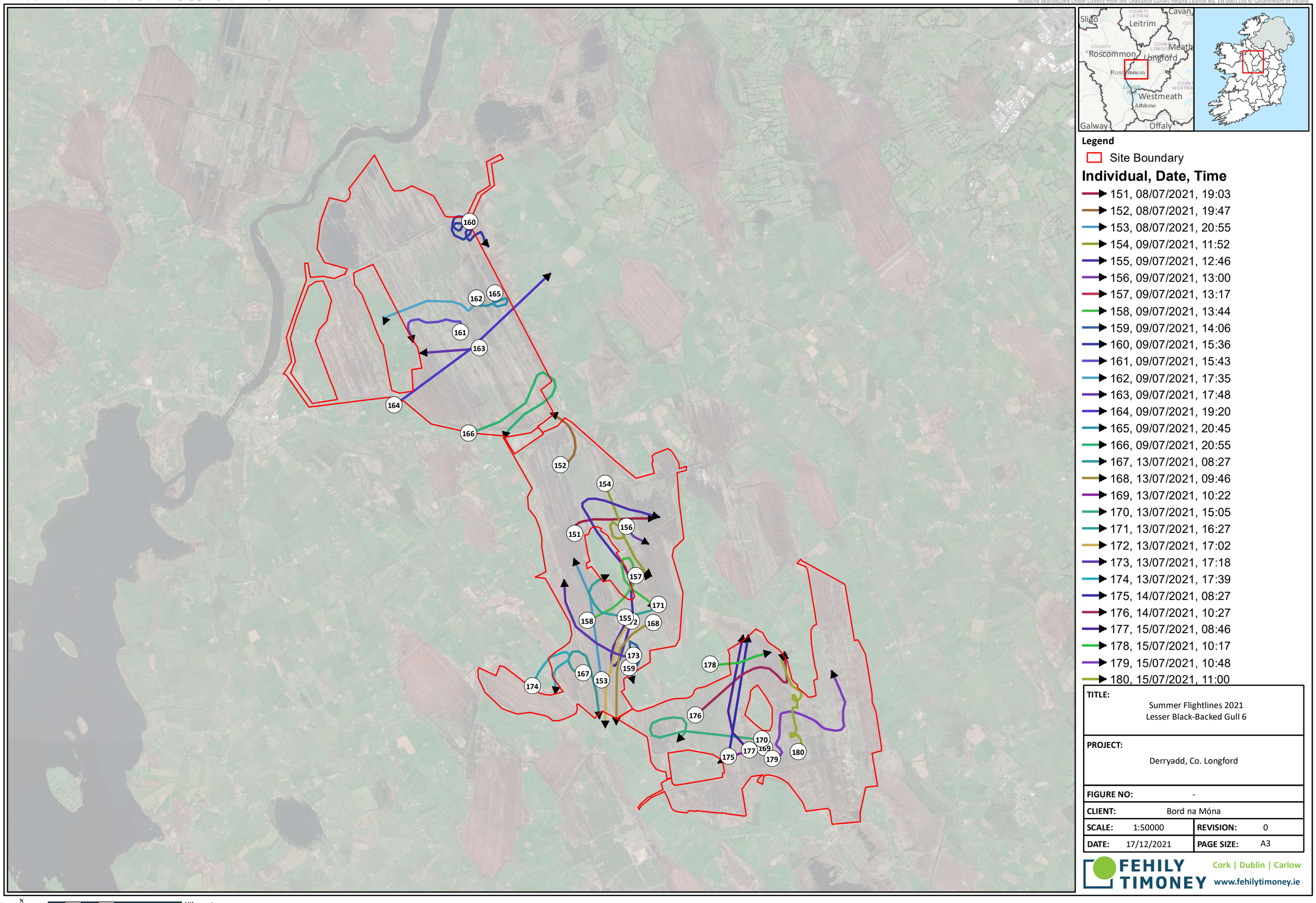
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N W E S

0 0.5 1 2 Kilometers

Path: R:\Map Production\2021\P21-119\workspace\Flightlines\P20-113_GIS_Flightlines_DerryaddWindFarm_A3.mxd

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Legend

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- 157, 09/07/2021, 13:17
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- 168, 13/07/2021, 09:46
- 169, 13/07/2021, 10:22
- 170, 13/07/2021, 15:05
- 171, 13/07/2021, 16:27
- 172, 13/07/2021, 17:02
- 173, 13/07/2021, 17:18
- 174, 13/07/2021, 17:39
- 175, 14/07/2021, 08:27
- 176, 14/07/2021, 10:27
- 177, 15/07/2021, 08:46
- 178, 15/07/2021, 10:17
- 179, 15/07/2021, 10:48
- 180, 15/07/2021, 11:00

TITLE:	Summer Flightlines 2021 Lesser Black-Backed Gull 6		
PROJECT:	Derryadd, Co. Longford		
FIGURE NO:	-		
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DATE:	17/12/2021	**PAGE SIZE:**	A3

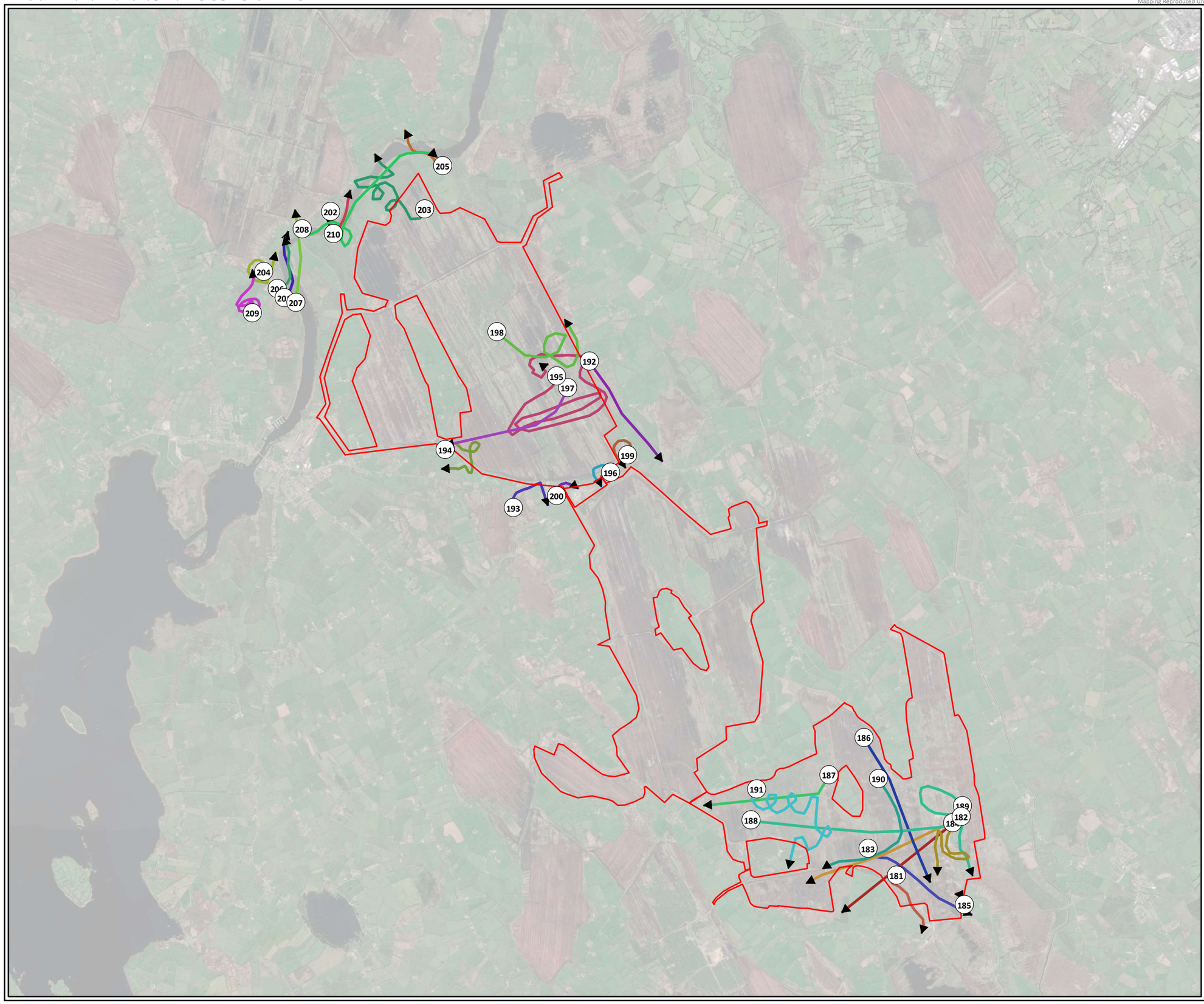
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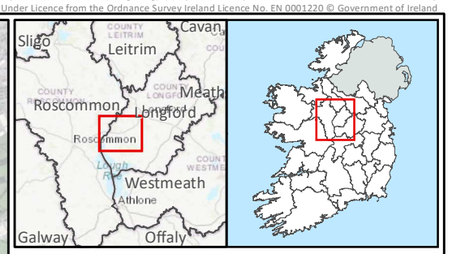
N W E S

0 0.5 1 2 Kilometers

Path: R:\Map Production\2021\P21-119\workspace\Flightlines\P20-113_GIS_Flightlines_DerryaddWindFarm_A3.mxd

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Site Boundary

Individual, Date, Time

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- 182, 15/07/2021, 14:40
- 183, 15/07/2021, 16:30
- 184, 15/07/2021, 18:13
- 185, 15/07/2021, 19:00
- 186, 16/07/2021, 09:43
- 187, 16/07/2021, 11:11
- 188, 16/07/2021, 11:26
- 189, 16/07/2021, 14:24
- 190, 16/07/2021, 15:00
- 191, 16/07/2021, 15:23
- 192, 27/07/2021, 09:22
- 193, 27/07/2021, 09:57
- 194, 27/07/2021, 10:10
- 195, 27/07/2021, 10:49
- 196, 27/07/2021, 11:48
- 197, 27/07/2021, 16:30
- 198, 27/07/2021, 16:49
- 199, 27/07/2021, 18:02
- 200, 27/07/2021, 18:55
- 201, 28/07/2021, 09:33
- 202, 28/07/2021, 10:06
- 203, 28/07/2021, 10:58
- 204, 28/07/2021, 11:59
- 205, 28/07/2021, 12:14
- 206, 28/07/2021, 13:44
- 207, 28/07/2021, 14:02
- 208, 28/07/2021, 14:57
- 209, 28/07/2021, 15:42
- 210, 28/07/2021, 16:03

TITLE:	Summer Flightlines 2021 Lesser Black-Backed Gull 7		
PROJECT:	Derryadd, Co. Longford		
FIGURE NO:	-		
CLIENT:	Bord na Móna		
SCALE:	1:50000	**REVISION:**	0
DATE:	17/12/2021	**PAGE SIZE:**	A3

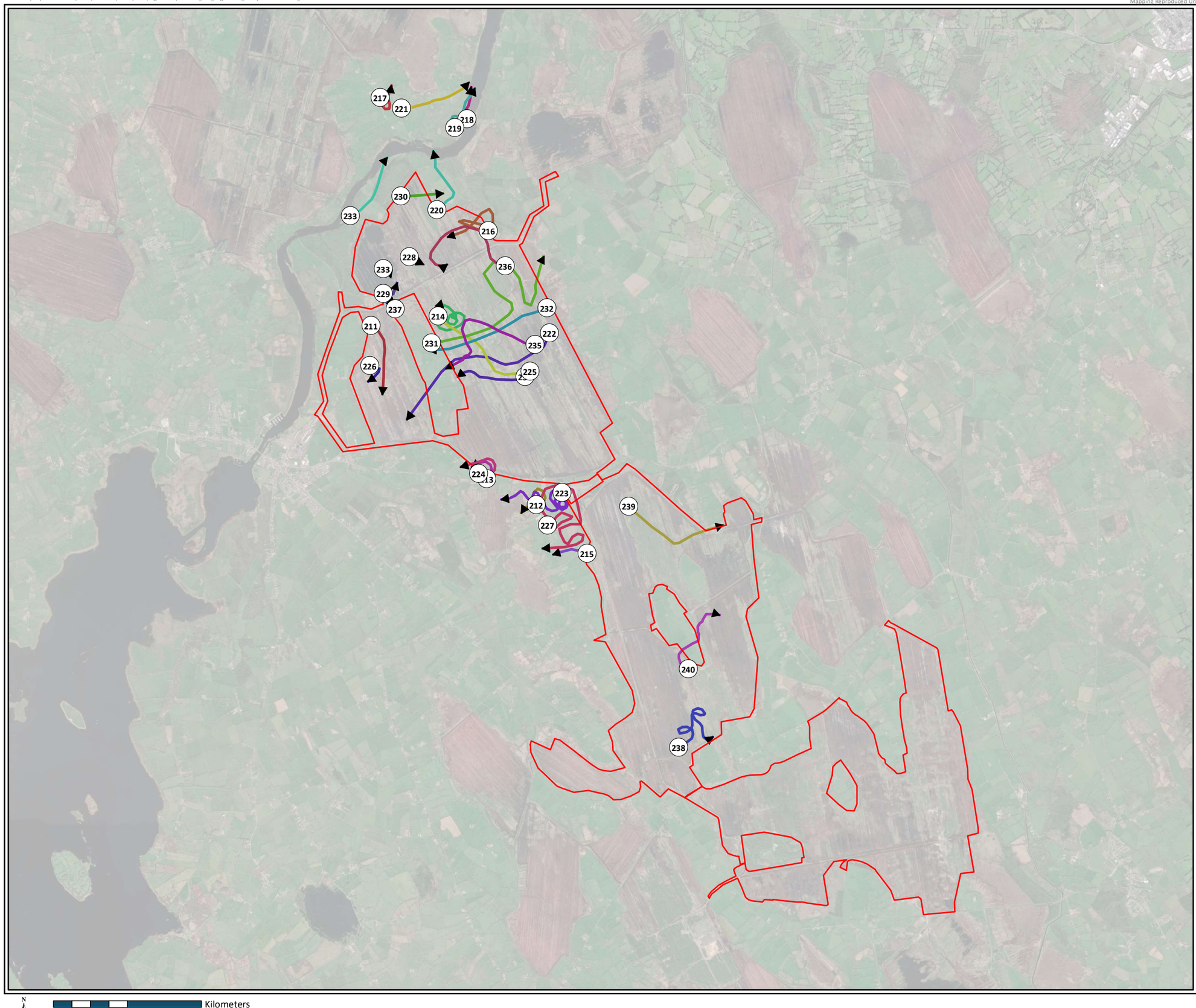
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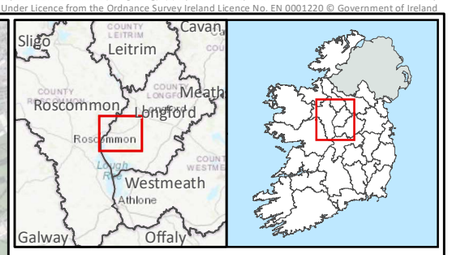
N W E S

0 0.5 1 2 Kilometers

Path: R:\Map Production\2021\P21-119\workspace\Flightlines\P20-113_GIS_Flightlines_DerryaddWindFarm_A3.mxd

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Individual, Date, Time

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- 213, 28/07/2021, 18:58
- 214, 28/07/2021, 19:15
- 215, 28/07/2021, 19:50
- 216, 29/07/2021, 11:32
- 217, 29/07/2021, 11:50
- 218, 29/07/2021, 12:42
- 219, 29/07/2021, 14:05
- 220, 29/07/2021, 15:02
- 221, 29/07/2021, 15:51
- 222, 29/07/2021, 17:52
- 223, 29/07/2021, 18:45
- 224, 29/07/2021, 19:03
- 225, 29/07/2021, 19:29
- 226, 29/07/2021, 20:11
- 227, 29/07/2021, 20:37
- 228, 30/07/2021, 11:17
- 229, 30/07/2021, 11:22
- 230, 30/07/2021, 11:48
- 231, 30/07/2021, 12:30
- 232, 30/07/2021, 14:52
- 233, 30/07/2021, 15:40
- 234, 30/07/2021, 16:10
- 235, 30/07/2021, 16:24
- 236, 30/07/2021, 17:15
- 237, 30/07/2021, 17:23
- 238, 02/08/2021, 10:02
- 239, 02/08/2021, 10:15
- 240, 02/08/2021, 10:58

TITLE:	Summer Flightlines 2021 Lesser Black-Backed Gull 8		
PROJECT:	Derryadd, Co. Longford		
FIGURE NO:	-		
CLIENT:	Bord na Móna		
SCALE:	1:50000	**REVISION:**	0
DATE:	17/12/2021	**PAGE SIZE:**	A3

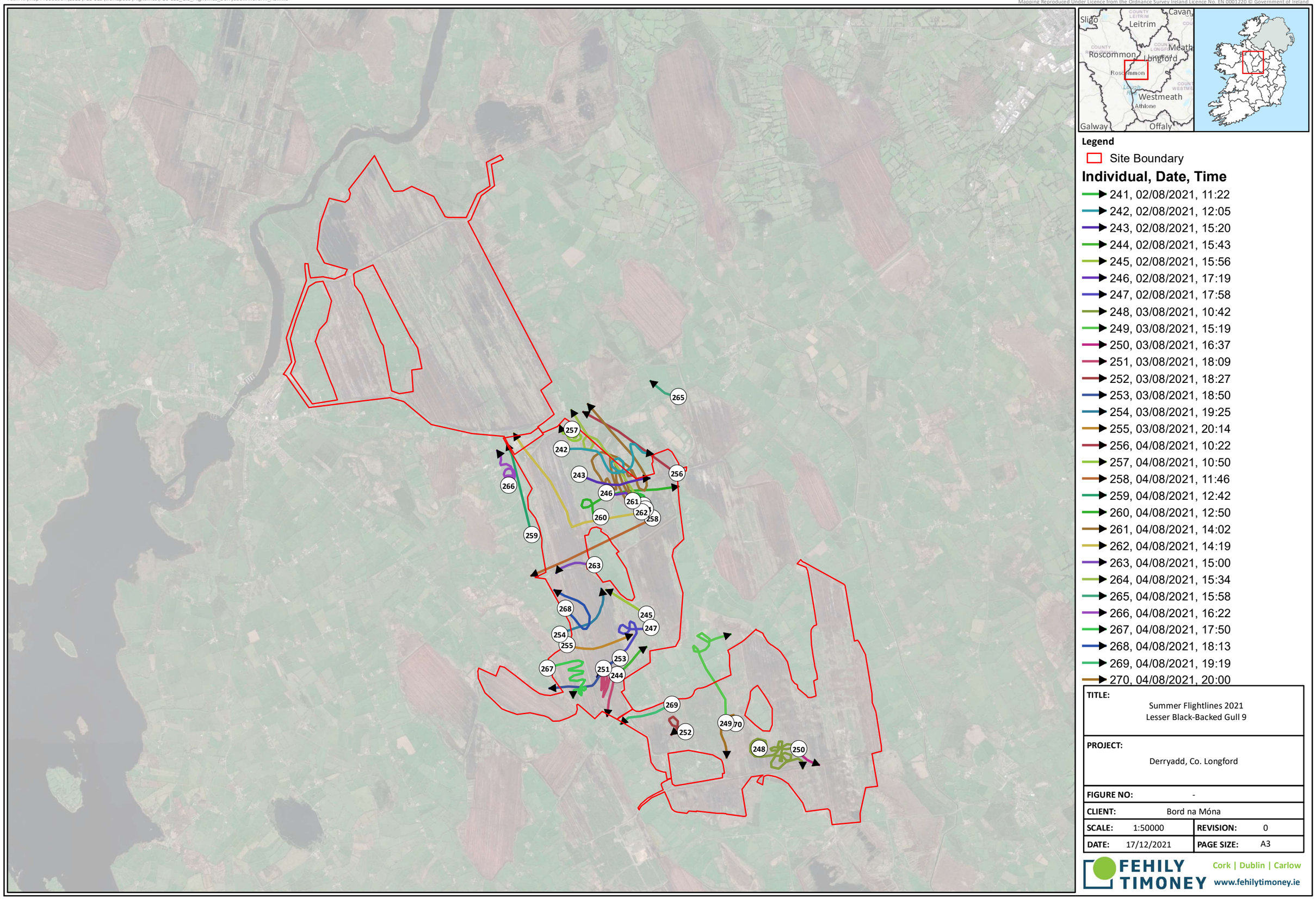
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N W E S

Kilometers
0 0.5 1 2

Path: R:\Map Production\2021\P21-119\workspace\Flightlines\P20-113_GIS_Flightlines_DerryaddWindFarm_A3.mxd

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Legend

Site Boundary

Individual, Date, Time

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- 242, 02/08/2021, 12:05
- 243, 02/08/2021, 15:20
- 244, 02/08/2021, 15:43
- 245, 02/08/2021, 15:56
- 246, 02/08/2021, 17:19
- 247, 02/08/2021, 17:58
- 248, 03/08/2021, 10:42
- 249, 03/08/2021, 15:19
- 250, 03/08/2021, 16:37
- 251, 03/08/2021, 18:09
- 252, 03/08/2021, 18:27
- 253, 03/08/2021, 18:50
- 254, 03/08/2021, 19:25
- 255, 03/08/2021, 20:14
- 256, 04/08/2021, 10:22
- 257, 04/08/2021, 10:50
- 258, 04/08/2021, 11:46
- 259, 04/08/2021, 12:42
- 260, 04/08/2021, 12:50
- 261, 04/08/2021, 14:02
- 262, 04/08/2021, 14:19
- 263, 04/08/2021, 15:00
- 264, 04/08/2021, 15:34
- 265, 04/08/2021, 15:58
- 266, 04/08/2021, 16:22
- 267, 04/08/2021, 17:50
- 268, 04/08/2021, 18:13
- 269, 04/08/2021, 19:19
- 270, 04/08/2021, 20:00

TITLE:	Summer Flightlines 2021 Lesser Black-Backed Gull 9		
PROJECT:	Derryadd, Co. Longford		
FIGURE NO:	-		
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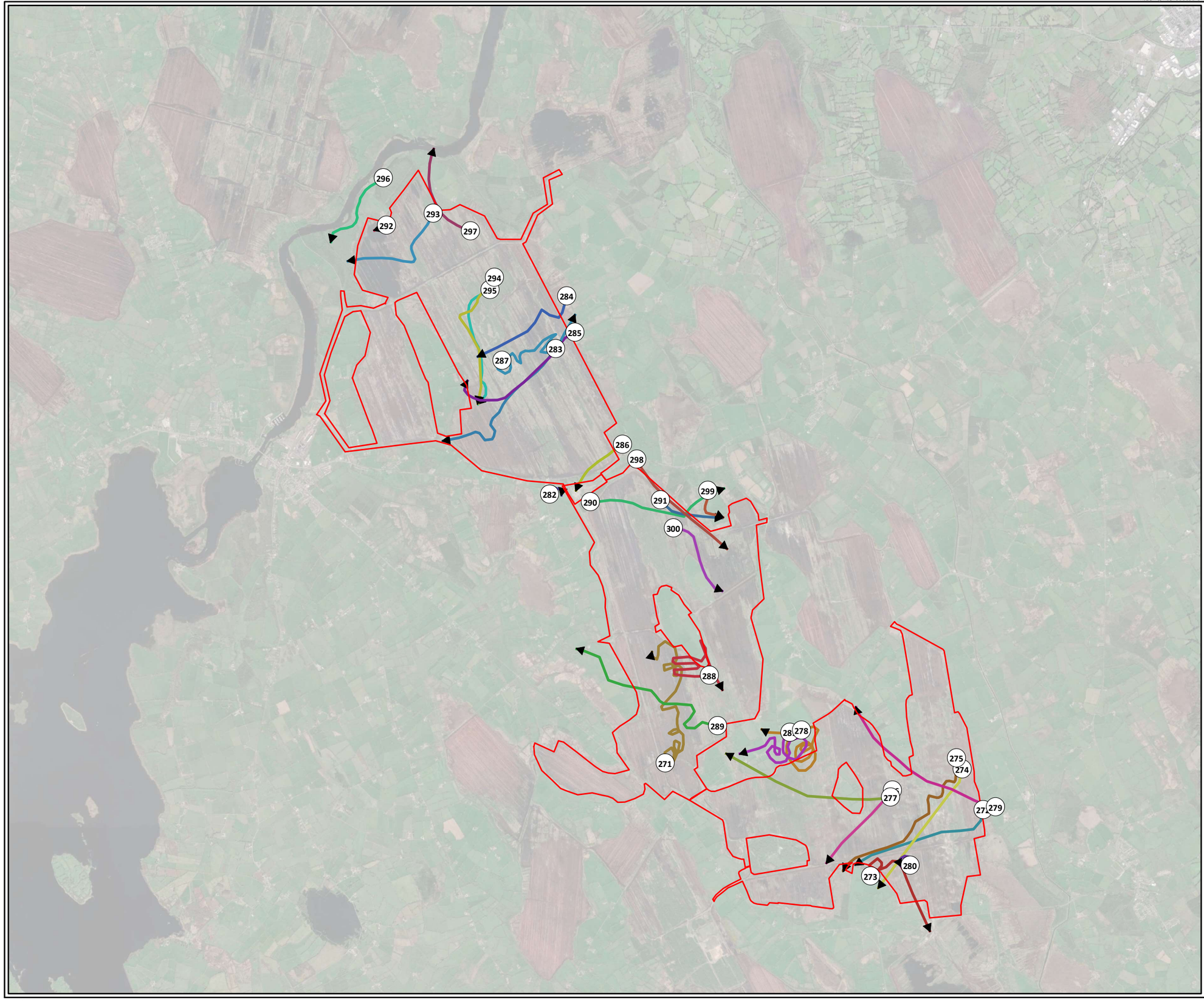
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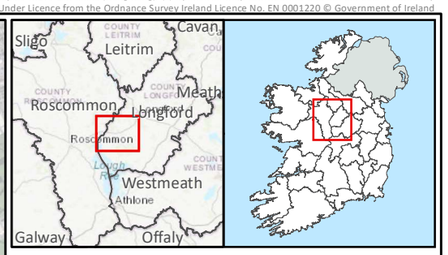
N W E S

0 0.5 1 2 Kilometers

Path: R:\Map Production\2021\P21-119\workspace\Flightlines\P20-113_GIS_Flightlines_DerryaddWindFarm_A3.mxd

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Legend

Site Boundary

Individual, Date, Time

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- 272, 05/08/2021, 11:52
- 273, 05/08/2021, 12:34
- 274, 05/08/2021, 13:40
- 275, 11/08/2021, 09:45
- 276, 11/08/2021, 11:00
- 277, 11/08/2021, 13:37
- 278, 11/08/2021, 15:08
- 279, 11/08/2021, 17:24
- 280, 11/08/2021, 19:06
- 281, 11/08/2021, 19:30
- 282, 12/08/2021, 11:04
- 283, 12/08/2021, 11:33
- 284, 12/08/2021, 12:42
- 285, 12/08/2021, 14:56
- 286, 12/08/2021, 15:27
- 287, 12/08/2021, 16:47
- 288, 12/08/2021, 18:40
- 289, 12/08/2021, 19:11
- 290, 12/08/2021, 19:23
- 291, 12/08/2021, 20:29
- 292, 13/08/2021, 11:09
- 293, 13/08/2021, 11:40
- 294, 13/08/2021, 12:58
- 295, 13/08/2021, 14:10
- 296, 13/08/2021, 16:10
- 297, 13/08/2021, 16:50
- 298, 13/08/2021, 18:15
- 299, 13/08/2021, 18:40
- 300, 13/08/2021, 19:12

TITLE:	Summer Flightlines 2021 Lesser Black-Backed Gull 10		
PROJECT:	Derryadd, Co. Longford		
FIGURE NO:	-		
CLIENT:	Bord na Móna		
SCALE:	1:50000	**REVISION:**	0
DATE:	17/12/2021	**PAGE SIZE:**	A3

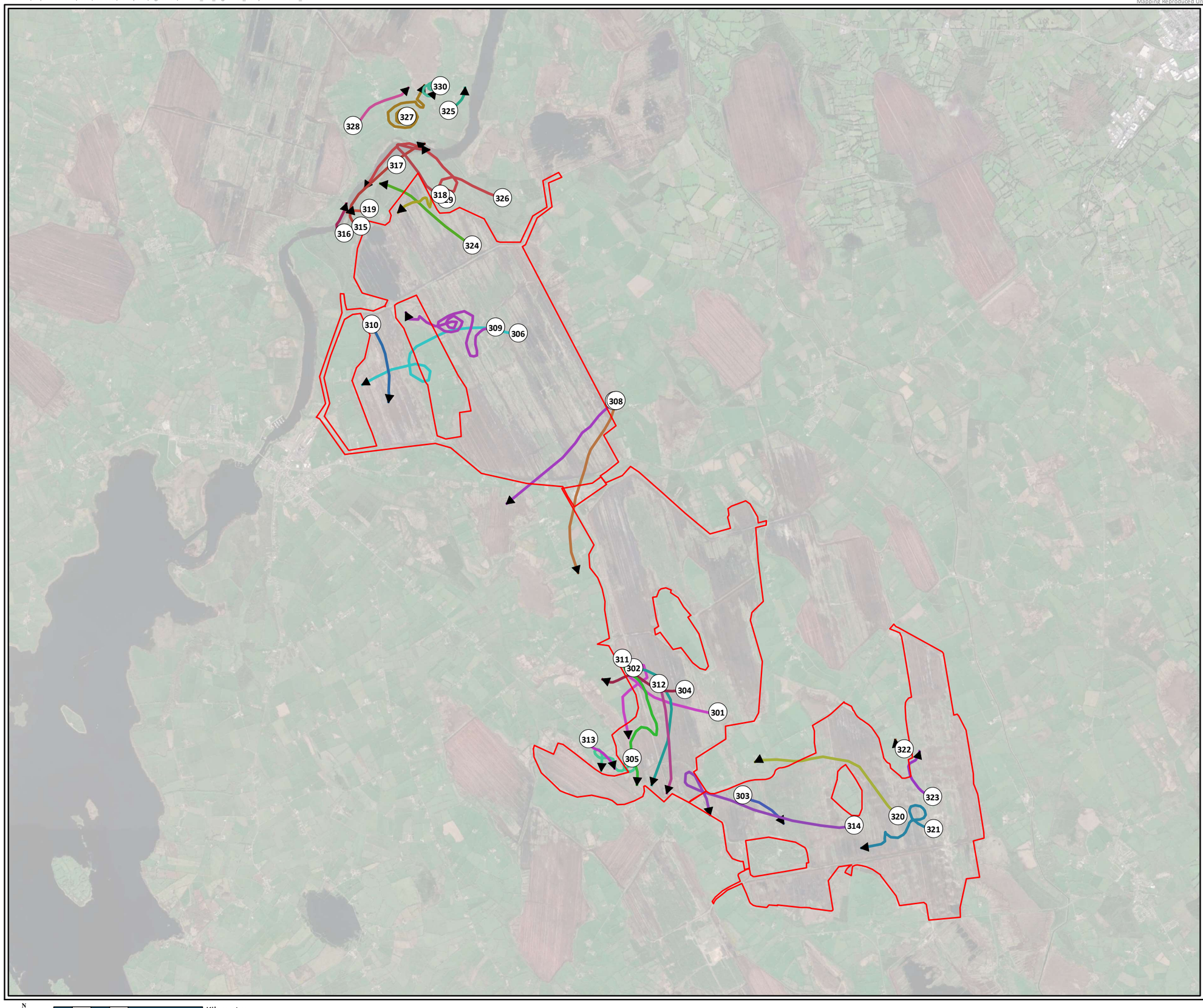
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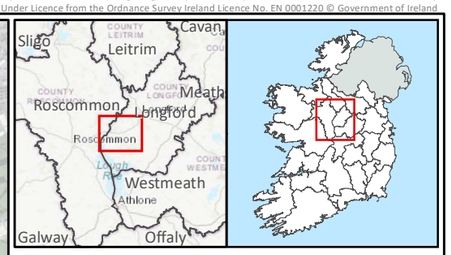
N W E S

0 0.5 1 2 Kilometers

Path: R:\Map Production\2021\P21-119\workspace\Flightlines\P20-113_GIS_Flightlines_DerryaddWindFarm_A3.mxd

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Legend

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Individual, Date, Time

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- 302, 14/08/2021, 11:17
- 303, 14/08/2021, 11:51
- 304, 14/08/2021, 12:46
- 305, 14/08/2021, 13:15
- 306, 16/08/2021, 09:29
- 307, 16/08/2021, 10:11
- 308, 16/08/2021, 13:27
- 309, 16/08/2021, 13:48
- 310, 16/08/2021, 15:16
- 311, 16/08/2021, 17:04
- 312, 16/08/2021, 17:39
- 313, 16/08/2021, 18:14
- 314, 16/08/2021, 18:40
- 315, 17/08/2021, 09:14
- 316, 17/08/2021, 10:49
- 317, 17/08/2021, 12:45
- 318, 17/08/2021, 14:21
- 319, 17/08/2021, 15:23
- 320, 17/08/2021, 16:53
- 321, 17/08/2021, 17:25
- 322, 17/08/2021, 18:34
- 323, 17/08/2021, 19:01
- 324, 18/08/2021, 09:48
- 325, 18/08/2021, 10:07
- 326, 18/08/2021, 10:33
- 327, 18/08/2021, 11:40
- 328, 18/08/2021, 11:52
- 329, 18/08/2021, 13:00
- 330, 18/08/2021, 13:38

TITLE:	Summer Flightlines 2021 Lesser Black-Backed Gull 11		
PROJECT:	Derryadd, Co. Longford		
FIGURE NO:	-		
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DATE:	17/12/2021	**PAGE SIZE:**	A3

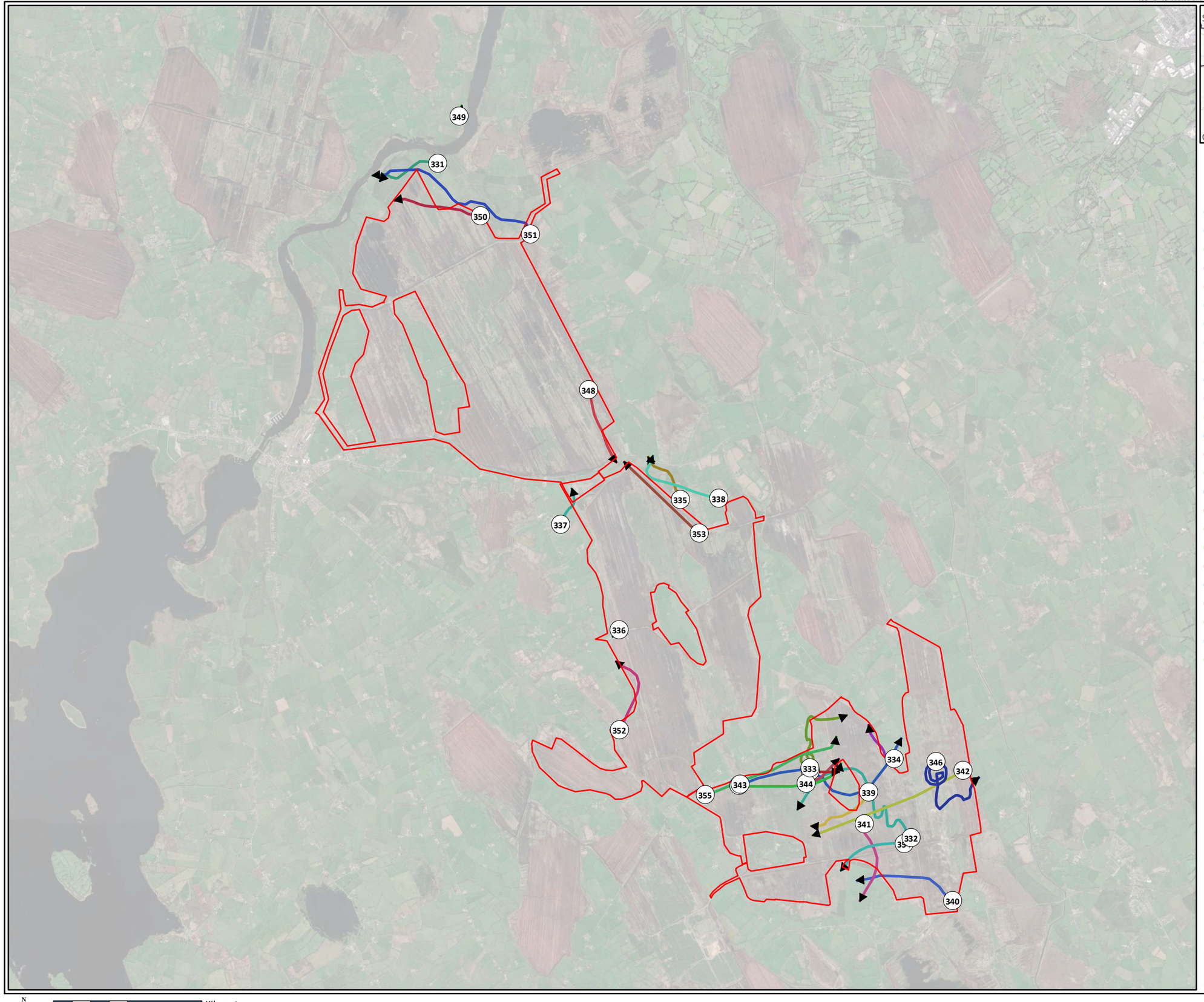
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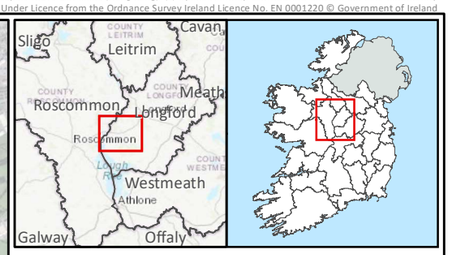
N W E S

Kilometers
0 0.5 1 2

Path: R:\Map Production\2021\P21-119\workspace\Flightlines\P20-113_GIS_Flightlines_DerryaddWindFarm_A3.mxd

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Legend

Site Boundary

Individual, Date, Time

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- 332, 18/08/2021, 17:08
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- 334, 18/08/2021, 18:10
- 335, 19/08/2021, 09:47
- 336, 19/08/2021, 10:15
- 337, 19/08/2021, 12:01
- 338, 19/08/2021, 13:56
- 339, 19/08/2021, 18:15
- 340, 19/08/2021, 19:10
- 341, 20/08/2021, 10:30
- 342, 20/08/2021, 11:15
- 343, 20/08/2021, 14:00
- 344, 20/08/2021, 15:33
- 345, 20/08/2021, 17:16
- 346, 20/08/2021, 18:05
- 347, 20/08/2021, 18:49
- 348, 02/09/2021, 15:17
- 349, 06/09/2021, 09:11
- 350, 06/09/2021, 10:19
- 351, 06/09/2021, 14:43
- 352, 06/09/2021, 17:10
- 353, 09/09/2021, 10:10
- 354, 13/09/2021, 11:00
- 355, 14/09/2021, 13:59

TITLE:	Summer Flightlines 2021 Lesser Black-Backed Gull 12		
PROJECT:	Derryadd, Co. Longford		
FIGURE NO:	-		
CLIENT:	Bord na Móna		
SCALE:	1:50000	**REVISION:**	0
DATE:	17/12/2021	**PAGE SIZE:**	A3

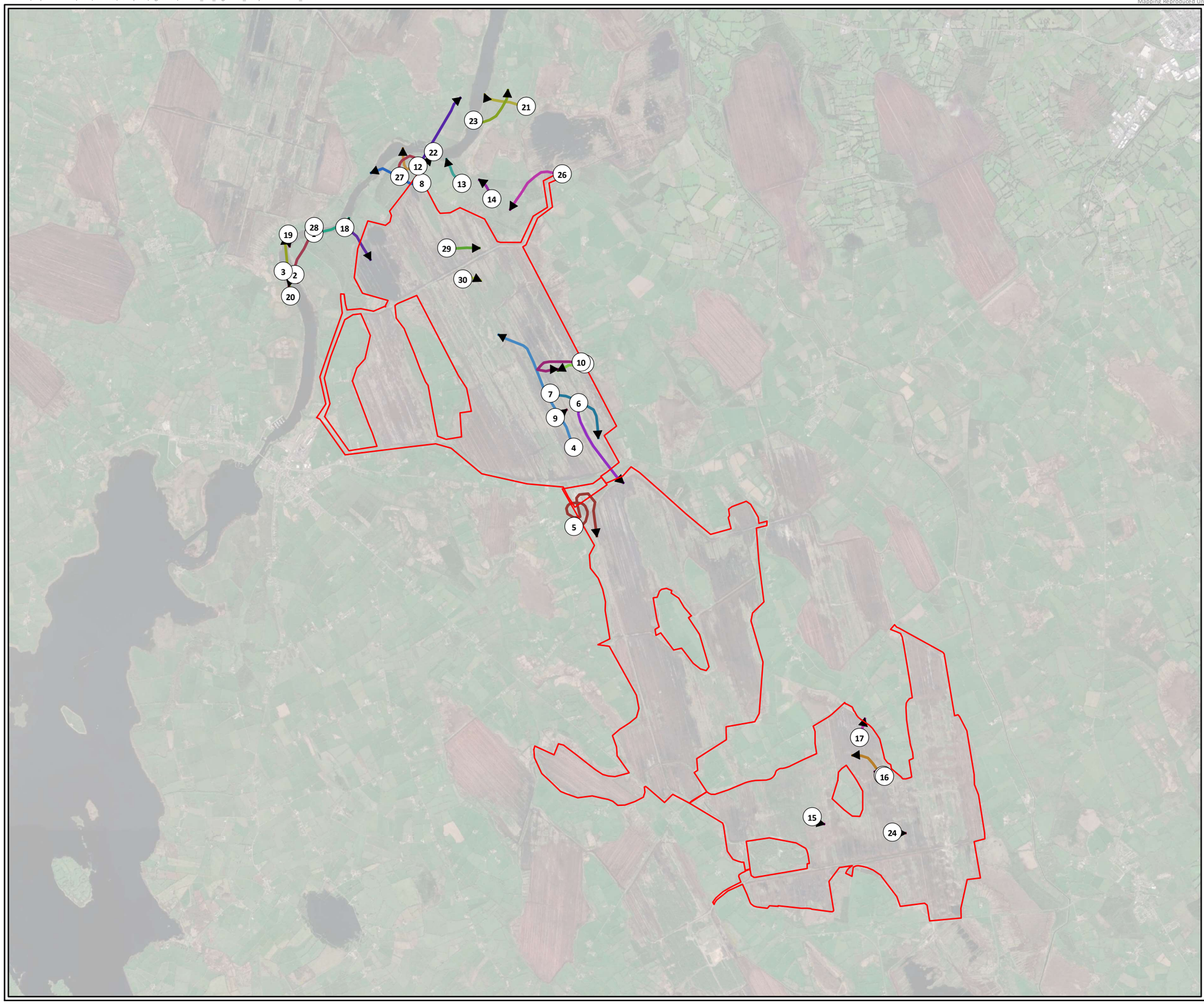
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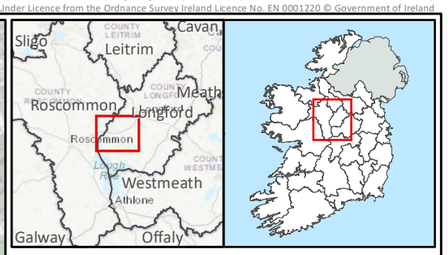
N W E S

0 0.5 1 2 Kilometers

Path: R:\Map Production\2021\P21-119\workspace\Flightlines\P20-113_GIS_Flightlines_DerryaddWindFarm_A3.mxd

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Legend

Site Boundary

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- 3, 29/04/2021, 14:41
- 4, 04/05/2021, 08:27
- 5, 04/05/2021, 09:40
- 6, 04/05/2021, 16:09
- 7, 04/05/2021, 16:39
- 8, 05/05/2021, 14:36
- 9, 05/05/2021, 18:34
- 10, 05/05/2021, 19:27
- 11, 06/05/2021, 09:51
- 12, 06/05/2021, 16:33
- 13, 06/05/2021, 17:30
- 14, 06/05/2021, 17:49
- 15, 21/05/2021, 11:28
- 16, 28/05/2021, 17:45
- 17, 28/05/2021, 19:00
- 18, 31/05/2021, 09:00
- 19, 31/05/2021, 11:35
- 20, 31/05/2021, 20:15
- 21, 01/06/2021, 10:32
- 22, 01/06/2021, 14:06
- 23, 01/06/2021, 15:00
- 24, 24/06/2021, 13:00
- 25, 25/06/2021, 12:52
- 26, 06/07/2021, 10:23
- 27, 06/07/2021, 14:07
- 28, 07/07/2021, 15:50
- 29, 07/07/2021, 20:26
- 30, 09/07/2021, 16:30

TITLE:	Summer Flightlines 2021 Mallard 1		
PROJECT:	Derryadd, Co. Longford		
FIGURE NO:	-		
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DATE:	17/12/2021	**PAGE SIZE:**	A3

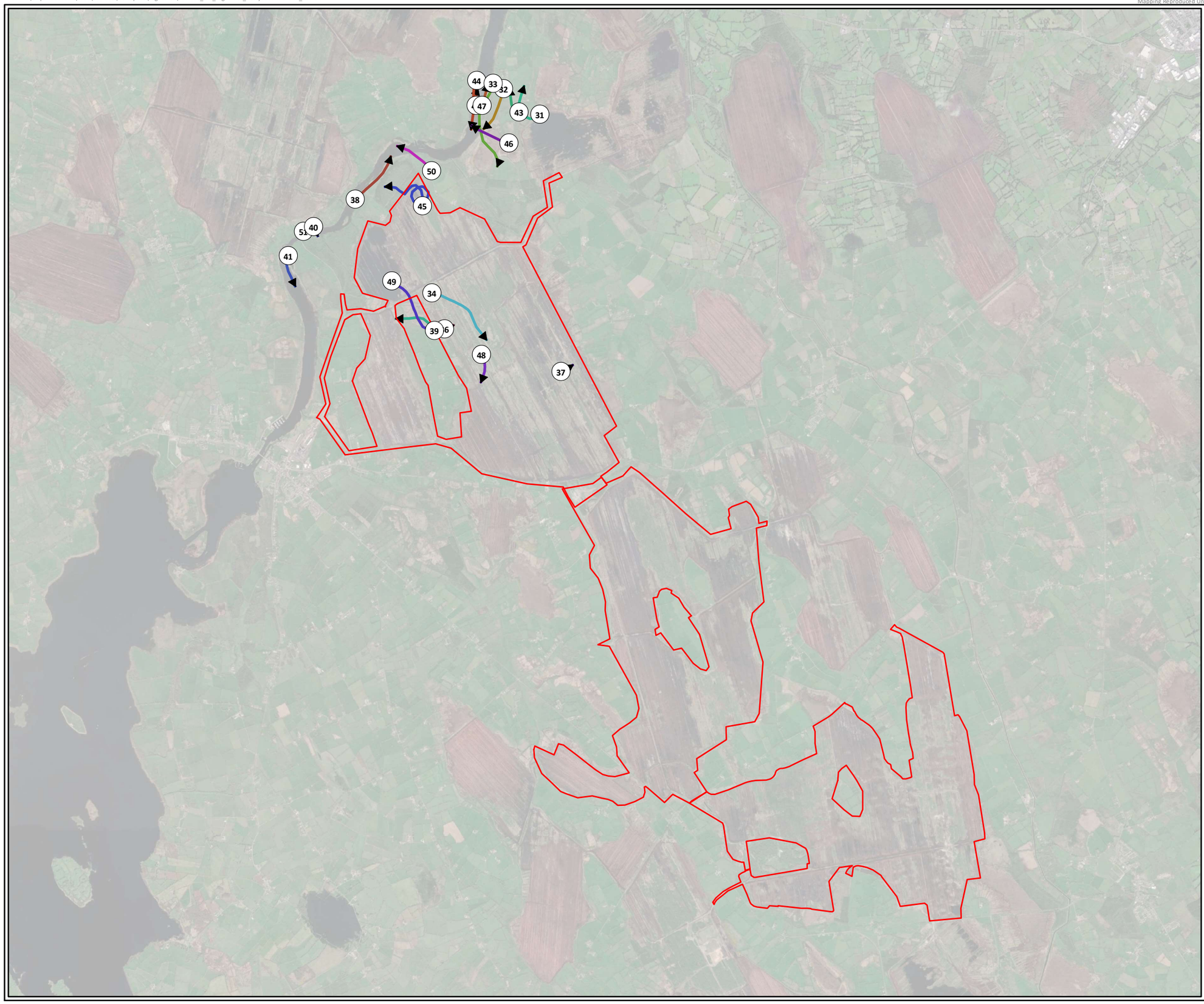
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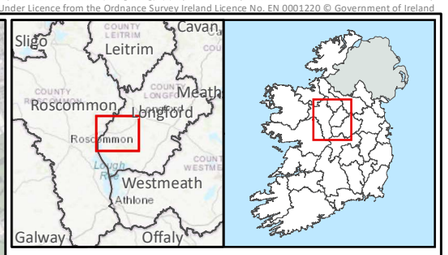
N W E S

0 0.5 1 2 Kilometers

Path: R:\Map Production\2021\P21-119\workspace\Flightlines\P20-113_GIS_Flightlines_DerryaddWindFarm_A3.mxd

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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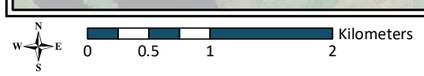


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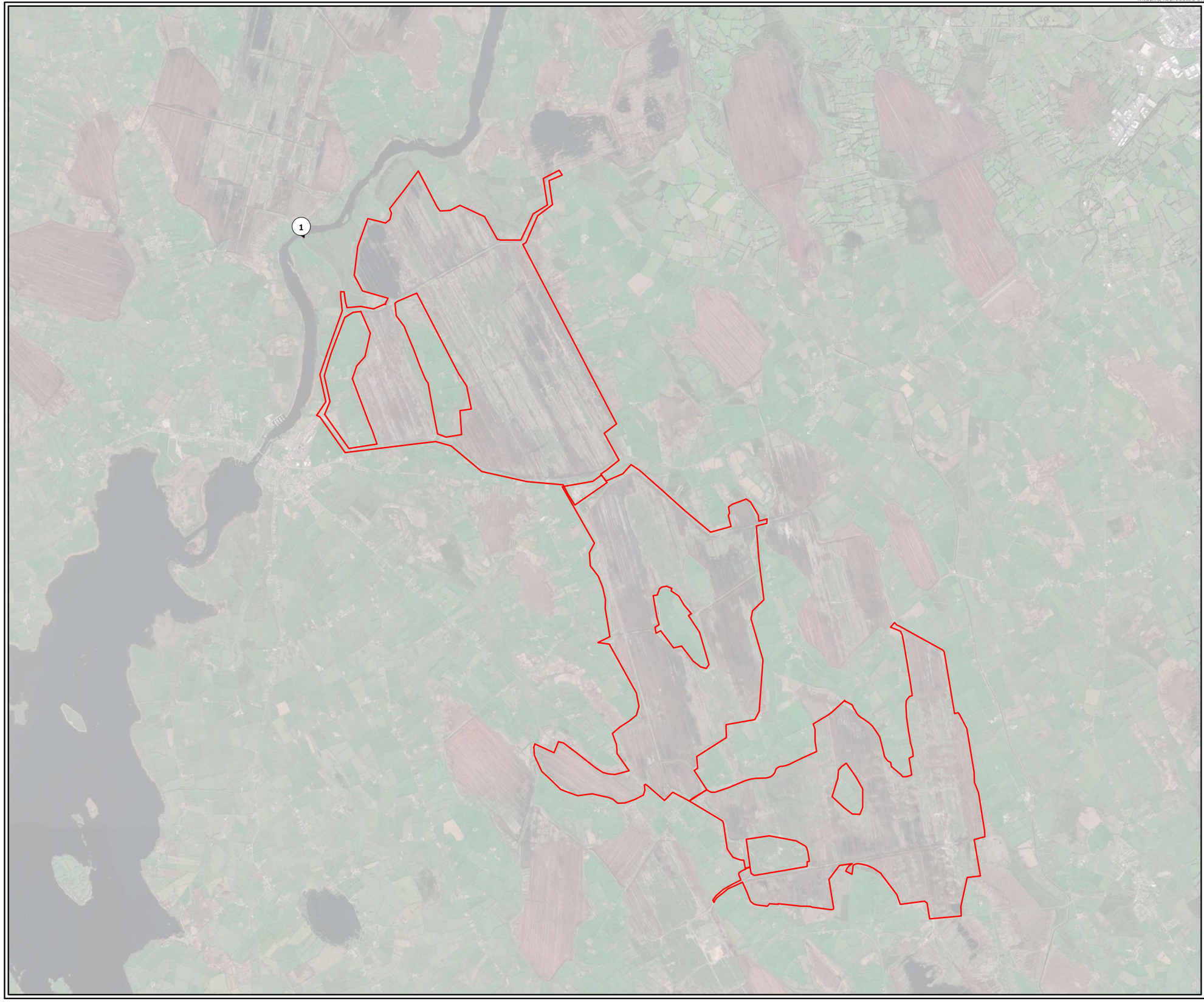


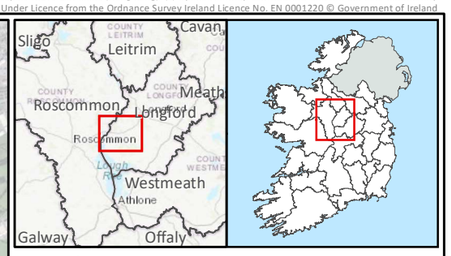
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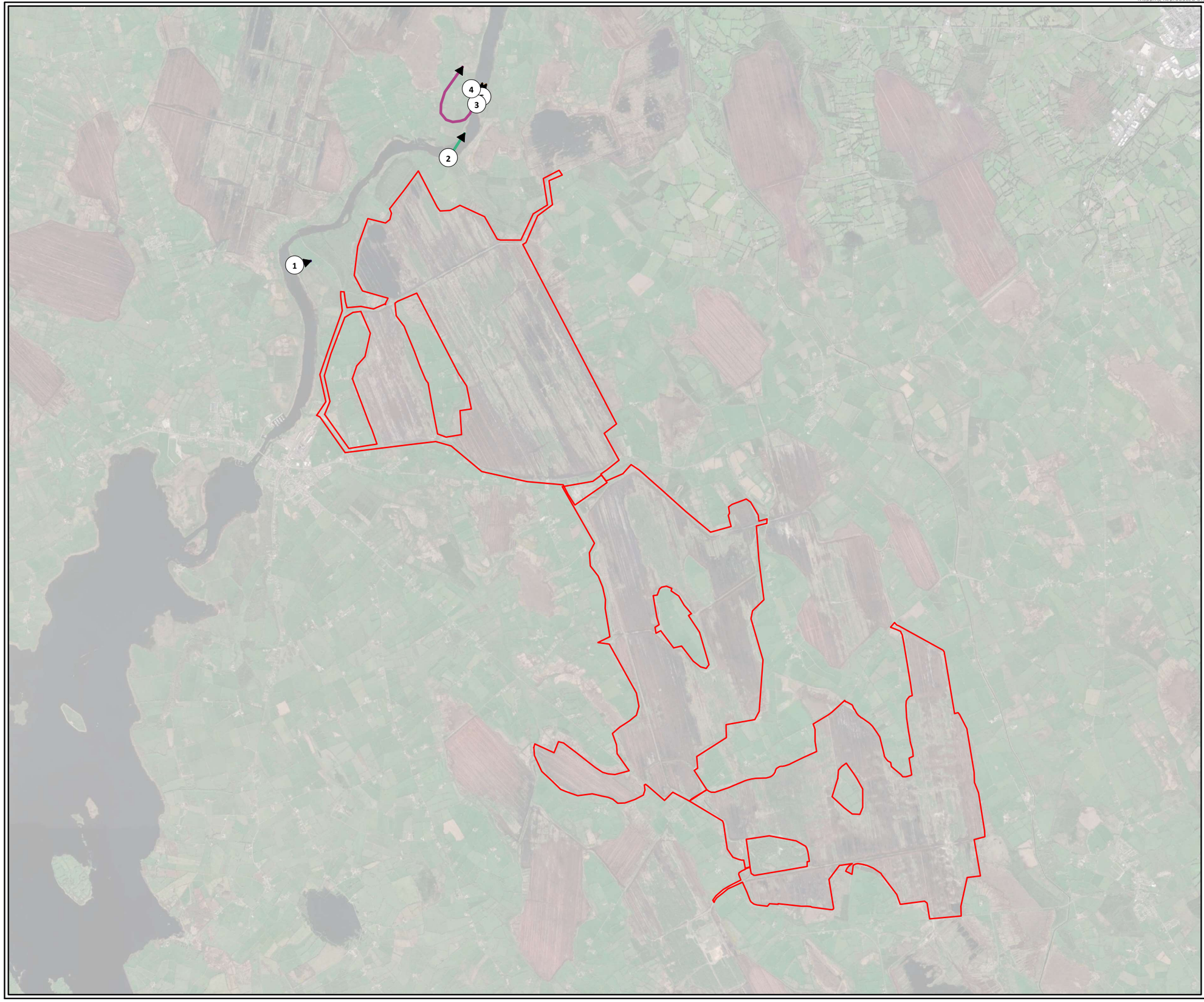
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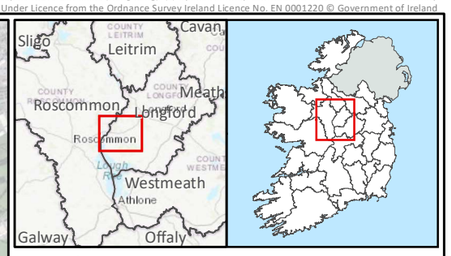
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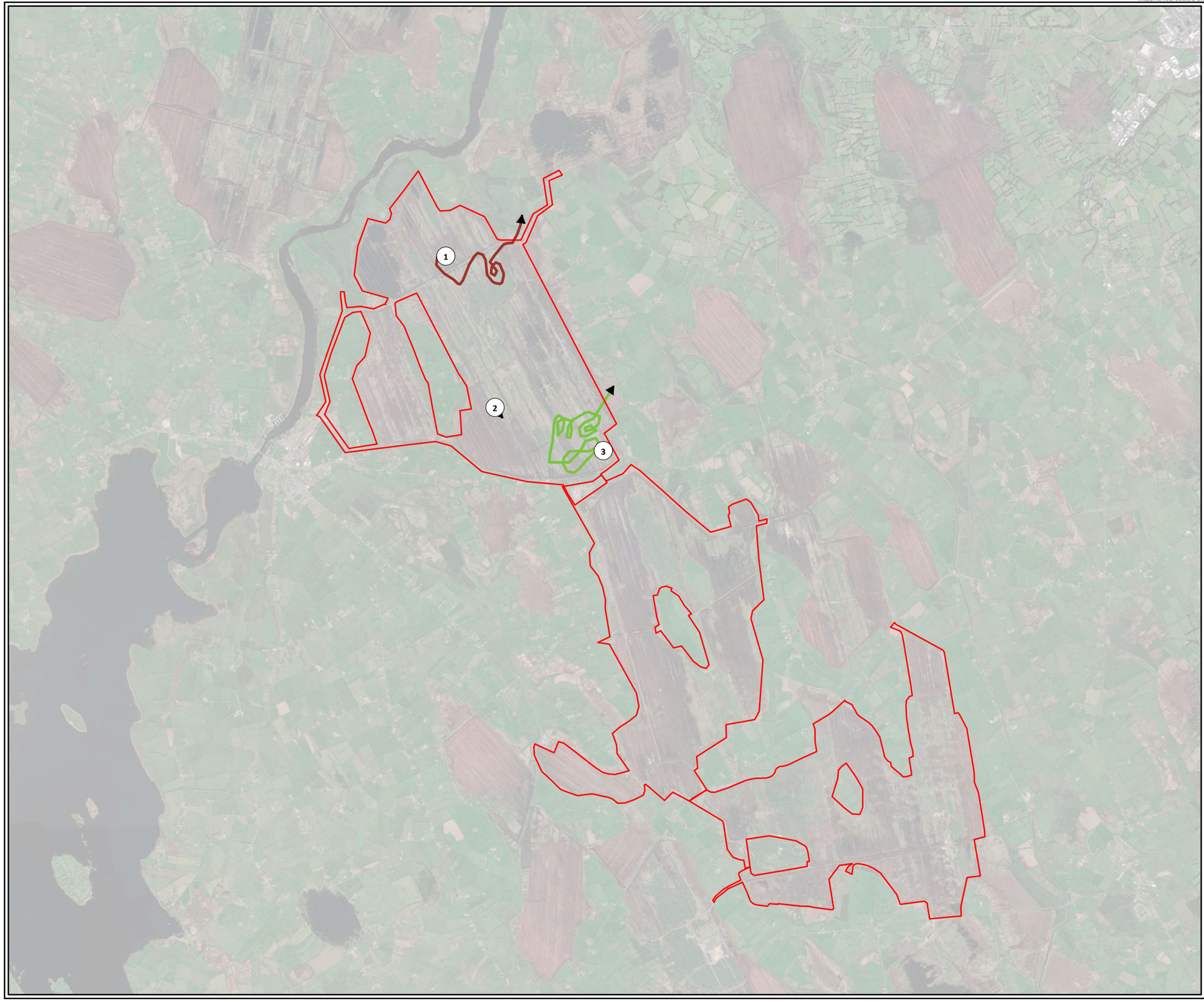
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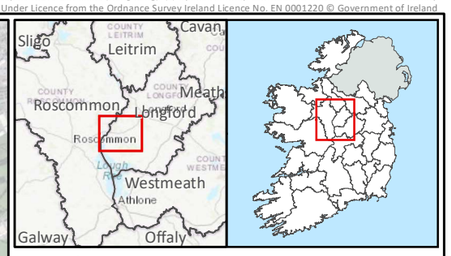
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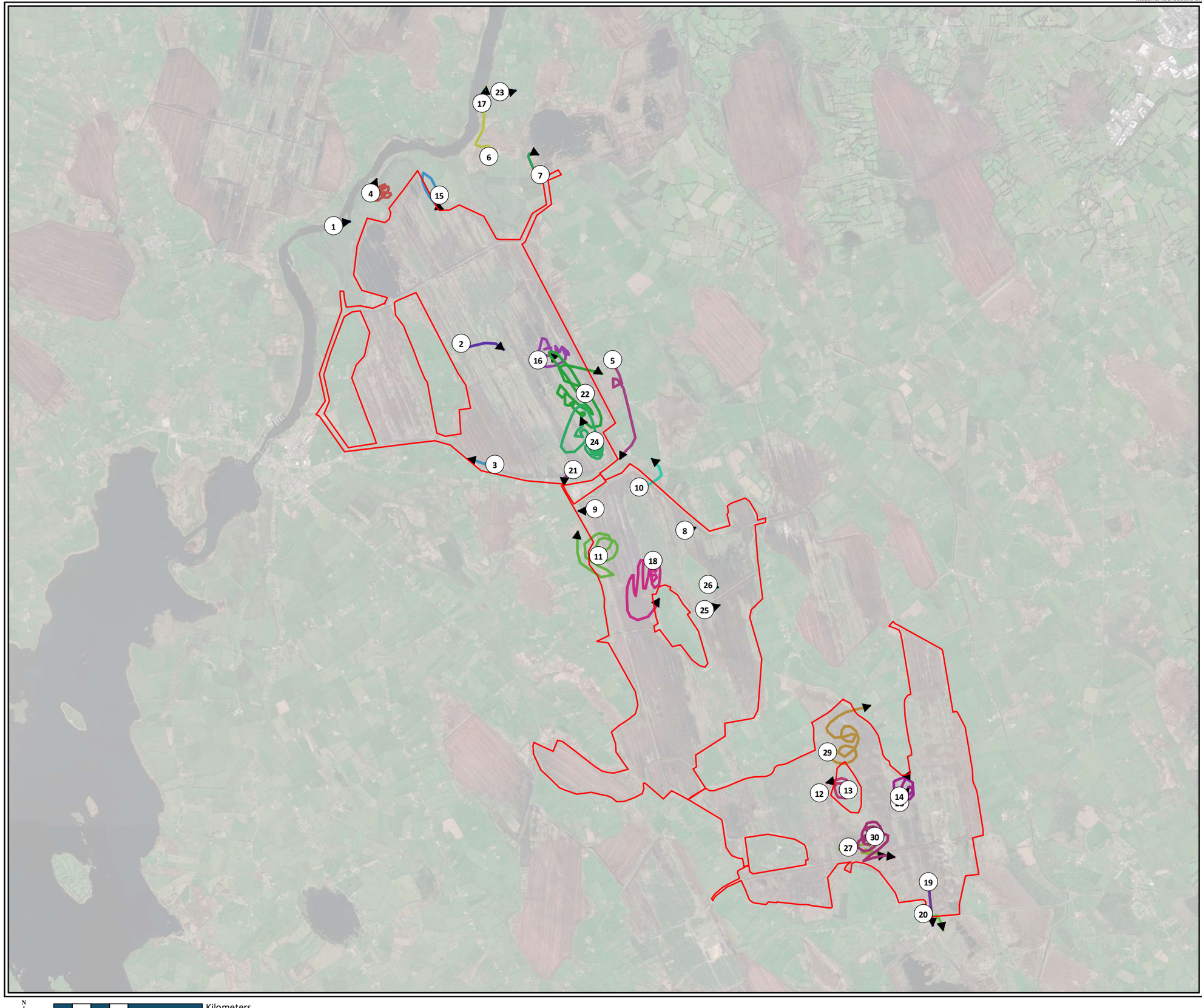
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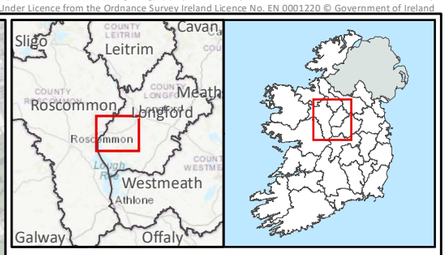
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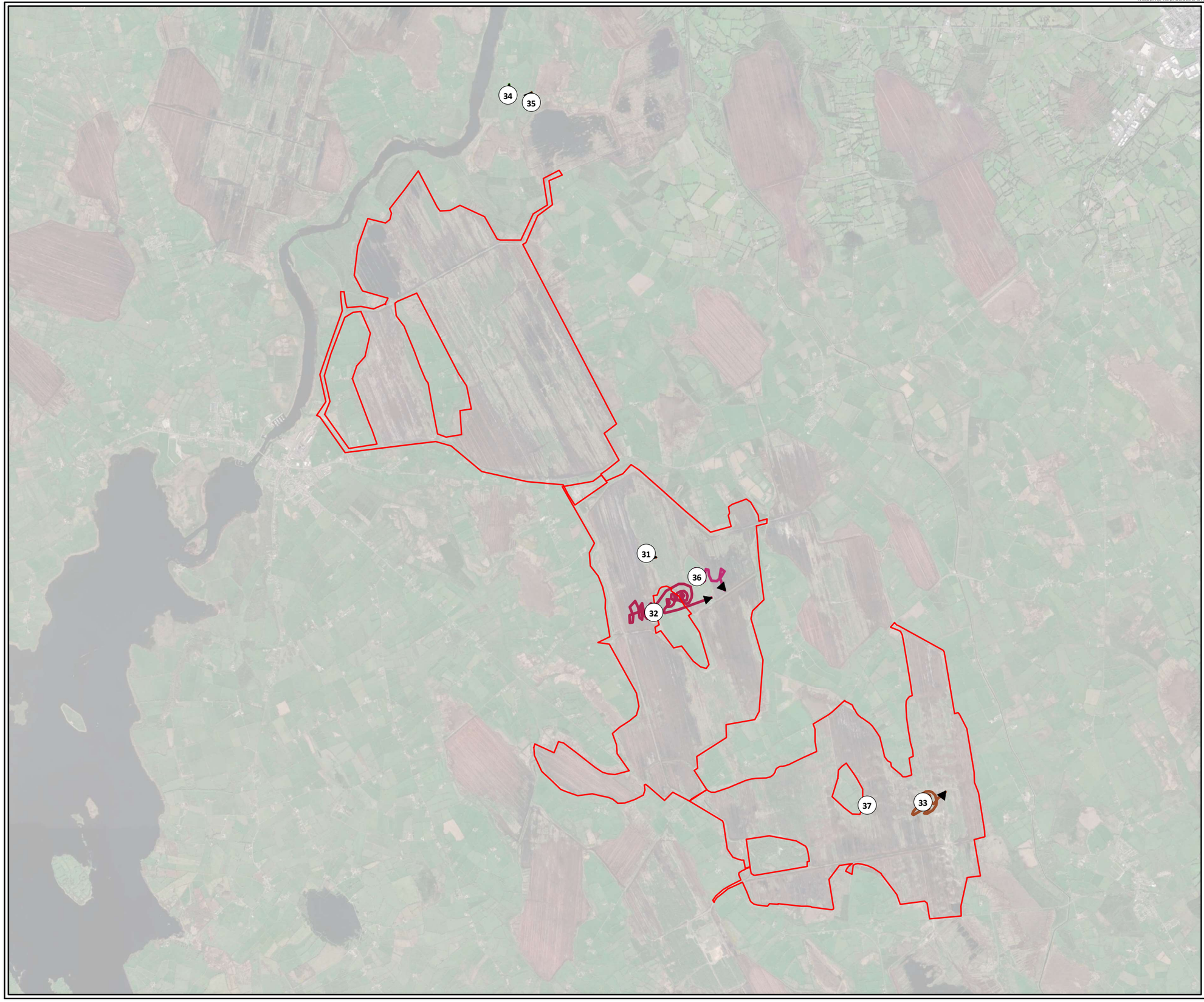
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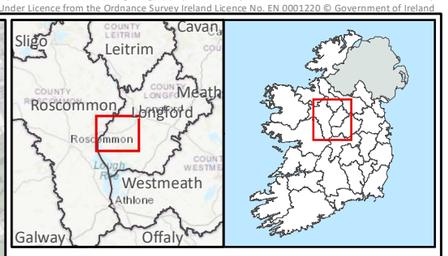
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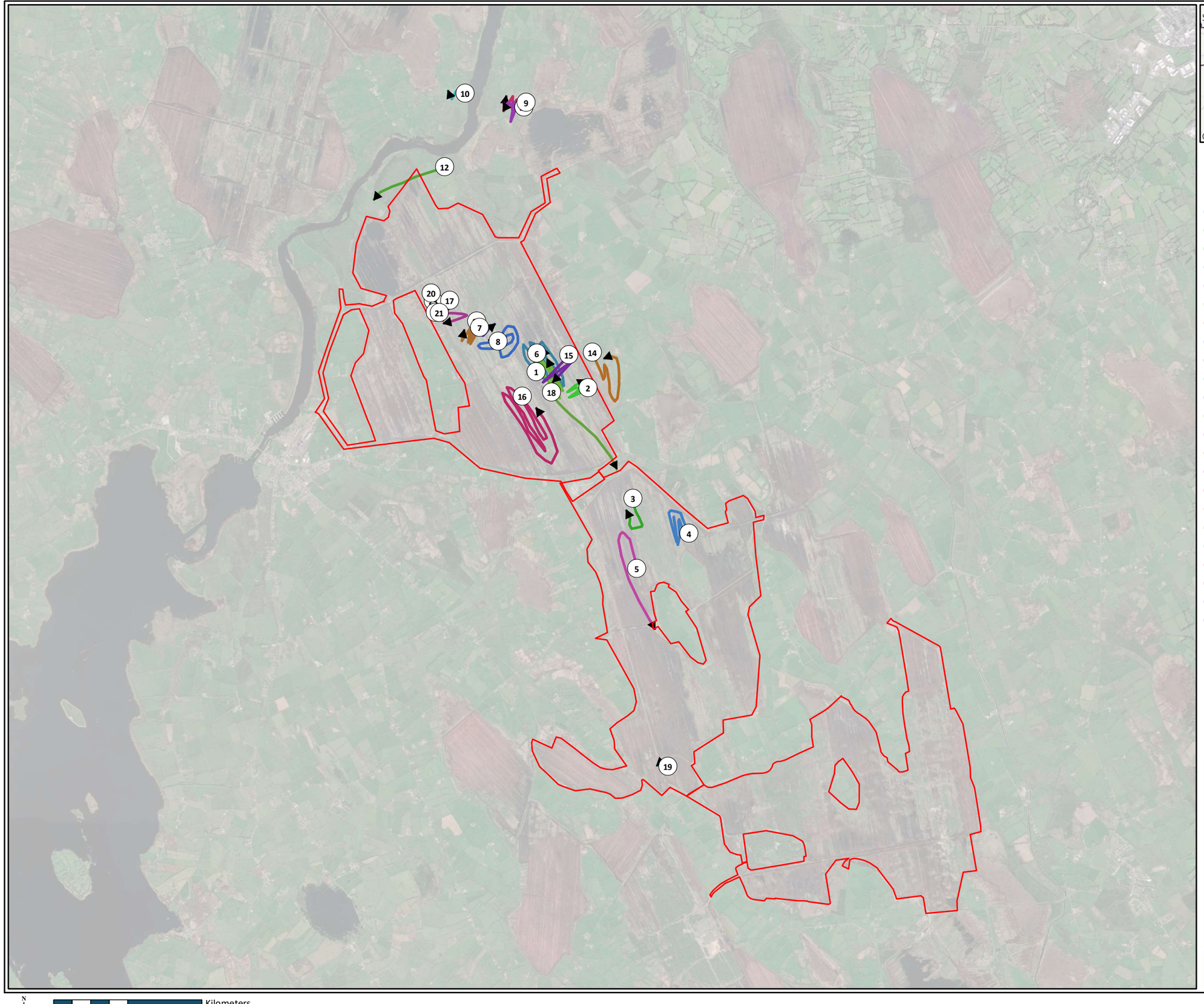
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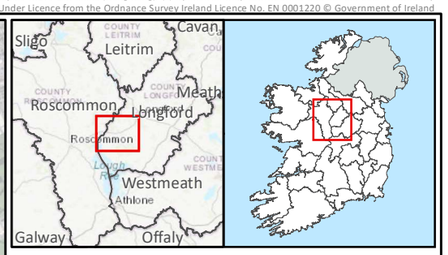
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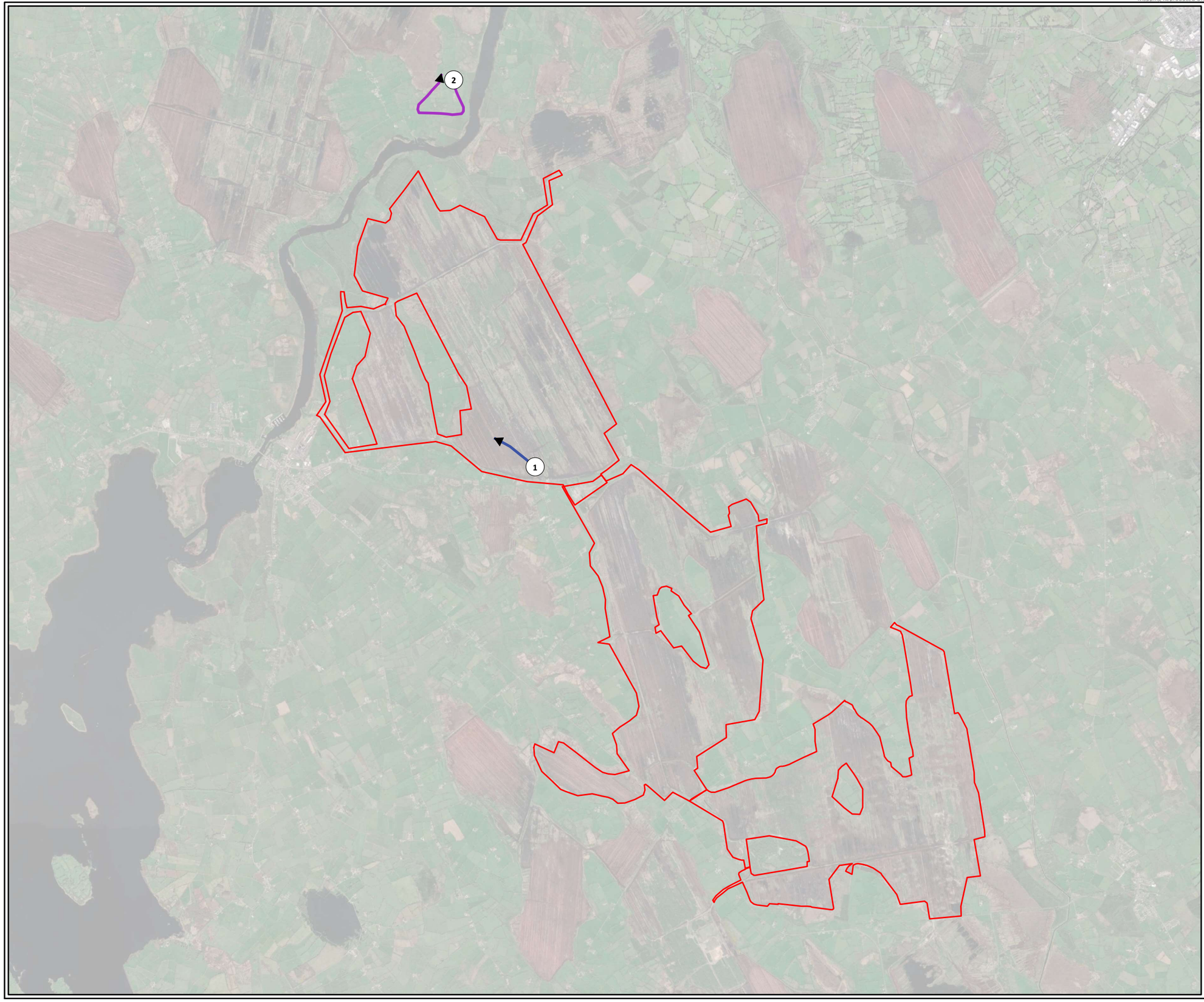
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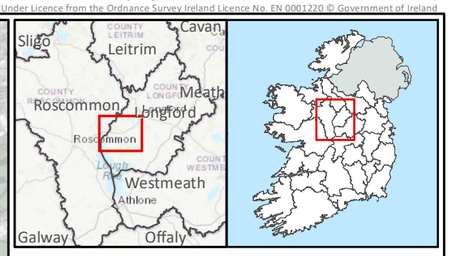
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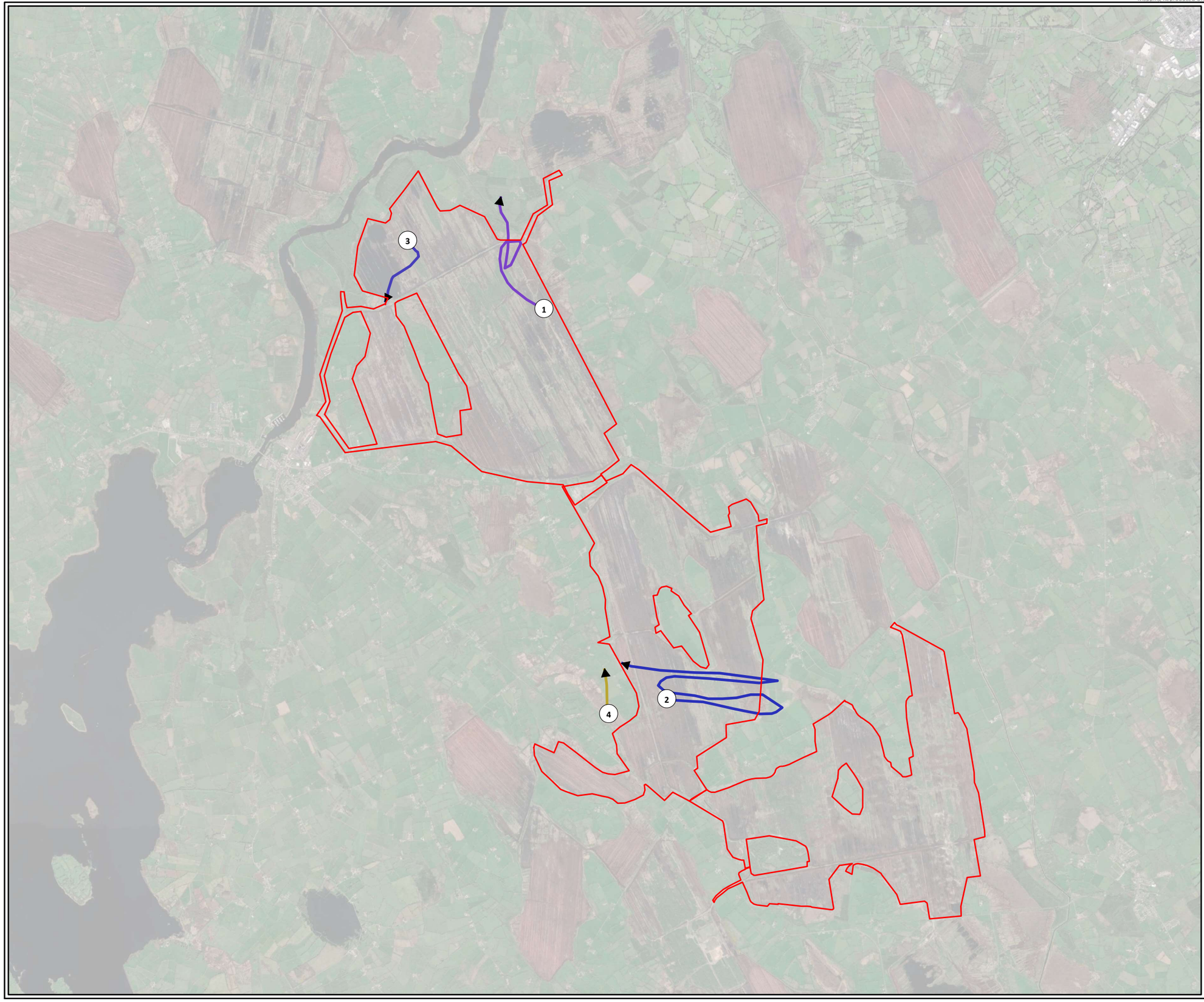
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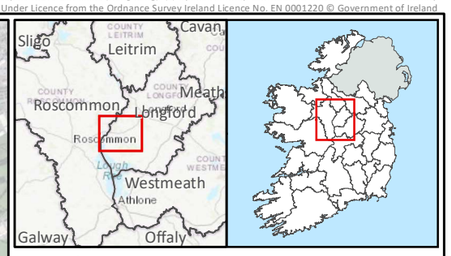
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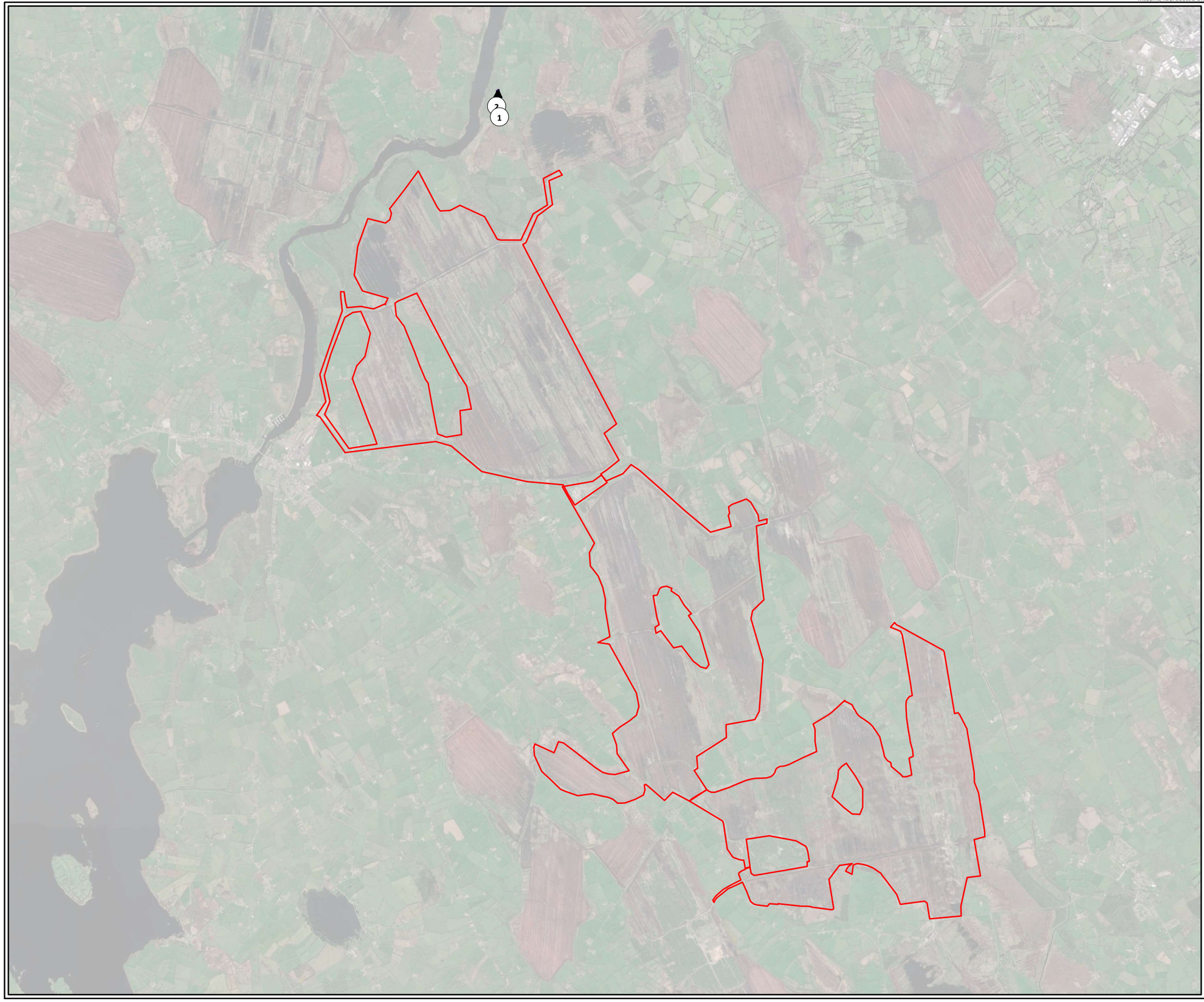
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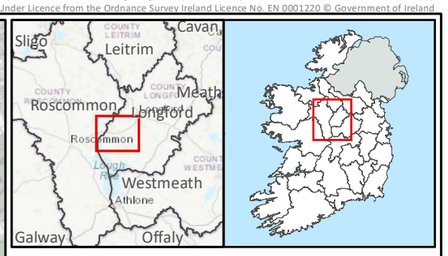
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APPENDIX 4

Hinterland Survey Results

Hinterland Survey Data Summer 2021

HVP	Date	Cloud	Visibility	Rain	Wind	Common Name
3	12/05/2021	6	Very Good	Dry	F1 SSE	Mute Swan
4	12/05/2021	6	Very Good	Dry	F1 SSE	Mute Swan
4	12/05/2021	6	Very Good	Dry	F1 SSE	Tufted Duck
4	12/05/2021	6	Very Good	Dry	F1 SSE	Little Grebe
4	12/05/2021	6	Very Good	Dry	F1 SSE	Moorhen
4	12/05/2021	6	Very Good	Dry	F1 SSE	Coot
4	12/05/2021	6	Very Good	Dry	F1 SSE	Little Egret
4	12/05/2021	6	Very Good	Dry	F1 SSE	Black-headed Gull
5	12/05/2021	6	Very Good	Dry	F1 SSE	Mallard
5	12/05/2021	6	Very Good	Dry	F1 SSE	Lesser Black-backed Gull
5	12/05/2021	6	Very Good	Dry	F1 SSE	Cormorant
5	12/05/2021	6	Very Good	Dry	F1 SSE	Common Tern
5	12/05/2021	6	Very Good	Dry	F1 SSE	Gadwall
5	12/05/2021	6	Very Good	Dry	F1 SSE	Tufted Duck
5	12/05/2021	6	Very Good	Dry	F1 SSE	Black-headed Gull
5	12/05/2021	6	Very Good	Dry	F1 SSE	Greylag Goose
5	12/05/2021	6	Very Good	Dry	F1 SSE	Great Crested Grebe
6	12/05/2021	6	Very Good	Dry	F1 SSE	Mallard
6	12/05/2021	6	Very Good	Dry	F1 SSE	Mute Swan
6	12/05/2021	6	Very Good	Dry	F1 SSE	Common Gull
6	12/05/2021	6	Very Good	Dry	F1 SSE	Lesser Black-backed Gull
6	12/05/2021	6	Very Good	Dry	F1 SSE	Black-headed Gull
6	12/05/2021	6	Very Good	Dry	F1 SSE	Cormorant
7	12/05/2021	6	Very Good	Dry	F1 SSE	Mute Swan
7	12/05/2021	6	Very Good	Dry	F1 SSE	Mallard
7	12/05/2021	6	Very Good	Dry	F1 SSE	Cormorant
7	12/05/2021	6	Very Good	Dry	F1 SSE	Lesser Black-backed Gull
7	12/05/2021	6	Very Good	Dry	F1 SSE	Grey Heron
7	12/05/2021	6	Very Good	Dry	F1 SSE	Black-headed Gull
10	12/05/2021	6	Very Good	Dry	F1 SSE	Mute Swan
10	12/05/2021	6	Very Good	Dry	F1 SSE	Mallard
11	13/05/2021	5	Very Good	Dry	F1 WNW	Mute Swan
11	13/05/2021	5	Very Good	Dry	F1 WNW	Great White Egret
11	13/05/2021	5	Very Good	Dry	F1 WNW	Black-headed Gull
11	13/05/2021	5	Very Good	Dry	F1 WNW	Cormorant
11	13/05/2021	5	Very Good	Dry	F1 WNW	Snipe
12	13/05/2021	5	Very Good	Dry	F1 WNW	Mute Swan
12	13/05/2021	5	Very Good	Dry	F1 WNW	Mallard
12	13/05/2021	5	Very Good	Dry	F1 WNW	Black-headed Gull
12	13/05/2021	5	Very Good	Dry	F1 WNW	Lesser Black-backed Gull
12	13/05/2021	5	Very Good	Dry	F1 WNW	Common Gull
12	13/05/2021	5	Very Good	Dry	F1 WNW	Great Crested Grebe
12	13/05/2021	5	Very Good	Dry	F1 WNW	Whimbrel
12	13/05/2021	5	Very Good	Dry	F1 WNW	Lapwing

HVP	Date	Cloud	Visibility	Rain	Wind	Common Name
12	13/05/2021	5	Very Good	Dry	F1 WNW	Cormorant
13	13/05/2021	5	Very Good	Dry	F1 WNW	Mallard
14	13/05/2021	5	Very Good	Dry	F1 WNW	Lesser Black-backed Gull
15	13/05/2021	5	Very Good	Dry	F1 WNW	Mute Swan
15	13/05/2021	5	Very Good	Dry	F1 WNW	Lesser Black-backed Gull
15	13/05/2021	5	Very Good	Dry	F1 WNW	Grey Heron
15	13/05/2021	5	Very Good	Dry	F1 WNW	Black-headed Gull
15	13/05/2021	5	Very Good	Dry	F1 WNW	Grey Wagtail
16	13/05/2021	5	Very Good	Dry	F1 WNW	Grey Wagtail
8	14/05/2021	7	Very Good	Dry	F1 S	Mute Swan
8	14/05/2021	7	Very Good	Dry	F1 S	Mallard
8	14/05/2021	7	Very Good	Dry	F1 S	Pink-footed Goose
8	14/05/2021	7	Very Good	Dry	F1 S	Kingfisher
8	14/05/2021	7	Very Good	Dry	F1 S	Whimbrel
8	14/05/2021	7	Very Good	Dry	F1 S	Tufted Duck
8	14/05/2021	7	Very Good	Dry	F1 S	Black-headed Gull
8	14/05/2021	7	Very Good	Dry	F1 S	Common Gull
9	14/05/2021	7	Very Good	Dry	F1 S	Black-headed Gull
9	14/05/2021	7	Very Good	Dry	F1 S	Cormorant
9	14/05/2021	7	Very Good	Dry	F1 S	Tufted Duck
9	14/05/2021	7	Very Good	Dry	F1 S	Great Crested Grebe
9	14/05/2021	7	Very Good	Dry	F1 S	Lesser Black-backed Gull
20	14/05/2021	6	Very Good	Dry	F1 S	Grey Wagtail
21	14/05/2021	6	Very Good	Dry	F1 S	Buzzard
21	14/05/2021	6	Very Good	Dry	F1 S	Grey Heron
23	14/05/2021	6	Very Good	Dry	F1 S	Grey Wagtail
25	14/05/2021	6	Very Good	Dry	F1 S	Grey Wagtail
11	11/06/2021	4	Very Good	Dry	F1 SSE	Cormorant
11	11/06/2021	4	Very Good	Dry	F1 SSE	Mute Swan
12	11/06/2021	4	Very Good	Dry	F1 SSE	Lesser Black-backed Gull
12	11/06/2021	4	Very Good	Dry	F1 SSE	Great Crested Grebe
12	11/06/2021	4	Very Good	Dry	F1 SSE	Black-headed Gull
12	11/06/2021	4	Very Good	Dry	F1 SSE	Mute Swan
13	11/06/2021	4	Very Good	Dry	F1 SSE	Buzzard
14	11/06/2021	4	Very Good	Dry	F1 SSE	Lesser Black-backed Gull
15	11/06/2021	4	Very Good	Dry	F1 SSE	Cormorant
15	11/06/2021	4	Very Good	Dry	F1 SSE	Lesser Black-backed Gull
15	11/06/2021	4	Very Good	Dry	F1 SSE	Black-headed Gull
15	11/06/2021	4	Very Good	Dry	F1 SSE	Mute Swan
16	11/06/2021	4	Very Good	Dry	F1 SSE	Black-headed Gull
16	11/06/2021	4	Very Good	Dry	F1 SSE	Grey Heron
18	11/06/2021	4	Very Good	Dry	F1 SSE	Buzzard
20	11/06/2021	4	Very Good	Dry	F1 SSE	Black-headed Gull
21	11/06/2021	4	Very Good	Dry	F1 SSE	Lesser Black-backed Gull
23	11/06/2021	4	Very Good	Dry	F1 SSE	Lesser Black-backed Gull

HVP	Date	Cloud	Visibility	Rain	Wind	Common Name
2	12/06/2021	6	Very Good	Dry	F1 SW	Grey Heron
3	12/06/2021	6	Very Good	Dry	F1 SW	Mute Swan
4	12/06/2021	6	Very Good	Dry	F1 SW	Snipe
4	12/06/2021	6	Very Good	Dry	F1 SW	Wigeon
4	12/06/2021	6	Very Good	Dry	F1 SW	Little Egret
4	12/06/2021	6	Very Good	Dry	F1 SW	Grey Heron
4	12/06/2021	6	Very Good	Dry	F1 SW	Moorhen
4	12/06/2021	6	Very Good	Dry	F1 SW	Coot
4	12/06/2021	6	Very Good	Dry	F1 SW	Black-headed Gull
4	12/06/2021	6	Very Good	Dry	F1 SW	Mallard
4	12/06/2021	6	Very Good	Dry	F1 SW	Tufted Duck
5	12/06/2021	6	Very Good	Dry	F1 SW	Gadwall
5	12/06/2021	6	Very Good	Dry	F1 SW	Common Tern
5	12/06/2021	6	Very Good	Dry	F1 SW	Little Egret
5	12/06/2021	6	Very Good	Dry	F1 SW	Tufted Duck
5	12/06/2021	6	Very Good	Dry	F1 SW	Lesser Black-backed Gull
5	12/06/2021	6	Very Good	Dry	F1 SW	Black-headed Gull
5	12/06/2021	6	Very Good	Dry	F1 SW	Cormorant
5	12/06/2021	6	Very Good	Dry	F1 SW	Great Crested Grebe
5	12/06/2021	6	Very Good	Dry	F1 SW	Coot
5	12/06/2021	6	Very Good	Dry	F1 SW	Mute Swan
6	12/06/2021	6	Very Good	Dry	F1 SW	Cormorant
6	12/06/2021	6	Very Good	Dry	F1 SW	Little Egret
6	12/06/2021	6	Very Good	Dry	F1 SW	Black-headed Gull
6	12/06/2021	6	Very Good	Dry	F1 SW	Lesser Black-backed Gull
6	12/06/2021	6	Very Good	Dry	F1 SW	Mallard
7	12/06/2021	6	Very Good	Dry	F1 SW	Grey Wagtail
7	12/06/2021	6	Very Good	Dry	F1 SW	Black-headed Gull
8	12/06/2021	6	Very Good	Dry	F1 SW	Oystercatcher
8	12/06/2021	6	Very Good	Dry	F1 SW	Common Tern
8	12/06/2021	6	Very Good	Dry	F1 SW	Little Egret
8	12/06/2021	6	Very Good	Dry	F1 SW	Moorhen
8	12/06/2021	6	Very Good	Dry	F1 SW	Coot
8	12/06/2021	6	Very Good	Dry	F1 SW	Black-headed Gull
8	12/06/2021	6	Very Good	Dry	F1 SW	Lesser Black-backed Gull
8	12/06/2021	6	Very Good	Dry	F1 SW	Mute Swan
8	12/06/2021	6	Very Good	Dry	F1 SW	Mallard
9	12/06/2021	6	Very Good	Dry	F1 SW	Black-headed Gull
9	12/06/2021	6	Very Good	Dry	F1 SW	Coot
9	12/06/2021	6	Very Good	Dry	F1 SW	Lesser Black-backed Gull
9	12/06/2021	4	Very Good	Dry	F1 SW	Cormorant
9	12/06/2021	6	Very Good	Dry	F1 SW	Mute Swan
10	12/06/2021	4	Very Good	Dry	F1 SW	Cormorant
10	12/06/2021	4	Very Good	Dry	F1 SW	Mute Swan
10	12/06/2021	4	Very Good	Dry	F1 SW	Black-headed Gull

HVP	Date	Cloud	Visibility	Rain	Wind	Common Name
10	12/06/2021	4	Very Good	Dry	F1 SW	Mallard
1	17/07/2021	2	Very Good	Dry	F1 N	Lesser Black-backed Gull
1	17/07/2021	2	Very Good	Dry	F1 N	Grey Wagtail
4	17/07/2021	2	Very Good	Dry	F1 N	Snipe
4	17/07/2021	2	Very Good	Dry	F1 N	Buzzard
4	17/07/2021	2	Very Good	Dry	F1 N	Coot
4	17/07/2021	2	Very Good	Dry	F1 N	Moorhen
4	17/07/2021	2	Very Good	Dry	F1 N	Water Rail
4	17/07/2021	2	Very Good	Dry	F1 N	Little Egret
4	17/07/2021	2	Very Good	Dry	F1 N	Grey Heron
4	17/07/2021	2	Very Good	Dry	F1 N	Lapwing
4	17/07/2021	2	Very Good	Dry	F1 N	Mallard
5	17/07/2021	2	Very Good	Dry	F1 N	Gadwall
5	17/07/2021	2	Very Good	Dry	F1 N	Tufted Duck
5	17/07/2021	2	Very Good	Dry	F1 N	Black-headed Gull
5	17/07/2021	2	Very Good	Dry	F1 N	Great Crested Grebe
5	17/07/2021	2	Very Good	Dry	F1 N	Cormorant
5	17/07/2021	2	Very Good	Dry	F1 N	Mallard
5	17/07/2021	2	Very Good	Dry	F1 N	Mute Swan
5	17/07/2021	2	Very Good	Dry	F1 N	Lesser Black-backed Gull
6	17/07/2021	2	Very Good	Dry	F1 N	Black-headed Gull
6	17/07/2021	2	Very Good	Dry	F1 N	Cormorant
6	17/07/2021	2	Very Good	Dry	F1 N	Mute Swan
6	17/07/2021	2	Very Good	Dry	F1 N	Lesser Black-backed Gull
7	17/07/2021	2	Very Good	Dry	F1 N	Lesser Black-backed Gull
7	17/07/2021	2	Very Good	Dry	F1 N	Black-headed Gull
7	17/07/2021	2	Very Good	Dry	F1 N	Mute Swan
7	17/07/2021	2	Very Good	Dry	F1 N	Mallard
8	17/07/2021	2	Very Good	Dry	F1 N	Lapwing
8	17/07/2021	2	Very Good	Dry	F1 N	Gadwall
8	17/07/2021	2	Very Good	Dry	F1 N	Grey Heron
8	17/07/2021	2	Very Good	Dry	F1 N	Little Egret
8	17/07/2021	2	Very Good	Dry	F1 N	Tufted Duck
8	17/07/2021	2	Very Good	Dry	F1 N	Lesser Black-backed Gull
8	17/07/2021	2	Very Good	Dry	F1 N	Black-headed Gull
8	17/07/2021	2	Very Good	Dry	F1 N	Pochard
8	17/07/2021	2	Very Good	Dry	F1 N	Mute Swan
8	17/07/2021	2	Very Good	Dry	F1 N	Mallard
9	17/07/2021	2	Very Good	Dry	F1 N	Lesser Black-backed Gull
9	17/07/2021	2	Very Good	Dry	F1 N	Tufted Duck
9	17/07/2021	2	Very Good	Dry	F1 N	Black-headed Gull
9	17/07/2021	2	Very Good	Dry	F1 N	Common Gull
9	17/07/2021	2	Very Good	Dry	F1 N	Gadwall
9	17/07/2021	2	Very Good	Dry	F1 N	Cormorant
9	17/07/2021	2	Very Good	Dry	F1 N	Little Egret

HVP	Date	Cloud	Visibility	Rain	Wind	Common Name
9	17/07/2021	2	Very Good	Dry	F1 N	Grey Heron
9	17/07/2021	2	Very Good	Dry	F1 N	Common Tern
9	17/07/2021	2	Very Good	Dry	F1 N	Mute Swan
10	17/07/2021	2	Very Good	Dry	F1 N	Mute Swan
10	17/07/2021	2	Very Good	Dry	F1 N	Grey Heron
11	17/07/2021	2	Very Good	Dry	F1 N	Black-headed Gull
11	17/07/2021	2	Very Good	Dry	F1 N	Lesser Black-backed Gull
11	17/07/2021	2	Very Good	Dry	F1 N	Great Crested Grebe
11	17/07/2021	2	Very Good	Dry	F1 N	Mute Swan
11	17/07/2021	2	Very Good	Dry	F1 N	Mallard
12	17/07/2021	2	Very Good	Dry	F1 N	Great Crested Grebe
12	17/07/2021	2	Very Good	Dry	F1 N	Mute Swan
13	17/07/2021	2	Very Good	Dry	F1 N	Mute Swan
14	17/07/2021	2	Very Good	Dry	F1 N	Common Gull
15	17/07/2021	2	Very Good	Dry	F1 N	Lesser Black-backed Gull
20	17/07/2021	2	Very Good	Dry	F1 N	Grey Wagtail
1	05/08/2021	8	Good	Showers	F2 SSW	Grey Heron
2	05/08/2021	8	Good	Showers	F2 SSW	Mallard
4	05/08/2021	8	Good	Showers	F2 SSW	Lesser Black-backed Gull
4	05/08/2021	8	Good	Showers	F2 SSW	Coot
4	05/08/2021	8	Good	Showers	F2 SSW	Little Egret
4	05/08/2021	8	Good	Showers	F2 SSW	Grey Heron
4	05/08/2021	8	Good	Showers	F2 SSW	Water Rail
4	05/08/2021	8	Good	Showers	F2 SSW	Mallard
5	05/08/2021	8	Good	Showers	F2 SSW	Lesser Black-backed Gull
5	05/08/2021	8	Good	Showers	F2 SSW	Cormorant
5	05/08/2021	8	Good	Showers	F2 SSW	Black-headed Gull
5	05/08/2021	8	Good	Showers	F2 SSW	Coot
5	05/08/2021	8	Good	Showers	F2 SSW	Tufted Duck
5	05/08/2021	8	Good	Showers	F2 SSW	Great Crested Grebe
5	05/08/2021	8	Good	Showers	F2 SSW	Mallard
5	05/08/2021	8	Good	Showers	F2 SSW	Mute Swan
6	05/08/2021	8	Good	Showers	F2 SSW	Black-headed Gull
6	05/08/2021	8	Good	Showers	F2 SSW	Lesser Black-backed Gull
8	05/08/2021	8	Good	Showers	F2 SSW	Lapwing
8	05/08/2021	8	Good	Showers	F2 SSW	Black-headed Gull
8	05/08/2021	8	Good	Showers	F2 SSW	Coot
8	05/08/2021	8	Good	Showers	F2 SSW	Moorhen
8	05/08/2021	8	Good	Showers	F2 SSW	Little Egret
8	05/08/2021	8	Good	Showers	F2 SSW	Little Grebe
8	05/08/2021	8	Good	Showers	F2 SSW	Great Crested Grebe
8	05/08/2021	8	Good	Showers	F2 SSW	Mallard
8	05/08/2021	8	Good	Showers	F2 SSW	Mute Swan
8	05/08/2021	8	Good	Showers	F2 SSW	Tufted Duck
9	05/08/2021	8	Good	Showers	F2 SSW	Cormorant

HVP	Date	Cloud	Visibility	Rain	Wind	Common Name
9	05/08/2021	8	Good	Showers	F2 SSW	Coot
9	05/08/2021	8	Good	Showers	F2 SSW	Great Crested Grebe
9	05/08/2021	8	Good	Showers	F2 SSW	Tufted Duck
9	05/08/2021	8	Good	Showers	F2 SSW	Mallard
9	05/08/2021	8	Good	Showers	F2 SSW	Mute Swan
9	05/08/2021	8	Good	Showers	F2 SSW	Lesser Black-backed Gull
9	05/08/2021	8	Good	Showers	F2 SSW	Black-headed Gull
10	05/08/2021	8	Good	Showers	F2 SSW	Mute Swan
10	05/08/2021	8	Good	Showers	F2 SSW	Mallard
11	05/08/2021	8	Good	Showers	F2 SSW	Great Crested Grebe
11	05/08/2021	8	Good	Showers	F2 SSW	Moorhen
11	05/08/2021	8	Good	Showers	F2 SSW	Mute Swan
12	05/08/2021	8	Good	Showers	F2 SSW	Cormorant
12	05/08/2021	8	Good	Showers	F2 SSW	Great Crested Grebe
12	05/08/2021	8	Good	Showers	F2 SSW	Mute Swan
14	05/08/2021	8	Good	Showers	F2 SSW	Lesser Black-backed Gull
15	05/08/2021	8	Good	Showers	F2 SSW	Grey Wagtail
15	05/08/2021	8	Good	Showers	F2 SSW	Lesser Black-backed Gull
15	05/08/2021	8	Good	Showers	F2 SSW	Mallard
15	05/08/2021	8	Good	Showers	F2 SSW	Mute Swan
18	05/08/2021	8	Good	Showers	F2 SSW	Buzzard
20	05/08/2021	8	Good	Showers	F2 SSW	Kingfisher
20	05/08/2021	8	Good	Showers	F2 SSW	Mallard
20	05/08/2021	8	Good	Showers	F2 SSW	Grey Wagtail
25	05/08/2021	8	Good	Showers	F2 SSW	Lesser Black-backed Gull
1	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Mallard
4	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Moorhen
4	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Coot
4	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Little Egret
4	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Water Rail
4	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Grey Heron
5	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Mallard
5	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Mute Swan
5	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Wigeon
5	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Cormorant
5	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Lesser Black-backed Gull
5	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Tufted Duck
5	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Coot
5	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Moorhen
5	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Little Grebe
5	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Black-headed Gull
5	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Great Crested Grebe
6	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Mallard
6	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Buzzard
6	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Lesser Black-backed Gull

HVP	Date	Cloud	Visibility	Rain	Wind	Common Name
7	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Mute Swan
7	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Lesser Black-backed Gull
8	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Mute Swan
8	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Mallard
8	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Common Sandpiper
8	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Lapwing
8	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Tufted Duck
8	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Little Grebe
8	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Coot
8	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Moorhen
8	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Buzzard
8	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Lesser Black-backed Gull
8	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Moorhen
8	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Great Crested Grebe
8	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Moorhen
9	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Little Egret
9	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Mute Swan
9	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Lesser Black-backed Gull
9	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Common Gull
9	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Black-headed Gull
9	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Cormorant
9	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Mallard
9	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Little Grebe
9	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Great Crested Grebe
9	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Tufted Duck
9	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Coot
9	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Moorhen
10	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Mallard
11	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Mallard
11	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Great Crested Grebe
11	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Grey Heron
11	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Little Egret
12	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Mute Swan
12	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Mallard
12	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Moorhen
12	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Water Rail
14	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Lesser Black-backed Gull
15	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Mute Swan
15	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Lesser Black-backed Gull
15	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Little Egret
17	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Lesser Black-backed Gull
22	14/08/2021	8	Good	Showers-Light Rain	F1 SSE	Lesser Black-backed Gull
1	09/09/2021	3	Very Good	Showers	F2 SSE	Mallard
1	09/09/2021	3	Very Good	Showers	F2 SSE	Moorhen
2	09/09/2021	3	Very Good	Showers	F2 SSE	Kingfisher

HVP	Date	Cloud	Visibility	Rain	Wind	Common Name
2	09/09/2021	3	Very Good	Showers	F2 SSE	Grey Heron
4	09/09/2021	3	Very Good	Showers	F2 SSE	Little Egret
4	09/09/2021	3	Very Good	Showers	F2 SSE	Water Rail
4	09/09/2021	3	Very Good	Showers	F2 SSE	Moorhen
4	09/09/2021	3	Very Good	Showers	F2 SSE	Grey Heron
4	09/09/2021	3	Very Good	Showers	F2 SSE	Buzzard
5	09/09/2021	3	Very Good	Showers	F2 SSE	Mallard
5	09/09/2021	3	Very Good	Showers	F2 SSE	Mute Swan
5	09/09/2021	3	Very Good	Showers	F2 SSE	Lesser Black-backed Gull
5	09/09/2021	3	Very Good	Showers	F2 SSE	Black-headed Gull
5	09/09/2021	3	Very Good	Showers	F2 SSE	Great Crested Grebe
5	09/09/2021	3	Very Good	Showers	F2 SSE	Moorhen
5	09/09/2021	3	Very Good	Showers	F2 SSE	Coot
5	09/09/2021	3	Very Good	Showers	F2 SSE	Grey Heron
5	09/09/2021	3	Very Good	Showers	F2 SSE	Little Grebe
5	09/09/2021	3	Very Good	Showers	F2 SSE	Little Egret
6	09/09/2021	3	Very Good	Showers	F2 SSE	Mute Swan
6	09/09/2021	3	Very Good	Showers	F2 SSE	Black-headed Gull
7	09/09/2021	3	Very Good	Showers	F2 SSE	Mute Swan
7	09/09/2021	3	Very Good	Showers	F2 SSE	Grey Heron
8	09/09/2021	3	Very Good	Showers	F2 SSE	Mute Swan
8	09/09/2021	3	Very Good	Showers	F2 SSE	Mallard
8	09/09/2021	3	Very Good	Showers	F2 SSE	Lapwing
8	09/09/2021	3	Very Good	Showers	F2 SSE	Grey Wagtail
8	09/09/2021	3	Very Good	Showers	F2 SSE	Teal
8	09/09/2021	3	Very Good	Showers	F2 SSE	Great Crested Grebe
8	09/09/2021	3	Very Good	Showers	F2 SSE	Little Grebe
8	09/09/2021	3	Very Good	Showers	F2 SSE	Black-headed Gull
8	09/09/2021	3	Very Good	Showers	F2 SSE	Moorhen
8	09/09/2021	3	Very Good	Showers	F2 SSE	Little Egret
8	09/09/2021	3	Very Good	Showers	F2 SSE	Grey Heron
8	09/09/2021	3	Very Good	Showers	F2 SSE	Cormorant
8	09/09/2021	3	Very Good	Showers	F2 SSE	Curlew
8	09/09/2021	3	Very Good	Showers	F2 SSE	Great Black-backed Gull
9	09/09/2021	3	Very Good	Showers	F2 SSE	Little Egret
9	09/09/2021	3	Very Good	Showers	F2 SSE	Grey Heron
9	09/09/2021	3	Very Good	Showers	F2 SSE	Mallard
9	09/09/2021	3	Very Good	Showers	F2 SSE	Lesser Black-backed Gull
9	09/09/2021	3	Very Good	Showers	F2 SSE	Great Crested Grebe
9	09/09/2021	3	Very Good	Showers	F2 SSE	Little Grebe
9	09/09/2021	3	Very Good	Showers	F2 SSE	Mute Swan
9	09/09/2021	3	Very Good	Showers	F2 SSE	Coot
9	09/09/2021	3	Very Good	Showers	F2 SSE	Cormorant
10	09/09/2021	3	Very Good	Showers	F2 SSE	Mute Swan
10	09/09/2021	3	Very Good	Showers	F2 SSE	Mallard

HVP	Date	Cloud	Visibility	Rain	Wind	Common Name
11	09/09/2021	3	Very Good	Showers	F2 SSE	Mute Swan
11	09/09/2021	3	Very Good	Showers	F2 SSE	Mallard
12	09/09/2021	3	Very Good	Showers	F2 SSE	Mute Swan
12	09/09/2021	3	Very Good	Showers	F2 SSE	Water Rail
12	09/09/2021	3	Very Good	Showers	F2 SSE	Grey Heron
13	09/09/2021	3	Very Good	Showers	F2 SSE	Snipe
14	09/09/2021	3	Very Good	Showers	F2 SSE	Mute Swan
15	09/09/2021	3	Very Good	Showers	F2 SSE	Mallard
15	09/09/2021	3	Very Good	Showers	F2 SSE	Mute Swan
15	09/09/2021	3	Very Good	Showers	F2 SSE	Moorhen
16	09/09/2021	3	Very Good	Showers	F2 SSE	Grey Heron
19	09/09/2021	3	Very Good	Showers	F2 SSE	Grey Wagtail
19	09/09/2021	3	Very Good	Showers	F2 SSE	Lesser Black-backed Gull
19	09/09/2021	3	Very Good	Showers	F2 SSE	Grey Heron
22	09/09/2021	3	Very Good	Showers	F2 SSE	Lesser Black-backed Gull

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APPENDIX 5

Transect Survey Schedule and Conditions

Date	Transect	Time	Cloud (Okta)	Precipitation	Visibility	Wind
May 2021						
12/05/2021	1	05:20-05:53	7/8	Dry	Very good	F1-2
13/05/2021	2	05:20-05:49	7/8	Dry	Very good	F1
12/05/2021	3	10:33-10:59	6/8	Dry	Very good	F1-2
12/05/2021	4	05:55-06:24	6/8	Dry	Very good	F1
12/05/2021	5	06:27-06:53	6/8	Dry	Very good	F1-2
12/05/2021	6	09:40-10:12	7/8	Dry	Very good	F1-2
12/05/2021	7	09:05-09:31	7/8	Dry	Very good	F1-2
12/05/2021	8	08:22-08:50	6/8	Dry	Very good	F1-2
12/05/2021	9	07:38-08:08	7/8	Dry	Very good	F1-2
12/05/2021	10	07:05-07:32	7/8	Dry	Very good	F1
14/05/2021	11	05:22-05:51	8/8	Dry	Very good	F1
14/05/2021	12	06:08-06:39	8/8	Dry	Very good	F1
13/05/2021	13	09:18-09:46	6/8	Dry	Very good	F1
13/05/2021	14	06:25-06:38	8/8	Dry	Very good	F1
13/05/2021	15	07:31-08:00	7/8	Dry	Good	F1
13/05/2021	16	08:34-09:03	6/8	Dry	Very good	F1
13/05/2021	17	10:03-10:32	5/8	Dry	Very good	F1
14/05/2021	18	09:37-10:36	7/8	Dry	Very good	F1
14/05/2021	19	08:45-09:13	7/8	Dry	Very good	F1
14/05/2021	20	08:02-07:30	7/8	Dry	Very good	F1
14/05/2021	21	07:49-08:22	6/8	Dry	Very good	F1
June 2021						
11/06/2021	1	05:18-05:55	8/8	Dry	Very good	F3-4
13/06/2021	2	05:10-05:41	8/8	Dry	Very good	F2
11/06/2021	3	06:32-07:00	8/8	Dry	Very good	F3-4
11/06/2021	4	05:59-06:29	4/8	Dry	Very good	F3-4
11/06/2021	5	10:52-11:22	7/8	Dry	Very good	F3-4
11/06/2021	6	10:02-10:27	8/8	Dry	Very good	F3
11/06/2021	7	09:30-09:54	8/8	Dry	Very good	F3
11/06/2021	8	08:45-09:13	6/8	Dry	Very good	F3
11/06/2021	9	07:54-08:23	5/8	Dry	Very good	F3-4
11/06/2021	10	07:15-07:45	4/8	Dry	Very good	F3-4
12/06/2021	11	05:15-05:46	8/8	Dry	Very good	F2

Date	Transect	Time	Cloud (Okta)	Precipitation	Visibility	Wind
12/06/2021	12	06:05-06:34	8/8	Dry	Very good	F2
12/06/2021	13	09:00-09:32	7/8	Dry	Very good	F2
12/06/2021	14	10:13-10:44	8/8	Dry	Very good	F2
12/06/2021	15	07:11-07:39	7/8	Dry	Very good	F2
12/06/2021	16	08:15-08:47	7/8	Dry	Very good	F2
13/06/2021	17	09:52-10:30	7/8	Dry	Very good	F1
13/06/2021	18	10:42-11:30	6/8	Dry	Very good	F1
13/06/2021	19	08:45-09:21	6/8	Dry	Very good	F1
13/06/2021	20	06:55-07:29	5/8	Dry	Very good	F1
13/06/2021	21	07:55-08:24	6/8	Dry	Very good	F1

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Appendix K.2 Baseline Ornithological Surveys – Derryadd Wind Farm, Migration and Winter 2021/2022 (Fehily Timoney, 2022a)

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DERRYADD, CO. LONGFORD WIND FARM ORNITHOLOGICAL SURVEY

BASELINE ORNITHOLOGICAL SURVEYS – DERRYADD WIND FARM, MIGRATION AND WINTER 2021/2022

Prepared for: Bord na Móna

Bord na Móna

Date: **June 2022**

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BASELINE ORNITHOLOGICAL SURVEYS – DERRYADD WIND FARM, MIGRATION 2021 AND WINTER 2021/2022

REVISION CONTROL TABLE, CLIENT, KEYWORDS AND ABSTRACT
User is responsible for Checking the Revision Status of This Document

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0	Client Issue	KM/MG	JK	JH	01/06/2022

Client: Bord na Móna

Keywords: Baseline, Ornithological Surveys, Wind Farm, Derryadd, Co. Longford

Abstract: This document outlines a baseline ornithological survey during autumn migrations and winter 2021/2022 at the potential Derryadd Wind Farm, Co. Longford. This ornithology report is required to assess the impacts of the proposed development on bird species within and surrounding the site.

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EXECUTIVE SUMMARY

Ornithological surveys for the winter 2021/2022 season at Derryadd Wind Farm recorded all bird species, within the wind farm site and the surrounding hinterland.

The methodology for the 2021/2022 vantage point surveys at Derryadd adhered to Scottish Natural Heritage guidance (SNH, 2017) for assessing the impact of proposed wind farm developments on target species' wintering populations. Two timed watches of three hours duration were carried out from each VP every month from October 2021 to March 2022 inclusive, totalling 36 hours of observation time at each VP over the survey period. Additionally, two timed watches of three hours duration were carried out from each VP in September 2021 to observe the migration period. Winter transect surveys and hinterland surveys were also undertaken during this period.

During vantage point surveys a total of 83 bird species were recorded. Of these species, 14 are of Red-list status under the Birds of Conservation Concern in Ireland (BoCCI) (Gilbert et al., 2021): bar-tailed godwit, black-tailed godwit, curlew, golden plover, grey wagtail, kestrel, lapwing, meadow pipit, redshank, redwing, shoveler, snipe, white-tailed eagle and yellowhammer. A total of 27 are Amber-listed and the remaining 42 are Green-listed. A total of ten Annex I species were recorded during vantage point surveys: bar-tailed godwit, little egret, golden plover, hen harrier, peregrine, merlin, marsh harrier, kingfisher, white-tailed eagle, and whooper swan.

During hinterland surveys surrounding the proposed site a total of 24 species were noted. Of these species, six are of Red-list status under the BoCCI (Gilbert et al., 2021): golden plover, goldeneye, grey wagtail, lapwing, shoveler and snipe. A further 11 Amber-listed species were observed: black-headed gull, coot, cormorant, goldcrest, great crested grebe, mallard, mute swan, teal, tufted duck, whooper swan and wigeon. Of these, three species are protected under Annex I of the EU Birds directive: golden plover, little egret, whooper swan.

During winter bird transects a total of 29 species were detected. Of these, two species are Red listed: redwing and meadow pipit. A total of two amber-listed species were recorded: linnet and starling.

1. INTRODUCTION

Fehily Timoney & Company (FT) was appointed by Bord na Móna to undertake winter ornithological surveys at the proposed Derryadd Wind Farm in 2021 to 2022. This report presents the results of these ornithological surveys and summarises the activity of specific target bird species during the winter survey period in 2021/2022. The study area of the proposed Derryadd Wind Farm is near Lanesborough, Co. Longford.

This ornithological assessment for surveys completed during winter 2021/2022 includes the assessment of bird species occurring within the proposed site boundary, and surveys of surrounding habitats of value to birds. Surveys adhered to Scottish Natural Heritage guidance (SNH, 2017). The following surveys were carried out:

- Vantage Point survey
- Hinterland survey
- Winter transect surveys

1.1 Study Area

The proposed Derryadd wind farm is located c. 3 km east of Lanesborough, Co. Longford, 4km west of Killashee, Co. Longford and 8km north of Newtowncashel, Co. Longford. The proposed wind farm is located on the Mountdillon group of peat extraction bogs in Co. Longford (Figure 1.1).

Habitats on the proposed site consist of cutover bog, recolonising cutover bog, remnant raised bog, colonising birch woodland and large ponds/lakes on cutover bog. Surrounding habitats and land uses are described by Corine 2018[1] as: Peat bogs (412), Pastures (code 231), Mixed Forests (313), Coniferous Forests (312), Transitional woodland scrub (324), Broad-leaved forests (311), and Discontinuous urban fabric (112).

Designated Sites within a 15km radius of the proposed wind farm are detailed in Table 1.1.

1 https://gis.epa.ie/EPAMaps/. Accessed 26/04/22

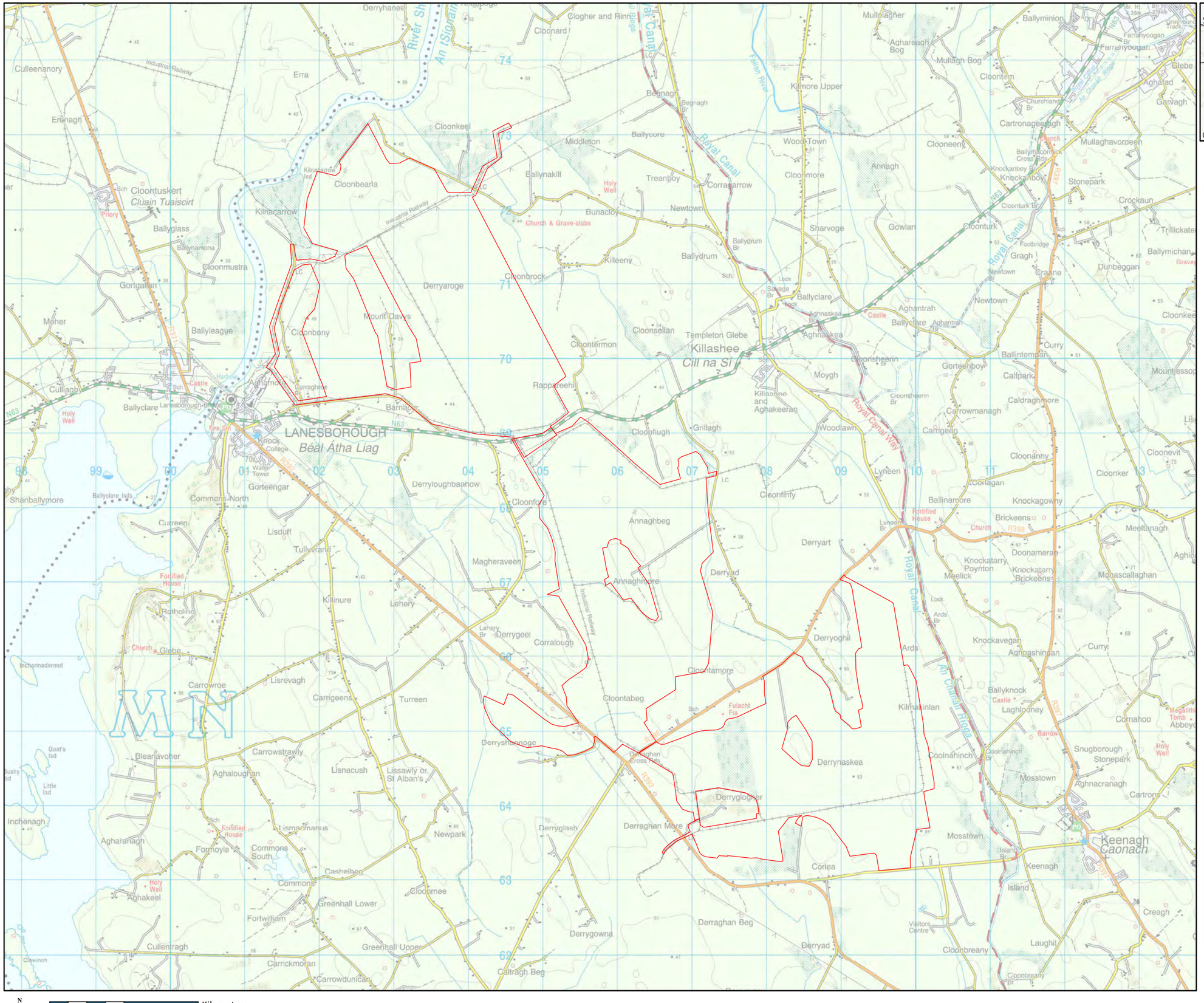
Table 1-1: Designated sites within a 15km radius of the proposed Derryadd Wind Farm.

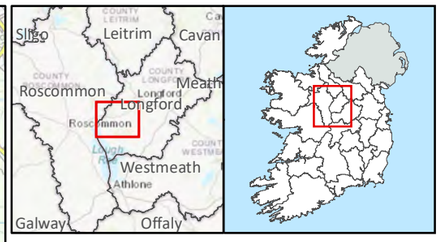
Site	Site Code	Type
Lough Ree	004064/000440/000440	SPA/SAC/pNHA
Fortwilliam Turlough	000448/000448	SAC/pNHA
Ballykenny-Fisherstown Bog	004101	SPA
Lough Forbes Complex	001818/001818	SAC/pNHA
Brown Bog	002346/000442	SAC/pNHA
Corbo Bog	002349/000602	SAC/pNHA
Annaghmore Lough	001626	SAC
Clooneen Bog	002348/000445	SAC/pNHA
Mount Jessop Bog	001450	SAC/NHA
Forthill Bog	001448	NHA
Derrycanan Bog	000605	NHA
Aghnamona Bog	000422	NHA
Cloonageeher Bog	001423	NHA
Lisnanarriagh Bog	002072	NHA
River Finn	002301	NHA
Lough Bawn	001819	pNHA
Lough Bannow	00449	pNHA
Royal Canal	002103	pNHA
Cordara Turlough	001821	pNHA
Derry Lough	001444	pNHA
Lough Slawn	001443	pNHA
Kilglass and Grange Loughs	000608	pNHA
Carrickglass Demesne	001822	pNHA
Lough Boderg and Lough Bofin	001642	pNHA
Annaghmore Lough (Roscommon)	001626	pNHA
Ardnakilla Lough	001617	pNHA

Note: *SPA = Special Protected Area (European site), SAC = Special Area of Conservation (European site), NHA = Natural Heritage Area (Nationally Designated Site), pNHA = proposed Natural Heritage Area

Path: R:\Map Production\2021\P21-119\workspace\Flightlines\P20-119_GIS_SiteLayout_Flightlines_A3.mxd

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Legend

Proposed Site Boundary

TITLE:	Site Location
PROJECT:	Derryadd Wind Farm
FIGURE NO:	1-1
CLIENT:	Bord na Móna
SCALE: 1:50000	**REVISION:** 0
DATE: 05/01/2022	**PAGE SIZE:** A3

N W E S

1 0.5 0 1 Kilometers

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2. SURVEY METHODOLOGY

The following surveys were carried out:

- Vantage point survey
- Hinterland survey
- Winter bird surveys

Methodologies for these surveys are detailed under the following headings:

2.1 Vantage Point Surveys

The main purposes of vantage point survey watches are to collect data on *target species* that will enable estimates to be made of:

a. The time spent flying over the defined survey area;

b. The relative use of different parts of the defined survey area;

c. The proportion of flying time spent within the upper and lower height limits as determined by the rotor diameter and rotor hub height.

Vantage Point (VP) surveys were carried out at the proposed Derryadd Wind Farm site from October 2021 to March 2022 (covering the winter season), in accordance with the Scottish Natural Heritage Methodology for assessing onshore wind farms (SNH, 2017). Additional surveys were conducted in September 2021 to assess migrating birds. A total of 11 fixed VP locations overlooking the study area were used during the VP surveys (see Figure 2.1 for VP locations), each with specific viewsheds chosen to provide coverage of the proposed Wind Farm in addition to a 500m buffer around the site boundary.

Vantage point locations were based on observations from walkover/reconnaissance surveys, viewshed analysis (using GIS) and collated information on known feeding and roosting sites from both desktop review and consultation. The number and location of vantage points was selected to achieve visibility of the entire study area and important features for birds in close proximity to the site (e.g., lakes, wetlands).

In line with recommended best practice (SNH, 2017 and Band *et al*. 2007), viewshed analysis was undertaken using ARCMAP 10.4.1, to calculate a theoretical zone of visibility from each vantage point. Visibility is calculated from each vantage point along an invisible layer suspended at the predicted lowermost height passed through by the rotor blade tips, using an observer height of 1.5 m. We note the following from SNH guidance in respect of priority areas for viewshed analysis (emphasis added):

> *"Where the key purpose is to estimate the risk of collision with turbines,* ***it is the visibility of the airspace to be occupied by the turbine rotors (the collision risk volume) that is of prime importance****. Therefore, it is recommended that visibility be calculated using the least visible part of this airspace, i.e. an imaginary layer suspended at the lowermost height passed through by the rotor blade tips (typically about 20-30m above ground level).*

Predicting visibility at this level is a simple task using GIS, however it should be noted that the baseline should take account of any forestry or other features that will potentially obstruct the view. For example, forestry may be 10-30m high and if viewshed height is taken as 20-30m ground level the visible area could be overestimated if there is forestry within the viewshed. Being able to view all or most of the site to ground level can be helpful in gauging overall bird activity and usage of the site but is not as important as being able to view the collision risk volume"

Following SNH guidance (2017), watches were conducted to sample diurnal activity of target species, fulfilling the required effort from SNH. Vantage Point (VP) surveys involved carrying out 2 x 3-hour VPs at each VP every month. As per SNH guidance (2017), 36 hours of vantage point effort was carried out at each vantage point during the winter period.

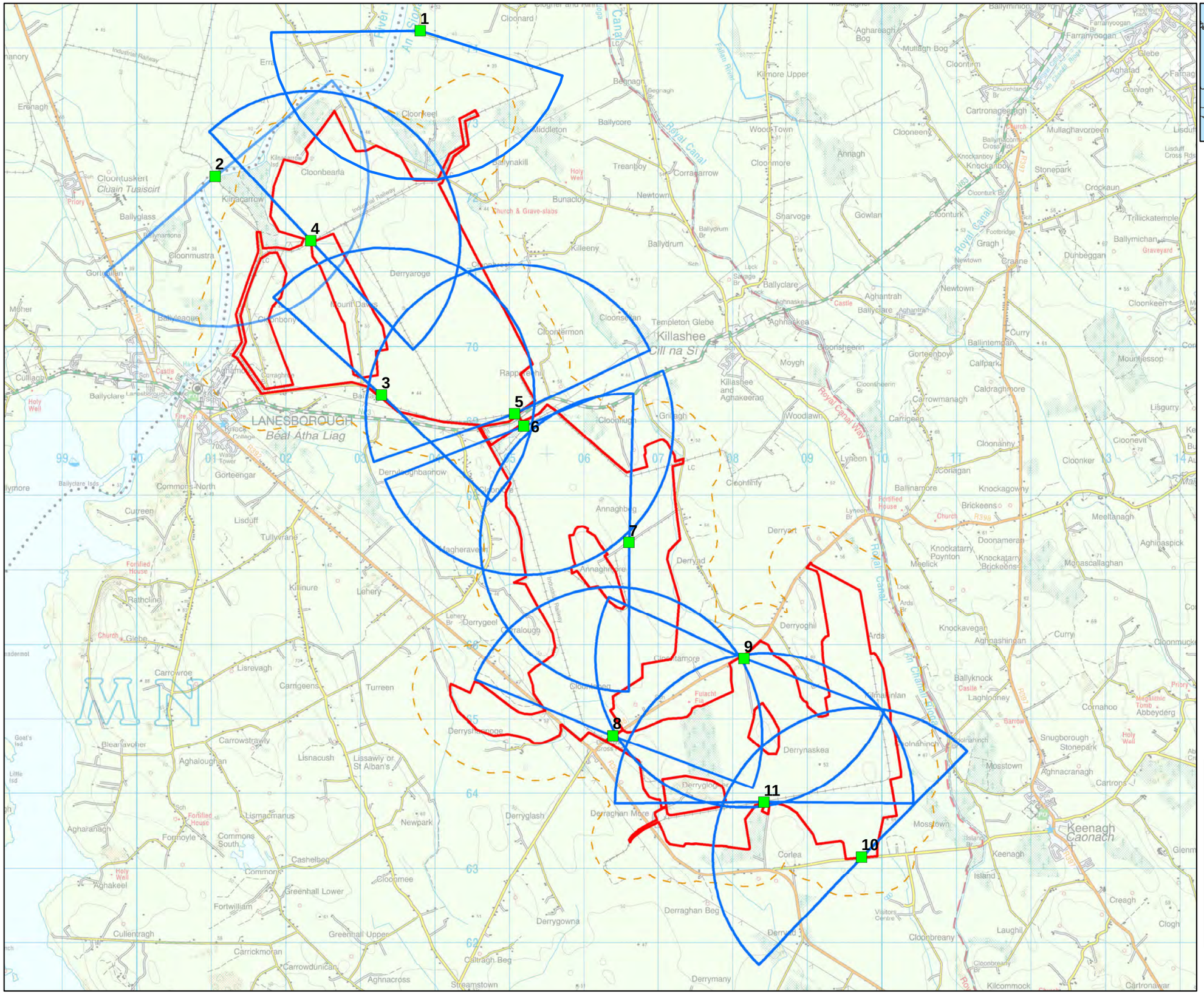
Data recorded included flight activity of target species (flight height, duration, directionality) in addition to metrics such as flock size (per recorded transit) and relative time of observation. Detailed notes of each observation of a target bird species were recorded including behaviour, sex (where possible), numbers, flight height, associated habitat and the period spent within the study area. Successful foraging events were also noted if they arose. Other bird species seen or heard during the VP surveys were also recorded and were considered separately in the analysis as additional species. Flight activity was annotated onto field maps. Total numbers of birds present both on arrival at the VP and on departure is noted. Details of each flight-path observation are provided in Section 3. Binoculars and telescopes were used to scan for target species. Dictaphones were utilised to dictate bird heights whilst tracking flight events.

Flight heights are estimated visually as allowed for in SNH (2017) guidance. Flight height estimation using a clinometer or rangefinder is accepted as an *alternative* means of determining flight height however this is often not practicable (equipment may be clumsy and birds may be lost from view whilst trying to focus additional equipment on a target species rapidly moving out of sight); it should be noted that in practice many flocks of swans do not fly close enough to a surveyor for a rangefinder to be used, resulting in most flights heights being estimated in any case. As is often the case an experienced observer will be able to record accurate observations at a higher frequency.

The proportion of survey time that activity was recorded inside and outside the 500m turbine buffer was used as part of the overall analysis and assessment of target species usage of the study area. All surveys were conducted during suitable weather conditions.

Path: \\FTC-FS01\MapInfoShare\Map Production\2021\P21-119\workspace\P21-119_GIS_Fig1_ViewshedAnalysis_A3.mxd

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Legend

- Vantage Points
- Viewsheds
- 500m buffer of site boundary
- Site Boundary

N W E S

0 0.5 1 2 3 4 Kilometers

TITLE:	Viewshed Analysis		
PROJECT:	Derryadd windfarm Farm, Co. Longford		
FIGURE NO:	1		
CLIENT:	BnM		
SCALE:	1:50000	**REVISION:**	0
DATE:	06/05/2021	**PAGE SIZE:**	A3

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2.2 Hinterland Surveys

The methodology used for wetland sites during hinterland surveys followed I-WeBS (Irish Wetland Bird Survey) methodology (Lewis *et al*, 2019), whereby each location was surveyed for the duration necessary to identify and obtain a count for all target species present. The same approach was adapted for non-wetland sites. A hinterland survey for raptors was conducted in accordance with Hardey *et al*. (2013) to assess hen harrier and other raptor activity over the winter period in the greater surroundings.

The surveys were carried out in suitable woodland, grassland, peatland and wetland habitats in the area surrounding the proposed wind farm site. This comprised of 25 sites within 10 km from the proposed wind farm site. These sites were chosen as they had suitable habitat for the following target species: raptors, waders, waterfowl, geese, swans and barn owl. Surveys were carried out between September 2021 and March 2022, covering the migration period and winter season. The sites detailed in Table 2.2 were checked regularly across this period:

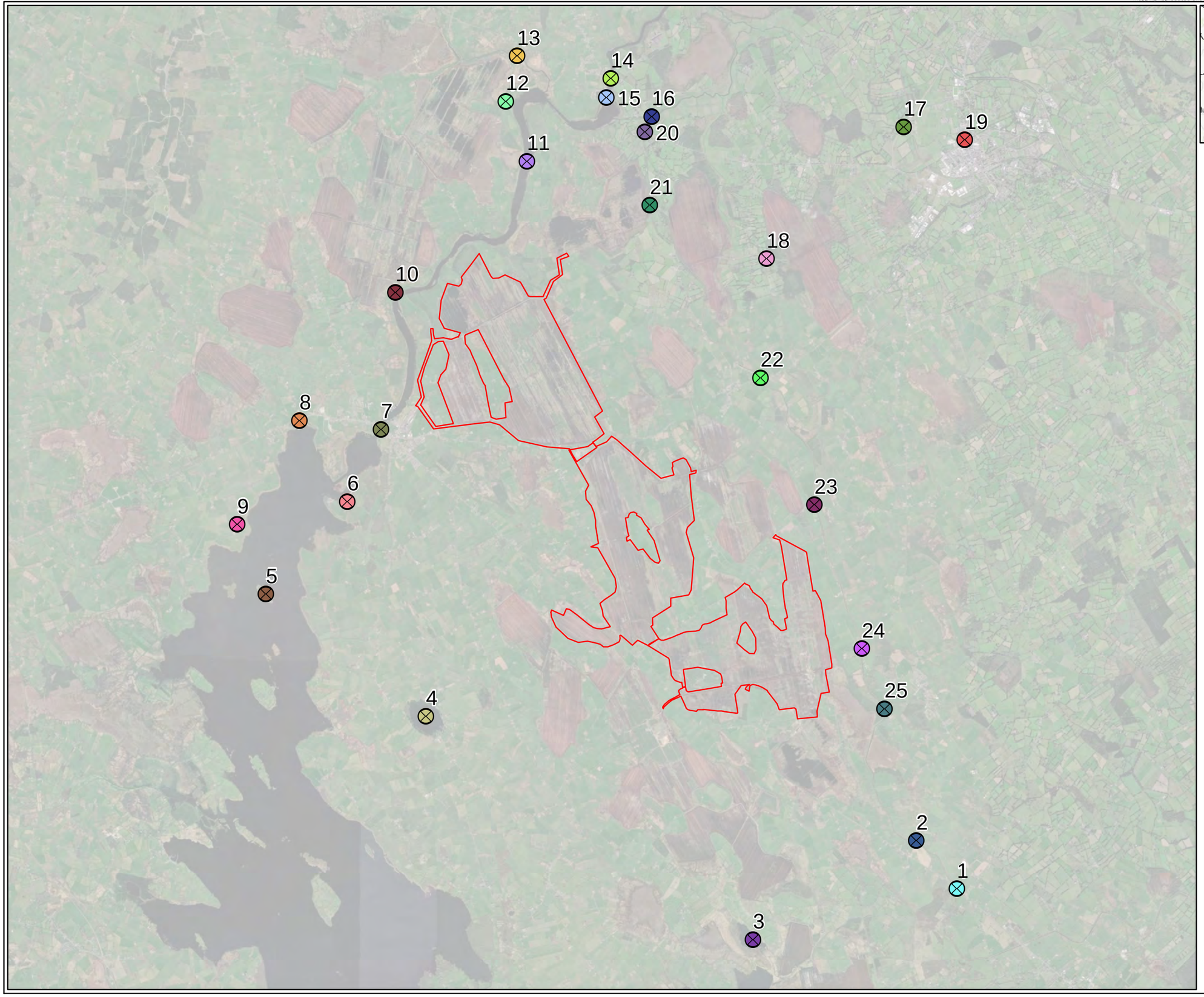
Table 2-1: Hinterland survey locations

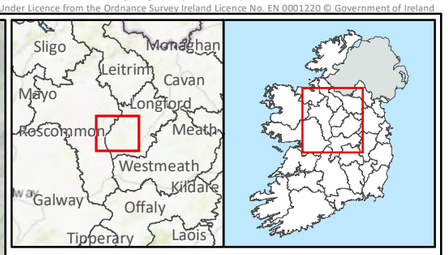
Code	Location	ITM Coordinates		Dates Visited
		Easting	Northing	
HVP1	*Pake Bridge, Royal Canal*	612898.185	759486.712	30/09/2021, 26/10/2021, 24/11/2021, 25/01/2022, 28/02/2022, 29/03/2022
HVP2	*Foygh Bridge, Royal Canal*	612023.763	760522.067	
HVP3	*Derrymacar Lough*	608506.111	758389.783	Not surveyed
HVP4	*Fortwilliam Turlough*	601465.614	763206.551	30/09/2021, 26/10/2021, 24/11/2021, 25/01/2022, 28/02/2022, 29/03/2022
HVP5	*Incharmadermot Island, Lough Ree*	598015.731	765839.47	
HVP6	*Cureen, Lough Ree*	599770.446	767832.499	
HVP7	*Lanesborough Bridge, Lough Ree*	600495.231	769387.084	
HVP8	*Cullaghy, Lough Ree*	598739.475	769573.953	
HVP9	*Gardenstown, Lough Ree*	597396.711	767345.703	
HVP10	*Cloonmustra, River Shannon*	600807.323	772340.698	
HVP11	*Erra & Derryhanee, River Shannon*	603635.518	7.944911	
HVP12	*Derrycashel, River Shannon*	603185.029	776452.94	30/09/2021, 28/10/2021, 24/11/2021, 25/01/2022, 28/02/2022, 29/03/2022

Code	Location	ITM Coordinates		Dates Visited
		Easting	Northing	
HVP13	*Feorish River*	603428.885	777430.82	30/09/2021, 28/10/2021, 25/01/2022, 28/02/2022, 29/03/2022
HVP14	*Tarmonbarry Bridge*	605449.722	776948.108	30/09/2021, 28/10/2021, 24/11/2021, 25/01/2022, 28/02/2022, 29/03/2022
HVP15	*Tarmonbarry Lock*	605352.886	776538.819	
HVP16	*Camlin River Complex*	606330.588, -	776126.409	
HVP17	*N5 Bridge over Camlin Park*	611752.094	775901.951	
HVP18	*Fallan Bridge*	608801.086	773065.52	
HVP19	*Richmond Bridge*	613068.179	775627.344	30/09/2021, 29/10/2021, 24/11/2021, 25/01/2022, 28/02/2022, 29/03/2022
HVP20	*Cloondara, Royal Canal*	606176.505	775790.583	
HVP21	*Begnagh Bridge, Royal Canal*	606287.094	774216.229	
HVP22	*Aghnaskea Bridge, Royal Canal*	608672.728	770495.836	
HVP23	*Lyneen Bridge, Royal Canal*	609831.385	767761.094	
HVP24	*Coolnahinch Bridge, Royal Canal*	610855.924	764658.67	
HVP25	*Island Bridge, Royal Canal*	611337.847	763361.965	

Path: R:\Map Production\2021\P21-119\workspace\Flightlines\P20-113_GIS_Flightlines_DerryaddWindFarm_A3.mxd

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Legend

Site Boundary

ID, Location

1, Park Bridge Royal Canal
2, Foygh Bridge Royal Canal
3, Derrymacar Lough
4, Fortwilliam Turlough
5, Incharmadermot Island Lough Ree
6, Cureen Lough Ree
7, Lanesborough Bridge Lough Ree
8, Cullaghy Lough Ree
9, Gardenstown Lough Ree
10, Cloonmustra River Shannon
11, Erra & Derryhanee River Shannon
12, Derrycashe River Shannon
13, Feorish River
14, Tarmonbarry Bridge
15, Tarmonbarry Lock
16, Camlin River Complex
17, N5 Bridge over Camplin Park
18, Fallan Bridge
19, Richmond Bridge
20, Cloondara Royal Canal
21, Begnagh Bridge Royal Canal
22, Aghnaskea Bridge Royal Canal
23, Lyneen Bridge Royal Canal
24, Coolnahinch Bridge Royal Canal
25, Island Bridge Royal Canal

TITLE:	Hinterland Sites		
PROJECT:	Derryadd, Co. Longford		
FIGURE NO:	2-2		
CLIENT:	Bord na Móna		
SCALE:	1:80000	**REVISION:**	0
DATE:	05/01/2022	**PAGE SIZE:**	A3

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2.3 Winter Bird Transect Surveys

Over the winter season, general bird transect surveys were carried out at 21 no. c. 1 km transects which were selected and centred on different habitats present within the subject sites (See Table 2-5).

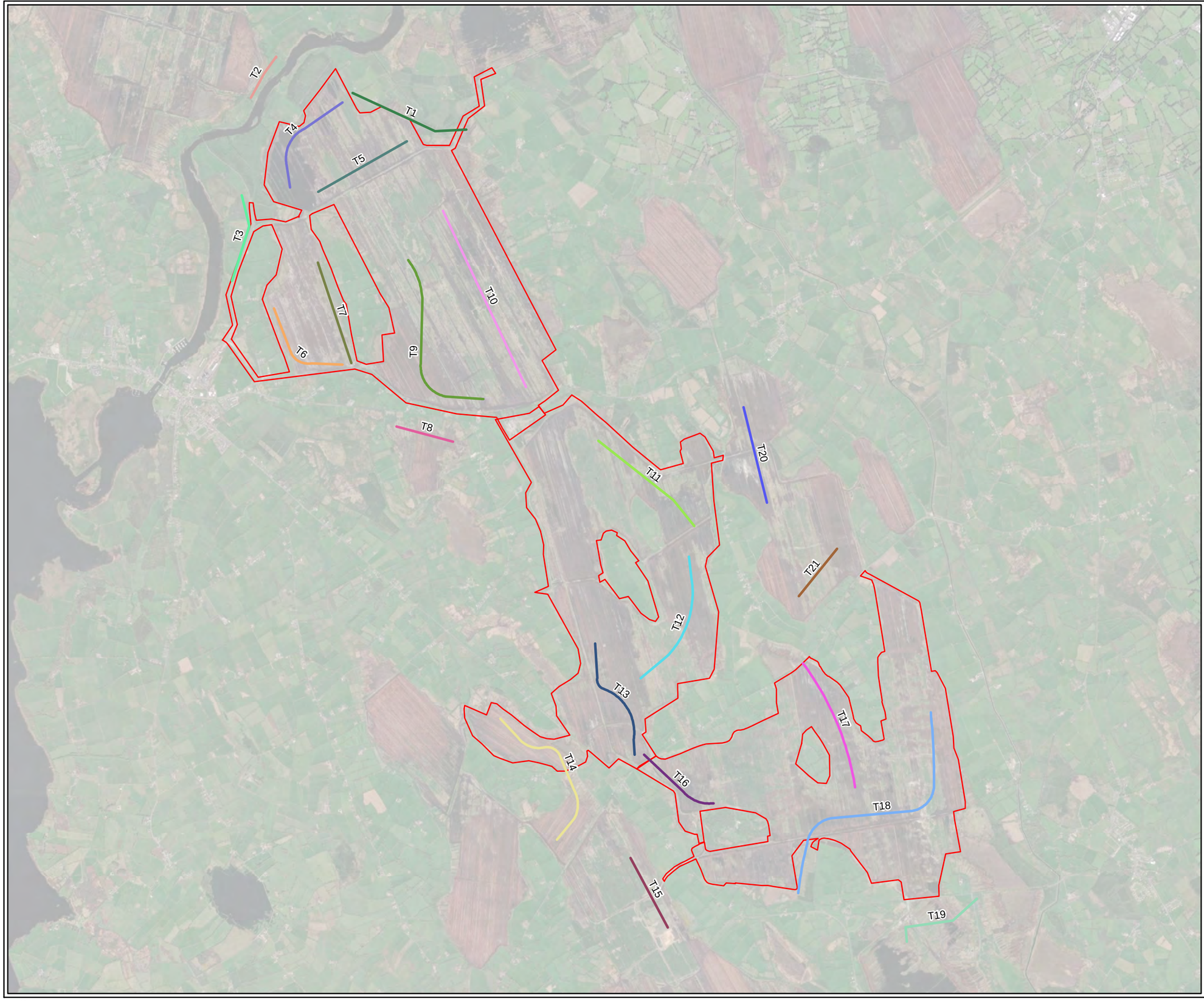
Surveyors recorded all birds seen or heard as they walked methodically along the transect routes. Birds were noted in four distance categories, measured at right angles to the transect line (within 25 m, between 25 m-100 m and over 100 m from the transect line) and those seen in flight only. Recording birds in distance bands gives a measure of bird detectability and allows relative population densities to be estimated if required (BTO, 2018). The winter transect survey details are available in Table 2.6, with further details including weather and survey times indicated in Appendix 5.

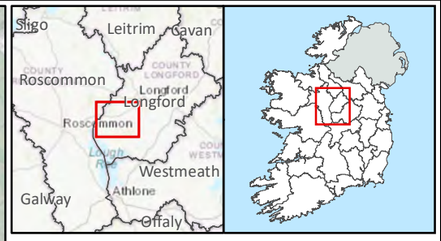
Table 2-2: Winter bird transect surveys

Transect	Month	
	February 2022	March 2022
1	03/02/2022	03/03/2022
2	03/02/2022	03/03/2022
3	03/02/2022	03/03/2022
4	03/02/2022	03/03/2022
5	04/02/2022	04/03/2022
6	04/02/2022	04/03/2022
7	04/02/2022	04/03/2022
8	04/02/2022	04/03/2022
9	07/02/2022	09/03/2022
10	07/02/2022	09/03/2022
11	07/02/2022	09/03/2022
12	07/02/2022	09/03/2022
13	11/02/2022	11/03/2022
14	11/02/2022	11/03/2022
15	11/02/2022	11/03/2022
16	11/02/2022	11/03/2022
17	15/02/2022	12/03/2022
18	15/02/2022	12/03/2022
19	15/02/2022	12/03/2022
20	15/02/2022	12/03/2022
21	15/02/2022	12/03/2022

Path: R:\Map Production\2021\P21-119\workspace\Flightlines\P20-119_GIS_Hinterland_A3.mxd

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Legend

Site Boundary

Transect

- T1
- T2
- T3
- T4
- T5
- T6
- T7
- T8
- T9
- T10
- T11
- T12
- T13
- T14
- T15
- T16
- T17
- T18
- T19
- T20
- T21

TITLE:	Bird Survey Transects		
PROJECT:	Derryadd, Co. Longford		
FIGURE NO:	2-3		
CLIENT:	Bord na Móna		
SCALE:	1:45000	**REVISION:**	0
DATE:	05/01/2022	**PAGE SIZE:**	A3

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N W E S

0 0.5 1 2 Kilometers

3. RESULTS

3.1 Avian usage of the Study Area – Vantage point

A total of two timed watches of three hours duration each were carried out at each of the 11 vantage points on a monthly basis from October 2021 to March 2022 inclusive. Additionally, two further timed watches (three hour duration) were conducted at these vantage points in September 2021. This surveying effort totals 36 hours of observation time at each VP over the winter survey period and six hours during the migration period (Appendix 2). Bird activity was recorded from the VPs during each survey. Table 3-1 shows all the species recorded during surveys. In total there were 562 individual flight lines of 27 target species observed during the entire survey period (migration and winter combined).

In total, 83 species of bird were noted. Of these species, 14 are of Red-list status under the BoCCI (Gilbert *et al*., 2021): bar-tailed godwit, black-tailed godwit, curlew, golden plover, grey wagtail, kestrel, lapwing, meadow pipit, redshank, redwing, shoveler, snipe, white-tailed eagle, and yellowhammer. A total of 27 are Amber-listed and the remaining 42 are Green-listed. Of the species noted, seven are listed under Annex I of the EU Birds Directive: bar-tailed godwit, little egret, golden plover, hen harrier, peregrine, merlin, marsh harrier, kingfisher, white-tailed eagle, and whooper swan. It is worth noting that the white-tailed eagle was not observed on site approx. 2km to the northwest. Table 3.1 details the conservation status of all 85 species.

3.1.1 Summary Results Migration Period and Winter 2021/2022

Target species observed, during this survey period at Derryadd were black-headed gull, black-tailed godwit, buzzard, cormorant, curlew, golden plover, great crested grebe, grey heron, greylag goose, hen harrier, kestrel, lapwing, lesser black-backed gull, little egret, mallard, marsh harrier, merlin, moorhen, mute swan, peregrine, pintail, shoveler, snipe, sparrowhawk, teal, whooper swan, and wigeon.

Table 3-1: Bird species recorded during VP surveys winter 2021/2022 and migration surveys[2]

Common name (BTO code)	Scientific name	*BoCCI status	**Annex I status
Bar-tailed Godwit	*Limosa lapponica*	Red	**Yes**
Blackbird	*Turdus merula*	Green	No
Blackcap	*Sylvia atricapilla*	Green	No
Black-headed Gull	*Chroicocephalus ridibundus*	Amber	No
Black-tailed Godwit	*Limosa limosa*	Red	No
Blue Tit	*Cyanistes caeruleus*	Green	No
Brambling	*Fringilla montifringilla*	Amber	No
Bullfinch	*Pyrrhula pyrrhula*	Green	No
Buzzard	*Buteo buteo*	Green	No
Chaffinch	*Fringilla coelebs*	Green	No
Chiffchaff	*Phylloscopus collybita*	Green	No

[2] Colours refer to the conservation status of the species according to Birds of Conservation Concern in Ireland.

Common name (BTO code)	Scientific name	*BoCCI status	**Annex I status
Coal Tit	*Periparus ater*	Green	No
Collared Dove	*Streptopelia decaocto*	Green	No
Common Crossbill	*Loxia curvirostra*	Green	No
Cormorant	*Phalacrocorax carbo*	Amber	No
Curlew	*Numenius arquata*	Red	No
Dunnock	*Prunella modularis*	Green	No
Fieldfare	*Turdus pilaris*	Green	No
Goldcrest	*Regulus regulus*	Amber	No
Golden Plover	*Pluvialis apricaria*	Red	**Yes**
Goldfinch	*Carduelis carduelis*	Green	No
Great Black-backed Gull	*Larus marinus*	Green	No
Great Crested Grebe	*Podiceps cristatus*	Amber	No
Great Spotted Woodpecker	*Dendrocopos major*	Green	No
Great Tit	*Parus major*	Green	No
Greenfinch	*Carduelis chloris*	Amber	No
Grey Heron	*Ardea cinerea*	Green	No
Grey Wagtail	*Motacilla cinerea*	Red	No
Greylag Goose	*Anser anser*	Amber	No
Hen Harrier	*Circus cyaneus*	Amber	**Yes**
Herring Gull	*Larus argentatus*	Amber	No
Hooded Crow	*Corvus cornix*	Green	No
House Sparrow	*Passer domesticus*	Amber	No
Jack Snipe	*Lymnocryptes minimus*	Green	No
Jackdaw	*Corvus monedula*	Green	No
Jay	*Garrulus glandarius*	Green	No
Kestrel	*Falco tinnunculus*	Red	No
Kingfisher	*Alcedo atthis*	Amber	**Yes**
Lapwing	*Vanellus vanellus*	Red	No
Lesser Black-backed Gull	*Larus fuscus*	Amber	No
Lesser Redpoll	*Carduelis cabaret*	Green	No
Linnet	*Carduelis cannabina*	Amber	No
Little Egret	*Egretta garzetta*	Green	**Yes**
Long-tailed Tit	*Aegithalos caudatus*	Green	No
Magpie	*Pica pica*	Green	No
Mallard	*Anas platyrhynchos*	Amber	No
Marsh Harrier	*Circus aeruginosus*	Amber	**Yes**
Meadow Pipit	*Anthus pratensis*	Red	No
Merlin	*Falco columbarius*	Amber	**Yes**
Mistle Thrush	*Turdus viscivorus*	Amber	No
Moorhen	*Gallinula chloropus*	Green	No

Common name (BTO code)	Scientific name	*BoCCI status	**Annex I status
Mute Swan	*Cygnus olor*	Amber	No
Peregrine	*Falco peregrinus*	Green	**Yes**
Pheasant	*Phasianus colchicus*	Green	No
Pied/White Wagtail	*Motacilla alba*	Green	No
Pintail	*Anas acuta*	Amber	No
Raven	*Corvus corax*	Green	No
Redshank	*Tringa totanus*	Red	No
Redwing	*Turdus iliacus*	Red	No
Reed Bunting	*Emberiza schoeniclus*	Green	No
Ringed Plover	*Charadrius hiaticula*	Amber	No
Robin	*Erithacus rubecula*	Green	No
Rook	*Corvus frugilegus*	Green	No
Shoveler	*Anas clypeata*	Red	No
Siskin	*Carduelis spinus*	Green	No
Skylark	*Alauda arvensis*	Amber	No
Snipe	*Gallinago gallinago*	Red	No
Song Thrush	*Turdus philomelos*	Green	No
Sparrowhawk	*Accipiter nisus*	Green	No
Starling	*Sturnus vulgaris*	Amber	No
Stonechat	*Saxicola torquatus*	Green	No
Swallow	*Hirundo rustica*	Amber	No
Teal	*Anas crecca*	Amber	No
Treecreeper	*Certhia familiaris*	Green	No
Water Rail	*Rallus aquaticus*	Green	No
White-tailed Eagle	*Haliaeetus albicilla*	Red	**Yes**
Whitethroat	*Sylvia communis*	Green	No
Whooper Swan	*Cygnus cygnus*	Amber	**Yes**
Wigeon	*Anas penelope*	Amber	No
Willow Warbler	*Phylloscopus trochilus*	Amber	No
Woodpigeon	*Columba palumbus*	Green	No
Wren	*Troglodytes troglodytes*	Green	No
Yellowhammer	*Emberiza citrinella*	Red	No

* Refers to the conservation status of the species according to Birds of Conservation Concern in Ireland

**refers to species listed on Annex I of the EU Birds Directive.

3.2 Target species observations during VP surveys

3.2.1 Black-Headed Gull

A single flightline for the Amber-listed black-headed gull was recorded during the VP surveys. This observation occurred in November from VP2 This species was recorded 0-30m height band for 52 seconds, outside the SNH buffer. A single bird was observed in this sighting.

3.2.2 Black-Tailed Godwit

Black-tailed godwit, a Red-listed species was recorded once, at VP1 on the 1st of February 2022. A single bird recorded during this observation. This bird flew at a height of 30-50m for 20 seconds, outside the SNH buffer.

3.2.3 Buzzard

Green-listed buzzard was observed on 71 occasions. Observations were distributed across all VPs and months. Buzzard was observed flying through all height bands, most frequently at the 0-30m band. Observations were usually of individual birds, but up to six individuals were recorded at once, on one occasion in March 2022 from VP3. A total of 55 observations were made inside the SNH buffer, five outside the buffer and 11 both inside and outside the buffer. Activities observed included hunting, calling, circling, hovering and calling.

3.2.4 Cormorant

Cormorant, an Amber-listed Species, was observed on seven occasions, from VP1, 2 and 4. Of these observations, five flightlines were inside the SNH buffer, and two were both inside and outside. Observations were all of individual birds. Fight occurred most frequently in the 50-185m height band (0-30m = 11s, 30-50m = 258s, 50-185m = 561s).

3.2.5 Curlew

Curlew, a Red-listed species was recorded once during the winter survey period, on the 2nd of March 2022. This observation was of seven birds, observed flying in the 30-50m height band at VP1 for 15 seconds.

3.2.6 Golden Plover

The Red-listed/Annex I golden plover was observed on 37 occasions. Observations occurred in all months from October 2021. Golden plover was observed at VPs 1, 3, 4, 5, 9, 10, and 11. This species was observed flying at all height bands, but most frequently at 50-185m (0-30m = 456s, 30-50m = 258s, 50-185m = 1928s, >185m = 7s). Observations included birds being flushed by walkers or other species, as well as groups moving location. Group size ranged from one to approximately 500. Of the flightlines observed, 25 were within the SNH buffer, eight were outside, and four were both inside and outside the buffer.

3.2.7 Great Crested Grebe

Amber-listed great crested grebe was observed once, with a single bird flying in the 0-30m height band for 120s. This observation was from VP2 in November 2021.

3.2.8 Grey Heron

The Green-listed Grey Heron was observed 59 times during the migration/winter surveys. Observations of this species were made during all surveyed months. This species generally flew at the 0-30m height band (0-30m = 11s, 30-50m = 258s, 50-185m = 561s). This species was observed at all VP locations. Observations were generally of single birds, but two individuals were noted on two occasions. Of the flightlines observed, 38 were within the SNH buffer, 16 were outside, and five were both inside and outside the buffer. Behaviours included birds flying to ponds and landing in sections of bog.

3.2.9 Greylag Goose

Greylag goose (Amber-listed) was observed once during the winter survey period, on the 27th December 2021. This species was observed at VP10 flying both inside and outside the SNH buffer. This group of six individuals flew at a height of 50-185m for a period of seven seconds.

3.2.10 Hen Harrier

A total of 11 observations were made of the (Amber-listed) Annex I listed species hen harrier at VPs 2, 3, 5, 7, 8, 10, and 11. Hen harrier was recorded in November, December, January, February and March. This species most frequently flew at the lower height band (0-30m) and was not observed flying above 185m (0-30m = 783s, 30-50m = 126s, 50-185m = 71s). Of the observed flightlines, eight were inside the SNH buffer and three were both inside and outside the buffer. Each observation was of a single individual, and both males and females were observed. Behaviours included flight, hunting and being mobbed by hooded crows.

3.2.11 Kestrel

Red-listed kestrel had 64 flightlines mapped across all VPs, except for VP2. This species was observed in all months. A single individual was noted in all observations. Of the observed flightlines, 63 were inside the SNH buffer and one was both inside and outside the buffer. Behaviours included circling, soaring, hunting, perching and being disturbed by walkers.

3.2.12 Lapwing

A total of 49 observations of Red-listed lapwing were recorded. This species was recorded from all VPs except VP7, VP9 and VP10. Observations were made in all months. This species was most frequently observed flying within the 30-50m height band (0-30m = 576s, 30-50m = 861s, 50-185m = 722s). The numbers of individuals per observation ranged from one to 112, with an average group size of 52. Of the observed flightlines, 22 were inside the SNH buffer, three were both inside and outside the buffer, and 24 were outside the buffer.

3.2.13 Lesser Black-backed Gull

Amber-listed lesser black-backed gull flightlines were recorded five times. Each flightline was of a single individual. Flightlines were all recorded during the migration surveys in September 2021, from VP2, 4 and 8. Flight was mostly observed in the 50-185m height band (0-30m =154s, 30-50m = 690s). Lesser black-backed gull was also recorded during surveys in February and March 2022. These additional records originated from VP1, 2, 4, 5, 8, 10 and 11.

3.2.14 Little Egret

Green-listed/Annex I little egret was recorded 30 times. Observations occurred in all months, from all VPs except 1, 8 and 11. Quantities ranged from one individual up to 11 birds. Of the flightlines, 25 were inside the SNH buffer and five were both inside and outside the buffers. Flight was mostly observed in the 0-30m height band (0-30m =481, 30-50m = 328s, 50-185m = 60s). Behaviours included flight, and landing in a cutover bog.

3.2.15 Mallard

Mallard (Amber-listed) was recorded 55 times. Observations originated from VPs 1, 2, 3, 4, 5, 10 and 11. Observations occurred in all surveyed months. Flight occurred in all height bands, most frequently in the 0-30m band (0-30m = 4448s, 30-50m = 552s, 50-185m = 442s, >185m = 36s). Of the flightlines, 31 were inside the SNH buffer and 12 were both inside and outside the buffers, and 12 were only outside the buffer. Behaviours included feeding in a flooded section of bog to the south of VP4, in the north of the site.

3.2.16 Marsh Harrier

Marsh harrier (Amber-listed, Annex I) was observed once in the winter surveys. On 16th of March a single female was observed from VP3, flying in 0-30 height band for 100 seconds. This individual was observed hunting within the SNH buffer.

3.2.17 Merlin

Amber-listed/Annex I merlin was observed five times. This species was observed from VP6, VP7, VP8, and VP11. Observations were made in December and January. All observations were of one individual and included an immature or female bird. Flight was most frequently in the 0-30m band (108s) but also occurred in the 30-50m band (35s). Behaviours included hunting, and merlin were observed being flushed by a buzzard, and attacked by a hen harrier.

3.2.18 Moorhen

Moorhen (Green-listed) was observed twice during the winter survey season. This species was observed from all VP2 and VP4 in November 2021. Both observations were of one individual. One of these observations was within the SNH buffer, and the other was outside. Flights only occurred in the 0-30m height band (7s).

3.2.19 Mute Swan

Amber-listed mute swan was observed 20 times during VP surveys. Observations occurred from October to March, and mute swan were observed from all VPs except for VP5 and VP8. Quantities observed ranged from one to four birds. Flight occurred in all height bands, most frequently in the 0-30m band (0-30m = 5103s, 30-50m = 403s, 50-185m = 21s, >185m = 30s). Of the flightlines, 11 were inside the SNH buffer and six were both inside and outside the buffers, and three were only outside the buffer. Behaviours included flight over rivers and feeding, as well as moving between foraging areas.

3.2.20 Peregrine

Green-listed/Annex I peregrine was observed nine times. This species was observed from VP1, VP3, VP4, VP6, VP7 and VP9. Observations were made in September, December, January, February and March. Flight occurred in all height bands, most frequently above 185m (0-30m = 88s, 30-50m = 198s, 50-185m =110s, >185m = 200s). Of the flightlines, 6 were inside the SNH buffer and three were only outside the buffer. Behaviours included perching and fly throughs.

3.2.21 Pintail

Pintail (Amber-listed) was observed once during the winter survey season. For this observation, six individuals were observed from VP1, flying both inside and outside the buffer. Flight height was 0-30m for 10s and 30-50m for 20s.

3.2.22 Shoveler

Red-listed shoveler was observed once during VP surveys, on the 2nd of March 2022. A single drake (male) was observed flying at a height of 0-30m for 10 seconds.

3.2.23 Snipe

Red-listed snipe was observed 16 times. This species was observed from VP2, VP4, VP5, VP6, VP7, VP8 and VP9. Observations were made in September (during migration surveys), October, November, December, and February. Quantities ranged from one to 15. Flight was most frequently below 30m (0-30m = 172s, 30-50m = 198s, 50-185m =32s). All observations were inside the SNH buffer, with the exception of one which was outside.

3.2.24 Sparrowhawk

Sparrowhawk (Green-listed) was observed 16 times. This species was observed from VPs 1, 2, 3, 4, 6 and 8. Both males and females were observed, with quantities of between one and two. Observations of sparrowhawk were made in all months except February. Sparrowhawk was observed in all height bands, except for above 185m. It was most frequently observed in the 50-185m band (0-30m = 197s, 30-50m = 148s, 50-185m =209s). Of the flightlines recorded, 11 were inside the SNH buffer, two were outside the buffer, and three were both inside and outside. Birds were observed with prey, landing in trees, displaying and flying through the viewshed.

3.2.25 Teal

Amber-listed teal was observed 15 times during VP surveys. Observations were noted from VP1, 2, 4, 5, and 6 and occurred from November to March inclusive. Quantities ranged from 1 to 32 birds. Teal was most frequently observed flying below 30m (0-30m = 3759s, 30-50m = 163s, 50-185m =13s). Of the observations, 12 were inside the SNH buffer, two were outside, and one was both inside and outside the buffer.

3.2.26 Whooper Swan

Amber-listed/Annex I whooper swan was observed 63 times. This species was observed from all VPs except for VP11. Observations were made from November 2021 to March 2022 inclusive. Quantities ranged from 1 to 16 birds. This species was recorded flying in all height bands, most frequently below 30m (0-30m = 15474s, 30-50m = 808s, 50-185m = 683s, >185m = 235s). Of the observations, 49 were only within the SNH buffer, 6 were outside and eight were both inside and outside the buffer. Many of the observations were of birds flying over, but were sometimes seen landed in areas of flooded bog within the site. Two of these observations were not of flights as the individual remained on the ground, but areas they were occupying are provided in the figures (Appendix 3).

3.2.27 Wigeon

Wigeon (Amber-listed) was observed 15 times during the surveys. Observations occurred from VP1, 2 3 and 4, from November to March inclusive. Quantities observed ranged from 1 to 130 birds. Flight was most frequently in the 0-30m height band (0-30m = 3680s, 30-50m = 115s, 50-185m = 308s). Of the observed flights, nine were inside the SNH buffer, two were outside the buffer and four were both inside and outside the buffer.

3.3 Hinterland Survey

Hinterland surveys to establish occupancy within a 10 km radius of the site were carried out over seven dates during winter 2021/2022, and one date for autumn migration surveys. The survey schedule and locations of the Hinterland watches are shown in Table 2-1.

For site-specific Hinterland survey results see Appendix 4 of this report.

A total of three Annex I species were recorded during hinterland surveys: golden plover, little egret and whooper swan. A total of six Red-listed species were observed: golden plover, goldeneye, grey wagtail, lapwing, shoveler and snipe. A further 11 Amber-listed species were observed: black-headed gull, coot, cormorant, goldcrest, great crested grebe, mallard, mute swan, teal, tufted duck, whooper swan and wigeon. All observed species, including green listed species are included in Table 3-2.

For site-specific Hinterland survey results see Appendix 4 of this report.

Species of conservation concern that are known to be potentially vulnerable to wind farm developments will be discussed in more detail in this section. Species have been selected for detailed discussion based on conservation status, vulnerability to wind farm developments and if species sightings have been confirmed on or near the proposed Wind Farm site, which will indicate potential links between species recorded at the proposed site and the surrounding environment.

3.3.1 Black-Headed Gull

This Amber-listed species was seen twice times during hinterland surveys, with observations made during November 2021. Observations were made from the following hinterland vantage points (HVPs): HVP7 (Lanesborough Bridge, Lough Ree, 0.9 km west), and HVP 11 (Erra and Derryhanee, River Shannon, 2.2km north). These HVPs are to the west and north of the proposed site, in the vicinity of Lough Ree and the River Shannon. The quantity of birds counted in these observations ranged from one to four.

3.3.2 Buzzard

Buzzard (Green-listed) was observed on nine occasions during the hinterland surveys. Buzzard was observed from the following hinterland vantage points: from HVP4 (Fortwilliam Turlough, 3.4 km west), HVP8 (Cullaghy, Lough Ree, 0.9km west), HVP12 (Derrycashel, River Shannon, 3.3km north), HVP16 (Camlin River Complex, 3.5km north), HVP17 (N5 Bridge over Camlin Park), HVP19 (Richmond Bridge, 8.9km north-east), HVP20 (Cloondara, Royal Canal, 3.1km north), and HVP21 (Begnagh Bridge, Royal Canal, 2.1km north). All observations were of individuals, except for the sighting at HVP4 on the 30th of September, where two buzzards were seen together.

3.3.3 Common Coot

Coot (Amber-listed) was observed 10 times during the hinterland surveys. Quantities ranged from 1 to 20, and averaging 4 individuals. Observations of coot occurred from late September 2021 to March 2022, and were recorded from HVP4 (Fortwilliam Turlough, 3.4km west), HVP5 (Incharmadermot Island, Lough Ree, 5.1km west), HVP6 (Cureen, Lough Ree, 2.4km west), HVP8 (Cullaghy, Lough Ree, 2.5km west), HVP9 (Gardenstown, Lough Ree, 4.6km west) and HVP10 (Cloonmustra, River Shannon, 1km north-west). These Hinterland Vantage Points (HVPs) all surround Lough Ree SPA (004064), which is a protected site for coot.

3.3.4 Cormorant

Cormorant (Amber-listed) were recorded three times during the hinterland surveys, with quantities ranging from one to three individuals. This species was observed during late September and November 2021. Sightings occurred at the following hinterland vantage points: HVP6 (Cureen, Lough Ree, 2.4km west), HVP9 (Gardenstown, Lough Ree, 4.6 km west), HVP15 (Tarmonbarry Lock, 3.5km north). These hinterland sites are in the vicinity of either Lough Ree or the River Shannon

3.3.5 Goldcrest

Amber-listed goldcrest was observed on three occasions, all in March 2022. Quantities ranged between 1 and 2 birds. These observations occurred at HVP4 (Fortwilliam Turlough, 3.4km west), HVP9 (Gardenstown, Lough Ree, 4.6km west) and HVP12 (Derrycashel, River Shannon, 3.3km north).

3.3.6 Golden Plover

Golden plover (Red-listed/Annex I) was observed once during the hinterland surveys. In November 2021, golden plover was observed from HVP4 (Fortwilliam Turlough, 3.4km west). Two birds were counted during this observation.

3.3.7 Goldeneye

Goldeneye (Red-listed) was observed twice during the hinterland surveys. In September 2021, during migration surveys, two goldeneye were observed from HVP8 (Cullaghy, Lough Ree, 2.5km west). In October 2021, 18 goldeneye were counted from this hinterland vantage point. This hinterland vantage point is at Lough Ree SPA (004064), which is a protected site for goldeneye.

3.3.8 Great Crested Grebe

Over the survey period, eight observations were made of great-crested grebe (Amber-listed). Sightings of this species occurred in September, October, November and February, and numbers per observation ranged from 1 to 7 (average = 3). These observations were made from HVP4 (Fortwilliam Turlough, 3.4km west), HVP5 (Incharmadermot Island, Lough Ree, 5.1km west), HVP6 (Cureen, Lough Ree, 2.4km west), HVP8 (Cullaghy, Lough Ree, 2.5km west), and HVP9 (Gardenstown, Lough Ree, 4.6km west).

3.3.9 Grey Wagtail

Red-listed grey wagtail was observed on once during hinterland surveys. This observation was of a single bird during the migration surveys. This observation was from HVP19 (Richmond Bridge, 8.9km north-east).

3.3.10 Lapwing

Overall, seven sightings of Red-listed lapwing were made during the hinterland surveys. Observations were made in September, October and November 2021 as well as February 2022. Lapwing were observed from HVP4 (Fortwilliam Turlough, 3.4km west), from HVP8 (Cullaghy, Lough Ree, 2.5km west), HVP11 (Erra & Derryhanee, River Shannon, 2.2km north) and HVP12 (Derrycashel, River Shannon, 3.3km north) and. Groups ranging from 1 to 260 (mean = 74) were observed September, October, November 2021 and February 2022. HVP8 is at Lough Ree SPA (004064), which is a protected site for lapwing.

3.3.11 Mallard

Mallard (Amber-listed) was observed on 31 occasions. Sightings were made during all surveyed months. Mallard was observed from HVP1 (Pake Bridge, Royal Canal, 4.8km south-east), HVP2 (Foygh Bridge, Royal Canal, 3.4km SE), HVP4 (Fortwilliam Turlough, 3.4km west), HVP5 (Incharmadermot Island, Lough Ree, 5.1km west), HVP6 (Cureen, Lough Ree, 2.4km west), HVP7 (Lanesborough Bridge, Lough Ree, 0.9 km west), HVP8 (Cullaghy, Lough Ree, 2.5km west),HVP9 (Gardenstown, Lough Ree, 4.6km west), HVP10 (Cloonmustra, River Shannon, 1km north-west), HVP11 (Erra & Derryhanee, River Shannon, 2.2km north), HVP14 (Tarmonbarry Bridge, 3.9km north), and HVP16 (Camlin River Complex, 3.5km north).

A number of these HVPs are located on the shores of Lough Ree SPA, which is designated for mallard. Counts of this species ranged from 1 to 30, with an average count of 7.

3.3.12 Mute Swan

Mute swan (Amber-listed) was observed species 39 times during the hinterland surveys. Observations occurred in all months and were evenly distributed across those months. Counts ranged from 1 to 20, with an average count of 6 per observation. Sightings occurred at the following HVPs: HVP4 (Fortwilliam Turlough, 3.4km W), HVP5 (Incharmadermot Island, Lough Ree, 5.1km west), HVP6 (Cureen, Lough Ree, 2.4km west), HVP7 (Lanesborough Bridge, Lough Ree, 0.9 km west), HVP8 (Cullaghy, Lough Ree, 2.5km west), HVP9 (Gardenstown, Lough Ree, 4.6km west), HVP10 (Cloonmustra, River Shannon, 1km north west), HVP11 (Erra & Derryhanee, River Shannon, 2.2km N), HVP12 (Derrycashel, River Shannon, 3.3km north), HVP15 (Tarmonbarry Lock, 3.5km north), HVP16 (Camlin River Complex, 3.5km north), HVP18 (Fallan Bridge, 2km east), and HVP21 (Begnagh Bridge, Royal Canal, 2.1km north).

3.3.13 Shoveler

Shoveler (Red-listed) was recorded once during the hinterland surveys. During this observation, 18 birds were observed from HVP4 (Fortwilliam Turlough, 3.4km west), on the 12th of November 2021.

3.3.14 Snipe

Snipe (Red-listed) was recorded once during the hinterland surveys. In November 2021, three snipe were observed from HVP4 (Fortwilliam Turlough, 3.4km west).

3.3.15 Teal

Amber-listed teal was observed 12 times during the hinterland surveys. Observations occurred in all surveyed months, with quantities ranging from 5 to 48 birds. Teal was observed at the following hinterland vantage points: HVP4 (Fortwilliam Turlough, 3.4km west), HVP5 (Incharmadermot Island, Lough Ree, 5.1km west), HVP7 (Lanesborough Bridge, Lough Ree, 0.9 km west) from HVP8 (Cullaghy, Lough Ree, 2.5km west) on the 9th of September 2021. Some of these sites are within the Lough Ree SPA, which lists teal as a Special Conservation Interest.

3.3.16 Tufted Duck

A total of 15 observations were made of the Amber-listed tufted duck. Observations were made at the following HVPs, which are in the vicinity of Lough Ree SPA, which is designated for tufted duck: HVP4 (Fortwilliam Turlough, 3.4km west), HVP5 (Incharmadermot Island, Lough Ree, 5.1km west), HVP8 (Cullaghy, Lough Ree, 2.5km west) and HVP9 (Gardenstown, Lough Ree, 4.6km west). Counts for this species ranged from 1 to 55 individuals. Observations occurred during all months. Some of these sites are within or near the Lough Ree SPA, which lists tufted duck as a Special Conservation Interest.

3.3.17 Whooper Swan

Amber-listed/Annex I whooper swan was observed three times from HVP4 (Fortwilliam Turlough, 3.4km west). This species was observed in October, November 2021 and January 2022. Quantities ranged from 2 to 32.

3.3.18 Wigeon

There were 17 observations of wigeon (Red-listed) during the hinterland surveys. Quantities observed ranged from 2 to 210. This species was observed in all survey months. Observations occurred from the following HVPs: HVP4 (Fortwilliam Turlough, 3.4km west), HVP5 (Incharmadermot Island, Lough Ree, 5.1km west), HVP6 (Cureen, Lough Ree, 2.4km west), HVP8 (Cullaghy, Lough Ree, 2.5km west), HVP9 (Gardenstown, Lough Ree, 4.6km west) and HVP11 (Erra & Derryhanee, River Shannon, 2.2km N). Some of these hinterland vantage points are near or within Lough Ree SPA, which lists wigeon as a Special Conservation Interest.

Table 3-2: Bird species recorded during hinterland surveys in winter 2021/2022 and during migration surveys in September 2021[3]

Common Name	Scientific Name	Conservation Status	
		BoCCI*	Annex I**
Black-headed Gull	*Chroicocephalus ridibundus*	Amber	No
Buzzard	*Buteo buteo*	Green	No
Coot	*Fulica atra*	Amber	No
Cormorant	*Phalacrocorax carbo*	Amber	No
Goldcrest	*Regulus regulus*	Amber	No
Golden Plover	*Pluvialis apricaria*	Red	**Yes**
Goldeneye	*Bucephala clangula*	Red	No
Great Black-backed Gull	*Larus marinus*	Green	No
Great Crested Grebe	*Podiceps cristatus*	Amber	No
Grey Heron	*Ardea cinerea*	Green	No
Grey Wagtail	*Motacilla cinerea*	Red	No
Lapwing	*Vanellus vanellus*	Red	No
Little Egret	*Egretta garzetta*	Green	**Yes**
Little Grebe	*Tachybaptus ruficollis*	Green	No
Mallard	*Anas platyrhynchos*	Amber	No
Moorhen	*Gallinula chloropus*	Green	No
Mute Swan	*Cygnus olor*	Amber	No
Shoveler	*Anas clypeata*	Red	No
Snipe	*Gallinago gallinago*	Red	No
Teal	*Anas crecca*	Amber	No

[3] Colours refers to the conservation status of the species according to Birds of Conservation Concern in Ireland. Species in bold refers to species listed on Annex I of the EU Birds Directive.

Common Name	Scientific Name	Conservation Status	
		BoCCI*	Annex I**
Tufted Duck	*Aythya fuligula*	Amber	No
Water Rail	*Rallus aquaticus*	Green	No
Whooper Swan	*Cygnus cygnus*	Amber	**Yes**
Wigeon	*Anas penelope*	Amber	No

* refers to the conservation status of the species according to Birds of Conservation Concern in Ireland

**refers to species listed on Annex I of the EU Birds Directive

3.4 Winter Bird Transect Surveys

For the winter season 2021, a total of 21 transects were chosen (Table 2.6). The results of the winter bird transect survey at Derryadd are shown in Table 3.4. A total of 29 species were recorded along the transects over the winter season.

A total of two Red-listed species were recorded: redwing and meadow pipit.

Redwing was observed in both February and March 2022. In February, redwing was observed from TR1, TR3, TR8, TR9, TR12, TR14 and TR17, with quantities ranging between 1 and 5. In March, redwing was observed from TR3 and TR11, with quantities of 2 to 4 redwing.

Similarly, meadow pipit was observed in both February and March 2022. In February, meadow pipit was observed from TR3, TR4, TR5, TR9, TR10, TR12, TR17, TR18, TR20. with quantities ranging between 1 and 2. In March, meadow pipit was observed from TR1, TR3, TR5, TR7, TR9, TR14, TR16, TR17, and TR20, with quantities of between 1 and 3.

A total of two Amber-listed species were recorded: linnet and starling.

Table 3-3: Results of winter bird transects surveys at Derryadd (TR1- TR21) in February and March 2022[4]

Species	TR1	TR2	TR3	TR4	TR5	TR6	TR7	TR8	TR9	TR10	TR11	TR12	TR13	TR14	TR15	TR16	TR17	TR18	TR19	TR20	TR21
Blackbird	14	8	9	2	5	2	2	7	6	7	2	9	7	6	7	10	9	8	4	7	1
Blue Tit	1	5	4	2	3	3		2		4		4	2	4	3	5	5	1	3		6
Bullfinch																					2
Chaffinch	6	5	8	2	6	3	3	4			14	7	7	5	4	14	10	7	9	2	10
Coal Tit														1							
Dunnock		4										1	2	2		2	2				1
Fieldfare									1			1									
Goldfinch					1						3		9		2			4	19		
Great Black-backed Gull				1																	
Great Spotted Woodpecker		1																			
Great Tit		2	1	1		4		2		1	3	1	2	1	2	8	4	2	1		3
Hooded Crow	1		3		4			4	4	2	1	1	2	1	4	1	4	3	5	1	2
Jackdaw					2	2						1			1						1
Lesser Redpoll									3		2		4				1		4		
Linnet									6		6	1	12		3		1	3	12		
Magpie	2		3		1	1	1	1	1	1	2		2	1	3	2	1	2			3
Mistle Thrush	1		2	2	2		2		1	1		5	2	1	1	1	2	1		2	1
Meadow Pipit	1		2	1	2		2		4	2		2		3		1	3	1		4	
Pheasant	1																	1			

[4] Colours refers to the conservation status of the species according to Birds of Conservation Concern in Ireland. Species in bold refers to species listed on Annex I of the EU Birds Directive

Species	TR1	TR2	TR3	TR4	TR5	TR6	TR7	TR8	TR9	TR10	TR11	TR12	TR13	TR14	TR15	TR16	TR17	TR18	TR19	TR20	TR21
Pied/White Wagtail				2			2		2	2	2			1						2	
Raven	1				2			1	1	1	1	1	1				1	3		1	
Redwing	1		7					1	1		4	1		1			1				
Reed Bunting	2		1	1	3	1		1		3	1	2	3		4	9	3	6	2	2	3
Robin	6	3	6	1	4	6	4	5	4	5	3	8	8	7	5	6	3	5	4	5	8
Rook	3	3	2			6	1	2		3		1		4	3		1		3		
Song Thrush	1	4	1	1	2	1		1		1	3	1	3	1	2	2	1	1	2		3
Starling		4	4		3						6		7		8		4		4	2	
Woodpigeon	3		1		4	3	2		1	6	2	2	3	3	5		4	2	2	7	3
Wren	11	10	10	8	7	6	5	10	8	9	4	5	12	7	7	12	10	5	7	7	8

4. DISCUSSION

In conclusion, FT carried out ornithological surveys at the proposed Derryadd Wind Farm during winter 2021/2022 and during the autumn migration period (late September 2021). Surveys took place between September 2021 and March 2022 inclusive. The following surveys were undertaken: vantage point surveys, winter bird transect surveys, and hinterland surveys. In total, there were 562 individual flight lines of 27 target species observed during the survey period. In total, 83 bird species were recorded during vantage point surveys. The activity patterns recorded show that the area is used by a wide variety of bird species.

Buzzard, sparrowhawk, kestrel and were noted to hunt within and around the proposed Wind Farm Site. Merlin and hen harrier were also observed hunting occasionally (once and twice respectively). The following species were observed foraging in or near the proposed Wind Farm site: mute swan, whooper swan, lapwing and mallard. This shows that the area is utilised by these species for foraging. Furthermore, buzzard, kestrel, golden plover and lapwing were recorded frequently during the surveys, indicating the presence of roost sites in the area but no roosts were confirmed in the site. Additionally, a variety of other species of conservation concern were heard and seen from the VPs. These included, bar-tailed godwit, golden plover, kingfisher, little egret, marsh harrier, peregrine, black-tailed godwit, curlew, grey wagtail, meadow pipit, redshank, redwing, shoveler, snipe, and yellowhammer.

Hinterland surveys were conducted to show the general wintering occupancy throughout the winter season in a c. 10km radius around the proposed site. During these hinterland surveys, 24 species of bird were noted. Of these, three species are protected under Annex I of the EU Birds directive, six are Red-listed, and 11 are Amber-listed.

The most important sites for wetland bird species of interest were HVP4 (Fortwilliam Turlough, 3.4km west), HVP8 (Cullaghy, Lough Ree, 2.5km west). These hinterland vantage points are near or within the Lough Ree SPA (004064). This SPA lists several Special Conservation Interests that were observed during on site during VP and transect surveys: whooper swan, wigeon, teal, mallard, shoveler, goldeneye, golden plover and lapwing. Other hinterland sites which support a variety of species of conservation interest are: HVP5 (Incharmadermot Island, Lough Ree, 5.1km west), HVP9 (Gardenstown, Lough Ree, 4.6km west), and HVP11 (Erra & Derryhanee, River Shannon, 2.2km north).

The above sites are all less than 5.1km from the proposed development. Many bird species that are vulnerable to wind farm developments are highly mobile and could potentially commute over the Wind Farm site, in the case of wetland birds, or utilise the proposed development site for feeding, in the case of raptors such as buzzard, kestrel and sparrowhawk.

The target bird species seen at both the hinterland surveys and VP surveys were black-headed gull, buzzard, cormorant, golden plover, great black-backed gull, great crested grebe, grey heron, lapwing, little egret, mallard, moorhen, mute swan, shoveler, snipe, teal, whooper swan, and wigeon. This demonstrates that these species are present both onsite and in the surrounding areas during the wintering season and that the local landscape provides suitable habitat for these species.

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FEHILY TIMONEY

CONSULTANTS IN ENGINEERING,
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APPENDIX 1

VP Survey Details

VP	Date	Start Time	End Time	Cloud (Oktas)	Visibility	Rain	Wind
1	24/09/2021	16:05	19:05	7	V.good	Dry	F1 WSW
1	27/09/2021	08:10	11:10	3	V.good	Dry	F1 SSW
2	20/09/2021	08:20	11:20	6	V.good	Dry	F2 W
2	20/09/2021	11:55	14:55	7	V.good	Dry	F2 W
3	28/09/2021	15:37	18:37	2	V.good	Dry	F1 WSW
3	29/09/2021	09:00	12:00	2	V.good	Dry	F1 W
4	23/09/2021	08:50	11:50	6	V.good	Dry	F1 WSW
4	23/09/2021	12:33	15:33	7	V.good	Dry	F1 W
5	20/09/2021	15:35	18:35	7	V.good	Dry	F2 W
5	21/09/2021	16:05	19:05	8	Good	Light showers	F2 SW
6	28/09/2021	08:20	11:20	3	V.good	Dry	F1 SSW
6	28/09/2021	12:00	15:00	3	V.good	Dry	F1 SSW
7	27/09/2021	11:45	14:45	4	V.good	Light showers	F1-2 SW
7	27/09/2021	15:25	18:25	4	V.good	Light showers	F1-2 SW
8	24/09/2021	08:55	11:55	7	V.good	Dry	F1 W
8	24/09/2021	12:30	15:30	7	V.good	Dry	F1 W
9	21/09/2021	08:45	11:45	7	V.good	Dry	F3 SW
9	21/09/2021	12:25	15:25	8	V.good	V. light showers	F3 SW
10	22/09/2021	08:47	11:47	7	V.good	Dry	F3 SW
10	22/09/2021	12:25	15:25	8	V.good	Dry	F4 SW
11	22/09/2021	16:05	19:05	8	V.good	Dry	F3 SW
11	23/09/2021	16:10	19:10	7	V.good	Dry	F1 SW
1	01/10/2021	11:20	14:20	4	V.good	Dry	F2 W
1	01/10/2021	07:45	10:45	2	V.good	Dry	F1-2 SW
2	28/10/2021	08:35	11:35	3	V.good	Dry	F2 S
2	28/10/2021	12:10	15:10	6	V.good	Light showers	F2 S
3	26/10/2021	08:20	11:20	8	V.good	Showers	F2 SSW
3	26/10/2021	12:00	15:00	8	V.good	Showers	F3 SSW
4	02/10/2021	08:00	11:00	4	V.good	Dry	F1 S
4	02/10/2021	11:45	14:45	5	V.good	Dry	F1 W
5	01/10/2021	15:05	18:05	6	V.good	Dry	F2 W
5	02/10/2021	15:20	18:20	5	V.good	Dry	F1 SSW
6	03/10/2021	08:00	11:00	8	V.good	Showers	F2 WSW
6	03/10/2021	11:34	14:34	8	V.good	Showers	F2 WSW
7	03/10/2021	15:05	18:05	8	V.good	Light showers	F1 W
7	27/10/2021	08:30	11:30	8	V.good	Showers	F2 S
8	27/10/2021	12:05	15:05	8	Good	Light rain/showers	F2 S
8	29/10/2021	08:40	11:40	5	V.good	Dry	F1 W

VP	Date	Start Time	End Time	Cloud (Oktas)	Visibility	Rain	Wind
9	25/10/2021	08:18	11:18	5	V.good	Dry	F2 SSW
9	29/10/2021	13:05	16:05	6	V.good	Dry	F1 SSW
10	20/10/2021	08:10	11:10	4	V.good	Dry	F1 WSW
10	25/10/2021	12:30	15:30	5	V.good	Dry	F1 SW
11	20/10/2021	11:45	14:45	5	V.good	Dry	F1 W
11	21/10/2021	15:15	18:15	6	V.good	Dry	F1 W
1	01/12/2021	08:20	11:20	4	Good	Showers	F3 NW
1	01/12/2021	11:20	14:20	4	Good	Showers	F3 NW
2	23/11/2021	08:15	11:15	8	Excellent	Dry	F0
2	23/11/2021	11:45	14:45	8	Excellent	Dry	F0
3	22/11/2021	09:15	12:15	0	Excellent	Dry	F0-1
3	22/11/2021	12:45	15:45	0	Excellent	Dry	F0-1
4	25/11/2021	08:00	11:00	3	Excellent	Dry	F1-2
4	25/11/2021	11:30	14:30	3	Excellent	Dry	F1-2
5	26/11/2021	08:00	11:00	6	Excellent	Occasional light showers	F3-4
5	26/11/2021	11:30	14:30	6	Excellent	Occasional light showers	F3-4
6	02/12/2021	09:10	12:10	4/8-7/8	Moderate	Dry	W F1-2
6	02/12/2021	12:40	15:40	7/8-8/8	Good-Poor	Light rain/showers	W F2
7	29/11/2021	10:45	13:45	8/8	Very good	Dry	W F2
7	29/11/2021	13:45	16:45	8/8	Very good	Dry	W F2
8	24/11/2021	09:00	12:00	7/8-3/8	Excellent	Showers then dry	NW F3
8	24/11/2021	12:30	15:30	3/8	Excellent	Dry/Drizzle	NW F3
9	19/11/2021	07:30	10:30	8/8	Good	Mist/Dry	SW F1
9	02/11/2021	08:20	11:20	5/8	Good	Dry	W F1
10	18/11/2021	11:00	14:00	8/8	Good	Dry	SE F2
10	18/11/2021	14:00	17:00	8/8	Good	Dry	SE F2
11	25/11/2021	08:50	11:50	2/8	Excellent	Dry	NW F3
11	25/11/2021	12:30	15:30	2/8	Good	Shower	NW F3
1	13/12/2021	09:30	12:30	7/8	Good	Light Drizzle	F1
1	13/12/2021	13:00	16:00	7/8	good	Light Drizzle	F1
2	14/12/2021	09:30	12:30	3/8	Good	Dry	F2
2	14/12/2021	13:00	16:00	3/8	Good	Dry	F2
3	13/12/2021	09:30	12:30	7/8	Moderate	Some drizzle	F2
3	13/12/2021	13:00	16:00	7/8	Moderate	Some drizzle	F2
4	15/12/2021	09:30	12:30	8/8	Good	Dry	F3
4	15/12/2021	13:00	16:00	8/8	Very good	Dry	F3
5	14/12/2021	13:00	16:00	7/8	Moderate	Dry	F2
5	14/12/2021	09:30	12:30	7/8	Good	Dry	F1

VP	Date	Start Time	End Time	Cloud (Oktas)	Visibility	Rain	Wind
6	16/12/2021	09:30	12:30	7/8	Moderate	Dry	F2
6	16/12/2021	13:00	16:00	7/8	Moderate	Dry	F2
7	15/12/2021	09:30	12:00	7/8	Moderate	Light Drizzle	F2
7	15/12/2021	13:00	16:00	6/8	Good	Dry	F2
8	27/12/2021	09:00	12:00	8/8	Moderate	Dry	F2
8	27/12/2021	13:00	16:00	4/8	Moderate	Light Drizzle	F2
9	16/12/2021	09:30	12:30	7/8	Good	Dry	F3
9	16/12/2021	13:00	14:00	7/8	Good	Dry	F3
10	27/12/2021	09:30	12:30	8/8	Moderate	Dry	F1
10	27/12/2021	13:00	16:00	8/8	Moderate	Dry	F1
11	28/12/2021	13:00	16:00	3/8	Excellent	Dry	F1
11	28/12/2021	09:30	12:30	3/8	Excellent	Dry	F1
1	07/01/2022	09:30	12:30	6/8	Good	Showers	F3
1	07/01/2022	13:00	16:00	7/8	Good	Showers	F3
2	17/01/2022	09:30	12:30	1/8	Excellent	Dry	F1
2	17/01/2022	13:00	16:00	1/8	Excellent	Dry	F1
3	18/01/2022	09:30	12:30	7/8	Good	Light Drizzle	F1
3	18/01/2022	13:00	16:00	7/8	Good	Light Drizzle	F1
4	24/01/2022	09:30	12:30	7/8	Good	Dry	F1
4	24/01/2022	13:00	16:00	7/8	Good	Dry	F1
5	25/01/2022	09:30	12:30	7/8	Moderate	Dry	F1
5	25/01/2022	13:00	16:00	7/8	Moderate	Dry	F2
6	24/01/2022	09:40	12:40	4/8	Good	Dry	F1
6	24/01/2022	13:10	16:10	4/8	Good	Dry	F1
7	06/01/2022	09:30	12:30	8/8	Moderate	Light Drizzle	F3
7	06/01/2022	13:00	16:00	8/8	Moderate	Light Drizzle	F3
8	11/01/2022	09:30	12:30	3/8	Good	Dry	F1
8	11/01/2022	13:00	16:00	3/8	Good	Dry	F1
9	12/01/2022	09:30	12:30	2/8	Very good	Dry	F1
9	12/01/2022	13:00	16:00	2/8	Very good	Dry	F1
10	17/01/2022	09:40	12:40	2/8	Good	Dry	F1
10	17/01/2022	13:10	16:10	2/8	Good	Dry	F1
11	18/01/2022	09:30	12:30	8/8	Moderate	Dry	F2
11	18/01/2022	13:00	16:00	8/8	Moderate	Light Rain	F2
1	01/02/2022	09:30	12:30	7/8	Good	Light Drizzle	F3
1	02/03/2022	13:00	16:00	7/8	Good	Light Drizzle-Dry	F3
2	03/02/2022	09:30	12:30	6/8	Excellent	Dry	F2
2	03/02/2022	13:00	16:00	6/8	Excellent	Dry	F2
3	02/02/2022	09:30	12:30	6/8	Good	Light Drizzle	F3
3	02/02/2022	13:00	16:00	7/8	Good	Dry	F3

VP	Date	Start Time	End Time	Cloud (Oktas)	Visibility	Rain	Wind
4	28/02/2022	09:30	13:00	2/8	Excellent	Dry	F1
4	28/02/2022	13:00	16:00	2/8	Excellent	Dry/Light Rain	F3
5	25/02/2022	09:30	12:30	6/8	Good	Dry	F1
5	25/02/2022	13:00	16:00	5/8	Good	Dry	F1
6	25/02/2022	09:30	12:30	7/8	Good	Dry	F2
6	25/02/2022	13:00	16:00	7/8	Good	Dry	F3
7	02/02/2022	09:40	12:40	8/8	Good	Dry	F2
7	02/02/2022	13:10	16:10	8/8	Good	Dry	F2
8	14/02/2022	09:15	12:15	6/8	Good	Showers	F4
8	14/02/2022	12:45	15:45	4/8	Good	Showers	F4
9	09/02/2022	09:15	12:15	4/8	Good	Dry	F3
9	09/02/2022	12:45	15:45	5/8	Good	Dry/Occasional Shower	F3
10	01/02/2022	09:40	12:40	8/8	Good	Drizzle	F2
10	01/02/2022	13:10	16:10	8/8	Good	Drizzle	F3
11	08/02/2022	09:30	12:30	8/8	Moderate	Drizzle	F3
11	08/02/2022	13:00	16:00	8/8	Moderate	Drizzle/Light Rain	F3
1	02/03/2022	09:30	12:30	8/8	Moderate	Heavy Drizzle	F2
1	02/03/2022	13:00	16:00	7/8	Good	Light Drizzle-Dry	F3
2	07/03/2022	09:30	12:30	6/8	Good	Dry	F3
2	07/03/2022	13:00	16:00	6/8	Good	Dry	F3
3	16/03/2022	09:30	12:30	1/8	Excellent	Dry	F1
3	16/03/2022	13:00	16:00	1/8	Excellent	Dry	F1
4	08/03/2022	09:30	12:30	7/8	Good	Dry	F4
4	08/03/2022	13:00	16:00	6/8	Good	Dry/Light Drizzle	F3
5	15/03/2022	09:30	12:30	7/8	Good	Dry	F2
5	15/03/2022	13:00	16:00	6/8	Good	Dry	F2
6	16/03/2022	09:30	12:30	3/8	Excellent	Dry	F1
6	16/03/2022	13:00	16:00	4/8	Excellent	Dry	F1
7	07/03/2022	09:35	12:35	8/8	Good	Dry	F3
7	07/03/2022	13:10	16:10	7/8	Good	Dry	F4
8	08/03/2022	09:40	12:40	8/8	Good	Heavy Showers	F3
8	08/03/2022	13:10	16:10	8/8	Good	Showers	F3
9	02/03/2022	09:40	12:40	8/8	Moderate	Drizzle	F3
9	02/03/2022	13:10	16:10	8/8	Moderate	Drizzle	F3
10	15/03/2022	09:45	12:45	8/8	Good	Dry	F1
10	15/03/2022	13:15	16:15	8/8	Good	Dry	F1
11	28/03/2022	09:30	12:30	1/8	Excellent	Dry	F1
11	28/03/2022	13:00	16:00	1/8	Excellent	Dry	F1

FEHILY TIMONEY

CONSULTANTS IN ENGINEERING,
ENVIRONMENTAL SCIENCE
& PLANNING

APPENDIX 2

Vantage Point Observations

VP no.	Flightline Number	Flightline Map	Date	Species	Time of Obs.	Inside/outside Buffer	Total Duration (s)	0-30m (s)	30 - 50m (s)	50-185m (s)	>185m (s)
2	1	8	20/09/2021	Mallard	08:52	in	24	24			
2	1	3	20/09/2021	Grey Heron	09:20	out	15	15			
2	1	1	20/09/2021	Buzzard	09:41	in	64	9	55		
2	1	6	20/09/2021	Lesser Black-backed Gull	10:04	in	143			143	
2	2	8	20/09/2021	Mallard	10:46	out	36	36			
2	2	6	20/09/2021	Lesser Black-backed Gull	11:08	out	48		48		
2	2	6	20/09/2021	Lesser Black-backed Gull	11:08	in	106		106		
2	3	8	20/09/2021	Mallard	12:09	out	37	37			
2	1	11	20/09/2021	Sparrowhawk	12:37	in	24	12	12		
2	2	3	20/09/2021	Grey Heron	13:06	out	16	16			
2	3	3	20/09/2021	Grey Heron	13:33	out	19	19			
2	1	2	20/09/2021	Cormorant	14:00	in	73		73		
2	1	2	20/09/2021	Cormorant	14:00	out	61		61		
2	2	1	20/09/2021	Buzzard	14:28	in	44		44		
5	3	1	20/09/2021	Buzzard	16:04	in	108	9	24	75	
5	1	10	20/09/2021	Snipe	16:47	in	33	17	16		
5	1	4	20/09/2021	Kestrel	17:15	in	205	73	102	30	
5	4	1	20/09/2021	Buzzard	17:57	in	47	6	41		
9	2	4	21/09/2021	Kestrel	09:13	in	363	26	27	310	
9	1	9	21/09/2021	Peregrine	09:46	in	51	8	43		
9	3	4	21/09/2021	Kestrel	10:33	in	144	7	15	122	
9	4	3	21/09/2021	Grey Heron	10:57	in	35	35			
9	5	1	21/09/2021	Buzzard	11:15	in	71		71		
9	4	4	21/09/2021	Kestrel	13:06	in	312		29	283	
9	6	1	21/09/2021	Buzzard	13:52	in	34	23	11		
9	5	4	21/09/2021	Kestrel	14:26	in	111		19	92	
9	6	4	21/09/2021	Kestrel	15:00	in	64		64		
5	7	1	21/09/2021	Buzzard	17:15	in	77		15	62	
5	7	4	21/09/2021	Kestrel	17:49	in	209	8	18	183	

VP no.	Flightline Number	Flightline Map	Date	Species	Time of Obs.	Inside/outside Buffer	Total Duration (s)	0-30m (s)	30 - 50m (s)	50-185m (s)	>185m (s)
5	8	1	21/09/2021	Buzzard	18:43	in	104			104	
10	8	4	22/09/2021	Kestrel	09:32	in	542	57	412	73	
10	9	4	22/09/2021	Kestrel	10:14	in	106	16	90		
10	5	3	22/09/2021	Grey Heron	10:53	in	21	21			
10	10	4	22/09/2021	Kestrel	11:20	in	75	61	14		
10	11	4	22/09/2021	Kestrel	13:09	in	222	26	180	16	
10	9	1	22/09/2021	Buzzard	14:14	in	35	8	27		
10	12	4	22/09/2021	Kestrel	15:00	in	17	17			
11	3	6	22/09/2021	Lesser Black-backed Gull	17:20	in	183			183	
11	13	4	22/09/2021	Kestrel	18:05	in	100	26	74		
11	10	1	22/09/2021	Buzzard	18:27	in	54	13	41		
4	11	1	23/09/2021	Buzzard	09:14	in	93	18	54	21	
4	2	2	23/09/2021	Cormorant	09:24	in	37	11	26		
4	4	6	23/09/2021	Lesser Black-backed Gull	09:38	in	165			165	
4	6	3	23/09/2021	Grey Heron	09:57	in	16	16			
4	1	7	23/09/2021	Little Egret	10:29	in	22	22			
4	2	10	23/09/2021	Snipe	10:50	in	41	21	20		
4	7	3	23/09/2021	Grey Heron	11:03	in	37	37			
4	2	7	23/09/2021	Little Egret	11:26	in	6	6			
4	4	8	23/09/2021	Mallard	11:44	in	69	69			
4	8	3	23/09/2021	Grey Heron	13:00	in	21	21			
4	3	10	23/09/2021	Snipe	13:13	in	15	15			
4	5	8	23/09/2021	Mallard	13:47	in	67	12	55		
4	12	1	23/09/2021	Buzzard	14:06	in	86		86		
4	4	10	23/09/2021	Snipe	14:24	in	29	19	10		
4	9	3	23/09/2021	Grey Heron	14:53	in	10	10			
4	3	7	23/09/2021	Little Egret	15:09	in	35	35			
4	10	3	23/09/2021	Grey Heron	15:21	in	12	12			
11	14	4	23/09/2021	Kestrel	17:11	in	364	111	173	80	

VP no.	Flightline Number	Flightline Map	Date	Species	Time of Obs.	Inside/outside Buffer	Total Duration (s)	0-30m (s)	30 - 50m (s)	50-185m (s)	>185m (s)
11	13	1	23/09/2021	Buzzard	18:00	in	79	10	69		
8	14	1	24/09/2021	Buzzard	09:25	in	83	7	76		
8	5	10	24/09/2021	Snipe	10:14	in	31	21	10		
8	5	6	24/09/2021	Lesser Black-backed Gull	10:29	in	199			199	
8	6	10	24/09/2021	Snipe	14:46	in	49	18	31		
1	11	3	24/09/2021	Grey Heron	16:52	in	162			162	
1	1	5	24/09/2021	Lapwing	17:06	out	36	36			
1	15	1	24/09/2021	Buzzard	17:24	in	52	11		41	
1	12	3	24/09/2021	Grey Heron	17:49	out	11	11			
1	6	8	24/09/2021	Mallard	18:10	out	17	17			
1	3	2	24/09/2021	Cormorant	18:37	in	33		33		
1	3	2	24/09/2021	Cormorant	18:37	out	65		65		
1	2	5	27/09/2021	Lapwing	08:33	out	45	12	33		
1	7	8	27/09/2021	Mallard	09:19	in	15	15			
1	7	8	27/09/2021	Mallard	09:19	out	31	31			
1	2	11	27/09/2021	Sparrowhawk	09:48	out	22	22			
1	13	3	27/09/2021	Grey Heron	10:12	out	19	19			
1	4	2	27/09/2021	Cormorant	10:50	in	152			152	
1	16	1	27/09/2021	Buzzard	10:56	in	63		63		
1	14	3	27/09/2021	Grey Heron	11:05	out	17	17			
7	17	1	27/09/2021	Buzzard	12:39	in	66	14	52		
7	15	4	27/09/2021	Kestrel	13:42	in	307	94	102	111	
7	16	4	27/09/2021	Kestrel	16:14	in	225	89	76	60	
7	17	4	27/09/2021	Kestrel	16:55	in	102	49	53		
6	3	11	28/09/2021	Sparrowhawk	09:02	in	101	12	10	79	
6	15	3	28/09/2021	Grey Heron	09:52	in	31	31			
6	18	4	28/09/2021	Kestrel	10:17	in	222	102	63	57	
6	18	1	28/09/2021	Buzzard	10:55	in	58	8	50		
6	19	4	28/09/2021	Kestrel	11:04	in	177	16	151		

VP no.	Flightline Number	Flightline Map	Date	Species	Time of Obs.	Inside/outside Buffer	Total Duration (s)	0-30m (s)	30 - 50m (s)	50-185m (s)	>185m (s)
6	4	11	28/09/2021	Sparrowhawk	12:21	in	73	60	13		
6	19	1	28/09/2021	Buzzard	12:58	in	103		103		
6	20	4	28/09/2021	Kestrel	13:44	in	66	14	52		
6	21	4	28/09/2021	Kestrel	14:35	in	220	52	168		
3	20	1	28/09/2021	Buzzard	16:04	in	69	15	54		
3	8	8	28/09/2021	Mallard	16:11	in	33	33			
3	22	4	28/09/2021	Kestrel	16:50	in	117	18	99		
3	16	3	28/09/2021	Grey Heron	17:15	in	15	15			
3	23	4	28/09/2021	Kestrel	18:00	in	78	30	48		
3	24	4	29/09/2021	Kestrel	09:37	in	172	55	67	50	
3	21	1	29/09/2021	Buzzard	10:11	in	44	12	32		
3	25	4	29/09/2021	Kestrel	11:06	in	58	20	38		
3	17	3	29/09/2021	Grey Heron	11:30	in	29	29			
1	3	28	01/10/2021	Lapwing	08:12	out	53	12	41		
1	5	16	01/10/2021	Cormorant	08:50	in	109			109	
1	22	14	01/10/2021	Buzzard	09:22	in	70	11	59		
1	18	21	01/10/2021	Grey Heron	09:43	out	15	15			
1	9	31	01/10/2021	Mallard	10:10	out	38	38			
1	19	21	01/10/2021	Grey Heron	11:55	out	17	17			
1	6	16	01/10/2021	Cormorant	12:08	in	202			202	
1	23	14	01/10/2021	Buzzard	12:30	in	89	19	70		
1	4	28	01/10/2021	Lapwing	13:14	out	55	33	22		
1	20	21	01/10/2021	Grey Heron	13:45	out	23	23			
1	10	31	01/10/2021	Mallard	14:02	in	30	30			
1	10	31	01/10/2021	Mallard	14:02	out	47	47			
1	5	41	01/10/2021	Sparrowhawk	14:15	out	10	10			
5	4	30	01/10/2021	Little Egret	16:10	in	36	36			
5	24	14	01/10/2021	Buzzard	16:40	in	79	8	71		
5	26	26	01/10/2021	Kestrel	17:13	in	134	8	20	106	

VP no.	Flightline Number	Flightline Map	Date	Species	Time of Obs.	Inside/outside Buffer	Total Duration (s)	0-30m (s)	30 - 50m (s)	50-185m (s)	>185m (s)
5	21	21	01/10/2021	Grey Heron	17:42	in	22	22			
4	25	14	02/10/2021	Buzzard	08:35	in	53		53		
4	7	16	02/10/2021	Cormorant	08:53	in	98			98	
4	5	30	02/10/2021	Little Egret	09:29	in	34	34			
4	22	21	02/10/2021	Grey Heron	10:10	in	18	18			
4	11	31	02/10/2021	Mallard	10:22	in	77	77			
4	7	40	02/10/2021	Snipe	10:43	in	15	15			
4	6	30	02/10/2021	Little Egret	12:06	in	35	35			
4	23	21	02/10/2021	Grey Heron	12:39	in	29	29			
4	24	21	02/10/2021	Grey Heron	13:04	in	7	7			
4	12	31	02/10/2021	Mallard	13:22	in	25	25			
4	5	28	02/10/2021	Lapwing	14:14	in	63	12	51		
5	26	14	02/10/2021	Buzzard	15:55	in	106	6	12	88	
5	25	21	02/10/2021	Grey Heron	16:26	in	57	57			
5	8	40	02/10/2021	Snipe	17:18	in	29	15	14		
6	27	26	03/10/2021	Kestrel	08:47	in	186	8	26	152	
6	27	14	03/10/2021	Buzzard	09:18	in	54	14	40		
6	6	41	03/10/2021	Sparrowhawk	09:50	in	26	26			
6	28	26	03/10/2021	Kestrel	10:15	in	66	19	47		
6	26	21	03/10/2021	Grey Heron	10:37	in	124	124			
6	29	26	03/10/2021	Kestrel	12:06	in	166	19	54	93	
6	28	14	03/10/2021	Buzzard	12:54	in	77	21	56		
6	30	26	03/10/2021	Kestrel	13:48	in	102			102	
7	27	21	03/10/2021	Grey Heron	16:22	in	31	31			
7	31	26	03/10/2021	Kestrel	16:58	in	79				79
10	32	26	20/10/2021	Kestrel	09:12	in	101	16	33	52	
10	28	21	20/10/2021	Grey Heron	10:00	in	27	27			
11	33	26	20/10/2021	Kestrel	14:01	in	202	58	105	59	
11	34	26	20/10/2021	Kestrel	15:47	in	154	22	34	98	

VP no.	Flightline Number	Flightline Map	Date	Species	Time of Obs.	Inside/outside Buffer	Total Duration (s)	0-30m (s)	30 - 50m (s)	50-185m (s)	>185m (s)
11	35	26	21/10/2021	Kestrel	14:33	in	77			77	
9	36	26	25/10/2021	Kestrel	09:10	in	144		18	126	
9	29	14	25/10/2021	Buzzard	10:17	in	60		60		
10	37	26	25/10/2021	Kestrel	12:35	in	117			117	
10	38	26	25/10/2021	Kestrel	13:30	in	88	9	11	68	
10	29	21	25/10/2021	Grey Heron	15:04	in	24	24			
3	1	18	26/10/2021	Golden Plover	08:33	in	47	37	0		
3	30	21	26/10/2021	Grey Heron	09:03	in	30	30			
3	2	18	26/10/2021	Golden Plover	09:51	in	72	37	35		
3	30	14	26/10/2021	Buzzard	10:15	in	63	14	49		
3	39	26	26/10/2021	Kestrel	10:42	in	118	19	22	77	
3	31	21	26/10/2021	Grey Heron	12:52	in	16	16			
3	3	18	26/10/2021	Golden Plover	13:25	in	80	5	13	62	
3	40	26	26/10/2021	Kestrel	14:14	in	172	12	65	95	
7	32	21	27/10/2021	Grey Heron	09:51	in	44	44			
8	31	14	27/10/2021	Buzzard	14:00	in	72	10	31	31	
2	1	36	28/10/2021	Mute Swan	08:51	in	10				
2	2	36	28/10/2021	Mute Swan	08:51	out	52				
2	32	14	28/10/2021	Buzzard	09:22	in	34	24			
2	33	21	28/10/2021	Grey Heron	09:49	out	22				
2	6	28	28/10/2021	Lapwing	10:24	out	48				
2	6	28	28/10/2021	Lapwing	10:24	in	13				
2	13	31	28/10/2021	Mallard	11:02	out	27				
2	14	31	28/10/2021	Mallard	11:08	out	30				
2	7	28	28/10/2021	Lapwing	12:44	out	62	30	32		
2	15	31	28/10/2021	Mallard	13:30	in	11	11			
2	15	31	28/10/2021	Mallard	13:30	out	22	22			
2	34	21	28/10/2021	Grey Heron	14:10	out	19	19			
2	33	14	28/10/2021	Buzzard	14:22	in	55	5	50		

VP no.	Flightline Number	Flightline Map	Date	Species	Time of Obs.	Inside/outside Buffer	Total Duration (s)	0-30m (s)	30 - 50m (s)	50-185m (s)	>185m (s)
2	35	21	28/10/2021	Grey Heron	14:51	out	17	17			
9	41	26	29/10/2021	Kestrel	14:14	in	153	10	23	120	
9	34	14	29/10/2021	Buzzard	14:38	in	149	18	58	73	
9	36	21	29/10/2021	Grey Heron	15:07	in	167	10	157		
9	4	18	02/11/2021	Golden Plover	08:36	in	64	64			
9	1	43	02/11/2021	Whooper Swan	08:38	in	30		30		
9	9	40	02/11/2021	Snipe	08:40	in	12	12			
9	5	18	02/11/2021	Golden Plover	08:48	in	275	60	5	210	
9	2	43	02/11/2021	Whooper Swan	09:44	in	38	38			
9	7	30	02/11/2021	Little Egret	10:01	in	33	33			
9	3	43	02/11/2021	Whooper Swan	10:12	in	No data				
10	10	40	18/11/2021	Snipe	11:05	in	5	5			
10	8	30	18/11/2021	Little Egret	11:09	in	13	13			
10	42	26	18/11/2021	Kestrel	12:02	in	9	9			
10	35	14	18/11/2021	Buzzard	12:48	in	122		10	112	
10	16	31	18/11/2021	Mallard	13:11	in	51			51	
10	17	31	18/11/2021	Mallard	13:15	in	38			38	
10	4	43	18/11/2021	Whooper Swan	14:18	in/out	55	45	10		
9	5	43	19/11/2021	Whooper Swan	07:52	in	14	14			
9	6	18	19/11/2021	Golden Plover	08:00	in	109	89	20		
9	6	43	19/11/2021	Whooper Swan	08:02	in	31	31			
9	7	18	19/11/2021	Golden Plover	09:01	in	42	37	5		
9	8	18	19/11/2021	Golden Plover	09:26	in	126	66	10	50	
3	43	26	22/11/2021	Kestrel	09:37	in	26	26			
3	36	14	22/11/2021	Buzzard	09:53	in	1320	1320			
2	1	35	23/11/2021	Moorhen	08:15	out	5	5			
2	3	36	23/11/2021	Mute Swan	08:15	out	1200	1200			
2	1	46	23/11/2021	Wigeon	08:28	out	28	28			
2	37	21	23/11/2021	Grey Heron	08:38	out	38	38			

VP no.	Flightline Number	Flightline Map	Date	Species	Time of Obs.	Inside/outside Buffer	Total Duration (s)	0-30m (s)	30 - 50m (s)	50-185m (s)	>185m (s)
2	4	36	23/11/2021	Mute Swan	08:43	out	61	61			
2	18	31	23/11/2021	Mallard	08:44	in	22	22			
2	4	36	23/11/2021	Mute Swan	08:48	in	30	30			
2	1	42	23/11/2021	Teal	08:50	out	16	16			
2	19	31	23/11/2021	Mallard	08:52	in	14	14			
2	19	31	23/11/2021	Mallard	08:52	out	30	30			
2	1	12	23/11/2021	Black-headed Gull	09:01	out	52	52			
2	20	31	23/11/2021	Mallard	09:15	in	36	30			
2	1	20	23/11/2021	Great Crested Grebe	10:51	out	120	120			
2	38	21	23/11/2021	Grey Heron	11:00	out	62	62			
2	8	28	23/11/2021	Lapwing	11:06	out	42	42			
2	7	43	23/11/2021	Whooper Swan	12:35	out	65		65		
2	11	40	23/11/2021	Snipe	12:39	out	52			32	
2	5	36	23/11/2021	Mute Swan	12:51	in	20	20			
2	5	36	23/11/2021	Mute Swan	12:51	out	15	15			
2	5	36	23/11/2021	Mute Swan	12:51	out	10		10		
2	5	36	23/11/2021	Mute Swan	12:51	in	41	5	26		
2	1	46	23/11/2021	Wigeon		in	20	20			
8	44	26	24/11/2021	Kestrel	12:40	in	20			20	
8	9	28	24/11/2021	Lapwing	13:04	in	30		30		
8	45	26	24/11/2021	Kestrel	14:38	in	10	10			
8	8	43	24/11/2021	Whooper Swan	15:15	in	900	900			
4	9	43	25/11/2021	Whooper Swan	08:00	in	10800	10800			
4	10	43	25/11/2021	Whooper Swan	08:00	in	2640	2640			
4	11	43	25/11/2021	Whooper Swan	08:01	in	40	10	30		
4	12	43	25/11/2021	Whooper Swan	08:10	in	69	50	19		
4	2	35	25/11/2021	Moorhen	08:18	in	2	2			
4	2	42	25/11/2021	Teal	08:18	in	20	20			
4	21	31	25/11/2021	Mallard	08:19	in	3600	3600			

VP no.	Flightline Number	Flightline Map	Date	Species	Time of Obs.	Inside/outside Buffer	Total Duration (s)	0-30m (s)	30 - 50m (s)	50-185m (s)	>185m (s)
4	13	43	25/11/2021	Whooper Swan	08:44	in	64	60	14		
11	1	24	25/11/2021	Gull sp.	09:25	in	60		45	10	
11	1	24	25/11/2021	Gull sp.	09:25	out	5			5	
4	14	43	25/11/2021	Whooper Swan	09:29	in	27		27		
4	15	43	25/11/2021	Whooper Swan	09:47	in	72	72			
11	46	26	25/11/2021	Kestrel	09:48	in	15	5			
11	47	26	25/11/2021	Kestrel	10:00	in	45	5	40		
4	41	22	25/11/2021	Grey Heron	10:11	in	51	51			
4	16	43	25/11/2021	Whooper Swan	10:14	in	122	75	36		
11	39	21	25/11/2021	Grey Heron	10:47	in					
4	2	46	25/11/2021	Wigeon	10:50	in	3600	3600			
4	3	42	25/11/2021	Teal	10:50	in	3600	3600			
11	40	22	25/11/2021	Grey Heron	10:52	in	2	2			
4	17	43	25/11/2021	Whooper Swan	11:00	in	61	61			
4	10	28	25/11/2021	Lapwing	11:40	in	146	26	120		
4	6	36	25/11/2021	Mute Swan	12:10	in	3600	3600			
4	37	14	25/11/2021	Buzzard	12:51	in	1500	1500			
5	18	43	26/11/2021	Whooper Swan	09:23	in	15	15			
5	1	25	26/11/2021	Hen Harrier	09:23	in	72	72			
5	2	25	26/11/2021	Hen Harrier	09:34	in	23	23			
5	19	43	26/11/2021	Whooper Swan	10:16	in	5	5			
5	4	42	26/11/2021	Teal	10:44	in	48	8	40		
5	22	31	26/11/2021	Mallard	11:31	in	58	8	10	40	
5	5	42	26/11/2021	Teal	11:37	in	47	15	32		
5	6	42	26/11/2021	Teal	11:42	in	121	50	71		
5	23	31	26/11/2021	Mallard	11:42	in	121	50	71		
5	20	43	26/11/2021	Whooper Swan	11:48	in	29	9	20		
5	24	31	26/11/2021	Mallard	12:22	in	153	50	50	53	
5	21	43	26/11/2021	Whooper Swan	12:32	in	103		103		

VP no.	Flightline Number	Flightline Map	Date	Species	Time of Obs.	Inside/outside Buffer	Total Duration (s)	0-30m (s)	30 - 50m (s)	50-185m (s)	>185m (s)
5	9	30	26/11/2021	Little Egret	12:58	in	30		30		
5	38	14	26/11/2021	Buzzard	13:35	in	37		37		
7	22	43	29/11/2021	Whooper Swan	11:19	in	16	16			
7	42	22	29/11/2021	Grey Heron	12:36	in	32		32		
7	43	22	29/11/2021	Grey Heron	14:28	in	61	61			
7	23	43	29/11/2021	Whooper Swan	15:21	in	108	108			
7	39	14	29/11/2021	Buzzard	15:24	in	59	59			
7	40	14	29/11/2021	Buzzard	16:06	in	72	72			
1	24	43	01/12/2021	Whooper Swan	08:32	out	30	30			
1	11	28	01/12/2021	Lapwing	08:46	out	23	23			
1	12	28	01/12/2021	Lapwing	08:50	out	32	25	7		
1	7	36	01/12/2021	Mute Swan	09:05	out	71	60	11		
1	13	28	01/12/2021	Lapwing	09:18	out	16	16			
1	14	28	01/12/2021	Lapwing	09:20	out	26	19	7		
1	25	31	01/12/2021	Mallard	09:23	out	18		18		
1	25	43	01/12/2021	Whooper Swan	09:27	out	56		56		
1	15	28	01/12/2021	Lapwing	09:28	out	18	18			
1	16	28	01/12/2021	Lapwing	09:31	out	120	110	10		
1	26	43	01/12/2021	Whooper Swan	09:58	out	50		50		
1	26	31	01/12/2021	Mallard	10:01	out	13	13			
1	17	28	01/12/2021	Lapwing	10:17	out	102	5	25	72	
1	18	28	01/12/2021	Lapwing	11:40	out	58			58	
1	8	36	01/12/2021	Mute Swan	11:59	out	64	54	10		
1	41	14	01/12/2021	Buzzard	12:57	out	6	6			
1	19	28	01/12/2021	Lapwing	13:09	out	18	18			
1	20	28	01/12/2021	Lapwing	13:11	out	10	8	2		
1	21	28	01/12/2021	Lapwing	13:30	out	21	21			
1	42	14	01/12/2021	Buzzard	14:06	out	42			42	
6	43	14	02/12/2021	Buzzard	09:40	in	180		180		

VP no.	Flightline Number	Flightline Map	Date	Species	Time of Obs.	Inside/outside Buffer	Total Duration (s)	0-30m (s)	30 - 50m (s)	50-185m (s)	>185m (s)
6	44	14	02/12/2021	Buzzard	10:03	in	50	5	45		
6	45	14	02/12/2021	Buzzard	10:20	in	65	10	55		
6	2	37	02/12/2021	Peregrine	10:30	in	300	50			
6	48	26	02/12/2021	Kestrel	11:44	in	10		10		
6	27	43	02/12/2021	Whooper Swan	12:57	in	50	50			
6	46	14	02/12/2021	Buzzard	14:29	in	16	16			
6	10	30	02/12/2021	Little Egret	14:39	in	65	65			
1	28	43	13/12/2021	Whooper Swan	09:35	out	9		9		
1	28	43	13/12/2021	Whooper Swan	09:35	in	6	6			
1	22	28	13/12/2021	Lapwing	09:42	out	8		8		
1	22	28	13/12/2021	Lapwing	09:42	in	292	5	25	272	
1	9	18	13/12/2021	Golden Plover	09:46	out	18			18	
1	9	18	13/12/2021	Golden Plover	09:46	in	300	5	3	292	
1	29	43	13/12/2021	Whooper Swan	09:55	in	6	3	3		
1	29	43	13/12/2021	Whooper Swan	09:55	out	9		9		
1	3	46	13/12/2021	Wigeon	10:00	in	32	5	15	12	
1	3	46	13/12/2021	Wigeon	10:01	out	9			9	
1	4	46	13/12/2021	Wigeon	10:12	in	14	4	2	8	
1	4	46	13/12/2021	Wigeon	10:12	out	8			8	
1	7	42	13/12/2021	Teal	10:13	in	15	2	5	3	
1	7	42	13/12/2021	Teal	10:13	out	10			10	
1	27	31	13/12/2021	Mallard	10:30	out	3	3			
1	27	31	13/12/2021	Mallard	10:30	in	5	5			
1	5	46	13/12/2021	Wigeon	10:40	in	12	3	3	6	
1	5	46	13/12/2021	Wigeon	10:40	out	15			15	
1	28	31	13/12/2021	Mallard	10:55	out	15		5	10	
1	28	31	13/12/2021	Mallard	10:55	in	10	3	7		
1	9	36	13/12/2021	Mute Swan	11:05	in	12	3	3	6	
1	9	36	13/12/2021	Mute Swan	11:05	out	15			15	

VP no.	Flightline Number	Flightline Map	Date	Species	Time of Obs.	Inside/outside Buffer	Total Duration (s)	0-30m (s)	30 - 50m (s)	50-185m (s)	>185m (s)
3	30	43	13/12/2021	Whooper Swan	11:26	in	100	50	50		
3	31	44	13/12/2021	Whooper Swan	11:34	in	70	30	40		
1	29	32	13/12/2021	Mallard	11:35	out	8			8	
1	29	32	13/12/2021	Mallard	11:35	in	22			22	
3	11	30	13/12/2021	Little Egret	11:56	in	60	60			
3	6	46	13/12/2021	Wigeon	12:09	in	10	10			
3	30	32	13/12/2021	Mallard	12:11	in	50			50	
1	44	22	13/12/2021	Grey Heron	12:15	out	18			18	
1	44	22	13/12/2021	Grey Heron	12:15	in	7			7	
3	31	32	13/12/2021	Mallard	12:19	in	60		60		
3	3	37	13/12/2021	Peregrine	12:20	in	80	30	50		
1	44	22	13/12/2021	Grey Heron	12:21	out	8		7		
1	44	22	13/12/2021	Grey Heron	12:21	in	10	3	3	4	
3	32	32	13/12/2021	Mallard	13:14	out	30		30		
3	7	41	13/12/2021	Sparrowhawk	13:18	in	20	20			
3	7	46	13/12/2021	Wigeon	13:20	out	10			10	
3	12	30	13/12/2021	Little Egret	13:31	in	60	30	30		
3	32	44	13/12/2021	Whooper Swan	13:39	in	180				180
1	45	22	13/12/2021	Grey Heron	13:41	out	7		7		
1	45	22	13/12/2021	Grey Heron	13:41	in	10	3	3	4	
3	8	41	13/12/2021	Sparrowhawk	13:59	in	5	5			
3	47	14	13/12/2021	Buzzard	15:02	out	5			5	
3	33	44	13/12/2021	Whooper Swan	15:06	in	180			180	
2	33	32	14/12/2021	Mallard	09:40	in	15	10	5		
2	10	36	14/12/2021	Mute Swan	09:43	in	20	20			
2	34	44	14/12/2021	Whooper Swan	09:56	in	15		15		
2	34	32	14/12/2021	Mallard	10:10	in	10	10			
2	23	28	14/12/2021	Lapwing	10:25	in	35	35			
5	13	30	14/12/2021	Little Egret	10:27	out	60			60	

VP no.	Flightline Number	Flightline Map	Date	Species	Time of Obs.	Inside/outside Buffer	Total Duration (s)	0-30m (s)	30 - 50m (s)	50-185m (s)	>185m (s)
5	13	30	14/12/2021	Little Egret	10:28	in	15	5	10		
5	35	44	14/12/2021	Whooper Swan	10:30	out	60			60	
5	14	30	14/12/2021	Little Egret	10:40	out	10		10		
5	14	30	14/12/2021	Little Egret	10:40	in	15	5	10		
5	36	44	14/12/2021	Whooper Swan	10:43	out	20			20	
5	36	44	14/12/2021	Whooper Swan	10:43	in	60	5	5	50	
5	37	44	14/12/2021	Whooper Swan	11:04	out	7			7	
5	37	44	14/12/2021	Whooper Swan	11:04	in	89			89	
5	48	14	14/12/2021	Buzzard	11:30	out	7			7	
5	48	14	14/12/2021	Buzzard	11:30	in	83			83	
2	24	28	14/12/2021	Lapwing	13:41	in	20		20		
2	24	28	14/12/2021	Lapwing	13:41	out	40		40		
5	15	30	14/12/2021	Little Egret	13:56	out	10		10		
5	15	30	14/12/2021	Little Egret	13:56	in	16	5	11		
7	49	14	15/12/2021	Buzzard	10:31	out	15		10	5	
7	16	30	15/12/2021	Little Egret	10:39	in	20		20		
7	50	14	15/12/2021	Buzzard	11:15	in	10		10		
7	49	26	15/12/2021	Kestrel	11:27	in	380		20	360	
7	4	37	15/12/2021	Peregrine	11:30	in	100			100	
4	46	22	15/12/2021	Grey Heron	11:40	out	4		4		
4	46	22	15/12/2021	Grey Heron	11:40	in	11	4	7		
4	51	15	15/12/2021	Buzzard	11:41	in	60		60		
4	5	37	15/12/2021	Peregrine	12:25	out	7		7		
4	5	37	15/12/2021	Peregrine	12:25	in	25		25		
7	3	25	15/12/2021	Hen Harrier	13:30	in	600	500	100		
7	1	34	15/12/2021	Merlin	13:31	in	20	20			
7	52	15	15/12/2021	Buzzard	14:01	in	30		30		
7	17	30	15/12/2021	Little Egret	14:07	in	10	10			
7	12	40	15/12/2021	Snipe	14:15	in	5	5			

VP no.	Flightline Number	Flightline Map	Date	Species	Time of Obs.	Inside/outside Buffer	Total Duration (s)	0-30m (s)	30 - 50m (s)	50-185m (s)	>185m (s)
6	18	30	16/12/2021	Little Egret	09:47	in	10	10			
6	38	44	16/12/2021	Whooper Swan	09:58	in	5	5			
6	39	44	16/12/2021	Whooper Swan	10:07	in	30	30			
6	40	44	16/12/2021	Whooper Swan	10:19	in	20	5	15		
9	19	30	16/12/2021	Little Egret	10:28	in	15	3	12		
6	20	30	16/12/2021	Little Egret	10:33	in	10	10			
6	13	40	16/12/2021	Snipe	10:44	in	4	4			
6	4	25	16/12/2021	Hen Harrier	10:47	in	7	7			
6	9	41	16/12/2021	Sparrowhawk	10:53	in	20		20		
6	41	44	16/12/2021	Whooper Swan	11:07	in	15	5	10		
9	10	18	16/12/2021	Golden Plover	11:13	in	45	5	10	30	
9	11	18	16/12/2021	Golden Plover	11:50	out	7				7
9	11	18	16/12/2021	Golden Plover	11:50	in	233			233	
6	53	15	16/12/2021	Buzzard	11:57	in	130	30	100		
6	8	42	16/12/2021	Teal	12:03	in	3	3			
6	42	44	16/12/2021	Whooper Swan	12:20	in	30	15	15		
6	43	44	16/12/2021	Whooper Swan	12:29	in	20	10	10		
6	44	44	16/12/2021	Whooper Swan	12:29	in	60	40	20		
9	12	18	16/12/2021	Golden Plover	14:01	in	5	2	3		
8	10	41	27/12/2021	Sparrowhawk	09:40	in	20	20			
8	11	41	27/12/2021	Sparrowhawk	09:57	in	30			30	
10	21	30	27/12/2021	Little Egret	10:43	out	5	5			
10	21	30	27/12/2021	Little Egret	10:43	in	8	8			
10	13	18	27/12/2021	Golden Plover	10:47	in	15	5	10		
10	1	23	27/12/2021	Greylag Goose	12:25	in	20			20	
10	1	23	27/12/2021	Greylag Goose	12:25	out	7			7	
8	2	34	27/12/2021	Merlin	14:27	in	40	10	30		
11	14	18	28/12/2021	Golden Plover	09:22	in	30	10	20		
11	25	28	28/12/2021	Lapwing	10:57	in	60	10		50	

VP no.	Flightline Number	Flightline Map	Date	Species	Time of Obs.	Inside/outside Buffer	Total Duration (s)	0-30m (s)	30 - 50m (s)	50-185m (s)	>185m (s)
11	15	18	28/12/2021	Golden Plover	11:09	in	20				
11	16	18	28/12/2021	Golden Plover	11:40	in	30			30	
11	5	25	28/12/2021	Hen Harrier	11:47	in	10	10			
11	3	34	28/12/2021	Merlin	11:49	in	15	15			
11	17	18	28/12/2021	Golden Plover	12:09	in	11			11	
7	4	34	06/01/2022	Merlin	10:36	out	10	10			
7	4	34	06/01/2022	Merlin	10:36	in	50	50			
1	26	28	07/01/2022	Lapwing	09:35	in	10		10		
1	45	44	07/01/2022	Whooper Swan	09:37	in	20		20	20	
1	18	18	07/01/2022	Golden Plover	09:44	in	20				
1	8	46	07/01/2022	Wigeon	10:16	in	30		30		
1	35	32	07/01/2022	Mallard	10:40	in	10	10			
1	9	42	07/01/2022	Teal	11:00	in	5	5			
1	27	28	07/01/2022	Lapwing	11:16	in	30			30	
1	6	37	07/01/2022	Peregrine	11:27	in	180				180
1	36	32	07/01/2022	Mallard	11:45	in	5		5		
1	54	15	07/01/2022	Buzzard	14:10	in	20		20		
1	46	45	07/01/2022	Whooper Swan	14:19	in	10		10		
1	10	42	07/01/2022	Teal	15:11	in	10	10			
1	28	28	07/01/2022	Lapwing	15:47	in	20	10	10		
8	47	45	11/01/2022	Whooper Swan	10:15	in	7			7	
8	47	45	11/01/2022	Whooper Swan	10:15	out	10			10	
8	6	25	11/01/2022	Hen Harrier	13:24	in	13			13	
9	48	45	12/01/2022	Whooper Swan	10:35	in	55				55
9	49	45	12/01/2022	Whooper Swan	10:50	in	10	10			
9	50	45	12/01/2022	Whooper Swan	13:13	in	35	5	10	10	
9	50	45	12/01/2022	Whooper Swan	13:13	out	10			10	
9	11	36	12/01/2022	Mute Swan	14:23	in	7	3			
2	30	29	17/01/2022	Lapwing	03:23	in	30		30		

VP no.	Flightline Number	Flightline Map	Date	Species	Time of Obs.	Inside/outside Buffer	Total Duration (s)	0-30m (s)	30 - 50m (s)	50-185m (s)	>185m (s)
10	19	18	17/01/2022	Golden Plover	09:45	in	15	5	5	5	
2	47	22	17/01/2022	Grey Heron	09:46	in	5	5			
2	29	28	17/01/2022	Lapwing	09:55	in	30		30		
10	7	25	17/01/2022	Hen Harrier	11:08	in	72	62	5	5	
10	7	25	17/01/2022	Hen Harrier	11:09	out	6		2	4	
10	20	18	17/01/2022	Golden Plover	11:09	in	13	2	2	4	
10	20	18	17/01/2022	Golden Plover	11:09	out	7	2	2	3	
2	12	36	17/01/2022	Mute Swan	11:13	in	40		40		
10	22	30	17/01/2022	Little Egret	11:24	in	14	6	8		
2	23	30	17/01/2022	Little Egret	11:33	in	30		30		
10	8	25	17/01/2022	Hen Harrier	11:53	in	78	69	5		
10	8	25	17/01/2022	Hen Harrier	11:53	out	4		4		
2	48	22	17/01/2022	Grey Heron	13:10	in	20	20			
10	50	26	17/01/2022	Kestrel	13:36	in	5	5			
2	12	41	17/01/2022	Sparrowhawk	14:13	in	10	10			
3	51	45	18/01/2022	Whooper Swan	09:57	in	30			30	
3	9	46	18/01/2022	Wigeon	11:19	in	15		15		
11	51	27	18/01/2022	Kestrel	11:30	out	5			5	
11	51	27	18/01/2022	Kestrel	11:30	in	25	5	5	15	
3	52	27	18/01/2022	Kestrel	14:44	in	30		30		
4	24	30	24/01/2022	Little Egret	10:03	in	20	20			
4	25	30	24/01/2022	Little Egret	11:33	in	40	20	20		
6	13	41	24/01/2022	Sparrowhawk	11:58	out	4		4		
6	13	41	24/01/2022	Sparrowhawk	11:58	in	28		28		
6	55	15	24/01/2022	Buzzard	11:59	out	6		6		
6	55	15	24/01/2022	Buzzard	11:59	in	26		26		
4	14	41	24/01/2022	Sparrowhawk	12:05	in	80			80	
6	56	15	24/01/2022	Buzzard	13:40	out	4		4		
6	56	15	24/01/2022	Buzzard	13:43	in	180		180		

VP no.	Flightline Number	Flightline Map	Date	Species	Time of Obs.	Inside/outside Buffer	Total Duration (s)	0-30m (s)	30 - 50m (s)	50-185m (s)	>185m (s)
6	5	34	24/01/2022	Merlin	13:43	in	3	3			
6	5	34	24/01/2022	Merlin	13:43	out	5		5		
5	52	45	25/01/2022	Whooper Swan	09:33	in	20	20			
5	11	42	25/01/2022	Teal	09:36	in	10	10			
5	53	27	25/01/2022	Kestrel	10:33	in	20	20			
1	21	19	01/02/2022	Golden Plover	09:35	out	10	10			
1	31	29	01/02/2022	Lapwing	09:35	out	30	10	20		
1	22	19	01/02/2022	Golden Plover	09:45	out	40			40	
1	53	45	01/02/2022	Whooper Swan	09:53	in	60			60	
1	23	19	01/02/2022	Golden Plover	09:57	out	60			60	
1	32	29	01/02/2022	Lapwing	09:57	out	80		40	40	
1	37	32	01/02/2022	Mallard	09:58	out	30		30		
1	12	42	01/02/2022	Teal	09:58	out	10	10			
1	10	46	01/02/2022	Wigeon	09:59	out	30	10	20		
1	54	45	01/02/2022	Whooper Swan	10:17	out	30		30		
1	24	19	01/02/2022	Golden Plover	10:35	out	20			20	
1	25	19	01/02/2022	Golden Plover	10:47	out	10	10			
1	33	29	01/02/2022	Lapwing	10:55	out	30				
1	26	19	01/02/2022	Golden Plover	11:30	out	300			300	
1	1	13	01/02/2022	Black-tailed Godwit	11:34	out	20		20		
10	38	32	01/02/2022	Mallard	11:39	in	32	16	16		
10	38	32	01/02/2022	Mallard	11:39	out	6		6		
1	1	38	01/02/2022	Pintail	12:12	out	20		20		
1	1	38	01/02/2022	Pintail	12:12	in	10	10			
1	39	32	01/02/2022	Mallard	12:24	out	15		15		
10	49	22	01/02/2022	Grey Heron	13:21	in	29		29		
10	49	22	01/02/2022	Grey Heron	13:21	out	11		11		
10	40	32	01/02/2022	Mallard	13:22	in	5	2	3		
10	40	32	01/02/2022	Mallard	13:22	out	9		9		

VP no.	Flightline Number	Flightline Map	Date	Species	Time of Obs.	Inside/outside Buffer	Total Duration (s)	0-30m (s)	30 - 50m (s)	50-185m (s)	>185m (s)
3	54	27	02/02/2022	Kestrel	09:57	in	30		30		
7	55	27	02/02/2022	Kestrel	10:25	in	24	24			
7	13	36	02/02/2022	Mute Swan	10:41	out	11				
7	13	36	02/02/2022	Mute Swan	10:41	in	16	16			
7	7	37	02/02/2022	Peregrine	11:08	in	28		28		
7	7	37	02/02/2022	Peregrine	11:09	out	17		17		
7	56	27	02/02/2022	Kestrel	11:11	in	23	5	18		
3	55	45	02/02/2022	Whooper Swan	11:14	in	20			20	
3	14	36	02/02/2022	Mute Swan	11:19	in	40		40		
7	57	27	02/02/2022	Kestrel	14:27	in	72	8	64		
2	15	36	03/02/2022	Mute Swan	09:57	in	40	10	30		
2	41	32	03/02/2022	Mallard	10:01	in	20		20		
2	41	32	03/02/2022	Mallard	10:01	out	30		30		
2	42	32	03/02/2022	Mallard	10:05	out	20	5	15		
2	34	29	03/02/2022	Lapwing	10:56	in	40			40	
2	50	22	03/02/2022	Grey Heron	10:59	in	10	10			
2	35	29	03/02/2022	Lapwing	11:18	in	60	20	40		
2	14	40	03/02/2022	Snipe	11:24	in	15	5	10		
2	9	25	03/02/2022	Hen Harrier	11:25	in	30	30			
2	57	15	03/02/2022	Buzzard	13:03	in	20		20		
2	15	40	03/02/2022	Snipe	14:24	in	20		20		
2	51	22	03/02/2022	Grey Heron	14:26	in	50		50		
11	43	32	08/02/2022	Mallard	10:39	in	6	6			
11	44	32	08/02/2022	Mallard	11:38	in	73	7	22	13	31
11	44	32	08/02/2022	Mallard	11:39	out	5				5
9	16	36	09/02/2022	Mute Swan	10:57	in	185		185		
9	58	15	09/02/2022	Buzzard	11:48	in	97		97		
9	58	15	09/02/2022	Buzzard	11:49	out	6		6		
8	52	22	14/02/2022	Grey Heron	11:26	in	19	19			

VP no.	Flightline Number	Flightline Map	Date	Species	Time of Obs.	Inside/outside Buffer	Total Duration (s)	0-30m (s)	30 - 50m (s)	50-185m (s)	>185m (s)
6	59	15	25/02/2022	Buzzard	09:35	out	7	7			
6	59	15	25/02/2022	Buzzard	09:35	in	32	26	6		
6	17	36	25/02/2022	Mute Swan	09:41	in	6	6			
6	56	45	25/02/2022	Whooper Swan	09:41	in	8	8			
6	57	45	25/02/2022	Whooper Swan	10:25	in	12	12			
5	60	15	25/02/2022	Buzzard	10:48	in	80		20	60	
6	58	45	25/02/2022	Whooper Swan	11:12	in	60	60			
6	61	15	25/02/2022	Buzzard	11:35	in	28			28	
6	61	15	25/02/2022	Buzzard	11:35	out	12			12	
5	61	15	25/02/2022	Buzzard	11:36	in	300		100	200	
6	59	45	25/02/2022	Whooper Swan	11:54	in	88	88			
5	58	27	25/02/2022	Kestrel	12:06	in	50			50	
5	62	15	25/02/2022	Buzzard	12:53	in	100			100	
5	27	19	25/02/2022	Golden Plover	12:58	in	80			80	
5	36	29	25/02/2022	Lapwing	12:58	in	60		60		
6	37	29	25/02/2022	Lapwing	14:05	in	28	5	23		
6	26	30	25/02/2022	Little Egret	14:14	in	15	5	25		
6	26	30	25/02/2022	Little Egret	14:14	out	12		12		
6	63	15	25/02/2022	Buzzard	15:10	out	22			22	
6	63	15	25/02/2022	Buzzard	15:11	in	73			73	
4	38	29	28/02/2022	Lapwing	09:40	in	30		30		
4	64	15	28/02/2022	Buzzard	09:42	in	60			60	
4	39	29	28/02/2022	Lapwing	11:00	in	100		10	90	
4	28	19	28/02/2022	Golden Plover	12:00	in	60			60	
4	13	42	28/02/2022	Teal	12:04	in	15		15		
4	27	30	28/02/2022	Little Egret	12:05	in	10		10		
4	16	40	28/02/2022	Snipe	12:09	in	30		30		
4	59	27	28/02/2022	Kestrel	14:00	In	100	10	90		
1	1	17	02/03/2022	Curlew	09:33	in	15		15		

VP no.	Flightline Number	Flightline Map	Date	Species	Time of Obs.	Inside/outside Buffer	Total Duration (s)	0-30m (s)	30 - 50m (s)	50-185m (s)	>185m (s)
1	11	46	02/03/2022	Wigeon	09:40	in	30		30		
9	60	45	02/03/2022	Whooper Swan	09:43	in	19	19			
1	45	32	02/03/2022	Mallard	09:46	in	60			60	
1	14	42	02/03/2022	Teal	10:05	in	5	5			
1	40	29	02/03/2022	Lapwing	10:11	in	5	5			
9	61	45	02/03/2022	Whooper Swan	10:31	in	56	9	47		
9	29	19	02/03/2022	Golden Plover	10:48	in	142	5	5	114	
9	29	19	02/03/2022	Golden Plover	10:51	out	18			18	
1	46	32	02/03/2022	Mallard	11:02	in	10		10		
1	30	19	02/03/2022	Golden Plover	11:09	in	100			100	
9	31	19	02/03/2022	Golden Plover	11:09	in	98			98	
9	18	36	02/03/2022	Mute Swan	11:25	in	38		38		
1	60	27	02/03/2022	Kestrel	11:42	in	50	10	10	30	
9	61	27	02/03/2022	Kestrel	11:48	in	64	64			
1	41	29	02/03/2022	Lapwing	13:01	out	20			20	
1	42	29	02/03/2022	Lapwing	13:01	out	20			20	
1	32	19	02/03/2022	Golden Plover	13:03	out	30		30		
1	33	19	02/03/2022	Golden Plover	13:03	out	30		30		
1	12	46	02/03/2022	Wigeon	13:19	in	20			20	
1	13	46	02/03/2022	Wigeon	13:19	in	20			20	
1	14	46	02/03/2022	Wigeon	13:30	in	100			100	
1	15	46	02/03/2022	Wigeon	13:30	in	100			100	
1	43	29	02/03/2022	Lapwing	13:44	out	25		25		
1	44	29	02/03/2022	Lapwing	13:44	out	25		25		
1	1	39	02/03/2022	Shoveler	13:45	in	10	10			
1	53	22	02/03/2022	Grey Heron	13:53	out	40			40	
1	54	22	02/03/2022	Grey Heron	13:53	out	40			40	
2	62	45	07/03/2022	Whooper Swan	10:37	in	60			60	
7	62	27	07/03/2022	Kestrel	10:57	in	337	337			

VP no.	Flightline Number	Flightline Map	Date	Species	Time of Obs.	Inside/outside Buffer	Total Duration (s)	0-30m (s)	30 - 50m (s)	50-185m (s)	>185m (s)
7	55	22	07/03/2022	Grey Heron	13:16	in	12	4	8		
2	45	29	07/03/2022	Lapwing	14:16	in	20			20	
4	47	32	08/03/2022	Mallard	10:21	in	10	10			
4	48	32	08/03/2022	Mallard	10:42	in	30			30	
4	63	45	08/03/2022	Whooper Swan	11:51	in	60	10	30	20	
4	63	45	08/03/2022	Whooper Swan	11:51	out	30			30	
4	15	42	08/03/2022	Teal	11:57	in	5	5			
4	49	32	08/03/2022	Mallard	12:04	in	10	10			
5	34	19	15/03/2022	Golden Plover	09:51	in	30		30		
5	50	32	15/03/2022	Mallard	10:09	in	40			40	
5	65	15	15/03/2022	Buzzard	10:39	in	80		10	70	
5	46	29	15/03/2022	Lapwing	10:39	in	10			10	
5	63	27	15/03/2022	Kestrel	10:40	in	40			40	
5	28	30	15/03/2022	Little Egret	10:56	in	20		20		
5	29	30	15/03/2022	Little Egret	10:57	in	30		30		
10	51	32	15/03/2022	Mallard	11:05	in	12			12	
10	51	32	15/03/2022	Mallard	11:05	out	15			15	
5	52	32	15/03/2022	Mallard	11:42	in	10		10		
5	47	29	15/03/2022	Lapwing	11:42	in	10	10			
10	66	15	15/03/2022	Buzzard	11:57	out	23			23	
10	66	15	15/03/2022	Buzzard	11:57	in	32		32		
10	66	15	15/03/2022	Buzzard	11:59	out	18		18		
5	35	19	15/03/2022	Golden Plover	13:21	in	50			50	
5	48	29	15/03/2022	Lapwing	13:23	in	15		15		
3	1	33	16/03/2022	Marsh Harrier	09:50	in	100	100			
3	49	29	16/03/2022	Lapwing	09:51	in	20		20		
3	30	30	16/03/2022	Little Egret	09:51	in	30		30		
3	53	32	16/03/2022	Mallard	09:51	in	15		15		
3	36	19	16/03/2022	Golden Plover	10:01	in	40			40	

VP no.	Flightline Number	Flightline Map	Date	Species	Time of Obs.	Inside/outside Buffer	Total Duration (s)	0-30m (s)	30 - 50m (s)	50-185m (s)	>185m (s)
3	67	15	16/03/2022	Buzzard	10:03	out	25				25
3	56	22	16/03/2022	Grey Heron	10:16	in	30	5	5	20	
6	68	15	16/03/2022	Buzzard	10:59	in	35			35	
6	68	15	16/03/2022	Buzzard	10:59	out	8			8	
6	69	15	16/03/2022	Buzzard	11:22	out	12				12
6	69	15	16/03/2022	Buzzard	11:22	in	32				32
3	10	25	16/03/2022	Hen Harrier	11:28	in	20	10	10		
3	8	37	16/03/2022	Peregrine	11:28	in	30			10	20
6	11	25	16/03/2022	Hen Harrier	11:35	out	7			7	
6	11	25	16/03/2022	Hen Harrier	11:36	in	42			42	
6	9	37	16/03/2022	Peregrine	12:24	out	5		5		
6	9	37	16/03/2022	Peregrine	12:24	in	23		23		
3	70	15	16/03/2022	Buzzard	13:02	in	30		30		
6	15	41	16/03/2022	Sparrowhawk	13:05	out	3		3		
6	15	41	16/03/2022	Sparrowhawk	13:05	in	28		8	20	
3	16	41	16/03/2022	Sparrowhawk	13:09	in	30		30		
3	16	41	16/03/2022	Sparrowhawk	13:09	out	20		20		
3	19	36	16/03/2022	Mute Swan	13:19	in	10		10		
3	57	22	16/03/2022	Grey Heron	15:14	in	25		25		
3	54	32	16/03/2022	Mallard	15:30	in	35		35		
11	37	19	28/03/2022	Golden Plover	10:10	in	20		20		
11	58	22	28/03/2022	Grey Heron	10:50	in	40	10	30		
11	20	36	28/03/2022	Mute Swan	10:52	in	30				30
11	71	15	28/03/2022	Buzzard	11:16	in	500		200	300	
11	64	27	28/03/2022	Kestrel	13:03	in	70	50	20		
	55	32	28/03/2022	Mallard	13:36	in	10	10			

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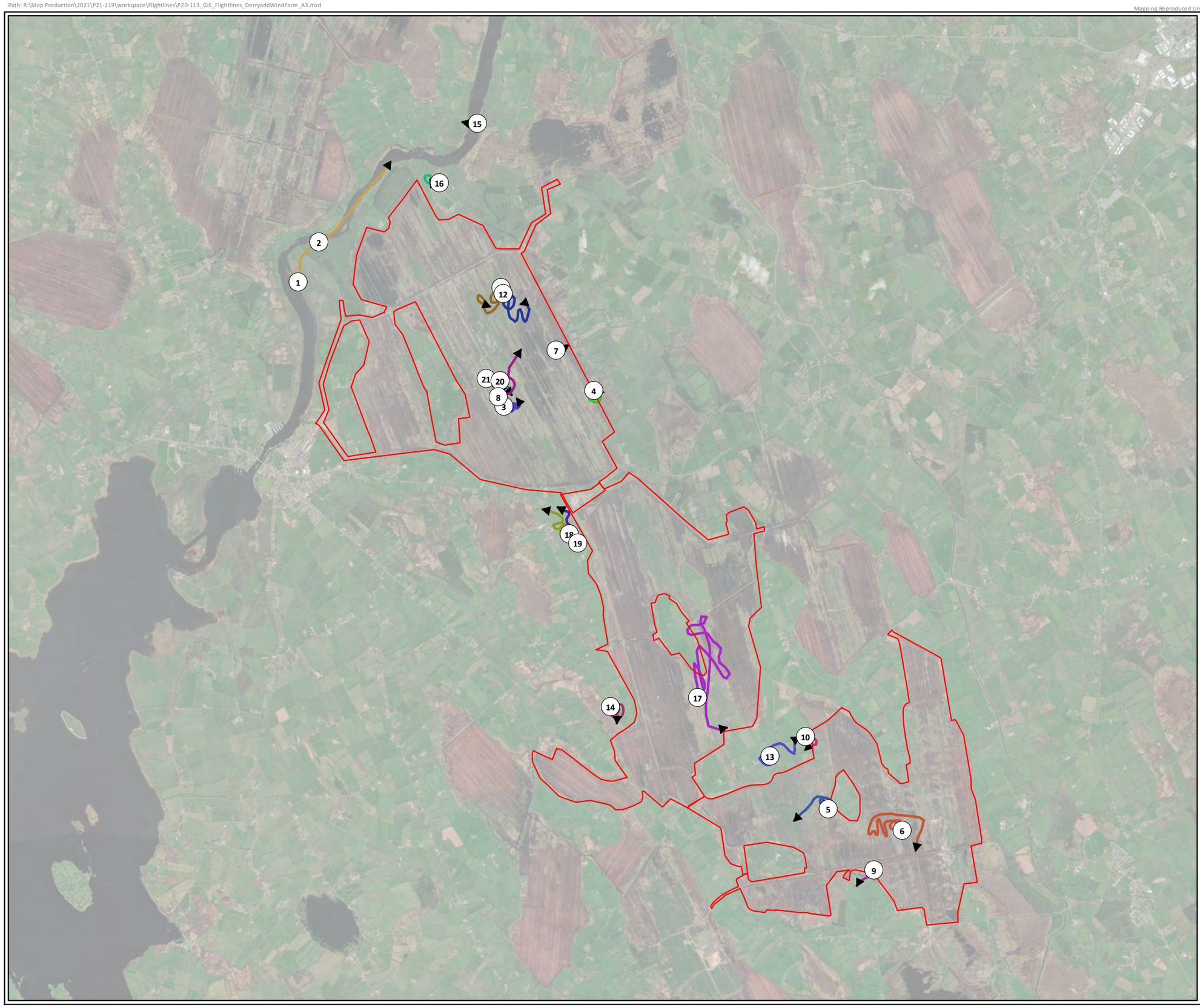
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ENVIRONMENTAL SCIENCE
& PLANNING

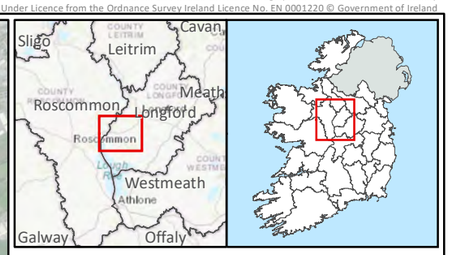
APPENDIX 3

Target Species Flight Line Maps

Path: R:\Map Production\2021\P21-119\workspace\Flightlines\P20-113_GIS_Flightlines_DerryaddWindFarm_A3.mxd

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Legend

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- 4, 20/09/2021, 17:57
- 5, 21/09/2021, 11:15
- 6, 21/09/2021, 13:52
- 7, 21/09/2021, 17:15
- 8, 21/09/2021, 18:43
- 9, 22/09/2021, 14:14
- 10, 22/09/2021, 18:27
- 11, 23/09/2021, 09:14
- 12, 23/09/2021, 14:06
- 13, 23/09/2021, 18:00
- 14, 24/09/2021, 09:25
- 15, 24/09/2021, 17:24
- 16, 27/09/2021, 10:56
- 17, 27/09/2021, 12:39
- 18, 28/09/2021, 10:55
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- 20, 28/09/2021, 16:04
- 21, 29/09/2021, 10:11

N W E S

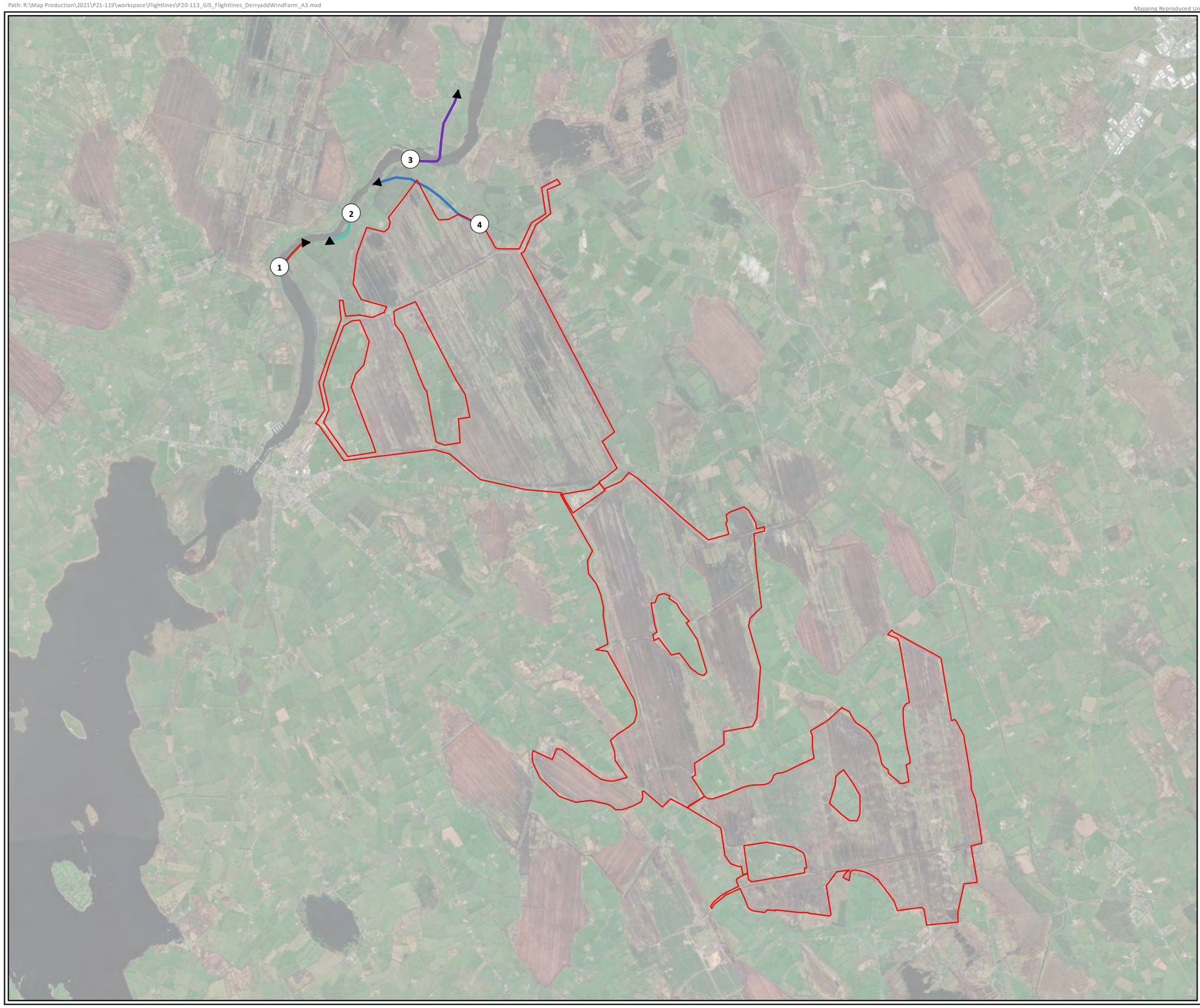
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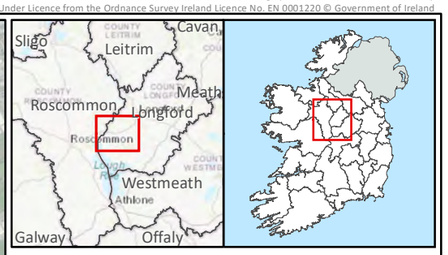
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PROJECT:	Derryadd, Co. Longford		
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DATE:	30/05/2022	**PAGE SIZE:**	A3

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Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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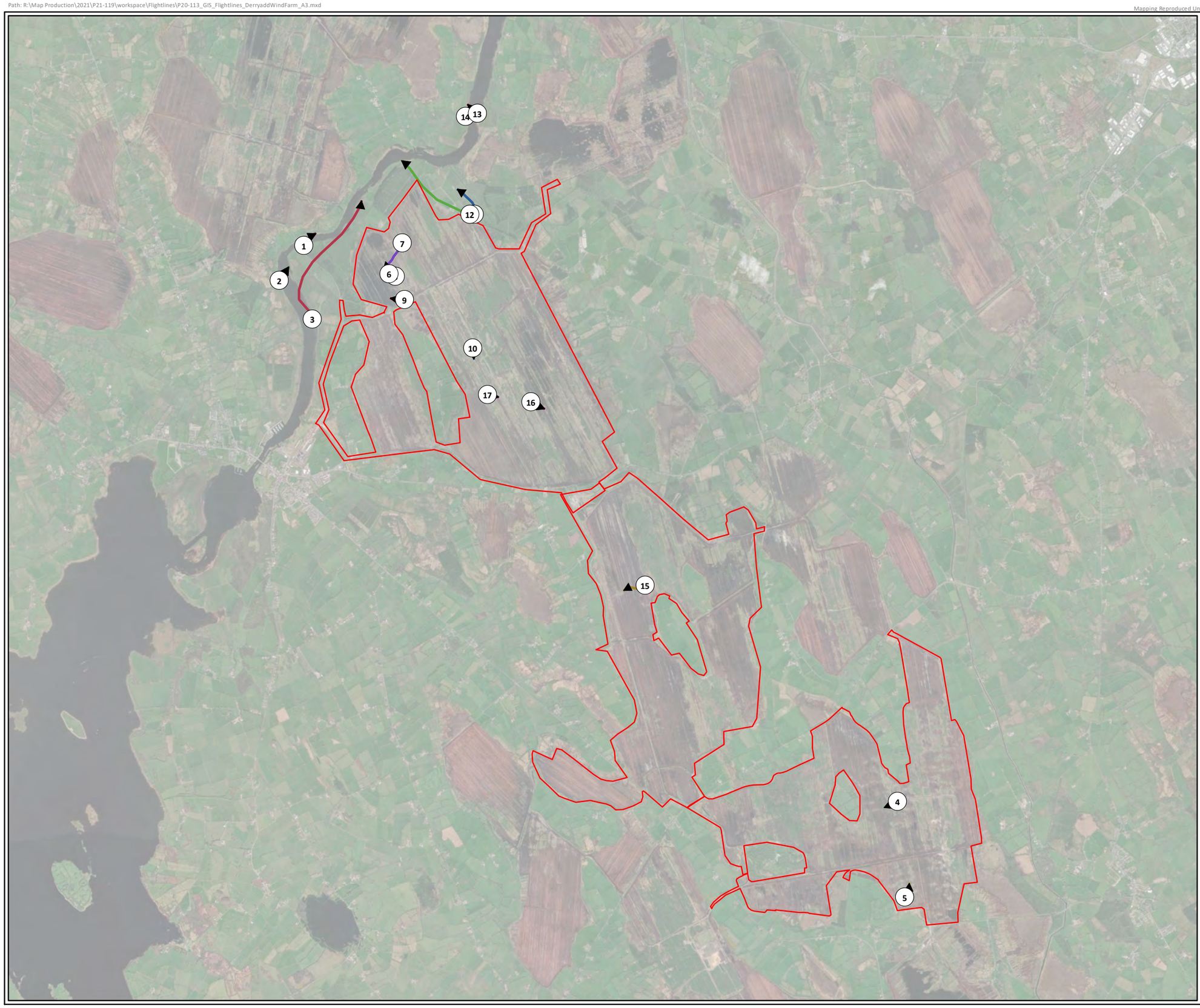
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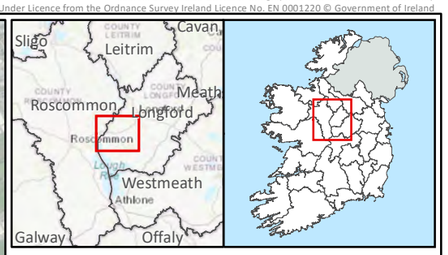
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PROJECT:	Derryadd, Co. Longford		
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Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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- 6, 23/09/2021, 09:57
- 7, 23/09/2021, 11:03
- 8, 23/09/2021, 13:00
- 9, 23/09/2021, 14:53
- 10, 23/09/2021, 15:21
- 11, 24/09/2021, 16:52
- 12, 24/09/2021, 17:49
- 13, 27/09/2021, 10:12
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- 15, 28/09/2021, 09:52
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- 17, 29/09/2021, 11:30

TITLE:	Migration Flightlines 2021 Grey Heron		
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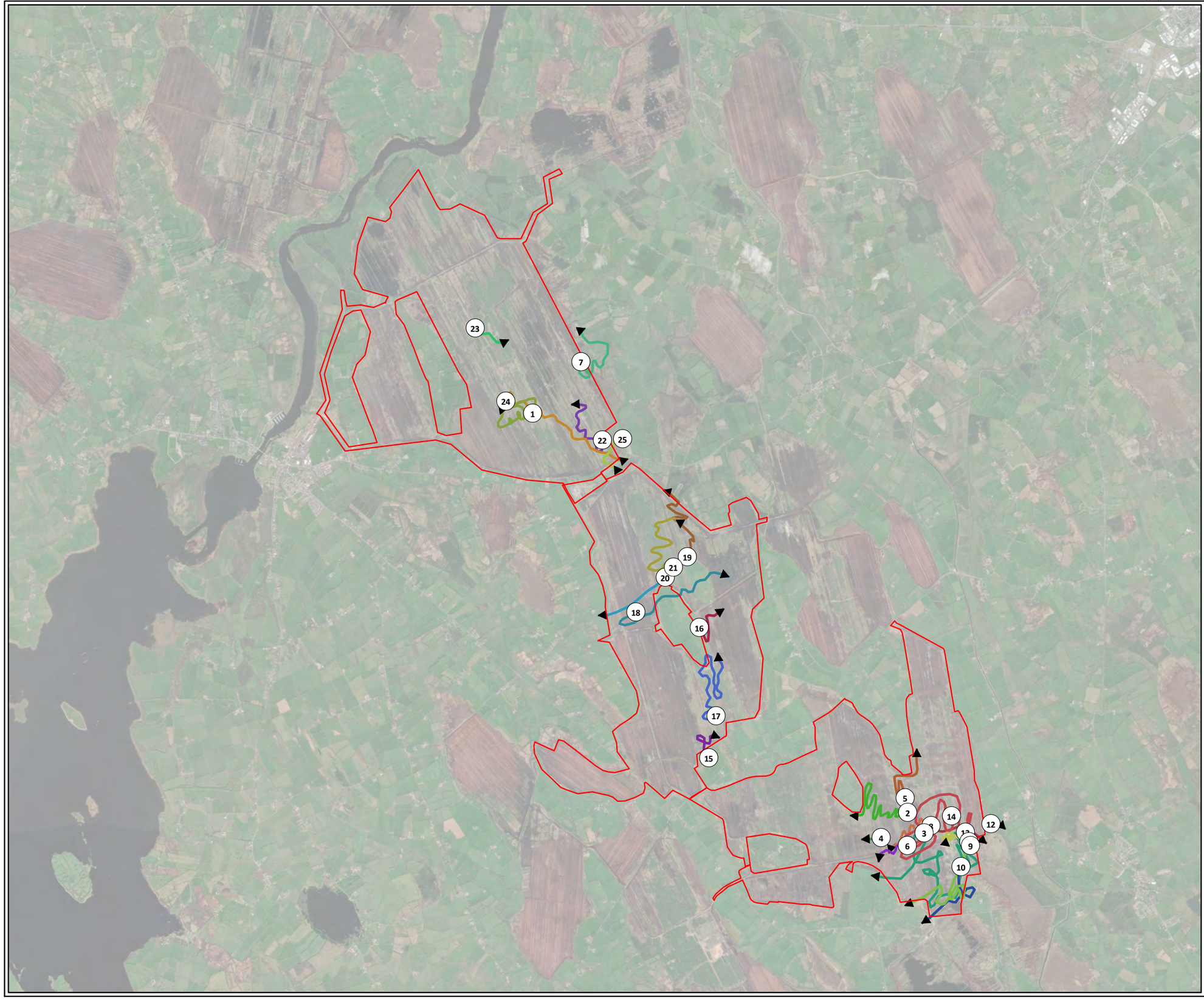
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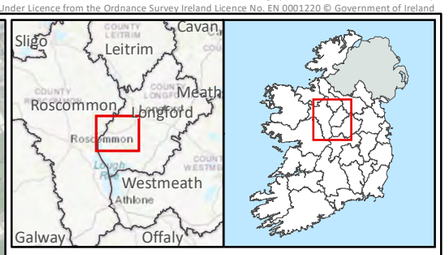
N W E S

0 0.5 1 2 Kilometers

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Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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- 12, 22/09/2021, 15:00
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- 14, 23/09/2021, 17:11
- 15, 27/09/2021, 13:42
- 16, 27/09/2021, 16:14
- 17, 27/09/2021, 16:55
- 18, 28/09/2021, 10:17
- 19, 28/09/2021, 11:04
- 20, 28/09/2021, 13:44
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TITLE:	Migration Flightlines 2021 Kestrel		
PROJECT:	Derryadd, Co. Longford		
FIGURE NO:	4		
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DATE:	30/05/2022	**PAGE SIZE:**	A3

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N W E S

Kilometers
0 0.5 1 2

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Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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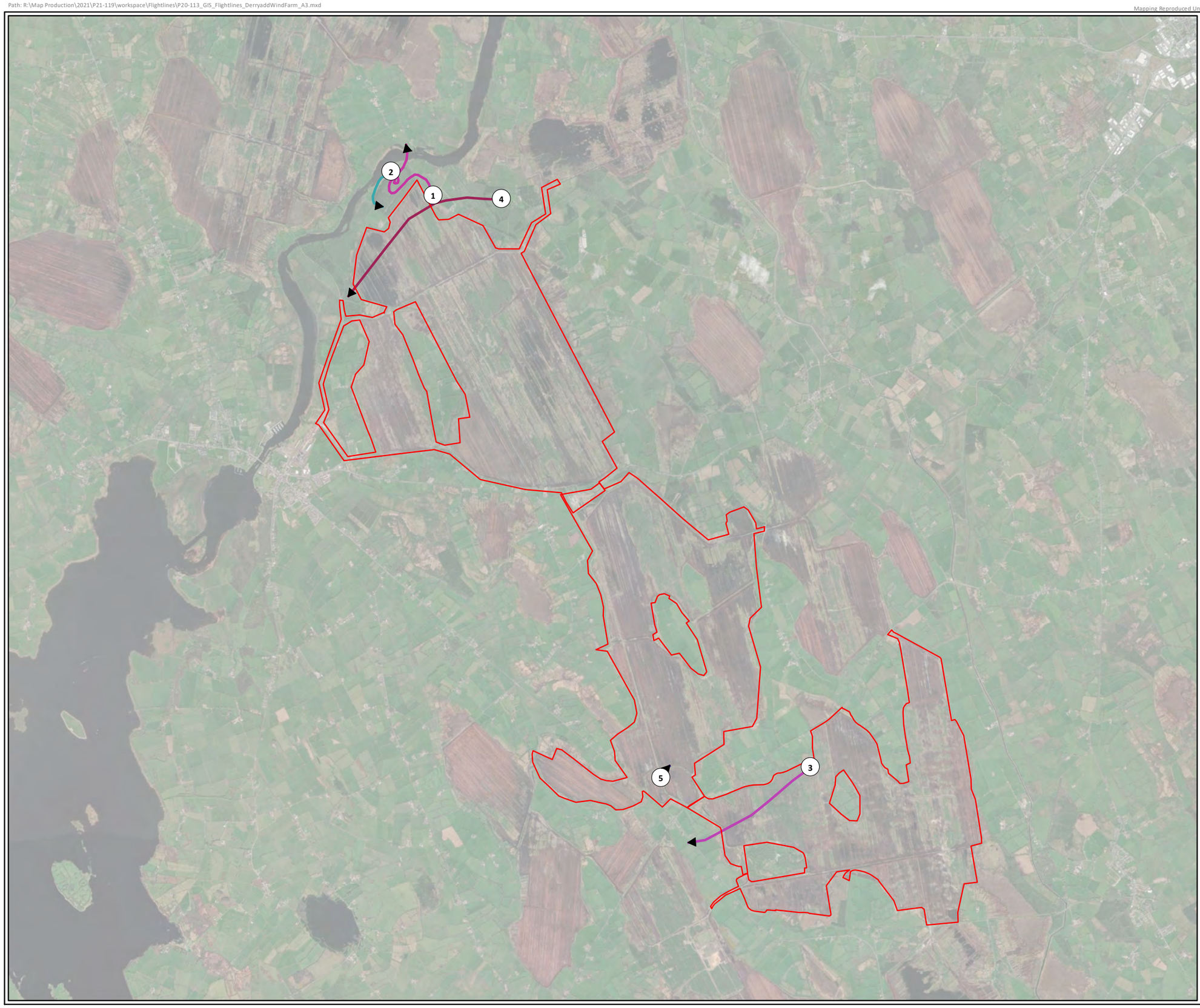
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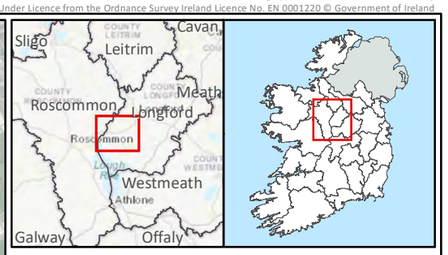
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Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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N W E S

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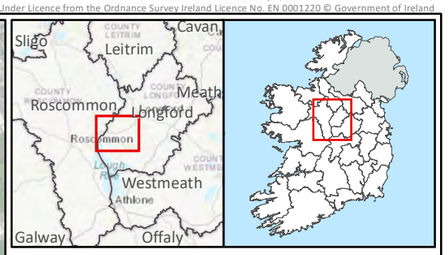
TITLE:	Migration Flightlines 2021 Lesser Black-Backed Gull		
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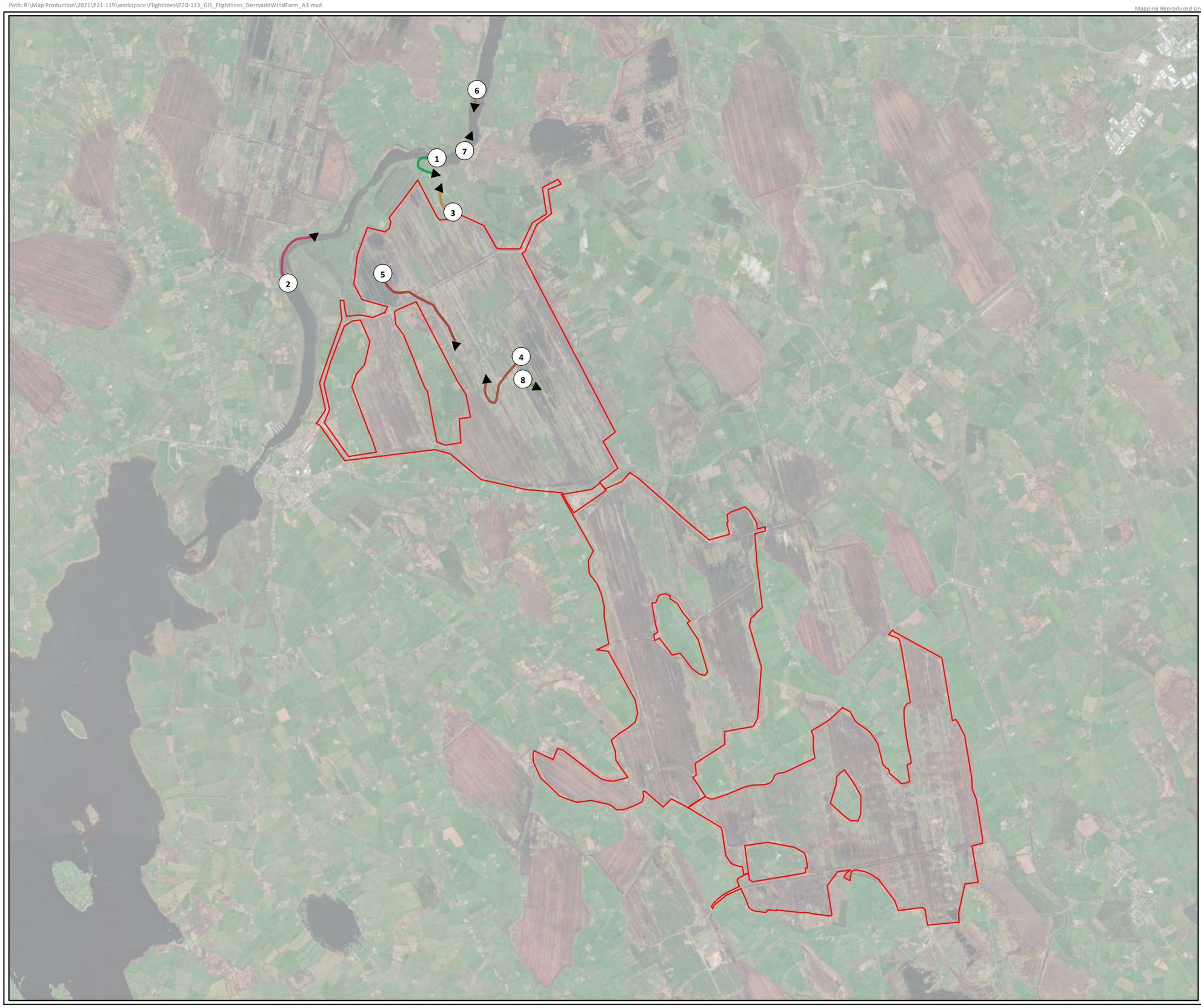
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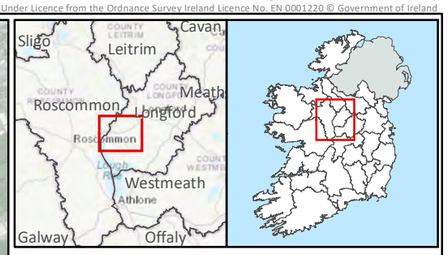
TITLE:	Migration Flightlines 2021 Little Egret		
PROJECT:	Derryadd, Co. Longford		
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N W E S

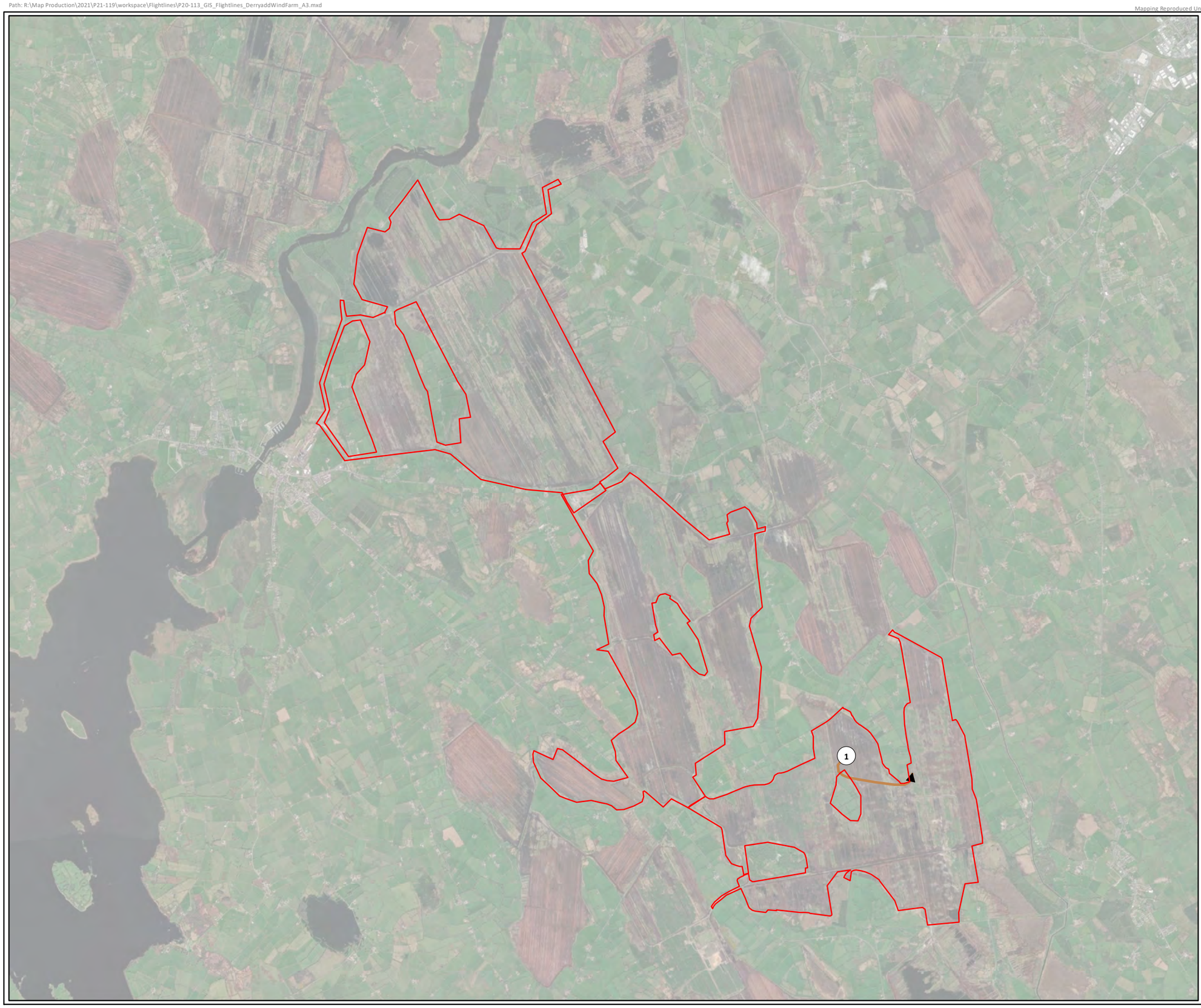
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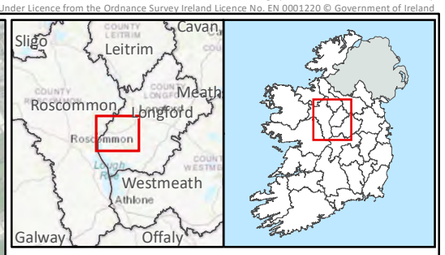
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Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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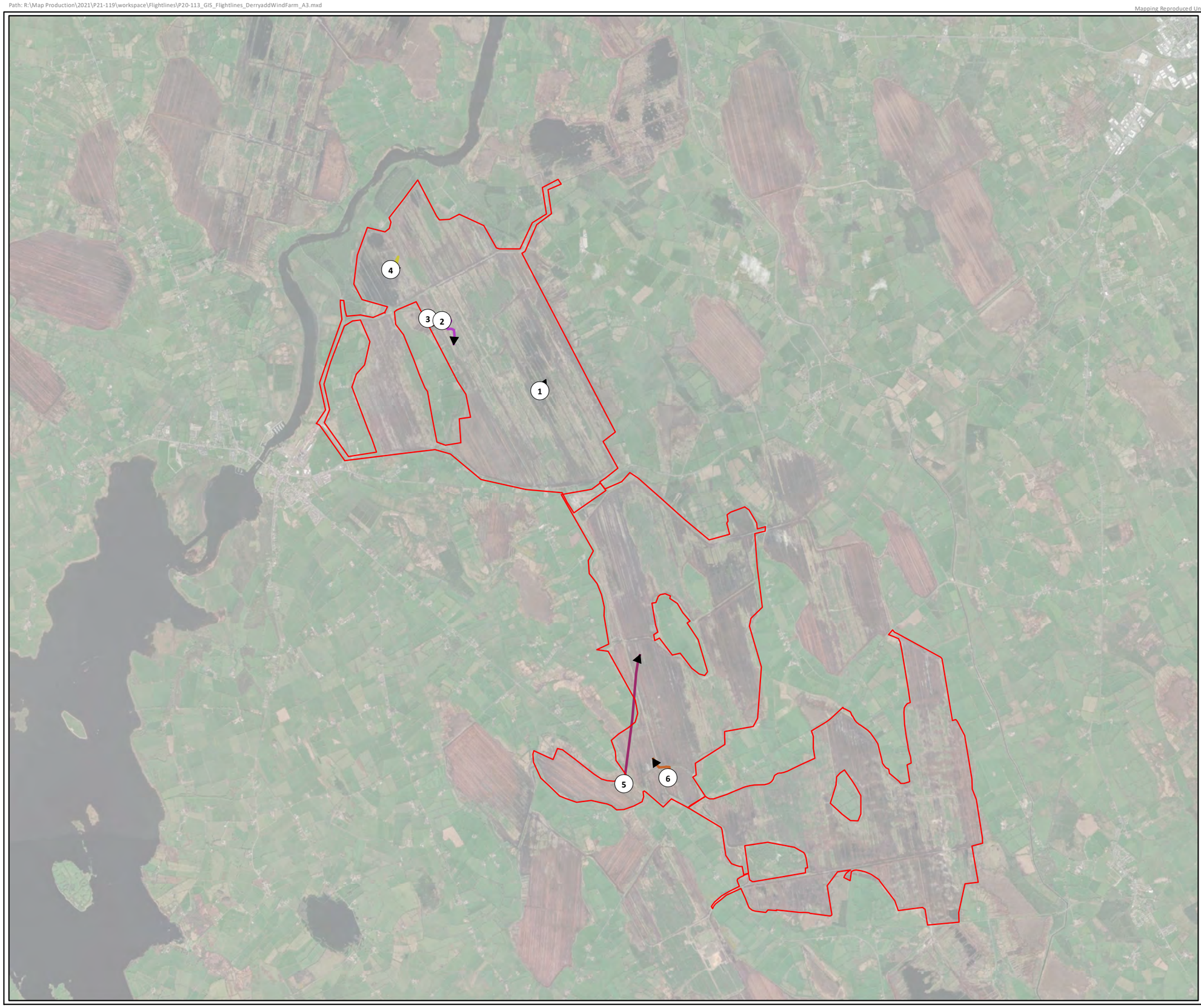
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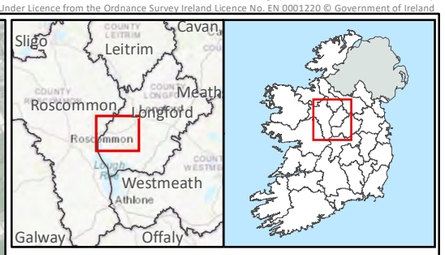
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PROJECT:	Derryadd, Co. Longford		
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Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Individual, Date, Time

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- 2, 23/09/2021, 10:50
- 3, 23/09/2021, 13:13
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- 5, 24/09/2021, 10:14
- 6, 24/09/2021, 14:46

N W E S

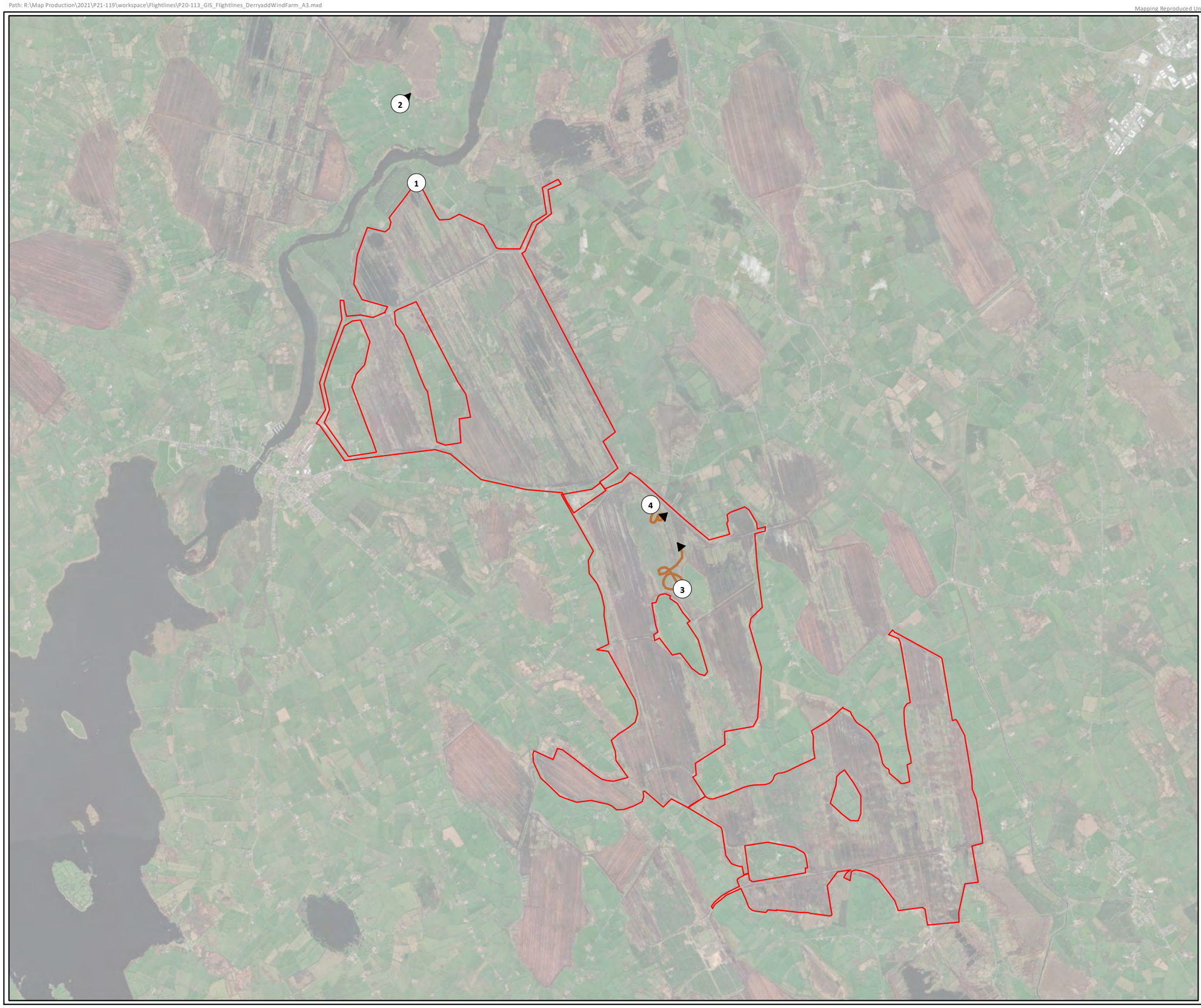
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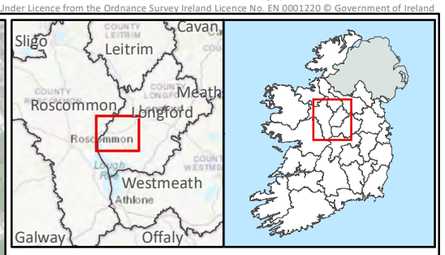
TITLE:	Migration Flightlines 2021 Snipe		
PROJECT:	Derryadd, Co. Longford		
FIGURE NO:	10		
CLIENT:	Bord na Móna		
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DATE:	30/05/2022	**PAGE SIZE:**	A3

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Path: R:\Map Production\2021\P21-119\workspace\Flightlines\P20-113_GIS_Flightlines_DerryaddWindFarm_A3.mxd

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Site Boundary

Individual, Date, Time

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N
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0 0.5 1 2 Kilometers

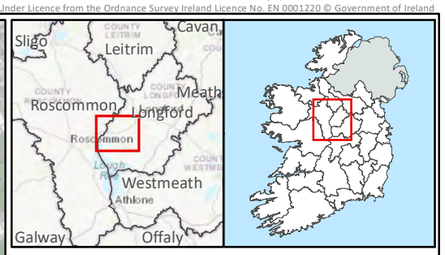
TITLE:	Migration Flightlines 2021 Sparrowhawlk		
PROJECT:	Derryadd, Co. Longford		
FIGURE NO:	11		
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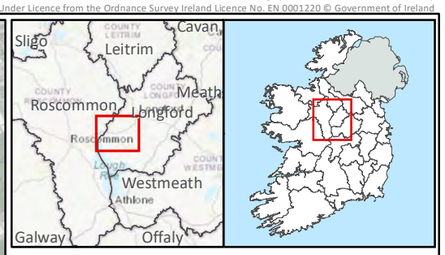
TITLE:	Winter 2021/2022 Flightlines Black-Headed Gull		
PROJECT:	Derryadd, Co. Longford		
FIGURE NO:	12		
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Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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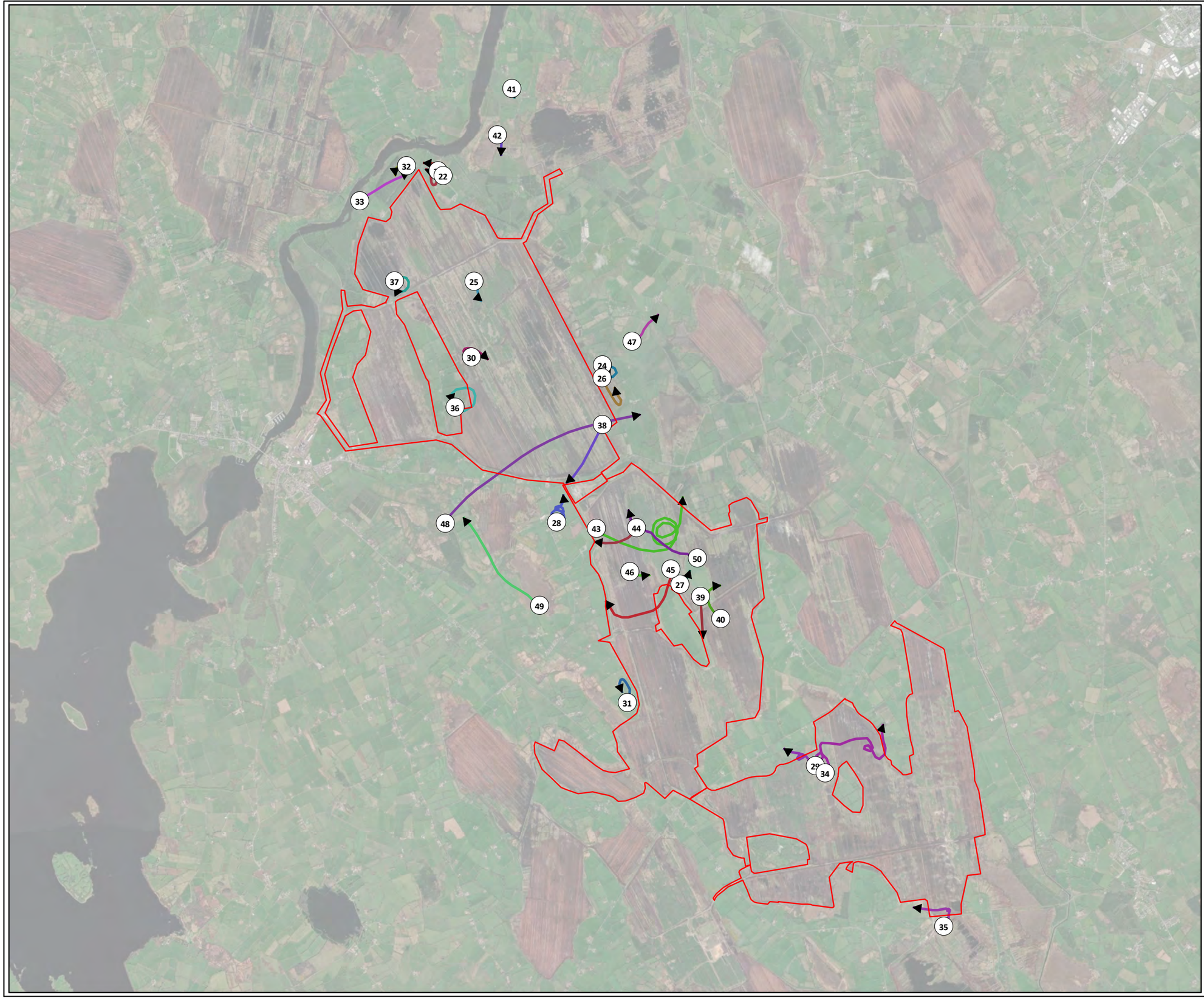
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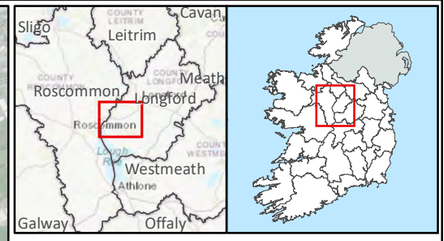
TITLE:	Winter 2021/2022 Flightlines Black-Tailed Godwit		
PROJECT:	Derryadd, Co. Longford		
FIGURE NO:	13		
CLIENT:	Bord na Móna		
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Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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- 27, 03/10/2021, 09:18
- 28, 03/10/2021, 12:54
- 29, 25/10/2021, 10:17
- 30, 26/10/2021, 10:15
- 31, 27/10/2021, 14:00
- 32, 28/10/2021, 09:22
- 33, 28/10/2021, 14:22
- 34, 29/10/2021, 14:38
- 35, 18/11/2021, 12:48
- 36, 22/11/2021, 09:53
- 37, 25/11/2021, 12:51
- 38, 26/11/2021, 13:35
- 39, 29/11/2021, 15:24
- 40, 29/11/2021, 16:06
- 41, 01/12/2021, 12:57
- 42, 01/12/2021, 14:06
- 43, 02/12/2021, 09:40
- 44, 02/12/2021, 10:03
- 45, 02/12/2021, 10:20
- 46, 02/12/2021, 14:29
- 47, 13/12/2021, 15:02
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- 49, 15/12/2021, 10:31
- 50, 15/12/2021, 11:15

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PROJECT:	Derryadd, Co. Longford		
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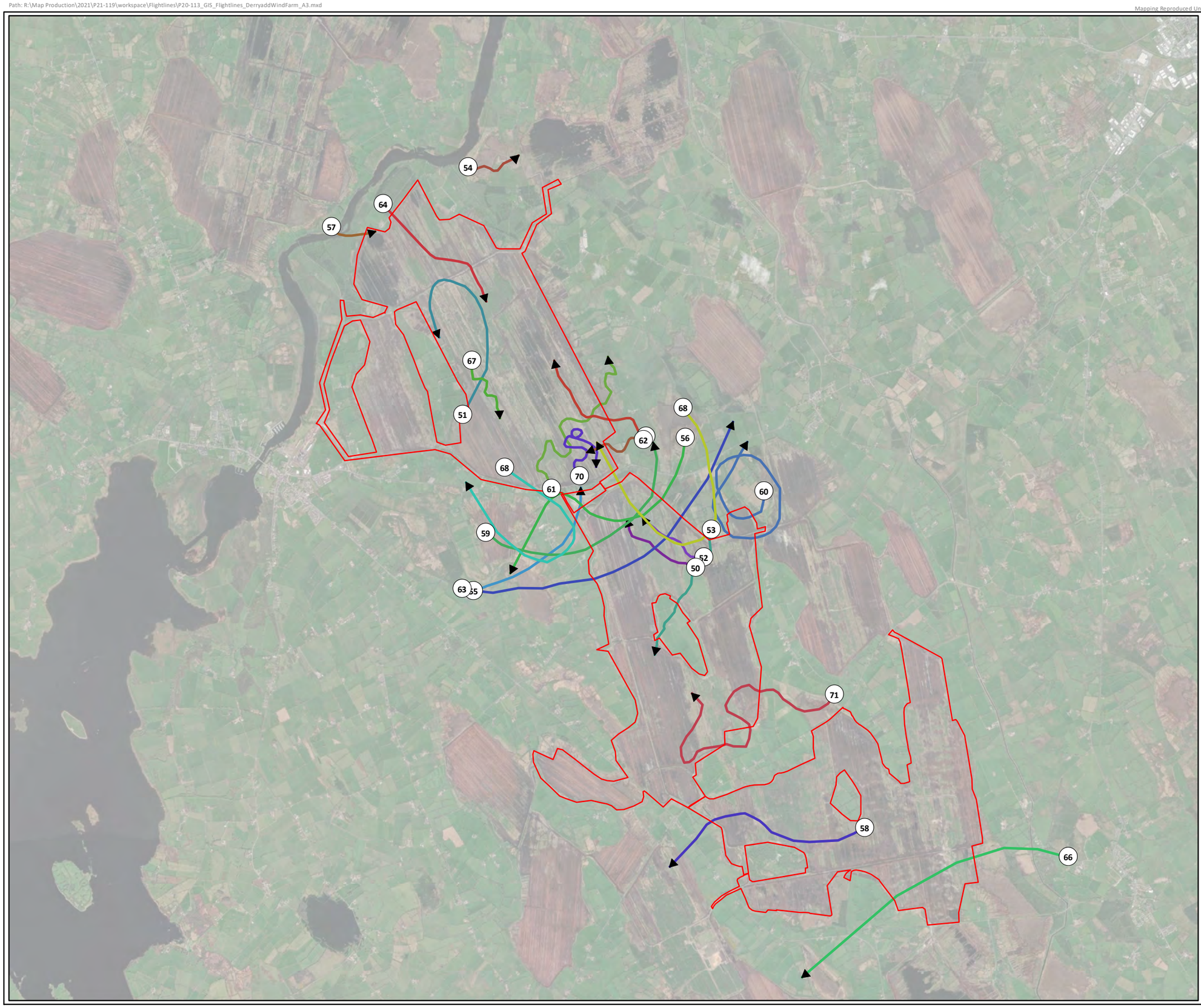
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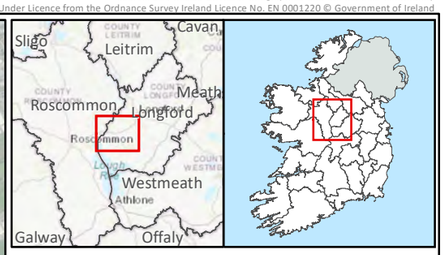
N W E S

Kilometers
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- 53, 16/12/2021, 11:57
- 54, 07/01/2022, 14:10
- 55, 24/01/2022, 11:59
- 56, 24/01/2022, 13:40
- 57, 03/02/2022, 13:03
- 58, 09/02/2022, 11:48
- 59, 25/02/2022, 09:35
- 60, 25/02/2022, 11:35
- 61, 25/02/2022, 11:36
- 62, 25/02/2022, 12:53
- 63, 25/02/2022, 15:11
- 64, 28/02/2022, 09:42
- 65, 15/03/2022, 10:39
- 66, 15/03/2022, 11:57
- 67, 16/03/2022, 10:03
- 68, 16/03/2022, 11:22
- 68, 16/03/2022, 10:59
- 70, 16/03/2022, 13:02
- 71, 28/03/2022, 11:16

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PROJECT:	Derryadd, Co. Longford		
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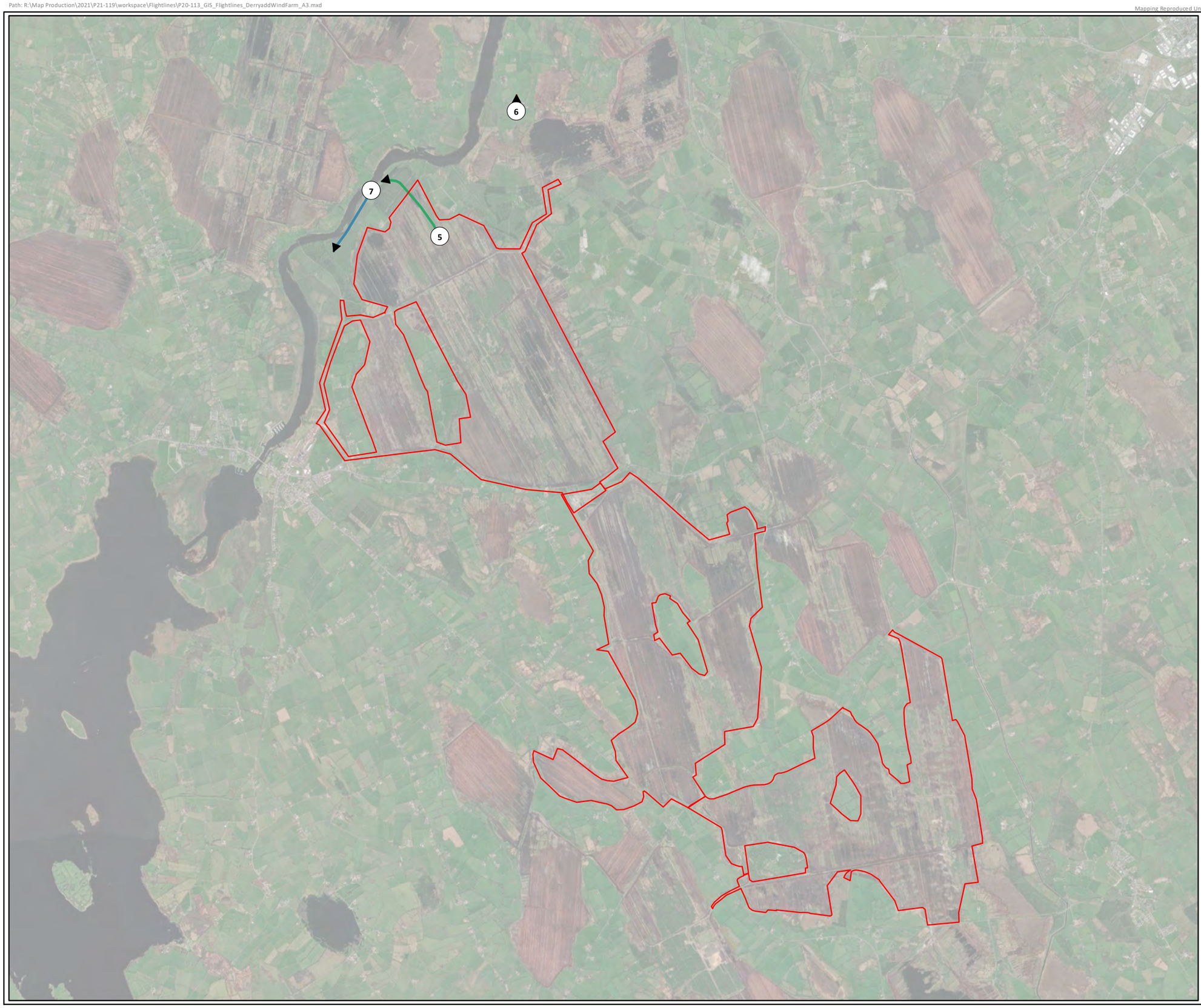
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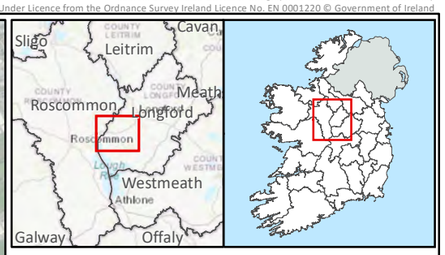
N W E S

Kilometers
0 0.5 1 2

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Individual, Date, Time

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N W E S

0 0.5 1 2 Kilometers

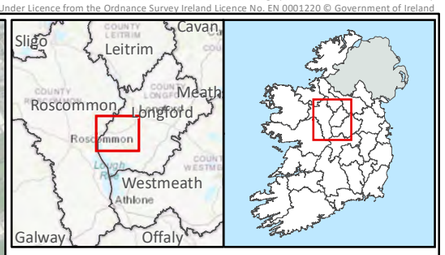
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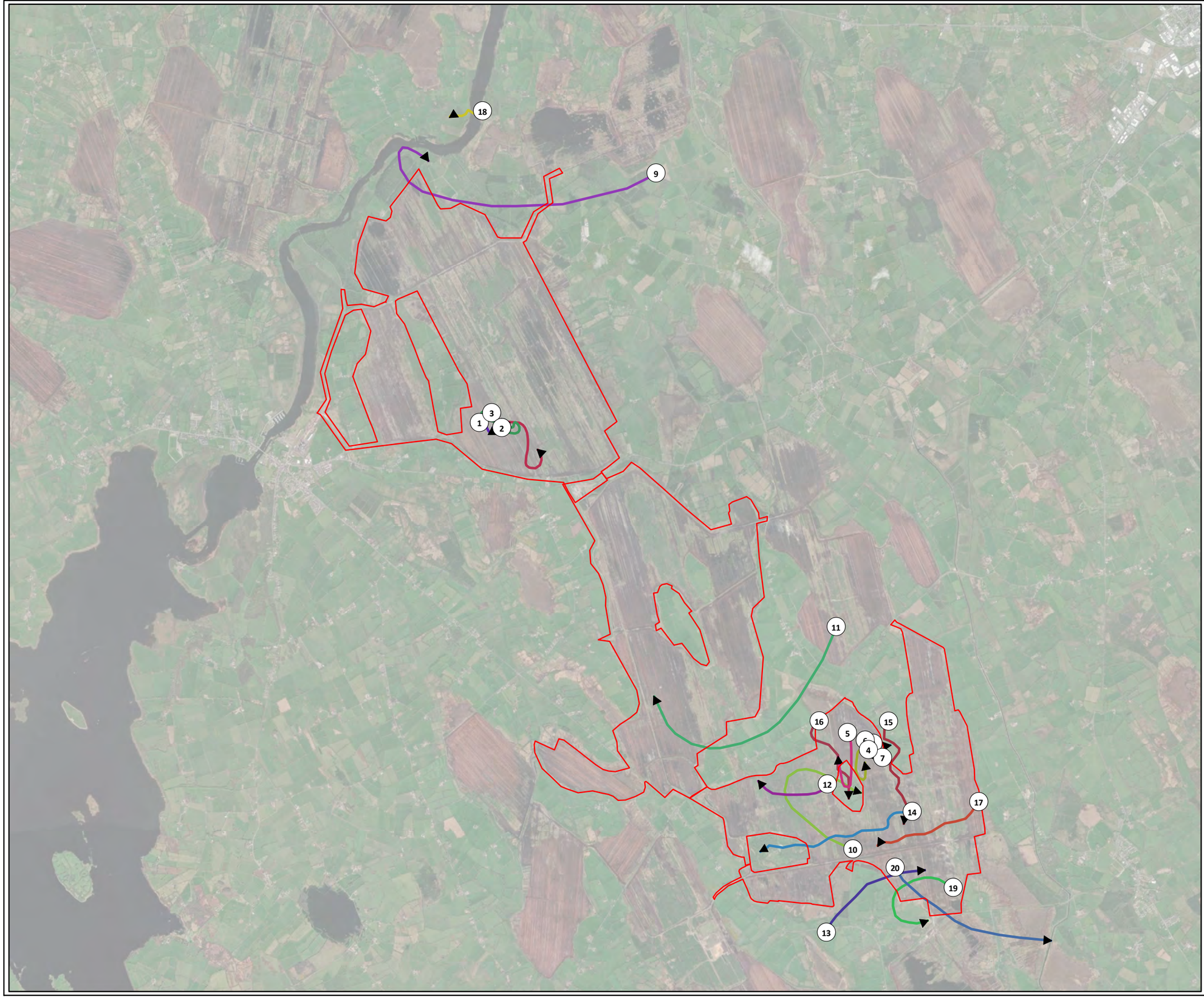
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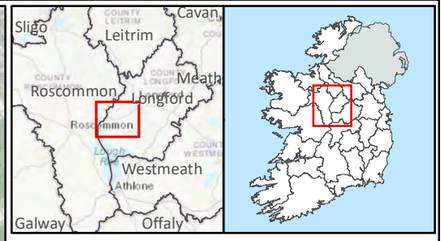
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Individual, Date, Time

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- 2, 26/10/2021, 09:51
- 3, 26/10/2021, 13:25
- 4, 02/11/2021, 08:36
- 5, 02/11/2021, 08:48
- 6, 19/11/2021, 08:00
- 7, 19/11/2021, 09:01
- 8, 19/11/2021, 09:26
- 9, 13/12/2021, 09:46
- 10, 16/12/2021, 11:13
- 11, 16/12/2021, 11:50
- 12, 16/12/2021, 14:01
- 13, 27/12/2021, 10:47
- 14, 28/12/2021, 09:22
- 15, 28/12/2021, 11:09
- 16, 28/12/2021, 11:40
- 17, 28/12/2021, 12:09
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- 20, 17/01/2022, 11:09

N W E S

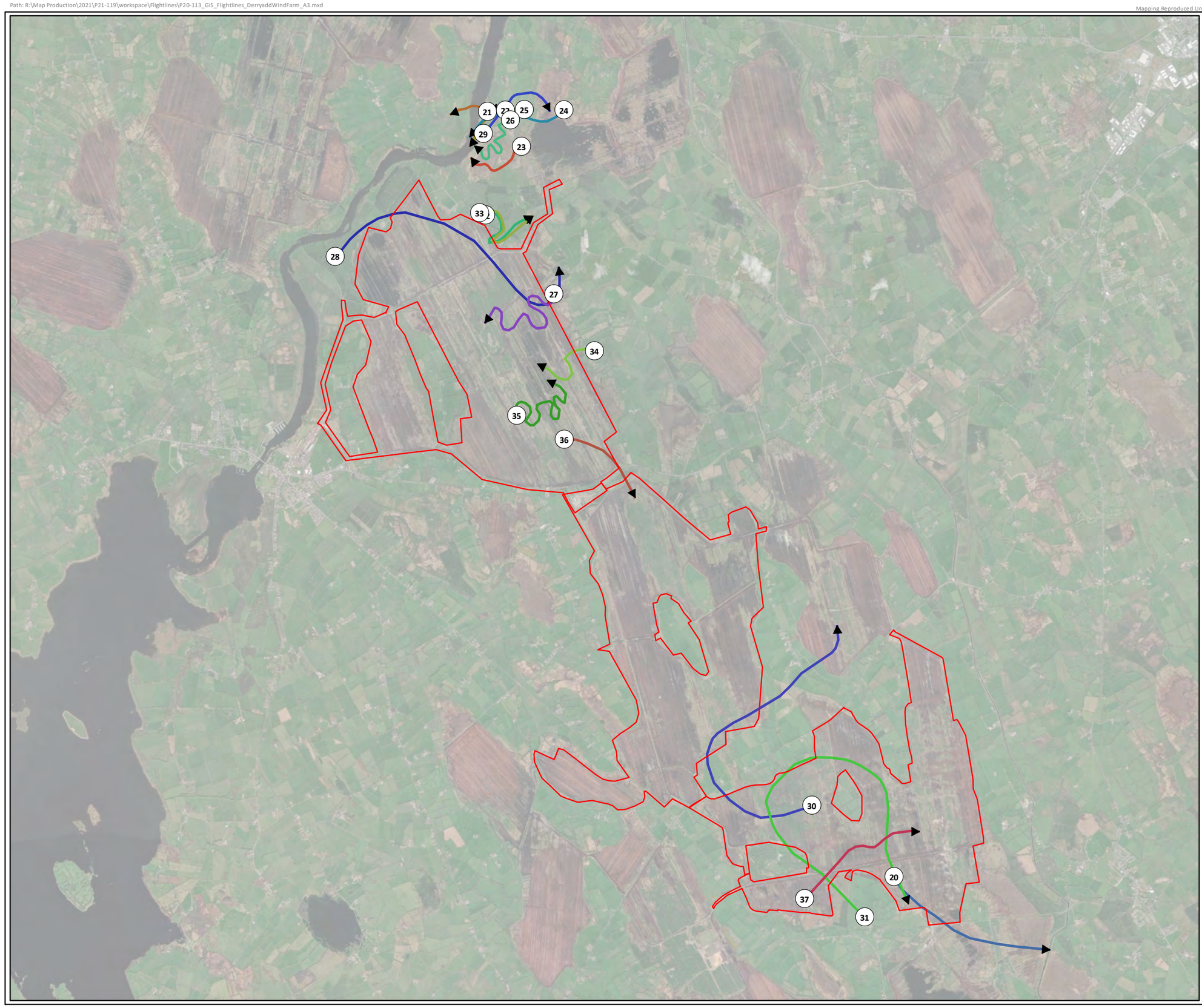
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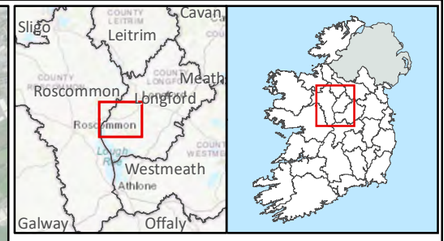
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- 25, 01/02/2022, 10:47
- 26, 01/02/2022, 11:30
- 27, 25/02/2022, 12:58
- 28, 28/02/2022, 12:00
- 29, 02/03/2022, 11:09
- 30, 02/03/2022, 10:48
- 31, 02/03/2022, 11:09
- 32, 02/03/2022, 13:03
- 33, 02/03/2022, 13:03
- 34, 15/03/2022, 09:51
- 35, 15/03/2022, 13:21
- 36, 16/03/2022, 10:01
- 37, 28/03/2022, 10:10

N W E S

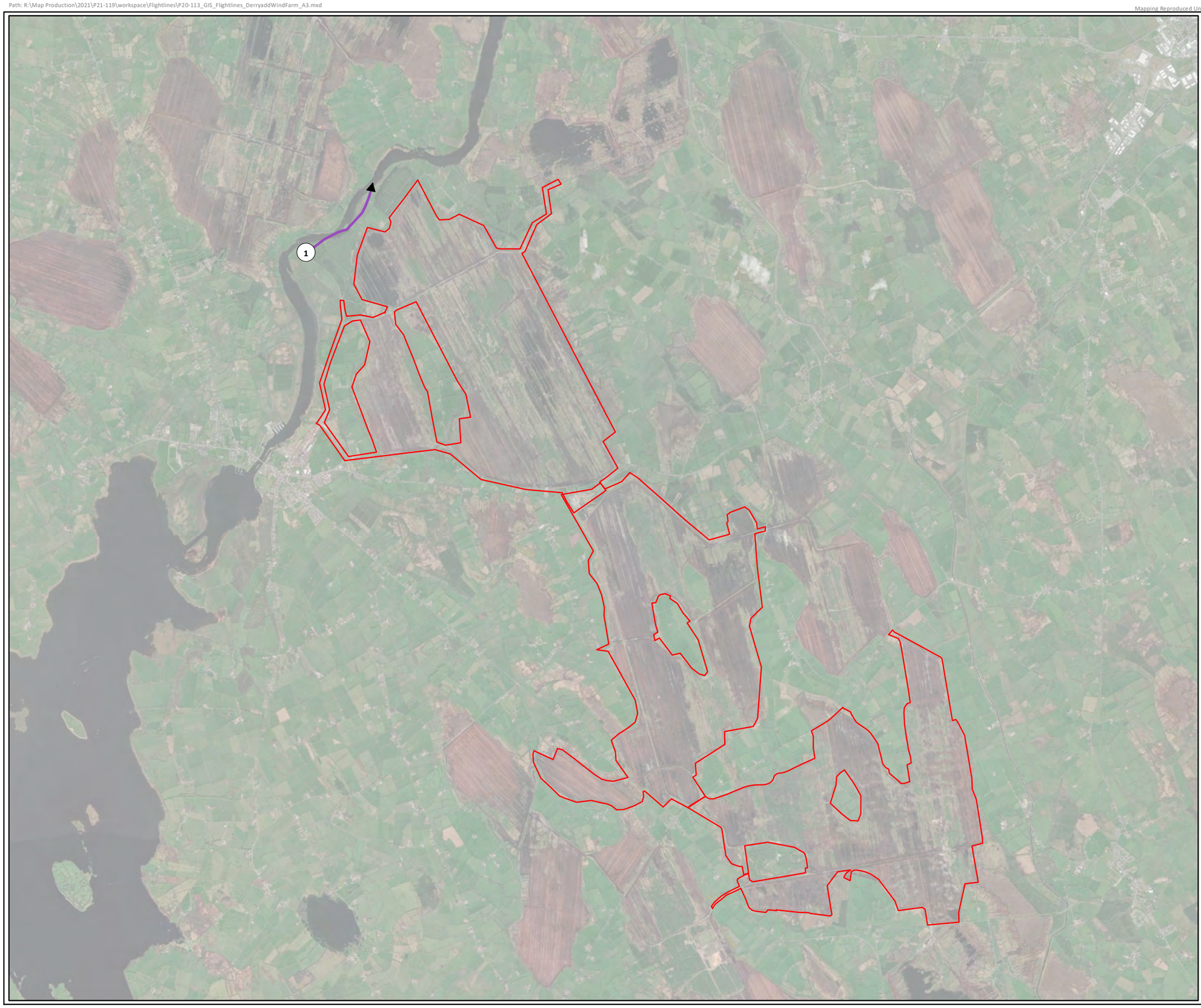
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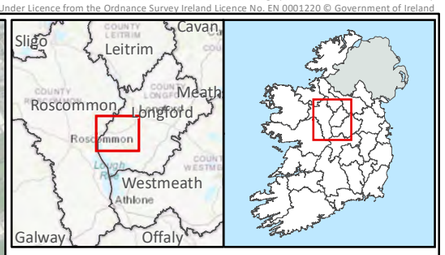
TITLE:	Winter 2021/2022 Flightlines Buzzard		
PROJECT:	Derryadd, Co. Longford		
FIGURE NO:	19		
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Site Boundary

Individual, Date, Time

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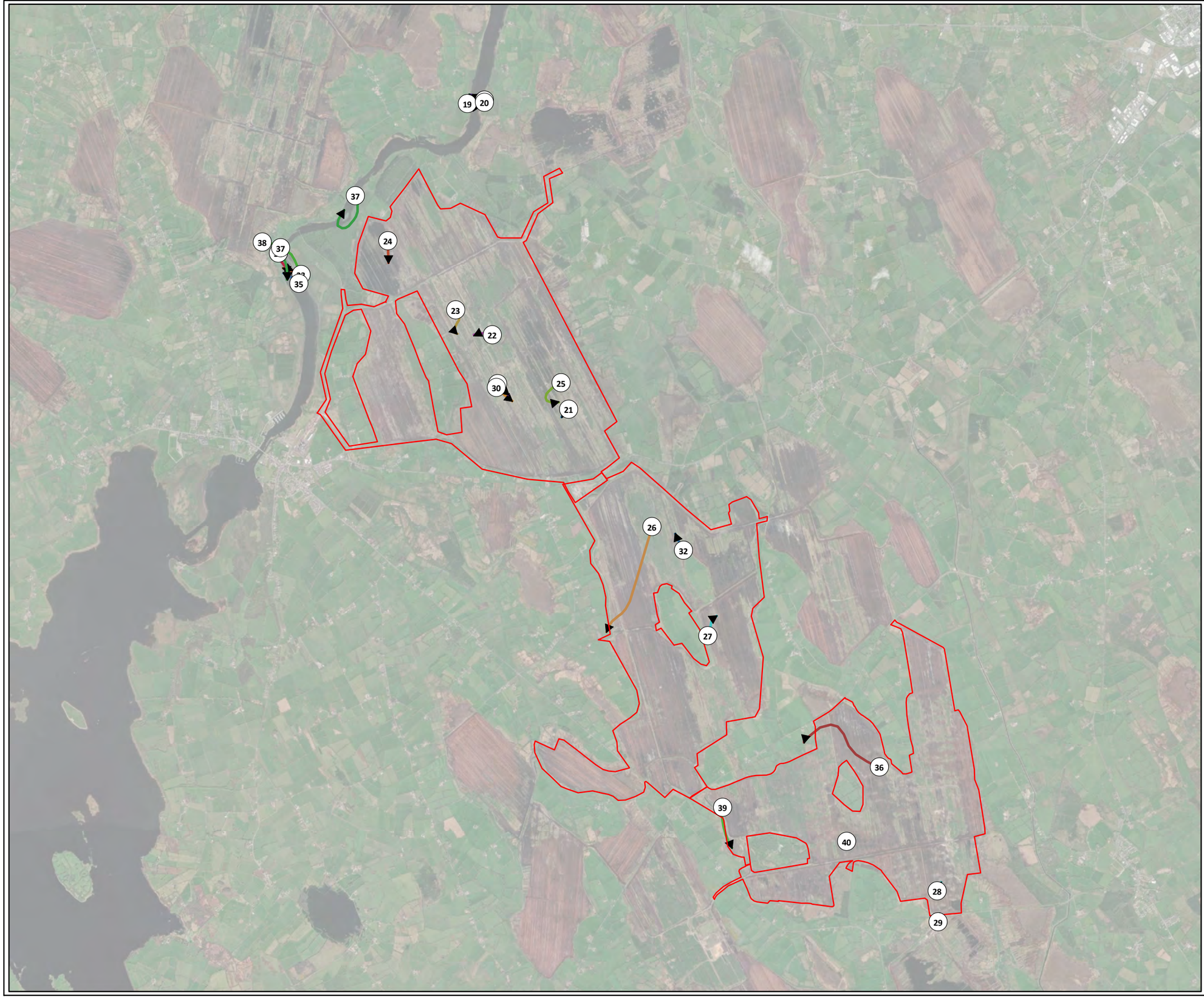
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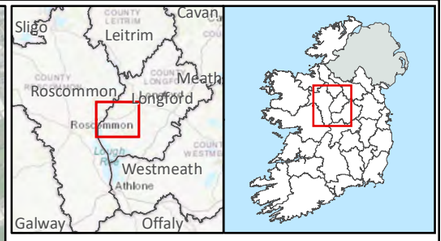
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FIGURE NO:	20		
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DATE:	30/05/2022	**PAGE SIZE:**	A3

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- 27, 03/10/2021, 16:22
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- 37, 23/11/2021, 08:38
- 38, 23/11/2021, 11:00
- 39, 25/11/2021, 10:47
- 40, 25/11/2021, 10:52

TITLE:	Winter 2021/2022 Flightlines Grey Heron		
PROJECT:	Derryadd, Co. Longford		
FIGURE NO:	21		
CLIENT:	Bord na Móna		
SCALE:	1:50000	**REVISION:**	0
DATE:	30/05/2022	**PAGE SIZE:**	A3

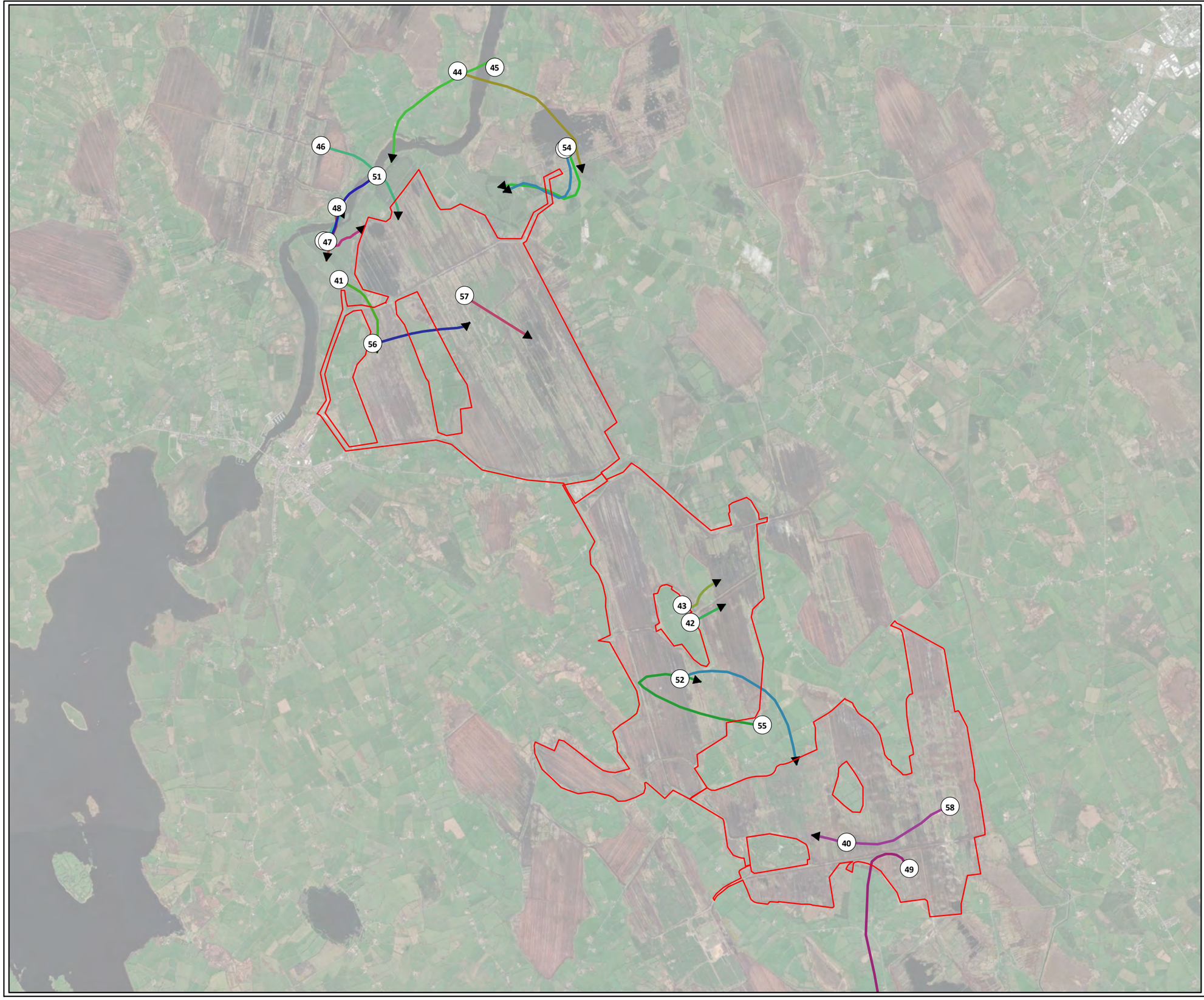
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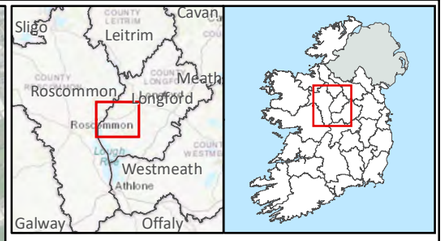
N W E S

0 0.5 1 2 Kilometers

Path: R:\Map Production\2021\P21-119\workspace\Flightlines\P20-113_GIS_Flightlines_DerryaddWindFarm_A3.mxd

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Legend

Site Boundary

Individual, Date, Time

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- 41, 25/11/2021, 10:11
- 42, 29/11/2021, 12:36
- 43, 29/11/2021, 14:28
- 44, 13/12/2021, 12:15
- 45, 13/12/2021, 13:41
- 46, 15/12/2021, 11:40
- 47, 17/01/2022, 09:46
- 48, 17/01/2022, 13:10
- 49, 01/02/2022, 13:21
- 50, 03/02/2022, 10:59
- 51, 03/02/2022, 14:26
- 52, 14/02/2022, 11:26
- 53, 02/03/2022, 13:53
- 54, 02/03/2022, 13:53
- 55, 07/03/2022, 13:16
- 56, 16/03/2022, 10:16
- 57, 16/03/2022, 15:14
- 58, 28/03/2022, 10:50

N W E S

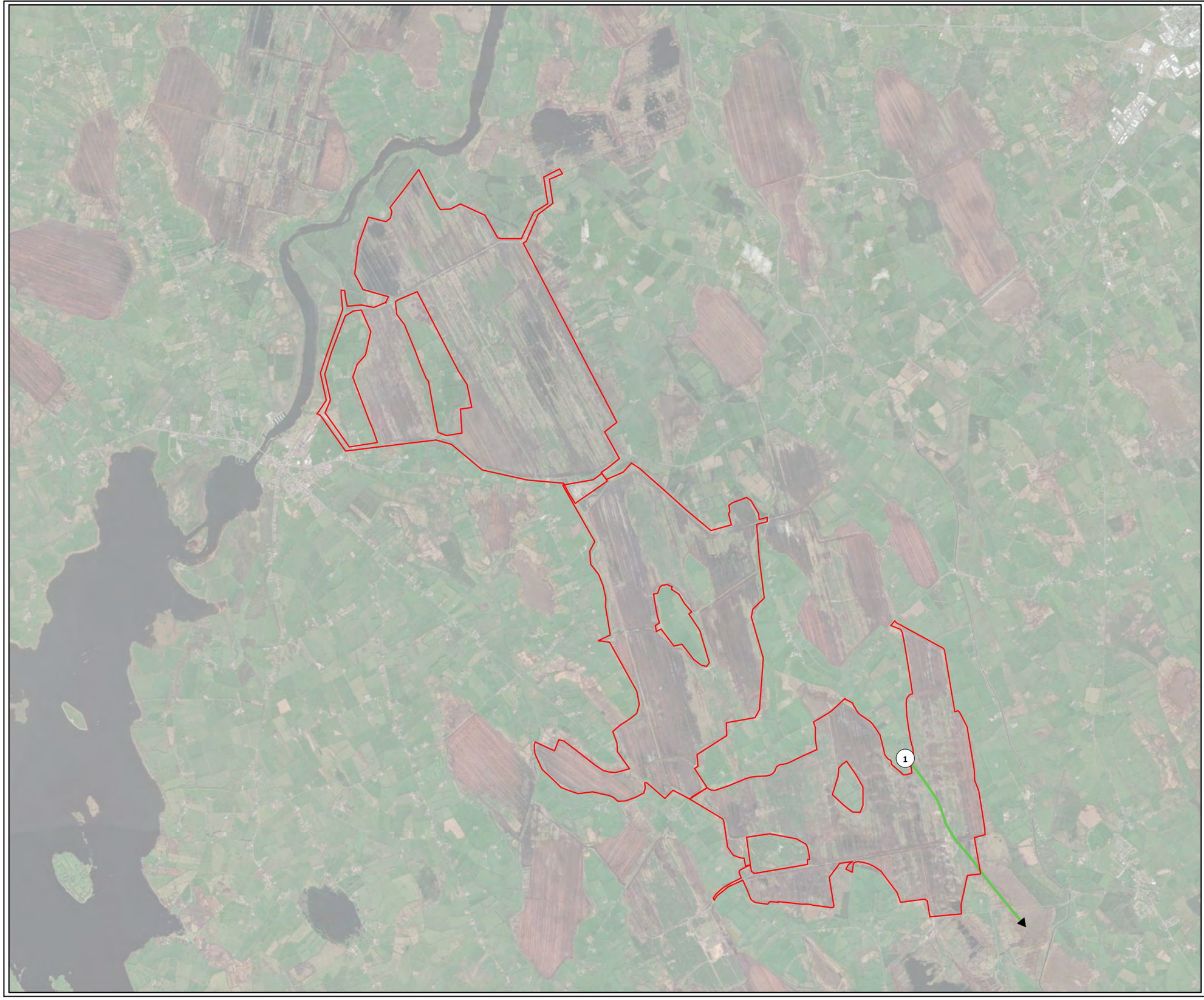
Kilometers
0 0.5 1 2

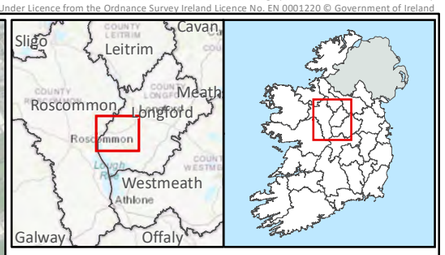
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PROJECT:	Derryadd, Co. Longford		
FIGURE NO:	22		
CLIENT:	Bord na Móna		
SCALE:	1:50000	**REVISION:**	0
DATE:	30/05/2022	**PAGE SIZE:**	A3

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Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Individual, Date, Time

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N
W E
S

Kilometers
0 0.5 1 2

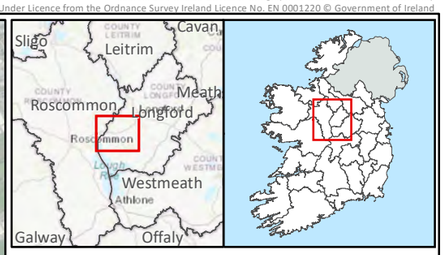
TITLE:	Winter 2021/2022 Flightlines Greylag Goose		
PROJECT:	Derryadd, Co. Longford		
FIGURE NO:	23		
CLIENT:	Bord na Móna		
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Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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N
W E
S

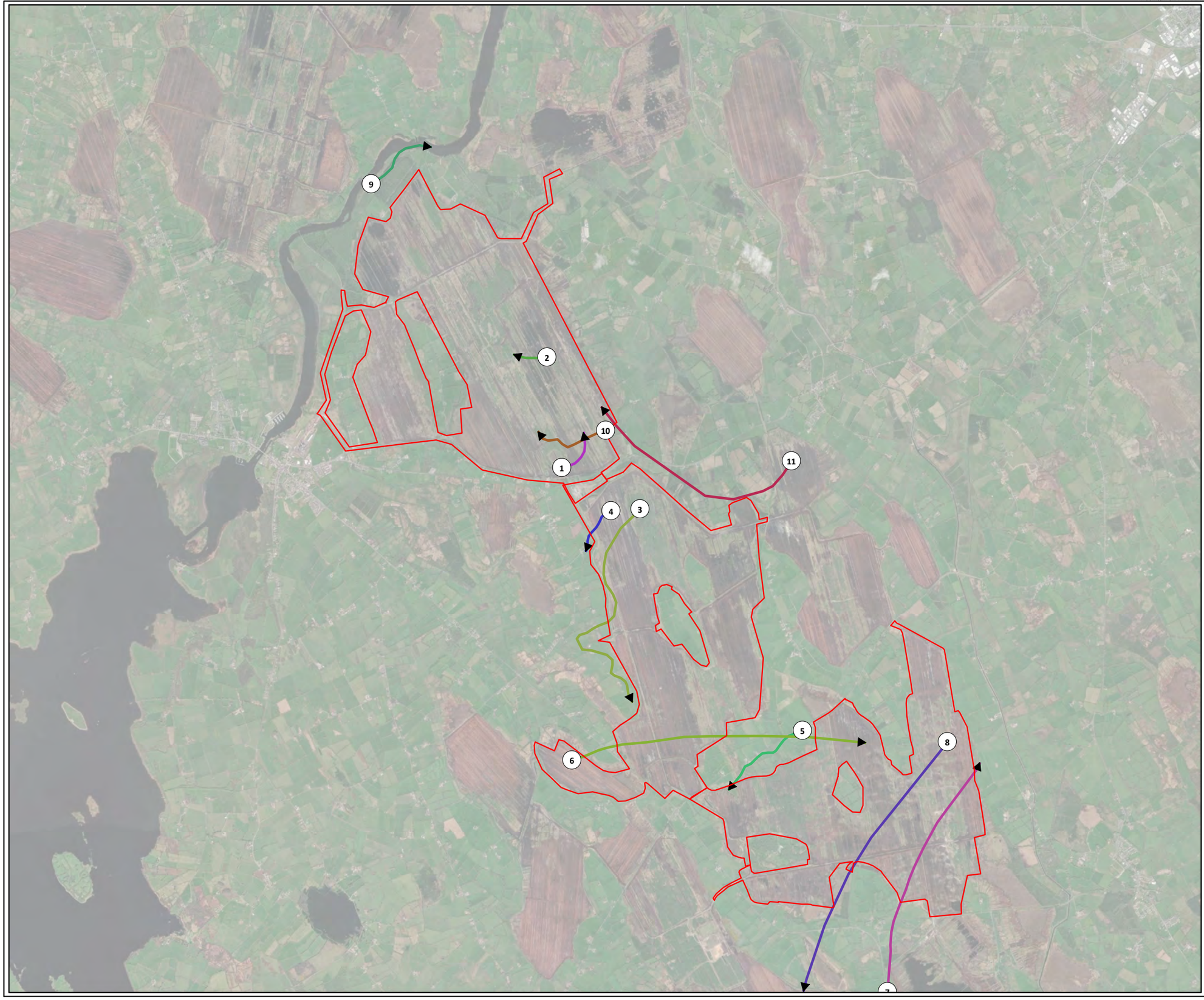
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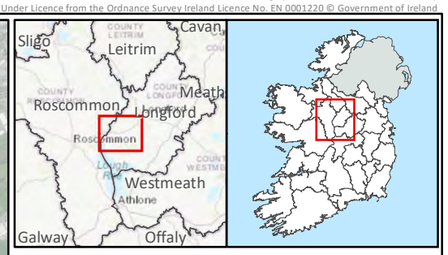
TITLE:	Winter 2021/2022 Flightlines Gull sp.		
PROJECT:	Derryadd, Co. Longford		
FIGURE NO:	24		
CLIENT:	Bord na Móna		
SCALE:	1:50000	**REVISION:**	0
DATE:	30/05/2022	**PAGE SIZE:**	A3

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- 2, 26/11/2021, 09:34
- 3, 15/12/2021, 13:30
- 4, 16/12/2021, 10:47
- 5, 28/12/2021, 11:47
- 6, 11/01/2022, 13:24
- 7, 17/01/2022, 11:09
- 8, 17/01/2022, 11:53
- 9, 03/02/2022, 11:25
- 10, 16/03/2022, 11:28
- 11, 16/03/2022, 11:35

N W E S

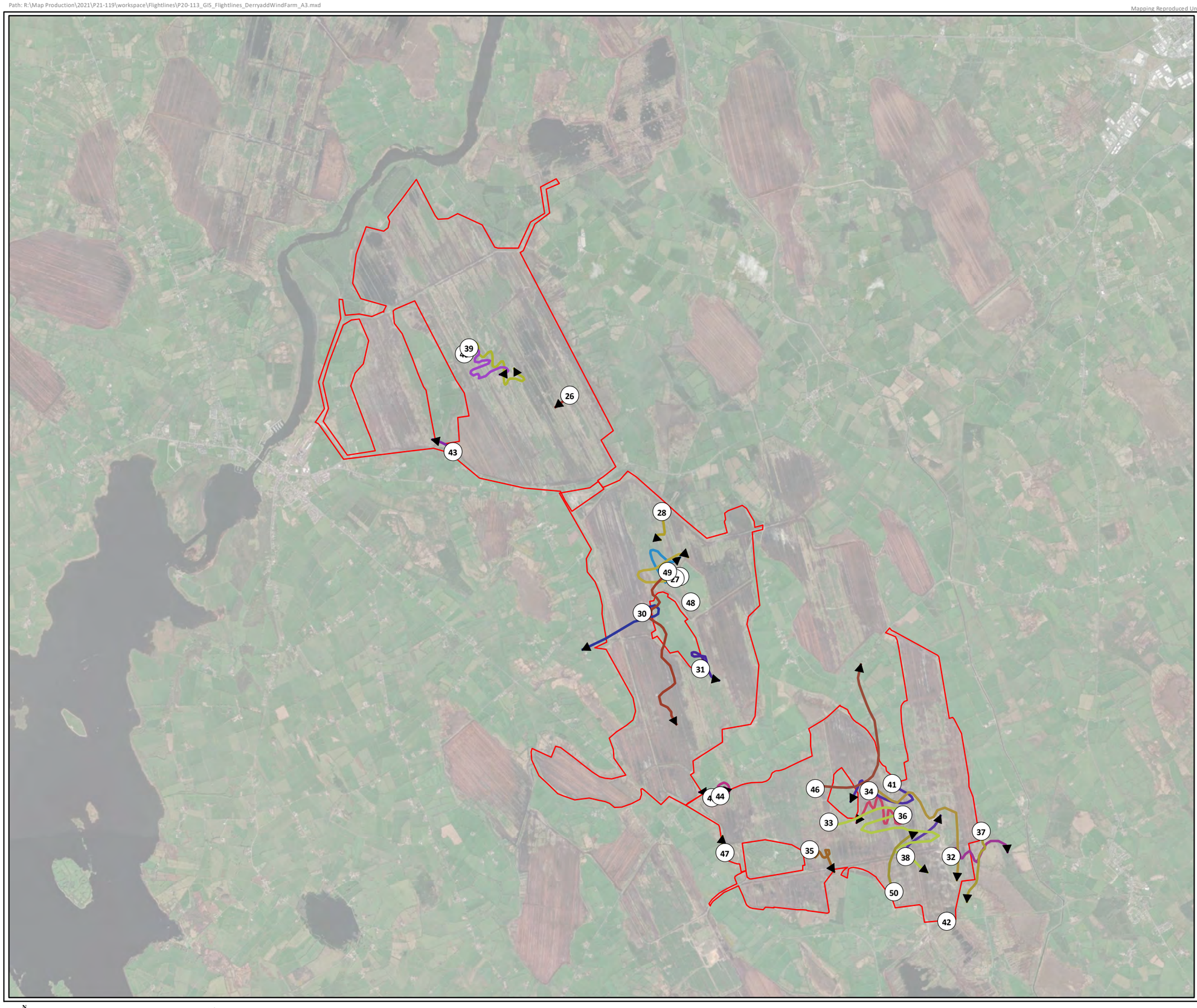
0 0.5 1 2 Kilometers

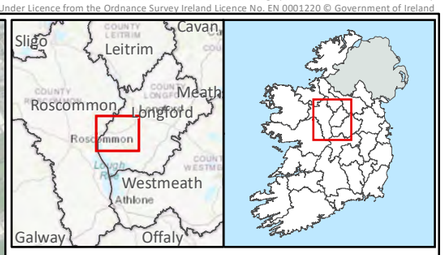
TITLE:	Winter 2021/2022 Flightlines Hen Harrier		
PROJECT:	Derryadd, Co. Longford		
FIGURE NO:	25		
CLIENT:	Bord na Móna		
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Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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- 27, 03/10/2021, 08:47
- 28, 03/10/2021, 10:15
- 29, 03/10/2021, 12:06
- 30, 03/10/2021, 13:48
- 31, 03/10/2021, 16:58
- 32, 20/10/2021, 09:12
- 33, 20/10/2021, 14:01
- 34, 20/10/2021, 15:47
- 35, 21/10/2021, 14:33
- 36, 25/10/2021, 09:10
- 37, 25/10/2021, 12:35
- 38, 25/10/2021, 13:30
- 39, 26/10/2021, 10:42
- 40, 26/10/2021, 14:14
- 41, 29/10/2021, 14:14
- 42, 18/11/2021, 12:02
- 43, 22/11/2021, 09:37
- 44, 24/11/2021, 12:40
- 45, 24/11/2021, 14:38
- 46, 25/11/2021, 09:48
- 47, 25/11/2021, 10:00
- 48, 02/12/2021, 11:44
- 49, 15/12/2021, 11:27
- 50, 17/01/2022, 13:36

TITLE:	Winter 2021/2022 Flightlines Kestrel		
PROJECT:	Derryadd, Co. Longford		
FIGURE NO:	26		
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DATE:	30/05/2022	**PAGE SIZE:**	A3

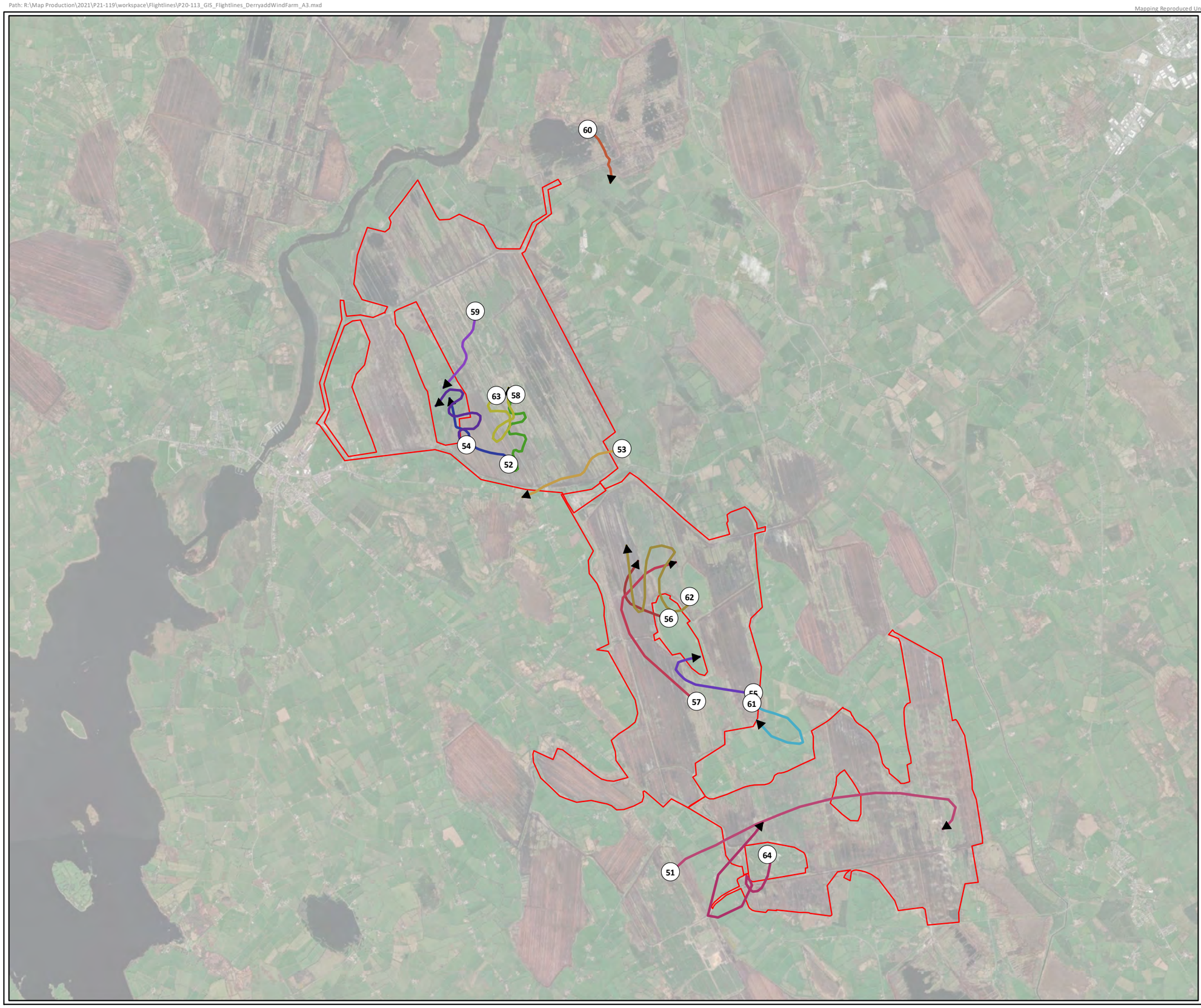
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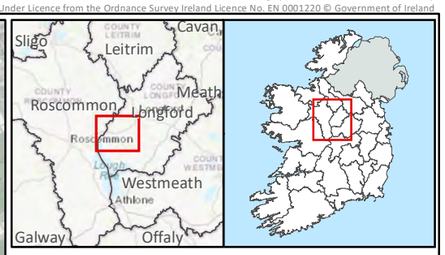
N W E S

Kilometers
0 0.5 1 2

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Individual, Date, Time

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- 52, 18/01/2022, 14:44
- 53, 25/01/2022, 10:33
- 54, 02/02/2022, 09:57
- 55, 02/02/2022, 10:25
- 56, 02/02/2022, 11:11
- 57, 02/02/2022, 14:27
- 58, 25/02/2022, 12:06
- 59, 28/02/2022, 14:00
- 60, 02/03/2022, 11:42
- 61, 02/03/2022, 11:48
- 62, 07/03/2022, 10:57
- 63, 15/03/2022, 10:40
- 64, 28/03/2022, 13:03

N W E S

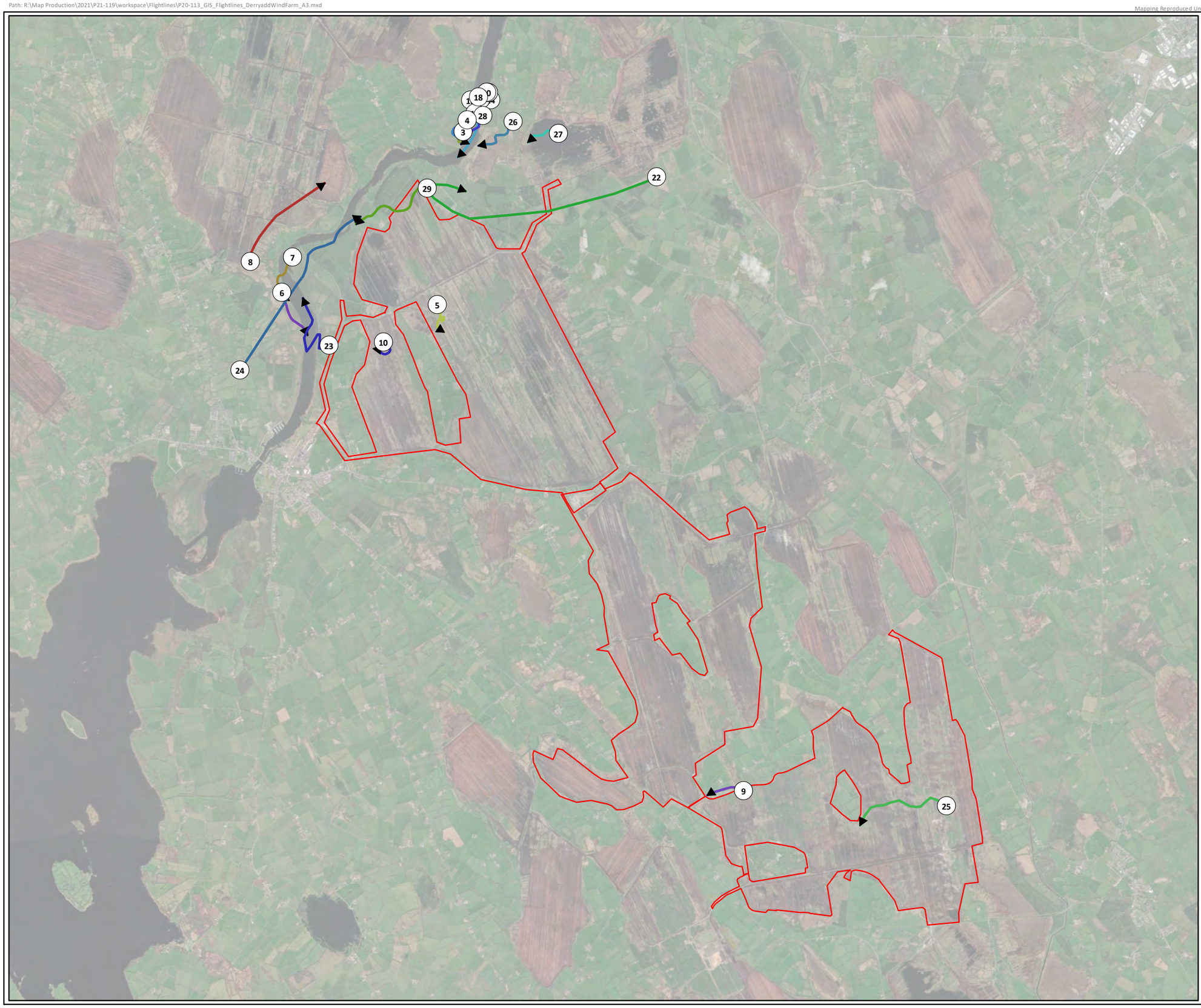
0 0.5 1 2 Kilometers

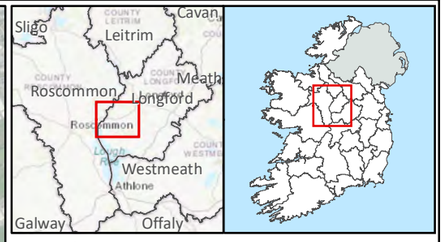
TITLE:	Winter 2021/2022 Flightlines Kestrel		
PROJECT:	Derryadd, Co. Longford		
FIGURE NO:	27		
CLIENT:	Bord na Móna		
SCALE:	1:50000	**REVISION:**	0
DATE:	30/05/2022	**PAGE SIZE:**	A3

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Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Site Boundary

Individual, Date, Time

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- 4, 01/10/2021, 13:14
- 5, 02/10/2021, 14:14
- 6, 28/10/2021, 10:24
- 7, 28/10/2021, 12:44
- 8, 23/11/2021, 11:06
- 9, 24/11/2021, 13:04
- 10, 25/11/2021, 11:40
- 11, 01/12/2021, 08:46
- 12, 01/12/2021, 08:50
- 13, 01/12/2021, 09:18
- 14, 01/12/2021, 09:20
- 15, 01/12/2021, 09:28
- 16, 01/12/2021, 09:31
- 17, 01/12/2021, 10:17
- 18, 01/12/2021, 11:40
- 19, 01/12/2021, 13:09
- 20, 01/12/2021, 13:11
- 21, 01/12/2021, 13:30
- 22, 13/12/2021, 09:42
- 23, 14/12/2021, 10:25
- 24, 14/12/2021, 13:41
- 25, 28/12/2021, 10:57
- 26, 07/01/2022, 09:35
- 27, 07/01/2022, 11:16
- 28, 07/01/2022, 15:47
- 29, 17/01/2022, 09:55

TITLE:	Winter 2021/2022 Flightlines Lapwing		
PROJECT:	Derryadd, Co. Longford		
FIGURE NO:	28		
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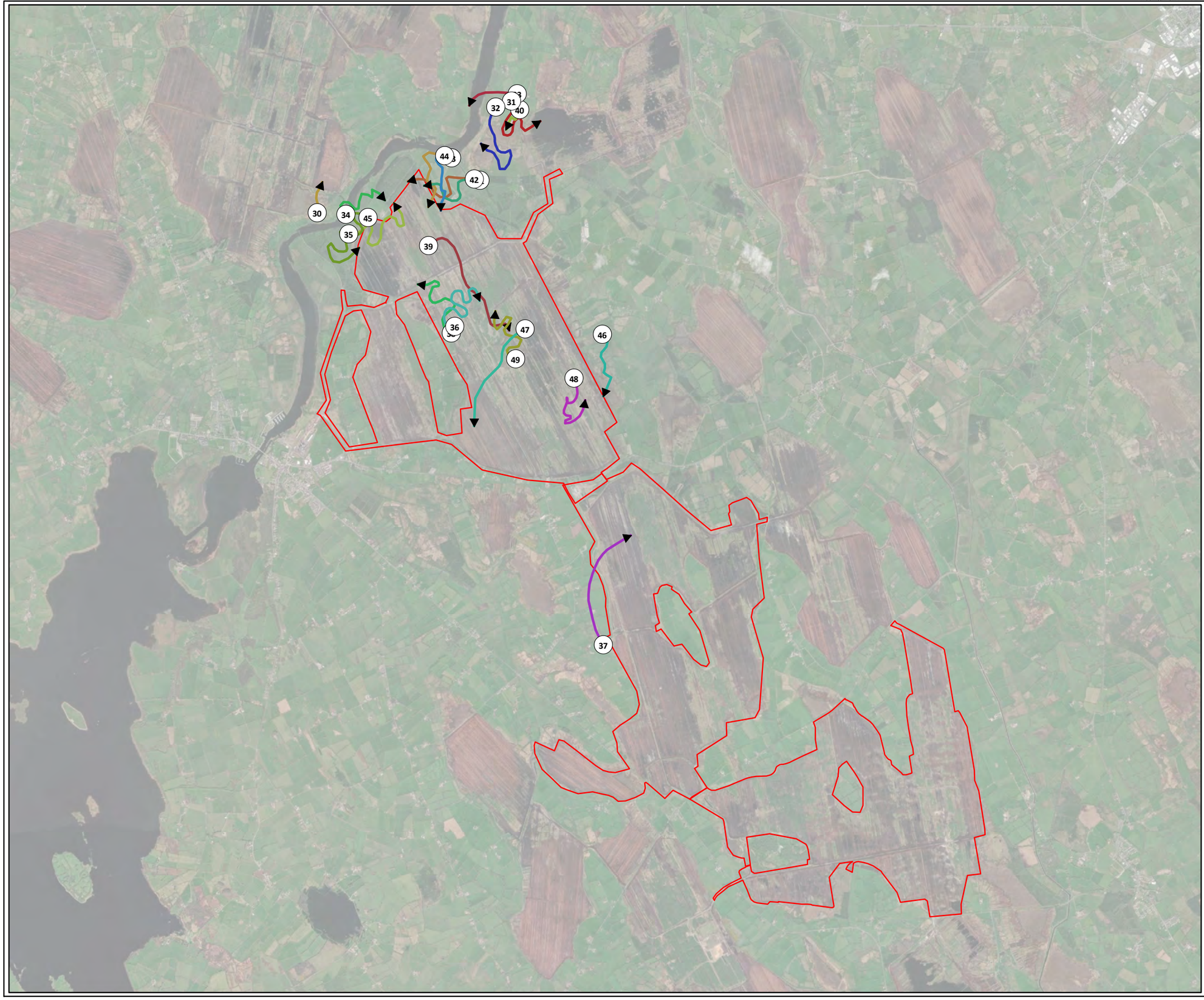
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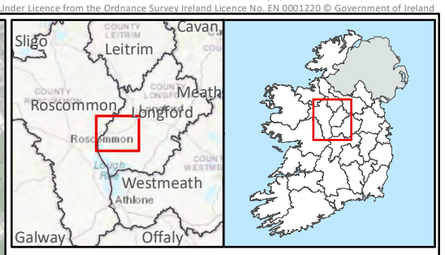
N W E S

0 0.5 1 2 Kilometers

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Site Boundary

Individual, Date, Time

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- 31, 01/02/2022, 09:35
- 32, 01/02/2022, 09:57
- 33, 01/02/2022, 10:55
- 34, 03/02/2022, 10:56
- 35, 03/02/2022, 11:18
- 36, 25/02/2022, 12:58
- 37, 25/02/2022, 14:05
- 38, 28/02/2022, 09:40
- 39, 28/02/2022, 11:00
- 40, 02/03/2022, 10:11
- 41, 02/03/2022, 13:01
- 42, 02/03/2022, 13:01
- 43, 02/03/2022, 13:44
- 44, 02/03/2022, 13:44
- 45, 07/03/2022, 14:16
- 46, 15/03/2022, 10:39
- 47, 15/03/2022, 11:42
- 48, 15/03/2022, 13:23
- 49, 16/03/2022, 09:51

N W E S

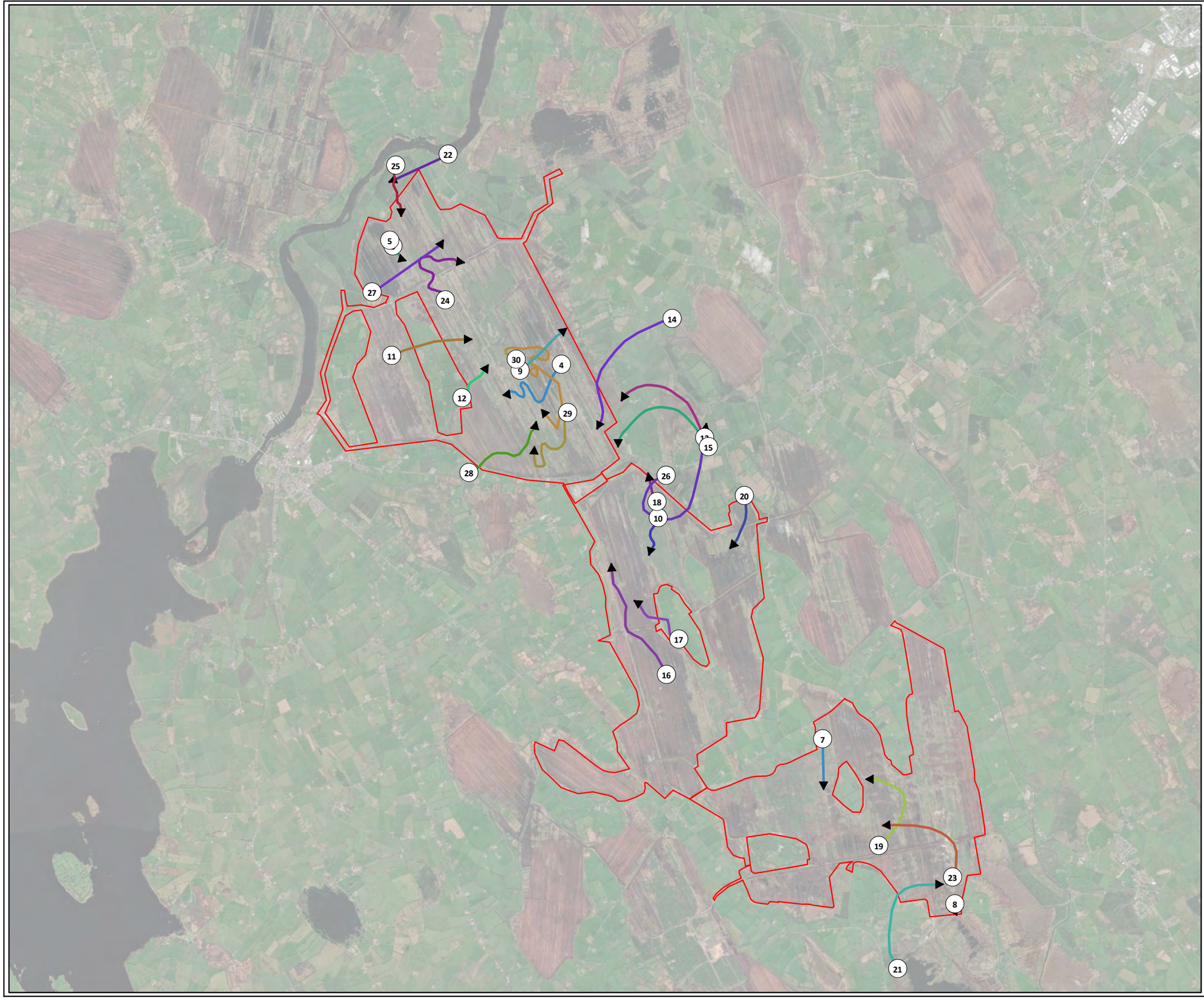
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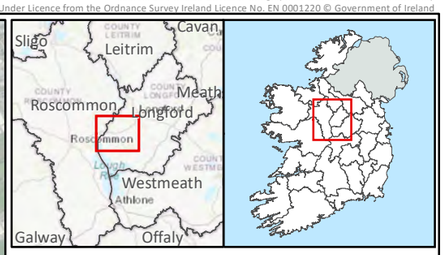
TITLE:	Winter 2021/2022 Flightlines Lapwing		
PROJECT:	Derryadd, Co. Longford		
FIGURE NO:	29		
CLIENT:	Bord na Móna		
SCALE:	1:50000	**REVISION:**	0
DATE:	30/05/2022	**PAGE SIZE:**	A3

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Site Boundary

Individual, Date, Time

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- 6, 02/10/2021, 12:06
- 7, 02/11/2021, 10:01
- 8, 18/11/2021, 11:09
- 9, 26/11/2021, 12:58
- 10, 02/12/2021, 14:39
- 11, 13/12/2021, 11:56
- 12, 13/12/2021, 13:31
- 13, 14/12/2021, 10:27
- 14, 14/12/2021, 10:40
- 15, 14/12/2021, 13:56
- 16, 15/12/2021, 10:39
- 17, 15/12/2021, 14:07
- 18, 16/12/2021, 09:47
- 19, 16/12/2021, 10:28
- 20, 16/12/2021, 10:33
- 21, 27/12/2021, 10:43
- 22, 17/01/2022, 11:33
- 23, 17/01/2022, 11:24
- 24, 24/01/2022, 10:03
- 25, 24/01/2022, 11:33
- 26, 25/02/2022, 14:14
- 27, 28/02/2022, 12:05
- 28, 15/03/2022, 10:56
- 29, 15/03/2022, 10:57
- 30, 16/03/2022, 09:51

TITLE:	Winter 2021/2022 Flightlines Little Egret		
PROJECT:	Derryadd, Co. Longford		
FIGURE NO:	30		
CLIENT:	Bord na Móna		
SCALE:	1:50000	**REVISION:**	0
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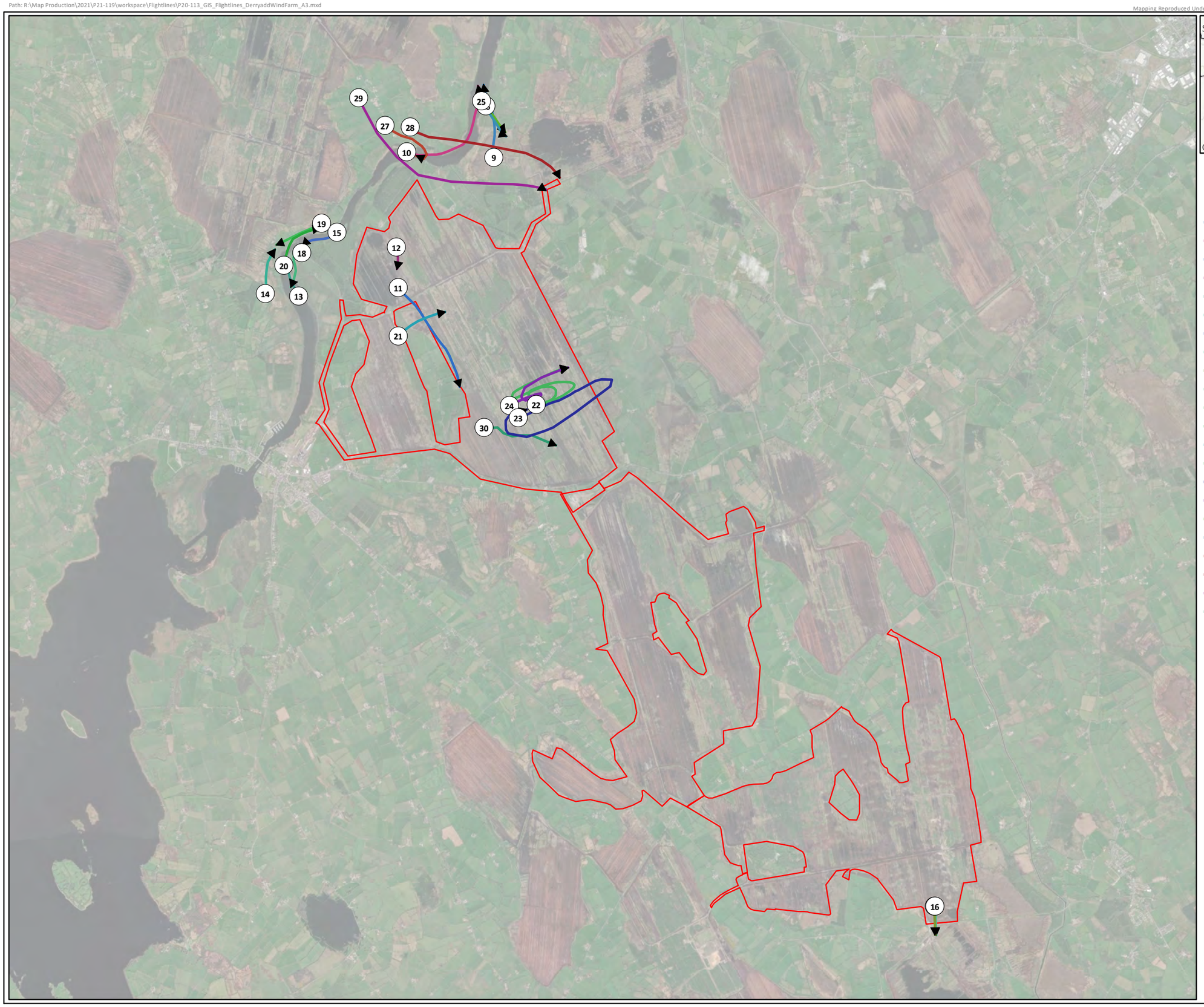
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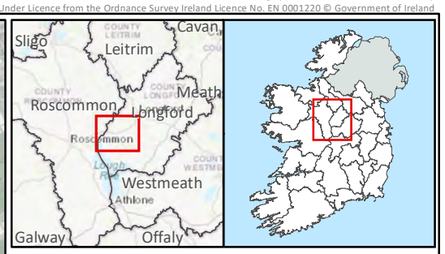
N W E S

0 0.5 1 2 Kilometers

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Site Boundary

Individual, Date, Time

- 9, 01/10/2021, 10:10
- 10, 01/10/2021, 14:02
- 11, 02/10/2021, 10:22
- 12, 02/10/2021, 13:22
- 13, 28/10/2021, 11:02
- 14, 28/10/2021, 11:08
- 15, 28/10/2021, 13:03
- 16, 18/11/2021, 13:11
- 17, 18/11/2021, 13:15
- 18, 23/11/2021, 08:44
- 19, 23/11/2021, 08:52
- 20, 23/11/2021, 09:15
- 21, 25/11/2021, 08:19
- 22, 26/11/2021, 11:31
- 23, 26/11/2021, 11:42
- 24, 26/11/2021, 12:22
- 25, 01/12/2021, 09:23
- 26, 01/12/2021, 10:01
- 27, 13/12/2021, 10:30
- 28, 13/12/2021, 10:55
- 29, 13/12/2021, 11:35
- 30, 13/12/2021, 12:11

TITLE:	Winter 2021/2022 Flightlines Mallard		
PROJECT:	Derryadd, Co. Longford		
FIGURE NO:	31		
CLIENT:	Bord na Móna		
SCALE:	1:50000	**REVISION:**	0
DATE:	30/05/2022	**PAGE SIZE:**	A3

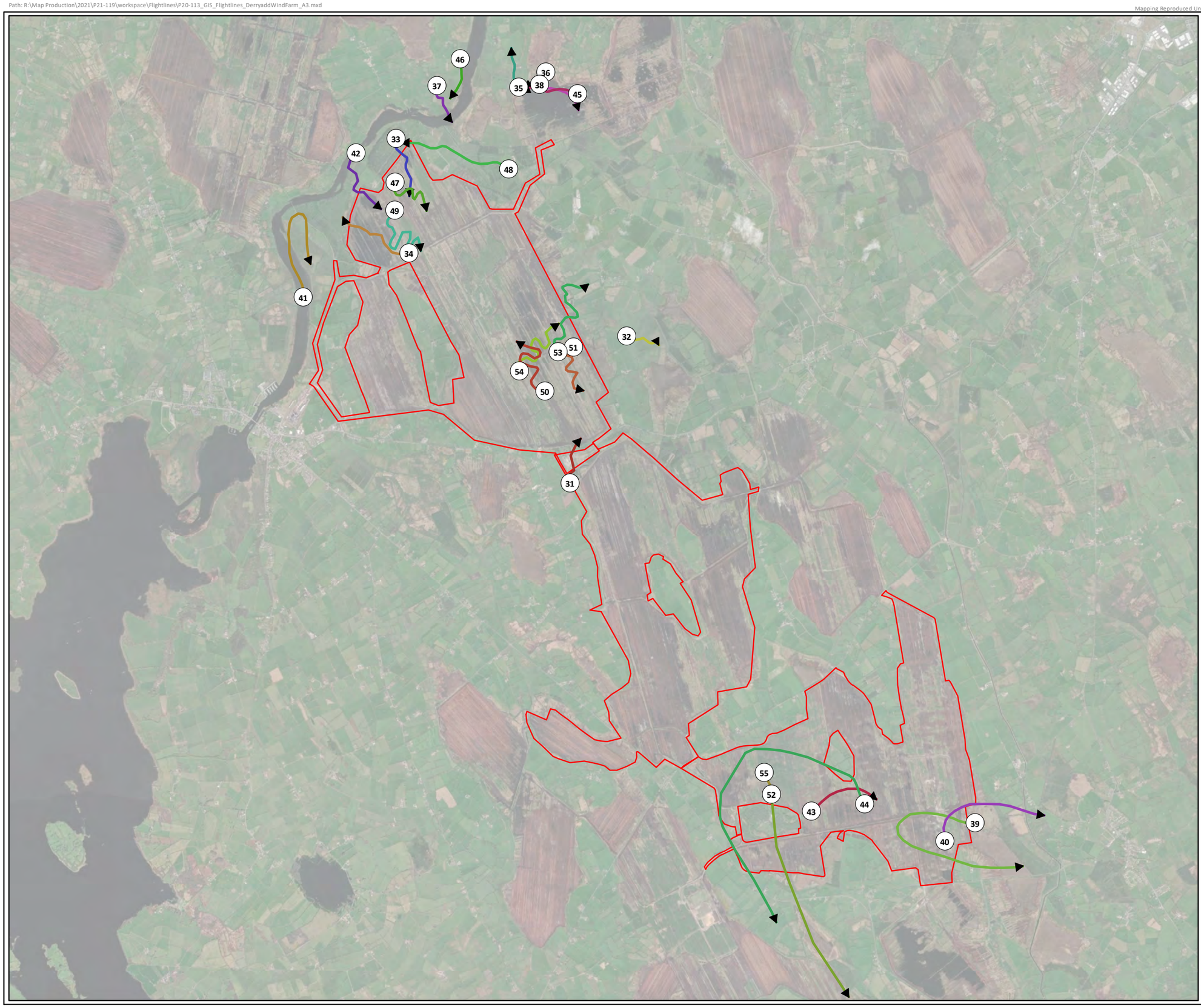
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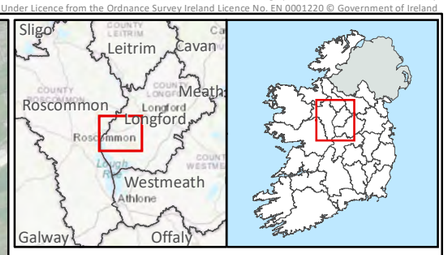
N W E S

0 0.5 1 2 Kilometers

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Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Legend

Site Boundary

Individual, Date, Time

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- 32, 13/12/2021, 13:14
- 33, 14/12/2021, 09:40
- 34, 14/12/2021, 10:10
- 35, 07/01/2022, 10:40
- 36, 07/01/2022, 11:45
- 37, 01/02/2022, 09:58
- 38, 01/02/2022, 12:24
- 39, 01/02/2022, 11:39
- 40, 01/02/2022, 13:22
- 41, 03/02/2022, 10:01
- 42, 03/02/2022, 10:05
- 43, 08/02/2022, 10:39
- 44, 08/02/2022, 11:38
- 45, 02/03/2022, 09:46
- 46, 02/03/2022, 11:02
- 47, 08/03/2022, 10:21
- 48, 08/03/2022, 10:42
- 49, 08/03/2022, 12:04
- 50, 15/03/2022, 10:09
- 51, 15/03/2022, 11:42
- 52, 15/03/2022, 11:05
- 53, 16/03/2022, 09:51
- 54, 16/03/2022, 15:30
- 55, 28/03/2022, 13:36

TITLE:	Winter 2021/2022 Flightlines Mallard		
PROJECT:	Derryadd, Co. Longford		
FIGURE NO:	32		
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DATE:	30/05/2022	**PAGE SIZE:**	A3

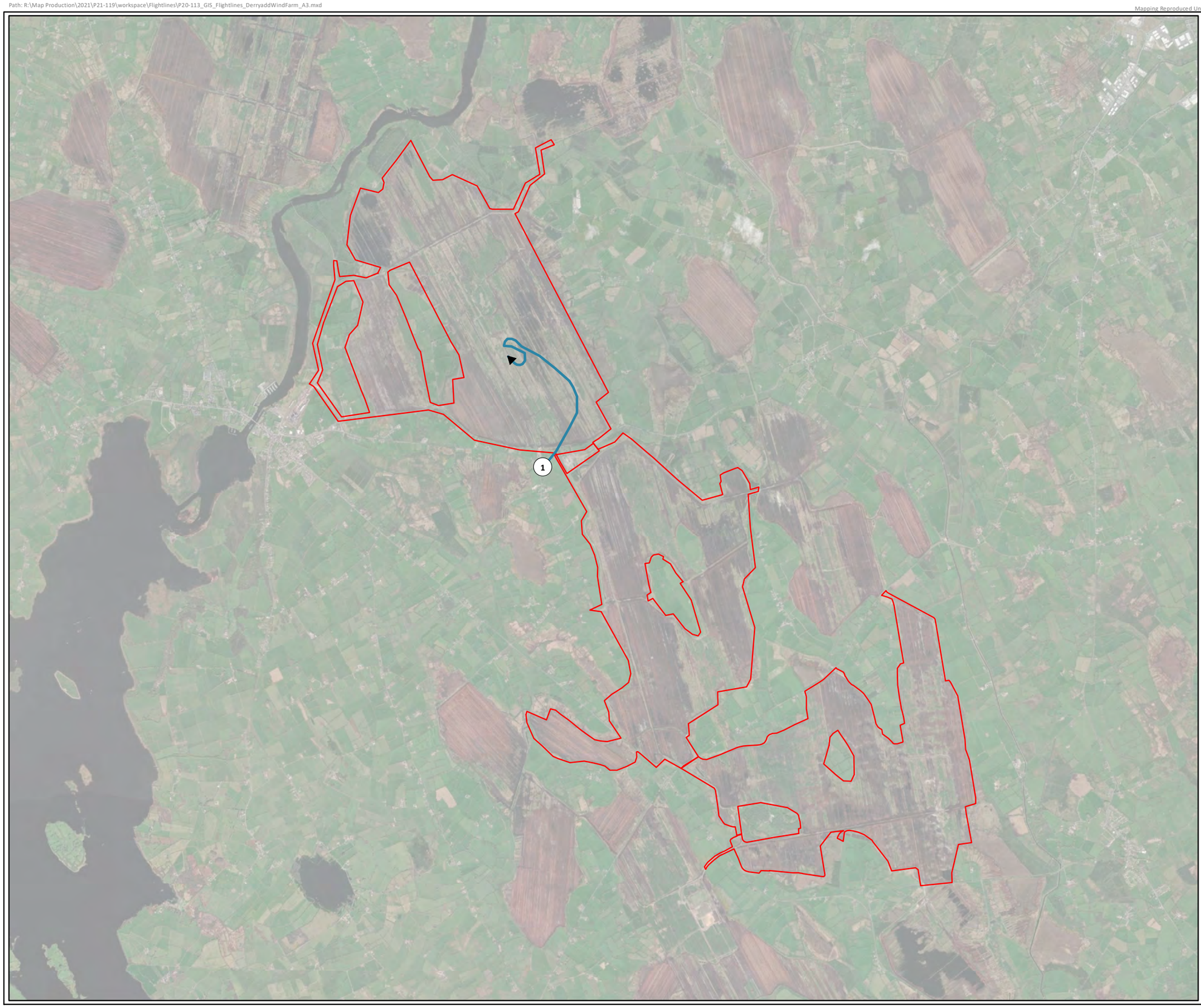
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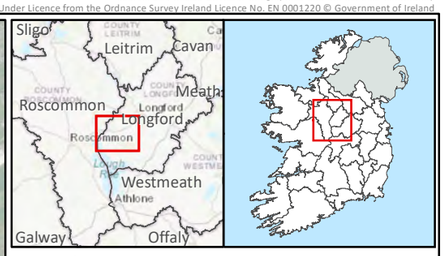
N W E S

Kilometers
0 0.5 1 2

Path: R:\Map Production\2021\P21-119\workspace\Flightlines\P20-113_GIS_Flightlines_DerryaddWindFarm_A3.mxd

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Site Boundary

Individual, Date, Time

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W E
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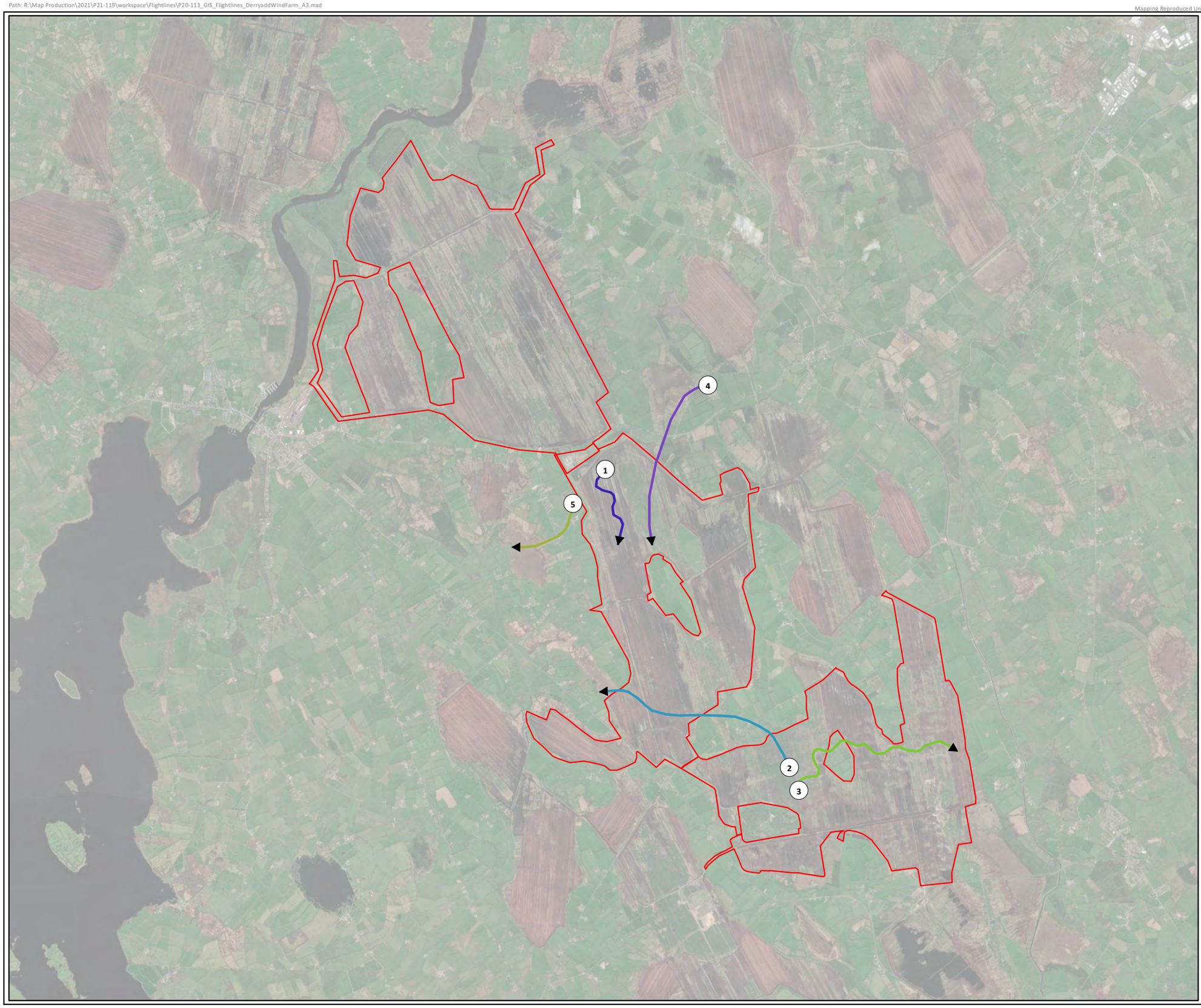
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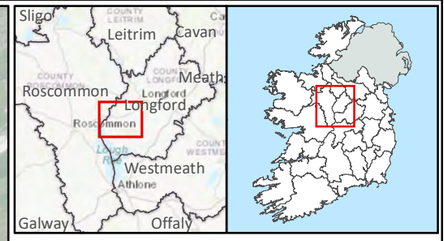
TITLE:	Winter 2021/2022 Flightlines Marsh Harrier		
PROJECT:	Derryadd, Co. Longford		
FIGURE NO:	33		
CLIENT:	Bord na Móna		
SCALE:	1:50000	**REVISION:**	0
DATE:	30/05/2022	**PAGE SIZE:**	A3

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Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Individual, Date, Time

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- 2, 27/12/2021, 14:27
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- 4, 06/01/2022, 10:36
- 5, 24/01/2022, 13:43

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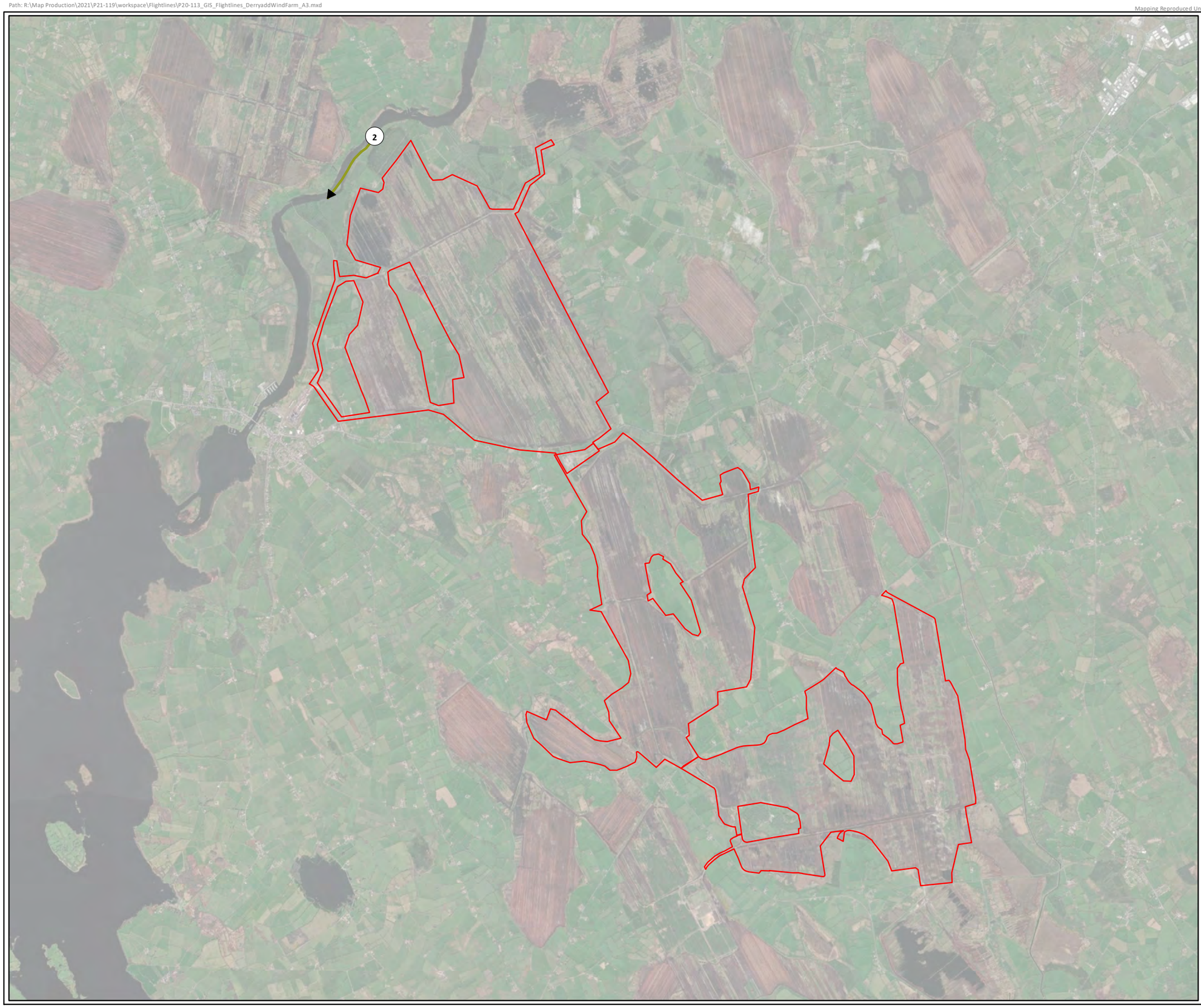
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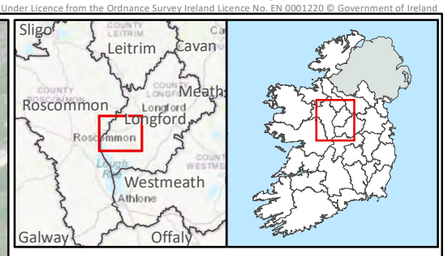
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PROJECT:	Derryadd, Co. Longford		
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CLIENT:	Bord na Móna		
SCALE:	1:50000	**REVISION:**	0
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Individual, Date, Time

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PROJECT:	Derryadd, Co. Longford		
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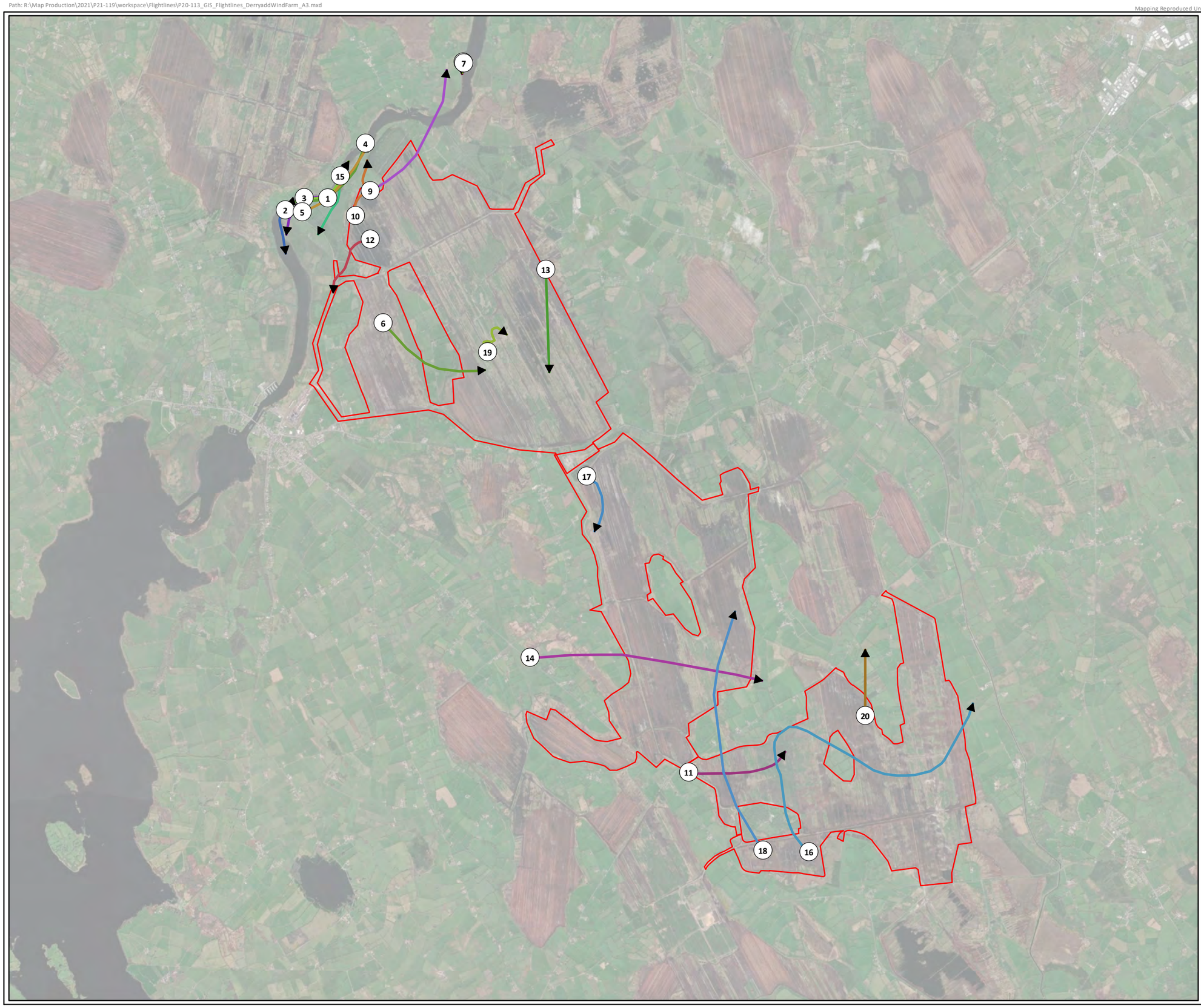
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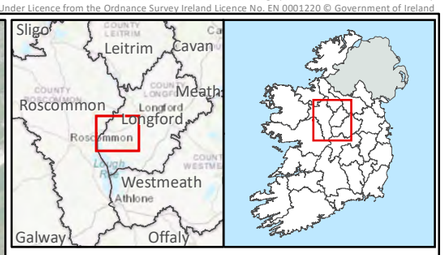
N W E S

0 0.5 1 2 Kilometers

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Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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- 3, 23/11/2021, 08:43
- 4, 23/11/2021, 08:48
- 5, 23/11/2021, 12:51
- 6, 25/11/2021, 12:10
- 7, 01/12/2021, 09:05
- 8, 01/12/2021, 11:59
- 9, 13/12/2021, 11:05
- 10, 14/12/2021, 09:43
- 11, 12/01/2022, 14:23
- 12, 17/01/2022, 11:13
- 13, 02/02/2022, 11:19
- 14, 02/02/2022, 10:41
- 15, 03/02/2022, 09:57
- 16, 09/02/2022, 10:57
- 17, 25/02/2022, 09:41
- 18, 02/03/2022, 11:25
- 19, 16/03/2022, 13:19
- 20, 28/03/2022, 10:52

TITLE:	Winter 2021/2022 Flightlines Mute Swan		
PROJECT:	Derryadd, Co. Longford		
FIGURE NO:	36		
CLIENT:	Bord na Móna		
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DATE:	30/05/2022	**PAGE SIZE:**	A3

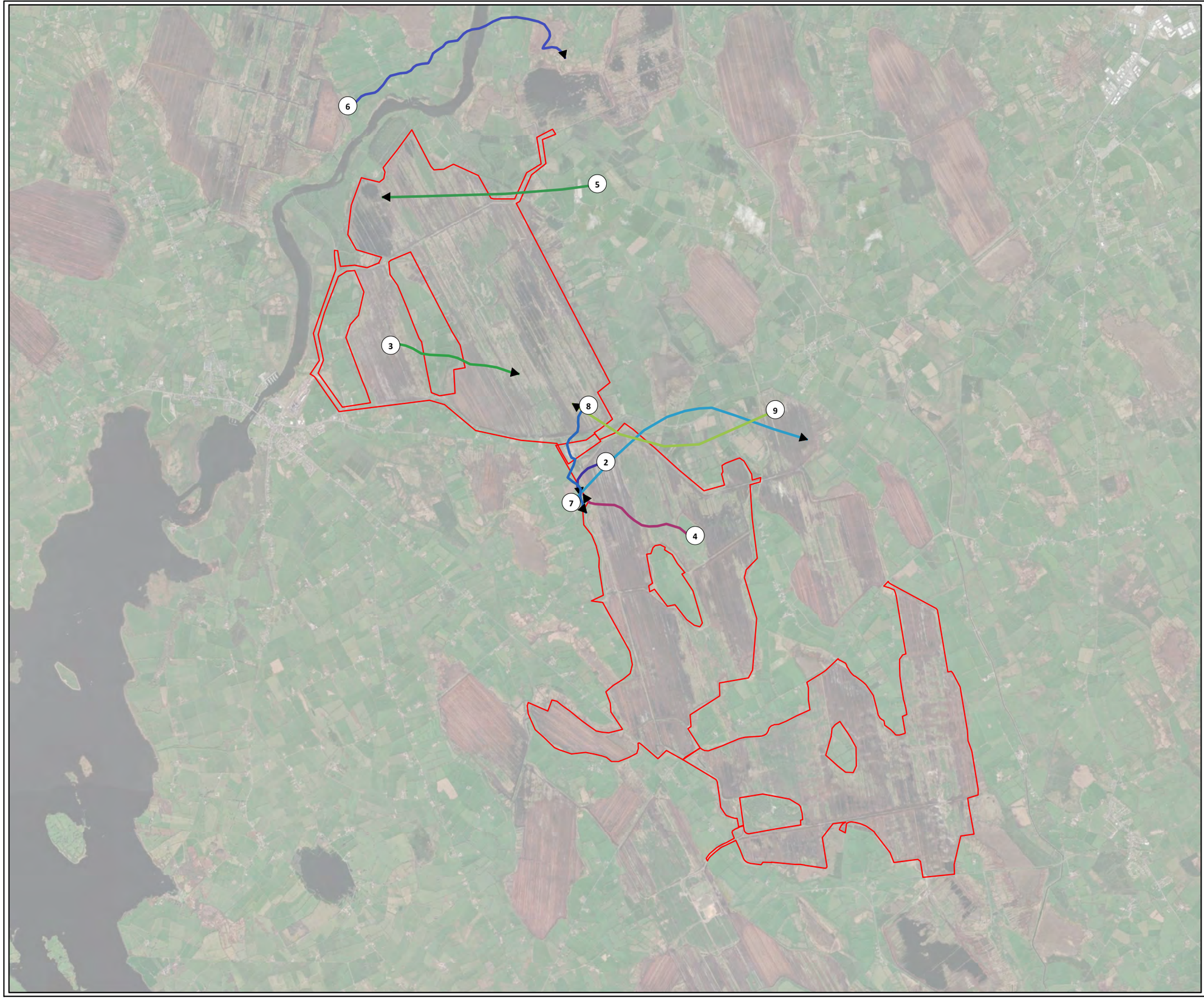
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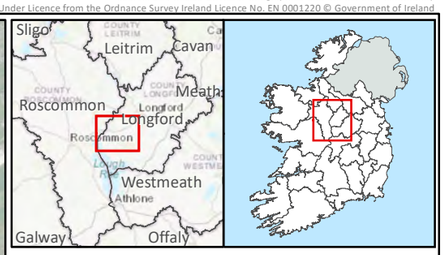
N W E S

Kilometers
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Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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- 3, 13/12/2021, 12:20
- 4, 15/12/2021, 11:30
- 5, 15/12/2021, 12:25
- 6, 07/01/2022, 11:27
- 7, 02/02/2022, 11:09
- 8, 16/03/2022, 11:28
- 9, 16/03/2022, 12:24

N W E S

0 0.5 1 2 Kilometers

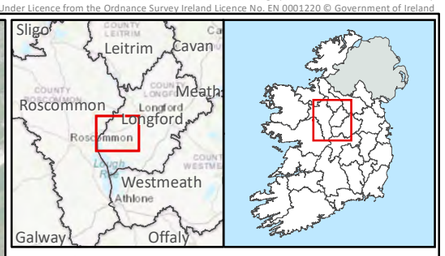
TITLE:	Winter 2021/2022 Flightlines Peregrine		
PROJECT:	Derryadd, Co. Longford		
FIGURE NO:	37		
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DATE:	30/05/2022	**PAGE SIZE:**	A3

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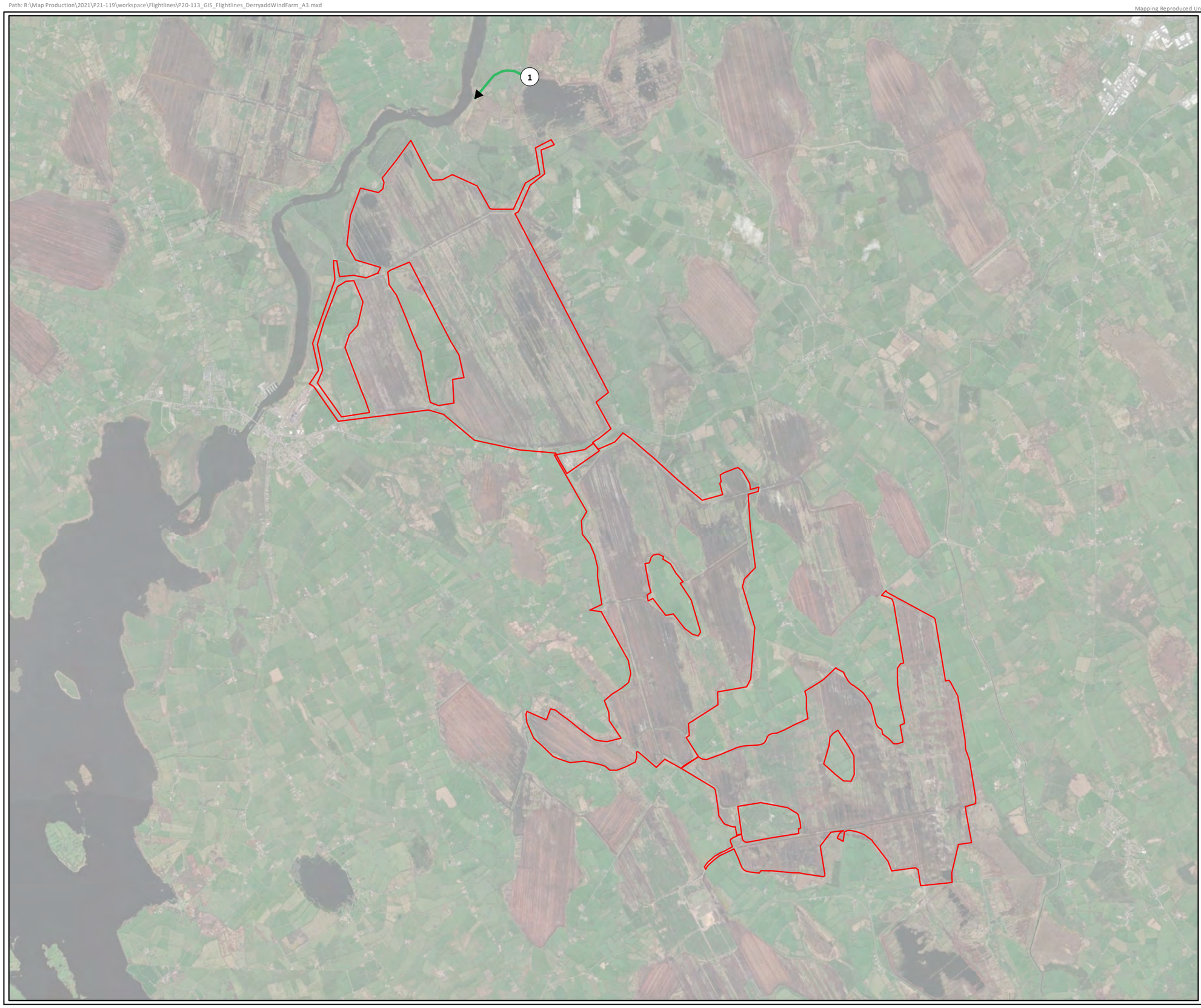
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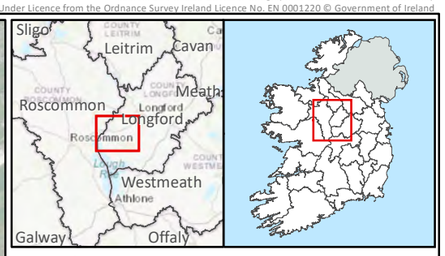
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CLIENT:	Bord na Móna		
SCALE:	1:50000	**REVISION:**	0
DATE:	30/05/2022	**PAGE SIZE:**	A3

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Site Boundary

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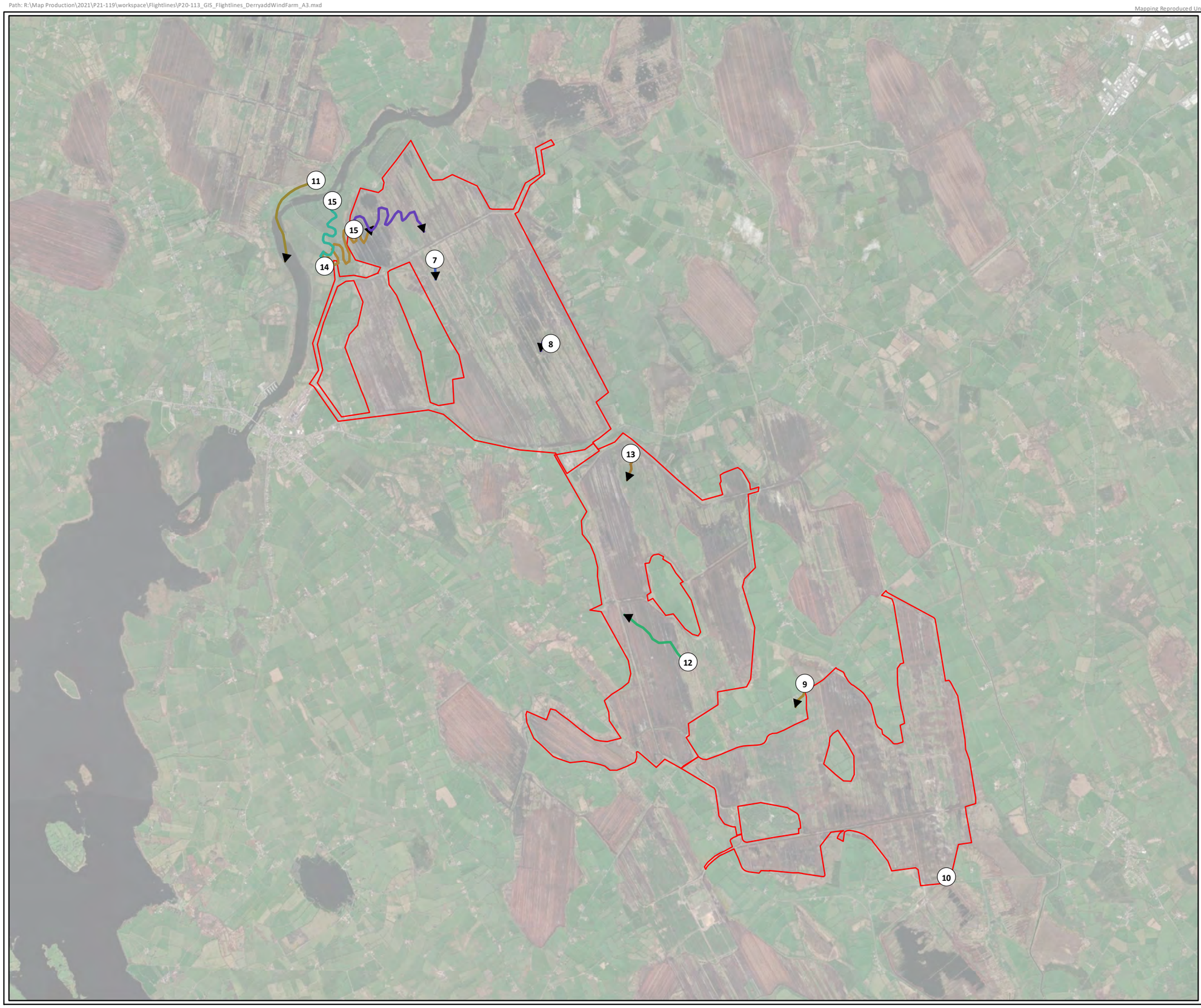
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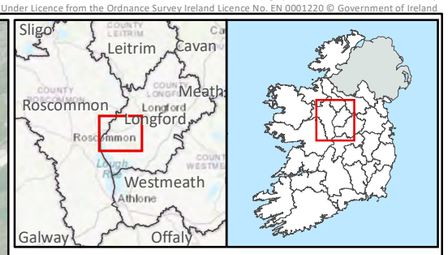
TITLE:	Winter 2021/2022 Flightlines Shoveler		
PROJECT:	Derryadd, Co. Longford		
FIGURE NO:	39		
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Site Boundary

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- 8, 02/10/2021, 17:18
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N W E S

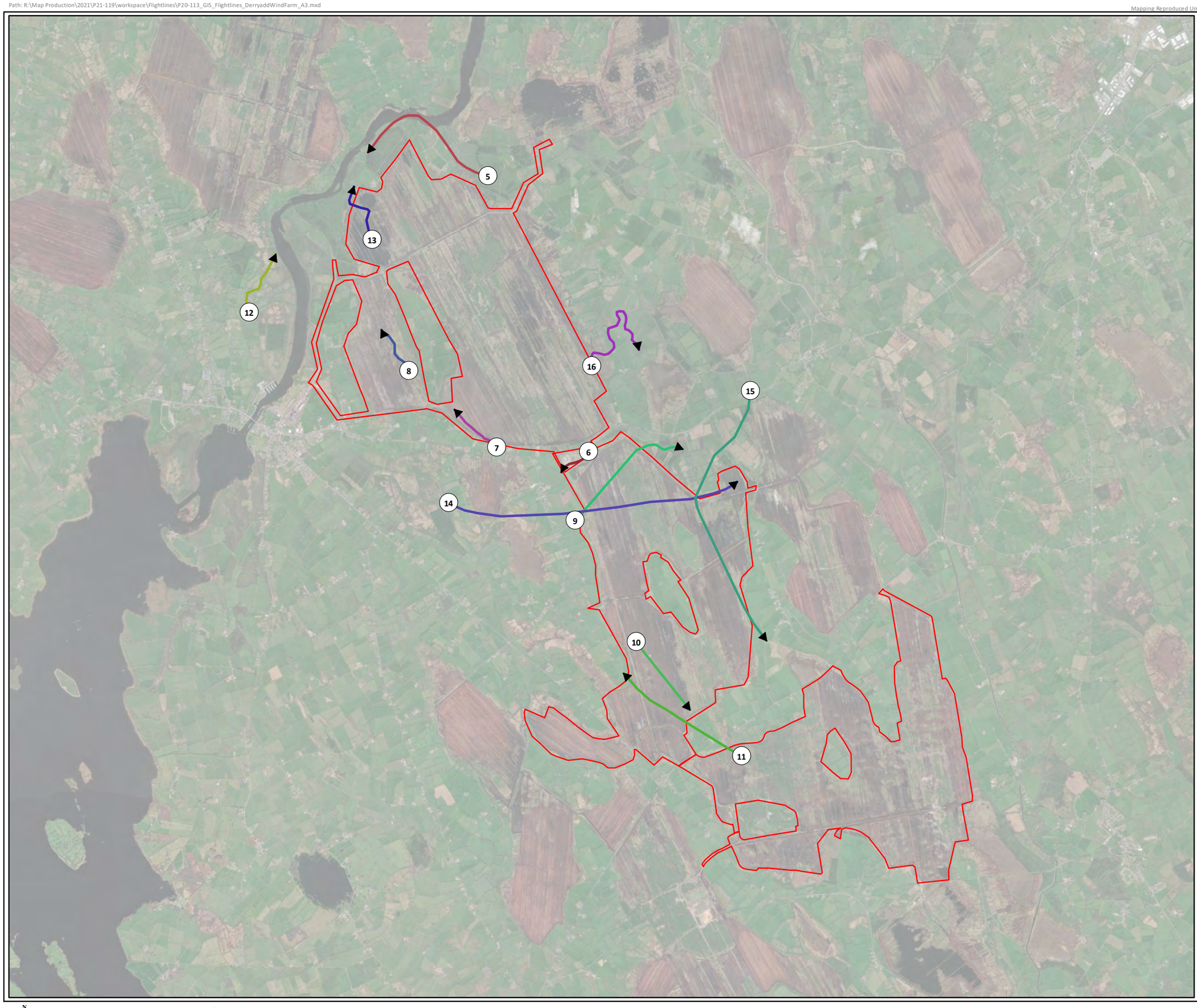
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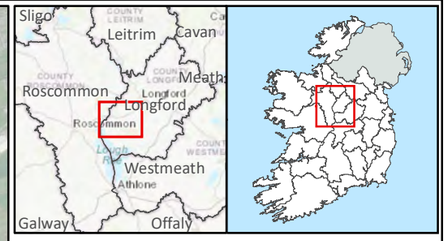
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Site Boundary

Individual, Date, Time

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- 6, 03/10/2021, 09:50
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- 8, 13/12/2021, 13:59
- 9, 16/12/2021, 10:53
- 10, 27/12/2021, 09:40
- 11, 27/12/2021, 09:57
- 12, 17/01/2022, 14:13
- 13, 24/01/2022, 12:05
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N W E S

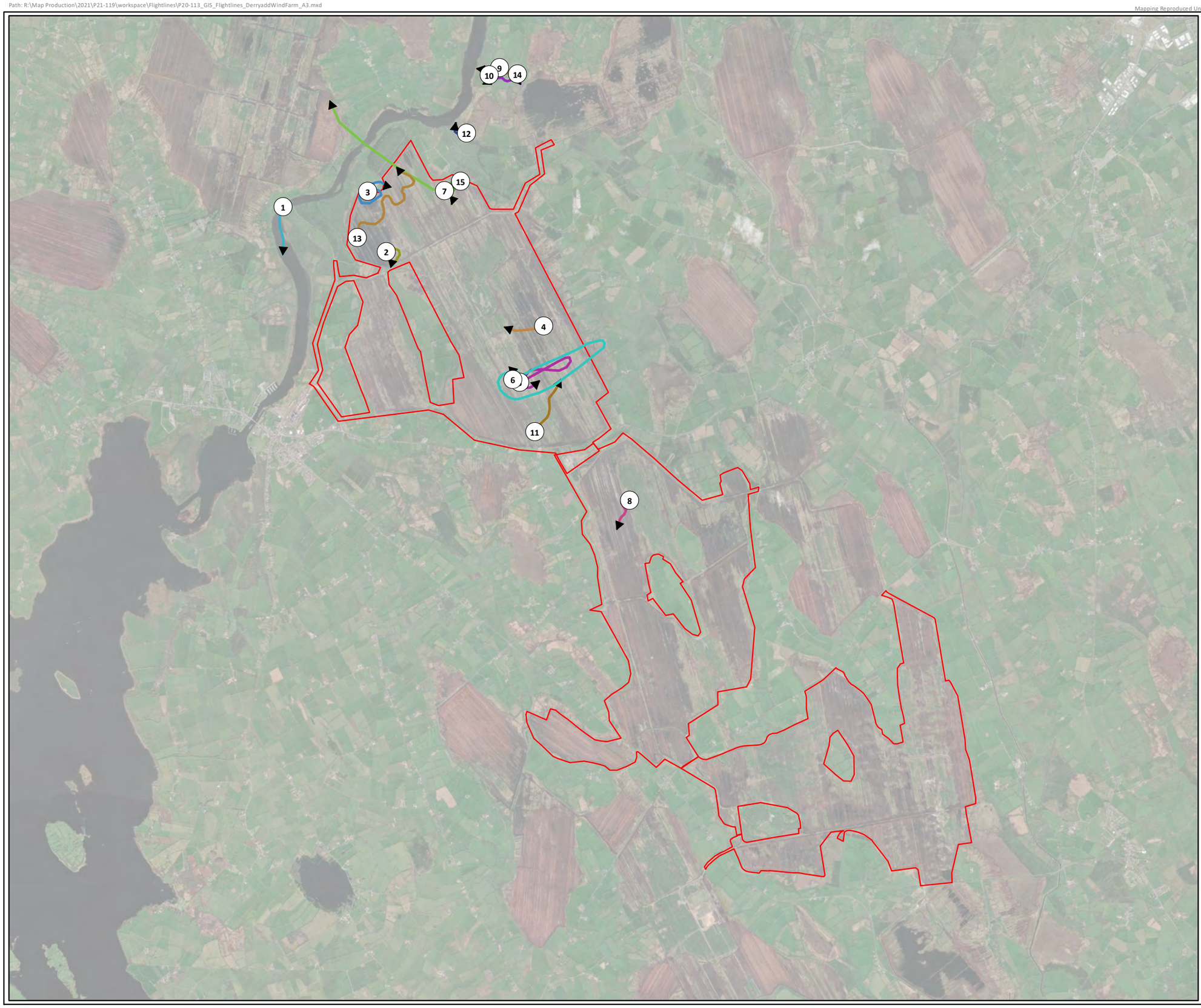
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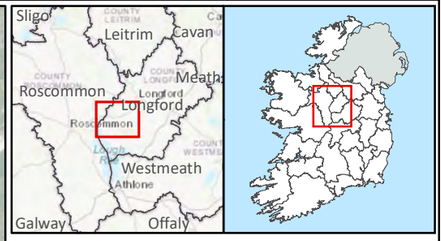
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DATE:	30/05/2022	**PAGE SIZE:**	A3

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Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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- 1, 23/11/2021, 08:50
- 2, 25/11/2021, 08:18
- 3, 25/11/2021, 10:50
- 4, 26/11/2021, 10:44
- 5, 26/11/2021, 11:37
- 6, 26/11/2021, 11:42
- 7, 13/12/2021, 10:13
- 8, 16/12/2021, 12:03
- 9, 07/01/2022, 11:00
- 10, 07/01/2022, 15:11
- 11, 25/01/2022, 09:36
- 12, 01/02/2022, 09:58
- 13, 28/02/2022, 12:04
- 14, 02/03/2022, 10:05
- 15, 08/03/2022, 11:57

TITLE:	Winter 2021/2022 Flightlines Teal		
PROJECT:	Derryadd, Co. Longford		
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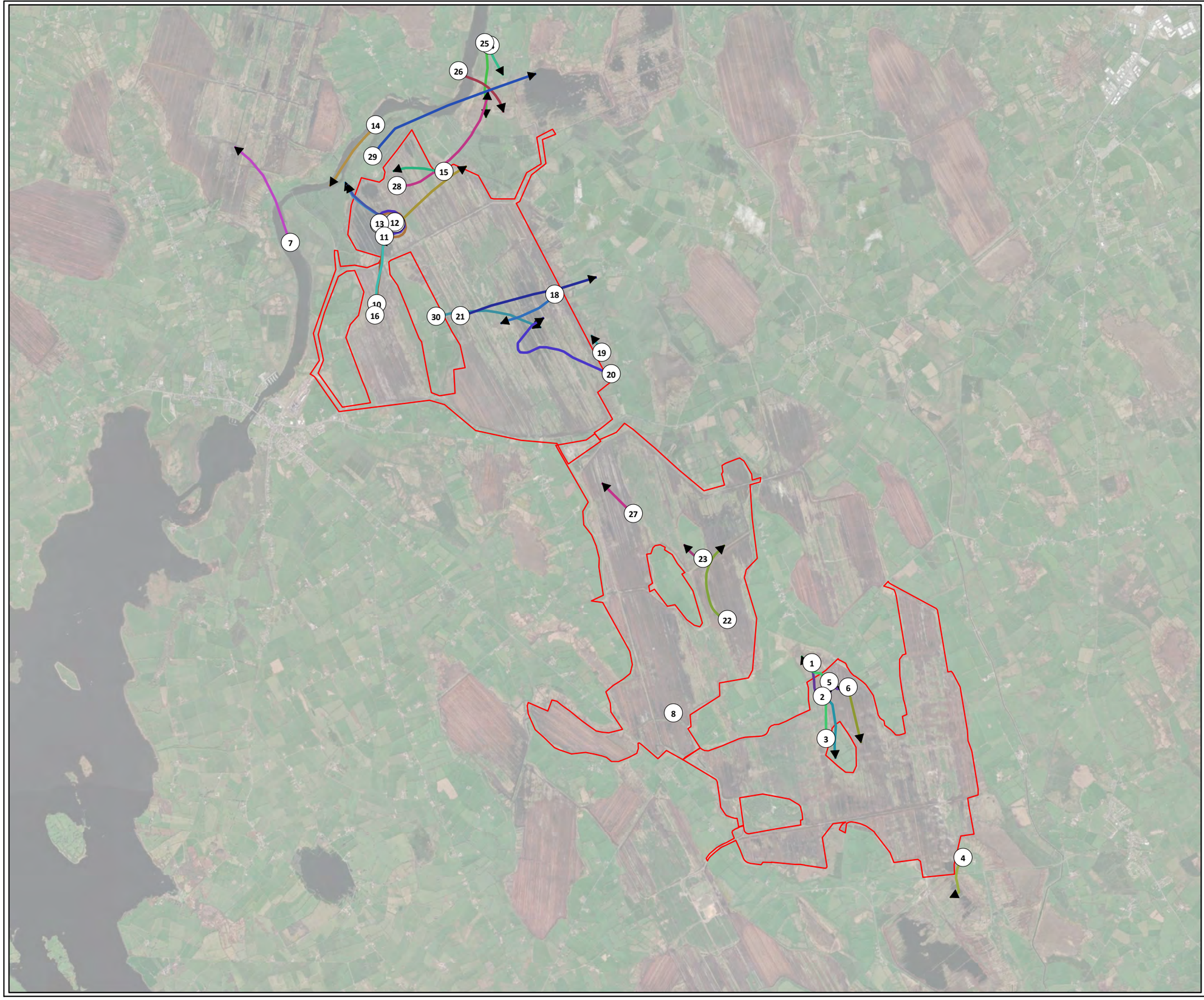
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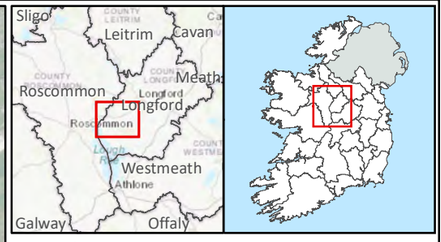
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Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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- 5, 19/11/2021, 07:52
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- 8, 24/11/2021, 15:15
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- 10, 25/11/2021, 08:00
- 11, 25/11/2021, 08:01
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- 14, 25/11/2021, 09:29
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- 17, 25/11/2021, 11:00
- 18, 26/11/2021, 09:23
- 19, 26/11/2021, 10:16
- 20, 26/11/2021, 11:48
- 21, 26/11/2021, 12:32
- 22, 29/11/2021, 11:19
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- 24, 01/12/2021, 08:32
- 25, 01/12/2021, 09:27
- 26, 01/12/2021, 09:58
- 27, 02/12/2021, 12:57
- 28, 13/12/2021, 09:35
- 29, 13/12/2021, 09:55
- 30, 13/12/2021, 11:26

TITLE:	Winter 2021/2022 Flightlines Whooper Swan		
PROJECT:	Derryadd, Co. Longford		
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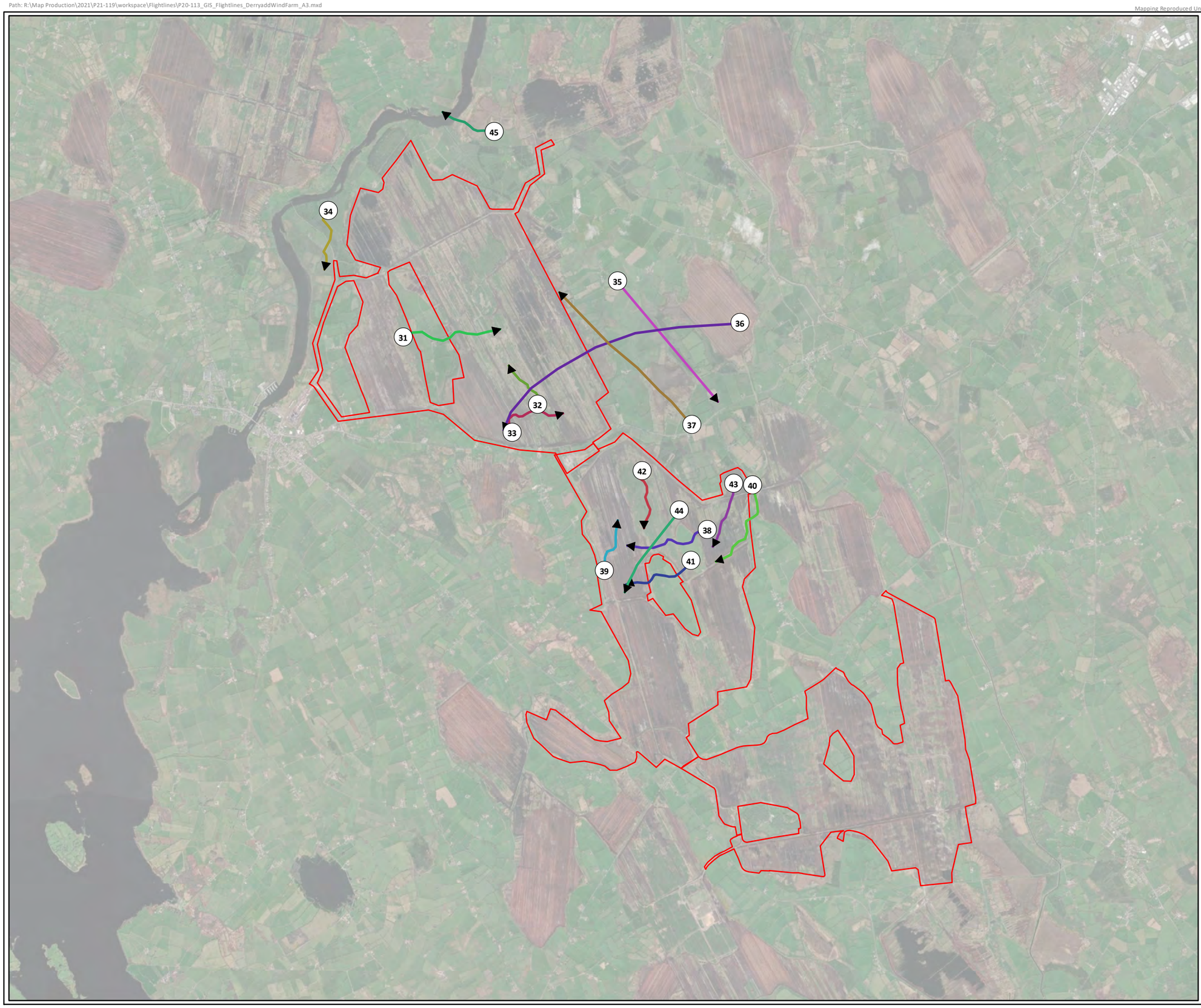
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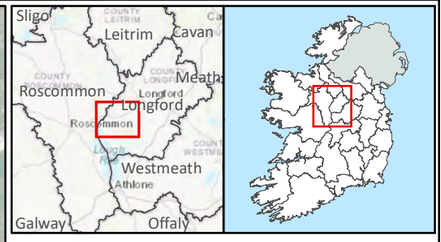
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Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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- 36, 14/12/2021, 10:43
- 37, 14/12/2021, 11:04
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N W E S

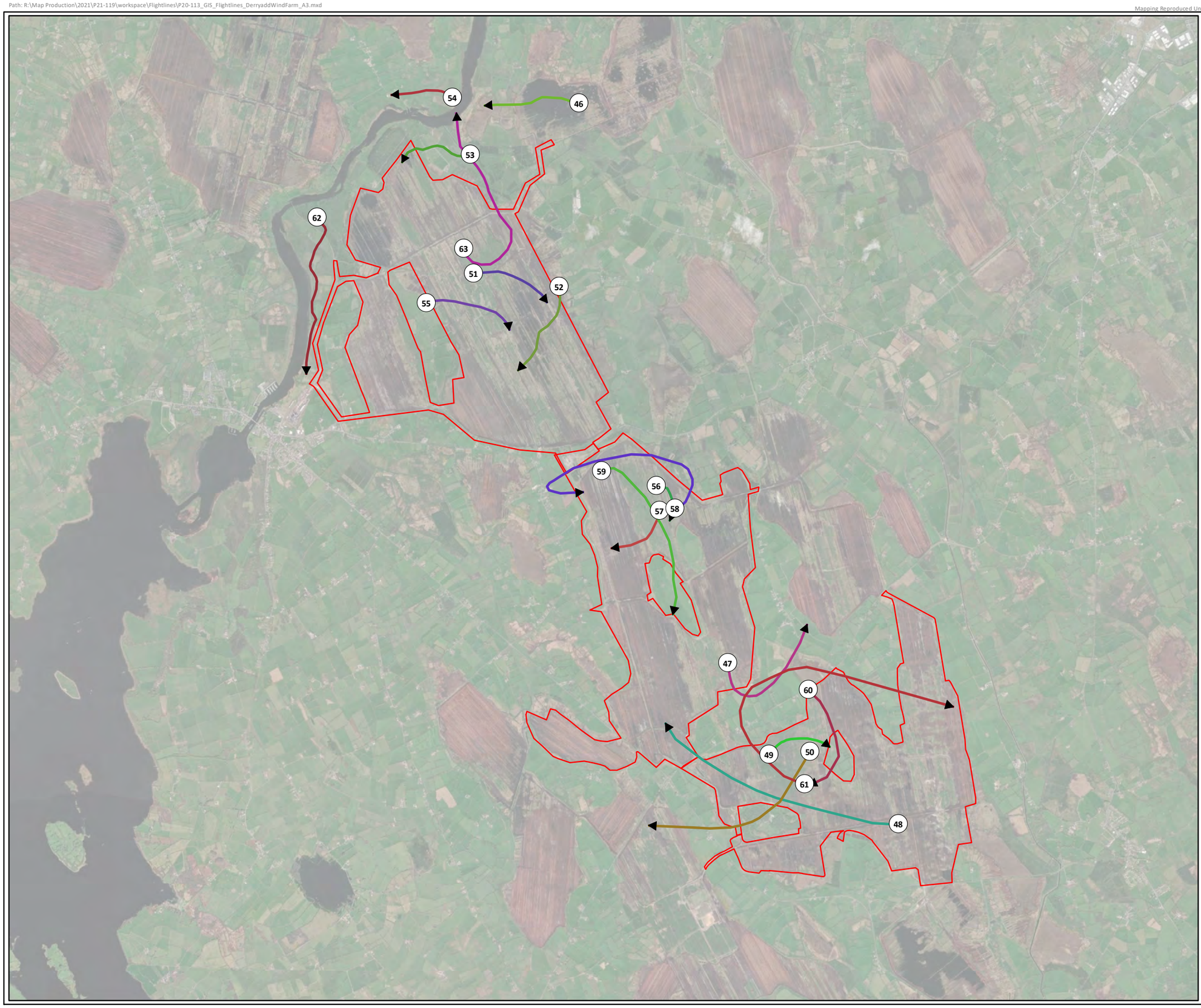
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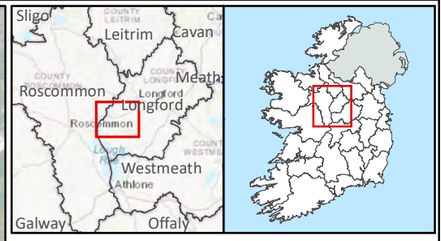
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Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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- 50, 12/01/2022, 13:13
- 51, 18/01/2022, 09:57
- 52, 25/01/2022, 09:33
- 53, 01/02/2022, 09:53
- 54, 01/02/2022, 10:17
- 55, 02/02/2022, 11:14
- 56, 25/02/2022, 09:41
- 57, 25/02/2022, 10:25
- 58, 25/02/2022, 11:12
- 59, 25/02/2022, 11:54
- 60, 02/03/2022, 09:43
- 61, 02/03/2022, 10:31
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- 63, 08/03/2022, 11:51

TITLE:	Winter 2021/2022 Flightlines Whooper Swan		
PROJECT:	Derryadd, Co. Longford		
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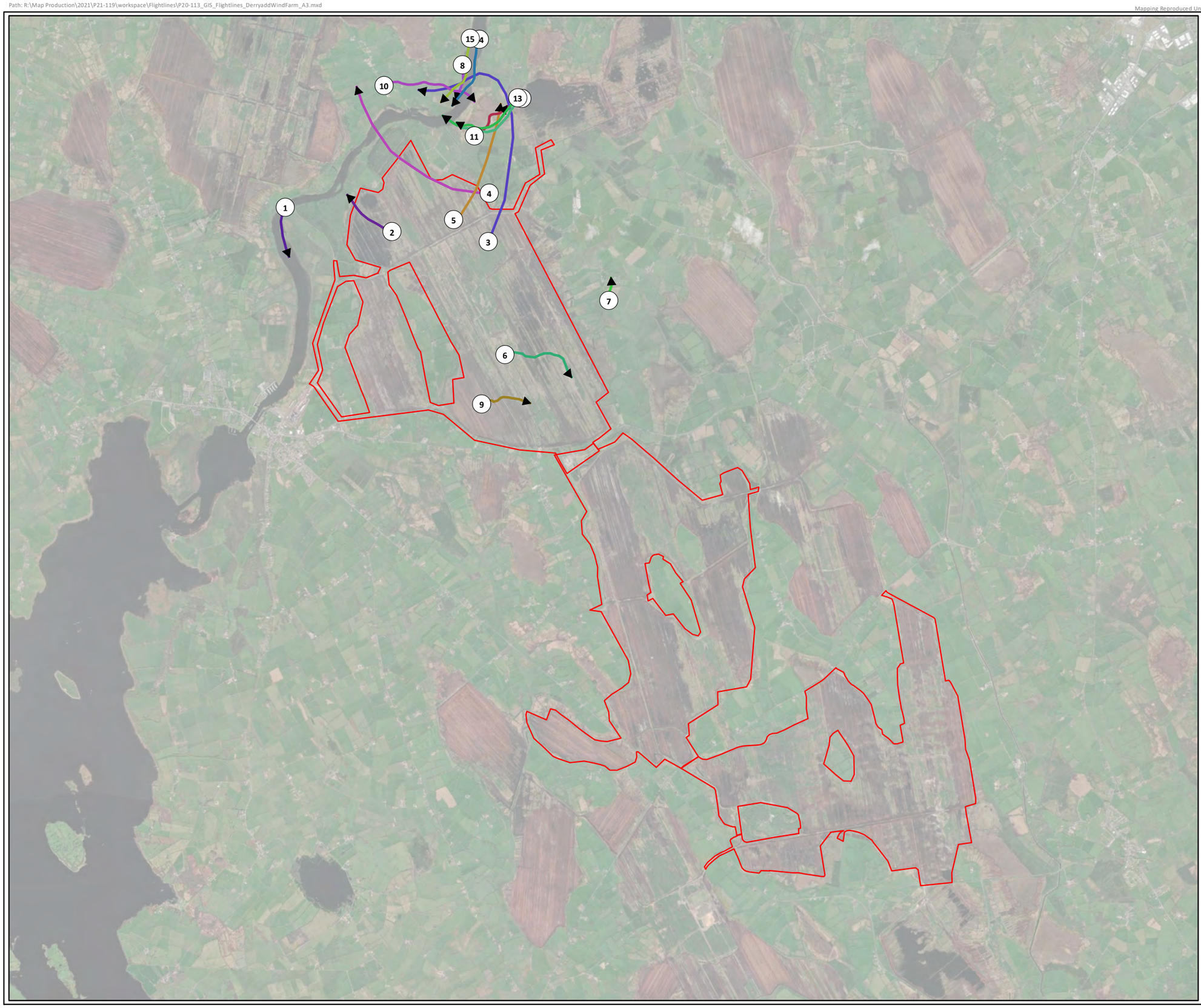
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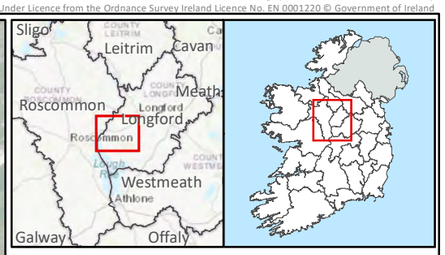
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- 10, 01/02/2022, 09:59
- 11, 02/03/2022, 09:40
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TITLE:	Winter 2021/2022 Flightlines Wigeon		
PROJECT:	Derryadd, Co. Longford		
FIGURE NO:	46		
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APPENDIX 4

Hinterland Survey Results

Hinterland Survey Data Migration 2021 and Winter 2021/2022

HVP	Date	Cloud	Visibility	Rain	Wind	Common Name
Migration 2021						
1	30/09/2021	8	Very Good	Showers	F2 SW	Mallard
1	30/09/2021	8	Very Good	Showers	F2 SW	Moorhen
2	30/09/2021	8	Very Good	Showers	F2 SW	Moorhen
2	30/09/2021	8	Very Good	Showers	F2 SW	Grey Heron
4	30/09/2021	8	Very Good	Showers	F2 SW	Little Egret
4	30/09/2021	8	Very Good	Showers	F2 SW	Mallard
4	30/09/2021	8	Very Good	Showers	F2 SW	Moorhen
4	30/09/2021	8	Very Good	Showers	F2 SW	Water Rail
4	30/09/2021	8	Very Good	Showers	F2 SW	Buzzard
4	30/09/2021	8	Very Good	Showers	F2 SW	Lapwing
5	30/09/2021	8	Very Good	Showers	F2 SW	Great Crested Grebe
5	30/09/2021	8	Very Good	Showers	F2 SW	Mute Swan
5	30/09/2021	8	Very Good	Showers	F2 SW	Mallard
5	30/09/2021	8	Very Good	Showers	F2 SW	Coot
5	30/09/2021	8	Very Good	Showers	F2 SW	Moorhen
5	30/09/2021	8	Very Good	Showers	F2 SW	Grey Heron
5	30/09/2021	8	Very Good	Showers	F2 SW	Little Egret
5	30/09/2021	8	Very Good	Showers	F2 SW	Little Grebe
6	30/09/2021	8	Very Good	Showers	F2 SW	Mute Swan
7	30/09/2021	8	Very Good	Showers	F2 SW	Mute Swan
7	30/09/2021	8	Very Good	Showers	F2 SW	Grey Heron
7	30/09/2021	8	Very Good	Showers	F2 SW	Moorhen
8	30/09/2021	8	Very Good	Showers	F2 SW	Great Black-backed Gull
8	30/09/2021	8	Very Good	Showers	F2 SW	Lapwing
8	30/09/2021	8	Very Good	Showers	F2 SW	Goldeneye
8	30/09/2021	8	Very Good	Showers	F2 SW	Tufted Duck
8	30/09/2021	8	Very Good	Showers	F2 SW	Teal
8	30/09/2021	8	Very Good	Showers	F2 SW	Mallard
8	30/09/2021	8	Very Good	Showers	F2 SW	Great Crested Grebe
8	30/09/2021	8	Very Good	Showers	F2 SW	Little Grebe
8	30/09/2021	8	Very Good	Showers	F2 SW	Mute Swan
8	30/09/2021	8	Very Good	Showers	F2 SW	Little Egret
8	30/09/2021	8	Very Good	Showers	F2 SW	Grey Heron
8	30/09/2021	8	Very Good	Showers	F2 SW	Moorhen
9	30/09/2021	8	Very Good	Showers	F2 SW	Tufted Duck
9	30/09/2021	8	Very Good	Showers	F2 SW	Grey Heron
9	30/09/2021	8	Very Good	Showers	F2 SW	Wigeon
9	30/09/2021	8	Very Good	Showers	F2 SW	Mallard
9	30/09/2021	8	Very Good	Showers	F2 SW	Great Crested Grebe
9	30/09/2021	8	Very Good	Showers	F2 SW	Little Grebe
9	30/09/2021	8	Very Good	Showers	F2 SW	Mallard

HVP	Date	Cloud	Visibility	Rain	Wind	Common Name
9	30/09/2021	8	Very Good	Showers	F2 SW	Coot
9	30/09/2021	8	Very Good	Showers	F2 SW	Cormorant
10	30/09/2021	8	Very Good	Showers	F2 SW	Mute Swan
11	30/09/2021	8	Very Good	Showers	F2 SW	Wigeon
11	30/09/2021	8	Very Good	Showers	F2 SW	Mute Swan
11	30/09/2021	8	Very Good	Showers	F2 SW	Grey Heron
11	30/09/2021	8	Very Good	Showers	F2 SW	Mallard
11	30/09/2021	8	Very Good	Showers	F2 SW	Moorhen
12	30/09/2021	8	Very Good	Showers	F2 SW	Grey Heron
13	30/09/2021	8	Very Good	Showers	F2 SW	No target species
14	30/09/2021	8	Very Good	Showers	F2 SW	Mallard
15	30/09/2021	8	Very Good	Showers	F2 SW	Moorhen
15	30/09/2021	8	Very Good	Showers	F2 SW	Mute Swan
16	30/09/2021	8	Very Good	Showers	F2 SW	No target species
17	30/09/2021	8	Very Good	Showers	F2 SW	No target species
18	30/09/2021	8	Very Good	Showers	F2 SW	No target species
19	30/09/2021	8	Very Good	Showers	F2 SW	Grey Wagtail
20	30/09/2021	8	Very Good	Showers	F2 SW	Buzzard
21	30/09/2021	8	Very Good	Showers	F2 SW	Grey Heron
22	30/09/2021	8	Very Good	Showers	F2 SW	No target species
23	30/09/2021	8	Very Good	Showers	F2 SW	No target species
24	30/09/2021	8	Very Good	Showers	F2 SW	No target species
25	30/09/2021	8	Very Good	Showers	F2 SW	No target species
Winter 2021/2022						
1	26/10/2021	8	Very Good	Showers	F3 SSW	Mallard
2	26/10/2021	8	Very Good	Showers	F3 SSW	Moorhen
2	26/10/2021	8	Very Good	Showers	F3 SSW	Mallard
4	26/10/2021	8	Very Good	Showers	F3 SSW	Moorhen
4	26/10/2021	8	Very Good	Showers	F3 SSW	Water Rail
4	26/10/2021	8	Very Good	Showers	F3 SSW	Grey Heron
4	26/10/2021	8	Very Good	Showers	F3 SSW	Mallard
4	26/10/2021	8	Very Good	Showers	F3 SSW	Whooper Swan
5	26/10/2021	8	Very Good	Showers	F3 SSW	Great Crested Grebe
5	26/10/2021	8	Very Good	Showers	F3 SSW	Mute Swan
5	26/10/2021	8	Very Good	Showers	F3 SSW	Mallard
5	26/10/2021	8	Very Good	Showers	F3 SSW	Coot
5	26/10/2021	8	Very Good	Showers	F3 SSW	Moorhen
5	26/10/2021	8	Very Good	Showers	F3 SSW	Little Grebe
6	26/10/2021	8	Very Good	Showers	F3 SSW	No target species
7	26/10/2021	8	Very Good	Showers	F3 SSW	Moorhen
7	26/10/2021	8	Very Good	Showers	F3 SSW	Mallard
8	26/10/2021	8	Very Good	Showers	F3 SSW	Great Black-backed Gull
8	26/10/2021	8	Very Good	Showers	F3 SSW	Tufted Duck
8	26/10/2021	8	Very Good	Showers	F3 SSW	Lapwing

HVP	Date	Cloud	Visibility	Rain	Wind	Common Name
8	26/10/2021	8	Very Good	Showers	F3 SSW	Goldeneye
8	26/10/2021	8	Very Good	Showers	F3 SSW	Teal
8	26/10/2021	8	Very Good	Showers	F3 SSW	Buzzard
8	26/10/2021	8	Very Good	Showers	F3 SSW	Mute Swan
8	26/10/2021	8	Very Good	Showers	F3 SSW	Little Egret
8	26/10/2021	8	Very Good	Showers	F3 SSW	Grey Heron
8	26/10/2021	8	Very Good	Showers	F3 SSW	Moorhen
8	26/10/2021	8	Very Good	Showers	F3 SSW	Great Crested Grebe
9	26/10/2021	8	Very Good	Showers	F3 SSW	Tufted Duck
9	26/10/2021	8	Very Good	Showers	F3 SSW	Wigeon
9	26/10/2021	8	Very Good	Showers	F3 SSW	Mallard
9	26/10/2021	8	Very Good	Showers	F3 SSW	Mute Swan
9	26/10/2021	8	Very Good	Showers	F3 SSW	Little Grebe
9	26/10/2021	8	Very Good	Showers	F3 SSW	Great Crested Grebe
10	28/10/2021	6	Very Good	Light showers	F2 S	Mallard
11	28/10/2021	6	Very Good	Light showers	F2 S	Wigeon
11	28/10/2021	6	Very Good	Light showers	F2 S	Mute Swan
11	28/10/2021	6	Very Good	Light showers	F2 S	Grey Heron
11	28/10/2021	6	Very Good	Light showers	F2 S	Moorhen
11	28/10/2021	6	Very Good	Light showers	F2 S	Mallard
12	28/10/2021	6	Very Good	Light showers	F2 S	No target species
13	28/10/2021	6	Very Good	Light showers	F2 S	Grey Heron
14	28/10/2021	6	Very Good	Light showers	F2 S	Mallard
15	28/10/2021	6	Very Good	Light showers	F2 S	Mute Swan
16	28/10/2021	6	Very Good	Light showers	F2 S	No target species
17	28/10/2021	6	Very Good	Light showers	F2 S	Buzzard
17	28/10/2021	6	Very Good	Light showers	F2 S	Grey Heron
18	29/10/2021	6	Very Good	Dry	F1 SSW	No target species
19	29/10/2021	6	Very Good	Dry	F1 SSW	Buzzard
20	29/10/2021	6	Very Good	Dry	F1 SSW	Grey Heron
21	29/10/2021	6	Very Good	Dry	F1 SSW	Grey Heron
22	29/10/2021	6	Very Good	Dry	F1 SSW	No target species
23	29/10/2021	6	Very Good	Dry	F1 SSW	No target species
24	29/10/2021	6	Very Good	Dry	F1 SSW	Grey Heron
25	29/10/2021	6	Very Good	Dry	F1 SSW	No target species
1	24/11/2021	8	Excellent	Occasional light rain	F1-F2	No target species
2	24/11/2021	8	Excellent	Occasional light rain	F1-F2	No target species
4	24/11/2021	8	Excellent	Occasional light rain	F1-F2	Lapwing
4	24/11/2021	8	Excellent	Occasional light rain	F1-F2	Wigeon
4	24/11/2021	8	Excellent	Occasional light rain	F1-F2	Mallard
4	24/11/2021	8	Excellent	Occasional light rain	F1-F2	Grey Heron
4	24/11/2021	8	Excellent	Occasional light rain	F1-F2	Mute Swan
4	24/11/2021	8	Excellent	Occasional light rain	F1-F2	Shoveler
4	24/11/2021	8	Excellent	Occasional light rain	F1-F2	Golden Plover

HVP	Date	Cloud	Visibility	Rain	Wind	Common Name
4	24/11/2021	8	Excellent	Occasional light rain	F1-F2	Teal
4	24/11/2021	8	Excellent	Occasional light rain	F1-F2	Whooper Swan
4	24/11/2021	8	Excellent	Occasional light rain	F1-F2	Moorhen
4	24/11/2021	8	Excellent	Occasional light rain	F1-F2	Tufted Duck
4	24/11/2021	8	Excellent	Occasional light rain	F1-F2	Snipe
5	24/11/2021	8	Excellent	Occasional light rain	F1-F2	Mute Swan
6	24/11/2021	8	Excellent	Occasional light rain	F1-F2	Mute Swan
6	24/11/2021	8	Excellent	Occasional light rain	F1-F2	Little Grebe
6	24/11/2021	8	Excellent	Occasional light rain	F1-F2	Great Crested Grebe
6	24/11/2021	8	Excellent	Occasional light rain	F1-F2	Cormorant
6	24/11/2021	8	Excellent	Occasional light rain	F1-F2	Mallard
6	24/11/2021	8	Excellent	Occasional light rain	F1-F2	Wigeon
7	24/11/2021	8	Excellent	Occasional light rain	F1-F2	Black-headed Gull
7	24/11/2021	8	Excellent	Occasional light rain	F1-F2	Mute Swan
7	24/11/2021	8	Excellent	Occasional light rain	F1-F2	Teal
8	24/11/2021	8	Excellent	Occasional light rain	F1-F2	Wigeon
8	24/11/2021	8	Excellent	Occasional light rain	F1-F2	Mallard
8	24/11/2021	8	Excellent	Occasional light rain	F1-F2	Mute Swan
8	24/11/2021	8	Excellent	Occasional light rain	F1-F2	Tufted Duck
9	24/11/2021	8	Excellent	Occasional light rain	F1-F2	Wigeon
10	24/11/2021	8	Excellent	Occasional light rain	F1-F2	No target species
11	24/11/2021	8	Excellent	Occasional light rain	F1-F2	No target species
12	24/11/2021	8	Excellent	Occasional light rain	F1-F2	Grey Heron
12	24/11/2021	8	Excellent	Occasional light rain	F1-F2	Buzzard
12	24/11/2021	8	Excellent	Occasional light rain	F1-F2	Lapwing
12	24/11/2021	8	Excellent	Occasional light rain	F1-F2	Mute Swan
15	24/11/2021	8	Excellent	Occasional light rain	F1-F2	Mute Swan
15	24/11/2021	8	Excellent	Occasional light rain	F1-F2	Cormorant
14	24/11/2021	8	Excellent	Occasional light rain	F1-F2	No target species
16	24/11/2021	8	Excellent	Occasional light rain	F1-F2	Buzzard
16	24/11/2021	8	Excellent	Occasional light rain	F1-F2	Mute Swan
20	24/11/2021	8	Excellent	Occasional light rain	F1-F2	No target species
11	24/11/2021	8	Excellent	Occasional light rain	F1-F2	Moorhen
11	24/11/2021	8	Excellent	Occasional light rain	F1-F2	Grey Heron
11	24/11/2021	8	Excellent	Occasional light rain	F1-F2	Mute Swan
11	24/11/2021	8	Excellent	Occasional light rain	F1-F2	Lapwing
11	24/11/2021	8	Excellent	Occasional light rain	F1-F2	Black-headed Gull
21	24/11/2021	8	Excellent	Occasional light rain	F1-F2	Mute Swan
21	24/11/2021	8	Excellent	Occasional light rain	F1-F2	Buzzard
18	24/11/2021	8	Excellent	Occasional light rain	F1-F2	No target species
17	24/11/2021	8	Excellent	Occasional light rain	F1-F2	No target species
19	24/11/2021	8	Excellent	Occasional light rain	F1-F2	No target species
22	24/11/2021	8	Excellent	Occasional light rain	F1-F2	No target species
23	24/11/2021	8	Excellent	Occasional light rain	F1-F2	No target species

HVP	Date	Cloud	Visibility	Rain	Wind	Common Name
24	24/11/2021	8	Excellent	Occasional light rain	F1-F2	No target species
25	24/11/2021	8	Excellent	Occasional light rain	F1-F2	No target species
1	25/01/2022	8	No Data	Dry	F1	No target species
2	25/01/2022	8	No Data	Dry	F1	No target species
4	25/01/2022	8	No Data	Dry	F1	Whooper Swan
4	25/01/2022	8	No Data	Dry	F1	Wigeon
4	25/01/2022	8	No Data	Dry	F1	Teal
4	25/01/2022	8	No Data	Dry	F1	Tufted Duck
4	25/01/2022	8	No Data	Dry	F1	Mallard
4	25/01/2022	8	No Data	Dry	F1	Coot
5	25/01/2022	8	No Data	Dry	F1	Mallard
5	25/01/2022	8	No Data	Dry	F1	Mute Swan
6	25/01/2022	8	No Data	Dry	F1	Mute Swan
6	25/01/2022	8	No Data	Dry	F1	Mallard
7	25/01/2022	8	No Data	Dry	F1	Moorhen
7	25/01/2022	8	No Data	Dry	F1	Mute Swan
8	25/01/2022	8	No Data	Dry	F1	Teal
8	25/01/2022	8	No Data	Dry	F1	Little Egret
8	25/01/2022	8	No Data	Dry	F1	Wigeon
8	25/01/2022	8	No Data	Dry	F1	Coot
8	25/01/2022	8	No Data	Dry	F1	Tufted Duck
9	25/01/2022	8	No Data	Dry	F1	Tufted Duck
9	25/01/2022	8	No Data	Dry	F1	Mallard
9	25/01/2022	8	No Data	Dry	F1	Little Egret
9	25/01/2022	8	No Data	Dry	F1	Mute Swan
9	25/01/2022	8	No Data	Dry	F1	Wigeon
10	25/01/2022	8	No Data	Dry	F1	No target species
11	25/01/2022	8	No Data	Dry	F1	Grey Heron
12	25/01/2022	8	No Data	Dry	F1	Moorhen
13	25/01/2022	8	No Data	Dry	F1	No target species
14	25/01/2022	8	No Data	Dry	F1	No target species
15	25/01/2022	8	No Data	Dry	F1	No target species
16	25/01/2022	8	No Data	Dry	F1	No target species
17	25/01/2022	8	No Data	Dry	F1	No target species
18	25/01/2022	8	No Data	Dry	F1	Mute Swan
19	25/01/2022	8	No Data	Dry	F1	No target species
20	25/01/2022	8	No Data	Dry	F1	No target species
21	25/01/2022	8	No Data	Dry	F1	No target species
22	25/01/2022	8	No Data	Dry	F1	No target species
23	25/01/2022	8	No Data	Dry	F1	No target species
24	25/01/2022	8	No Data	Dry	F1	No target species
25	25/01/2022	8	No Data	Dry	F1	No target species
1	28/02/2022	2	Good	Dry	F1	No target species
2	28/02/2022	2	Good	Dry	F1	No target species

HVP	Date	Cloud	Visibility	Rain	Wind	Common Name
4	28/02/2022	2	Good	Dry	F1	Coot
4	28/02/2022	2	Good	Dry	F1	Tufted Duck
4	28/02/2022	2	Good	Dry	F1	Teal
4	28/02/2022	2	Good	Dry	F1	Mallard
4	28/02/2022	2	Good	Dry	F1	Lapwing
4	28/02/2022	2	Good	Dry	F1	Great Crested Grebe
4	28/02/2022	2	Good	Dry	F1	Wigeon
4	28/02/2022	2	Good	Dry	F1	Mute Swan
5	28/02/2022	2	Good	Dry	F1	Mute Swan
5	28/02/2022	2	Good	Dry	F1	Mallard
5	28/02/2022	2	Good	Dry	F1	Wigeon
5	28/02/2022	2	Good	Dry	F1	Teal
5	28/02/2022	2	Good	Dry	F1	Grey Heron
6	28/02/2022	2	Good	Dry	F1	Grey Heron
6	28/02/2022	2	Good	Dry	F1	Coot
6	28/02/2022	2	Good	Dry	F1	Moorhen
6	28/02/2022	2	Good	Dry	F1	Mute Swan
6	28/02/2022	2	Good	Dry	F1	Little Grebe
7	28/02/2022	2	Good	Dry	F1	No target species
8	28/02/2022	2	Good	Dry	F1	Mute Swan
8	28/02/2022	2	Good	Dry	F1	Wigeon
8	28/02/2022	2	Good	Dry	F1	Teal
8	28/02/2022	2	Good	Dry	F1	Tufted Duck
8	28/02/2022	2	Good	Dry	F1	Mallard
9	28/02/2022	2	Good	Dry	F1	No target species
10	28/02/2022	2	Good	Dry	F1	Grey Heron
10	28/02/2022	2	Good	Dry	F1	Coot
11	28/02/2022	2	Good	Dry	F1	Moorhen
12	28/02/2022	2	Good	Dry	F1	Mute Swan
12	28/02/2022	2	Good	Dry	F1	Grey Heron
13	28/02/2022	2	Good	Dry	F1	Grey Heron
14	28/02/2022	2	Good	Dry	F1	No target species
15	28/02/2022	2	Good	Dry	F1	No target species
16	28/02/2022	2	Good	Dry	F1	No target species
17	28/02/2022	2	Good	Dry	F1	No target species
18	28/02/2022	2	Good	Dry	F1	No target species
19	28/02/2022	2	Good	Dry	F1	No target species
20	28/02/2022	2	Good	Dry	F1	No target species
21	28/02/2022	2	Good	Dry	F1	No target species
22	28/02/2022	2	Good	Dry	F1	No target species
23	28/02/2022	2	Good	Dry	F1	No target species
24	28/02/2022	2	Good	Dry	F1	No target species
25	28/02/2022	2	Good	Dry	F1	No target species
1	29/03/2022	4	Good	Dry	F1	No target species

HVP	Date	Cloud	Visibility	Rain	Wind	Common Name
2	29/03/2022	4	Good	Dry	F1	No target species
4	29/03/2022	4	Good	Dry	F1	Tufted Duck
4	29/03/2022	4	Good	Dry	F1	Moorhen
4	29/03/2022	4	Good	Dry	F1	Coot
4	29/03/2022	4	Good	Dry	F1	Mallard
4	29/03/2022	4	Good	Dry	F1	Wigeon
4	29/03/2022	4	Good	Dry	F1	Goldcrest
4	29/03/2022	4	Good	Dry	F1	Teal
5	29/03/2022	4	Good	Dry	F1	Tufted Duck
5	29/03/2022	4	Good	Dry	F1	Teal
5	29/03/2022	4	Good	Dry	F1	Mallard
5	29/03/2022	4	Good	Dry	F1	Grey Heron
5	29/03/2022	4	Good	Dry	F1	Wigeon
5	29/03/2022	4	Good	Dry	F1	Mute Swan
6	29/03/2022	4	Good	Dry	F1	No target species
7	29/03/2022	4	Good	Dry	F1	Mute Swan
7	29/03/2022	4	Good	Dry	F1	Little Egret
7	29/03/2022	4	Good	Dry	F1	Moorhen
8	29/03/2022	4	Good	Dry	F1	Mute Swan
8	29/03/2022	4	Good	Dry	F1	Little Egret
8	29/03/2022	4	Good	Dry	F1	Teal
8	29/03/2022	4	Good	Dry	F1	Wigeon
8	29/03/2022	4	Good	Dry	F1	Mallard
8	29/03/2022	4	Good	Dry	F1	Moorhen
8	29/03/2022	4	Good	Dry	F1	Coot
8	29/03/2022	4	Good	Dry	F1	Tufted Duck
9	29/03/2022	4	Good	Dry	F1	Mute Swan
9	29/03/2022	4	Good	Dry	F1	Grey Heron
9	29/03/2022	4	Good	Dry	F1	Tufted Duck
9	29/03/2022	4	Good	Dry	F1	Goldcrest
10	29/03/2022	4	Good	Dry	F1	Mute Swan
10	29/03/2022	4	Good	Dry	F1	Grey Heron
11	29/03/2022	4	Good	Dry	F1	No target species
12	29/03/2022	4	Good	Dry	F1	Mute Swan
12	29/03/2022	4	Good	Dry	F1	Goldcrest
13	29/03/2022	4	Good	Dry	F1	No target species
14	29/03/2022	4	Good	Dry	F1	No target species
15	29/03/2022	4	Good	Dry	F1	Mute Swan
16	29/03/2022	4	Good	Dry	F1	Grey Heron
16	29/03/2022	4	Good	Dry	F1	Mallard
17	29/03/2022	4	Good	Dry	F1	No target species
18	29/03/2022	4	Good	Dry	F1	No target species
19	29/03/2022	4	Good	Dry	F1	No target species
20	29/03/2022	4	Good	Dry	F1	No target species

HVP	Date	Cloud	Visibility	Rain	Wind	Common Name
21	29/03/2022	4	Good	Dry	F1	No target species
22	29/03/2022	4	Good	Dry	F1	No target species
23	29/03/2022	4	Good	Dry	F1	No target species
24	29/03/2022	4	Good	Dry	F1	No target species
25	29/03/2022	4	Good	Dry	F1	No target species

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APPENDIX 5

Transect Survey Schedule and Conditions

Date	Transect	Cloud (Okta)	Precipitation	Visibility	Wind	Start Time	End Time
February 2022							
03/02/2022	1	5/8	Light Rain	Good	F2	09:15	09:47
03/02/2022	2	5/8	Light Rain	Good	F2	08:25	09:00
03/02/2022	3	5/8	Light Rain	Good	F2	10:10	10:41
03/02/2022	4	5/8	Light Rain	Good	F2	10:55	11:27
04/02/2022	5	5/8	Drizzle	Good	F2	08:30	09:05
04/02/2022	6	5/8	Drizzle	Good	F2	09:17	09:50
04/02/2022	7	5/8	Drizzle	Good	F2	09:58	11:00
04/02/2022	8	5/8	Drizzle	Good	F2	11:20	11:56
07/02/2022	9	7/8	Light Rain	Good	F2	08:25	08:57
07/02/2022	10	7/8	Light Rain	Good	F2	09:10	09:40
07/02/2022	11	7/8	Light Rain	Good	F2	09:55	10:30
07/02/2022	12	7/8	Light Rain	Good	F2	11:00	11:39
11/02/2022	13	6/8	Drizzle	Good	F1	09:01	09:35
11/02/2022	14	6/8	Drizzle	Good	F1	09:45	10:18
11/02/2022	15	6/8	Drizzle	Good	F1	10:30	11:02
11/02/2022	16	7/8	Light Rain	Moderat	F1	11:15	11:45
15/02/2022	17	4/8	Dry	Good	F1	10:28	11:00
15/02/2022	18	4/8	Dry	Good	F1	09:00	09:38
15/02/2022	19	4/8	Dry	Good	F1	09:45	10:16
15/02/2022	20	4/8	Dry	Good	F1	11:15	11:45
15/02/2022	21	4/8	Dry	Good	F1	11:55	12:30
March 2022							
03/03/2022	1	8/8	Dry	Moderate	F1	09:00	13:00
03/03/2022	2	8/8	Dry	Moderate	F1	09:00	13:00
03/03/2022	3	8/8	Dry	Moderate	F1	09:00	13:00
03/03/2022	4	8/8	Dry	Moderate	F1	09:00	13:00
04/03/2022	5	8/8	Dry	Moderate	F1	08:30	12:40
04/03/2022	6	8/8	Dry	Moderate	F1	08:30	12:40
04/03/2022	7	8/8	Dry	Moderate	F1	08:30	12:40
04/03/2022	8	8/8	Dry	Moderate	F1	08:30	12:40
09/03/2022	9	7/8	Light Drizzle	Good	F1	08:30	12:45
09/03/2022	10	7/8	Light Drizzle	Good	F1	08:30	12:45
09/03/2022	11	7/8	Light Drizzle	Good	F1	08:30	12:45
09/03/2022	12	7/8	Light Drizzle	Good	F1	08:30	12:45
11/03/2022	13	7/8	Dry	Good	F1	08:40	13:10
11/03/2022	14	7/8	Dry	Good	F1	08:40	13:10
11/03/2022	15	7/8	Dry	Good	F1	08:40	13:10

Date	Transect	Cloud (Okta)	Precipitation	Visibility	Wind	Start Time	End Time
11/03/2022	16	7/8	Dry	Good	F1	08:40	13:10
12/03/2022	17	8/8	Dry	Moderate	F1	09:00	13:00
12/03/2022	18	8/8	Dry	Moderate	F1	09:00	13:00
12/03/2022	19	8/8	Dry	Moderate	F1	09:00	13:00
12/03/2022	20	8/8	Dry	Moderate	F1	09:00	13:00
12/03/2022	21	8/8	Dry	Moderate	F1	09:00	13:00

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Appendix K.3 BREEDING SEASON 2021 - BREEDING SEASON 2024

Vantage Point Survey Effort

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-21	06/05/2021	VP1	1	12:33	15:33	NNW	F2	Dry	7	V.g	N/A	N/A
Breeding-21	06/05/2021	VP1	2	16:04	19:04	NNW	F2	Dry	7	V.g	N/A	N/A
Breeding-21	29/04/2021	VP2	1	09:38	12:38	E	F1	Dry	5	V.g	N/A	N/A
Breeding-21	29/04/2021	VP2	2	13:32	16:32	E	F1	Dry	6	V.g	N/A	N/A
Breeding-21	04/05/2021	VP3	1	07:26	10:26	WNW	F2-3	H. Showers	5	g	N/A	N/A
Breeding-21	04/05/2021	VP3	2	15:15	18:15	WNW	F2	H. Showers	4	g	N/A	N/A
Breeding-21	05/05/2021	VP4	1	08:15	11:15	SSE	F2	L. Showers	4	V.g	N/A	N/A
Breeding-21	05/05/2021	VP4	2	12:47	15:47	SSE	F2	L. Showers	4	V.g	N/A	N/A
Breeding-21	06/05/2021	VP5	1	08:25	11:25	WNW/NW	F2	Dry	7	V.g	N/A	N/A
Breeding-21	05/05/2021	VP5	2	16:35	19:35	NW	F1	Dry	7	V.g	N/A	N/A
Breeding-21	07/05/2021	VP6	1	09:42	12:42	SE	F1	Dry	5	V.g	N/A	N/A
Breeding-21	07/05/2021	VP6	2	13:16	16:16	SE	F1	Dry	6	V.g	N/A	N/A
Breeding-21	11/05/2021	VP7	1	07:09	10:09	S	F2	Dry	5	V.g	N/A	N/A
Breeding-21	07/05/2021	VP7	2	16:50	19:50	SSE	F1	Dry	5	V.g	N/A	N/A
Breeding-21	11/05/2021	VP8	1	17:02	20:02	SSE	F1	Dry	7	V.g	N/A	N/A
Breeding-21	19/05/2021	VP8	2	10:30	13:30	WNW	F3	Dry	6	V.g	N/A	N/A
Breeding-21	22/05/2021	VP9	1	10:31	13:31	NW	F2	H. Showers	5	g	N/A	N/A
Breeding-21	21/05/2021	VP9	2	09:15	12:15	NW	F2	Dry	8	V.g	N/A	N/A
Breeding-21	27/05/2021	VP10	1	11:03	14:03	SE	F1	Drizzle	8	g - poor	N/A	N/A
Breeding-21	22/05/2021	VP10	2	14:05	17:05	W	F2	Dry	5	g	N/A	N/A
Breeding-21	28/05/2021	VP11	1	12:45	15:45	SSW	F1	L. Showers	8	V.g	N/A	N/A
Breeding-21	28/05/2021	VP11	2	16:22	19:22	SSW	F1	L. Showers	8	g	N/A	N/A
Breeding-21	01/06/2021	VP1	1	09:16	12:16	NNE	F2	Dry	7	V.g	N/A	N/A
Breeding-21	01/06/2021	VP1	2	12:57	15:57	ENE	F1	Dry	8	V.g	N/A	N/A

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-21	31/05/2021	VP2	1	08:45	11:45	SSE	F3	Dry	4	V.g	N/A	N/A
Breeding-21	31/05/2021	VP2	2	17:31	20:31	SSE	F3	Dry	4	V.g	N/A	N/A
Breeding-21	01/06/2021	VP3	1	17:05	20:05	NW	F1	Dry	4	G (Hazy)	N/A	N/A
Breeding-21	02/06/2021	VP3	2	13:07	16:07	NE	F2	H. Showers	6	V.g	N/A	N/A
Breeding-21	10/06/2021	VP4	1	13:09	16:09	SW	F4	Dry	7	V.g	N/A	N/A
Breeding-21	10/06/2021	VP4	2	17:02	20:02	SW	F4	Dry	7	V.g	N/A	N/A
Breeding-21	16/06/2021	VP5	1	13:32	16:32	SW	F3	Dry	6	V.g	N/A	N/A
Breeding-21	16/06/2021	VP5	2	17:06	20:06	SW	F3	Dry	3	V.g	N/A	N/A
Breeding-21	17/06/2021	VP6	1	10:45	13:45	NW	F3	Dry	6	G (Hazy)	N/A	N/A
Breeding-21	17/06/2021	VP6	2	14:30	17:30	NW	F3	L. Showers	7	V.g	N/A	N/A
Breeding-21	18/06/2021	VP7	1	13:04	16:04	N	F1-2	Dry	7	G (Hazy)	N/A	N/A
Breeding-21	18/06/2021	VP7	2	09:05	12:05	N	F1-2	Dry	7	G (Hazy)	N/A	N/A
Breeding-21	23/06/2021	VP8	1	10:05	13:05	WNW	F2	Dry	8	V.g	N/A	N/A
Breeding-21	23/06/2021	VP8	2	14:10	17:10	WNW	F2	Dry	8	V.g	N/A	N/A
Breeding-21	23/06/2021	VP9	1	18:10	21:10	WNW	F2	Dry	7	V.g	N/A	N/A
Breeding-21	24/06/2021	VP9	2	10:15	13:15	SW	F3	L. Showers	8	G	N/A	N/A
Breeding-21	24/06/2021	VP10	1	14:00	17:00	W	F3	H. Showers	8	Poor	N/A	N/A
Breeding-21	24/06/2021	VP10	2	17:35	20:35	W	F3	Constant Light Rain	8	Poor	N/A	N/A
Breeding-21	25/06/2021	VP11	1	11:00	14:00	N	F4	Dry	7	V.g	N/A	N/A
Breeding-21	25/06/2021	VP11	2	14:40	17:40	N	F4	Dry	8	V.g	N/A	N/A
Breeding-21	06/07/2021	VP1	1	09:05	12:05	W	F2	Light Showers	8	Good	N/A	N/A
Breeding-21	06/07/2021	VP1	2	13:00	16:00	NW	F3	Showers	8	Good	N/A	N/A
Breeding-21	07/07/2021	VP2	1	11:02	14:02	WNW	F2-3	Light Showers	8	v.good	N/A	N/A
Breeding-21	07/07/2021	VP2	2	14:45	17:45	WNW	F3	Dry	8	v.good	N/A	N/A

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-21	06/07/2021	VP3	1	08:40	11:40	W	F2	V. Light Showers	7	v.good	N/A	N/A
Breeding-21	05/07/2021	VP3	2	16:05	19:05	W	F2	V. Light Showers	8	v.good	N/A	N/A
Breeding-21	07/07/2021	VP4	1	18:30	21:30	WNW	F3	Dry	7	v.good	N/A	N/A
Breeding-21	09/07/2021	VP4	2	14:50	17:50	S	F2	Dry	7	v.good	N/A	N/A
Breeding-21	06/07/2021	VP5	1	16:55	19:55	WNW	F3	Light Showers	8	Good-poor	N/A	N/A
Breeding-21	09/07/2021	VP5	2	18:30	21:30	S	F2	Dry	7	V.good	N/A	N/A
Breeding-21	08/07/2021	VP6	1	11:10	14:10	WSW	F2	Dry	8	V.good	N/A	N/A
Breeding-21	08/07/2021	VP6	2	15:05	18:05	WSW	F2	Dry	8	V.good	N/A	N/A
Breeding-21	08/07/2021	VP7	1	18:45	21:45	WSW	F1-2	Dry	8	V.good	N/A	N/A
Breeding-21	09/07/2021	VP7	2	11:15	14:15	S	F2	Dry	8	V.good	N/A	N/A
Breeding-21	13/07/2021	VP8	1	07:35	10:35	WNW	F1	Dry	5	V.good	N/A	N/A
Breeding-21	13/07/2021	VP8	2	15:00	18:00	WNW	F1	Dry	6	V.good	N/A	N/A
Breeding-21	14/07/2021	VP9	1	07:50	10:50	W	F1	Dry	4	V.good	N/A	N/A
Breeding-21	15/07/2021	VP9	2	08:10	11:10	NW	F1	Dry	2	V.good	N/A	N/A
Breeding-21	15/07/2021	VP10	1	16:10	19:10	WNW	F1	Dry	5	V.good	N/A	N/A
Breeding-21	15/07/2021	VP10	2	12:05	15:05	WNW	F1	Dry	3	V.good	N/A	N/A
Breeding-21	16/07/2021	VP11	1	08:30	11:30	W	F1	Dry	3	V.good	N/A	N/A
Breeding-21	16/07/2021	VP11	2	12:30	15:30	W	F1	Dry	2	V.good	N/A	N/A
Breeding-21	29/07/2021	VP1	1	10:10	13:10	W	F3	Dry	8	V.good	N/A	N/A
Breeding-21	29/07/2021	VP1	2	14:00	17:00	W	F2-3	Dry	8	V.good	N/A	N/A
Breeding-21	28/07/2021	VP2	1	09:17	12:17	W	F3	Dry	7	V.good	N/A	N/A
Breeding-21	28/07/2021	VP2	2	13:05	16:05	W	F3	Light Showers	8	V.good	N/A	N/A
Breeding-21	28/07/2021	VP3	1	17:00	20:00	WNW	F3-4	Light Showers	8	good	N/A	N/A
Breeding-21	29/07/2021	VP3	2	17:40	20:40	NW	F1-2	Dry	8	V.good	N/A	N/A

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-21	30/07/2021	VP4	1	10:45	13:45	WNW	F2	Heavy Showers	8	Good-poor	N/A	N/A
Breeding-21	30/07/2021	VP4	2	14:30	17:30	WNW	F2-3	Showers	8	Good	N/A	N/A
Breeding-21	27/07/2021	VP5	1	09:05	12:05	WNW	F1-2	Light Showers	6-8	Good	N/A	N/A
Breeding-21	27/07/2021	VP5	2	16:00	19:00	WNW	F1-2	Heavy Showers	7	Good	N/A	N/A
Breeding-21	04/08/2021	VP6	1	10:00	13:00	S	F2-3	Heavy Showers	7-8	Good-poor	N/A	N/A
Breeding-21	04/08/2021	VP6	2	13:50	16:50	S	F2-3	Showers	8	Good	N/A	N/A
Breeding-21	02/08/2021	VP7	1	09:35	12:35	SSW	F1-2	Showers	7	V.good	N/A	N/A
Breeding-21	02/08/2021	VP7	2	15:05	18:05	SSW	F1-2	Dry	6	V.good	N/A	N/A
Breeding-21	03/08/2021	VP8	1	17:30	20:30	S	F1-2	Dry	5	V.good	N/A	N/A
Breeding-21	04/08/2021	VP8	2	17:30	20:30	S/SE	F1	Heavy Showers	8	Good-poor	N/A	N/A
Breeding-21	03/08/2021	VP9	1	09:45	12:45	SSW	F1	Dry	8	V.good	N/A	N/A
Breeding-21	03/08/2021	VP9	2	13:45	16:45	S	F2	Dry	6	Good(hazy)	N/A	N/A
Breeding-21	05/08/2021	VP10	1	11:06	14:06	S	F2-3	Heavy Showers	8	Poor	N/A	N/A
Breeding-21	11/08/2021	VP10	2	09:15	12:15	W	F3	Showers	8	Good-v.good	N/A	N/A
Breeding-21	11/08/2021	VP11	1	12:55	15:55	WSW	F3-4	Dry	6	V.good	N/A	N/A
Breeding-21	11/08/2021	VP11	2	16:40	19:40	SW	F3	Dry	2	V.good	N/A	N/A
Breeding-21	18/08/2021	VP1	1	08:56	11:56	W	F3	Dry	8	V.good	N/A	N/A
Breeding-21	18/08/2021	VP1	2	12:42	15:42	W	F2	Dry	8	V.good	N/A	N/A
Breeding-21	17/08/2021	VP2	1	08:50	11:50	WNW	F3-4	Dry	8	V.good	N/A	N/A
Breeding-21	17/08/2021	VP2	2	12:30	15:30	WNW	F3-4	Dry	8	V.good	N/A	N/A
Breeding-21	16/08/2021	VP3	1	08:47	11:47	W	F3	Dry	8	V.good	N/A	N/A
Breeding-21	16/08/2021	VP3	2	12:30	15:30	W	F3	V. Light Showers	8	V.good	N/A	N/A
Breeding-21	13/08/2021	VP4	1	10:31	13:01	SW	F4	Light Showers	6	V.good	N/A	N/A

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-21	13/08/2021	VP4	2	14:05	17:05	SW	F4	V. Light Showers	7	V.good	N/A	N/A
Breeding-21	12/08/2021	VP5	1	10:25	13:25	S	F4	Showers	8	V.good	N/A	N/A
Breeding-21	12/08/2021	VP5	2	14:05	17:05	WSW	F4-5	Light Showers	4	V.good	N/A	N/A
Breeding-21	19/08/2021	VP6	1	09:10	12:10	E	F1	Dry	8	V.good	N/A	N/A
Breeding-21	19/08/2021	VP6	2	12:55	15:55	SW	F1	Dry	7	V.good	N/A	N/A
Breeding-21	12/08/2021	VP7	1	17:45	20:45	SW	F3	Dry	3	V.good	N/A	N/A
Breeding-21	13/08/2021	VP7	2	17:40	20:40	SW	F3	Showers	7	Good	N/A	N/A
Breeding-21	14/08/2021	VP8	1	10:35	13:35	SSE	F1	Showers	8	Good	N/A	N/A
Breeding-21	16/08/2021	VP8	2	16:20	19:20	W	F3	v.light showers	8	Good-poor	N/A	N/A
Breeding-21	17/08/2021	VP9	1	16:20	19:20	W	F3	v.light showers	8	Good	N/A	N/A
Breeding-21	18/08/2021	VP9	2	16:18	19:18	W	F2	Dry	8	V.good	N/A	N/A
Breeding-21	19/08/2021	VP10	1	16:40	19:40	SW	F2	Light Showers	7	V.good	N/A	N/A
Breeding-21	20/08/2021	VP10	2	09:17	12:17	SE	F3	Showers	7	V.good	N/A	N/A
Breeding-21	20/08/2021	VP11	1	12:55	15:55	SE	F2	Heavy Showers	7	Good-poor	N/A	N/A
Breeding-21	20/08/2021	VP11	2	16:33	19:33	S/SE	F2	Heavy Showers	5	Good-poor	N/A	N/A
Breeding-21	06/09/2021	VP1	1	08:25	11:25	S	F1	Dry	6	V.good	N/A	N/A
Breeding-21	06/09/2021	VP1	2	12:00	15:00	S	F1	Dry	5	V.good	N/A	N/A
Breeding-21	12/09/2021	VP2	1	11:55	14:55	NNE	F1	Dry	4	V.good	N/A	N/A
Breeding-21	12/09/2021	VP2	2	15:30	18:30	NNE	F1	Dry	4	V.good	N/A	N/A
Breeding-21	02/09/2021	VP3	1	08:45	11:45	ENE	F3	Dry	4	V.good	N/A	N/A
Breeding-21	02/09/2021	VP3	2	12:24	15:24	ENE	F3	Dry	7	V.good	N/A	N/A
Breeding-21	07/09/2021	VP4	1	12:15	15:15	ESE/E	F1	Dry	7	V.good	N/A	N/A
Breeding-21	07/09/2021	VP4	2	15:55	18:55	E/ENE	F1	Dry	5	V.good	N/A	N/A
Breeding-21	02/09/2021	VP5	1	16:00	19:00	ENE	F1-2	Dry	6	Good	N/A	N/A

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-21	03/09/2021	VP5	2	08:53	11:53	E	F2	Dry	5	Good	N/A	N/A
Breeding-21	09/09/2021	VP6	1	08:35	11:35	SSE	F2	Showers	5	Good	N/A	N/A
Breeding-21	12/09/2021	VP6	2	08:20	11:20	N	F1	Dry	7	V.good	N/A	N/A
Breeding-21	03/09/2021	VP7	1	12:30	15:30	E	F2	Dry	6	Good	N/A	N/A
Breeding-21	03/09/2021	VP7	2	16:05	19:05	E	F2	Dry	5	Good	N/A	N/A
Breeding-21	06/09/2021	VP8	1	16:00	19:00	SSW	F1	Dry	8	V.good	N/A	N/A
Breeding-21	07/09/2021	VP8	2	08:30	11:30	ESE	F1	Dry	8	V.good	N/A	N/A
Breeding-21	13/09/2021	VP9	1	08:30	11:30	NE	F1	Dry	5	V.good	N/A	N/A
Breeding-21	13/09/2021	VP9	2	12:15	15:15	N	F1	Dry	8	V.good	N/A	N/A
Breeding-21	13/09/2021	VP10	1	16:00	19:00	SSE	F1	Light showers	8	V.good	N/A	N/A
Breeding-21	14/09/2021	VP10	2	08:35	11:35	SE	F1	V. Light Showers	7	V.good	N/A	N/A
Breeding-21	14/09/2021	VP11	1	12:15	15:15	SE	F1	V. Light Showers	8	V.good	N/A	N/A
Breeding-21	14/09/2021	VP11	2	15:55	18:55	SE	F1	Dry	4	V.good	N/A	N/A
Breeding-21	24/09/2021	VP1	1	16:05	19:05	WSW	F1	Dry	4	V.good	N/A	N/A
Breeding-21	27/09/2021	VP1	2	08:10	11:10	SSW	F1	Dry	4	V.good	N/A	N/A
Breeding-21	20/09/2021	VP2	1	08:20	11:20	W	F2	Dry	6	V.good	N/A	N/A
Breeding-21	20/09/2021	VP2	2	11:55	14:55	W	F2	Dry	7	V.good	N/A	N/A
Breeding-21	28/09/2021	VP3	1	15:37	18:37	WSW	F1	Dry	7	V.good	N/A	N/A
Breeding-21	29/09/2021	VP3	2	09:00	12:00	W	F1	Dry	6	V.good	N/A	N/A
Breeding-21	23/09/2021	VP4	1	08:50	11:50	WSW	F1	Dry	3	V.good	N/A	N/A
Breeding-21	23/09/2021	VP4	2	12:33	15:33	W	F1	Dry	6	V.good	N/A	N/A
Breeding-21	20/09/2021	VP5	1	15:35	18:35	W	F2	Dry	7	V.good	N/A	N/A
Breeding-21	21/09/2021	VP5	2	16:05	19:05	SW	F2	Light showers	7	Good	N/A	N/A
Breeding-21	28/09/2021	VP6	1	08:20	11:20	SSW	F1	Dry	7	V.good	N/A	N/A

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-21	28/09/2021	VP6	2	12:00	15:00	SSW	F1	Dry	8	V.good	N/A	N/A
Breeding-21	27/09/2021	VP7	1	11:45	14:45	SW	F1-2	Light showers	8	V.good	N/A	N/A
Breeding-21	27/09/2021	VP7	2	15:25	18:25	SW	F1-2	Light showers	7	V.good	N/A	N/A
Breeding-21	24/09/2021	VP8	1	08:55	11:55	W	F1	Dry	8	V.good	N/A	N/A
Breeding-21	24/09/2021	VP8	2	12:30	15:30	W	F1	Dry	8	V.good	N/A	N/A
Breeding-21	21/09/2021	VP9	1	08:45	11:45	SW	F3	Dry	8	V.good	N/A	N/A
Breeding-21	21/09/2021	VP9	2	12:25	15:25	SW	F3	V. light showers	7	V.good	N/A	N/A
Breeding-21	22/09/2021	VP10	1	08:47	11:47	SW	F3	Dry	8	V.good	N/A	N/A
Breeding-21	22/09/2021	VP10	2	12:25	15:25	SW	F4	Dry	8	V.good	N/A	N/A
Breeding-21	22/09/2021	VP11	1	16:05	19:05	SW	F3	Dry	8	V.good	N/A	N/A
Breeding-21	23/09/2021	VP11	2	16:10	19:10	SW	F1	Dry	8	V.good	N/A	N/A
Winter-21	01/10/2021	VP1	1	11:20	14:20	W	F2	Dry	4	V.good	N/A	N/A
Winter-21	01/10/2021	VP1	2	07:45	10:45	SW	F1-2	Dry	2	V.good	N/A	N/A
Winter-21	28/10/2021	VP2	1	08:35	11:35	S	F2	Dry	3	V.good	N/A	N/A
Winter-21	28/10/2021	VP2	2	12:10	15:10	S	F2	Light showers	6	V.good	N/A	N/A
Winter-21	26/10/2021	VP3	1	08:20	11:20	SSW	F2	Showers	8	V.good	N/A	N/A
Winter-21	26/10/2021	VP3	2	12:00	15:00	SSW	F3	Showers	8	V.good	N/A	N/A
Winter-21	02/10/2021	VP4	1	08:00	11:00	S	F1	Dry	4	V.good	N/A	N/A
Winter-21	02/10/2021	VP4	2	11:45	14:45	W	F1	Dry	5	V.good	N/A	N/A
Winter-21	01/10/2021	VP5	1	15:05	18:05	W	F2	Dry	6	V.good	N/A	N/A
Winter-21	02/10/2021	VP5	2	15:20	18:20	SSW	F1	Dry	5	V.good	N/A	N/A
Winter-21	03/10/2021	VP6	1	08:00	11:00	WSW	F2	Showers	8	V.good	N/A	N/A
Winter-21	03/10/2021	VP6	2	11:34	14:34	WSW	F2	Showers	8	V.good	N/A	N/A
Winter-21	03/10/2021	VP7	1	15:05	18:05	W	F1	Light showers	8	V.good	N/A	N/A

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Winter-21	27/10/2021	VP7	2	08:30	11:30	S	F2	Showers	8	V.good	N/A	N/A
Winter-21	27/10/2021	VP8	1	12:05	15:05	S	F2	Light rain/showers	8	Good	N/A	N/A
Winter-21	29/10/2021	VP8	2	08:40	11:40	W	F1	Dry	5	V.good	N/A	N/A
Winter-21	25/10/2021	VP9	1	08:18	11:18	SSW	F2	Dry	5	V.good	N/A	N/A
Winter-21	29/10/2021	VP9	2	13:05	16:05	SSW	F1	Dry	6	V.good	N/A	N/A
Winter-21	20/10/2021	VP10	1	08:10	11:10	WSW	F1	Dry	4	V.good	N/A	N/A
Winter-21	25/10/2021	VP10	2	12:30	15:30	SW	F1	Dry	5	V.good	N/A	N/A
Winter-21	20/10/2021	VP11	1	11:45	14:45	W	F1	Dry	5	V.good	N/A	N/A
Winter-21	20/10/2021	VP11	2	15:15	18:15	W	F1	Dry	5	V.good	N/A	N/A
Winter-21	01/12/2021	VP1	1	08:20	11:20	NW	F3	Showers	4	Good	N/A	N/A
Winter-21	01/12/2021	VP1	2	11:20	14:20	NW	F3	Showers	4	Good	N/A	N/A
Winter-21	23/11/2021	VP2	1	08:15	11:15		F0	Dry	8	Excellent	N/A	N/A
Winter-21	23/11/2021	VP2	2	11:45	14:45		F0	Dry	8	Excellent	N/A	N/A
Winter-21	22/11/2021	VP3	1	09:15	12:15		F0-1	Dry	0	Excellent	N/A	N/A
Winter-21	22/11/2021	VP3	2	12:45	15:45		F0-1	Dry	0	Excellent	N/A	N/A
Winter-21	25/11/2021	VP4	1	08:00	11:00		F1-2	Dry	3	Excellent	N/A	N/A
Winter-21	25/11/2021	VP4	2	11:30	14:30		F1-2	Dry	3	Excellent	N/A	N/A
Winter-21	26/11/2021	VP5	1	08:00	11:00		F3-4	Occasional light showers	6	Excellent	N/A	N/A
Winter-21	26/11/2021	VP5	2	11:30	14:30		F3-4	Occasional light showers	6	Excellent	N/A	N/A
Winter-21	02/12/2021	VP6	1	09:10	12:10	W	F1-2	Dry	4	Moderate	N/A	N/A
Winter-21	02/12/2021	VP6	2	12:40	15:40	W	F2	Light rain/showers	7	Good-Poor	N/A	N/A
Winter-21	29/11/2021	VP7	1	10:45	13:45	W	F2	Dry	8	Very good	N/A	N/A

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Winter-21	29/11/2021	VP7	2	13:45	16:45	W	F2	Dry	8	Very good	N/A	N/A
Winter-21	24/11/2021	VP8	1	09:00	12:00	NW	F3	Showers then dry	4	Excellent	N/A	N/A
Winter-21	24/11/2021	VP8	2	12:30	15:30	NW	F3	Dry (drizzle at 13:15-13:20)	3	Excellent	N/A	N/A
Winter-21	19/11/2021	VP9	1	07:30	10:30	SW	F1	Mist/Dry	8	Good	N/A	N/A
Winter-21	02/11/2021	VP9	2	08:20	11:20	W	F1	Dry	5	Good	N/A	N/A
Winter-21	18/11/2021	VP10	1	14:00	17:00	SE	F2	Dry	8	Good	N/A	N/A
Winter-21	18/11/2021	VP10	2	11:00	14:00	SE	F2	Dry	8	Good	N/A	N/A
Winter-21	25/11/2021	VP11	1	08:50	11:50	NW	F3	Dry	2	Excellent	N/A	N/A
Winter-21	25/11/2021	VP11	2	12:30	15:30	NW	F3	Shower	2	Good	N/A	N/A
Winter-21	13/12/2021	VP1	1	09:30	12:30		F1	Light Drizzle	7	Good	N/A	N/A
Winter-21	13/12/2021	VP1	2	13:00	16:00		F1	Light Drizzle	7	good	N/A	N/A
Winter-21	14/12/2021	VP2	1	09:30	12:30		F2	Dry	3	Good	N/A	N/A
Winter-21	14/12/2021	VP2	2	13:00	16:00		F2	Dry	3	Good	N/A	N/A
Winter-21	13/12/2021	VP3	1	09:30	12:30		F2	Some drizzle	7	Moderate	N/A	N/A
Winter-21	13/12/2021	VP3	2	13:00	16:00		F2	Some drizzle	7	Moderate	N/A	N/A
Winter-21	15/12/2021	VP4	1	09:30	12:30		F3	Dry	8	Good	N/A	N/A
Winter-21	15/12/2021	VP4	2	13:00	16:00		F3	Dry	8	Very good	N/A	N/A
Winter-21	14/12/2021	VP5	1	13:00	16:00		F2	Dry	7	Moderate	N/A	N/A
Winter-21	14/12/2021	VP5	2	09:30	12:30		F1	Dry	7	Good	N/A	N/A
Winter-21	16/12/2021	VP6	1	09:30	12:30		F2	Dry	7	Moderate	N/A	N/A
Winter-21	16/12/2021	VP6	2	13:00	16:00		F2	Dry	7	Moderate	N/A	N/A
Winter-21	15/12/2021	VP7	1	09:30	12:00		F2	Light drizzle at 10:55am	7	Moderate	N/A	N/A

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Winter-21	15/12/2021	VP7	2	13:00	16:00		F2	Dry	6	Good	N/A	N/A
Winter-21	27/12/2021	VP8	1	09:00	12:00		F2	Dry	8	Moderate	N/A	N/A
Winter-21	27/12/2021	VP8	2	13:00	16:00		F2	Light Drizzle	4	Moderate	N/A	N/A
Winter-21	16/12/2021	VP9	1	09:30	12:30		F3	Dry	7	Good	N/A	N/A
Winter-21	16/12/2021	VP9	2	13:00	14:00		F3	Dry	7	Good	N/A	N/A
Winter-21	27/12/2021	VP10	1	09:30	12:30		F1	Dry	8	Moderate	N/A	N/A
Winter-21	27/12/2021	VP10	2	13:00	16:00		F1	Dry	8	Moderate	N/A	N/A
Winter-21	28/12/2021	VP11	1	13:00	16:00		F1	Dry	3	Excellent	N/A	N/A
Winter-21	28/12/2021	VP11	2	09:30	12:30		F1	Dry	3	Excellent	N/A	N/A
Winter-22	07/01/2022	VP1	1	09:30	12:30		F3	Showers	6	Good	N/A	N/A
Winter-22	07/01/2022	VP1	2	13:00	16:00		F3	Showers	7	Good	N/A	N/A
Winter-22	17/01/2022	VP2	1	09:30	12:30		F1	Dry	1	Excellent	N/A	N/A
Winter-22	17/01/2022	VP2	2	13:00	16:00		F1	Dry	1	Excellent	N/A	N/A
Winter-22	18/01/2022	VP3	1	09:30	12:30		F1	Light Drizzle	7	Good	N/A	N/A
Winter-22	18/01/2022	VP3	2	13:00	16:00		F1	Light Drizzle	7	Good	N/A	N/A
Winter-22	24/01/2022	VP4	1	09:30	12:30		F1	Dry	7	Good	N/A	N/A
Winter-22	24/01/2022	VP4	2	13:00	16:00		F1	Dry	7	Good	N/A	N/A
Winter-22	25/01/2022	VP5	1	09:30	12:30		F1	Dry	7	Moderate	N/A	N/A
Winter-22	25/01/2022	VP5	2	13:00	16:00		F2	Dry	7	Moderate	N/A	N/A
Winter-22	24/01/2022	VP6	1	09:40	12:40		F1	Dry	4	Good	N/A	N/A
Winter-22	24/01/2022	VP6	2	13:10	16:10		F1	Dry	4	Good	N/A	N/A
Winter-22	06/01/2022	VP7	1	09:30	12:30		F3	Light Drizzle	8	Moderate	N/A	N/A
Winter-22	06/01/2022	VP7	2	13:00	16:00		F3	Light Drizzle	8	Moderate	N/A	N/A
Winter-22	11/01/2022	VP8	1	09:30	12:30		F1	Dry	3	Good	N/A	N/A

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Winter-22	11/01/2022	VP8	2	13:00	16:00		F1	Dry	3	Good	N/A	N/A
Winter-22	12/01/2022	VP9	1	09:30	12:30		F1	Dry	2	Very good	N/A	N/A
Winter-22	12/01/2022	VP9	2	13:00	16:00		F1	Dry	2	Very good	N/A	N/A
Winter-22	17/01/2022	VP10	1	09:40	12:40		F1	Dry	2	Good	N/A	N/A
Winter-22	17/01/2022	VP10	2	13:10	16:10		F1	Dry	2	Good	N/A	N/A
Winter-22	18/01/2022	VP11	1	09:30	12:30		F2	Dry	8	Moderate	N/A	N/A
Winter-22	18/01/2022	VP11	2	13:00	16:00		F2	Light Rain	8	Moderate	N/A	N/A
Winter-22	01/02/2022	VP1	1	09:30	12:30		F3	Light Drizzle	7	Good	N/A	N/A
Winter-22	01/02/2022	VP1	2	13:00	16:00		F3	Light Drizzle-Dry	7	Good	N/A	N/A
Winter-22	03/02/2022	VP2	1	09:30	12:30		F2	Dry	6	Excellent	N/A	N/A
Winter-22	03/02/2022	VP2	2	13:00	16:00		F2	Dry	6	Excellent	N/A	N/A
Winter-22	02/02/2022	VP3	1	09:30	12:30		F3	Light Drizzle	6	Good	N/A	N/A
Winter-22	02/02/2022	VP3	2	13:00	16:00		F3	Dry	7	Good	N/A	N/A
Winter-22	28/02/2022	VP4	1	09:30	13:00		F1	Dry	2	Excellent	N/A	N/A
Winter-22	28/02/2022	VP4	2	13:00	16:00		F3	Dry/Light Rain	2	Excellent	N/A	N/A
Winter-22	25/02/2022	VP5	1	09:30	12:30		F1	Dry	6	Good	N/A	N/A
Winter-22	25/02/2022	VP5	2	13:00	16:00		F1	Dry	5	Good	N/A	N/A
Winter-22	25/02/2022	VP6	1	09:30	12:30		F2	Dry	7	Good	N/A	N/A
Winter-22	25/02/2022	VP6	2	13:00	16:00		F3	Dry	7	Good	N/A	N/A
Winter-22	02/02/2022	VP7	1	09:40	12:40		F2	Dry	8	Good	N/A	N/A
Winter-22	02/02/2022	VP7	2	13:10	16:10		F2	Dry	8	Good	N/A	N/A
Winter-22	14/02/2022	VP8	1	09:15	12:15		F4	Showers	6	Good	N/A	N/A
Winter-22	14/02/2022	VP8	2	12:45	15:45		F4	Showers	4	Good	N/A	N/A
Winter-22	09/02/2022	VP9	1	09:15	12:15		F3	Dry	4	Good	N/A	N/A

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Winter-22	09/02/2022	VP9	2	12:45	15:45		F3	Dry/Occassional Shower	5	Good	N/A	N/A
Winter-22	01/02/2022	VP10	1	09:40	12:40		F2	Drizzle	8	Good	N/A	N/A
Winter-22	01/02/2022	VP10	2	13:10	16:10		F3	Drizzle	8	Good	N/A	N/A
Winter-22	08/02/2022	VP11	1	09:30	12:30		F3	Drizzle	8	Moderate	N/A	N/A
Winter-22	08/02/2022	VP11	2	13:00	16:00		F2	Drizzle	8	Moderate	N/A	N/A
Winter-22	02/03/2022	VP1	1	09:30	12:30		F2	Heavy Drizzle	8	Moderate	N/A	N/A
Winter-22	02/03/2022	VP1	2	13:00	16:00		F3	Light Drizzle-Dry	7	Good	N/A	N/A
Winter-22	07/03/2022	VP2	1	09:30	12:30		F3	Dry	6	Good	N/A	N/A
Winter-22	07/03/2022	VP2	2	13:00	16:00		F3	Dry	6	Good	N/A	N/A
Winter-22	16/03/2022	VP3	1	09:30	12:30		F1	Dry	1	Excellent	N/A	N/A
Winter-22	16/03/2022	VP3	2	13:00	16:00		F1	Dry	1	Excellent	N/A	N/A
Winter-22	08/03/2022	VP4	1	09:30	12:30		F4	Dry	7	Good	N/A	N/A
Winter-22	08/03/2022	VP4	2	13:00	16:00		F3	Dry/Light Drizzle	6	Good	N/A	N/A
Winter-22	15/03/2022	VP5	1	09:30	12:30		F2	Dry	7	Good	N/A	N/A
Winter-22	15/03/2022	VP5	2	13:00	16:00		F2	Dry	6	Good	N/A	N/A
Winter-22	16/03/2022	VP6	1	09:30	12:30		F1	Dry	3	Excellent	N/A	N/A
Winter-22	16/03/2022	VP6	2	13:00	16:00		F1	Dry	4	Excellent	N/A	N/A
Winter-22	07/03/2022	VP7	1	09:35	12:35		F3	Dry	8	Good	N/A	N/A
Winter-22	07/03/2022	VP7	2	13:10	16:10		F4	Dry	7	Good	N/A	N/A
Winter-22	08/03/2022	VP8	1	09:40	12:40		F3	Heavy showers	8	Good	N/A	N/A
Winter-22	08/03/2022	VP8	2	13:10	16:10		F3	Showers	8	Good	N/A	N/A
Winter-22	02/03/2022	VP9	1	09:40	12:40		F3	Drizzle	8	Moderate	N/A	N/A
Winter-22	02/03/2022	VP9	2	13:10	16:10		F3	Drizzle	8	Moderate	N/A	N/A

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Winter-22	15/03/2022	VP10	1	09:45	12:45		F1	Dry	8	Good	N/A	N/A
Winter-22	15/03/2022	VP10	2	13:15	16:15		F1	Dry	8	Good	N/A	N/A
Winter-22	28/03/2022	VP11	1	09:30	12:30		F1	Dry	1	Excellent	N/A	N/A
Winter-22	28/03/2022	VP11	2	13:00	16:00		F1	Dry	1	Excellent	N/A	N/A
Breeding-22	11/04/2022	VP9	Dawn	07:00	08:00	E	5	0	7/8	4	0	0
Breeding-22	11/04/2022	VP9	Dawn	08:00	09:00	E	5	0	8/8	4	0	0
Breeding-22	11/04/2022	VP9	Dawn	10:20	11:20	E	5	0	7/8	4	0	0
Breeding-22	11/04/2022	VP9	Dawn	11:20	12:20	E	5	0	7/8	4	0	0
Breeding-22	11/04/2022	VP9	Dawn	12:20	13:20	E	5	0	7/8	4	0	0
Breeding-22	11/04/2022	VP9	Dawn	13:20	14:20	E	4	0	8/8	4	0	0
Breeding-22	12/04/2022	VP8	Dawn	06:45	07:45	E	2	0	3/8	4	0	0
Breeding-22	12/04/2022	VP8	Dawn	07:45	08:45	E	2	0	3/8	4	0	0
Breeding-22	12/04/2022	VP8	Dawn	09:55	10:55	E	2	0	4/8	4	0	0
Breeding-22	12/04/2022	VP8	Dawn	10:55	11:55	E	2	0	7/8	4	0	0
Breeding-22	12/04/2022	VP8	Dawn	11:55	12:55	E	2	0	7/8	4	0	0
Breeding-22	12/04/2022	VP8	Dawn	12:55	13:55	E	2	0	7/8	4	0	0
Breeding-22	13/04/2022	VP10	Dawn	06:45	07:45	SW	1	0	7/8	3	0	0
Breeding-22	13/04/2022	VP10	Dawn	07:45	08:45	SW	1	0	7/8	4	0	0
Breeding-22	13/04/2022	VP10	Dawn	09:50	10:50	SW	2	0	7/8	4	0	0
Breeding-22	13/04/2022	VP10	Dawn	10:50	11:50	SW	2	0	7/8	4	0	0
Breeding-22	13/04/2022	VP10	Dawn	11:50	12:50	SW	2	0	7/8	4	0	0
Breeding-22	13/04/2022	VP10	Dawn	12:50	13:50	SW	2	0	7/8	4	0	0
Breeding-22	15/04/2022	VP11	Dawn	06:45	07:45	SE	4	0	8/8	4	0	0
Breeding-22	15/04/2022	VP11	Dawn	07:45	08:45	SE	4	0	8/8	4	0	0

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-22	15/04/2022	VP11	Dawn	08:45	09:45	S	5	0	8/8	4	0	0
Breeding-22	15/04/2022	VP11	Dawn	09:45	10:45	S	6	0	8/8	4	0	0
Breeding-22	15/04/2022	VP11	Dawn	10:45	11:45	S	6	2	8/8	4	0	0
Breeding-22	15/04/2022	VP11	Dawn	11:45	12:45	S	6	2	8/8	4	0	0
Breeding-22	12/04/2022	VP1	Day	14:00	15:00	E	2	0	8/8	4	0	0
Breeding-22	12/04/2022	VP1	Day	15:00	16:00	E	2	0	7/8	4	0	0
Breeding-22	12/04/2022	VP1	Day	16:00	17:00	ESE	2	0	7/8	4	0	0
Breeding-22	12/04/2022	VP1	Day	17:30	18:30	ESE	2	0	6/8	4	0	0
Breeding-22	12/04/2022	VP1	Day	18:30	19:30	SW	2	0	6/8	4	0	0
Breeding-22	12/04/2022	VP1	Dusk	19:30	20:30	SW	1	0	5/8	4	0	0
Breeding-22	13/04/2022	VP2	Day	14:00	15:00	SW	1	0	7/8	4	0	0
Breeding-22	13/04/2022	VP2	Day	15:00	16:00	SW	3	0	7/8	4	0	0
Breeding-22	13/04/2022	VP2	Day	16:00	17:00	SW	2	0	6/8	4	0	0
Breeding-22	13/04/2022	VP2	Day	17:30	18:30	SW	2	0	5/8	4	0	0
Breeding-22	13/04/2022	VP2	Day	18:30	19:30	WSW	2	0	2/8	4	0	0
Breeding-22	13/04/2022	VP2	Dusk	19:30	20:30	WSW	1	0	1/8	4	0	0
Breeding-22	14/04/2022	VP3	Dawn	06:40	07:40	SSE	1	0	8/8	4	0	0
Breeding-22	14/04/2022	VP3	Day	07:40	08:40	SSE	1	0	8/8	4	0	0
Breeding-22	14/04/2022	VP3	Day	08:40	09:40	SSE	2	2	8/8	4	0	0
Breeding-22	14/04/2022	VP3	Day	11:00	12:00	SSE	2	2	8/8	4	0	0
Breeding-22	14/04/2022	VP3	Day	12:00	13:00	SSE	2	2	8/8	4	0	0
Breeding-22	14/04/2022	VP3	Day	13:00	14:00	SSE	3	3	8/8	4	0	0
Breeding-22	15/04/2022	VP4	Dawn	06:50	07:50	SE	4	0	8/8	4	0	0
Breeding-22	15/04/2022	VP4	Day	07:50	08:50	SE	4	0	8/8	4	0	0

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-22	15/04/2022	VP4	Day	08:50	09:50	SE	4	2	8/8	4	0	0
Breeding-22	15/04/2022	VP4	Day	10:20	11:20	SSE	5	2	8/8	4	0	0
Breeding-22	15/04/2022	VP4	Day	11:20	12:20	S	5	0	8/8	4	0	0
Breeding-22	15/04/2022	VP4	Day	12:20	13:20	S	5	0	8/8	4	0	0
Breeding-22	20/04/2022	VP5	Day	14:15	15:15	SSE	3	0	5/8	4	0	0
Breeding-22	20/04/2022	VP5	Day	15:15	16:15	SSE	4	0	6/8	4	0	0
Breeding-22	20/04/2022	VP5	Day	16:15	17:15	SSE	4	0	7/8	4	0	0
Breeding-22	20/04/2022	VP5	Day	17:45	18:45	SSE	3	0	7/8	4	0	0
Breeding-22	20/04/2022	VP5	Day	18:45	19:45	SSE	3	0	7/8	4	0	0
Breeding-22	20/04/2022	VP5	Dusk	19:45	20:45	SSE	2	0	7/8	4	0	0
Breeding-22	21/04/2022	VP6	Dawn	06:30	07:30	E	2	0	8/8	4	0	0
Breeding-22	21/04/2022	VP6	Day	07:30	08:30	E	4	0	8/8	4	0	0
Breeding-22	21/04/2022	VP6	Day	08:30	09:30	E	4	0	8/8	4	0	0
Breeding-22	21/04/2022	VP6	Day	10:00	11:00	E	4	0	8/8	4	0	0
Breeding-22	21/04/2022	VP6	Day	11:00	12:00	E	4	0	7/8	4	0	0
Breeding-22	21/04/2022	VP6	Day	12:00	13:00	E	4	0	7/8	4	0	0
Breeding-22	21/04/2022	VP7	Day	16:40	17:40	E	3	0	7/8	4	0	0
Breeding-22	21/04/2022	VP7	Day	17:40	18:40	E	3	0	7/8	4	0	0
Breeding-22	21/04/2022	VP7	Day	18:40	19:40	E	3	0	7/8	4	0	0
Breeding-22	22/04/2022	VP7	Dawn	06:15	07:15	E	1	0	8/8	4	0	0
Breeding-22	22/04/2022	VP7	N/A	07:15	08:15	E	2	0	8/8	4	0	0
Breeding-22	22/04/2022	VP7	N/A	08:15	09:15	E	2	0	8/8	4	0	0
Breeding-22	03/05/2022	VP4	Day	14:35	15:35	W	3	0	7/8	4	0	0
Breeding-22	03/05/2022	VP4	Day	15:35	16:35	W	2	0	8/8	4	0	0

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-22	03/05/2022	VP4	Day	16:35	17:35	W	1	0	8/8	4	0	0
Breeding-22	03/05/2022	VP4	Day	18:05	19:05	W	1	0	8/8	4	0	0
Breeding-22	03/05/2022	VP4	Day	19:05	20:05	WSW	2	3	8/8	4	0	0
Breeding-22	03/05/2022	VP4	Dusk	20:05	21:05	WSW	1	0	8/8	4	0	0
Breeding-22	04/05/2022	VP5	Dawn	05:50	06:50	W	1	2	8/8	4	0	0
Breeding-22	04/05/2022	VP5	Day	06:50	07:50	W	2	0	8/8	4	0	0
Breeding-22	04/05/2022	VP5	Day	07:50	08:50	W	2	0	8/8	4	0	0
Breeding-22	04/05/2022	VP5	Day	13:00	14:00	WNW	2	0	7/8	4	0	0
Breeding-22	04/05/2022	VP5	Day	14:00	15:00	WNW	2	0	6/8	4	0	0
Breeding-22	04/05/2022	VP5	Day	15:00	16:00	WNW	2	0	6/8	4	0	0
Breeding-22	16/05/2022	VP6	Day	15:00	16:00	SW	3	4	8/8	4	0	0
Breeding-22	16/05/2022	VP6	Day	16:00	17:00	SW	3	3	7/8	4	0	0
Breeding-22	16/05/2022	VP6	Day	17:00	18:00	SW	3	3	7/8	4	0	0
Breeding-22	16/05/2022	VP6	Day	18:30	19:30	SW	3	0	7/8	4	0	0
Breeding-22	16/05/2022	VP6	Day	19:30	20:30	SW	3	0	7/8	4	0	0
Breeding-22	16/05/2022	VP6	Dusk	20:30	21:30	SW	3	0	7/8	4	0	0
Breeding-22	18/05/2022	VP1	Dawn	05:35	06:35	S	2	2	8/8	4	0	0
Breeding-22	18/05/2022	VP1	Day	06:35	07:35	S	2	0	8/8	4	0	0
Breeding-22	18/05/2022	VP1	Day	07:35	08:35	S	3	0	8/8	4	0	0
Breeding-22	18/05/2022	VP1	Day	09:05	10:05	S	3	0	7/8	4	0	0
Breeding-22	18/05/2022	VP1	Day	10:05	11:05	S	3	0	7/8	4	0	0
Breeding-22	18/05/2022	VP1	Day	11:05	12:05	S	4	0	7/8	4	0	0
Breeding-22	19/05/2022	VP7	Day	14:45	15:45	SSW	3	0	6/8	4	0	0
Breeding-22	19/05/2022	VP7	Day	15:45	16:45	SSW	3	0	6/8	4	0	0

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-22	19/05/2022	VP7	Day	16:45	17:45	SSW	3	0	6/8	4	0	0
Breeding-22	19/05/2022	VP7	Day	18:30	19:30	SSW	3	0	6/8	4	0	0
Breeding-22	19/05/2022	VP7	Day	19:30	20:30	SSW	3	0	6/8	4	0	0
Breeding-22	19/05/2022	VP7	Dusk	20:30	21:30	SSW	2	0	6/8	4	0	0
Breeding-22	30/05/2022	VP3	Day	14:10	15:10	W	3	3	7/8	4	0	0
Breeding-22	30/05/2022	VP3	Day	15:10	16:10	W	3	3	7/8	4	0	0
Breeding-22	30/05/2022	VP3	Day	16:10	17:10	W	3	3	7/8	4	0	0
Breeding-22	30/05/2022	VP3	Day	18:50	19:50	W	3	5	8/8	3	0	0
Breeding-22	30/05/2022	VP3	Day	19:50	20:50	W	2	3	7/8	4	0	0
Breeding-22	30/05/2022	VP3	Dusk	20:50	21:50	W	2	0	6/8	4	0	0
Breeding-22	31/05/2022	VP2	Dawn	05:15	06:15	WNWW	0	0	8/8	4	0	0
Breeding-22	31/05/2022	VP2	Day	06:15	07:15	WNW	0	0	7/8	4	0	0
Breeding-22	31/05/2022	VP2	Day	07:15	08:15	WNW	2	3	7/8	4	0	0
Breeding-22	31/05/2022	VP2	Day	09:35	10:35	WNW	2	0	7/8	4	0	0
Breeding-22	31/05/2022	VP2	Day	10:35	11:35	WNW	3	0	6/8	4	0	0
Breeding-22	31/05/2022	VP2	Day	11:35	12:35	WNW	3	0	6/8	4	0	0
Breeding-22	04/05/2022	VP11	Dusk	15:10	16:10	W	6	0	7/8	4	0	0
Breeding-22	04/05/2022	VP11	Dusk	16:10	17:10	W	6	0	4/8	4	0	0
Breeding-22	04/05/2022	VP11	Dusk	17:10	18:10	W	5	0	4/8	4	0	0
Breeding-22	04/05/2022	VP11	Dusk	18:10	19:10	W	5	0	6/8	4	0	0
Breeding-22	04/05/2022	VP11	Dusk	19:10	20:10	W	4	0	7/8	3	0	0
Breeding-22	04/05/2022	VP11	Dusk	20:10	21:10	W	1	0	7/8	3	0	0
Breeding-22	09/05/2022	VP8	Dusk	15:20	16:20	SW	6	1	7/8	4	0	0
Breeding-22	09/05/2022	VP8	Dusk	16:20	17:20	SW	6	0	7/8	4	0	0

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-22	09/05/2022	VP8	Dusk	17:20	18:20	SW	7	0	5/8	4	0	0
Breeding-22	09/05/2022	VP8	Dusk	18:20	19:20	SW	7	0	4/8	4	0	0
Breeding-22	09/05/2022	VP8	Dusk	19:20	20:20	SW	6	0	4/8	4	0	0
Breeding-22	09/05/2022	VP8	Dusk	20:20	21:20	SW	6	0	4/8	4	0	0
Breeding-22	11/05/2022	VP9	Dusk	15:20	16:20	W	3	4	6/8	4	0	0
Breeding-22	11/05/2022	VP9	Dusk	16:20	17:20	W	4	0	5/8	4	0	0
Breeding-22	11/05/2022	VP9	Dusk	17:20	18:20	W	6	0	5/8	4	0	0
Breeding-22	11/05/2022	VP9	Dusk	18:20	19:20	W	6	0	4/8	4	0	0
Breeding-22	11/05/2022	VP9	Dusk	19:20	20:20	W	6	0	3/8	4	0	0
Breeding-22	11/05/2022	VP9	Dusk	20:20	21:20	W	6	1	7/8	4	0	0
Breeding-22	12/05/2022	VP10	Dusk	15:20	16:20	SW	5	0	7/8	4	0	0
Breeding-22	12/05/2022	VP10	Dusk	16:20	17:20	SW	6	1	8/8	4	0	0
Breeding-22	12/05/2022	VP10	Dusk	17:20	18:20	SW	6	0	8/8	4	0	0
Breeding-22	12/05/2022	VP10	Dusk	18:20	19:20	SW	5	0	8/8	4	0	0
Breeding-22	12/05/2022	VP10	Dusk	19:20	20:20	SW	5	1	8/8	4	0	0
Breeding-22	12/05/2022	VP10	Dusk	20:20	21:20	SW	5	1	8/8	4	0	0
Breeding-22	08/06/2022	VP3	Day	11:45	12:45	WSW	4	5	8/8	3	0	0
Breeding-22	08/06/2022	VP3	Day	12:45	13:45	WSW	4	5	8/8	3	0	0
Breeding-22	08/06/2022	VP3	Day	13:45	14:45	WSW	4	3	7/8	4	0	0
Breeding-22	08/06/2022	VP3	Day	15:40	16:40	WSW	4	0	7/8	4	0	0
Breeding-22	08/06/2022	VP3	Day	16:40	17:40	WSW	5	0	7/8	4	0	0
Breeding-22	08/06/2022	VP3	Day	17:40	18:40	WSW	5	0	7/8	4	0	0
Breeding-22	09/06/2022	VP1	Day	14:20	15:20	SSW	6	0	7/8	4	0	0
Breeding-22	09/06/2022	VP1	Day	15:20	16:20	SW	6	0	7/8	4	0	0

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-22	09/06/2022	VP1	Day	16:20	17:20	SW	5	0	7/8	4	0	0
Breeding-22	09/06/2022	VP1	Day	17:50	18:50	SW	5	0	6/8	4	0	0
Breeding-22	09/06/2022	VP1	Day	18:50	19:50	SW	5	0	4/8	4	0	0
Breeding-22	09/06/2022	VP1	Day	19:50	20:50	SW	5	0	4/8	4	0	0
Breeding-22	10/06/2022	VP2	Day	10:05	11:05	SW	4	3	7/8	4	0	0
Breeding-22	10/06/2022	VP2	Day	11:05	12:05	SW	4	4	7/8	4	0	0
Breeding-22	10/06/2022	VP2	Day	12:05	13:05	SW	5	0	6/8	4	0	0
Breeding-22	10/06/2022	VP2	Day	13:35	14:35	SW	6	0	6/8	4	0	0
Breeding-22	10/06/2022	VP2	Day	14:35	15:35	SW	5	0	7/8	4	0	0
Breeding-22	10/06/2022	VP2	Day	15:35	16:35	SW	5	0	7/8	4	0	0
Breeding-22	27/06/2022	VP4	Day	13:55	14:55	SSW	3	0	7/8	4	0	0
Breeding-22	27/06/2022	VP4	Day	14:55	15:55	SSW	3	0	7/8	4	0	0
Breeding-22	27/06/2022	VP4	Day	15:55	16:55	SSW	3	0	7/8	4	0	0
Breeding-22	27/06/2022	VP4	Day	17:25	18:25	SSW	3	0	7/8	4	0	0
Breeding-22	27/06/2022	VP4	Day	18:25	19:25	SSW	3	3	7/8	4	0	0
Breeding-22	27/06/2022	VP4	Day	19:25	20:25	SSW	3	3	7/8	4	0	0
Breeding-22	28/06/2022	VP5	Day	14:05	15:05	SW	4	0	7/8	4	0	0
Breeding-22	28/06/2022	VP5	Day	15:05	16:05	SW	4	0	7/8	4	0	0
Breeding-22	28/06/2022	VP5	Day	16:05	17:05	SW	4	0	7/8	4	0	0
Breeding-22	28/06/2022	VP5	Day	17:35	18:35	SW	3	0	7/8	4	0	0
Breeding-22	28/06/2022	VP5	Day	18:35	19:35	SSW	2	0	7/8	4	0	0
Breeding-22	28/06/2022	VP5	Day	19:35	20:35	SSW	2	0	7/8	4	0	0
Breeding-22	29/06/2022	VP6	Day	08:30	09:30	SSW	2	0	7/8	4	0	0
Breeding-22	29/06/2022	VP6	Day	09:30	10:30	SSW	2	0	8/8	4	0	0

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-22	29/06/2022	VP6	Day	10:30	11:30	SSW	2	3	8/8	4	0	0
Breeding-22	29/06/2022	VP6	Day	14:55	15:55	W	2	4	7/8	4	0	0
Breeding-22	29/06/2022	VP6	Day	15:55	16:55	W	2	4	7/8	4	0	0
Breeding-22	29/06/2022	VP6	Day	16:55	17:55	W	2	4	8/8	4	0	0
Breeding-22	30/06/2022	VP7	Day	12:35	13:35	WSW	3	0	7/8	4	0	0
Breeding-22	30/06/2022	VP7	Day	13:35	14:35	W	3	0	8/8	4	0	0
Breeding-22	30/06/2022	VP7	Day	14:35	15:35	W	3	0	8/8	4	0	0
Breeding-22	30/06/2022	VP7	Day	18:00	19:00	W	3	0	7/8	4	0	0
Breeding-22	30/06/2022	VP7	Day	19:00	20:00	WSW	3	3	8/8	4	0	0
Breeding-22	30/06/2022	VP7	Day	20:00	21:00	W	2	5	8/8	4	0	0
Breeding-22	07/06/2022	VP11	Day	11:20	12:20	SE	1	0	6/8	4	0	0
Breeding-22	07/06/2022	VP11	Day	12:20	13:20	SE	1	0	7/8	4	0	0
Breeding-22	07/06/2022	VP11	Day	13:20	14:20	SE	1	0	8/8	4	0	0
Breeding-22	07/06/2022	VP11	Day	14:20	15:20	SE	2	0	8/8	4	0	0
Breeding-22	07/06/2022	VP11	Day	15:20	16:20	SE	3	0	8/8	4	0	0
Breeding-22	07/06/2022	VP11	Day	16:20	17:20	SE	3	0	8/8	4	0	0
Breeding-22	08/06/2022	VP10	Day	13:15	14:15	SW	4	1	7/8	4	0	0
Breeding-22	08/06/2022	VP10	Day	14:15	15:15	SW	3	1	8/8	4	0	0
Breeding-22	08/06/2022	VP10	Day	15:15	16:15	SW	4	1	6/8	4	0	0
Breeding-22	09/06/2022	VP10	Day	12:25	13:25	SW	3	0	6/8	4	0	0
Breeding-22	09/06/2022	VP10	Day	13:25	14:25	SW	4	0	4/8	4	0	0
Breeding-22	09/06/2022	VP10	Day	14:25	15:25	SW	4	0	7/8	4	0	0
Breeding-22	09/06/2022	VP9	Day	15:30	16:30	SW	4	0	7/8	4	0	0
Breeding-22	09/06/2022	VP9	Day	16:30	17:30	SW	3	0	6/8	4	0	0

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-22	09/06/2022	VP9	Day	17:30	18:30	SW	4	0	6/8	4	0	0
Breeding-22	09/06/2022	VP9	Day	18:30	19:30	SW	3	0	6/8	4	0	0
Breeding-22	09/06/2022	VP9	Day	19:30	20:30	SW	4	0	5/8	4	0	0
Breeding-22	09/06/2022	VP9	Day	20:30	21:30	SW	4	0	6/8	4	0	0
Breeding-22	17/06/2022	VP8	Day	10:35	11:35	SW	2	2	8/8	4	0	0
Breeding-22	17/06/2022	VP8	Day	11:35	12:35	SW	1	2	8/8	4	0	0
Breeding-22	17/06/2022	VP8	Day	12:35	13:35	SW	1	1	8/8	4	0	0
Breeding-22	17/06/2022	VP8	Day	13:35	14:35	SW	1	0	8/8	4	0	0
Breeding-22	17/06/2022	VP8	Day	14:35	15:35	SW	1	0	8/8	4	0	0
Breeding-22	17/06/2022	VP8	Day	15:35	16:35	SW	1	0	8/8	4	0	0
Breeding-22	05/07/2022	VP9	Day	10:40	11:40	W	2	0	8/8	4	0	0
Breeding-22	05/07/2022	VP9	Day	11:40	12:40	W	2	0	8/8	4	0	0
Breeding-22	05/07/2022	VP9	Day	12:40	13:40	W	2	0	8/8	4	0	0
Breeding-22	05/07/2022	VP9	Day	13:40	14:40	W	2	0	8/8	4	0	0
Breeding-22	05/07/2022	VP9	Day	14:40	15:40	W	3	0	8/8	4	0	0
Breeding-22	05/07/2022	VP9	Day	15:40	16:40	W	2	0	8/8	4	0	0
Breeding-22	07/07/2022	VP10	Day	10:40	11:40	W	2	0	7/8	4	0	0
Breeding-22	07/07/2022	VP10	Day	11:40	12:40	W	2	0	7/8	4	0	0
Breeding-22	07/07/2022	VP10	Day	12:40	13:40	W	1	0	6/8	4	0	0
Breeding-22	07/07/2022	VP10	Day	13:40	14:40	NW	2	0	5/8	4	0	0
Breeding-22	07/07/2022	VP10	Day	14:40	15:40	NW	2	0	6/8	4	0	0
Breeding-22	07/07/2022	VP10	Day	15:40	16:40	NW	1	0	7/8	4	0	0
Breeding-22	12/07/2022	VP8	Day	10:20	11:20	SW	1	0	8/8	4	0	0
Breeding-22	12/07/2022	VP8	Day	11:20	12:20	SW	2	0	8/8	4	0	0

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-22	12/07/2022	VP8	Day	12:20	13:20	SW	2	0	8/8	4	0	0
Breeding-22	12/07/2022	VP8	Day	13:20	14:20	SW	1	0	8/8	4	0	0
Breeding-22	12/07/2022	VP8	Day	14:20	15:20	W	1	0	8/8	4	0	0
Breeding-22	12/07/2022	VP8	Day	15:20	16:20	W	1	0	8/8	4	0	0
Breeding-22	13/07/2022	VP11	Day	10:05	11:05	W	2	0	2/8	4	0	0
Breeding-22	13/07/2022	VP11	Day	11:05	12:05	W	3	0	8/8	4	0	0
Breeding-22	13/07/2022	VP11	Day	12:05	13:05	W	2	0	7/8	4	0	0
Breeding-22	13/07/2022	VP11	Day	13:05	14:05	W	2	0	7/8	4	0	0
Breeding-22	13/07/2022	VP11	Day	14:05	15:05	W	2	0	8/8	4	0	0
Breeding-22	13/07/2022	VP11	Day	15:05	16:05	W	2	0	7/8	4	0	0
Breeding-22	01/07/2022	VP1	Day	10:20	11:20	S	2	0	7/8	4	0	0
Breeding-22	01/07/2022	VP1	Day	11:20	12:20	S	2	0	7/8	4	0	0
Breeding-22	01/07/2022	VP1	Day	12:20	13:20	S	2	3	7/8	4	0	0
Breeding-22	04/07/2022	VP1	Day	13:45	14:45	W	3	0	8/8	4	0	0
Breeding-22	04/07/2022	VP1	Day	14:45	15:45	W	3	0	8/8	4	0	0
Breeding-22	04/07/2022	VP1	Day	15:45	16:45	W	3	0	7/8	4	0	0
Breeding-22	05/07/2022	VP3	Day	10:55	11:55	W	3	0	7/8	4	0	0
Breeding-22	05/07/2022	VP3	Day	11:55	12:55	W	3	0	7/8	4	0	0
Breeding-22	05/07/2022	VP3	Day	12:55	13:55	W	3	0	7/8	4	0	0
Breeding-22	06/07/2022	VP3	Day	07:50	08:50	W	4	0	8/8	4	0	0
Breeding-22	06/07/2022	VP3	Day	08:50	09:50	W	4	0	8/8	4	0	0
Breeding-22	06/07/2022	VP3	Day	09:50	10:50	W	4	0	8/8	4	0	0
Breeding-22	06/07/2022	VP2	Day	13:05	14:05	W	4	0	8/8	4	0	0
Breeding-22	06/07/2022	VP2	Day	14:05	15:05	W	5	0	8/8	4	0	0

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-22	06/07/2022	VP2	Day	15:05	16:05	W	4	0	8/8	4	0	0
Breeding-22	06/07/2022	VP2	Day	16:35	17:35	W	4	0	8/8	4	0	0
Breeding-22	06/07/2022	VP2	Day	17:35	18:35	W	4	0	8/8	4	0	0
Breeding-22	06/07/2022	VP2	Day	18:35	19:35	W	4	0	8/8	4	0	0
Breeding-22	07/07/2022	VP4	Day	14:20	15:20	NW	3	0	6/8	4	0	0
Breeding-22	07/07/2022	VP4	Day	15:20	16:20	NW	3	0	6/8	4	0	0
Breeding-22	07/07/2022	VP4	Day	16:20	17:20	NW	2	0	7/8	4	0	0
Breeding-22	08/07/2022	VP4	Day	11:50	12:50	WNW	3	0	7/8	4	0	0
Breeding-22	08/07/2022	VP4	Day	12:50	13:50	W	3	0	7/8	4	0	0
Breeding-22	08/07/2022	VP4	Day	13:50	14:50	W	2	0	7/8	4	0	0
Breeding-22	27/07/2022	VP5	Day	12:30	13:30	SSE	1	0	8/8	4	0	0
Breeding-22	27/07/2022	VP5	Day	13:30	14:30	SSE	1	0	8/8	4	0	0
Breeding-22	27/07/2022	VP5	Day	14:30	15:30	SSE	1	0	8/8	4	0	0
Breeding-22	27/07/2022	VP5	Day	16:00	17:00	SSE	1	0	8/8	4	0	0
Breeding-22	27/07/2022	VP5	Day	17:00	18:00	SSE	1	3	8/8	4	0	0
Breeding-22	27/07/2022	VP5	Day	18:00	19:00	SSE	2	2	8/8	4	0	0
Breeding-22	28/07/2022	VP6	Day	10:45	11:45	ESE	2	0	7/8	4	0	0
Breeding-22	28/07/2022	VP6	Day	11:45	12:45	ESE	3	0	7/8	4	0	0
Breeding-22	28/07/2022	VP6	Day	12:45	13:45	ESE	3	0	7/8	4	0	0
Breeding-22	28/07/2022	VP6	Day	16:30	17:30	ESE	3	0	7/8	4	0	0
Breeding-22	28/07/2022	VP6	Day	17:30	18:30	E	3	0	7/8	4	0	0
Breeding-22	28/07/2022	VP6	Day	18:30	19:30	ESE	3	0	7/8	4	0	0
Breeding-22	29/07/2022	VP7	Day	08:45	09:45	S	4	0	7/8	4	0	0
Breeding-22	29/07/2022	VP7	Day	09:45	10:45	S	4	0	7/8	4	0	0

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-22	29/07/2022	VP7	Day	10:45	11:45	S	4	0	8/8	4	0	0
Breeding-22	29/07/2022	VP7	Day	12:15	13:15	S	4	0	8/8	4	0	0
Breeding-22	29/07/2022	VP7	Day	13:15	14:15	S	3	0	8/8	4	0	0
Breeding-22	29/07/2022	VP7	Day	14:15	15:15	SSW	4	0	8/8	4	0	0
Breeding-22	03/08/2022	VP3	Day	12:30	13:30	W	3	0	8/8	4	0	0
Breeding-22	03/08/2022	VP3	Day	13:30	14:30	W	4	0	8/8	4	0	0
Breeding-22	03/08/2022	VP3	Day	14:30	15:30	W	3	0	8/8	4	0	0
Breeding-22	03/08/2022	VP3	Day	16:20	17:20	W	3	3	8/8	4	0	0
Breeding-22	03/08/2022	VP3	Day	17:20	18:20	NW	3	4	7/8	4	0	0
Breeding-22	03/08/2022	VP3	Day	18:20	19:20	NW	3	4	8/8	4	0	0
Breeding-22	04/08/2022	VP1	Day	09:55	10:55	NW	4	0	6/8	4	0	0
Breeding-22	04/08/2022	VP1	Day	10:55	11:55	NW	4	0	5/8	4	0	0
Breeding-22	04/08/2022	VP1	Day	11:55	12:55	NW	4	0	6/8	4	0	0
Breeding-22	04/08/2022	VP1	Day	15:50	16:50	NW	4	0	5/8	4	0	0
Breeding-22	04/08/2022	VP1	Day	16:50	17:50	NW	3	0	6/8	4	0	0
Breeding-22	04/08/2022	VP1	Day	17:50	18:50	NW	3	0	7/8	4	0	0
Breeding-22	05/08/2022	VP2	Day	08:05	09:05	WNW	4	0	7/8	4	0	0
Breeding-22	05/08/2022	VP2	Day	09:05	10:05	WNW	4	0	7/8	4	0	0
Breeding-22	05/08/2022	VP2	Day	10:05	11:05	WNW	4	0	6/8	4	0	0
Breeding-22	05/08/2022	VP2	Day	11:35	12:35	WNW	4	0	7/8	4	0	0
Breeding-22	05/08/2022	VP2	Day	12:35	13:35	WNW	4	0	6/8	4	0	0
Breeding-22	05/08/2022	VP2	Day	13:35	14:35	WNW	4	0	6/8	4	0	0
Breeding-22	16/08/2022	VP4	Day	10:00	11:00	N	4	0	7/8	4	0	0
Breeding-22	16/08/2022	VP4	Day	11:00	12:00	N	5	0	7/8	4	0	0

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-22	16/08/2022	VP4	Day	12:00	13:00	N	5	0	7/8	4	0	0
Breeding-22	16/08/2022	VP4	Day	16:15	17:15	N	4	0	7/8	4	0	0
Breeding-22	16/08/2022	VP4	Day	17:15	18:15	N	4	0	7/8	4	0	0
Breeding-22	16/08/2022	VP4	Day	18:15	19:15	N	4	0	7/8	4	0	0
Breeding-22	17/08/2022	VP5	Day	08:45	09:15	NW	3	0	7/8	4	0	0
Breeding-22	17/08/2022	VP5	Day	10:30	11:30	NW	3	0	7/8	4	0	0
Breeding-22	17/08/2022	VP5	Day	11:30	12:30	NW	3	0	7/8	4	0	0
Breeding-22	17/08/2022	VP5	Day	12:30	13:30	NW	3	0	7/8	4	0	0
Breeding-22	23/08/2022	VP5	Day	16:00	17:00	WSW	3	0	6/8	4	0	0
Breeding-22	23/08/2022	VP5	Day	17:00	18:30	WSW	3	0	7/8	4	0	0
Breeding-22	30/08/2022	VP6	Day	11:00	12:00	E	4	0	4/8	4	0	0
Breeding-22	30/08/2022	VP6	Day	12:00	13:00	E	4	0	6/8	4	0	0
Breeding-22	30/08/2022	VP6	Day	13:00	14:00	E	4	0	5/8	4	0	0
Breeding-22	30/08/2022	VP6	Day	16:20	17:20	E	4	0	2/8	4	0	0
Breeding-22	30/08/2022	VP6	Day	17:20	18:20	E	3	0	2/8	4	0	0
Breeding-22	30/08/2022	VP6	Day	18:20	19:20	E	3	0	2/8	4	0	0
Breeding-22	31/08/2022	VP7	Day	11:00	12:00	ENE	3	0	6/8	4	0	0
Breeding-22	31/08/2022	VP7	Day	12:00	13:00	ENE	3	0	6/8	4	0	0
Breeding-22	31/08/2022	VP7	Day	13:00	14:00	ENE	3	0	5/8	4	0	0
Breeding-22	31/08/2022	VP7	Day	15:00	16:00	ENE	3	0	5/8	4	0	0
Breeding-22	31/08/2022	VP7	Day	16:00	17:00	ENE	3	0	6/8	4	0	0
Breeding-22	31/08/2022	VP7	Day	17:00	18:00	ENE	3	0	6/8	4	0	0
Breeding-22	05/08/2022	VP10	Day	10:45	11:45	NW	3	0	6/8	4	0	0
Breeding-22	05/08/2022	VP10	Day	11:45	12:45	NW	2	0	4/8	4	0	0

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-22	05/08/2022	VP10	Day	12:45	13:45	NW	3	0	5/8	4	0	0
Breeding-22	05/08/2022	VP10	Day	13:45	14:45	NW	1	0	7/8	4	0	0
Breeding-22	05/08/2022	VP10	Day	14:45	15:45	NW	1	0	7/8	4	0	0
Breeding-22	05/08/2022	VP10	Day	15:45	16:45	NW	1	0	8/8	4	0	0
Breeding-22	08/08/2022	VP9	Day	10:30	11:30	S	1	0	6/8	4	0	0
Breeding-22	08/08/2022	VP9	Day	11:30	12:30	S	1	0	4/8	4	0	0
Breeding-22	08/08/2022	VP9	Day	12:30	13:30	S	3	0	3/8	4	0	0
Breeding-22	08/08/2022	VP9	Day	13:30	14:30	SW	3	0	2/8	4	0	0
Breeding-22	08/08/2022	VP9	Day	14:30	15:30	SW	3	0	3/8	4	0	0
Breeding-22	08/08/2022	VP9	Day	15:30	16:30	SW	3	0	3/8	4	0	0
Breeding-22	09/08/2022	VP11	Day	10:45	11:45	S	1	0	1/8	4	0	0
Breeding-22	09/08/2022	VP11	Day	11:45	12:45	S	1	0	1/8	4	0	0
Breeding-22	09/08/2022	VP11	Day	12:45	13:45	S	1	0	1/8	4	0	0
Breeding-22	09/08/2022	VP11	Day	13:45	14:45	S	1	0	1/8	4	0	0
Breeding-22	09/08/2022	VP11	Day	14:45	15:45	S	1	0	1/8	4	0	0
Breeding-22	09/08/2022	VP11	Day	15:45	16:45	S	1	0	2/8	4	0	0
Breeding-22	17/08/2022	VP8	Day	10:40	11:40	NW	1	0	1/8	4	0	0
Breeding-22	17/08/2022	VP8	Day	11:40	12:40	NW	1	0	1/8	4	0	0
Breeding-22	17/08/2022	VP8	Day	12:40	13:40	NW	1	0	2/8	4	0	0
Breeding-22	17/08/2022	VP8	Day	13:40	14:40	NW	1	0	5/8	4	0	0
Breeding-22	17/08/2022	VP8	Day	14:40	15:40	SW	1	0	3/8	4	0	0
Breeding-22	17/08/2022	VP8	Day	15:40	16:40	SW	1	0	3/8	4	0	0
Breeding-22	06/09/2022	VP3	Day	11:30	12:30	ESE	4	0	7/8	4	0	0
Breeding-22	06/09/2022	VP3	Day	12:30	13:30	ESE	4	3	8/8	4	0	0

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-22	06/09/2022	VP3	Day	13:30	14:30	ESE	4	3	8/8	4	0	0
Breeding-22	06/09/2022	VP3	Day	15:00	16:00	SE	4	3	7/8	4	0	0
Breeding-22	06/09/2022	VP3	Day	16:00	17:00	SE	4	0	7/8	4	0	0
Breeding-22	06/09/2022	VP3	Day	17:00	18:00	SE	4	0	8/8	4	0	0
Breeding-22	08/09/2022	VP2	Day	09:05	10:05	NE	3	0	8/8	4	0	0
Breeding-22	08/09/2022	VP2	Day	10:05	11:05	NE	4	0	7/8	4	0	0
Breeding-22	08/09/2022	VP2	Day	11:05	12:05	NE	4	0	8/8	4	0	0
Breeding-22	08/09/2022	VP2	Day	13:25	14:25	NE	4	0	8/8	4	0	0
Breeding-22	08/09/2022	VP2	Day	14:25	15:25	NE	4	0	7/8	4	0	0
Breeding-22	08/09/2022	VP2	Day	15:25	16:25	NE	4	0	7/8	4	0	0
Breeding-22	26/09/2022	VP4	Day	12:30	13:30	NW	5	3	8/8	4	0	0
Breeding-22	26/09/2022	VP4	Day	13:30	14:30	NW	5	0	7/8	4	0	0
Breeding-22	26/09/2022	VP4	Day	14:30	15:30	NW	5	0	7/8	4	0	0
Breeding-22	26/09/2022	VP4	Day	16:30	17:30	NW	5	0	7/8	4	0	0
Breeding-22	26/09/2022	VP4	Day	17:30	18:30	NW	5	0	7/8	4	0	0
Breeding-22	26/09/2022	VP4	Day	18:30	19:30	NW	5	0	7/8	4	0	0
Breeding-22	27/09/2022	VP1	Day	11:50	12:50	WNW	4	3	8/8	4	0	0
Breeding-22	27/09/2022	VP1	Day	12:50	13:50	WNW	4	3	8/8	4	0	0
Breeding-22	27/09/2022	VP1	Day	13:50	14:50	WNW	4	4	8/8	4	0	0
Breeding-22	27/09/2022	VP1	Day	15:50	16:50	WNW	3	4	8/8	4	0	0
Breeding-22	27/09/2022	VP1	Day	16:50	17:50	WNW	3	0	8/8	4	0	0
Breeding-22	27/09/2022	VP1	Day	17:50	18:50	WNW	3	0	8/8	4	0	0
Breeding-22	28/09/2022	VP6	Day	08:40	09:40	WNW	3	0	8/8	4	0	0
Breeding-22	28/09/2022	VP6	Day	09:40	10:40	WNW	3	0	8/8	4	0	0

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-22	28/09/2022	VP6	Day	10:40	11:40	WNW	3	0	8/8	4	0	0
Breeding-22	28/09/2022	VP6	Day	12:10	13:10	WNW	3	0	8/8	4	0	0
Breeding-22	28/09/2022	VP6	Day	13:10	14:10	NW	3	2	8/8	4	0	0
Breeding-22	28/09/2022	VP6	Day	14:10	15:10	NW	3	3	8/8	4	0	0
Breeding-22	29/09/2022	VP5	Day	08:30	09:30	NW	2	0	7/8	4	0	0
Breeding-22	29/09/2022	VP5	Day	09:30	10:30	NW	2	0	7/8	4	0	0
Breeding-22	29/09/2022	VP5	Day	10:30	11:30	NW	2	0	7/8	4	0	0
Breeding-22	29/09/2022	VP5	Day	12:50	13:50	NW	2	0	7/8	4	0	0
Breeding-22	29/09/2022	VP5	Day	13:50	14:50	NW	2	0	6/8	4	0	0
Breeding-22	29/09/2022	VP5	Day	14:50	15:50	NW	2	0	7/8	4	0	0
Breeding-22	29/09/2022	VP7	Day	16:40	17:40	NW	3	0	7/8	4	0	0
Breeding-22	29/09/2022	VP7	Day	17:40	18:40	NW	2	0	7/8	4	0	0
Breeding-22	29/09/2022	VP7	Day	18:40	19:10	NW	2	0	7/8	4	0	0
Breeding-22	30/09/2022	VP7	Day	12:20	15:50	SW	4	1	8/8	4	0	0
Breeding-22	05/09/2022	VP10	Day	12:40	13:40	SE	4	0	5/8	4	0	0
Breeding-22	05/09/2022	VP10	Day	13:40	14:40	SE	4	0	7/8	4	0	0
Breeding-22	05/09/2022	VP10	Day	14:40	15:40	SE	4	0	7/8	4	0	0
Breeding-22	05/09/2022	VP10	Day	15:40	16:40	SE	4	3	8/8	4	0	0
Breeding-22	05/09/2022	VP10	Day	16:40	17:40	SE	4	0	8/8	4	0	0
Breeding-22	05/09/2022	VP10	Day	17:40	18:40	SE	4	0	8/8	4	0	0
Breeding-22	08/09/2022	VP9	Day	09:30	10:30	N	3	0	7/8	4	0	0
Breeding-22	08/09/2022	VP9	Day	10:30	11:30	N	3	0	7/8	4	0	0
Breeding-22	08/09/2022	VP9	Day	11:30	12:30	N	3	0	6/8	4	0	0
Breeding-22	12/09/2022	VP9	Day	14:40	15:40	N	2	0	7/8	4	0	0

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-22	12/09/2022	VP9	Day	15:40	16:40	N	2	0	8/8	4	0	0
Breeding-22	12/09/2022	VP9	Day	16:40	17:40	N	2	0	8/8	4	0	0
Breeding-22	08/09/2022	VP8	Day	12:40	13:40	N	3	0	5/8	4	0	0
Breeding-22	08/09/2022	VP8	Day	13:40	14:40	N	3	0	4/8	4	0	0
Breeding-22	08/09/2022	VP8	Day	14:40	15:40	N	2	0	5/8	4	0	0
Breeding-22	12/09/2022	VP8	Day	11:20	12:20	N	1	0	8/8	4	0	0
Breeding-22	12/09/2022	VP8	Day	12:20	13:20	N	1	0	8/8	4	0	0
Breeding-22	12/09/2022	VP8	Day	13:20	14:20	N	1	0	8/8	4	0	0
Breeding-22	16/09/2022	VP11	Day	11:05	12:05	N	1	0	1/8	4	0	0
Breeding-22	16/09/2022	VP11	Day	12:05	13:05	N	2	0	3/8	4	0	0
Breeding-22	16/09/2022	VP11	Day	13:05	14:05	N	2	0	4/8	4	0	0
Breeding-22	16/09/2022	VP11	Day	14:35	15:35	N	2	0	5/8	4	0	0
Breeding-22	16/09/2022	VP11	Day	15:35	16:35	N	2	0	6/8	4	0	0
Breeding-22	16/09/2022	VP11	Day	16:35	17:35	N	2	0	6/8	4	0	0
Winter-22	04/10/2022	VP8	Dawn	07:35	08:35	SW	1	1	8/8	3	0	0
Winter-22	04/10/2022	VP8	Dawn	08:35	09:35	SW	1	2	8/8	3	0	0
Winter-22	04/10/2022	VP8	Dawn	09:35	10:35	W	1	0	8/8	4	0	0
Winter-22	04/10/2022	VP8	Dawn	15:00	16:00	SW	1	0	8/8	4	0	0
Winter-22	04/10/2022	VP8	Dawn	16:00	17:00	SW	1	0	8/8	4	0	0
Winter-22	04/10/2022	VP8	Dawn	17:00	18:00	SW	1	1	8/8	4	0	0
Winter-22	05/10/2022	VP7	Dawn	07:30	08:30	S	2	0	8/8	3	0	0
Winter-22	05/10/2022	VP7	Dawn	08:30	09:30	SW	2	1	8/8	4	0	0
Winter-22	05/10/2022	VP7	Dawn	09:30	10:30	SW	2	1	8/8	4	0	0
Winter-22	05/10/2022	VP7	Dawn	14:50	15:50	W	2	1	3/8	4	0	0

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Winter-22	05/10/2022	VP7	Dawn	15:50	16:50	W	2	0	7/8	4	0	0
Winter-22	05/10/2022	VP7	Dawn	16:50	17:50	W	2	0	4/8	4	0	0
Winter-22	06/10/2022	VP9	Dawn	07:25	08:25	SW	3	0	7/8	3	0	0
Winter-22	06/10/2022	VP9	Dawn	08:25	09:25	SW	4	0	5/8	4	0	0
Winter-22	06/10/2022	VP9	Dawn	09:25	10:25	SW	4	0	8/8	4	0	0
Winter-22	06/10/2022	VP9	Dawn	15:00	16:00	SW	4	0	6/8	4	0	0
Winter-22	06/10/2022	VP9	Dawn	16:00	17:00	SW	5	1	7/8	4	0	0
Winter-22	06/10/2022	VP9	Dawn	17:00	18:00	SW	5	1	8/8	4	0	0
Winter-22	12/10/2022	VP10	Dawn	07:45	08:45	W	2	1	8/8	3	0	0
Winter-22	12/10/2022	VP10	Dawn	08:45	09:45	W	2	0	7/8	4	0	0
Winter-22	12/10/2022	VP10	Dawn	09:45	10:45	W	2	0	7/8	4	0	0
Winter-22	12/10/2022	VP10	Dawn	11:15	12:15	W	3	0	8/8	4	0	0
Winter-22	12/10/2022	VP10	Dawn	12:15	13:15	W	2	0	7/8	4	0	0
Winter-22	12/10/2022	VP10	Dawn	13:15	14:15	W	2	0	7/8	4	0	0
Winter-22	13/10/2022	VP11	Dawn	07:30	08:30	SE	1	0	4/8	3	0	0
Winter-22	13/10/2022	VP11	Dawn	08:30	09:30	SE	2	0	3/8	4	0	0
Winter-22	13/10/2022	VP11	Dawn	09:30	10:30	SE	2	0	3/8	4	0	0
Winter-22	13/10/2022	VP11	Dawn	11:00	12:00	S	3	0	4/8	4	0	0
Winter-22	13/10/2022	VP11	Dawn	12:00	13:00	S	4	0	8/8	4	0	0
Winter-22	13/10/2022	VP11	Dawn	13:00	14:00	S	3	1	8/8	4	0	0
Winter-22	05/10/2022	VP1	Dusk	16:35	19:35	N	1 to 4	0	1-4	4	0	0
Winter-22	07/10/2022	VP3	Day	10:10	13:10	SW	1 to 3	4	1-5	3 to 4	0	0
Winter-22	07/10/2022	VP3	Day	16:00	19:00	SW	2 to 3	0	2-3	4	0	0
Winter-22	08/10/2022	VP4	Day	12:10	18:10	-	1 to 2	0	2-7	4	0	0

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Winter-22	09/10/2022	VP1	Day	09:15	12:15	N	2 to 3	0-2	8	3 to 4	0	0
Winter-22	12/10/2022	VP5	Day	09:40	12:40	-	2	0	2-3	4	0	0
Winter-22	17/10/2022	VP5	Day	10:00	13:00	SW	3 to 5	0	5-6	4	0	0
Winter-22	18/10/2022	VP6	Day	09:35	12:35	-	0 to 1	0	1-2	4	0	0
Winter-22	19/10/2022	VP6	Day	10:40	13:40	E	3 to 4	3	8	3 to 4	0	0
Winter-22	25/10/2022	VP2	Day	14:00	17:00	SE	2 to 4	0 - 3	6 to 7	4	0	0
Winter-22	31/10/2022	VP2	Day	08:10	11:10	-	2	4	8	2 to 3	0	0
Winter-22	03/11/2022	VP8	Dusk	11:00	12:00	SE	1	0	1/8	4	0	0
Winter-22	03/11/2022	VP8	Dusk	12:00	13:00	SE	1	0	2/8	4	0	0
Winter-22	03/11/2022	VP8	Dusk	13:00	14:00	SE	1	0	4/8	4	0	0
Winter-22	03/11/2022	VP8	Dusk	14:30	15:30	SE	1	0	4/8	4	0	0
Winter-22	03/11/2022	VP8	Dusk	15:30	16:30	SE	1	0	4/8	4	0	0
Winter-22	03/11/2022	VP8	Dusk	16:30	17:30	SE	1	0	3/8	4	0	0
Winter-22	04/11/2022	VP10	Day	09:00	10:00	SW	1	0	8/8	3	0	0
Winter-22	04/11/2022	VP10	Day	10:00	11:00	SW	2	0	7/8	4	0	0
Winter-22	04/11/2022	VP10	Day	11:00	12:00	SW	2	0	8/8	4	0	0
Winter-22	04/11/2022	VP10	Day	12:30	13:30	W	3	0	8/8	4	0	0
Winter-22	04/11/2022	VP10	Day	13:30	14:30	W	3	0	8/8	4	0	0
Winter-22	04/11/2022	VP10	Day	14:30	15:30	SW	2	0	8/8	4	0	0
Winter-22	07/11/2022	VP7	Day	09:00	10:00	S	3	0	7/8	3	0	0
Winter-22	07/11/2022	VP7	Day	10:00	11:00	S	2	1	8/8	4	0	0
Winter-22	07/11/2022	VP7	Day	11:00	12:00	S	3	0	8/8	4	0	0
Winter-22	07/11/2022	VP7	Day	12:20	13:20	S	3	1	8/8	4	0	0
Winter-22	07/11/2022	VP7	Day	13:20	14:20	S	4	1	8/8	4	0	0

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Winter-22	07/11/2022	VP7	Day	14:20	15:20	S	4	1	8/8	4	0	0
Winter-22	14/11/2022	VP11	Dusk	10:40	11:40	S	2	0	3/8	3	0	0
Winter-22	14/11/2022	VP11	Dusk	11:40	12:40	S	3	0	1/8	4	0	0
Winter-22	14/11/2022	VP11	Dusk	12:40	13:40	S	3	0	2/8	4	0	0
Winter-22	14/11/2022	VP11	Dusk	14:10	15:10	S	4	0	2/8	4	0	0
Winter-22	14/11/2022	VP11	Dusk	15:10	16:10	SE	3	0	1/8	4	0	0
Winter-22	14/11/2022	VP11	Dusk	16:10	17:10	SE	4	0	2/8	3	0	0
Winter-22	15/11/2022	VP9	Day	09:00	10:00	S	1	0	1/8	3	0	0
Winter-22	15/11/2022	VP9	Day	10:00	11:00	S	1	0	1/8	4	0	0
Winter-22	15/11/2022	VP9	Day	11:00	12:00	S	1	0	1/8	4	0	0
Winter-22	15/11/2022	VP9	Day	12:10	13:10	S	1	0	1/8	4	0	0
Winter-22	15/11/2022	VP9	Day	13:10	14:10	S	2	0	1/8	4	0	0
Winter-22	15/11/2022	VP9	Day	14:10	15:10	S	1	0	4/8	4	0	0
Winter-22	14/11/2022	VP1	Day	09:20	15:20	SE	2	0	1/8 2/8	4	0	0
Winter-22	18/11/2022	VP2	Day	09:25	15:25	NW	1	1	1/8 2/8	4	0	0
Winter-22	05/11/2022	VP3	Dawn	07:50	10:50	-	1	0	2/8 - 6/8	4	0	0
Winter-22	05/11/2022	VP3	Day	11:50	14:50	-	1	0	1/8 - 2/8	4	0	0
Winter-22	11/11/2022	VP4	Day	10:40	13:40	SW	4-5	0	7/8 - 8/8	3/4	0	0
Winter-22	13/11/2022	VP4	Day	12:10	15:10	SE	4	1	6/8 - 7/8	3/4	0	0

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Winter-22	28/11/2022	VP5	Dawn	08:30	11:30	NW	4	0	4/8 5/8	4	0	0
Winter-22	28/11/2022	VP5	Day	12:45	15:45	NW	2	0	2/8-3/8	4	0	0
Winter-22	21/11/2022	VP6	Dawn	08:00	14:00	SW	1	1	5/8 - 8/8	4	0	0
Winter-22	01/12/2022	VP10	Dawn	07:45	08:45	SE	3	0	8/8	3	0	0
Winter-22	01/12/2022	VP10	Dawn	08:45	09:45	SE	3	0	8/8	4	0	0
Winter-22	01/12/2022	VP10	Dawn	09:45	10:45	S	3	0	6/8	4	0	0
Winter-22	01/12/2022	VP10	Dawn	11:15	12:15	S	3	0	8/8	4	0	0
Winter-22	01/12/2022	VP10	Dawn	12:15	13:15	S	4	0	8/8	4	0	0
Winter-22	01/12/2022	VP10	Dawn	13:15	14:15	S	3	1	7/8	4	0	0
Winter-22	02/12/2022	VP9	Dusk	10:30	11:30	SE	3	0	8/8	3	0	0
Winter-22	02/12/2022	VP9	Dusk	11:30	12:30	SE	2	0	6/8	4	0	0
Winter-22	02/12/2022	VP9	Dusk	12:30	13:30	SE	2	0	7/8	4	0	0
Winter-22	02/12/2022	VP9	Dusk	14:00	15:00	SE	2	0	7/8	4	0	0
Winter-22	02/12/2022	VP9	Dusk	15:00	16:00	SE	2	0	7/8	4	0	0
Winter-22	02/12/2022	VP9	Dusk	16:00	17:00	SE	2	0	7/8	3	0	0
Winter-22	05/12/2022	VP8	Day	08:30	09:30	NE	1	1	7/8	4	0	0
Winter-22	05/12/2022	VP8	Day	09:30	10:30	NE	3	0	7/8	4	0	0
Winter-22	05/12/2022	VP8	Day	10:30	11:30	NE	3	0	7/8	4	0	0
Winter-22	05/12/2022	VP8	Day	12:00	13:00	NE	2	0	6/8	4	0	0
Winter-22	05/12/2022	VP8	Day	13:00	14:00	NE	2	1	5/8	4	0	0
Winter-22	05/12/2022	VP8	Day	14:00	15:00	NE	3	1	7/8	4	0	0

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Winter-22	06/12/2022	VP11	Day	08:30	09:30	N	2	0	2/8	4	1	0
Winter-22	06/12/2022	VP11	Day	09:30	10:30	N	2	0	1/8	4	1	0
Winter-22	06/12/2022	VP11	Day	10:30	11:30	N	2	0	1/8	4	0	0
Winter-22	06/12/2022	VP11	Day	12:00	13:00	N	3	0	1/8	4	0	0
Winter-22	06/12/2022	VP11	Day	13:00	14:00	N	2	0	1/8	4	0	0
Winter-22	06/12/2022	VP11	Day	14:00	15:00	N	3	0	1/8	4	0	0
Winter-22	19/12/2022	VP7	Dusk	10:25	11:25	S	4	3	8/8	3	0	0
Winter-22	19/12/2022	VP7	Dusk	11:25	12:25	SW	5	3	7/8	4	0	0
Winter-22	19/12/2022	VP7	Dusk	12:25	13:25	SW	4	0	7/8	4	0	0
Winter-22	19/12/2022	VP7	Dusk	13:55	14:55	SW	4	0	3/8	4	0	0
Winter-22	19/12/2022	VP7	Dusk	14:55	15:55	SW	4	0	3/8	4	0	0
Winter-22	19/12/2022	VP7	Dusk	15:55	16:55	SW	4	0	2/8	3	0	0
Winter-22	16/12/2022	VP1	Day	09:00	12:00	-	1	0	1	4	1	0
Winter-22	16/12/2022	VP1	Dusk	13:30	16:30	-	1	0	1	4	1	0
Winter-22	21/12/2022	VP2	Day	09:20	12:20	SW	3	0	4	4	0	0
Winter-22	21/12/2022	VP2	Dusk	13:30	16:30	SW	2	0	2	4	0	0
Winter-22	11/12/2022	VP3	Day	09:15	12:15	-	1	0	2	4	1	0
Winter-22	11/12/2022	VP3	Day	13:10	16:10	-	1	0	2	4	1	0
Winter-22	19/12/2022	VP4	Day	08:45	11:45	N	4	3	8	4	0	0
Winter-22	19/12/2022	VP4	Day	13:00	16:00	N	2	1	3-7	4	0	0
Winter-22	30/12/2022	VP5	Day	09:25	12:25	SW	3	0-4	3-7	4	0	0
Winter-22	30/12/2022	VP5	Day	13:20	16:20	SW	3	1	6	4	0	0
Winter-22	20/12/2022	VP6	Day	09:20	12:20	SW	2-3	0-4	2-5	3-4	0	0
Winter-22	20/12/2022	VP6	Dusk	13:30	16:30	SW	1-4	0-4	3-8	3-4	0	0

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Winter-23	09/01/2023	VP1	Day	09:25	12:25	W	2	0	2	4	0	0
Winter-23	09/01/2023	VP1	Dusk	13:40	16:40	W	2	3	3	4	0	0
Winter-23	13/01/2023	VP2	Dawn	08:30	11:30	SW	2	0	3	4	0	0
Winter-23	13/01/2023	VP2	Day	12:45	15:45	SW	2	3	7	4	0	0
Winter-23	08/01/2023	VP3	Day	09:30	12:30	SW	2	0	8	4	0	0
Winter-23	08/01/2023	VP3	Day	13:35	16:35	SW	1	1	7	4	0	0
Winter-23	16/01/2023	VP4	Day	09:00	12:00	-	1	0	2	4	0	0
Winter-23	16/01/2023	VP4	Day	13:45	16:45	-	1	0	4	4	0	0
Winter-23	20/01/2023	VP5	Day	09:35	12:35	SE	0	0	3	4	0	0
Winter-23	20/01/2023	VP5	Day	13:30	16:30	SE	0	0	6	4	0	0
Winter-23	18/01/2023	VP6	Day	09:35	12:35	-	2	0	6	4	0	0
Winter-23	18/01/2023	VP6	Day	13:30	16:30	-	1	0	5	4	0	0
Winter-23	09/01/2023	VP10	Dusk	10:45	11:45	W	2	1	2/8	4	0	0
Winter-23	09/01/2023	VP10	Dusk	11:45	12:45	W	3	0	3/8	4	0	0
Winter-23	09/01/2023	VP10	Dusk	12:45	13:45	W	5	0	4/8	4	0	0
Winter-23	09/01/2023	VP10	Dusk	14:10	15:10	W	5	1	7/8	4	0	0
Winter-23	09/01/2023	VP10	Dusk	15:10	16:10	W	5	0	7/8	4	0	0
Winter-23	09/01/2023	VP10	Dusk	16:10	17:10	W	5	1	7/8	3	0	0
Winter-23	11/01/2023	VP8	Dawn	08:10	09:10	SW	4	0	8/8	3	0	0
Winter-23	11/01/2023	VP8	Dawn	09:10	10:10	SW	5	1	8/8	4	0	0
Winter-23	11/01/2023	VP8	Dawn	10:10	11:10	SW	4	0	7/8	4	0	0
Winter-23	11/01/2023	VP8	Dawn	11:40	12:40	SW	3	1	6/8	4	0	0
Winter-23	11/01/2023	VP8	Dawn	12:40	13:40	SW	3	0	6/8	4	0	0
Winter-23	11/01/2023	VP8	Dawn	13:40	14:40	SW	4	0	8/8	3	0	0

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Winter-23	16/01/2023	VP9	Dawn	08:10	09:10	W	3	0	3/8	3	1	0
Winter-23	16/01/2023	VP9	Dawn	09:10	10:10	W	4	0	3/8	4	1	0
Winter-23	16/01/2023	VP9	Dawn	10:10	11:10	W	4	0	3/8	4	1	0
Winter-23	16/01/2023	VP9	Dawn	11:40	12:40	W	4	0	2/8	4	1	0
Winter-23	16/01/2023	VP9	Dawn	12:40	13:40	W	4	0	2/8	4	1	0
Winter-23	16/01/2023	VP9	Dawn	13:40	14:40	W	4	0	2/8	4	1	0
Winter-23	19/01/2023	VP7	Dusk	10:50	11:50	W	1	0	1/8	4	1	0
Winter-23	19/01/2023	VP7	Dusk	11:50	12:50	W	1	0	1/8	4	1	0
Winter-23	19/01/2023	VP7	Dusk	12:50	13:50	W	1	0	1/8	4	1	0
Winter-23	19/01/2023	VP7	Dusk	14:20	15:20	W	1	0	1/8	4	1	0
Winter-23	19/01/2023	VP7	Dusk	15:20	16:20	W	1	0	1/8	4	1	0
Winter-23	19/01/2023	VP7	Dusk	16:20	17:20	W	1	0	1/8	3	1	0
Winter-23	20/01/2023	VP11	Dawn	08:10	09:10	E	4	0	4/8	3	1	0
Winter-23	20/01/2023	VP11	Dawn	09:10	10:10	E	5	0	3/8	4	1	0
Winter-23	20/01/2023	VP11	Dawn	10:10	11:10	E	4	0	2/8	4	1	0
Winter-23	20/01/2023	VP11	Dawn	12:30	13:30	SE	4	0	5/8	4	1	0
Winter-23	20/01/2023	VP11	Dawn	13:30	14:30	SE	4	0	5/8	4	1	0
Winter-23	20/01/2023	VP11	Dawn	14:30	15:30	SE	4	0	5/8	3	1	0
Winter-23	02/02/2023	VP10	Day	08:40	09:40	SW	4	0	8/8	4	0	0
Winter-23	02/02/2023	VP10	Day	09:40	10:40	SW	4	0	8/8	4	0	0
Winter-23	02/02/2023	VP10	Day	10:40	11:40	SW	4	0	7/8	4	0	0
Winter-23	02/02/2023	VP10	Day	12:10	13:10	SW	4	0	8/8	4	0	0
Winter-23	02/02/2023	VP10	Day	13:10	14:10	SW	4	0	8/8	4	0	0
Winter-23	02/02/2023	VP10	Day	14:10	15:10	SW	4	0	8/8	4	0	0

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Winter-23	09/02/2023	VP9	Dusk	11:30	12:30	SW	3	0	4/8	4	0	0
Winter-23	09/02/2023	VP9	Dusk	12:30	13:30	SW	3	0	3/8	4	0	0
Winter-23	09/02/2023	VP9	Dusk	13:30	14:30	SW	4	0	3/8	4	0	0
Winter-23	09/02/2023	VP9	Dusk	15:05	16:05	SW	4	0	7/8	4	0	0
Winter-23	09/02/2023	VP9	Dusk	16:05	17:05	SW	4	0	8/8	4	0	0
Winter-23	09/02/2023	VP9	Dusk	17:05	18:05	SW	3	0	8/8	3	0	0
Winter-23	13/02/2023	VP11	Dawn	07:30	08:30	SE	4	0	8/8	3	0	0
Winter-23	13/02/2023	VP11	Dawn	08:30	09:30	SE	4	0	8/8	4	0	0
Winter-23	13/02/2023	VP11	Dawn	09:30	10:30	SE	4	0	8/8	4	0	0
Winter-23	13/02/2023	VP11	Dawn	11:00	12:00	S	3	0	6/8	4	0	0
Winter-23	13/02/2023	VP11	Dawn	12:00	13:00	S	3	0	6/8	4	0	0
Winter-23	13/02/2023	VP11	Dawn	13:00	14:00	S	4	0	5/8	4	0	0
Winter-23	14/02/2023	VP7	Dusk	11:40	12:40	S	4	0	7/8	4	0	0
Winter-23	14/02/2023	VP7	Dusk	12:40	13:40	S	4	0	7/8	4	0	0
Winter-23	14/02/2023	VP7	Dusk	13:40	14:40	S	4	0	7/8	4	0	0
Winter-23	14/02/2023	VP7	Dusk	15:10	16:10	S	4	0	7/8	4	0	0
Winter-23	14/02/2023	VP7	Dusk	16:10	17:10	S	4	0	7/8	4	0	0
Winter-23	14/02/2023	VP7	Dusk	17:10	18:10	S	4	0	7/8	3	0	0
Winter-23	15/02/2023	VP8	Dusk	11:40	12:40	S	4	0	7/8	4	0	0
Winter-23	15/02/2023	VP8	Dusk	12:40	13:40	S	4	0	8/8	4	0	0
Winter-23	15/02/2023	VP8	Dusk	13:40	14:40	S	4	0	8/8	4	0	0
Winter-23	15/02/2023	VP8	Dusk	15:10	16:10	S	4	0	8/8	4	0	0
Winter-23	15/02/2023	VP8	Dusk	16:10	17:10	S	4	0	8/8	4	0	0
Winter-23	15/02/2023	VP8	Dusk	17:10	18:10	S	4	3	8/8	3	0	0

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Winter-23	06/02/2023	VP1	Day	10:00	13:00	SW	3	0	6	4	0	0
Winter-23	06/02/2023	VP1	Day	14:00	17:00	SW	2	0	8	4	0	0
Winter-23	17/02/2023	VP2	Day	08:10	11:10	SW	1	2	8	4	0	0
Winter-23	17/02/2023	VP2	Day	12:20	15:20	SW	2	0	8	4	0	0
Winter-23	10/02/2023	VP3	Day	08:30	11:30	-	0	0	8	4	0	0
Winter-23	10/02/2023	VP3	Day	12:00	15:00	-	1	1	8	3	0	0
Winter-23	13/02/2023	VP4	Day	09:15	12:15	SE	3	0	7	4	0	0
Winter-23	13/02/2023	VP4	Dusk	14:25	17:25	SE	3	0	4	4	0	0
Winter-23	24/02/2023	VP5	Day	07:45	10:45	NW	2	0	7	4	0	0
Winter-23	24/02/2023	VP5	Day	11:40	14:40	NW	2	2	7	3	0	0
Winter-23	27/02/2023	VP6	Day	08:30	11:30	-	0	0	8	4	0	0
Winter-23	27/02/2023	VP6	Day	12:05	15:05	-	0	0	8	4	0	0
Winter-23	07/03/2023	VP1	Day	08:25	11:25	NE	1	0	0/1	4	1	0
Winter-23	07/03/2023	VP1	Day	13:25	16:25	NE	1	0	2/3	4	0	0
Winter-23	10/03/2023	VP2	Day	09:15	12:15	n/a	1	0	5	4	0	1
Winter-23	10/03/2023	VP2	Day	13:10	16:10	n/a	1	0	5	4	0	0
Winter-23	06/03/2023	VP3	Day	07:40	10:40	n/a	0	0	8	4	0	0
Winter-23	06/03/2023	VP3	Day	11:40	14:40	n/a	0	0	8	4	0	0
Winter-23	21/03/2023	VP4	Day	08:05	11:05	SW	2	1	7	4	0	0
Winter-23	21/03/2023	VP4	Day	12:45	15:45	SW	2	3	8	3	0	0
Winter-23	29/03/2023	VP5	Day	09:35	12:35	SSE	3	2	8	3	0	0
Winter-23	29/03/2023	VP5	Day	13:40	16:40	SSE	2	0	8	3	0	0
Winter-23	28/03/2023	VP6	Day	09:35	12:35	SSW	2	1	8	4	0	0
Winter-23	28/03/2023	VP6	Day	13:15	16:15	SSW	2	2	8	3	0	0

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Winter-23	07/03/2023	VP10	Dusk	12:20	13:20	N	2	0	3/8	4	0	0
Winter-23	07/03/2023	VP10	Dusk	13:20	14:20	N	1	0	4/8	4	0	0
Winter-23	07/03/2023	VP10	Dusk	14:20	15:20	N	1	0	3/8	4	0	0
Winter-23	07/03/2023	VP10	Dusk	15:50	16:50	N	1	0	3/8	4	0	0
Winter-23	07/03/2023	VP10	Dusk	16:50	17:50	N	1	0	1/8	4	0	0
Winter-23	07/03/2023	VP10	Dusk	17:50	18:50	N	1	0	1/8	3	0	0
Winter-23	08/03/2023	VP7	Day	10:10	11:10	NE	4	0	7/8	4	0	0
Winter-23	08/03/2023	VP7	Day	11:10	12:10	NE	4	0	7/8	4	0	0
Winter-23	08/03/2023	VP7	Day	12:10	13:10	NE	4	0	7/8	4	0	0
Winter-23	08/03/2023	VP7	Day	13:40	14:40	E	4	0	7/8	4	0	0
Winter-23	08/03/2023	VP7	Day	14:40	15:40	E	4	0	7/8	4	0	0
Winter-23	08/03/2023	VP7	Day	15:40	16:40	E	3	0	7/8	4	0	0
Winter-23	14/03/2023	VP9	Dusk	12:40	13:40	W	4	1	6/8	4	0	0
Winter-23	14/03/2023	VP9	Dusk	13:40	14:40	W	4	1	6/8	4	0	0
Winter-23	14/03/2023	VP9	Dusk	14:40	15:40	W	4	1	8/8	4	0	0
Winter-23	14/03/2023	VP9	Dusk	16:10	17:10	NW	3	1	6/8	4	0	0
Winter-23	14/03/2023	VP9	Dusk	17:10	18:10	NW	3	0	6/8	4	0	0
Winter-23	14/03/2023	VP9	Dusk	18:10	19:10	NW	4	0	7/8	3	0	0
Winter-23	15/03/2023	VP8	Day	09:05	10:05	SE	4	3	8/8	4	0	0
Winter-23	15/03/2023	VP8	Day	10:05	11:05	SE	4	3	8/8	4	0	0
Winter-23	15/03/2023	VP8	Day	11:05	12:05	SE	4	3	8/8	4	0	0
Winter-23	15/03/2023	VP8	Day	12:35	13:35	SE	4	3	8/8	4	0	0
Winter-23	15/03/2023	VP8	Day	13:35	14:35	SE	4	0	8/8	4	0	0
Winter-23	15/03/2023	VP8	Day	14:35	15:35	SE	4	3	8/8	4	0	0

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Winter-23	20/03/2023	VP11	Day	12:00	13:00	S	4	0	8/8	4	0	0
Winter-23	20/03/2023	VP11	Day	13:00	14:00	S	4	0	8/8	4	0	0
Winter-23	20/03/2023	VP11	Day	14:00	15:00	S	4	0	8/8	4	0	0
Winter-23	20/03/2023	VP11	Day	15:30	16:30	S	4	0	8/8	4	0	0
Winter-23	20/03/2023	VP11	Day	16:30	17:30	S	4	1	8/8	4	0	0
Winter-23	20/03/2023	VP11	Day	17:30	18:30	S	4	1	8/8	4	0	0
Breeding-23	06/04/2023	VP4	1	14:20	17:20	NW	3	1	6	4	0	0
Breeding-23	06/04/2023	VP4	2	17:50	20:50	NW	2	0	3	4	0	0
Breeding-23	07/04/2023	VP9	1	14:20	17:20	S	4	0	2	4	0	0
Breeding-23	07/04/2023	VP9	2	17:50	20:50	S	3	0	2	4	0	0
Breeding-23	13/04/2023	VP10	1	14:25	17:25	W	4	0	4	4	0	0
Breeding-23	13/04/2023	VP10	2	17:55	20:55	W	4	0	4	4	0	0
Breeding-23	14/04/2023	VP11	1	14:30	17:30	NW	4	1	2	4	0	0
Breeding-23	14/04/2023	VP11	2	18:00	21:00	NW	3	1	3	4	0	0
Breeding-23	04/04/2023	VP1	1	13:45	14:45	S	4	0	8	4	0	0
Breeding-23	04/04/2023	VP1	1	14:45	15:45	S	4	0	8	4	0	0
Breeding-23	04/04/2023	VP1	1	15:45	16:45	S	4	0	8	4	0	0
Breeding-23	04/04/2023	VP1	2	17:15	18:15	S	4	0	8	4	0	0
Breeding-23	04/04/2023	VP1	2	18:15	19:15	S	3	3	8	4	0	0
Breeding-23	04/04/2023	VP1	2	19:15	20:15	S	2	5	8	3	0	0
Breeding-23	05/04/2023	VP3	1	09:30	10:30	SW	2	2	8	3	0	0
Breeding-23	05/04/2023	VP3	1	10:30	11:30	SW	2	2	8	3	0	0
Breeding-23	05/04/2023	VP3	1	11:30	12:30	SW	2	2	8	3	0	0
Breeding-23	05/04/2023	VP3	2	17:20	18:20	W	3	3	7	4	0	0

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-23	05/04/2023	VP3	2	18:20	19:20	W	2	0	6	4	0	0
Breeding-23	05/04/2023	VP3	2	19:20	20:20	W	1	0	6	4	0	0
Breeding-23	06/04/2023	VP2	1	14:20	15:20	WNW	4	0	7	4	0	0
Breeding-23	06/04/2023	VP2	1	15:20	16:20	WNW	4	0	7	4	0	0
Breeding-23	06/04/2023	VP2	1	16:20	17:20	WNW	4	3	6	4	0	0
Breeding-23	07/04/2023	VP2	2	06:50	07:50	SSW	4	0	4	4	0	0
Breeding-23	07/04/2023	VP2	2	07:50	08:50	SSW	4	0	4	4	0	0
Breeding-23	07/04/2023	VP2	2	08:50	09:50	SSW	4	0	4	4	0	0
Breeding-23	13/04/2023	VP5	1	12:00	13:00	WNW	3	0	6	4	0	0
Breeding-23	13/04/2023	VP5	1	13:00	14:00	WNW	4	0	7	4	0	0
Breeding-23	13/04/2023	VP5	1	14:00	15:00	WNW	4	0	6	4	0	0
Breeding-23	13/04/2023	VP5	2	18:00	19:00	W	4	0	7	4	0	0
Breeding-23	13/04/2023	VP5	2	19:00	20:00	W	3	0	6	4	0	0
Breeding-23	13/04/2023	VP5	2	20:00	21:00	W	1	0	6	4	0	0
Breeding-23	14/04/2023	VP6	1	06:00	07:00	NNW	0	0	3	4	0	0
Breeding-23	14/04/2023	VP6	1	07:00	08:00	NW	0	0	1	4	0	0
Breeding-23	14/04/2023	VP6	1	08:00	09:00	WNW	1	0	4	4	0	0
Breeding-23	14/04/2023	VP6	2	09:30	10:30	WNW	2	0	2	4	0	0
Breeding-23	14/04/2023	VP6	2	10:30	11:30	WNW	3	0	4	4	0	0
Breeding-23	14/04/2023	VP6	2	11:30	12:30	WNW	3	0	4	4	0	0
Breeding-23	24/04/2023	VP7	1	14:40	15:40	N	3	0	7	4	0	0
Breeding-23	24/04/2023	VP7	1	15:40	16:40	N	4	0	7	4	0	0
Breeding-23	24/04/2023	VP7	1	16:40	17:40	N	4	0	7	4	0	0
Breeding-23	24/04/2023	VP7	2	18:10	19:10	N	2	0	6	4	0	0

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-23	24/04/2023	VP7	2	19:10	20:10	N	1	0	6	4	0	0
Breeding-23	24/04/2023	VP7	2	20:10	21:10	N	0	0	4	4	0	0
Breeding-23	25/04/2023	VP8	1	18:10	19:10	SSE	2	0	8	4	0	0
Breeding-23	25/04/2023	VP8	1	19:10	20:10	SSE	2	0	8	4	0	0
Breeding-23	25/04/2023	VP8	1	20:10	21:10	SSE	1	0	8	4	0	0
Breeding-23	26/04/2023	VP8	2	13:50	14:50	SSE	3	0	7	4	0	0
Breeding-23	26/04/2023	VP8	2	14:50	15:50	SSE	3	0	7	4	0	0
Breeding-23	26/04/2023	VP8	2	15:50	16:50	SSE	3	0	7	4	0	0
Breeding-23	04/05/2023	VP3	1	05:45	08:45	E	4	0	4	4	0	0
Breeding-23	04/05/2023	VP3	2	12:00	15:00	E	4	0	4	4	0	0
Breeding-23	24/05/2023	VP4	1	05:10	08:10	W	1	0	7	4	0	0
Breeding-23	24/05/2023	VP4	2	11:00	14:00	NW	3	0	7	4	0	0
Breeding-23	09/05/2023	VP2	1	15:10	18:10	W	2	0	7	4	0	0
Breeding-23	09/05/2023	VP2	2	18:40	21:40	W	2	0	7	4	0	0
Breeding-23	10/05/2023	VP6	1	14:40	15:40	SW	2	0	8	4	0	0
Breeding-23	10/05/2023	VP6	1	15:40	16:40	SW	2	3	8	4	0	0
Breeding-23	10/05/2023	VP6	1	16:40	17:40	SW	2	0	8	4	0	0
Breeding-23	10/05/2023	VP6	2	18:10	21:10	SW	2	0	7	4	0	0
Breeding-23	20/05/2023	VP5	1	08:50	11:50	SSE	1	0	6	4	0	0
Breeding-23	20/05/2023	VP5	2	14:35	17:35	SE	2	0	5	4	0	0
Breeding-23	22/05/2023	VP1	1	08:30	11:30	N	3	0	5	4	0	0
Breeding-23	22/05/2023	VP1	2	12:00	15:00	N	3	0	5	4	0	0
Breeding-23	23/05/2023	VP8	1	05:10	08:10	NW	1	0	5	4	0	0
Breeding-23	23/05/2023	VP8	2	09:25	12:25	NW	3	0	4	4	0	0

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-23	25/05/2023	VP7	1	10:00	13:00	N	3	0	7	4	0	0
Breeding-23	25/05/2023	VP7	2	16:30	19:30	NW	3	0	7	4	0	0
Breeding-23	26/05/2023	VP11	1	13:35	16:35	NE	1	0	6	4	0	0
Breeding-23	27/05/2023	VP11	2	05:10	08:10	N	1	0	6	4	0	0
Breeding-23	30/05/2023	VP9	1	05:10	08:10	E	1	0	2	4	0	0
Breeding-23	30/05/2023	VP9	2	14:50	17:50	E	2	0	3	4	0	0
Breeding-23	31/05/2023	VP10	1	05:00	08:00	E	1	0	3	4	0	0
Breeding-23	31/05/2023	VP10	2	08:30	11:30	E	3	0	4	4	0	0
Breeding-23	08/06/2023	VP4	1	14:55	17:55	E	4	0	2	4	0	0
Breeding-23	08/06/2023	VP4	2	18:25	21:25	E	3	0	5	4	0	0
Breeding-23	21/06/2023	VP3	1	12:10	15:10	SW	2	1	7	4	0	0
Breeding-23	21/06/2023	VP3	2	17:40	20:40	W	3	0	4	4	0	0
Breeding-23	05/06/2023	VP7	1	12:50	15:50	E	3	0	4	4	0	0
Breeding-23	05/06/2023	VP7	2	17:40	20:40	E	3	0	1	4	0	0
Breeding-23	08/06/2023	VP6	1	13:30	16:30	E	3	0	4	4	0	0
Breeding-23	08/06/2023	VP6	2	17:40	20:40	E	3	0	4	4	0	0
Breeding-23	15/06/2023	VP2	1	11:00	14:00	SE	3	0	3	4	0	0
Breeding-23	15/06/2023	VP2	2	18:25	21:25	SE	1	2	7	4	0	0
Breeding-23	16/06/2023	VP10	1	07:50	10:50	SE	3	0	7	4	0	0
Breeding-23	16/06/2023	VP10	2	13:15	16:15	SE	4	2	8	4	0	0
Breeding-23	20/06/2023	VP8	1	12:05	15:05	SW	3	0	6	4	0	0
Breeding-23	20/06/2023	VP8	2	16:05	19:05	W	2	0	6	4	0	0
Breeding-23	22/06/2023	VP1	1	08:20	11:20	S	1	0	4	4	0	0
Breeding-23	22/06/2023	VP1	2	12:50	15:50	S	2	0	4	4	0	0

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-23	26/06/2023	VP5	1	12:30	15:30	W	4	2	7	4	0	0
Breeding-23	26/06/2023	VP5	2	17:35	20:35	W	3	0	7	4	0	0
Breeding-23	27/06/2023	VP11	1	06:35	09:35	SW	2	1	7	4	0	0
Breeding-23	27/06/2023	VP11	2	15:35	18:35	SW	3	0	7	4	0	0
Breeding-23	29/06/2023	VP9	1	07:00	10:00	W	1	0	5	4	0	0
Breeding-23	29/06/2023	VP9	2	13:50	16:50	W	3	0	6	4	0	0
Breeding-23	05/07/2023	VP3	1	09:20	12:20	W	3	0	7	4	0	0
Breeding-23	05/07/2023	VP3	2	14:50	17:50	W	4	1	7	4	0	0
Breeding-23	06/07/2023	VP4	1	09:40	12:40	S	4	1	8	4	0	0
Breeding-23	06/07/2023	VP4	2	13:10	16:10	SE	5	3	8	4	0	0
Breeding-23	12/07/2023	VP7	1	11:40	12:40	WNW	4	3	7	4	0	0
Breeding-23	12/07/2023	VP7	1	12:40	13:40	WNW	4	0	6	4	0	0
Breeding-23	12/07/2023	VP7	1	13:40	14:40	WNW	4	0	6	4	0	0
Breeding-23	12/07/2023	VP7	2	16:10	17:10	NW	4	0	6	4	0	0
Breeding-23	12/07/2023	VP7	2	18:00	19:00	NW	4	0	7	4	0	0
Breeding-23	12/07/2023	VP7	2	19:00	20:00	NW	4	0	7	4	0	0
Breeding-23	13/07/2023	VP6	1	09:25	12:25	WNW	3	0	7	4	0	0
Breeding-23	13/07/2023	VP6	2	13:20	15:20	W	3	0	7	4	0	0
Breeding-23	13/07/2023	VP6	2	15:20	16:20	W	3	3	7	4	0	0
Breeding-23	14/07/2023	VP1	1	09:30	12:30	E	3	4	8	3	0	0
Breeding-23	14/07/2023	VP1	2	13:30	14:30	E	3	4	8	3	0	0
Breeding-23	14/07/2023	VP1	2	14:30	15:30	E	3	3	8	3	0	0
Breeding-23	14/07/2023	VP1	2	15:30	16:30	E	3	2	8	4	0	0
Breeding-23	20/07/2023	VP5	1	06:45	09:45	NW	1	0	6	4	0	0

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-23	20/07/2023	VP5	2	14:30	17:30	NW	2	0	6	4	0	0
Breeding-23	21/07/2023	VP2	1	10:30	13:30	W	2	0	7	4	0	0
Breeding-23	21/07/2023	VP2	2	15:35	16:35	W	3	2	8	4	0	0
Breeding-23	21/07/2023	VP2	2	16:35	17:35	W	3	2	8	4	0	0
Breeding-23	21/07/2023	VP2	2	17:35	18:35	W	3	4	8	3	0	0
Breeding-23	24/07/2023	VP8	1	12:00	15:00	NW	2	0	7	4	0	0
Breeding-23	24/07/2023	VP8	2	17:50	20:50	NW	2	0	6	4	0	0
Breeding-23	25/07/2023	VP10	1	09:40	12:40	W	2	0	7	4	0	0
Breeding-23	25/07/2023	VP10	2	15:15	18:15	W	2	0	6	4	0	0
Breeding-23	26/07/2023	VP11	1	08:35	11:35	S	3	0	8	4	0	0
Breeding-23	26/07/2023	VP11	2	12:40	15:40	S	3	4	8	3	0	0
Breeding-23	27/07/2023	VP9	1	07:10	10:10	W	1	0	7	4	0	0
Breeding-23	27/07/2023	VP9	2	14:10	17:10	W	2	0	6	4	0	0
Breeding-23	01/08/2023	VP4	1	09:40	12:40	W	1	0	7	4	0	0
Breeding-23	01/08/2023	VP4	2	13:10	16:10	W	1	0	7	4	0	0
Breeding-23	02/08/2023	VP3	1	09:00	12:00	N	2	3	8	4	0	0
Breeding-23	02/08/2023	VP3	2	12:30	15:30	N	3	1	7	4	0	0
Breeding-23	08/08/2023	VP7	1	12:55	15:55	NW	1	0	7	4	0	0
Breeding-23	08/08/2023	VP7	2	17:30	18:30	NNW	1	0	6	4	0	0
Breeding-23	08/08/2023	VP7	2	18:30	19:30	W	0	0	7	4	0	0
Breeding-23	08/08/2023	VP7	2	19:30	20:30	WSW	0	0	8	4	0	0
Breeding-23	09/08/2023	VP1	1	09:40	12:40	SW	3	0	7	4	0	0
Breeding-23	09/08/2023	VP1	2	15:15	18:15	SW	3	0	7	4	0	0
Breeding-23	11/08/2023	VP5	1	08:35	11:35	SW	3	0	7	4	0	0

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-23	11/08/2023	VP5	2	14:00	15:00	SW	3	0	7	4	0	0
Breeding-23	11/08/2023	VP5	2	15:00	16:00	SW	3	3	7	4	0	0
Breeding-23	11/08/2023	VP5	2	16:00	17:00	SW	3	0	7	4	0	0
Breeding-23	14/08/2023	VP2	1	10:30	13:30	NW	2	0	7	4	0	0
Breeding-23	14/08/2023	VP2	2	14:05	17:05	NW	2	0	7	4	0	0
Breeding-23	15/08/2023	VP6	1	11:35	14:35	NW	2	0	6	4	0	0
Breeding-23	15/08/2023	VP6	2	17:40	20:40	NW	2	0	5	4	0	0
Breeding-23	16/08/2023	VP8	1	08:40	11:40	E	1	0	5	4	0	0
Breeding-23	16/08/2023	VP8	1	15:15	18:15	E	1	0	5	4	0	0
Breeding-23	21/08/2023	VP11	1	11:45	13:45	SW	3	0	7	4	0	0
Breeding-23	21/08/2023	VP11	1	13:45	14:45	SW	3	2	8	4	0	0
Breeding-23	21/08/2023	VP11	2	15:15	17:15	SW	3	0	8	4	0	0
Breeding-23	21/08/2023	VP11	2	17:15	18:15	SW	2	2	8	4	0	0
Breeding-23	22/08/2023	VP10	1	11:20	14:20	SW	3	0	7	4	0	0
Breeding-23	22/08/2023	VP10	2	16:30	19:30	W	2	0	7	4	0	0
Breeding-23	23/08/2023	VP9	1	09:00	12:00	SW	2	0	7	4	0	0
Breeding-23	23/08/2023	VP9	2	13:00	16:00	SW	2	0	7	4	0	0
Breeding-23	03/09/2023	VP6	1	09:05	12:05	-	1	0	7	4	0	0
Breeding-23	03/09/2023	VP6	2	12:55	15:55	-	1	0	7	4	0	0
Breeding-23	20/09/2023	VP9	1	09:40	12:40	SW	4	0	6	4	0	0
Breeding-23	20/09/2023	VP9	2	13:40	16:40	SW	4	3	6	4	0	0
Breeding-23	21/09/2023	VP5	1	09:25	12:25	-	1	0	2	4	0	0
Breeding-23	21/09/2023	VP5	2	13:30	16:30	-	1	0	2	4	0	0
Breeding-23	29/09/2023	VP11	1	09:50	12:50	SE	2	0	0	4	0	0

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-23	30/09/2023	VP11	2	13:00	16:00	SE	3	4	8	4	0	0
Breeding-23	25/09/2023	VP3	1	07:45	10:45	S	4	0	4	4	0	0
Breeding-23	25/09/2023	VP3	2	13:00	16:00	SW	4	1	7	4	0	0
Breeding-23	25/09/2023	VP1	1	07:30	10:30	S	3	0	8	4	0	0
Breeding-23	25/09/2023	VP1	2	11:00	14:00	S	4	0	8	4	0	0
Breeding-23	29/09/2023	VP4	1	07:45	10:45	SW	2	0	4	4	0	0
Breeding-23	29/09/2023	VP4	2	12:15	15:15	SW	3	0	3	4	0	0
Breeding-23	18/09/2023	VP10	1	13:30	14:30	W	5	0	4	4	0	0
Breeding-23	18/09/2023	VP10	1	14:30	15:30	W	5	2	4	4	0	0
Breeding-23	18/09/2023	VP10	1	15:30	16:30	W	5	0	4	4	0	0
Breeding-23	18/09/2023	VP10	2	17:00	18:00	W	5	0	6	4	0	0
Breeding-23	18/09/2023	VP10	2	18:00	19:00	W	5	0	7	4	0	0
Breeding-23	18/09/2023	VP10	2	19:00	20:00	W	5	2	7	4	0	0
Breeding-23	26/09/2023	VP2	1	07:55	10:55	SW	4	0	7	4	0	0
Breeding-23	26/09/2023	VP2	2	16:50	17:50	SW	2	2	7	4	0	0
Breeding-23	26/09/2023	VP2	2	17:50	18:50	SW	1	0	4	4	0	0
Breeding-23	26/09/2023	VP2	2	18:50	19:50	SW	1	0	4	4	0	0
Breeding-23	28/09/2023	VP7	1	16:40	17:40	SW	4	3	8	4	0	0
Breeding-23	28/09/2023	VP7	1	17:40	18:40	SW	3	4	8	3	0	0
Breeding-23	28/09/2023	VP7	1	18:40	19:40	SW	3	1	8	4	0	0
Breeding-23	29/09/2023	VP7	2	12:45	15:45	WSW	4	0	5	4	0	0
Winter-23	02/10/2023	VP8	1	11:10	14:10	SW	2	0	6	4	0	0
Winter-23	02/10/2023	VP8	2	16:40	19:40	SW	2	0	5	4	0	0
Winter-23	03/10/2023	VP1	1	09:20	12:20	SW	3	0	3	4	0	0

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Winter-23	03/10/2023	VP1	2	12:55	15:55	SW	3	1	6	4	0	0
Winter-23	05/10/2023	VP3	1	09:25	12:25	S	1	3	8	3	0	0
Winter-23	05/10/2023	VP3	2	13:15	16:15	S	3	2	8	3	0	0
Winter-23	08/10/2023	VP4	1	08:00	11:00	SE	0	1	4	4	0	0
Winter-23	08/10/2023	VP4	2	12:55	15:55	SE	1	0	3	4	0	0
Winter-23	15/10/2023	VP2	1	09:45	12:45	E	0	0	1	4	0	0
Winter-23	15/10/2023	VP2	2	13:20	16:20	E	0	0	2	4	0	0
Winter-23	27/10/2023	VP5	1	09:30	12:30	SE	1	0	4	4	0	0
Winter-23	28/10/2023	VP5	2	11:00	14:00	SE	1	0	4	4	0	0
Winter-23	03/10/2023	VP10	1	07:00	10:00	SW	3	0	5	4	0	0
Winter-23	03/10/2023	VP10	2	12:20	15:20	W	4	0	6	4	0	0
Winter-23	04/10/2023	VP7	1	07:10	10:10	SW	3	0	8	4	0	0
Winter-23	04/10/2023	VP7	2	13:00	16:00	SW	4	1	6	4	0	0
Winter-23	06/10/2023	VP8	1	07:10	10:10	SW	3	3	8	3	0	0
Winter-23	06/10/2023	VP8	2	12:35	15:35	SW	3	1	8	4	0	0
Winter-23	09/10/2023	VP6	1	07:20	09:10	S	2	0	4	3	0	0
Winter-23	09/10/2023	VP6	1	10:10	11:20	S	2	0	4	3	0	0
Winter-23	09/10/2023	VP6	2	11:20	14:20	S	2	0	2	4	0	0
Winter-23	07/10/2023	VP11	1	07:35	10:35	SW	2	0	5	4	0	0
Winter-23	07/10/2023	VP11	2	11:05	14:05	SW	2	0	5	4	0	0
Winter-23	12/10/2023	VP9	1	08:15	09:15	NE	1	0	7	4	0	0
Winter-23	12/10/2023	VP9	1	09:15	10:15	ENE	1	0	6	4	0	0
Winter-23	12/10/2023	VP9	1	10:15	11:15	ESE	2	0	6	4	0	0
Winter-23	12/10/2023	VP9	2	14:15	17:15	SSW	2	0	6	4	0	0

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Winter-23	07/11/2023	VP1	1	08:15	11:15	SE	1	0	2	4	0	0
Winter-23	07/11/2023	VP1	2	12:40	15:40	SE	1	0	2	4	0	0
Winter-23	08/11/2023	VP2	2	13:35	16:35	SW	4	2	7	4	0	0
Winter-23	08/11/2023	VP2	1	09:15	12:15	SW	3	3	2	4	0	0
Winter-23	02/11/2023	VP3	1	07:10	10:10	W	1	0	3	4	0	0
Winter-23	06/11/2023	VP3	2	09:20	12:20	W	1	0	5	4	0	0
Winter-23	03/11/2023	VP4	1	07:15	10:15	SE	1	0	2	4	0	0
Winter-23	12/11/2023	VP4	2	10:15	13:15	SW	2	2	7	4	0	0
Winter-23	09/11/2023	VP5	1	09:15	12:15	W	3	3	6	4	0	0
Winter-23	09/11/2023	VP5	2	13:15	16:15	W	1	2	7	3	0	0
Winter-23	02/11/2023	VP10	1	09:45	12:45	S	2	0	4	4	0	0
Winter-23	02/11/2023	VP10	2	14:35	17:35	W	4	0	4	4	0	0
Winter-23	03/11/2023	VP6	1	11:00	14:00	W	3	0	4	4	0	0
Winter-23	03/11/2023	VP6	2	15:30	18:30	W	3	1	3	4	0	0
Winter-23	06/11/2023	VP7	1	10:15	13:15	W	4	0	2	4	0	0
Winter-23	06/11/2023	VP7	2	14:30	17:30	W	4	0	4	4	0	0
Winter-23	09/11/2023	VP8	1	09:00	12:00	S	3	3	7	4	0	0
Winter-23	09/11/2023	VP8	2	14:25	17:25	W	2	0	5	4	0	0
Winter-23	22/11/2023	VP9	1	08:05	11:05	W	3	0	6	4	0	0
Winter-23	22/11/2023	VP9	2	14:05	17:05	W	3	0	6	4	0	0
Winter-23	24/11/2023	VP11	1	07:45	10:45	NW	1	0	4	4	0	0
Winter-23	24/11/2023	VP11	1	13:50	16:50	N	1	0	4	4	0	0
Winter-23	05/12/2023	VP3	1	09:10	12:10	-	0	0	1	100	1	0
Winter-23	05/12/2023	VP3	2	13:10	16:10	-	0	0	1	100	0	0

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Winter-23	08/12/2023	VP4	1	09:40	12:40	SW	3	4	8	80	0	0
Winter-23	09/12/2023	VP4	2	12:40	15:40	SW	4	1	7	100	0	0
Winter-23	11/12/2023	VP1	1	09:20	12:20	-	0	0	3	100	0	0
Winter-23	11/12/2023	VP1	2	13:10	16:10	-	1	2	5	100	0	0
Winter-23	15/12/2023	VP2	1	10:20	13:20	-	0	0	8	100	0	0
Winter-23	16/12/2023	VP2	2	09:35	12:35	S	4	1	8	100	0	0
Winter-23	19/12/2023	VP5	1	09:10	12:10	-	1	1	6	100	0	0
Winter-23	19/12/2023	VP5	2	13:15	16:15	-	1	0	4	100	0	0
Winter-23	04/12/2023	VP10	1	07:50	10:50	NW	2	0	1	4	1	0
Winter-23	04/12/2023	VP10	2	13:10	16:10	NW	2	0	1	4	1	0
Winter-23	05/12/2023	VP6	1	07:50	10:50	NW	1	0	3	4	1	0
Winter-23	05/12/2023	VP6	2	11:20	14:20	NW	2	0	1	4	1	0
Winter-23	06/12/2023	VP7	1	07:55	10:55	SE	4	0	7	4	0	0
Winter-23	06/12/2023	VP7	2	13:30	16:30	SE	4	3	8	4	0	0
Winter-23	07/12/2023	VP8	1	07:55	10:55	SE	4	3	8	4	0	0
Winter-23	07/12/2023	VP8	2	13:40	16:40	S	2	3	7	4	0	0
Winter-23	05/12/2023	VP9	1	10:25	13:25	N	0	0	1	4	1	0
Winter-23	05/12/2023	VP9	2	13:55	14:55	ENE	0	0	2	4	1	0
Winter-23	05/12/2023	VP9	2	14:55	15:55	E	0	0	4	4	1	0
Winter-23	05/12/2023	VP9	2	15:55	16:55	E	0	0	8	4	1	0
Winter-23	07/12/2023	VP11	1	09:10	12:10	S	3	4	8	4	0	0
Winter-23	07/12/2023	VP11	2	13:55	16:55	S	3	0	8	4	0	0
Winter-24	16/01/2024	VP1	1	09:10	12:10	SW	3	0	4	4	0	0
Winter-24	16/01/2024	VP1	2	13:00	16:00	SW	3	1	5	4	0	0

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Winter-24	12/01/2024	VP2	1	09:10	12:10	-	0	0	8	4	0	0
Winter-24	04/02/2024	VP2	2	10:40	13:40	SW	3	0	8	4	0	0
Winter-24	04/01/2024	VP3	1	11:55	14:55	-	2	0	4	4	0	0
Winter-24	05/01/2024	VP3	2	10:35	13:35	-	1	0	3	4	0	0
Winter-24	06/01/2024	VP4	1	09:50	12:50	-	0	0	1	4	1	0
Winter-24	06/01/2024	VP4	2	13:30	16:30	-	0	0	1	4	0	0
Winter-24	17/01/2024	VP5	1	10:00	13:00	-	0	0	1	4	1	0
Winter-24	17/01/2024	VP5	2	13:55	16:55	-	1	0	1	4	1	0
Winter-24	03/01/2024	VP10	1	09:45	12:45	W	2	1	7	4	0	0
Winter-24	03/01/2024	VP10	2	14:05	17:05	W	2	0	7	4	0	0
Winter-24	04/01/2024	VP6	1	10:35	13:35	S	2	0	1	4	0	0
Winter-24	04/01/2024	VP6	2	14:05	17:05	S	2	0	6	4	0	0
Winter-24	08/01/2024	VP8	1	08:30	11:30	E	1	0	2	4	1	0
Winter-24	08/01/2024	VP8	2	14:05	17:05	E	1	0	2	4	0	0
Winter-24	15/01/2024	VP7	1	09:00	12:00	NW	1	0	2	4	1	0
Winter-24	15/01/2024	VP7	2	14:25	17:25	NW	2	0	2	4	0	0
Winter-24	09/01/2024	VP11	1	10:30	13:30	E	4	0	3	4	1	0
Winter-24	09/01/2024	VP11	2	14:05	17:05	E	4	0	1	4	1	0
Winter-24	11/01/2024	VP9	1	08:15	11:15	NE	2	0	8	4	0	0
Winter-24	11/01/2024	VP9	2	14:00	17:00	NE	3	0	8	4	0	0
Winter-24	08/02/2024	VP3	1	09:20	12:20	E	2	1	8	3	0	1
Winter-24	08/02/2024	VP3	2	13:10	16:10	E	3	1	8	3	0	0
Winter-24	16/02/2024	VP4	1	09:05	12:05	SW	0	0	6	4	0	0
Winter-24	17/02/2024	VP4	2	11:15	14:15	SW	1	0	6	4	0	0

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Winter-24	18/02/2024	VP2	1	11:45	14:45	SW	1	0	5	4	0	0
Winter-24	23/02/2024	VP2	2	09:20	12:20	SW	2	1	6	4	0	0
Winter-24	25/02/2024	VP1	1	09:10	12:10	E	0	0	4	4	0	0
Winter-24	25/02/2024	VP1	2	13:10	16:10	E	0	0	6	4	0	0
Winter-24	26/02/2024	VP5	1	09:30	12:30	N	1	0	2	4	0	0
Winter-24	26/02/2024	VP5	2	13:10	16:10	N	0	0	2	4	0	0
Winter-24	01/02/2024	VP10	1	08:30	11:30	SW	2	0	7	4	0	0
Winter-24	01/02/2024	VP10	2	13:55	16:55	SW	4	0	8	4	0	0
Winter-24	02/02/2024	VP7	1	08:15	11:15	SW	4	2	8	4	0	0
Winter-24	02/02/2024	VP7	2	13:35	16:35	SW	4	1	8	4	0	0
Winter-24	07/02/2024	VP6	1	09:05	12:05	N	1	0	3	4	1	0
Winter-24	07/02/2024	VP6	2	12:35	15:35	NE	1	0	6	4	1	0
Winter-24	13/02/2024	VP8	1	08:30	11:30	S	2	0	7	4	0	0
Winter-24	13/02/2024	VP8	2	14:00	17:00	E	2	3	8	4	0	0
Winter-24	22/02/2024	VP11	1	08:45	11:45	SW	2	0	7	4	0	0
Winter-24	22/02/2024	VP11	2	12:55	15:55	W	2	0	7	4	0	0
Winter-24	28/02/2024	VP9	1	07:05	10:05	SW	2	2	8	4	0	0
Winter-24	28/02/2024	VP9	2	15:00	18:00	SW	2	3	8	4	0	0
Winter-24	18/03/2024	VP1	1	09:40	12:40	S	3	1	7	4	0	0
Winter-24	18/03/2024	VP1	2	13:40	16:40	S	4	2	8	3	0	0
Winter-24	24/03/2024	VP2	1	09:15	12:15	SW	2	0	8	4	0	0
Winter-24	24/03/2024	VP2	2	13:35	16:35	SW	2	0	8	4	0	0
Winter-24	07/03/2024	VP3	1	09:10	12:10	SE	2	0	3	4	0	0
Winter-24	07/03/2024	VP3	2	13:00	16:00	SE	2	0	3	4	0	0

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Winter-24	15/03/2024	VP4	1	09:00	12:00	NW	2	0	6	4	0	0
Winter-24	15/03/2024	VP4	2	13:10	16:10	NW	2	0	5	4	0	0
Winter-24	25/03/2024	VP5	1	09:30	12:30	SE	2	0	7	4	0	0
Winter-24	27/03/2024	VP5	2	09:50	12:50	SE	2	0	7	4	0	0
Winter-24	04/03/2024	VP6	1	07:05	10:05	SE	3	0	6	4	0	0
Winter-24	04/03/2024	VP6	2	10:35	13:35	SE	4	0	7	4	0	0
Winter-24	05/03/2024	VP10	1	07:15	10:15	SW	4	1	8	4	0	0
Winter-24	05/03/2024	VP10	2	12:50	15:50	SW	3	0	4	4	0	0
Winter-24	06/03/2024	VP7	1	07:30	10:30	SE	3	0	7	4	0	0
Winter-24	06/03/2024	VP7	2	13:20	16:20	SE	4	0	8	4	0	0
Winter-24	11/03/2024	VP8	1	09:00	12:00	SE	1	0	8	4	0	0
Winter-24	11/03/2024	VP8	2	15:00	18:00	SW	1	0	8	4	0	0
Winter-24	07/03/2024	VP9	1	09:50	12:50	ESE	4	0	6	4	0	0
Winter-24	07/03/2024	VP9	2	13:55	16:55	ESE	4	0	6	4	0	0
Winter-24	18/03/2024	VP11	1	15:45	18:45	S	3	3	7	4	0	0
Winter-24	19/03/2024	VP11	2	11:00	14:00	S	1	0	8	4	0	0
Breeding-24	14/04/2024	VP1	1	10:55	13:55	SW	3	1	6	4	0	0
Breeding-24	14/04/2024	VP1	2	17:15	20:15	SW	3	1	7	4	0	0
Breeding-24	11/04/2024	VP2	1	13:30	16:30	SW	2	2	8	3	0	0
Breeding-24	11/04/2024	VP2	2	17:00	20:00	SW	3	3	8	4	0	0
Breeding-24	09/04/2024	VP3	1	10:20	13:20	NW	2	3	5	4	0	0
Breeding-24	12/04/2024	VP3	1	06:50	09:50	N	0	2	8	4	0	0
Breeding-24	09/04/2024	VP4	1	14:35	17:35	NW	3	0	5	4	0	0
Breeding-24	20/04/2024	VP4	2	06:50	09:50	N	0	0	1	3	0	0

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-24	29/04/2024	VP5	1	10:00	13:00	SW	2	3	8	4	0	0
Breeding-24	30/04/2024	VP5	2	07:45	10:45	SW	2	1	8	4	0	0
Breeding-24	02/04/2024	VP10	1	12:15	15:15	SE	1	0	6	4	0	0
Breeding-24	02/04/2024	VP10	2	17:45	20:45	E	1	3	8	4	0	0
Breeding-24	03/04/2024	VP7	1	12:40	15:40	W	1	0	7	4	0	0
Breeding-24	03/04/2024	VP7	2	17:45	20:45	SE	1	1	7	4	0	0
Breeding-24	04/04/2024	VP8	1	12:00	15:00	SE	1	0	8	4	0	0
Breeding-24	04/04/2024	VP8	2	17:45	20:45	SE	2	1	7	4	0	0
Breeding-24	09/04/2024	VP6	1	14:25	17:25	W	3	0	7	4	0	0
Breeding-24	09/04/2024	VP6	2	17:55	20:55	W	3	0	6	4	0	0
Breeding-24	09/04/2024	VP11	1	18:00	21:00	W	3	0	4	4	0	0
Breeding-24	10/04/2024	VP9	1	18:00	21:00	SW	3	1	8	4	0	0
Breeding-24	11/04/2024	VP11	2	08:20	11:20	SSW	3	0	8	4	0	0
Breeding-24	11/04/2024	VP9	2	11:50	14:50	SSW	3	0	8	4	0	0
Breeding-24	09/05/2024	VP1	1	05:10	08:10	SE	1	0	8	4	0	0
Breeding-24	09/05/2024	VP1	2	09:20	12:20	SE	1	0	6	4	0	0
Breeding-24	25/05/2024	VP2	1	15:40	18:40	SE	3	3	8	4	0	0
Breeding-24	26/05/2024	VP2	2	05:10	08:10	SE	2	2	8	3	0	0
Breeding-24	14/05/2024	VP3	1	13:30	16:30	E	1	1	6	4	0	0
Breeding-24	14/05/2024	VP3	2	17:40	20:40	E	1	0	6	4	0	0
Breeding-24	22/05/2024	VP4	1	09:30	12:30	NW	2	0	8	4	0	0
Breeding-24	22/05/2024	VP4	2	13:15	16:15	NW	4	0	8	4	0	0
Breeding-24	28/05/2024	VP5	1	09:45	12:45	SW	3	1	7	4	0	0
Breeding-24	28/05/2024	VP5	2	14:00	17:00	SW	4	0	6	4	0	0

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-24	07/05/2024	VP10	1	05:05	08:05	N	2	0	2	4	0	0
Breeding-24	07/05/2024	VP10	2	10:50	13:50	E	2	0	5	4	0	0
Breeding-24	08/05/2024	VP6	1	05:05	08:05	S	1	0	1	3	0	0
Breeding-24	08/05/2024	VP6	2	08:35	11:35	SW	1	0	6	4	0	0
Breeding-24	09/05/2024	VP7	1	05:05	08:05	SE	1	0	7	4	0	0
Breeding-24	09/05/2024	VP7	2	10:40	13:40	S	1	0	6	4	0	0
Breeding-24	14/05/2024	VP8	1	04:55	07:55	E	0	0	6	4	0	0
Breeding-24	14/05/2024	VP8	2	09:30	12:30	E	3	0	8	4	0	0
Breeding-24	08/05/2024	VP11	1	16:40	19:40	SW	1	0	3	4	0	0
Breeding-24	09/05/2024	VP11	2	05:05	08:05	S	1	0	7	4	0	0
Breeding-24	15/05/2024	VP9	1	05:10	08:10	ENE	1	0	7	4	0	0
Breeding-24	16/05/2024	VP9	2	12:40	15:40	NE	2	0	6	4	0	0
Breeding-24	16/06/2024	VP1	1	09:30	12:30	NW	3	0	6	4	0	0
Breeding-24	16/06/2024	VP1	2	14:05	17:05	NW	2	0	7	4	0	0
Breeding-24	23/06/2024	VP2	1	09:20	12:20	SW	2	0	6	4	0	0
Breeding-24	23/06/2024	VP2	2	13:00	16:00	SW	2	0	5	4	0	0
Breeding-24	06/06/2024	VP3	1	08:30	11:30	NW	3	0	5	4	0	0
Breeding-24	06/06/2024	VP3	2	16:05	19:05	NW	1	0	4	4	0	0
Breeding-24	10/06/2024	VP4	1	05:15	08:15	NW	1	0	1	4	0	0
Breeding-24	10/06/2024	VP4	2	12:40	15:40	NW	3	0	5	4	0	0
Breeding-24	25/06/2024	VP5	1	11:20	14:20	N	3	0	5	4	0	0
Breeding-24	25/06/2024	VP5	2	15:00	18:00	N	3	0	6	4	0	0
Breeding-24	04/06/2024	VP8	1	07:30	10:30	W	4	1	8	4	0	0
Breeding-24	04/06/2024	VP8	2	12:20	15:20	NW	4	0	6	4	0	0

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-24	05/06/2024	VP10	1	07:30	10:30	W	3	0	4	3	0	0
Breeding-24	05/06/2024	VP10	2	13:00	16:00	W	3	1	6	4	0	0
Breeding-24	06/06/2024	VP6	1	07:30	10:30	W	3	0	4	4	0	0
Breeding-24	06/06/2024	VP6	2	11:00	14:00	W	3	0	4	4	0	0
Breeding-24	10/06/2024	VP7	1	07:30	10:30	N	3	0	6	4	0	0
Breeding-24	10/06/2024	VP7	2	13:15	16:15	N	3	0	5	4	0	0
Breeding-24	19/06/2024	VP9	1	11:55	14:55	SW	1	0	2	4	0	0
Breeding-24	19/06/2024	VP9	2	15:40	18:40	W	1	0	3	4	0	0
Breeding-24	20/06/2024	VP11	1	16:20	19:20	SW	1	0	6	4	0	0
Breeding-24	21/06/2024	VP11	2	07:00	10:00	S	2	0	7	4	0	0
Breeding-24	15/07/2024	VP1	1	08:40	11:40	SE	1	0	7	4	0	0
Breeding-24	15/07/2024	VP1	2	13:30	16:30	SE	0	0	6	4	0	0
Breeding-24	21/07/2024	VP2	1	08:00	11:00	SW	2	3	8	3	0	0
Breeding-24	21/07/2024	VP2	2	12:00	15:00	SW	2	1	8	4	0	0
Breeding-24	07/07/2024	VP3	1	08:40	11:40	W	0	1	6	4	0	0
Breeding-24	07/07/2024	VP3	2	14:00	17:00	W	1	1	7	4	0	0
Breeding-24	08/07/2024	VP4	1	11:20	14:20	SE	1	0	5	4	0	0
Breeding-24	08/07/2024	VP4	2	14:50	17:50	SE	0	0	6	4	0	0
Breeding-24	29/07/2024	VP5	1	08:50	11:50	SW	3	0	7	4	0	0
Breeding-24	29/07/2024	VP5	2	13:20	16:20	SW	2	0	8	4	0	0
Breeding-24	01/07/2024	VP10	1	07:40	10:40	W	2	1	8	4	0	0
Breeding-24	01/07/2024	VP10	2	13:10	16:10	NW	4	0	7	4	0	0
Breeding-24	02/07/2024	VP7	1	07:40	10:40	W	2	0	8	4	0	0
Breeding-24	02/07/2024	VP7	2	13:10	16:10	W	3	0	7	4	0	0

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-24	04/07/2024	VP6	1	07:35	10:35	W	4	3	8	4	0	0
Breeding-24	04/07/2024	VP6	2	11:05	14:05	W	4	0	7	4	0	0
Breeding-24	08/07/2024	VP8	1	06:30	09:30	E	1	0	1	4	0	0
Breeding-24	08/07/2024	VP8	2	11:15	14:15	E	2	0	2	4	0	0
Breeding-24	23/07/2024	VP11	1	18:05	21:05	SW	1	0	7	4	0	0
Breeding-24	24/07/2024	VP11	2	14:40	17:40	S	3	0	6	4	0	0
Breeding-24	31/07/2024	VP9	1	06:10	09:10	E	1	0	5	4	0	0
Breeding-24	31/07/2024	VP9	2	09:45	12:45	SE	1	0	4	4	0	0
Breeding-24	05/08/2024	VP1	1	06:45	09:45	SW	2	2	8	3	0	0
Breeding-24	05/08/2024	VP1	2	13:10	16:10	SW	3	0	7	4	0	0
Breeding-24	25/08/2024	VP2	1	11:35	14:35	SW	4	2	8	4	0	0
Breeding-24	25/08/2024	VP2	2	14:00	17:00	W	2	3	6	4	0	0
Breeding-24	12/08/2024	VP3	1	09:20	12:20	SW	1	1	7	4	0	0
Breeding-24	12/08/2024	VP3	2	13:10	16:10	SW	1	0	7	4	0	0
Breeding-24	19/08/2024	VP4	1	09:45	12:45	SE	2	3	8	4	0	0
Breeding-24	19/08/2024	VP4	2	14:05	17:05	SE	3	2	8	3	0	0
Breeding-24	23/08/2024	VP5	1	08:10	11:10	W	2	1	3	4	0	0
Breeding-24	23/08/2024	VP5	2	14:45	17:45	W	2	3	5	4	0	0
Breeding-24	01/08/2024	VP10	1	07:25	10:25	W	3	0	7	4	0	0
Breeding-24	01/08/2024	VP10	2	12:40	15:40	SW	3	0	7	4	0	0
Breeding-24	06/08/2024	VP7	1	13:00	16:00	SW	4	0	7	4	0	0
Breeding-24	06/08/2024	VP7	2	13:10	16:10	SW	4	3	8	4	0	0
Breeding-24	07/08/2024	VP6	1	06:40	09:40	SW	4	3	8	4	0	0
Breeding-24	07/08/2024	VP6	2	10:10	13:10	W	4	0	8	4	0	0

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-24	12/08/2024	VP8	1	07:25	10:25	W	4	0	5	4	0	0
Breeding-24	12/08/2024	VP8	2	12:05	15:05	SW	4	0	4	4	0	0
Breeding-24	06/08/2024	VP9	1	16:35	19:35	SW	4	0	7	4	0	0
Breeding-24	07/08/2024	VP9	2	09:40	12:40	SW	4	2	8	4	0	0
Breeding-24	08/08/2024	VP11	1	09:35	12:35	S	2	0	7	4	0	0
Breeding-24	19/08/2024	VP11	2	16:15	19:15	SW	4	2	8	4	0	0
Breeding-24	15/09/2024	VP3	1	11:05	14:05	W	1	0	6	4	0	0
Breeding-24	16/09/2024	VP3	2	09:20	12:20	SE	1	0	1	4	0	0
Breeding-24	18/09/2024	VP1	1	08:45	11:45	SE	1	0	4	3	0	0
Breeding-24	18/09/2024	VP1	2	12:35	15:35	SE	1	0	1	4	0	0
Breeding-24	22/09/2024	VP2	1	08:50	11:50	NE	1	0	8	4	0	0
Breeding-24	22/09/2024	VP2	2	12:35	15:35	NE	2	0	8	4	0	0
Breeding-24	24/09/2024	VP4	1	09:00	12:00	NW	2	0	6	4	0	0
Breeding-24	24/09/2024	VP4	2	13:25	16:25	NW	2	0	4	4	0	0
Breeding-24	26/09/2024	VP5	1	09:00	12:00	NE	3	1	8	4	0	0
Breeding-24	26/09/2024	VP5	2	13:45	16:45	NE	2	1	8	4	0	0
Breeding-24	03/09/2024	VP6	1	07:30	10:30	SW	2	0	8	4	0	0
Breeding-24	03/09/2024	VP6	2	11:00	14:00	W	3	0	8	4	0	0
Breeding-24	04/09/2024	VP10	1	07:05	10:05	W	4	3	8	4	0	0
Breeding-24	04/09/2024	VP10	2	12:20	15:20	NW	4	3	8	4	0	0
Breeding-24	05/09/2024	VP7	1	07:30	10:30	NE	3	0	1	4	0	0
Breeding-24	05/09/2024	VP7	2	13:00	16:00	NE	4	0	6	4	0	0
Breeding-24	09/09/2024	VP8	1	07:30	10:30	W	2	0	4	4	0	0
Breeding-24	09/09/2024	VP8	2	11:00	14:00	W	4	0	6	4	0	0

Vantage Point Survey Effort												
Season	Date	Survey	Watch	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-24	02/09/2024	VP9	1	15:00	18:00	NW	3	0	7	4	0	0
Breeding-24	03/09/2024	VP9	2	16:30	19:30	NW	2	0	8	4	0	0
Breeding-24	05/09/2024	VP11	1	15:05	18:05	NE	4	0	6	4	0	0
Breeding-24	11/09/2024	VP11	2	14:30	17:30	NW	4	2	6	4	0	0

Breeding and Winter Transect Survey Effort

Breeding & Winter Transect Survey Effort										
Season	Date	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
Breeding-22	08/04/2022	T14	N	4	0	5/8	1	4	0	0
Breeding-22	11/04/2022	T19	N	5	0	7/8	1	4	0	0
Breeding-22	12/04/2022	T15	E	2	0	8/8	1	4	0	0
Breeding-22	13/04/2022	T21	SW	4	0	7/8	1	4	0	0
Breeding-22	19/04/2022	T18	SW	1	0	1/8	1	4	0	0
Breeding-22	19/04/2022	T13	S	1	0	3/8	1	4	0	0
Breeding-22	19/04/2022	T16	W	1	0	6/8	1	4	0	0
Breeding-22	20/04/2022	T12	E	1	0	1/8	1	4	0	0
Breeding-22	20/04/2022	T11	SE	1	0	7/8	1	4	0	0
Breeding-22	20/04/2022	T20	SE	1	0	7/8	1	4	0	0
Breeding-22	21/04/2022	T17	E	5	0	3/8	1	4	0	0
Breeding-22	21/04/2022	T6	E	4	0	4/8	1	4	0	0
Breeding-22	21/04/2022	T7	E	4	0	5/8	1	4	0	0
Breeding-22	22/04/2022	T10	NE	2	0	1/8	2	4	0	0
Breeding-22	22/04/2022	T9	NE	2	0	4/8	1	4	0	0
Breeding-22	22/04/2022	T8	NE	3	0	8/8	1	4	0	0
Breeding-22	22/04/2022	T3	NE	4	0	8/8	1	4	0	0
Breeding-22	12/04/2022	T2	E	2	2	8/8	1	4	0	0
Breeding-22	12/04/2022	T4	E	2	2	8/8	1	4	0	0
Breeding-22	13/04/2022	T1	SW	1	0	7/8	2	4	0	0
Breeding-22	13/04/2022	T5	SW	1	0	7/8	2	4	0	0
Breeding-22	04/05/2022	T1	WNW	3	0	7/8	2	4	0	0
Breeding-22	17/05/2022	T5	WSW	3	0	6/8	2	4	0	0
Breeding-22	17/05/2022	T4	WSW	3	3	7/8	2	4	0	0

Breeding & Winter Transect Survey Effort										
Season	Date	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
Breeding-22	17/05/2022	T2	SSW	3	3	7/8	2	4	0	0
Breeding-22	05/05/2022	T14	SW	3	0	8/8	1	4	0	0
Breeding-22	05/05/2022	T15	SW	4	0	8/8	1	4	0	0
Breeding-22	05/05/2022	T19	SW	4	0	7/8	1	4	0	0
Breeding-22	10/05/2022	T18	SW	6	1	7/8	1	4	0	0
Breeding-22	10/05/2022	T13	SW	3	1	6/8	1	4	0	0
Breeding-22	10/05/2022	T16	SW	5	0	6/8	1	4	0	0
Breeding-22	11/05/2022	T17	W	4	0	7/8	2	4	0	0
Breeding-22	11/05/2022	T21	W	5	0	5/8	2	4	0	0
Breeding-22	11/05/2022	T20	W	6	0	6/8	2	4	0	0
Breeding-22	12/05/2022	T11	S	4	0	7/8	1	4	0	0
Breeding-22	12/05/2022	T12	S	5	1	6/8	1	4	0	0
Breeding-22	12/05/2022	T8	S	5	0	6/8	1	4	0	0
Breeding-22	13/05/2022	T10	SW	5	0	7/8	1	4	0	0
Breeding-22	13/05/2022	T9	SW	5	0	7/8	1	4	0	0
Breeding-22	19/05/2022	T3	S	3	0	1/8	2	4	0	0
Breeding-22	19/05/2022	T7	S	5	0	1/8	2	4	0	0
Breeding-22	19/05/2022	T6	S	5	0	1/8	2	4	0	0
Breeding-22	09/06/2022	T1	S	5	2	8/8	1	3	0	0
Breeding-22	09/06/2022	T5	SSW	5	2	8/8	1	4	0	0
Breeding-22	09/06/2022	T4	SSW	5	0	7/8	2	4	0	0
Breeding-22	10/06/2022	T2	SW	4	0	7/8	2	4	0	0
Breeding-22	07/06/2022	T14	E	1	0	8/8	1	4	0	0
Breeding-22	07/06/2022	T19	E	1	0	5/8	1	4	0	0

Breeding & Winter Transect Survey Effort										
Season	Date	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
Breeding-22	07/06/2022	T15	SE	1	0	4/8	2	4	0	0
Breeding-22	08/06/2022	T21	SW	4	1	7/8	2	4	0	0
Breeding-22	08/06/2022	T13	SW	4	0	7/8	2	4	0	0
Breeding-22	08/06/2022	T16	SW	4	0	8/8	2	4	0	0
Breeding-22	09/06/2022	T17	SE	4	1	8/8	1	4	0	0
Breeding-22	09/06/2022	T20	S	3	0	8/8	2	4	0	0
Breeding-22	10/06/2022	T11	S	4	0	7/8	2	4	0	0
Breeding-22	10/06/2022	T12	S	4	0	6/8	2	4	0	0
Breeding-22	14/06/2022	T10	S	1	0	7/8	2	4	0	0
Breeding-22	14/06/2022	T9	S	1	0	7/8	2	4	0	0
Breeding-22	17/06/2022	T7	SW	3	2	8/8	2	4	0	0
Breeding-22	17/06/2022	T6	SW	2	2	8/8	2	4	0	0
Breeding-22	17/06/2022	T3	SW	2	1	8/8	2	4	0	0
Breeding-22	20/06/2022	T18	NW	1	0	1/8	2	4	0	0
Breeding-22	20/06/2022	T8	NW	1	0	1/8	2	4	0	0
Breeding-22	05/07/2022	T14	W	2	0	7/8	2	4	0	0
Breeding-22	05/07/2022	T15	W	2	1	8/8	2	4	0	0
Breeding-22	05/07/2022	T19	W	2	0	8/8	2	4	0	0
Breeding-22	06/07/2022	T13	W	2	0	8/8	2	4	0	0
Breeding-22	06/07/2022	T16	W	2	0	8/8	2	4	0	0
Breeding-22	06/07/2022	T21	W	2	0	8/8	2	4	0	0
Breeding-22	07/07/2022	T11	NW	2	0	8/8	2	4	0	0
Breeding-22	07/07/2022	T12	NW	2	0	8/8	2	4	0	0
Breeding-22	11/07/2022	T10	S	1	0	7/8	2	4	0	0

Breeding & Winter Transect Survey Effort										
Season	Date	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
Breeding-22	11/07/2022	T9	S	2	0	7/8	2	4	0	0
Breeding-22	12/07/2022	T20	SW	2	0	7/8	2	4	0	0
Breeding-22	12/07/2022	T17	SW	2	0	8/8	2	4	0	0
Breeding-22	13/07/2022	T18	W	2	0	7/8	2	4	0	0
Breeding-22	13/07/2022	T8	W	1	0	1/8	2	4	0	0
Breeding-22	14/07/2022	T7	W	2	0	3/8	2	4	0	0
Breeding-22	14/07/2022	T6	W	2	0	3/8	2	4	0	0
Breeding-22	14/07/2022	T3	W	2	0	3/8	2	4	0	0
Breeding-22	08/07/2022	T4	W	3	0	8/8	2	4	0	0
Breeding-22	08/07/2022	T5	W	3	0	7/8	2	4	0	0
Breeding-22	08/07/2022	T1	W	3	0	7/8	2	4	0	0
Breeding-22	28/07/2022	T2	ESE	1	0	6/8	2	4	0	0
Breeding-22	24/08/2022	T4	SW	4	0	6/8	2	4	0	0
Breeding-22	24/08/2022	T5	SW	4	0	6/8	2	4	0	0
Breeding-22	24/08/2022	T1	SW	4	0	7/8	2	4	0	0
Breeding-22	31/08/2022	T2	ENE	2	0	6/8	2	4	0	0
Breeding-22	05/08/2022	T14	W	1	0	2/8	2	4	0	0
Breeding-22	06/08/2022	T15	W	1	0	7/8	2	4	0	0
Breeding-22	07/08/2022	T19	W	1	0	7/8	2	4	0	0
Breeding-22	08/08/2022	T13	S	1	0	6/8	2	4	0	0
Breeding-22	08/08/2022	T16	S	1	0	5/8	2	4	0	0
Breeding-22	09/08/2022	T11	S	1	0	6/8	2	4	0	0
Breeding-22	09/08/2022	T12	S	1	0	6/8	2	4	0	0
Breeding-22	09/08/2022	T20	S	1	0	2/8	2	4	0	0

Breeding & Winter Transect Survey Effort										
Season	Date	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
Breeding-22	10/08/2022	T10	S	1	0	2/8	2	3	0	0
Breeding-22	10/08/2022	T9	S	1	0	1/8	2	4	0	0
Breeding-22	11/08/2022	T18	SW	1	0	0/8	2	4	0	0
Breeding-22	11/08/2022	T21	SW	1	0	0/8	2	4	0	0
Breeding-22	17/08/2022	T17	NW	1	0	2/8	2	4	0	0
Breeding-22	17/08/2022	T8	NW	1	0	1/8	2	4	0	0
Breeding-22	23/08/2022	T7	SW	1	0	2/8	2	4	0	0
Breeding-22	23/08/2022	T6	SW	2	0	3/8	2	4	0	0
Breeding-22	23/08/2022	T3	SW	2	0	2/8	2	4	0	0
Breeding-22	27/09/2022	T4	NW	4	2	8/8	1	4	0	0
Breeding-22	27/09/2022	T5	NW	4	2	8/8	1	4	0	0
Breeding-22	27/09/2022	T1	WNW	4	2	8/8	1	4	0	0
Breeding-22	29/09/2022	T2	NW	2	0	7/8	2	4	0	0
Breeding-22	05/09/2022	T14	E	1	0	1/8	2	4	0	0
Breeding-22	05/09/2022	T15	E	2	0	1/8	2	4	0	0
Breeding-22	05/09/2022	T19	SE	4	0	3/8	2	4	0	0
Breeding-22	08/09/2022	T13	NW	2	0	8/8	2	4	0	0
Breeding-22	08/09/2022	T16	NW	3	0	8/8	2	4	0	0
Breeding-22	12/09/2022	T11	W	1	0	8/8	2	4	0	0
Breeding-22	12/09/2022	T12	W	2	0	8/8	2	4	0	0
Breeding-22	12/09/2022	T20	W	1	0	8/8	2	4	0	0
Breeding-22	13/09/2022	T10	N	1	0	7/8	2	3	0	0
Breeding-22	13/09/2022	T9	N	2	0	8/8	2	4	0	0
Breeding-22	14/09/2022	T18	NW	1	0	8/8	2	4	0	0

Breeding & Winter Transect Survey Effort										
Season	Date	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
Breeding-22	14/09/2022	T21	NW	2	0	8/8	2	4	0	0
Breeding-22	16/09/2022	T17	W	1	0	3/8	2	4	0	0
Breeding-22	16/09/2022	T8	W	1	0	2/8	2	4	0	0
Breeding-22	26/09/2022	T7	NW	1	0	2/8	2	4	0	0
Breeding-22	26/09/2022	T6	NW	3	0	6/8	2	4	0	0
Breeding-22	26/09/2022	T3	NW	3	0	7/8	2	4	0	0
Winter-22	04/10/2022	T14	W	1	0	8/8	2	4	0	0
Winter-22	04/10/2022	T15	W	1	0	8/8	2	4	0	0
Winter-22	04/10/2022	T19	W	1	0	8/8	2	4	0	0
Winter-22	05/10/2022	T21	SW	2	1	8/8	2	4	0	0
Winter-22	05/10/2022	T20	SW	2	0	5/8	2	4	0	0
Winter-22	05/10/2022	T17	SW	2	2	8/8	2	4	0	0
Winter-22	06/10/2022	T13	SW	2	1	7/8	1	4	0	0
Winter-22	06/10/2022	T16	SW	4	2	8/8	1	4	0	0
Winter-22	06/10/2022	T18	SW	3	1	7/8	1	4	0	0
Winter-22	10/10/2022	T3	N	1 to 3	0	1 to 4	2	4	0	0
Winter-22	10/10/2022	T4	-	1 to 2	0	1 to 2	2	4	0	0
Winter-22	10/10/2022	T5	SSW	3 to 4	0	3 to 4	2	4	0	0
Winter-22	12/10/2022	T10	-	2	0	2 to 4	2	4	0	0
Winter-22	14/10/2022	T7	-	1 to 2	0	3 to 5	2	4	0	0
Winter-22	14/10/2022	T6	SW	2 to 4	3	3 to 6	2	4	0	0
Winter-22	17/10/2022	T9	SW	3 to 4	0	4 to 8	2	4	0	0
Winter-22	18/10/2022	T8	-	1	0	1 to 8!	2	4	0	0

Breeding & Winter Transect Survey Effort										
Season	Date	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
Winter-22	25/10/2022	T1	SSE	3	0	5 to 6	2	4	0	0
Winter-22	26/10/2022	T12	SSE	3 to 4	0	4 to 5	1	4	0	0
Winter-22	26/10/2022	T11	SSE	4 to 5	1	4 to 5	1	4	0	0
Winter-22	27/10/2022	T2	SSE	2 to 3	0	4 to 5	1	4	0	0
Winter-22	03/11/2022	T14	SE	2	0	1/8	2	4	0	0
Winter-22	03/11/2022	T15	SE	2	0	2/8	2	4	0	0
Winter-22	04/11/2022	T19	SW	1	1	4/8	2	4	0	0
Winter-22	07/11/2022	T20	S	3	3	8/8	2	4	0	0
Winter-22	08/11/2022	T17	S	3	0	2/8	2	4	0	0
Winter-22	08/11/2022	T21	S	3	0	2/8	2	4	0	0
Winter-22	14/11/2022	T13	S	2	0	4/8	2	4	0	0
Winter-22	14/11/2022	T16	S	2	0	3/8	2	4	0	0
Winter-22	15/11/2022	T18	S	1	0	1/8	2	4	0	0
Winter-22	02/12/2022	T14	SE	3	0	7/8	2	3	0	0
Winter-22	02/12/2022	T15	SE	3	0	8/8	2	3	0	0
Winter-22	07/12/2022	T19	NW	1	0	2/8	2	4	1	0
Winter-22	08/12/2022	T17	N	1	0	4/8	2	2	1	0
Winter-22	08/12/2022	T20	N	1	0	3/8	2	2	1	0
Winter-22	12/12/2022	T18	E	1	0	1/8	2	4	1	0
Winter-22	12/12/2022	T21	E	1	0	1/8	2	4	1	0
Winter-22	19/12/2022	T13	S	4	3	8/8	2	4	0	0
Winter-22	19/12/2022	T16	S	5	3	8/8	1	4	0	0
Winter-23	09/01/2023	T14	W	4	1	7/8	2	4	0	0
Winter-23	09/01/2023	T15	W	3	0	2/8	2	4	0	0

Breeding & Winter Transect Survey Effort										
Season	Date	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
Winter-23	13/01/2023	T13	W	4	0	4/8	2	4	0	0
Winter-23	13/01/2023	T16	W	3	0	3/8	2	4	0	0
Winter-23	19/01/2023	T19	W	1	0	4/8	2	3	1	0
Winter-23	19/01/2023	T18	W	1	0	2/8	2	4	1	0
Winter-23	20/01/2023	T21	SE	1	0	5/8	2	4	1	0
Winter-23	23/01/2023	T17	S	1	0	8/8	1	1	0	0
Winter-23	23/01/2023	T20	S	1	0	8/8	1	1	0	0
Winter-23	03/02/2023	T14	SW	2	0	7/8	2	4	0	0
Winter-23	03/02/2023	T15	SW	3	0	7/8	2	4	0	0
Winter-23	09/02/2023	T19	SW	2	0	2/8	2	4	0	0
Winter-23	09/02/2023	T17	SW	3	0	3/8	2	4	0	0
Winter-23	10/02/2023	T13	SW	4	0	8/8	2	4	0	0
Winter-23	10/02/2023	T16	SW	4	0	8/8	2	4	0	0
Winter-23	13/02/2023	T20	S	4	0	4/8	2	4	0	0
Winter-23	14/02/2023	T18	S	4	2	8/8	2	4	0	0
Winter-23	14/02/2023	T21	S	4	0	8/8	2	4	0	0
Winter-23	15/02/2023	T11	S	3	0	2/8	2	4	0	0
Winter-23	15/02/2023	T12	S	4	0	4/8	2	4	0	0
Winter-23	16/02/2023	T8	SW	3	0	8/8	1	1	0	0
Winter-23	03/03/2023	T19	N	2	0	8/8	2	4	0	0
Winter-23	03/03/2023	T14	NE	2	0	8/8	2	4	0	0
Winter-23	03/03/2023	T15	NE	2	0	8/8	2	4	0	0
Winter-23	07/03/2023	T13	NE	2	0	1/8	2	4	0	0
Winter-23	07/03/2023	T16	NE	2	0	1/8	2	4	0	0

Breeding & Winter Transect Survey Effort										
Season	Date	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
Winter-23	08/03/2023	T18	NE	3	0	6/8	2	4	0	0
Winter-23	14/03/2023	T17	W	4	0	7/8	2	4	0	0
Winter-23	14/03/2023	T21	W	4	0	7/8	2	4	0	0
Winter-23	16/03/2023	T11	S	4	0	7/8	2	4	0	0
Winter-23	16/03/2023	T12	S	4	0	7/8	2	4	0	0
Winter-23	20/03/2023	T20	S	4	1	8/8	2	4	0	0
Winter-23	20/03/2023	T8	S	4	0	8/8	2	4	0	0
Breeding-23	06/04/2023	T6	NW	2	1	7	2	4	0	0
Breeding-23	07/04/2023	T16	S	3	0	2	2	4	0	0
Breeding-23	13/04/2023	T14	W	5	0	5	2	4	0	0
Breeding-23	05/04/2023	T5	WSW	3	0	8	2	4	0	0
Breeding-23	05/04/2023	T4	WSW	3	0	8	2	4	0	0
Breeding-23	05/04/2023	T1	WSW	2	0	8	2	4	0	0
Breeding-23	06/04/2023	T10	NW	3	0	6	2	4	0	0
Breeding-23	06/04/2023	T9	NW	3	0	6	2	4	0	0
Breeding-23	07/04/2023	T2	SSW	3	0	4	2	4	0	0
Breeding-23	13/04/2023	T11	W	4	0	7	2	4	0	0
Breeding-23	24/04/2023	T3	NE	3	0	7	2	4	0	0
Breeding-23	25/04/2023	T7	NE	3	0	3	2	4	0	0
Breeding-23	25/04/2023	T8	NE	2	0	4	2	4	0	0
Breeding-23	25/04/2023	T12	E	2	0	5	2	4	0	0
Breeding-23	26/04/2023	T15	SE	3	0	7	2	4	0	0
Breeding-23	26/04/2023	T13	SE	4	0	7	2	4	0	0
Breeding-23	26/04/2023	T21	SE	4	0	7	2	4	0	0

Breeding & Winter Transect Survey Effort										
Season	Date	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
Breeding-23	27/04/2023	T19	SE	3	0	8	2	4	0	0
Breeding-23	28/04/2023	T17	W	3	4	8	2	4	0	0
Breeding-23	28/04/2023	T18	W	3	0	8	2	4	0	0
Breeding-23	28/04/2023	T20	W	3	0	8	2	4	0	0
Breeding-23	04/05/2023	T6	E	4	0	6	2	4	0	0
Breeding-23	24/05/2023	T4	W	2	0	4	2	4	0	0
Breeding-23	24/05/2023	T5	W	2	0	3	2	4	0	0
Breeding-23	09/05/2023	T1	W	2	2	8	2	4	0	0
Breeding-23	20/05/2023	T9	SE	2	0	6	2	4	0	0
Breeding-23	22/05/2023	T3	N	3	0	5	2	4	0	0
Breeding-23	22/05/2023	T2	N	3	0	5	2	4	0	0
Breeding-23	23/05/2023	T10	N	3	0	4	2	4	0	0
Breeding-23	23/05/2023	T8	N	2	0	4	2	4	0	0
Breeding-23	25/05/2023	T11	N	3	0	7	2	4	0	0
Breeding-23	25/05/2023	T12	NW	4	0	8	2	4	0	0
Breeding-23	26/05/2023	T19	NE	2	0	3	2	4	0	0
Breeding-23	26/05/2023	T16	NE	2	0	7	2	4	0	0
Breeding-23	27/05/2023	T18	N	2	0	6	2	4	0	0
Breeding-23	27/05/2023	T17	N	2	0	6	2	4	0	0
Breeding-23	29/05/2023	T20	E	2	0	5	2	4	0	0
Breeding-23	29/05/2023	T21	E	2	0	5	2	4	0	0
Breeding-23	29/05/2023	T14	E	2	0	5	2	4	0	0
Breeding-23	29/05/2023	T15	E	2	0	4	2	4	0	0
Breeding-23	30/05/2023	T13	E	2	0	2	2	4	0	0

Breeding & Winter Transect Survey Effort										
Season	Date	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
Breeding-23	30/05/2023	T7	E	2	0	3	2	4	0	0
Breeding-23	04/05/2023	T6	E	4	0	6	2	4	0	0
Breeding-23	24/05/2023	T4	W	2	0	4	2	4	0	0
Breeding-23	24/05/2023	T5	W	2	0	3	2	4	0	0
Breeding-23	05/06/2023	T21	E	3	0	2	2	4	0	0
Breeding-23	09/06/2023	T9	E	3	0	5	2	4	0	0
Breeding-23	15/06/2023	T13	SE	3	0	3	2	4	0	0
Breeding-23	15/06/2023	T16	SE	3	0	5	2	4	0	0
Breeding-23	16/06/2023	T14	SE	3	0	7	2	4	0	0
Breeding-23	21/06/2023	T1	SW	2	0	7	2	4	0	0
Breeding-23	21/06/2023	T2	SW	2	0	7	2	4	0	0
Breeding-23	21/06/2023	T3	W	3	0	7	2	4	0	0
Breeding-23	26/06/2023	T10	W	3	2	7	2	4	0	0
Breeding-23	27/06/2023	T19	SW	3	0	7	2	4	0	0
Breeding-23	27/06/2023	T18	SW	3	0	7	2	4	0	0
Breeding-23	28/06/2023	T11	NW	2	3	7	2	4	0	0
Breeding-23	28/06/2023	T12	NW	2	3	7	2	4	0	0
Breeding-23	28/06/2023	T15	NW	2	0	7	2	4	0	0
Breeding-23	29/06/2023	T17	W	3	0	6	2	4	0	0
Breeding-23	29/06/2023	T20	W	3	0	6	2	4	0	0
Breeding-23	30/06/2023	T7	W	3	1	8	1	4	0	0
Breeding-23	30/06/2023	T8	W	3	1	8	1	3	0	0
Breeding-23	05/07/2023	T4	W	2	0	6	2	4	0	0
Breeding-23	05/07/2023	T5	W	3	1	7	2	4	0	0

Breeding & Winter Transect Survey Effort										
Season	Date	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
Breeding-23	07/07/2023	T6	S	3	1	7	2	4	0	0
Breeding-23	12/07/2023	T12	W	4	0	7	2	4	0	0
Breeding-23	20/07/2023	T3	NW	2	0	6	2	4	0	0
Breeding-23	20/07/2023	T8	NW	2	0	6	2	4	0	0
Breeding-23	20/07/2023	T9	NW	2	0	6	2	4	0	0
Breeding-23	21/07/2023	T10	SW	3	2	8	2	4	0	0
Breeding-23	24/07/2023	T15	NW	2	0	7	2	4	0	0
Breeding-23	24/07/2023	T16	NW	2	0	6	2	4	0	0
Breeding-23	25/07/2023	T11	W	2	0	7	2	4	0	0
Breeding-23	25/07/2023	T21	W	2	0	7	2	4	0	0
Breeding-23	25/07/2023	T20	W	2	0	6	2	4	0	0
Breeding-23	27/07/2023	T1	W	2	0	6	2	4	0	0
Breeding-23	28/07/2023	T7	SW	3	0	7	2	4	0	0
Breeding-23	28/07/2023	T14	SW	3	0	7	2	4	0	0
Breeding-23	28/07/2023	T13	SW	3	0	6	2	4	0	0
Breeding-23	31/07/2023	T18	SW	2	1	8	2	4	0	0
Breeding-23	31/07/2023	T17	SW	2	2	8	2	4	0	0
Breeding-23	31/07/2023	T19	SW	2	3	8	2	4	0	0
Breeding-23	02/08/2023	T4	N	3	0	8	2	4	0	0
Breeding-23	02/08/2023	T5	N	3	0	7	2	4	0	0
Breeding-23	03/08/2023	T6	NW	3	1	8	2	4	0	0
Breeding-23	08/08/2023	T11	NW	1	0	6	2	4	0	0
Breeding-23	09/08/2023	T1	SW	3	0	7	2	4	0	0
Breeding-23	09/08/2023	T3	SW	2	0	7	2	4	0	0

Breeding & Winter Transect Survey Effort										
Season	Date	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
Breeding-23	11/08/2023	T10	SW	3	0	7	2	4	0	0
Breeding-23	15/08/2023	T9	NW	2	2	6	2	4	0	0
Breeding-23	15/08/2023	T12	NW	2	0	6	2	4	0	0
Breeding-23	16/08/2023	T18	E	1	0	6	2	4	0	0
Breeding-23	17/08/2023	T2	SE	3	0	7	2	4	0	0
Breeding-23	18/08/2023	T17	SE	3	2	8	2	4	0	0
Breeding-23	22/08/2023	T20	SW	3	3	8	2	4	0	0
Breeding-23	22/08/2023	T21	SW	3	0	7	2	4	0	0
Breeding-23	23/08/2023	T19	W	2	0	7	2	4	0	0
Breeding-23	23/08/2023	T15	W	2	0	7	2	4	0	0
Breeding-23	31/08/2023	T7	S	2	1	8	1	3	0	0
Breeding-23	31/08/2023	T8	S	2	0	8	2	4	0	0
Breeding-23	31/08/2023	T16	S	2	0	8	2	4	0	0
Breeding-23	31/08/2023	T13	S	2	0	8	2	4	0	0
Breeding-23	31/08/2023	T14	S	2	2	8	2	4	0	0
Breeding-23	25/09/2023	T4	SW	4	0	7	2	4	0	0
Breeding-23	25/09/2023	T5	SW	4	0	7	2	4	0	0
Breeding-23	29/09/2023	T6	SW	3	0	3	2	4	0	0
Winter-23	03/10/2023	T20	W	3	0	7	2	4	0	0
Winter-23	03/10/2023	T21	W	3	0	7	2	4	0	0
Winter-23	04/10/2023	T9	SW	4	1	8	2	4	0	0
Winter-23	04/10/2023	T8	SW	4	0	7	2	4	0	0
Winter-23	06/10/2023	T3	SW	2	3	8	2	3	0	0
Winter-23	06/10/2023	T7	SW	3	0	8	2	4	0	0

Breeding & Winter Transect Survey Effort										
Season	Date	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
Winter-23	09/10/2023	T19	SW	2	0	1	2	4	0	0
Winter-23	10/10/2023	T2	SW	2	0	7	2	4	0	0
Winter-23	11/10/2023	T1	NW	2	0	8	2	4	0	0
Winter-23	06/10/2023	T10	SW	3	0	6	2	4	0	0
Winter-23	11/10/2023	T15	N	2	0	7	2	4	0	0
Winter-23	11/10/2023	T16	N	2	0	7	2	4	0	0
Winter-23	12/10/2023	T17	SE	2	0	6	2	4	0	0
Winter-23	13/10/2023	T18	NW	3	0	7	2	4	0	0
Winter-23	13/10/2023	T14	NW	3	0	7	2	4	0	0
Winter-23	13/10/2023	T11	NW	3	0	7	2	4	0	0
Winter-23	13/10/2023	T12	NW	3	0	7	2	4	0	0
Winter-23	14/10/2023	T13	W	3	3	6	2	4	0	0
Winter-23	18/10/2023	T6	E	4	2	8	2	4	0	0
Winter-23	18/10/2023	T4	E	4	5	8	1	3	0	0
Winter-23	19/10/2023	T5	E	3	0	8	2	4	0	0
Winter-23	02/11/2023	T21	SW	4	0	4	2	4	0	0
Winter-23	03/11/2023	T19	W	2	0	3	2	4	0	0
Winter-23	06/11/2023	T20	W	4	0	3	2	4	0	0
Winter-23	08/11/2023	T3	SW	3	0	1	2	4	0	0
Winter-23	08/11/2023	T2	SW	4	2	4	2	4	0	0
Winter-23	09/11/2023	T9	W	3	2	7	2	4	0	0
Winter-23	09/11/2023	T7	W	4	0	7	2	4	0	0
Winter-23	13/11/2023	T8	W	5	1	4	2	4	0	0
Winter-23	13/11/2023	T1	W	4	0	6	2	4	0	0

Breeding & Winter Transect Survey Effort										
Season	Date	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
Winter-23	20/11/2023	T16	NW	2	0	4	2	4	0	0
Winter-23	21/11/2023	T12	NW	1	0	7	2	4	0	0
Winter-23	21/11/2023	T11	NW	1	0	7	2	4	0	0
Winter-23	21/11/2023	T17	WNW	1	0	7	2	4	0	0
Winter-23	22/11/2023	T15	W	3	0	6	2	4	0	0
Winter-23	23/11/2023	T18	W	3	2	5	2	4	0	0
Winter-23	24/11/2023	T14	N	1	0	4	2	4	0	0
Winter-23	27/11/2023	T10	NW	4	0	4	2	4	0	0
Winter-23	27/11/2023	T5	N	4	0	3	2	4	0	0
Winter-23	27/11/2023	T4	N	3	0	4	2	4	0	0
Winter-23	28/11/2023	T13	W	0	0	5	2	4	1	0
Winter-23	28/11/2023	T6	W	1	0	4	2	4	0	0
Winter-23	04/12/2023	T21	NW	2	0	1	2	4	1	0
Winter-23	04/12/2023	T20	NW	2	0	1	2	4	1	0
Winter-23	05/12/2023	T19	NW	2	0	3	2	4	1	0
Winter-23	06/12/2023	T9	SE	4	0	8	2	4	0	0
Winter-23	06/12/2023	T8	SE	4	3	4	2	4	0	0
Winter-23	07/12/2023	T7	SE	3	3	8	2	4	0	0
Winter-23	07/12/2023	T3	S	2	0	7	2	4	0	0
Winter-23	08/12/2023	T1	S	4	3	8	2	4	0	0
Winter-23	11/12/2023	T2	SW	2	0	2	2	4	0	0
Winter-23	06/12/2023	T10	SE	4	4	7	2	4	0	0
Winter-23	18/12/2023	T15	SW	2	1	8	2	4	0	0
Winter-23	19/12/2023	T13	W	4	0	7	2	4	4	0

Breeding & Winter Transect Survey Effort										
Season	Date	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
Winter-23	19/12/2023	T16	W	4	2	7	2	4	0	0
Winter-23	19/12/2023	T17	W	4	0	4	2	4	0	0
Winter-23	19/12/2023	T4	W	4	0	4	2	4	0	0
Winter-23	20/12/2023	T6	W	5	0	8	2	4	0	0
Winter-23	20/12/2023	T12	W	5	2	8	2	4	0	0
Winter-23	20/12/2023	T18	W	4	1	8	2	4	0	0
Winter-23	21/12/2023	T14	NW	5	0	7	2	4	0	0
Winter-23	22/12/2023	T5	W	4	0	7	2	4	0	0
Winter-23	22/12/2023	T11	W	4	0	7	2	4	0	0
Winter-24	03/01/2024	T21	W	1	0	7	2	3	0	0
Winter-24	03/01/2024	T20	W	1	0	7	2	4	0	0
Winter-24	04/01/2024	T19	S	2	0	1	2	4	0	0
Winter-24	05/01/2024	T2	W	1	0	3	2	4	0	0
Winter-24	08/01/2024	T3	E	1	0	7	2	4	1	0
Winter-24	08/01/2024	T7	E	1	0	7	2	4	1	0
Winter-24	12/01/2024	T1	W	1	0	8	2	4	0	0
Winter-24	15/01/2024	T9	NW	1	0	2	2	4	1	0
Winter-24	15/01/2024	T8	NW	2	0	2	2	4	1	0
Winter-24	02/01/2024	T12	SW	3	1	8	2	4	0	0
Winter-24	03/01/2024	T5	SW	1	0	8	2	4	0	0
Winter-24	03/01/2024	T4	SW	1	0	7	2	4	0	0
Winter-24	03/01/2024	T6	W	1	0	7	2	4	0	0
Winter-24	03/01/2024	T16	W	2	0	6	2	4	0	0
Winter-24	10/01/2024	T11	NE	1	0	0	2	4	2	0

Breeding & Winter Transect Survey Effort										
Season	Date	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
Winter-24	10/01/2024	T10	NE	1	0	0	2	4	2	0
Winter-24	10/01/2024	T15	NE	1	0	2	2	4	2	0
Winter-24	11/01/2024	T18	NE	3	0	8	2	4	0	0
Winter-24	25/01/2024	T17	SW	4	2	7	2	4	0	0
Winter-24	25/01/2024	T13	SW	3	3	7	2	4	0	0
Winter-24	26/01/2024	T14	SW	4	2	5	2	4	0	0
Winter-24	01/02/2024	T21	SW	2	0	6	2	4	0	0
Winter-24	01/02/2024	T20	SW	2	0	7	2	4	0	0
Winter-24	02/02/2024	T9	SW	4	2	8	2	4	0	0
Winter-24	02/02/2024	T8	SW	4	0	8	2	4	0	0
Winter-24	06/02/2024	T2	NW	3	3	8	2	4	0	0
Winter-24	07/02/2024	T19	NE	1	0	7	2	4	0	0
Winter-24	13/02/2024	T7	E	2	0	7	2	4	0	0
Winter-24	13/02/2024	T3	E	2	0	7	2	4	0	0
Winter-24	14/02/2024	T1	S	2	0	8	2	4	0	0
Winter-24	20/02/2024	T4	SW	1	0	7	2	4	0	0
Winter-24	20/02/2024	T5	SW	1	0	7	2	4	0	0
Winter-24	20/02/2024	T17	SW	2	2	7	2	4	0	0
Winter-24	20/02/2024	T18	SW	2	0	7	2	4	0	0
Winter-24	21/02/2024	T14	SW	3	2	7	2	4	0	0
Winter-24	23/02/2024	T6	W	2	0	8	2	4	0	0
Winter-24	23/02/2024	T13	W	2	0	6	2	4	0	0
Winter-24	28/02/2024	T11	SW	2	0	7	2	4	0	0
Winter-24	28/02/2024	T15	SW	2	2	7	2	4	0	0

Breeding & Winter Transect Survey Effort										
Season	Date	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
Winter-24	29/02/2024	T10	SW	2	0	7	2	4	0	0
Winter-24	29/02/2024	T12	SW	2	3	8	2	4	0	0
Winter-24	29/02/2024	T16	SW	2	4	8	2	3	0	0
Winter-24	04/03/2024	T19	SE	4	1	8	2	4	0	0
Winter-24	05/03/2024	T21	SW	3	0	3	2	4	0	0
Winter-24	05/03/2024	T20	SW	3	0	3	2	4	0	0
Winter-24	06/03/2024	T3	SE	4	0	8	2	4	0	0
Winter-24	06/03/2024	T9	SE	3	0	8	2	4	0	0
Winter-24	07/03/2024	T2	SE	2	0	4	2	4	0	0
Winter-24	08/03/2024	T1	E	3	0	6	2	4	0	0
Winter-24	11/03/2024	T8	S	2	0	8	2	4	0	0
Winter-24	04/03/2024	T7	SW	2	0	8	2	4	0	0
Winter-24	05/03/2024	T12	SW	4	0	5	2	4	0	0
Winter-24	05/03/2024	T11	SW	4	0	6	2	4	0	0
Winter-24	05/03/2024	T4	SW	2	0	7	2	4	0	0
Winter-24	06/03/2024	T10	SE	5	0	8	2	4	0	0
Winter-24	06/03/2024	T13	SE	5	0	8	2	4	0	0
Winter-24	06/03/2024	T14	SE	4	0	8	2	4	0	0
Winter-24	06/03/2024	T17	SE	4	0	8	2	4	0	0
Winter-24	13/03/2024	T5	W	1	4	8	2	3	0	0
Winter-24	13/03/2024	T6	W	1	1	8	2	3	0	0
Winter-24	13/03/2024	T18	W	1	0	8	2	4	0	0
Winter-24	14/03/2024	T15	S	2	4	8	2	3	0	0
Winter-24	15/03/2024	T16	NW	2	0	5	2	4	0	0

Breeding & Winter Transect Survey Effort										
Season	Date	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
Breeding-24	02/04/2024	T21	E	1	0	6	2	4	0	0
Breeding-24	02/04/2024	T20	E	1	0	6	2	4	0	0
Breeding-24	03/04/2024	T6	SW	1	1	7	2	4	0	0
Breeding-24	04/04/2024	T3	SE	2	0	8	2	4	0	0
Breeding-24	04/04/2024	T2	SE	2	0	8	2	4	0	0
Breeding-24	09/04/2024	T19	NW	3	0	4	2	4	0	0
Breeding-24	15/04/2024	T4	W	4	1	7	2	4	0	0
Breeding-24	15/04/2024	T1	W	4	0	6	2	4	0	0
Breeding-24	15/04/2024	T5	W	4	3	7	2	4	0	0
Breeding-24	08/04/2024	T7	NE	1	1	8	2	4	0	0
Breeding-24	08/04/2024	T11	NE	2	1	8	1	3	0	0
Breeding-24	08/04/2024	T12	N	2	1	8	2	3	0	0
Breeding-24	09/04/2024	T13	NW	5	2	3	2	4	0	0
Breeding-24	09/04/2024	T16	NW	5	0	4	2	4	0	0
Breeding-24	09/04/2024	T17	NW	4	0	5	2	4	0	0
Breeding-24	09/04/2024	T15	NW	4	0	6	2	4	0	0
Breeding-24	10/04/2024	T18	SW	3	0	8	2	4	0	0
Breeding-24	10/04/2024	T8	SW	3	0	8	2	4	0	0
Breeding-24	10/04/2024	T10	SW	4	4	8	1	3	0	0
Breeding-24	11/04/2024	T14	SW	4	2	8	2	4	0	0
Breeding-24	18/04/2024	T9	W	2	0	6	2	4	0	0
Breeding-24	07/05/2024	T21	NE	2	0	3	2	4	0	0
Breeding-24	07/05/2024	T20	NE	2	0	5	2	4	0	0
Breeding-24	08/05/2024	T19	S	1	0	7	2	4	0	0

Breeding & Winter Transect Survey Effort										
Season	Date	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
Breeding-24	09/05/2024	T6	S	1	0	7	2	4	0	0
Breeding-24	09/05/2024	T3	S	1	0	8	2	4	0	0
Breeding-24	10/05/2024	T4	S	3	0	1	2	4	0	0
Breeding-24	10/05/2024	T1	S	3	0	1	2	4	0	0
Breeding-24	10/05/2024	T5	S	3	0	1	2	4	0	0
Breeding-24	14/05/2024	T2	E	1	0	8	2	4	0	0
Breeding-24	09/05/2024	T14	SW	1	0	4	2	4	0	0
Breeding-24	09/05/2024	T15	SW	1	0	3	2	4	0	0
Breeding-24	09/05/2024	T16	SW	1	0	3	2	4	0	0
Breeding-24	10/05/2024	T17	S	3	0	3	2	4	0	0
Breeding-24	10/05/2024	T11	S	3	0	2	2	4	0	0
Breeding-24	13/05/2024	T8	SE	2	0	7	2	4	0	0
Breeding-24	13/05/2024	T9	SE	2	0	6	2	4	0	0
Breeding-24	14/05/2024	T7	E	3	0	6	2	4	0	0
Breeding-24	14/05/2024	T12	E	3	0	7	2	4	0	0
Breeding-24	15/05/2024	T18	E	3	0	4	2	4	0	0
Breeding-24	16/05/2024	T10	NE	2	0	4	2	4	0	0
Breeding-24	16/05/2024	T13	NE	1	0	1	2	4	0	0
Breeding-24	04/06/2024	T2	W	4	0	3	2	4	0	0
Breeding-24	05/06/2024	T21	W	3	0	5	2	4	0	0
Breeding-24	05/06/2024	T20	W	3	0	6	2	4	0	0
Breeding-24	06/06/2024	T19	W	3	0	4	2	4	0	0
Breeding-24	10/06/2024	T3	N	3	0	7	2	4	0	0
Breeding-24	10/06/2024	T6	N	3	0	7	2	4	0	0

Breeding & Winter Transect Survey Effort										
Season	Date	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
Breeding-24	11/06/2024	T4	NW	3	0	3	2	4	0	0
Breeding-24	11/06/2024	T1	NW	3	0	4	2	4	0	0
Breeding-24	11/06/2024	T5	NW	3	1	7	2	4	0	0
Breeding-24	17/06/2024	T14	NW	1	0	6	2	4	0	0
Breeding-24	19/06/2024	T18	NW	1	0	2	2	4	0	0
Breeding-24	20/06/2024	T13	SW	1	0	6	2	4	0	0
Breeding-24	20/06/2024	T16	SW	1	0	6	2	4	0	0
Breeding-24	20/06/2024	T15	SW	1	0	6	2	4	0	0
Breeding-24	21/06/2024	T17	S	3	0	7	2	4	0	0
Breeding-24	24/06/2024	T12	SW	2	0	6	2	4	0	0
Breeding-24	24/06/2024	T8	SW	2	0	6	2	4	0	0
Breeding-24	25/06/2024	T9	N	2	0	7	2	4	0	0
Breeding-24	25/06/2024	T10	N	3	0	7	2	4	0	0
Breeding-24	25/06/2024	T11	N	3	0	7	2	4	0	0
Breeding-24	25/06/2024	T7	N	2	0	7	2	4	0	0
Breeding-24	01/07/2024	T21	W	2	1	8	2	4	0	0
Breeding-24	01/07/2024	T20	W	2	0	8	2	4	0	0
Breeding-24	02/07/2024	T6	W	2	0	8	2	4	0	0
Breeding-24	02/07/2024	T3	W	3	0	8	2	4	0	0
Breeding-24	04/07/2024	T19	W	4	0	7	2	4	0	0
Breeding-24	05/07/2024	T4	W	2	0	7	2	4	0	0
Breeding-24	05/07/2024	T1	W	2	0	7	2	4	0	0
Breeding-24	05/07/2024	T5	W	2	0	7	2	4	0	0
Breeding-24	08/07/2024	T2	E	1	1	1	2	4	0	0

Breeding & Winter Transect Survey Effort										
Season	Date	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
Breeding-24	22/07/2024	T15	SW	2	0	8	2	4	0	0
Breeding-24	22/07/2024	T10	W	2	2	8	2	4	0	0
Breeding-24	22/07/2024	T11	W	1	2	8	2	4	0	0
Breeding-24	23/07/2024	T18	N	1	0	6	2	4	0	0
Breeding-24	23/07/2024	T17	N	1	0	7	2	4	0	0
Breeding-24	23/07/2024	T12	N	1	0	8	2	4	0	0
Breeding-24	24/07/2024	T8	S	3	0	7	2	4	0	0
Breeding-24	29/07/2024	T7	SW	2	0	7	2	4	0	0
Breeding-24	29/07/2024	T9	SW	2	0	7	2	4	0	0
Breeding-24	30/07/2024	T14	NW	1	0	6	2	4	0	0
Breeding-24	30/07/2024	T13	NW	1	0	6	2	4	0	0
Breeding-24	31/07/2024	T16	SE	1	0	4	2	4	0	0
Breeding-24	01/08/2024	T21	SW	3	0	7	2	4	0	0
Breeding-24	01/08/2024	T20	SW	3	0	6	2	4	0	0
Breeding-24	06/08/2024	T6	SW	4	0	8	2	4	0	0
Breeding-24	06/08/2024	T3	SW	4	0	8	2	4	0	0
Breeding-24	07/08/2024	T19	W	4	0	8	2	4	0	0
Breeding-24	09/08/2024	T4	W	3	1	4	2	4	0	0
Breeding-24	09/08/2024	T1	W	4	0	6	2	4	0	0
Breeding-24	09/08/2024	T5	W	4	0	4	2	4	0	0
Breeding-24	12/08/2024	T2	W	4	0	4	2	4	0	0
Breeding-24	06/08/2024	T15	SW	3	2	8	2	4	0	0
Breeding-24	06/08/2024	T13	SW	4	2	7	2	4	0	0
Breeding-24	07/08/2024	T10	SW	4	0	7	2	4	0	0

Breeding & Winter Transect Survey Effort										
Season	Date	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
Breeding-24	07/08/2024	T11	SW	4	0	8	2	4	0	0
Breeding-24	08/08/2024	T14	SW	2	2	8	2	4	0	0
Breeding-24	19/08/2024	T12	SE	4	3	8	2	4	0	0
Breeding-24	19/08/2024	T8	S	4	3	8	2	4	0	0
Breeding-24	20/08/2024	T7	W	5	2	6	2	4	0	0
Breeding-24	20/08/2024	T17	W	4	0	4	2	4	0	0
Breeding-24	20/08/2024	T16	W	5	0	5	2	4	0	0
Breeding-24	21/08/2024	T9	SW	4	1	8	1	3	0	0
Breeding-24	21/08/2024	T18	SW	4	0	8	2	4	0	0
Breeding-24	03/09/2024	T19	W	3	3	8	2	4	0	0
Breeding-24	04/09/2024	T21	W	3	1	8	2	4	0	0
Breeding-24	04/09/2024	T20	W	3	0	8	2	4	0	0
Breeding-24	05/09/2024	T6	NE	4	0	7	2	4	0	0
Breeding-24	05/09/2024	T3	NE	4	0	7	2	4	0	0
Breeding-24	06/09/2024	T4	NE	3	0	3	2	4	0	0
Breeding-24	06/09/2024	T1	NE	3	0	4	2	4	0	0
Breeding-24	06/09/2024	T5	NE	3	0	4	2	4	0	0
Breeding-24	09/09/2024	T2	W	4	0	7	2	4	0	0
Breeding-24	03/09/2024	T11	NW	2	0	8	2	4	0	0
Breeding-24	04/09/2024	T9	NW	4	2	5	2	4	0	0
Breeding-24	04/09/2024	T10	NW	4	0	5	2	4	0	0
Breeding-24	05/09/2024	T18	NE	2	0	4	2	4	0	0
Breeding-24	05/09/2024	T17	NE	3	0	6	2	4	0	0
Breeding-24	12/09/2024	T7	NW	3	0	4	2	4	0	0

Breeding & Winter Transect Survey Effort										
Season	Date	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
Breeding-24	13/09/2024	T8	S	2	0	8	2	4	0	0
Breeding-24	13/09/2024	T12	S	2	0	8	2	4	0	0
Breeding-24	13/09/2024	T16	S	4	0	8	2	4	0	0
Breeding-24	13/09/2024	T13	S	4	0	8	2	4	0	0
Breeding-24	16/09/2024	T14	S	2	0	3	2	4	0	0
Breeding-24	16/09/2024	T15	S	2	0	5	2	4	0	0

I-Webs and Breeding Waders Survey Effort

I-Webs and Breeding Wader Survey Effort									
Date	Survey	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-22	19/04/2022	Ref: 3	W	2	0	7/8	1	4	0
Breeding-22	19/04/2022	53.607979, -7.857910	W	2	0	7/8	1	4	0
Breeding-22	19/04/2022	Ref: 2	W	2	0	7/8	1	4	0
Breeding-22	19/04/2022	Ref: 1	W	2	0	7/8	1	4	0
Breeding-22	20/04/2022	Ref: 22	SE	1	0	7/8	1	4	0
Breeding-22	20/04/2022	Ref: 23	SE	1	0	7/8	1	4	0
Breeding-22	20/04/2022	Ref: 24	SE	1	0	7/8	1	4	0
Breeding-22	20/04/2022	Ref: 25	SE	1	0	7/8	1	4	0
Breeding-22	20/04/2022	Ref: 9	SE	1	0	7/8	1	4	0
Breeding-22	20/04/2022	Ref: 5	SE	1	0	7/8	1	4	0
Breeding-22	20/04/2022	Ref: 4	SE	1	0	7/8	1	4	0
Breeding-22	21/04/2022	Ref: 6	E	6	0	6/7	1	4	0
Breeding-22	21/04/2022	Ref: 7	E	6	0	6/7	1	4	0
Breeding-22	21/04/2022	Ref: 8	E	6	0	6/7	1	4	0
Breeding-22	21/04/2022	Ref: 10	E	6	0	6/7	1	4	0
Breeding-22	21/04/2022	Ref: 13	E	6	0	6/7	1	4	0
Breeding-22	21/04/2022	Ref: 12	E	6	0	6/7	1	4	0
Breeding-22	21/04/2022	Ref: 15	E	6	0	6/7	1	4	0
Breeding-22	21/04/2022	Ref: 14	E	6	0	6/7	1	4	0
Breeding-22	21/04/2022	Ref: 19	E	6	0	6/7	1	4	0
Breeding-22	21/04/2022	Ref: 20	E	6	0	6/7	1	4	0
Breeding-22	21/04/2022	Ref: 17	E	6	0	6/7	1	4	0
Breeding-22	21/04/2022	Ref: 18	E	6	0	6/7	1	4	0

I-Webs and Breeding Wader Survey Effort									
Date	Survey	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-22	22/04/2022	53.721786, -7.909405.	NE	3	0	8/8	1	4	0
Breeding-22	22/04/2022	53.714470, -7.911256.	NE	3	0	8/8	1	4	0
Breeding-22	22/04/2022	53.716144, -7.912804	NE	3	0	8/8	1	4	0
Breeding-22	22/04/2022	53.715838, -7.918620	NE	3	0	8/8	1	4	0
Breeding-22	22/04/2022	53.713490, -7.924625	NE	3	0	8/8	1	4	0
Breeding-22	22/04/2022	53.717552, -7.904746	NE	3	0	8/8	1	4	0
Breeding-22	22/04/2022	53.687698, -7.882752	NE	3	0	8/8	1	4	0
Breeding-22	17/05/2022	VPS 10,7,8	SSW	3	3	7/8	2	4	0
Breeding-22	04/05/2022	Ref: 3	SW	3	1	7/8	1	4	0
Breeding-22	04/05/2022	Corlea Wetlands.	SW	3	1	7/8	1	4	0
Breeding-22	04/05/2022	Ref: 24	SW	3	1	7/8	1	4	0
Breeding-22	04/05/2022	Ref: 25	SW	3	1	7/8	1	4	0
Breeding-22	04/05/2022	Ref: 2	SW	3	1	7/8	1	4	0
Breeding-22	05/05/2022	Ref: 1	SW	3	1	7/8	1	4	0
Breeding-22	10/05/2022	Rhynmount Canal Bridge.	SW	6	0	6/8	1	4	0

I-Webs and Breeding Wader Survey Effort									
Date	Survey	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-22	10/05/2022	Rhynmount Bog.	SW	6	0	6/8	1	4	0
Breeding-22	10/05/2022	Rhynmount Bog.	SW	6	0	6/8	1	4	0
Breeding-22	10/05/2022	Rhynmount Bog.	SW	6	0	6/8	1	4	0
Breeding-22	10/05/2022	Rhynmount Bog.	SW	6	0	6/8	1	4	0
Breeding-22	10/05/2022	Rhynmount Bog.	SW	6	0	6/8	1	4	0
Breeding-22	11/05/2022	Ref: 12	W	6	0	7/8	1	4	0
Breeding-22	11/05/2022	Ref: 13	W	6	0	7/8	1	4	0
Breeding-22	11/05/2022	Ref: 11	W	6	0	7/8	1	4	0
Breeding-22	11/05/2022	Ref: 14	W	6	0	7/8	1	4	0
Breeding-22	11/05/2022	Ref: 15	W	6	0	7/8	1	4	0
Breeding-22	11/05/2022	Ref: 17	W	6	0	7/8	1	4	0
Breeding-22	11/05/2022	Ref: 20	W	6	0	7/8	1	4	0
Breeding-22	11/05/2022	Ref: 19	W	6	0	7/8	1	4	0
Breeding-22	11/05/2022	Ref: 18	W	6	0	7/8	1	4	0
Breeding-22	11/05/2022	Ref: 21	W	6	0	7/8	1	4	0
Breeding-22	11/05/2022	Ref: 22	W	6	0	7/8	1	4	0
Breeding-22	11/05/2022	Ref: 23	W	6	0	7/8	1	4	0
Breeding-22	11/05/2022	Ref: 6	W	6	0	7/8	1	4	0
Breeding-22	12/05/2022	Ref: 5	SW	5	0	7/8	1	4	0
Breeding-22	12/05/2022	Ref: 9	SW	5	0	7/8	1	4	0

I-Webs and Breeding Wader Survey Effort									
Date	Survey	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-22	12/05/2022	Ref: 4	SW	5	0	7/8	1	4	0
Breeding-22	10/06/2022	Ref: 11	SW	5	0	4/8	2	4	0
Breeding-22	10/06/2022	Ref: 7	SW	5	0	4/8	2	4	0
Breeding-22	10/06/2022	Ref: 7	SW	5	0	4/8	2	4	0
Breeding-22	10/06/2022	Ref: 10	SW	5	0	4/8	2	4	0
Breeding-22	10/06/2022	Ref: 8	SW	5	0	4/8	2	4	0
Breeding-22	10/06/2022	Ref: 6	SW	5	0	4/8	2	4	0
Breeding-22	10/06/2022	Ref: 9	SW	5	0	4/8	2	4	0
Breeding-22	10/06/2022	Ref: 9	SW	5	0	4/8	2	4	0
Breeding-22	10/06/2022	Ref: 5	SW	4	0	3/8	2	4	0
Breeding-22	10/06/2022	Ref: 5	SW	4	0	3/8	2	4	0
Breeding-22	10/06/2022	Ref: 5	SW	4	0	3/8	2	4	0
Breeding-22	10/06/2022	Ref: 5	SW	4	0	3/8	2	4	0
Breeding-22	10/06/2022	Ref: 4	SW	4	0	3/8	2	4	0
Breeding-22	10/06/2022	Ref: 4	SW	4	0	3/8	2	4	0
Breeding-22	10/06/2022	Ref: 4	SW	4	0	3/8	2	4	0
Breeding-22	14/06/2022	Rhynmount Canal Bridge.	SW	2	0	6/8	2	4	0
Breeding-22	14/06/2022	Rhynmount Bog.	SW	2	0	6/8	2	4	0
Breeding-22	14/06/2022	Rhynmount Bog.	SW	2	0	6/8	2	4	0
Breeding-22	14/06/2022	Rhynmount Bog.	SW	2	0	6/8	2	4	0

I-Webs and Breeding Wader Survey Effort									
Date	Survey	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-22	14/06/2022	Rhynmount Bog.	SW	2	0	6/8	2	4	0
Breeding-22	14/06/2022	Rhynmount Bog.	SW	2	0	6/8	2	4	0
Breeding-22	14/06/2022	Rhynmount Bog.	SW	1	0	7/8	2	4	0
Breeding-22	14/06/2022	Rhynmount Bog.	SW	1	0	7/8	2	4	0
Breeding-22	14/06/2022	Ref: 20	SW	1	0	7/8	2	4	0
Breeding-22	14/06/2022	Ref: 19	SW	2	0	8/8	2	4	0
Breeding-22	14/06/2022	Ref: 14	SW	2	0	8/8	2	4	0
Breeding-22	14/06/2022	Ref: 15	SW	2	0	8/8	2	4	0
Breeding-22	14/06/2022	Ref: 13	SW	2	0	8/8	2	4	0
Breeding-22	14/06/2022	Ref: 12	SW	2	0	8/8	2	4	0
Breeding-22	14/06/2022	Ref: 12	SW	2	0	7/8	2	4	0
Breeding-22	14/06/2022	Ref: 17	SW	2	0	7/8	2	4	0
Breeding-22	14/06/2022	Ref: 18	SW	2	0	7/8	2	4	0
Breeding-22	14/06/2022	Ref: 21	SW	2	0	7/8	2	4	0
Breeding-22	20/06/2022	Ref: 22	SW	1	0	1/8	2	4	0
Breeding-22	20/06/2022	Ref: 23	SW	1	0	1/8	2	4	0
Breeding-22	20/06/2022	Ref: 24	SW	1	0	1/8	2	4	0
Breeding-22	20/06/2022	Ref: 25	SW	1	0	1/8	2	4	0
Breeding-22	20/06/2022	Ref: 2	SW	1	0	1/8	2	4	0
Breeding-22	20/06/2022	Ref: 1	SW	1	0	1/8	2	4	0

I-Webs and Breeding Wader Survey Effort									
Date	Survey	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-22	20/06/2022	Ref: 3	SW	1	0	1/8	2	4	0
Breeding-22	20/06/2022	Corlea Wetlands.	SW	1	0	1/8	2	4	0
Breeding-22	20/06/2022	Corlea Wetlands.	SW	1	0	1/8	2	4	0
Breeding-22	20/06/2022	Corlea Wetlands.	SW	1	0	1/8	2	4	0
Breeding-22	20/06/2022	Corlea Wetlands.	SW	1	0	1/8	2	4	0
Breeding-22	20/06/2022	Corlea Wetlands.	SW	1	0	1/8	2	4	0
Breeding-22	06/07/2022	Site NW of T13	W	2	0	8/8	2	4	0
Breeding-22	06/07/2022	Ref No: 6	W	2	0	8/8	2	4	0
Breeding-22	06/07/2022	Ref No: 5	W	2	0	8/8	2	4	0
Breeding-22	06/07/2022	Ref No: 9	W	4	3	8/8	2	4	0
Breeding-22	06/07/2022	Ref No: 4	W	4	3	8/8	2	4	0
Breeding-22	06/07/2022	Ref No: 3	W	4	3	8/8	2	4	0
Breeding-22	11/07/2022	Ref No: 7	S	2	0	7/8	2	4	0
Breeding-22	11/07/2022	Ref No: 8	S	2	0	7/8	2	4	0
Breeding-22	11/07/2022	Ref No: 10	S	2	0	7/8	2	4	0
Breeding-22	11/07/2022	Ref No: 13	S	3	0	7/8	2	4	0
Breeding-22	11/07/2022	Ref No: 12	S	3	0	7/8	2	4	0
Breeding-22	11/07/2022	Ref No: 15	S	3	0	7/8	2	4	0
Breeding-22	11/07/2022	Ref No: 14	S	3	0	7/8	2	4	0

I-Webs and Breeding Wader Survey Effort									
Date	Survey	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-22	11/07/2022	Ref No: 17	S	3	0	7/8	2	4	0
Breeding-22	11/07/2022	Ref No: 19	S	3	0	7/8	2	4	0
Breeding-22	11/07/2022	Ref No: 20	S	3	0	7/8	2	4	0
Breeding-22	11/07/2022	Ref No: 18	S	3	0	7/8	2	4	0
Breeding-22	11/07/2022	Rhynmount Canal Bridge.	S	4	0	7/8	2	4	0
Breeding-22	11/07/2022	Rhynmount Bog.	S	4	0	7/8	2	4	0
Breeding-22	11/07/2022	Rhynmount Bog.	S	4	0	7/8	2	4	0
Breeding-22	11/07/2022	Rhynmount Bog.	S	4	0	7/8	2	4	0
Breeding-22	11/07/2022	Rhynmount Bog.	S	4	0	7/8	2	4	0
Breeding-22	11/07/2022	Ref No: 21	S	4	0	7/8	2	4	0
Breeding-22	14/07/2022	Ref No: 11	W	2	0	7/8	2	4	0
Breeding-22	14/07/2022	Ref No: 22	W	2	0	7/8	2	4	0
Breeding-22	14/07/2022	Ref No: 23	W	2	0	7/8	2	4	0
Breeding-22	14/07/2022	Ref No: 24	W	1	0	6/8	2	4	0
Breeding-22	14/07/2022	Ref No: 25	W	1	0	6/8	2	4	0
Breeding-22	14/07/2022	Ref No: 2	W	1	0	6/8	2	4	0
Breeding-22	14/07/2022	Ref No: 1	W	1	0	6/8	2	4	0
Breeding-22	14/07/2022	Corlea Wetlands	W	1	0	6/8	2	4	0

I-Webs and Breeding Wader Survey Effort									
Date	Survey	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-22	10/08/2022	Ref No: 7	SW	2	0	1/8	2	4	0
Breeding-22	10/08/2022	Ref No: 8	SW	2	0	1/8	2	4	0
Breeding-22	10/08/2022	Ref No: 10	SW	2	0	1/8	2	4	0
Breeding-22	10/08/2022	Ref No: 6	SW	2	0	0/8	2	4	0
Breeding-22	10/08/2022	Ref No: 5	SW	2	0	0/8	2	4	0
Breeding-22	10/08/2022	Ref No: 9	SW	2	0	0/8	2	4	0
Breeding-22	10/08/2022	Ref No: 4	SW	2	0	0/8	2	4	0
Breeding-22	10/08/2022	Ref No: 3	SW	2	0	0/8	2	4	0
Breeding-22	10/08/2022	Corlea Wetlands	SW	2	0	0/8	2	4	0
Breeding-22	11/08/2022	Rhynmount Canal Bridge.	SW	1	0	0/8	2	4	0
Breeding-22	11/08/2022	Rhynmount Bog.	SW	1	0	0/8	2	4	0
Breeding-22	11/08/2022	Rhynmount Bog.	SW	1	0	0/8	2	4	0
Breeding-22	11/08/2022	Rhynmount Bog.	SW	1	0	0/8	2	4	0
Breeding-22	11/08/2022	Rhynmount Bog.	SW	1	0	0/8	2	4	0
Breeding-22	11/08/2022	Ref No: 13	SW	1	0	1/8	2	4	0
Breeding-22	11/08/2022	Ref No: 12	SW	1	0	1/8	2	4	0
Breeding-22	11/08/2022	Ref No: 15	SW	1	0	1/8	2	4	0
Breeding-22	11/08/2022	Ref No: 14	SW	1	0	1/8	2	4	0

I-Webs and Breeding Wader Survey Effort									
Date	Survey	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-22	11/08/2022	Ref No: 17	SW	1	0	1/8	2	4	0
Breeding-22	11/08/2022	Ref No: 18	SW	1	0	1/8	2	4	0
Breeding-22	11/08/2022	Ref No: 19	SW	1	0	0/8	2	4	0
Breeding-22	11/08/2022	Ref No: 20	SW	1	0	0/8	2	4	0
Breeding-22	23/08/2022	Ref No: 11	SW	2	0	3/8	2	4	0
Breeding-22	23/08/2022	Ref No: 21	SW	2	0	3/8	2	4	0
Breeding-22	23/08/2022	Ref No: 22	SW	2	0	4/8	2	4	0
Breeding-22	23/08/2022	Ref No: 23	SW	2	0	4/8	2	4	0
Breeding-22	23/08/2022	Ref No: 24	SW	2	0	4/8	2	4	0
Breeding-22	23/08/2022	Ref No: 25	SW	2	0	4/8	2	4	0
Breeding-22	23/08/2022	Ref No: 2	SW	2	0	4/8	2	4	0
Breeding-22	23/08/2022	Ref No: 1	SW	2	0	4/8	2	4	0
Breeding-22	13/09/2022	Ref No: 7	N	1	0	8/8	2	4	0
Breeding-22	13/09/2022	Ref No: 8	N	1	0	8/8	2	4	0
Breeding-22	13/09/2022	Ref No: 10	N	1	0	8/8	2	4	0
Breeding-22	13/09/2022	Ref No: 6	N	1	0	8/8	2	4	0
Breeding-22	13/09/2022	Ref No: 9	N	1	0	7/8	2	4	0
Breeding-22	13/09/2022	Ref No: 5	N	1	0	7/8	2	4	0
Breeding-22	13/09/2022	Ref No: 4	N	1	0	7/8	2	4	0
Breeding-22	13/09/2022	Ref No: 3	N	1	0	7/8	2	4	0
Breeding-22	13/09/2022	Ref No: 11	NW	1	0	7/8	2	4	0
Breeding-22	13/09/2022	Ref No: 21	NW	1	0	7/8	2	4	0
Breeding-22	14/09/2022	Rhynmount Bog.	NW	1	0	7/8	2	4	0

I-Webs and Breeding Wader Survey Effort									
Date	Survey	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-22	14/09/2022	Rhynmount Bog.	NW	1	0	7/8	2	4	0
Breeding-22	14/09/2022	Rhynmount Bog.	NW	1	0	8/8	2	4	0
Breeding-22	14/09/2022	Ref No: 20	NW	1	0	8/8	2	4	0
Breeding-22	14/09/2022	Ref No: 19	NW	1	0	7/8	2	4	0
Breeding-22	14/09/2022	Ref No: 14	NW	1	0	7/8	2	4	0
Breeding-22	14/09/2022	Ref No: 15	NW	1	0	7/8	2	4	0
Breeding-22	14/09/2022	Ref No: 13	NW	1	0	7/8	2	4	0
Breeding-22	14/09/2022	Ref No: 12	NW	1	0	7/8	2	4	0
Breeding-22	14/09/2022	Ref No: 17	NW	1	0	7/8	2	4	0
Breeding-22	14/09/2022	Ref No: 18	NW	1	0	7/8	2	4	0
Breeding-22	26/09/2022	Ref No: 22	NW	3	0	8/8	2	4	0
Breeding-22	26/09/2022	Ref No: 23	NW	3	0	8/8	2	4	0
Breeding-22	26/09/2022	Ref No: 24	NW	3	0	8/8	2	4	0
Breeding-22	26/09/2022	Ref No: 25	NW	4	0	8/8	2	4	0
Breeding-22	26/09/2022	Ref No: 2	NW	4	0	8/8	2	4	0
Breeding-22	26/09/2022	Ref No: 1	NW	4	0	8/8	2	4	0
Breeding-22	26/09/2022	Corlea Wetlands	NW	4	0	8/8	2	4	0
Winter-22	12/10/2022	Rhynmount Bog VP1	W	1	0	7/8	2	4	0
Winter-22	12/10/2022	Rhynmount Bog VP2	W	1	0	8/8	2	4	0

I-Webs and Breeding Wader Survey Effort									
Date	Survey	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Winter-22	12/10/2022	Rhynmount Bog VP3	W	1	0	7/8	2	4	0
Winter-22	13/10/2022	Ref No 8	S	3	1	8/8	1	4	0
Winter-22	13/10/2022	Ref No 7	S	3	1	8/8	1	4	0
Winter-22	13/10/2022	Ref No 6	S	3	0	8/8	1	4	0
Winter-22	13/10/2022	Ref No 9	S	3	0	8/8	1	4	0
Winter-22	13/10/2022	Ref No 5	S	3	0	8/8	1	4	0
Winter-22	14/10/2022	Ref No 12	W	1	0	5/8	2	4	0
Winter-22	14/10/2022	Derrycashel Bog	W	1	0	6/8	2	4	0
Winter-22	14/10/2022	Ref No 14	W	2	0	2/8	2	4	0
Winter-22	14/10/2022	Ref No 15	W	2	0	2/8	2	4	0
Winter-22	14/10/2022	Ref No 17	W	2	0	2/8	2	4	0
Winter-22	14/10/2022	Ref No 20	W	2	0	2/8	2	4	0
Winter-22	14/10/2022	Ref No 19	W	1	0	3/8	2	4	0
Winter-22	14/10/2022	Ref No 18	W	1	0	5/8	2	4	0
Winter-22	14/10/2022	Ref No 21	W	1	0	5/8	2	4	0
Winter-22	14/10/2022	Ref No 11	W	1	0	5/8	2	4	0
Winter-22	14/10/2022	Ref No 22	W	1	0	5/8	2	4	0
Winter-22	08/11/2022	Ref No 8	S	3	0	3/8	2	4	0
Winter-22	08/11/2022	Ref No 10	S	3	1	6/8	2	4	0
Winter-22	08/11/2022	Ref No 7	S	3	1	6/8	2	4	0
Winter-22	08/11/2022	Ref No 6	S	3	1	6/8	2	4	0
Winter-22	08/11/2022	Ref No 5	S	3	0	7/8	2	4	0

I-Webs and Breeding Wader Survey Effort									
Date	Survey	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Winter-22	08/11/2022	Ref No 9	S	4	0	7/8	2	4	0
Winter-22	16/11/2022	Rhynmount Bog VP1	E	1	0	1/8	2	4	0
Winter-22	16/11/2022	Rhynmount Bog VP2	E	1	0	1/8	2	4	0
Winter-22	16/11/2022	Rhynmount Bog VP3	E	1	0	1/8	2	4	0
Winter-22	16/11/2022	Ref No 13	E	1	0	2/8	2	4	0
Winter-22	16/11/2022	Ref No 12	E	1	0	3/8	2	4	0
Winter-22	16/11/2022	Derrycashel Bog	E	1	0	3/8	2	4	0
Winter-22	16/11/2022	Ref No 11	E	1	0	3/8	2	4	0
Winter-22	17/11/2022	Ref No 18	W	2	0	2/8	2	4	0
Winter-22	17/11/2022	Ref No 14	W	2	0	2/8	2	4	0
Winter-22	17/11/2022	Ref No 15	W	2	0	1/8	2	4	0
Winter-22	17/11/2022	Ref No 17	W	2	0	1/8	2	4	0
Winter-22	17/11/2022	Ref No 20	W	2	0	1/8	2	4	0
Winter-22	17/11/2022	Ref No 19	W	2	0	2/8	2	4	0
Winter-22	17/11/2022	Ref No 21	W	1	0	1/8	2	4	0
Winter-22	17/11/2022	Ref No 22	W	1	0	1/8	2	4	0
Winter-22	07/12/2022	Ref No 8	NW	1	0	2/8	2	4	0
Winter-22	07/12/2022	Ref No 10	NW	1	0	2/8	2	4	0
Winter-22	07/12/2022	Ref No 7	NW	1	0	2/8	2	4	0
Winter-22	07/12/2022	Ref No 5	NW	1	0	3/8	2	4	0

I-Webs and Breeding Wader Survey Effort									
Date	Survey	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Winter-22	07/12/2022	Ref No 9	NW	1	0	4/8	2	4	0
Winter-22	07/12/2022	Ref No 6	NW	1	0	4/8	2	4	0
Winter-22	08/12/2022	Rhynmount Bog VP1	N	1	0	2/8	2	3	1
Winter-22	08/12/2022	Rhynmount Bog VP2	N	1	0	2/8	2	4	0
Winter-22	08/12/2022	Rhynmount Bog VP3	N	1	0	2/8	2	4	0
Winter-22	08/12/2022	Ref No 13	N	1	0	2/8	2	4	0
Winter-22	08/12/2022	Ref No 12	N	1	0	2/8	2	4	0
Winter-22	08/12/2022	Derrycashel Bog	W	1	0	1/8	2	4	0
Winter-22	12/12/2022	Ref No 15	E	1	0	1/8	2	4	1
Winter-22	12/12/2022	Ref No 14	E	1	0	1/8	2	4	1
Winter-22	12/12/2022	Ref No 18	E	1	0	1/8	2	4	1
Winter-22	12/12/2022	Ref No 17	E	1	0	1/8	2	4	1
Winter-22	12/12/2022	Ref No 19	E	1	0	2/8	2	4	1
Winter-22	12/12/2022	Ref No 18	E	1	0	2/8	2	4	1
Winter-22	12/12/2022	Ref No 20	E	1	0	2/8	2	4	1
Winter-22	12/12/2022	Ref No 21	E	1	0	2/8	2	4	1
Winter-22	12/12/2022	Ref No 22	E	1	0	2/8	2	4	1
Winter-22	12/12/2022	Ref No 11	E	1	0	2/8	2	4	1
Winter-23	10/01/2023	Ref No 8	S	4	1	8/8	1	4	0
Winter-23	10/01/2023	Ref No 10	S	5	1	8/8	1	4	0

I-Webs and Breeding Wader Survey Effort									
Date	Survey	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Winter-23	10/01/2023	Ref No 7	S	5	1	8/8	1	4	0
Winter-23	10/01/2023	Ref No 6	S	5	1	8/8	1	4	0
Winter-23	10/01/2023	Ref No 5	S	4	1	8/8	1	4	0
Winter-23	10/01/2023	Ref No 9	SW	4	1	8/8	1	4	0
Winter-23	13/01/2023	53.695868, -7.913023	W	3	0	2/8	2	4	0
Winter-23	13/01/2023	Rhynmount Bog VP1	W	3	0	2/8	2	4	0
Winter-23	13/01/2023	Rhynmount Bog VP2	W	3	0	4/8	2	4	0
Winter-23	13/01/2023	Rhynmount Bog VP3	SW	2	0	7/8	2	4	0
Winter-23	23/01/2023	Ref No 12	S	1	0	8/8	1	1	0
Winter-23	23/01/2023	Ref No 13	S	1	0	8/8	1	1	0
Winter-23	23/01/2023	Derrycashel Bog	S	1	0	8/8	1	1	0
Winter-23	23/01/2023	Ref No 17	S	1	0	8/8	1	1	0
Winter-23	23/01/2023	Ref No 18	S	1	0	8/8	1	1	0
Winter-23	23/01/2023	Ref No 14	S	1	0	8/8	1	1	0
Winter-23	23/01/2023	Ref No 19	S	1	0	8/8	1	1	0
Winter-23	23/01/2023	Ref No 20	S	1	0	8/8	1	1	0
Winter-23	23/01/2023	Ref No 21	S	1	0	8/8	1	1	0
Winter-23	23/01/2023	Ref No 22	S	1	0	8/8	1	1	0
Winter-23	03/02/2023	Ref No 7	SW	4	0	7/8	2	4	0
Winter-23	03/02/2023	Ref No 8	SW	4	0	7/8	2	4	0

I-Webs and Breeding Wader Survey Effort									
Date	Survey	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Winter-23	03/02/2023	Ref No 10	SW	4	0	6/8	2	4	0
Winter-23	03/02/2023	Ref No 6	SW	4	0	7/8	2	4	0
Winter-23	03/02/2023	Ref No 5	SW	4	0	7/8	2	4	0
Winter-23	03/02/2023	Ref No 9	SW	4	0	7/8	2	4	0
Winter-23	10/02/2023	Ref No 13	SW	4	0	8/8	2	4	0
Winter-23	10/02/2023	Ref No 12	SW	4	0	8/8	2	4	0
Winter-23	10/02/2023	Derrycashel Bog	SW	4	2	8/8	2	4	0
Winter-23	10/02/2023	Ref No 15	SW	4	0	8/8	2	4	0
Winter-23	10/02/2023	Ref No 14	SW	4	0	8/8	2	4	0
Winter-23	10/02/2023	Ref No 17	SW	4	0	8/8	2	4	0
Winter-23	10/02/2023	Ref No 18	SW	4	0	8/8	2	4	0
Winter-23	16/02/2023	Ref No 19	SW	3	0	8/8	1	3	0
Winter-23	16/02/2023	Ref No 20	SW	3	0	8/8	1	3	0
Winter-23	16/02/2023	Rhynmount Bog VP1	SW	2	0	6/8	1	4	0
Winter-23	16/02/2023	Rhynmount Bog VP2	SW	2	0	8/8	1	4	0
Winter-23	16/02/2023	Rhynmount Bog VP3	SW	2	0	8/8	1	4	0
Winter-23	16/02/2023	Ref No 21	S	3	1	8/8	1	4	0
Winter-23	16/02/2023	Ref No 22	S	3	1	8/8	1	4	0
Winter-23	16/02/2023	Bunaclay, grass field.	S	3	1	8/8	1	4	0
Winter-23	03/03/2023	Ref No 8	NE	2	0	8/8	2	4	0

I-Webs and Breeding Wader Survey Effort									
Date	Survey	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Winter-23	03/03/2023	Ref No 10	NE	2	0	8/8	2	4	0
Winter-23	03/03/2023	Ref No 7	NE	2	0	8/8	2	4	0
Winter-23	03/03/2023	Ref No 5	NE	1	0	8/8	2	4	0
Winter-23	03/03/2023	Ref No 9	NE	1	0	8/8	2	4	0
Winter-23	16/03/2023	Rhynmount Bog VP1	S	3	0	7/8	2	4	0
Winter-23	16/03/2023	Rhynmount Bog VP2	S	3	0	7/8	2	4	0
Winter-23	16/03/2023	Rhynmount Bog VP3	S	4	0	8/8	2	4	0
Winter-23	16/03/2023	Ref No 13	S	3	4	8/8	2	4	0
Winter-23	16/03/2023	Ref No 12	S	3	4	8/8	2	4	0
Winter-23	16/03/2023	Derrycashel Bog	S	3	4	8/8	2	4	0
Winter-23	16/03/2023	Bunaclay, grass field. 1	S	3	4	8/8	2	4	0
Winter-23	16/03/2023	Bunaclay, grass field. 2	S	3	4	8/8	2	4	0
Winter-23	21/03/2023	Ref No 14	S	4	0	8/8	2	4	0
Winter-23	21/03/2023	Ref No 15	S	4	0	8/8	2	4	0
Winter-23	21/03/2023	Ref No 17	S	4	1	8/8	2	4	0
Winter-23	21/03/2023	Ref No 18	S	4	1	8/8	2	4	0
Winter-23	21/03/2023	Ref No 19	S	4	1	8/8	2	4	0

I-Webs and Breeding Wader Survey Effort									
Date	Survey	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Winter-23	21/03/2023	Ref No 20	S	4	1	8/8	2	4	0
Winter-23	21/03/2023	Ref No 21	S	4	1	8/8	2	4	0
Winter-23	21/03/2023	Ref No 22	S	4	1	8/8	2	4	0
Breeding-23	14/04/2023	N/A	NW	2	0	2	2	4	1
Breeding-23	27/04/2023	5 km	SE	3	0	8	2	4	0
Breeding-23	03/05/2023	N/A	SE	4	0	4	2	4	0
Breeding-23	26/05/2023	5 km	NE	2	0	2	2	4	0
Breeding-23	02/06/2023	North	E	2	0	4	2	4	0
Breeding-23	09/06/2023	5 km	E	3	0	5	2	4	0
Breeding-23	07/07/2023	North	S	3	1	7	2	4	0
Breeding-23	19/07/2023	5 km	NW	2	0	7	2	4	0
Breeding-23	03/08/2023	North	NW	3	1	7	2	4	0
Breeding-23	10/08/2023	5 km	S	4	0	7	2	4	0
Breeding-23	28/09/2023	North	S	4	4	8	2	4	0
Breeding-23	29/09/2023	North	SW	3	0	3	2	4	0
Winter-23	10/10/2023	North	SW	2	0	7	2	4	0
Winter-23	11/10/2023	North	NW	2	0	8	2	4	0
Winter-23	06/10/2023	5 km	SW	3	2	7	2	4	0
Winter-23	06/10/2023	5 km	SW	3	0	6	2	4	0
Winter-23	14/10/2023	5 km	W	3	0	2	2	4	0
Winter-23	14/10/2023	5 km	W	3	0	4	2	4	0
Winter-23	18/10/2023	5 km	E	4	4	8	1	3	0
Winter-23	18/10/2023	5 km	E	4	1	8	1	4	0
Winter-23	08/11/2023	North	SW	3	4	1	2	4	0

I-Webs and Breeding Wader Survey Effort									
Date	Survey	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Winter-23	13/11/2023	North	W	4	0	4	2	4	0
Winter-23	20/11/2023	South of site	NW	2	0	4	2	4	0
Winter-23	23/11/2023	South of site	W	3	0	4	2	4	0
Winter-23	27/11/2023	South of site	NW	2	1	8	2	4	0
Winter-23	27/11/2023	South of site	NW	4	0	5	2	4	0
Winter-23	08/12/2023	North	S	4	3	8	2	4	0
Winter-23	11/12/2023	North	SW	2	0	2	2	4	0
Winter-23	06/12/2023	South of site	SE	4	0	7	2	4	0
Winter-23	18/12/2023	South of site	SW	2	1	8	2	4	0
Winter-23	21/12/2023	South of site	NW	5	2	7	2	4	0
Winter-24	05/01/2024	North	W	2	0	3	2	4	0
Winter-24	12/01/2024	North	W	1	0	8	2	4	0
Winter-24	02/01/2024	Southern half of site	SW	3	4	8	1	3	0
Winter-24	02/01/2024	Southern half of site	SW	3	1	8	2	4	0
Winter-24	25/01/2024	South of site	SW	4	2	7	2	4	0

I-Webs and Breeding Wader Survey Effort									
Date	Survey	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Winter-24	26/01/2024	South of site	SW	3	0	2	2	4	0
Winter-24	06/02/2024	North	SW	3	1	8	2	4	0
Winter-24	14/02/2024	North	S	2	3	8	2	4	0
Winter-24	19/02/2024	South of site	W	3	0	5	2	4	0
Winter-24	21/02/2024	South of site	SW	3	2	7	2	4	0
Winter-24	23/02/2024	South of site	W	2	0	8	2	4	0
Winter-24	07/03/2024	North	SE	2	0	3	2	4	0
Winter-24	08/03/2024	North	E	3	0	6	2	4	0
Winter-24	14/03/2024	South Of Site	S	2	1	8	2	4	0
Winter-24	15/03/2024	South of site	NW	2	0	6	2	4	0
Winter-24	18/03/2024	South Of Site	S	3	0	7	2	4	0
Breeding-24	08/04/2024	South	SE	1	1	6	2	4	0
Breeding-24	15/04/2024	South	E	4	3	4	2	4	0
Breeding-24	16/04/2024	2 km buffer North of site	NW	4	2	6	2	4	0

I-Webs and Breeding Wader Survey Effort									
Date	Survey	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-24	17/04/2024	2 km buffer North of site	W	2	1	8	2	4	0
Breeding-24	18/04/2024	2 km buffer North of site	W	1	0	6	2	4	0
Breeding-24	10/05/2024	South	S	3	3	8	2	4	0
Breeding-24	13/05/2024	South	E	3	3	8	2	4	0
Breeding-24	14/05/2024	2km	E	3	2	8	2	4	0
Breeding-24	15/05/2024	2km	E	3	2	7	2	4	0
Breeding-24	16/05/2024	2km Buffer	NE	1	0	2	2	4	0
Breeding-24	07/06/2024	South	W	4	0	7	2	4	0
Breeding-24	11/06/2024	South	NW	4	0	7	2	4	0
Breeding-24	17/06/2024	2km buffer	NW	1	0	6	2	4	0
Breeding-24	18/06/2024	2km buffer	NW	2	0	4	2	4	0
Breeding-24	24/06/2024	2KM Buffer	SW	2	0	6	2	4	0
Breeding-24	03/07/2024	South	S	2	1	7	2	4	0
Breeding-24	05/07/2024	South	W	2	0	7	2	4	0
Breeding-24	24/07/2024	2km buffer	S	3	1	8	2	4	0
Breeding-24	29/07/2024	2km buffer	SW	2	0	7	2	4	0
Breeding-24	30/07/2024	2km buffer	NW	1	0	6	2	4	0
Breeding-24	08/08/2024	South	SE	3	1	7	2	4	0
Breeding-24	09/08/2024	South	W	4	0	7	2	4	0
Breeding-24	20/08/2024	2 Km buffer	W	4	2	5	2	4	0

I-Webs and Breeding Wader Survey Effort									
Date	Survey	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-24	21/08/2024	2 Km buffer	SW	3	1	8	1	3	0
Breeding-24	27/08/2024	2 Km buffer	SW	3	2	8	2	4	0
Breeding-24	02/09/2024	South	NW	3	1	7	2	4	0
Breeding-24	06/09/2024	South	NE	3	0	4	2	4	0
Breeding-24	03/09/2024	2km buffer	W	2	0	8	2	4	0
Breeding-24	04/09/2024	2km buffer	NW	3	2	7	2	4	0
Breeding-24	16/09/2024	2km buffer	S	2	0	2	2	4	0

Hen Harrier Vantage Point and Breeding Raptor Survey Effort

Hen Harrier Vantage Point and Breeding Raptor Survey Effort									
Date	Survey	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-22	19/04/2022	VP 1	W	4	0	7/8	1	4	0
Breeding-22	20/04/2022	VP 2	SW	3	0	3/7	1	4	0
Breeding-22	21/04/2022	VP 3	E	6	0	7/8	1	4	0
Breeding-22	22/04/2022	VP 4	NE	6	0	8/8	1	4	0
Breeding-22	19/04/2022	RVP 1	NW	1	0	8/8	2	4	0
Breeding-22	19/04/2022	RVP 2	WNW	1	0	7/8	2	4	0
Breeding-22	19/04/2022	RVP 3	WNW	3	4	8/8	1	4	0
Breeding-22	19/04/2022	Raptor Transect 1	NW	3	3	7/8	2	4	0
Breeding-22	17/05/2022	RVP 2	SSW	3	3	7/8	2	4	0
Breeding-22	17/05/2022	RVP 1	SSW	3	3	7/8	2	4	0
Breeding-22	19/05/2022	RVP 3	SSW	3	0	7/8	2	4	0
Breeding-22	19/05/2022	Raptor Transect 1	SSW	3	0	7/8	2	4	0
Breeding-22	19/05/2022	RVP 4	SSW	3	0	6/8	2	4	0
Breeding-22	04/05/2022	RVP6	W	4	0	4/8	2	4	0
Breeding-22	05/05/2022	RVP5	SW	4	0	7/8	1	4	0
Breeding-22	13/05/2022	RVP7	SW	4	0	7/8	1	4	0
Breeding-22	19/05/2022	RVP8	SW	4	0	2/8	2	4	0
Breeding-22	27/06/2022	RVP 1	SW	3	0	7/8	2	4	0
Breeding-22	28/06/2022	Raptor Transect 1	SSW	4	3	8/8	2	4	0
Breeding-22	28/06/2022	RVP 2	SSW	4	3	8/8	2	4	0
Breeding-22	28/06/2022	RVP 2	SSW	4	0	7/8	2	4	0
Breeding-22	29/06/2022	RVP 3	SSW	2	0	7/8	2	4	0
Breeding-22	30/06/2022	RVP 4	SSW	2	0	7/8	2	4	0
Breeding-22	08/06/2022	RVP8	SW	4	1	7/8	2	4	0

Hen Harrier Vantage Point and Breeding Raptor Survey Effort									
Date	Survey	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-22	08/06/2022	RVP6	SW	4	0	3/8	2	4	0
Breeding-22	08/06/2022	RVP7	SW	2	0	7/8	2	4	0
Breeding-22	08/06/2022	RVP5	NW	1	0	1/8	2	4	0
Breeding-22	06/07/2022	RVP5	W	4	0	8/8	2	4	0
Breeding-22	07/07/2022	Near T11	NW	2	0	8/8	2	4	0
Breeding-22	11/07/2022	RVP7	S	3	0	7/8	2	4	0
Breeding-22	14/07/2022	RVP6	W	1	0	6/8	2	4	0
Breeding-22	14/07/2022	RVP8	W	1	0	6/8	2	4	0
Breeding-22	04/07/2022	RVP 2	W	3	0	6/8	2	4	0
Breeding-22	05/07/2022	RVP 1	W	3	0	7/8	2	4	0
Breeding-22	07/07/2022	RVP 3	NW	2	0	6/8	2	4	0
Breeding-22	07/07/2022	RT 1	NW	2	0	6/8	2	4	0
Breeding-22	07/07/2022	RVP 4	NW	2	0	6/8	2	4	0
Breeding-22	04/08/2022	RVP 2	NW	2	0	7/8	2	4	0
Breeding-22	16/08/2022	RVP 1	N	3	0	7/8	2	4	0
Breeding-22	24/08/2022	RVP 3	SW	4	0	7/8	2	4	0
Breeding-22	24/08/2022	RVP 4	SW	4	0	7/8	2	4	0
Breeding-22	31/08/2022	Raptor Transect 1	ENE	2	0	6/8	2	4	0
Breeding-22	10/08/2022	RVP8	SW	1	0	1/8	2	4	0
Breeding-22	11/08/2022	RVP7	SW	1	0	0/8	2	4	0
Breeding-22	23/08/2022	RVP6	SW	2	0	4/8	2	4	0
Breeding-22	23/08/2022	RVP5	SW	2	0	3/8	2	4	0
Breeding-22	07/09/2022	RVP 1	SE	4	0	8/8	2	4	0
Breeding-22	07/09/2022	Raptor Transect 1	SE	4	0	8/8	2	4	0

Hen Harrier Vantage Point and Breeding Raptor Survey Effort									
Date	Survey	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-22	07/09/2022	RVP 3	SE	4	3	8/8	2	4	0
Breeding-22	07/09/2022	RVP 4	ESE	4	3	7/8	2	4	0
Breeding-22	07/09/2022	RVP 2	ESE	4	4	7/8	2	4	0
Breeding-22	13/09/2022	RVP6	N	1	0	8/8	2	4	0
Breeding-22	14/09/2022	RVP7	NW	1	0	8/8	2	4	0
Breeding-22	26/09/2022	RVP8	NW	5	1	8/8	2	4	0
Breeding-22	26/09/2022	RVP5	NW	5	1	8/8	2	4	0
Winter-22	04/10/2022	HHVP1	SW	1	0	8/8	2	3	0
Winter-22	05/10/2022	HHVP2	W	5	0	6/8	2	3	0
Winter-22	06/10/2022	HHVP3	SW	4	1	8/8	2	3	0
Winter-22	12/10/2022	HHVP4	W	1	0	5/8	2	3	0
Winter-22	13/10/2022	HHVP5	S	1	0	8/8	1	3	0
Winter-22	14/10/2022	HHVP6	W	1	0	1/8	1	3	0
Winter-22	04/11/2022	HHVP1	SW	2	0	8/8	2	4	0
Winter-22	04/11/2022	HHVP1	SW	2	0	8/8	2	3	0
Winter-22	07/11/2022	HHVP2	S	5	1	8/8	2	3	0
Winter-22	07/11/2022	HHVP2	S	4	0	8/8	2	3	0
Winter-22	08/11/2022	HHVP3	S	3	0	8/8	2	4	0
Winter-22	08/11/2022	HHVP3	S	3	0	8/8	2	3	0
Winter-22	15/11/2022	HHVP4	SE	2	0	3/8	2	4	0
Winter-22	15/11/2022	HHVP4	SE	2	0	4/8	2	3	0
Winter-22	16/11/2022	HHVP5	E	1	0	2/8	2	4	0
Winter-22	16/11/2022	HHVP5	E	1	0	4/8	2	3	0
Winter-22	18/11/2022	HHVP6	W	1	0	2/8	2	4	0

Hen Harrier Vantage Point and Breeding Raptor Survey Effort									
Date	Survey	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Winter-22	18/11/2022	HHVP6	W	1	0	3/8	2	3	0
Winter-22	01/12/2022	HHVP1	S	3	0	7/8	1	4	0
Winter-22	01/12/2022	HHVP1	S	3	0	8/8	1	3	0
Winter-22	05/12/2022	HHVP2	NE	3	1	7/8	2	4	0
Winter-22	05/12/2022	HHVP2	NE	3	1	8/8	2	3	0
Winter-22	06/12/2022	HHVP3	N	1	0	1/8	2	4	0
Winter-22	06/12/2022	HHVP3	N	1	0	1/8	2	3	0
Winter-22	07/12/2022	HHVP4	NW	2	0	4/8	2	4	0
Winter-22	07/12/2022	HHVP4	NW	2	0	4/8	2	3	0
Winter-22	08/12/2022	HHVP5	N	1	0	1/8	2	4	0
Winter-22	08/12/2022	HHVP5	N	1	0	1/8	2	3	1
Winter-22	12/12/2022	HHVP6	E	1	0	2/8	2	4	1
Winter-22	12/12/2022	HHVP6	E	1	0	2/8	2	3	1
Winter-23	10/01/2023	HHVP2	SW	4	1	8/8	1	4	0
Winter-23	10/01/2023	HHVP2	SW	3	0	8/8	1	3	0
Winter-23	11/01/2023	HHVP3	S	4	0	7/8	1	4	0
Winter-23	11/01/2023	HHVP3	SW	3	1	8/8	1	3	0
Winter-23	13/01/2023	HHVP6	SW	2	0	7/8	2	4	0
Winter-23	13/01/2023	HHVP6	SW	2	0	7/8	2	3	0
Winter-23	16/01/2023	HHVP1	SW	1	0	7/8	2	4	1
Winter-23	16/01/2023	HHVP1	SW	1	0	7/8	2	3	1
Winter-23	20/01/2023	HHVP4	SE	2	0	6/8	2	4	1
Winter-23	20/01/2023	HHVP4	SE	2	0	6/8	2	3	1
Winter-23	23/01/2023	HHVP5	S	1	0	8/8	1	1	1

Hen Harrier Vantage Point and Breeding Raptor Survey Effort									
Date	Survey	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Winter-23	23/01/2023	HHVP5	S	1	0	8/8	1	1	1
Winter-23	02/02/2023	HHVP1	SW	4	0	8/8	1	4	0
Winter-23	02/02/2023	HHVP1	SW	4	0	7/8	1	3	0
Winter-23	10/02/2023	HHVP5	SW	4	0	8/8	2	4	0
Winter-23	10/02/2023	HHVP5	SW	4	0	8/8	2	3	0
Winter-23	13/02/2023	HHVP4	S	4	0	4/8	2	4	0
Winter-23	13/02/2023	HHVP4	S	4	0	8/8	2	3	0
Winter-23	16/02/2023	HHVP6	SW	4	0	8/8	2	4	0
Winter-23	16/02/2023	HHVP6	SW	4	0	8/8	2	3	0
Winter-23	03/03/2023	HHVP1	E	1	0	8/8	2	4	0
Winter-23	03/03/2023	HHVP1	E	1	0	8/8	2	3	0
Winter-23	08/03/2023	HHVP4	E	4	0	8/8	2	4	0
Winter-23	08/03/2023	HHVP4	E	4	0	8/8	2	3	0
Winter-23	16/03/2023	HHVP5	SW	3	0	8/8	2	4	0
Winter-23	16/03/2023	HHVP5	SW	3	0	8/8	2	3	0
Winter-23	21/03/2023	HHVP6	S	4	1	8/8	2	4	0
Winter-23	21/03/2023	HHVP6	S	4	1	8/8	2	3	0
Breeding-23	07/04/2023	RVP 1	SSW	3	0	4	2	4	0
Breeding-23	10/04/2023	RVP 3	W	3	4	7	2	4	0
Breeding-23	10/04/2023	RVP 3	W	3	4	7	2	4	0
Breeding-23	10/04/2023	RVP 4	W	3	4	7	2	4	0
Breeding-23	10/04/2023	RVP 4	W	3	4	7	2	4	0
Breeding-23	10/04/2023	RVP 2	W	3	0	7	2	4	0
Breeding-23	10/04/2023	RVP 2	W	3	3	8	2	4	0

Hen Harrier Vantage Point and Breeding Raptor Survey Effort									
Date	Survey	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-23	14/04/2023	RVP 1	WNW	3	0	4	2	4	0
Breeding-23	25/04/2023	RVP 7	SE	2	0	7	2	4	0
Breeding-23	26/04/2023	RVP 6	SE	2	0	8	2	4	0
Breeding-23	27/04/2023	RVP 5	SE	3	0	8	2	4	0
Breeding-23	27/04/2023	RVP 8	SE	3	0	8	2	4	0
Breeding-23	08/05/2023	RVP 1	SW	3	0	7	2	4	0
Breeding-23	08/05/2023	RVP 3	SW	2	0	7	2	4	0
Breeding-23	08/05/2023	RVP 3	W	2	3	8	2	4	0
Breeding-23	08/05/2023	RVP 4	W	2	0	7	2	4	0
Breeding-23	09/05/2023	RVP 1	W	2	0	7	2	4	0
Breeding-23	10/05/2023	RVP 2	SW	2	2	8	2	4	0
Breeding-23	11/05/2023	RVP 5	NW	2	2	8	1	4	0
Breeding-23	11/05/2023	RVP 5	NW	2	0	7	2	4	0
Breeding-23	11/05/2023	RVP 7	NW	2	3	8	1	4	0
Breeding-23	11/05/2023	RVP 7	NW	2	2	7	2	4	0
Breeding-23	11/05/2023	RVP 6	NW	2	0	6	2	4	0
Breeding-23	11/05/2023	RVP 8	NW	2	0	6	2	4	0
Breeding-23	09/06/2023	RVP 1	E	3	0	6	2	4	0
Breeding-23	21/06/2023	RVP 2	SW	2	0	7	2	4	0
Breeding-23	21/06/2023	RVP 8	W	3	0	6	2	4	0
Breeding-23	28/06/2023	RVP 3	NW	1	4	8	1	3	0
Breeding-23	28/06/2023	RVP 4	NW	3	0	7	2	4	0
Breeding-23	28/06/2023	RVP 7	NW	3	0	7	2	4	0
Breeding-23	30/06/2023	RVP 5	W	2	0	8	2	4	0

Hen Harrier Vantage Point and Breeding Raptor Survey Effort									
Date	Survey	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-23	30/06/2023	RVP 6	W	3	0	8	2	4	0
Breeding-23	13/07/2023	RVP 1	SW	2	0	7	2	4	0
Breeding-23	19/07/2023	RVP 3	NW	2	0	7	2	4	0
Breeding-23	19/07/2023	RVP 4	NW	2	0	7	2	4	0
Breeding-23	28/07/2023	RVP 2	SW	3	0	7	2	4	0
Breeding-23	28/07/2023	RVP 5	SW	3	0	6	2	4	0
Breeding-23	28/07/2023	RVP 8	SW	3	0	6	2	4	0
Breeding-23	31/07/2023	RVP 7	SW	3	2	8	2	4	0
Breeding-23	31/07/2023	RVP 6	SW	3	0	7	2	4	0
Breeding-23	10/08/2023	RVP 4	S	4	0	7	2	4	0
Breeding-23	10/08/2023	RVP 1	S	4	0	7	2	4	0
Breeding-23	10/08/2023	RVP 1	S	4	3	7	2	4	0
Breeding-23	14/08/2023	RVP 3	NW	2	0	6	2	4	0
Breeding-23	14/08/2023	RVP 3	NW	1	0	6	2	4	0
Breeding-23	17/08/2023	RVP 2	SE	3	0	7	2	4	0
Breeding-23	17/08/2023	RVP 5	SE	3	0	6	2	4	0
Breeding-23	17/08/2023	RVP 6	SE	3	0	6	2	4	0
Breeding-23	18/08/2023	RVP 7	SE	3	0	8	2	4	0
Breeding-23	18/08/2023	RVP 8	SE	3	0	8	2	4	0
Winter-23	17/10/2023	HHVP3	SE	1	3	8	2	3	0
Winter-23	22/10/2023	HHVP5	E	2	0	6	1	3	0
Winter-23	29/10/2023	HHVP4	NE	2	0	7	1	4	0
Winter-23	31/10/2023	HHVP6	SE	2	0	6	1	4	0
Winter-23	06/10/2023	HHVP1	SW	2	0	6	2	4	0

Hen Harrier Vantage Point and Breeding Raptor Survey Effort									
Date	Survey	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Winter-23	18/10/2023	HHVP2	E	2	5	8	1	3	0
Winter-23	19/11/2023	HHVP3	W	3	0	6	2	4	0
Winter-23	21/11/2023	HHVP6	N	1	0	5	2	4	0
Winter-23	25/11/2023	HHVP4	N	1	0	8	2	3	0
Winter-23	26/11/2023	HHVP5	N	0	0	7	1	4	0
Winter-23	20/11/2023	HHVP1	NW	0	0	2	2	4	0
Winter-23	21/11/2023	HHVP2	W	1	0	8	2	4	0
Winter-23	07/12/2023	HHVP3	SE	3	0	6	2	4	0
Winter-23	22/12/2023	HHVP4	W	4	0	7	2	4	0
Winter-23	23/12/2023	HHVP6	SW	2	0	8	2	4	0
Winter-23	23/12/2023	HHVP5	SW	2	3	7	2	4	0
Winter-23	18/12/2023	HHVP1	W	1	0	7	2	4	0
Winter-23	20/12/2023	HHVP2	W	3	1	8	2	4	0
Winter-24	12/01/2024	HHVP5	SW	1	0	5	2	4	0
Winter-24	14/01/2024	HHVP6	SW	0	0	4	2	4	0
Winter-24	28/01/2024	HHVP3	SW	4	0	8	2	4	0
Winter-24	30/01/2024	HHVP4	SW	2	0	7	2	4	0
Winter-24	03/01/2024	HHVP1	W	1	0	4	2	4	0
Winter-24	10/01/2024	HHVP2	NE	1	0	7	2	4	2
Winter-24	13/02/2024	HHVP3	SW	0	0	7	1	4	0
Winter-24	18/02/2024	HHVP4	SW	1	0	6	1	4	0
Winter-24	28/02/2024	HHVP5	SW	2	2	8	2	3	0
Winter-24	20/02/2024	HHVP6	SW	3	0	6	2	4	0
Winter-24	21/02/2024	HHVP1	SW	2	0	7	2	4	0

Hen Harrier Vantage Point and Breeding Raptor Survey Effort									
Date	Survey	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Winter-24	22/02/2024	HHVP2	W	2	0	7	2	4	0
Winter-24	07/03/2024	HHVP3	SE	3	0	7	2	4	0
Winter-24	14/03/2024	HHVP4	SW	0	0	8	2	4	0
Winter-24	23/03/2024	HHVP5	SW	3	0	6	2	4	0
Winter-24	28/03/2024	HHVP6	SW	1	0	2	2	4	0
Winter-24	05/03/2024	HHVP1	S	1	0	7	2	4	0
Winter-24	06/03/2024	HHVP2	SE	2	0	8	2	4	0
Breeding-24	21/04/2024	N/A	NE	1	0	8	2	4	0
Breeding-24	25/04/2024	N/A	NW	1	1	8	2	4	0
Breeding-24	16/04/2024	2 km buffer	NW	3	0	6	2	4	0
Breeding-24	17/04/2024	RVP 7	W	3	2	7	2	4	0
Breeding-24	17/04/2024	RVP 8	W	3	0	7	2	4	0
Breeding-24	05/05/2024	VP1-5	NE	1	0	8	1	4	0
Breeding-24	19/05/2024	RVP2 to RVP4	N	1	0	1	2	4	0
Breeding-24	19/05/2024	RVP1 and RVP5	NE	1	0	1	2	4	0
Breeding-24	10/05/2024	2km	S	3	0	1	2	4	0
Breeding-24	15/05/2024	BO Roost watch 53.641033, -7.839886	E	0	0	2	2	4	0
Breeding-24	09/06/2024	1,2 and surround	W	1	0	8	2	4	0
Breeding-24	22/06/2024	1,3 and other areas	SW	2	0	2	2	4	0
Breeding-24	28/06/2024	4,5 and others	S	3	0	5	2	4	0
Breeding-24	30/06/2024	1,4 and others	NW	3	0	6	2	4	0
Breeding-24	30/06/2024	NA	NW	3	0	6	2	4	0
Breeding-24	14/06/2024	RVP7	SW	2	3	8	2	4	0

Hen Harrier Vantage Point and Breeding Raptor Survey Effort									
Date	Survey	Survey Location	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility	Frost	Snow
Breeding-24	14/06/2024	RVP8	SW	2	0	8	2	4	0
Breeding-24	14/06/2024	RVP6	SW	2	0	8	2	4	0
Breeding-24	14/07/2024	RVP 1,2,3 and surrounds	SE	1	0	8	2	4	0
Breeding-24	14/07/2024	RVP 1,2,3 and surrounds	SE	1	1	7	2	4	0
Breeding-24	20/07/2024	RVP 2,4,5 and surrounds	NW	2	2	8	2	3	0
Breeding-24	22/07/2024	RVP 2,4,5 and surrounds	N	3	2	8	2	3	0
Breeding-24	25/07/2024	2km buffer	SW	2	2	8	2	4	0
Breeding-24	11/08/2024	Around 2,3,4	SE	2	0	5	2	4	0
Breeding-24	16/08/2024	1,2 and surrounds	W	2	0	7	2	4	0
Breeding-24	24/08/2024	1,3 and surrounds	W	3	1	4	2	4	0
Breeding-24	24/08/2024	2,5 and surrounds	W	3	4	4	2	4	0
Breeding-24	27/08/2024	2 Km buffer	SW	3	0	5	2	4	0
Breeding-24	08/09/2024	1,5 and surrounds	N	3	0	6	2	4	0
Breeding-24	09/09/2024	3,4 and surrounds	SW	5	0	4	2	4	0
Breeding-24	23/09/2024	RVP2 and surrounds	N	1	0	8	2	4	0
Breeding-24	23/09/2024	North of 5 - Corlea	N	1	0	8	2	4	0
Breeding-24	12/09/2024	2km buffer	NW	3	2	5	2	4	0

Woodcock Transect Survey Effort

Woodcock Transect Survey Effort									
Date	Survey	Survey Location	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility
Breeding-22	04/05/2022	WK3	20:30	21:55	WNW	1	0	6/8	4
Breeding-22	13/05/2022	WK1	20:45	22:00	SW	4	0	7/8	4
Breeding-22	19/05/2022	WK2	20:45	22:00	SW	4	0	2/8	4
Breeding-22	28/06/2022	WK2	21:20	22:50	SSW	1	0	8/8	0
Breeding-22	29/06/2022	WK3	21:20	22:20	WNW	0	2	8/8	4
Breeding-22	29/06/2022	WK3	22:20	22:45	WNW	0	3	8/8	4
Breeding-22	09/06/2022	WK1	09:45	11:00	SW	2	0	2/8	4
Breeding-23	03/05/2023	WK3	20:50	22:05	SE	3	0	4	4
Breeding-23	04/05/2023	WK2	20:40	22:00	E	4	1	8	4
Breeding-23	24/05/2023	WK3	21:20	22:35	NW	3	0	7	4
Breeding-23	26/05/2023	WK2	21:20	22:35	NE	2	0	8	4
Breeding-23	08/05/2023	WK1	20:40	22:20	W	1	0	7	4
Breeding-23	25/05/2023	WK1	21:00	22:30	NW	1	0	4	4
Breeding-23	08/06/2023	WK3	21:35	22:50	E	3	0	8	4
Breeding-23	21/06/2023	WK2	21:45	23:00	W	3	1	4	4
Breeding-23	08/06/2023	WK1	21:40	22:55	E	1	0	5	4
Breeding-24	09/05/2024	WK2	20:16	22:16	S	1	0	8	4
Breeding-24	28/05/2024	WK2	21:00	22:30	SW	2	0	8	4
Breeding-24	08/05/2024	WK1	20:30	22:03	SW	0	0	3	4
Breeding-24	09/05/2024	WK3	20:30	22:05	SW	0	0	2	4
Breeding-24	22/05/2024	WK1	20:55	22:30	NW	1	0	6	4
Breeding-24	23/05/2024	WK3	21:05	22:35	NW	3	0	7	4
Breeding-24	06/06/2024	WK2	21:20	22:45	NW	0	0	3	4
Breeding-24	11/06/2024	WK1	21:20	22:50	NW	1	0	4	4

Woodcock Transect Survey Effort									
Date	Survey	Survey Location	Start Time	Finish Time	Wind Direction	Wind Speed	Rain	Cloud Cover	Visibility
Breeding-24	13/06/2024	WK3	21:20	22:55	SW	2	0	8	4

Appendix K.4 EUROPEAN GOLDEN PLOVER

Vantage Point (Flight)									
Season	VP	Date	Time	Abundance	Seconds in Band 1 (0-25m)	Seconds in Band 2 (26-50m)	Seconds in Band 3 (51-150m)	Seconds in Band 4 (151-200m)	Seconds in Band 5 (201+m)
Non-breeding	VP3	26/10/2021	08:33	5	37	0	0	0	0
Non-breeding	VP3	26/10/2021	09:51	1	37	35	0	0	0
Non-breeding	VP3	26/10/2021	13:25	5	5	13	62	0	0
Non-breeding	VP9	02/11/2021	08:36	16	64	0	0	0	0
Non-breeding	VP9	02/11/2021	08:48	26	60	5	210	0	0
Non-breeding	VP9	19/11/2021	08:00	21	89	20	0	0	0
Non-breeding	VP9	19/11/2021	09:01	9	37	5	0	0	0
Non-breeding	VP9	19/11/2021	09:26	13	66	10	50	0	0
Non-breeding	VP1	13/12/2021	09:46	20	5	3	310	0	0
Non-breeding	VP9	16/12/2021	11:13	3	5	10	30	0	0
Non-breeding	VP9	16/12/2021	11:50	28	0	0	233	0	7
Non-breeding	VP9	16/12/2021	14:01	3	2	3	0	0	0
Non-breeding	VP10	27/12/2021	10:47	8	5	10	0	0	0
Non-breeding	VP11	28/12/2021	09:22	1	10	20	0	0	0
Non-breeding	VP11	28/12/2021	11:09	35	20	0	0	0	0
Non-breeding	VP11	28/12/2021	11:40	57	0	0	30	0	0
Non-breeding	VP11	28/12/2021	12:09	1	0	0	11	0	0
Non-breeding	VP1	07/01/2022	09:44	8	0	0	20	0	0
Non-breeding	VP10	17/01/2022	09:45	40	5	5	5	0	0
Non-breeding	VP10	17/01/2022	11:09	40	4	4	7	0	0
Non-breeding	VP1	01/02/2022	09:35	2	10	0	0	0	0
Non-breeding	VP1	01/02/2022	09:45	6	0	0	40	0	0
Non-breeding	VP1	01/02/2022	09:57	44	0	0	60	0	0
Non-breeding	VP1	01/02/2022	10:35	45	0	0	20	0	0
Non-breeding	VP1	01/02/2022	10:47	4	10	0	0	0	0
Non-breeding	VP1	01/02/2022	11:30	500	0	0	300	0	0
Non-breeding	VP5	25/02/2022	12:58	30	0	0	80	0	0
Non-breeding	VP4	28/02/2022	12:00	1	0	0	60	0	0

Vantage Point (Flight)									
Season	VP	Date	Time	Abundance	Seconds in Band 1 (0-25m)	Seconds in Band 2 (26-50m)	Seconds in Band 3 (51-150m)	Seconds in Band 4 (151-200m)	Seconds in Band 5 (201+m)
Non-breeding	VP1	02/03/2022	11:09	6	0	0	100	0	0
Non-breeding	VP1	02/03/2022	13:03	7	0	30	0	0	0
Non-breeding	VP9	02/03/2022	10:48	48	5	5	132	0	0
Non-breeding	VP9	02/03/2022	11:09	19	0	0	98	0	0
Non-breeding	VP5	15/03/2022	09:51	24	0	30	0	0	0
Non-breeding	VP5	15/03/2022	13:21	50	0	0	50	0	0
Non-breeding	VP3	16/03/2022	10:01	60	0	0	40	0	0
Non-breeding	VP11	28/03/2022	10:10	5	0	20	0	0	0
Breeding	VP9	11/04/2022	13:12	95	0	130	0	0	0
Breeding	VP9	11/04/2022	13:30	59	0	65	0	0	0
Breeding	VP10	13/04/2022	10:24	15	30	0	0	0	0
Breeding	VP 5	29/09/2022	14:02	35	0	0	170	0	0
Non-breeding	VP8	04/10/2022	15:32	48	0	0	60	165	65
Non-breeding	VP7	05/10/2022	09:54	19	0	60	120	0	0
Non-breeding	VP9	06/10/2022	08:15	16	60	120	120	0	0
Non-breeding	VP9	06/10/2022	08:45	32	0	0	30	0	0
Non-breeding	VP9	06/10/2022	09:25	30	0	0	160	0	0
Non-breeding	VP9	06/10/2022	16:25	6	25	0	0	0	0
Non-breeding	VP11	13/10/2022	11:05	110	0	0	0	210	0
Non-breeding	VP8	03/11/2022	11:05	105	0	0	0	115	0
Non-breeding	VP8	03/11/2022	11:20	150	0	0	0	0	125
Non-breeding	VP11	14/11/2022	13:35	220	0	0	35	35	0
Non-breeding	VP11	14/11/2022	14:25	55	0	0	0	55	0
Non-breeding	VP11	14/11/2022	15:05	50	0	0	0	120	0
Non-breeding	VP9	15/11/2022	11:35	195	20	20	0	0	0
Non-breeding	VP9	09/02/2023	14:15	2	0	20	0	0	0
Breeding	VP9	07/04/2023	15:05	205	20	60	180	480	0
Breeding	VP9	07/04/2023	16:41	110	120	250	250	0	0

Vantage Point (Flight)									
Season	VP	Date	Time	Abundance	Seconds in Band 1 (0-25m)	Seconds in Band 2 (26-50m)	Seconds in Band 3 (51-150m)	Seconds in Band 4 (151-200m)	Seconds in Band 5 (201+m)
Non-breeding	VP10	03/10/2023	08:55	35	30	60	10	0	0
Non-breeding	VP10	03/10/2023	09:10	20	30	65	0	0	0
Non-breeding	VP10	03/10/2023	09:30	42	0	0	65	0	0
Non-breeding	VP10	03/10/2023	12:55	6	0	0	35	0	0
Non-breeding	VP7	04/10/2023	09:05	2	0	35	0	0	0
Non-breeding	VP8	06/10/2023	09:15	45	0	75	30	0	0
Non-breeding	VP8	06/10/2023	09:50	15	0	25	0	0	0
Non-breeding	VP8	06/10/2023	14:10	1	0	20	0	0	0
Non-breeding	VP6	09/10/2023	10:15	55	25	65	120	0	0
Non-breeding	VP6	09/10/2023	11:35	35	0	110	360	0	0
Non-breeding	VP6	09/10/2023	12:05	85	0	65	210	0	0
Non-breeding	VP6	09/10/2023	13:55	55	0	60	280	0	0
Non-breeding	VP9	12/10/2023	09:18	45	0	0	0	215	0
Non-breeding	VP11	24/11/2023	08:10	150	0	0	640	0	0
Non-breeding	VP11	07/12/2023	10:21	150	0	0	432	0	0
Non-breeding	VP6	04/01/2024	13:20	38	0	0	0	20	0
Non-breeding	VP6	04/03/2024	07:35	1	0	250	0	0	0
Non-breeding	VP6	04/03/2024	09:10	11	0	120	230	110	0
Non-breeding	VP6	04/03/2024	09:10	11	0	0	45	0	0
Non-breeding	VP6	04/03/2024	09:20	22	0	60	110	0	0
Non-breeding	VP10	05/03/2024	14:35	130	0	20	35	35	0
Non-breeding	VP9	07/03/2024	10:40	38	0	20	575	0	0

Vantage Point (Non-flight)									
Map Ref.	Season	VP	Date	Time	Abundance	Dominant Habitat	Activity	Breeding Code	Breeding Status
P01830	Non-breeding	VP9	06/10/2022	07:25	16	PB4	Roosting.	N/A	N/A

Vantage Point (Non-flight)									
Map Ref.	Season	VP	Date	Time	Abundance	Dominant Habitat	Activity	Breeding Code	Breeding Status
P01842	Non-breeding	VP9	15/11/2022	09:00	195	PB4	Roosting.	N/A	N/A
P04083	Breeding	VP9	07/04/2023	14:20	205	N/A	Roosting	N/A	N/A
P05860	Non-breeding	VP10	03/10/2023	07:10	50	N/A	Roosting	N/A	N/A
P06104	Breeding	VP9	11/04/2024	12:51	58	N/A	roosting	H	Possible

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P01949	Non-breeding	Ref No 8	08/11/2022	65	Roosting around shore-line.	N/A	N/A
P01989	Non-breeding	Ref No 18	17/11/2022	150	Roosting on flodded field.	N/A	N/A
P02032	Non-breeding	Ref No 8	07/12/2022	210	Roosting around shore-line.	N/A	N/A
P02089	Non-breeding	Ref No 17	12/12/2022	350	Roosting on flooded field.	N/A	N/A
P02227	Non-breeding	Ref No 8	03/02/2023	10	Roosting around shore-line.	N/A	N/A
P04201	Breeding	Rhymount VP2	14/04/2023	30	Flyover	F	Non-Breeding
P06377	Non-breeding	Ref No: 8	10/10/2023	25	Roosting	N/A	N/A
P06383	Non-breeding	Gortgallan Bog	10/10/2023	65	Circling	N/A	N/A
P06187	Non-breeding	Ref No: 8	08/11/2023	75	Roosting	N/A	N/A
P06193	Non-breeding	Gortgallan Bog	08/11/2023	7	Foraging	N/A	N/A
P06198	Non-breeding	Derrycashel Bog	08/11/2023	4	Roosting	N/A	N/A
P06220	Non-breeding	Onsite	13/11/2023	18	Roosting	N/A	N/A
P06519	Non-breeding	Ref No: 17	11/12/2023	42	Roosting	N/A	N/A
P06600	Non-breeding	Ref No: 8	05/01/2024	10	N/A	N/A	N/A
P04937	Breeding	Ref No:2	08/04/2024	5	Flushed from cover.	N/A	N/A

CBS & Winter Transect Survey									
Map Ref.	Season	Survey Location	Date	Time	Abundance	Dominant Habitat	Activity	Breeding Code	Breeding Status
P02535	Non-breeding	T14	04/10/2022	10:55	110	PB4	Circling.	N/A	N/A
P02536	Non-breeding	T14	04/10/2022	11:25	21	PB4	Circling.	N/A	N/A
P02579	Non-breeding	T21	05/10/2022	10:55	3	PB4	Foraging	N/A	N/A
P02599	Non-breeding	T20	05/10/2022	12:30	19	PB4	Circling.	N/A	N/A
P02632	Non-breeding	T13	06/10/2022	11:00	310	PB4	Circling.	N/A	N/A
P02797	Non-breeding	T14	03/11/2022	07:45	25	PB4	Flyover	N/A	N/A
P02816	Non-breeding	T15	03/11/2022	09:45	35	PB4	Flyover	N/A	N/A
P02882	Non-breeding	T17	08/11/2022	08:30	12	PB4	Roosting.	N/A	N/A
P02946	Non-breeding	T18	15/11/2022	07:45	165	PB4	Roosting.	N/A	N/A
P03031	Non-breeding	T17	08/12/2022	08:55	11	PB4	Roosting	N/A	N/A
P03106	Non-breeding	T18	12/12/2022	09:25	6	PB4	Roosting	N/A	N/A
P03295	Non-breeding	T13	13/01/2023	08:40	2	PB4	Roosting	N/A	N/A
P03410	Non-breeding	T17	23/01/2023	08:45	47	PB4	Roosting	N/A	N/A
P03526	Non-breeding	T17	09/02/2023	10:35	2	PB4	Roosting	N/A	N/A
P03838	Non-breeding	T18	08/03/2023	08:55	14	PB4	Roosting	N/A	N/A
P03853	Non-breeding	T17	14/03/2023	10:25	110	PB4	Roosting	N/A	N/A
P04235	Breeding	T10	06/04/2023	11:25	12	PB4	N/A	N/A	N/A
P06357	Non-breeding	T9	04/10/2023	10:35	130	PB4	Circling	N/A	N/A
P06366	Non-breeding	T2	10/10/2023	08:25	1	PB4	Flushed from cover.	N/A	N/A
P06420	Non-breeding	T13	14/10/2023	14:42	55	PB4	Flight	N/A	N/A
P06180	Non-breeding	T8	13/11/2023	10:10	13	PB4	Flyover	N/A	N/A
P06251	Non-breeding	T14	24/11/2023	13:06	15	PB4	Roosting	N/A	N/A
P06266	Non-breeding	T13	28/11/2023	08:51	60	PB4	Roosting	N/A	N/A
P06525	Non-breeding	T17	19/12/2023	12:10	3	PB4	Roosting	N/A	N/A
P06539	Non-breeding	T12	20/12/2023	11:10	28	PB4	Flushed	N/A	N/A
P06543	Non-breeding	T18	20/12/2023	13:42	15	PB4	Roosting	N/A	N/A
P05916	Non-breeding	T12	02/01/2024	15:46	56	PB4	N/A	N/A	N/A
P05993	Non-breeding	T17	20/02/2024	11:30	15	PB4	N/A	N/A	N/A
P05997	Non-breeding	T14	21/02/2024	16:04	25	PB4	N/A	N/A	N/A
P06056	Non-breeding	T12	05/03/2024	11:37	26	PB4	N/A	N/A	N/A
P06083	Non-breeding	T13	06/03/2024	12:08	7	PB4	N/A	N/A	N/A
P06087	Non-breeding	T17	06/03/2024	15:45	180	PB4	N/A	N/A	N/A

CBS & Winter Transect Survey									
Map Ref.	Season	Survey Location	Date	Time	Abundance	Dominant Habitat	Activity	Breeding Code	Breeding Status
P04996	Breeding	Transect 12	08/04/2024	15:50	18	pb4	N/A	H	Possible

Hinterland (Raptors) Survey & Hen Harrier Roost Watch						
Map Ref.	Season	Location	Date	Abundance	Breeding Code	Breeding Status
P00729	Non-breeding	HHVP4	24/11/2021	2	N/A	N/A

Incidental Sightings					
Map Ref.	Season	Date	Abundance	Breeding Code	Breeding Status
P04016	Non-breeding	11/01/2023	1	N/A	N/A

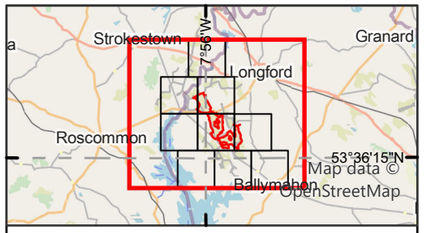
8°2'40"W
7°53'50"W
7°45'0"W
53°45'0"N
53°40'0"N
53°35'0"N
776000
768000
760000
593600
604000
614400

Sheet 1
Sheet 2
Sheet 3
Sheet 4
Sheet 5
Sheet 6

Strokestown Golf Club
Townparks (Longford By)
Enybegs
Ballytoohey
Termonbarry
Cloondara
Cloonrollagh
Cloonbalt
Longford
Feraghfad
Stonepark (Ardagh By)
Cloontuskert
Ballyleague
Knock
Keenagh
Fearagh
Knockcroghery
Galey
Lough Ree
Derrymacar Lough
Drinan
Ballymahon
Community

N5
R371
R194
R194
N63
R371
N55
R387
R368
N63
R392
R392
N55

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Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-23
- Breeding-24

Flightline observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-22
- Breeding-23

0 1.5 3
Kilometres

NOTES

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Rev	Date	Description	By	Chkd.
A	25/03/2025	First issue	S.P	I.H

Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Flight and non-flight observations European Golden Plover Overview

Scale @ A3: 1:85,000

Prepared by:	Checked by:	Date:
S.Pezzetta	I.Heanue	March 2025

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7°53'50"W

53°45'0"N

604000

776000

Ballytoohey

Termonbarry

Cloondara

M5

N5

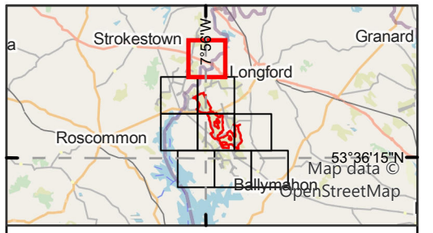
P06198

P06519

P02089

P01989

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Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-22/23
- Non-breeding-23/24

0 0.5 1

Kilometres

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Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Flight and non-flight observations
European Golden Plover
Sheet 1 of 6

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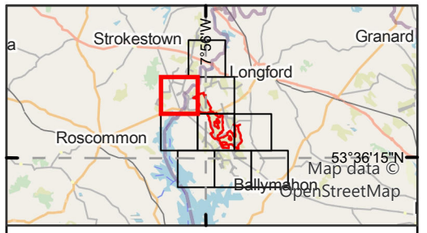
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Draft: A

8°2'40"W





Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-22/23
- Non-breeding-23/24

Flightline observations - Seasons

- Non-breeding-21/22

0 0.5 1
Kilometres

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Project: Derryadd Wind Farm

Title: Flight and non-flight observations
European Golden Plover
Sheet 2 of 6

Scale @ A3: 1:22,000

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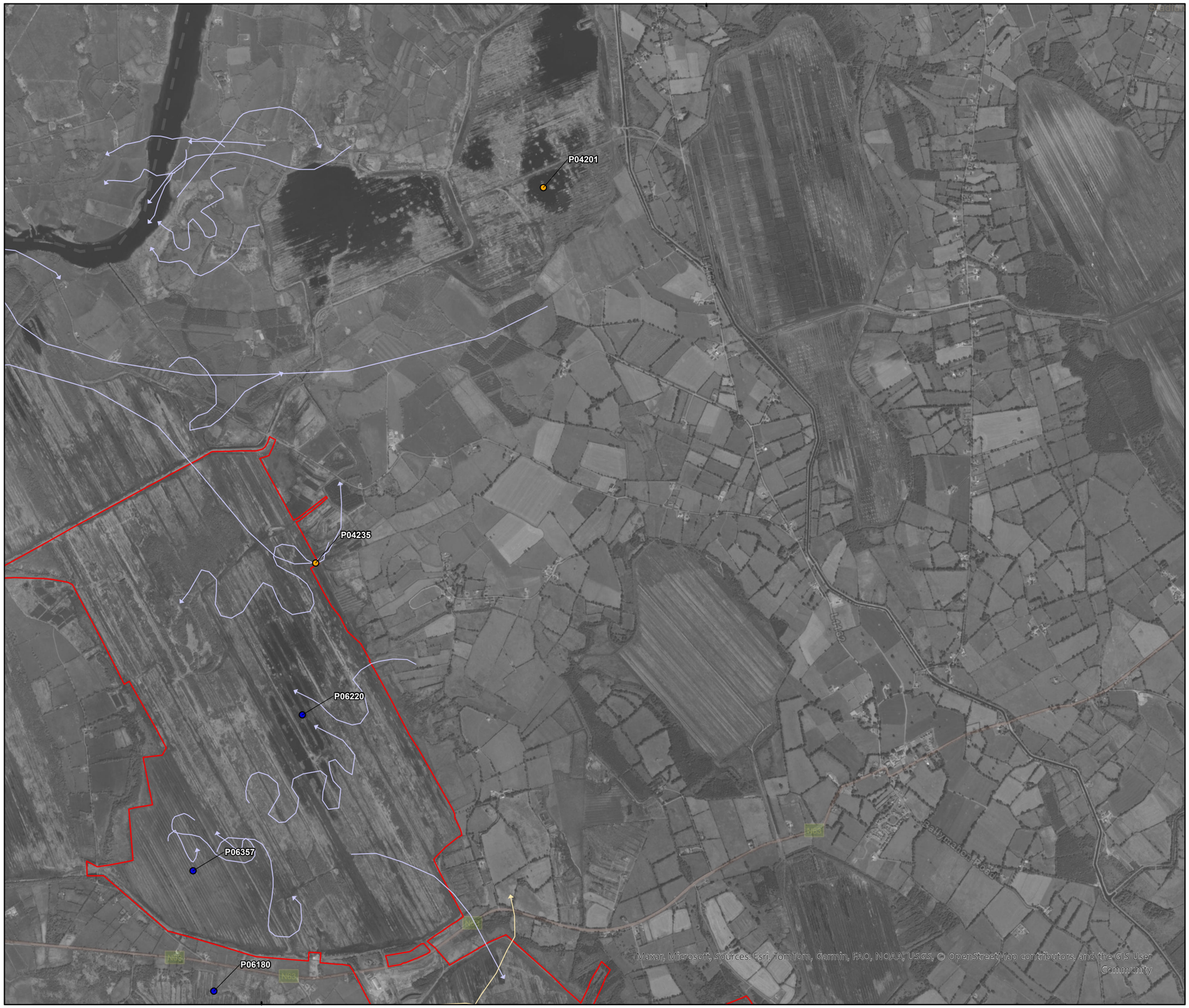
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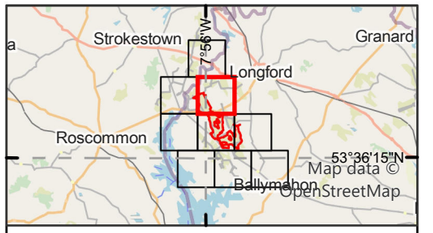
Map Ref: 11399-025.ApX-SUM-GP-TOB-A

Draft: A

7°53'50"W



604000



Legend

- Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-23/24
- Breeding-23

Flightline observations - Seasons

- Non-breeding-21/22
- Breeding-22

0 0.5 1
Kilometres

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Project: Derryadd Wind Farm

Title: Flight and non-flight observations
European Golden Plover
Sheet 3 of 6

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7°53'50"W

53°40'0"N

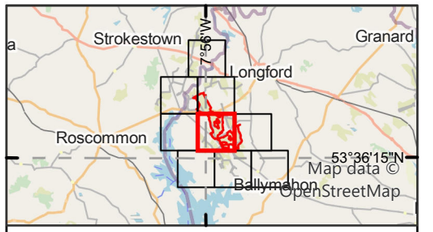
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604000

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N63 R392 R398 Ballymahon Road L4455

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Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-23
- Breeding-24

Flightline observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-22
- Breeding-23

0 0.5 1
Kilometres

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European Golden Plover
Sheet 4 of 6

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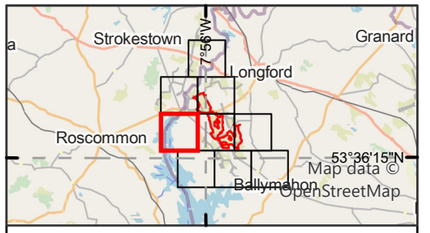
Draft: A

8°2'40"W

53°40'0"N

768000





Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-21/22
- Non-breeding-23/24

0 0.5 1
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Title: Flight and non-flight observations
European Golden Plover
Sheet 5 of 6

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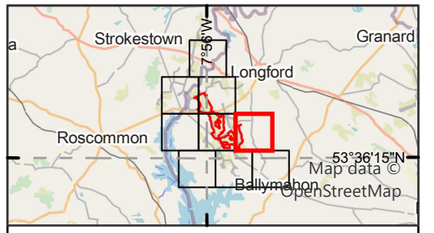
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Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-23
- Breeding-24

Flightline observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-22
- Breeding-23

0 0.5 1
Kilometres

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Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Flight and non-flight observations
European Golden Plover
Sheet 6 of 6

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Appendix K.5 NORTHERN LAPWING

Vantage Point (Flight)									
Season	VP	Date	Time	Abundance	Seconds in Band 1 (0-25m)	Seconds in Band 2 (26-50m)	Seconds in Band 3 (51-150m)	Seconds in Band 4 (151-200m)	Seconds in Band 5 (201+m)
VP3	04/05/2021	15:22	3	48	47	0	0	0	VP3
VP3	04/05/2021	17:45	2	27	0	0	0	0	VP3
VP4	05/05/2021	11:11	1	14	0	0	0	0	VP4
VP5	05/05/2021	17:17	1	3	0	0	0	0	VP5
VP5	05/05/2021	18:18	1	17	0	0	0	0	VP5
VP5	05/05/2021	19:13	1	13	0	0	0	0	VP5
VP5	06/05/2021	08:36	1	4	0	0	0	0	VP5
VP6	07/05/2021	13:27	1	45	0	0	0	0	VP6
VP3	02/06/2021	13:32	8	38	35	62	0	0	VP3
VP4	10/06/2021	14:07	1	27	0	0	0	0	VP4
VP4	10/06/2021	15:25	1	23	22	0	0	0	VP4
VP4	10/06/2021	17:21	1	34	0	0	0	0	VP4
VP4	10/06/2021	17:55	1	12	0	0	0	0	VP4
VP4	10/06/2021	19:06	1	25	0	0	0	0	VP4
VP5	16/06/2021	17:31	1	16	0	0	0	0	VP5
VP6	17/06/2021	13:10	1	86	0	0	0	0	VP6
VP10	24/06/2021	15:50	1	31	32	0	0	0	VP10
VP10	24/06/2021	16:09	2	36	0	0	0	0	VP10
VP10	24/06/2021	18:43	1	25	0	0	0	0	VP10
VP3	05/07/2021	16:53	1	13	0	0	0	0	VP3
VP1	06/07/2021	09:30	15	25	78	105	0	0	VP1
VP1	06/07/2021	11:03	2	36	0	0	0	0	VP1
VP1	06/07/2021	15:34	2	18	61	0	0	0	VP1
VP5	27/07/2021	11:00	26	9	41	231	0	0	VP5
VP5	27/07/2021	18:14	10	8	11	53	0	0	VP5
VP1	29/07/2021	12:22	2	12	10	15	0	0	VP1
VP10	11/08/2021	11:37	63	0	17	81	0	0	VP10
VP1	06/09/2021	09:28	4	27	0	0	0	0	VP1

Vantage Point (Flight)									
Season	VP	Date	Time	Abundance	Seconds in Band 1 (0-25m)	Seconds in Band 2 (26-50m)	Seconds in Band 3 (51-150m)	Seconds in Band 4 (151-200m)	Seconds in Band 5 (201+m)
VP1	24/09/2021	17:06	2	36	0	0	0	0	VP1
VP1	27/09/2021	08:33	2	12	33	0	0	0	VP1
VP1	01/10/2021	13:14	2	33	22	0	0	0	VP1
VP1	01/10/2021	08:12	2	12	41	0	0	0	VP1
VP4	02/10/2021	14:14	2	12	51	0	0	0	VP4
VP2	28/10/2021	10:24	8	61	0	0	0	0	VP2
VP2	28/10/2021	12:44	2	30	32	0	0	0	VP2
VP2	23/11/2021	11:06	60	42	0	0	0	0	VP2
VP8	24/11/2021	13:04	1	0	30	0	0	0	VP8
VP4	25/11/2021	11:40	33	26	120	0	0	0	VP4
VP1	01/12/2021	08:46	4	23	0	0	0	0	VP1
VP1	01/12/2021	08:50	32	25	7	0	0	0	VP1
VP1	01/12/2021	09:18	5	16	0	0	0	0	VP1
VP1	01/12/2021	09:20	25	19	7	0	0	0	VP1
VP1	01/12/2021	09:28	16	18	0	0	0	0	VP1
VP1	01/12/2021	09:31	63	110	10	0	0	0	VP1
VP1	01/12/2021	10:17	48	5	25	72	0	0	VP1
VP1	01/12/2021	11:40	90	0	0	58	0	0	VP1
VP1	01/12/2021	13:09	17	18	0	0	0	0	VP1
VP1	01/12/2021	13:11	3	8	2	0	0	0	VP1
VP1	01/12/2021	13:30	27	21	0	0	0	0	VP1
VP1	13/12/2021	09:42	110	5	33	272	0	0	VP1
VP2	14/12/2021	10:25	5	35	0	0	0	0	VP2
VP2	14/12/2021	13:41	6	0	60	0	0	0	VP2
VP11	28/12/2021	10:57	1	10	0	50	0	0	VP11
VP1	07/01/2022	09:35	33	0	10	0	0	0	VP1
VP1	07/01/2022	11:16	6	0	0	30	0	0	VP1
VP1	07/01/2022	15:47	3	10	10	0	0	0	VP1

Vantage Point (Flight)									
Season	VP	Date	Time	Abundance	Seconds in Band 1 (0-25m)	Seconds in Band 2 (26-50m)	Seconds in Band 3 (51-150m)	Seconds in Band 4 (151-200m)	Seconds in Band 5 (201+m)
VP2	17/01/2022	09:55	19	0	30	0	0	0	VP2
VP2	17/01/2022	03:23	3	0	30	0	0	0	VP2
VP1	01/02/2022	09:35	26	10	20	0	0	0	VP1
VP1	01/02/2022	09:57	60	0	40	40	0	0	VP1
VP1	01/02/2022	10:55	7	0	30	0	0	0	VP1
VP2	03/02/2022	10:56	25	0	0	40	0	0	VP2
VP2	03/02/2022	11:18	44	20	40	0	0	0	VP2
VP5	25/02/2022	12:58	12	0	60	0	0	0	VP5
VP6	25/02/2022	14:05	11	5	23	0	0	0	VP6
VP4	28/02/2022	09:40	3	0	30	0	0	0	VP4
VP4	28/02/2022	11:00	26	0	10	90	0	0	VP4
VP1	02/03/2022	10:11	6	5	0	0	0	0	VP1
VP1	02/03/2022	13:01	6	0	0	20	0	0	VP1
VP1	02/03/2022	13:44	18	0	25	0	0	0	VP1
VP2	07/03/2022	14:16	2	0	0	20	0	0	VP2
VP5	15/03/2022	10:39	1	0	0	10	0	0	VP5
VP5	15/03/2022	11:42	3	10	0	0	0	0	VP5
VP5	15/03/2022	13:23	1	0	15	0	0	0	VP5
VP3	16/03/2022	09:51	7	0	20	0	0	0	VP3
VP 4	15/04/2022	11:13	2	10	30	20	0	0	VP 4
VP10	12/05/2022	18:31	1	29	0	0	0	0	VP10
VP 4	27/06/2022	19:48	2	0	75	0	0	0	VP 4
VP10	07/07/2022	15:45	24	15	25	0	0	0	VP10
VP10	04/11/2022	14:25	21	0	0	30	0	0	VP10
VP1	14/11/2022	11:10	37	6	0	0	0	0	VP1
VP5	28/11/2022	10:36	1	0	0	8	0	0	VP5
VP10	01/12/2022	12:05	35	30	30	30	165	0	VP10
VP 1	16/12/2022	09:25	7	7	0	0	0	0	VP 1

Vantage Point (Flight)									
Season	VP	Date	Time	Abundance	Seconds in Band 1 (0-25m)	Seconds in Band 2 (26-50m)	Seconds in Band 3 (51-150m)	Seconds in Band 4 (151-200m)	Seconds in Band 5 (201+m)
VP1	16/12/2022	15:37	4	6	0	0	0	0	VP1
VP1	09/01/2023	14:25	50	6	30	0	0	0	VP1
VP10	09/01/2023	13:40	62	10	10	20	30	0	VP10
VP10	09/01/2023	14:20	62	10	10	30	230	0	VP10
VP1	06/02/2023	12:15	70	0	8	0	0	0	VP1
VP7	14/02/2023	15:25	35	5	10	0	0	0	VP7
VP7	14/02/2023	16:45	35	0	0	85	0	0	VP7
VP7	14/02/2023	17:15	65	0	0	155	0	0	VP7
VP7	08/03/2023	15:30	34	30	55	0	0	0	VP7
VP5	29/03/2023	12:27	1	12	0	0	0	0	VP5
VP7	05/06/2023	20:10	3	10	45	0	0	0	VP7
VP2	15/06/2023	19:48	2	0	10	40	0	0	VP2
VP5	26/06/2023	20:15	1	0	20	0	0	0	VP5
VP9	29/06/2023	08:11	5	0	40	0	0	0	VP9
VP4	06/07/2023	10:55	1	0	0	45	0	0	VP4
VP6	13/07/2023	15:06	4	20	175	0	0	0	VP6
VP8	24/07/2023	20:09	8	0	45	0	0	0	VP8
VP1	03/10/2023	11:15	1	18	0	0	0	0	VP1
VP1	07/11/2023	10:12	1	5	2	0	0	0	VP1
VP4	12/11/2023	11:40	85	0	130	0	0	0	VP4
VP9	22/11/2023	15:46	12	10	20	25	0	0	VP9
VP1	11/12/2023	11:11	1	3	0	0	0	0	VP1
VP1	11/12/2023	11:19	1	1	0	0	0	0	VP1
VP4	06/01/2024	12:09	5	8	0	0	0	0	VP4
VP1	16/01/2024	15:21	2	11	0	0	0	0	VP1
VP7	06/03/2024	13:30	1	0	30	85	0	0	VP7
VP6	08/05/2024	06:35	4	65	85	0	0	0	VP6
VP6	08/05/2024	07:05	2	135	120	0	0	0	VP6

Vantage Point (Flight)									
Season	VP	Date	Time	Abundance	Seconds in Band 1 (0-25m)	Seconds in Band 2 (26-50m)	Seconds in Band 3 (51-150m)	Seconds in Band 4 (151-200m)	Seconds in Band 5 (201+m)
VP6	08/05/2024	07:30	4	120	100	0	0	0	VP6
VP6	08/05/2024	08:55	4	75	0	0	0	0	VP6
VP5	28/05/2024	11:13	2	2	0	0	0	0	VP5
VP5	28/05/2024	15:21	1	3	0	0	0	0	VP5
VP6	06/06/2024	11:40	1	30	60	0	0	0	VP6

Vantage Point (Non-flight)									
Map Ref.	Season	VP	Date	Time	Abundance	Dominant Habitat	Activity	Breeding Code	Breeding Status
P00951	Breeding	VP10	09/06/2022	12:55	2	PB4	Flushed	H	Possible
P00952	Breeding	VP9	09/06/2022	15:30	2	PB4	Flushed	A	Probable
P00957	Breeding	VP10	07/07/2022	10:55	24	PB4	Roosting/ Foraging.	FL	Confirmed
P00961	Breeding	VP10	07/07/2022	10:55	1	PB4	Roosting	N/A	N/A
P00969	Breeding	VP4	27/07/2022	16:11	1	pb4	In suitable breeding habitat	H	Possible
P01862	Non-breeding	VP10	02/02/2023	08:40	28	PB4	Roosting.	N/A	N/A
P01868	Non-breeding	VP7	14/02/2023	11:25	9	PB4	Roosting.	N/A	N/A
P01884	Non-breeding	VP7	08/03/2023	13:20	5	PB4	Display	N/A	N/A
P04104	Breeding	VP4	24/05/2023	07:55	1	N/A	Display	D	Probable
P04117	Breeding	VP4	08/06/2023	17:10	1	N/A	Roosting	N/A	N/A
P04138	Breeding	VP4	01/08/2023	10:45	1	N/A	Flushed	N/A	N/A
P05859	Non-breeding	VP10	03/10/2023	07:10	32	N/A	Roosting	N/A	N/A
P05887	Non-breeding	VP6	04/03/2024	09:05	1	N/A	Foraging	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P00014	Breeding	N/A	19/05/2021	2	N/A	S	Possible
P00020	Breeding	N/A	19/05/2021	2	N/A	H	Possible
P00867	Breeding	53.6665599, -7.8859379	19/05/2021	2	singing/displaying. Occ terr	D	Probable
P00873	Breeding	53.6932033, -7.9679042	19/05/2021	2	occ terr	H	Possible
P00004	Breeding	N/A	21/05/2021	2	N/A	H	Possible
P00005	Breeding	N/A	21/05/2021	8	N/A	H	Possible
P00006	Breeding	N/A	21/05/2021	2	N/A	H	Possible
P00857	Breeding	53.6577184, -7.8971227	21/05/2021	2	Occ terr	H	Possible
P00858	Breeding	53.6577184, -7.8971227	21/05/2021	8	Occ terr	H	Possible
P00859	Breeding	53.6577184, -7.8971227	21/05/2021	2	Occ terr	H	Possible
P00023	Breeding	N/A	01/06/2021	2	N/A	H	Possible
P00876	Breeding	53.6932033, -7.9679042	01/06/2021	2	occ terr	H	Possible
P00034	Breeding	N/A	03/06/2021	10	N/A	H	Possible
P00036	Breeding	N/A	03/06/2021	2	N/A	H	Possible
P00887	Breeding	53.6577184, -7.8971227	03/06/2021	10	occ terr	H	Possible
P00889	Breeding	53.6665599, -7.8859379	03/06/2021	2	Occ terr	H	Possible
P00040	Breeding	N/A	16/06/2021	2	Confirmed. Ad with recently fledged young.	FL	Confirmed
P00893	Breeding	53.6932033, -7.9679042	16/06/2021	2	Confirmed. Ad with recently fledged young.	FL	Confirmed
P00042	Breeding	N/A	17/06/2021	14	Confirmed. Ad's with at least 2 recently fledged young.	FL	Confirmed
P00043	Breeding	N/A	17/06/2021	2	occ terr	H	Possible

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P00895	Breeding	53.6577184, -7.8971227	17/06/2021	14	Confirmed. Ad's with at least 2 recently fledged young.	FL	Confirmed
P00896	Breeding	53.6577184, -7.8971227	17/06/2021	2	occ terr	H	Possible
P00049	Breeding	N/A	18/06/2021	2	Occ terr	H	Possible
P00902	Breeding	53.6665599, -7.8859379	18/06/2021	2	Occ terr	H	Possible
P01113	Breeding	New site	22/04/2022	2	Suitable nesting habitat, flying/call display over bog.	D	Probable
P01122	Breeding	New site	22/04/2022	3	Suitable nesting habitat, flying/call display over bog.	N/A	N/A
P01295	Breeding	Corlea Wetlands	05/05/2022	1	Suitable nesting habitat	H	Possible
P01305	Breeding	Rhynmount Bog.	10/05/2022	4	Adult seen incubating. 3 others mobbing HC	ON	Confirmed
P01309	Breeding	Rhynmount Bog.	10/05/2022	3	Flushed and alarm calling.	A	Probable
P01313	Breeding	Rhynmount Bog.	10/05/2022	4	Flushed and alarm calling.	A	Probable
P01332	Breeding	Ref: 4	12/05/2022	1	Foraging on field.	N/A	N/A
P01472	Breeding	Rhynmount Bog.	14/06/2022	1	Flying over.	F	Non-Breeding
P01476	Breeding	Rhynmount Bog.	14/06/2022	3	Grounded on small island.	H	Possible
P01488	Breeding	Corlea Wetlands	20/06/2022	1	Alarm call heard, not seen.	A	Probable
P01566	Breeding	Site NW of T13	06/07/2022	2	Suitable nesting habitat, flushed and alarm calling.	A	Probable

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P01568	Breeding	Site NW of T13	06/07/2022	3	Suitable nesting habitat, flushed and alarm calling.	A	Probable
P01579	Breeding	ref: 4	06/07/2022	1	Foraging around the wetland.	N/A	N/A
P01588	Breeding	ref: 8	11/07/2022	1	Foraging on grass field.	N/A	N/A
P01692	Breeding	ref: 8	10/08/2022	1	Foraging around the shoreline.	N/A	N/A
P01797	Breeding	Ref No: 8	13/09/2022	25	Roosting around the shoreline.	N/A	N/A
P01818	Breeding	Rhynmount Bog.	14/09/2022	1	Calling from cover, couldn't see the bird probably more than 1 present.	N/A	N/A
P01904	Non-breeding	Ref No 8	13/10/2022	75	Roosting around shore-line.	N/A	N/A
P01940	Non-breeding	iwebs 1234	31/10/2022	57	Mostly on 'island' but sometimes flying and then returning to roost	N/A	N/A
P02012	Non-breeding	Site 4	06/11/2022	100	In 3 groups 40/30/30. The largest group on 'island' in middle of turlough	N/A	N/A
P02024	Non-breeding	Near site 4, LeTergullion	06/11/2022	23	Roosting (WN,SV, MA, L)	N/A	N/A
P01948	Non-breeding	Ref No 8	08/11/2022	85	Roosting around shore-line.	N/A	N/A
P01959	Non-breeding	Ref No 5	08/11/2022	7	Roosting around shore-line of island.	N/A	N/A
P01964	Non-breeding	Rhynmount Bog	16/11/2022	5	Flyover	N/A	N/A
P01988	Non-breeding	Ref No 18	17/11/2022	210	Roosting on flodded field.	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P02004	Non-breeding	Site 23	27/11/2022	4	Sometimes just loafing around, preening, standing but also feeding in muddy wet grass	N/A	N/A
P02005	Non-breeding	Site 4	27/11/2022	43	10 individuals on ground but joined by 33 more flying in from the east. The letter landed at same location, roosting, feeding and loafing.	N/A	N/A
P02031	Non-breeding	Ref No 8	07/12/2022	180	Roosting around shore-line.	N/A	N/A
P02038	Non-breeding	Ref No 10	07/12/2022	25	Roosting on flooded field.	N/A	N/A
P02048	Non-breeding	Ref No 5	07/12/2022	5	Roosting on island.	N/A	N/A
P02087	Non-breeding	Ref No 17	12/12/2022	45	Roosting on flooded field.	N/A	N/A
P02096	Non-breeding	Fermoyle, Nr site 4 turlough	17/12/2022	3	Flying	N/A	N/A
P02101	Non-breeding	Site 4, Turlough at LeTergullion	17/12/2022	2	Flew in from the east with CU	N/A	N/A
P02103	Non-breeding	Site 23 Ballyduff, Stewart Family farm	17/12/2022	2	One flew over head NE, the other in field feeding	N/A	N/A
P02113	Non-breeding	Site 4, Turlough at LeTergullion	27/12/2022	25	Roosting at side of turlough	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P02131	Non-breeding	Site 23, Ballyduff, Stewart Family farm	27/12/2022	60	Most roosting. A few feeding and moving about	N/A	N/A
P02170	Non-breeding	Ref No 8	10/01/2023	35	Foraging around shore-line.	N/A	N/A
P02132	Non-breeding	Site 23 Ballyduff	15/01/2023	15	Flying, heading South	N/A	N/A
P02312	Non-breeding	Site 23 Ballyduff	15/01/2023	15	Flying, heading South	N/A	N/A
P02209	Non-breeding	Ref No 17	23/01/2023	72	Roosting on flooded field.	N/A	N/A
P02147	Non-breeding	Site 4, Turlough	29/01/2023	120	Circling overhead until eventually all landing onwestern bank	N/A	N/A
P02327	Non-breeding	Site 4, Turlough	29/01/2023	120	Circling overhead until eventually all landing onwestern bank	N/A	N/A
P02226	Non-breeding	Ref No 8	03/02/2023	94	Roosting around shore-line.	N/A	N/A
P02229	Non-breeding	Ref No 10	03/02/2023	80	Foraging on flooded field.	N/A	N/A
P02268	Non-breeding	Rhynmount Bog VP2	16/02/2023	1	Call/ flight display	N/A	N/A
P02299	Non-breeding	East of Site 4, Newpark	25/02/2023	18	Flew in circled then landed beside water	N/A	N/A
P02370	Non-breeding	East of Site 4, Newpark	25/02/2023	18	Flew in circled then landed beside water	N/A	N/A
P02443	Non-breeding	Ref No 5	03/03/2023	55	Roosting on island.	N/A	N/A
P02458	Non-breeding	Rhynmount Bog VP2	16/03/2023	2	Roosting	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P04202	Breeding	Rhymount VP2	14/04/2023	4	Alarm calling/ flight display.	A	Probable
P04213	Breeding	Onsite	14/04/2023	5	Alarm calling/ flight display.	A	Probable
P04214	Breeding	Onsite	14/04/2023	4	Alarm calling/ flight display.	A	Probable
P04286	Breeding	Turlough	27/04/2023	2	Pair of Lapwing in suitable habitat, alarm calling, probably breeding	P	Probable
P04323	Breeding	Onsite	03/05/2023	1	Alarm call flight display	A	Probable
P04324	Breeding	Onsite	03/05/2023	2	Alarm call flight display	A	Probable
P04328	Breeding	Onsite	03/05/2023	1	Alarm call flight display	A	Probable
P04332	Breeding	Rhynmount VP2	03/05/2023	5	1 bird on nest	ON	Confirmed
P04354	Breeding	Derrycashel Bog	03/05/2023	1	Alarm call flight display	A	Probable
P04429	Breeding	5 KM radius	26/05/2023	1	Lapwing alarm calling, probably breeding	A	Probable
P04468	Breeding	Onsite	02/06/2023	6	Alarm calling	A	Probable
P04473	Breeding	Onsite	02/06/2023	4	Alarm calling	A	Probable
P04480	Breeding	Rhynmount VP2	02/06/2023	4	Foraging	N/A	N/A
P04491	Breeding	Derrycashel Bog	02/06/2023	1	Alarm calling	A	Probable
P04524	Breeding	5 KM radius	09/06/2023	2	Pair of Lapwing alarm calling.	A	Probable
P04606	Breeding	Onsite	07/07/2023	16	Roosting, fixed flock of adults and juvs.	H	Possible
P04631	Breeding	Ref No: 8	07/07/2023	21	Roosting	N/A	N/A
P04723	Breeding	Rhynmount VP2	03/08/2023	1	Roosting	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P06376	Non-breeding	Ref No: 8	10/10/2023	17	Roosting	N/A	N/A
P06397	Non-breeding	Rhynmount	11/10/2023	3	Roosting	N/A	N/A
P06447	Non-breeding	4	14/10/2023	10	10 Lapwing on turlough	N/A	N/A
P06189	Non-breeding	Ref No: 8	08/11/2023	45	Roosting	N/A	N/A
P06215	Non-breeding	Grass field	13/11/2023	15	Roosting	N/A	N/A
P06219	Non-breeding	Onsite	13/11/2023	48	Roosting	N/A	N/A
P06299	Non-breeding	4	23/11/2023	15	15 Lapwing at edge of turlough	N/A	N/A
P06315	Non-breeding	N/A	27/11/2023	2	2 Lapwing flying over.	N/A	N/A
P06327	Non-breeding	4	27/11/2023	70	70 Lapwing on turlough	N/A	N/A
P06558	Non-breeding	4	06/12/2023	2	2 Lapwing on Turlough	N/A	N/A
P06564	Non-breeding	4	06/12/2023	2	2 Lapwing flying over	N/A	N/A
P06518	Non-breeding	Ref No: 17	11/12/2023	165	Roosting	N/A	N/A
P06599	Non-breeding	Ref No: 8	05/01/2024	72	N/A	N/A	N/A
P06615	Non-breeding	Ref No: 13	12/01/2024	1	N/A	N/A	N/A
P06621	Non-breeding	Ref No: 17	12/01/2024	6	N/A	N/A	N/A
P06684	Non-breeding	Ref No: 8	06/02/2024	9	N/A	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P06709	Non-breeding	Rhynmount	14/02/2024	1	N/A	N/A	N/A
P06739	Non-breeding	Southern half of site	19/02/2024	55	55 Lapwing at edge of Turlough	N/A	N/A
P06754	Non-breeding	Southern half of site	21/02/2024	75	Flying west	N/A	N/A
P06760	Non-breeding	Southern half of site	23/02/2024	12	12 Lapwing flying over.	N/A	N/A
P06806	Non-breeding	Rhynmount	08/03/2024	4	Foraging	N/A	N/A
P04935	Breeding	Ref No:2	08/04/2024	3	Flight/ Alarm Call display, on suitable breeding ground	A	Probable
P04946	Breeding	Ref No:5	08/04/2024	2	Flight/ Alarm Call display, on suitable breeding ground	A	Probable
P04949	Breeding	Ref No:7	08/04/2024	3	Flight/ Alarm Call display, on suitable breeding ground	A	Probable
P04953	Breeding	Ref No:9	15/04/2024	2	Flight display, on suitable breeding ground	D	Probable
P05093	Breeding	Ref No:1	10/05/2024	1	Foraging	N/A	N/A
P05099	Breeding	Ref No:3	10/05/2024	1	Alarm Call display, on suitable breeding ground	A	Probable
P05108	Breeding	Ref No:7	10/05/2024	4	Alarm Call display, on suitable breeding ground	A	Probable
P05111	Breeding	Ref No:9	13/05/2024	3	Flight/ Alarm Call display, on suitable breeding ground	A	Probable

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P05116	Breeding	Ref No:11	13/05/2024	3	Flight/ Alarm Call display, on suitable breeding ground	A	Probable
P05158	Breeding	2Km Buffer	14/05/2024	1	Lapwing circling and calling	S	Possible
P05164	Breeding	2Km Buffer	14/05/2024	2	2 Lapwing circling/alarm calling	A	Probable
P05165	Breeding	2Km Buffer	14/05/2024	2	2 Lapwing circling/alarm calling	A	Probable
P05280	Breeding	Ref No:1	07/06/2024	2	Flight/ Alarm Call display, on suitable breeding ground	A	Probable
P05287	Breeding	Ref No:2	07/06/2024	2	Flight/ Alarm Call display, on suitable breeding ground	A	Probable
P05289	Breeding	Ref No:3	07/06/2024	2	Alarm Call display, on suitable breeding ground	A	Probable
P05297	Breeding	Ref No:7	07/06/2024	2	Flight/ Alarm Call display, on suitable breeding ground	A	Probable
P05302	Breeding	Ref No:9	11/06/2024	2	Flight/ Alarm Call display, on suitable breeding ground	A	Probable
P05312	Breeding	Ref No:12	11/06/2024	2	Foraging adults.	N/A	N/A
P05326	Breeding	2km buffer	17/06/2024	2	2 Lapwing circling and alarm calling	A	Probable
P05328	Breeding	2km buffer	17/06/2024	1	Lapwing took flight from ground, alarm calling	A	Probable
P05333	Breeding	2km buffer	17/06/2024	2	2 Lapwing circling and alarm calling	A	Probable

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P05378	Breeding	2KM buffer	24/06/2024	1	Lapwing took flight from ground mobbing a hooded crow.	A	Probable
P05453	Breeding	Ref No:1	03/07/2024	4	Roosting.	N/A	N/A
P05459	Breeding	Ref No:2	03/07/2024	2	Alarm Call display, on suitable breeding ground	A	Probable
P05472	Breeding	Ref No:9	05/07/2024	2	Alarm Call display, on suitable breeding ground	A	Probable
P05544	Breeding	2KM Buffer	30/07/2024	10	10 Lapwing took flight from wetland, 4 juvenilles.	H	Possible
P05599	Breeding	Ref No:2	08/08/2024	4	Foraging	N/A	N/A
P05752	Breeding	Ref No:1	02/09/2024	12	Roosting Adult/ Juv.	N/A	N/A
P05755	Breeding	Ref No:2	02/09/2024	2	Foraging adults	N/A	N/A
P05774	Breeding	Ref No:10	06/09/2024	2	Roosting.	N/A	N/A
P05782	Breeding	Ref No:12	06/09/2024	4	Roosting.	N/A	N/A

CBS & Winter Transect Survey									
Map Ref.	Season	Survey Location	Date	Time	Abundance	Dominant Habitat	Activity	Breeding Code	Breeding Status
P00076	Breeding	T5	12/05/2021	N/A	1	N/A	N/A	N/A	N/A
P00080	Breeding	T9	12/05/2021	N/A	1	N/A	N/A	N/A	N/A
P00084	Breeding	T10	12/05/2021	N/A	1	N/A	N/A	N/A	N/A
P00087	Breeding	T10	12/05/2021	N/A	1	N/A	N/A	N/A	N/A
P00088	Breeding	T10	12/05/2021	N/A	1	N/A	N/A	N/A	N/A
P00089	Breeding	T10	12/05/2021	N/A	1	N/A	N/A	N/A	N/A
P00091	Breeding	T10	12/05/2021	N/A	1	N/A	N/A	N/A	N/A
P00096	Breeding	T10	12/05/2021	N/A	1	N/A	N/A	N/A	N/A
P00098	Breeding	T11	14/05/2021	N/A	1	N/A	N/A	N/A	N/A
P00100	Breeding	T11	14/05/2021	N/A	1	N/A	N/A	N/A	N/A

CBS & Winter Transect Survey									
Map Ref.	Season	Survey Location	Date	Time	Abundance	Dominant Habitat	Activity	Breeding Code	Breeding Status
P00103	Breeding	T11	14/05/2021	N/A	1	N/A	N/A	N/A	N/A
P00107	Breeding	T11	14/05/2021	N/A	1	N/A	N/A	N/A	N/A
P00109	Breeding	T11	14/05/2021	N/A	1	N/A	N/A	N/A	N/A
P00125	Breeding	T20	14/05/2021	N/A	1	N/A	N/A	N/A	N/A
P00127	Breeding	T20	14/05/2021	N/A	1	N/A	N/A	N/A	N/A
P00152	Breeding	T3	11/06/2021	N/A	1	N/A	N/A	N/A	N/A
P00174	Breeding	T5	11/06/2021	N/A	1	N/A	N/A	N/A	N/A
P00180	Breeding	T9	11/06/2021	N/A	1	N/A	N/A	N/A	N/A
P00182	Breeding	T10	11/06/2021	N/A	1	N/A	N/A	N/A	N/A
P00184	Breeding	T10	11/06/2021	N/A	1	N/A	N/A	N/A	N/A
P00186	Breeding	T10	11/06/2021	N/A	1	N/A	N/A	N/A	N/A
P00196	Breeding	T10	11/06/2021	N/A	1	N/A	N/A	N/A	N/A
P00202	Breeding	T11	12/06/2021	N/A	1	N/A	N/A	N/A	N/A
P00204	Breeding	T11	12/06/2021	N/A	1	N/A	N/A	N/A	N/A
P00206	Breeding	T11	12/06/2021	N/A	1	N/A	N/A	N/A	N/A
P00211	Breeding	T11	12/06/2021	N/A	1	N/A	N/A	N/A	N/A
P00215	Breeding	T11	12/06/2021	N/A	1	N/A	N/A	N/A	N/A
P00238	Breeding	T20	13/06/2021	N/A	1	N/A	N/A	N/A	N/A
P00242	Breeding	T20	13/06/2021	N/A	1	N/A	N/A	N/A	N/A
P01151	Breeding	T4	12/04/2022	09:52	2	pb4	P,H	A	Probable
P01152	Breeding	T4	12/04/2022	09:52	2	pb4	P,H	A	Probable
P01167	Breeding	T5	13/04/2022	10:20	2	pb4	p	P	Probable
P01037	Breeding	T11	20/04/2022	N/A	3	PB4	Nest containing eggs	NE	Confirmed
P01040	Breeding	T20	20/04/2022	N/A	2	PB4	Courtship and display	D	Probable
P01059	Breeding	T10	22/04/2022	N/A	8	PB4	Courtship and display	D	Probable
P01060	Breeding	T10	22/04/2022	N/A	2	PB4	Courtship and display	D	Probable
P01237	Breeding	T17	11/05/2022	N/A	1	PB4	Foraging.	N/A	N/A
P01243	Breeding	T20	11/05/2022	N/A	4	PB4	Flushed.	A	Probable
P01249	Breeding	T11	12/05/2022	N/A	5	PB4	Flushed.	A	Probable
P01263	Breeding	T10	13/05/2022	N/A	2	PB4	Flushed.	N/A	N/A
P01265	Breeding	T10	13/05/2022	N/A	4	PB4	Display.	D	Probable
P01266	Breeding	T10	13/05/2022	N/A	2	PB4	Display.	D	Probable
P01179	Breeding	T5	17/05/2022	07:29	2	pb4	A	A	Probable
P01180	Breeding	T4	17/05/2022	07:55	2	pb4	A	A	Probable

CBS & Winter Transect Survey									
Map Ref.	Season	Survey Location	Date	Time	Abundance	Dominant Habitat	Activity	Breeding Code	Breeding Status
P01181	Breeding	T4	17/05/2022	08:00	2	pb4	A	A	Probable
P01399	Breeding	T20	09/06/2022	N/A	1	PB4	Flushed.	A	Probable
P01402	Breeding	T20	09/06/2022	N/A	2	PB4	Flushed.	A	Probable
P01408	Breeding	T11	10/06/2022	N/A	6	PB4	Flushed.	D	Probable
P01428	Breeding	T10	14/06/2022	N/A	2	PB4	Alarm calling	A	Probable
P01430	Breeding	T10	14/06/2022	N/A	1	PB4	Flushed.	A	Probable
P01449	Breeding	T18	20/06/2022	N/A	1	PB4	Alarm calling	A	Probable
P01514	Breeding	T11	07/07/2022	N/A	2	PB4	Alarm call	A	Probable
P01520	Breeding	T11	07/07/2022	N/A	33	PB4	Flushed	H	Possible
P01623	Breeding	T4	08/07/2022	N/A	2	pb4	N/A	A	Probable
P01625	Breeding	T4	08/07/2022	N/A	1	pb4	N/A	A	Probable
P01626	Breeding	T5	08/07/2022	N/A	1	pb4	N/A	A	Probable
P01537	Breeding	T10	11/07/2022	N/A	2	PB4	Alarm call	DD	Confirmed
P01542	Breeding	T10	11/07/2022	N/A	18	PB4	Alarm call	A	Probable
P01672	Breeding	T10	10/08/2022	N/A	10	PB4	Flushed	N/A	N/A
P01674	Breeding	T10	10/08/2022	N/A	7	PB4	Flushed	N/A	N/A
P01675	Breeding	T10	10/08/2022	N/A	48	PB4	Flushed	N/A	N/A
P02633	Non-breeding	T13	06/10/2022	11:00	1	PB4	Circling.	N/A	N/A
P03135	Non-breeding	T7	12/12/2022	N/A	23	WS1	Flying	N/A	N/A
P03624	Non-breeding	T11	15/02/2023	08:30	34	PB4	Flushed	N/A	N/A
P03709	Non-breeding	T4	05/03/2023	N/A	80	PB4	Flying, On ground	N/A	N/A
P03816	Non-breeding	T13	07/03/2023	10:25	3	PB4	Foraging	N/A	N/A
P03882	Non-breeding	T11	16/03/2023	09:05	12	PB4	Display/ Roosting	N/A	N/A
P03902	Non-breeding	T12	16/03/2023	10:30	4	PB4	Displaying.	N/A	N/A
P03920	Non-breeding	T20	20/03/2023	09:40	3	PB4	Displaying.	N/A	N/A
P04226	Breeding	T4	05/04/2023	14:50	2	PB4	N/A	A	Probable

CBS & Winter Transect Survey									
Map Ref.	Season	Survey Location	Date	Time	Abundance	Dominant Habitat	Activity	Breeding Code	Breeding Status
P04246	Breeding	T11	13/04/2023	16:30	4	PB4	N/A	A	Probable
P04264	Breeding	T12	25/04/2023	12:45	2	PB4	N/A	P	Probable
P04267	Breeding	T12	25/04/2023	13:50	4	PB4	N/A	D	Probable
P04290	Breeding	T19	27/04/2023	12:10	2	PB4	N/A	A	Probable
P04293	Breeding	T17	28/04/2023	09:18	2	PB4	N/A	A	Probable
P04389	Breeding	T10	23/05/2023	14:05	2	PB4	N/A	A	Probable
P04298	Breeding	T4	24/05/2023	08:20	4	PB4	N/A	D	Probable
P04310	Breeding	T5	24/05/2023	09:45	2	PB4	N/A	D	Probable
P04315	Breeding	T5	24/05/2023	10:05	2	PB4	N/A	N/A	N/A
P04400	Breeding	T12	25/05/2023	14:45	2	PB4	N/A	A	Probable
P04402	Breeding	T12	25/05/2023	14:50	2	PB4	N/A	A	Probable
P04407	Breeding	T12	25/05/2023	15:12	2	PB4	N/A	P	Probable
P04442	Breeding	T13	30/05/2023	11:30	1	PB4	N/A	A	Probable
P04534	Breeding	T13	15/06/2023	15:45	1	PB4	N/A	H	Possible
P04536	Breeding	T13	15/06/2023	15:53	1	PB4	N/A	A	Probable
P04455	Breeding	T4	21/06/2023	15:30	2	PB4	N/A	A	Probable
P04461	Breeding	T5	21/06/2023	17:20	1	PB4	N/A	A	Probable
P04551	Breeding	T10	26/06/2023	16:32	1	PB4	N/A	F	Non-Breeding
P04555	Breeding	T18	27/06/2023	12:02	3	PB4	N/A	FL	Confirmed
P04562	Breeding	T12	28/06/2023	10:40	4	PB4	N/A	A	Probable
P04572	Breeding	T17	29/06/2023	11:50	4	PB4	N/A	A	Probable
P04575	Breeding	T4	05/07/2023	12:35	1	PB4	N/A	N/A	N/A
P04578	Breeding	T4	05/07/2023	12:45	1	PB4	N/A	A	Probable
P04657	Breeding	T3	20/07/2023	11:12	8	GS4	N/A	H	Possible
P04660	Breeding	T10	21/07/2023	14:20	2	PB4	N/A	A	Probable
P04667	Breeding	T11	25/07/2023	08:22	4	PB4	N/A	H	Possible
P04675	Breeding	T7	28/07/2023	10:42	16	PB4	N/A	H	Possible
P04679	Breeding	T13	28/07/2023	14:45	2	PB4	N/A	N/A	N/A
P04685	Breeding	T17	31/07/2023	10:56	5	PB4	N/A	H	Possible
P06428	Non-breeding	T5	19/10/2023	09:03	1	PB4	Roosting	N/A	N/A
P06164	Non-breeding	T20	06/11/2023	14:05	4	PB4	Foraging	N/A	N/A

CBS & Winter Transect Survey									
Map Ref.	Season	Survey Location	Date	Time	Abundance	Dominant Habitat	Activity	Breeding Code	Breeding Status
P06167	Non-breeding	T3	08/11/2023	10:35	5	PB4	Flyover	N/A	N/A
P06261	Non-breeding	T4	27/11/2023	15:25	24	PB4	Roosting	N/A	N/A
P06530	Non-breeding	T4	19/12/2023	15:22	33	PB4	Roosting	N/A	N/A
P06057	Non-breeding	T12	05/03/2024	11:54	3	PB4	N/A	N/A	N/A
P06085	Non-breeding	T13	06/03/2024	12:41	2	PB4	N/A	N/A	N/A
P04892	Breeding	T20	02/04/2024	16:35	3	PB4	N/A	A	Probable
P04896	Breeding	T20	02/04/2024	16:45	2	PB4	N/A	A	Probable
P04899	Breeding	T20	02/04/2024	17:20	1	PB4	N/A	N/A	N/A
P04995	Breeding	Transect 11	08/04/2024	15:05	1	pb4	N/A	N/A	N/A
P04997	Breeding	Transect 12	08/04/2024	15:58	2	pb4	N/A	P	Probable
P04998	Breeding	Transect 12	08/04/2024	16:08	2	pb4	N/A	P	Probable
P05005	Breeding	Transect 13	09/04/2024	10:21	1	pb4	N/A	H	Possible
P05024	Breeding	Transect 18	10/04/2024	11:28	2	pb4	N/A	P	Probable
P05042	Breeding	Transect 10	10/04/2024	16:18	1	pb4	N/A	N/A	N/A
P04925	Breeding	T5	15/04/2024	10:50	2	PB4	N/A	A	Probable
P04928	Breeding	T5	15/04/2024	11:40	1	PB4	N/A	A	Probable
P05051	Breeding	T21	07/05/2024	08:20	1	PB4	N/A	A	Probable
P05053	Breeding	T20	07/05/2024	09:30	1	PB4	N/A	H	Possible
P05070	Breeding	T4	10/05/2024	07:40	3	PB4	N/A	D	Probable
P05071	Breeding	T4	10/05/2024	07:55	1	PB4	N/A	D	Probable
P05076	Breeding	T4	10/05/2024	08:15	1	PB4	N/A	D	Probable
P05085	Breeding	T5	10/05/2024	11:05	2	PB4	N/A	N/A	N/A
P05138	Breeding	T17	10/05/2024	14:08	2	pb4	N/A	P	Probable

CBS & Winter Transect Survey									
Map Ref.	Season	Survey Location	Date	Time	Abundance	Dominant Habitat	Activity	Breeding Code	Breeding Status
P05139	Breeding	T17	10/05/2024	14:21	2	pb4	N/A	P	Probable
P05145	Breeding	T11	11/05/2024	16:03	2	pb4	N/A	A	Probable
P05172	Breeding	T12	14/05/2024	16:43	1	pb4	N/A	N/A	N/A
P05174	Breeding	T12	14/05/2024	17:06	2	pb4	N/A	S	Possible
P05201	Breeding	T10	16/05/2024	10:29	3	PB4	N/A	S	Possible
P05209	Breeding	T13	16/05/2024	10:51	2	PB4	N/A	S	Possible
P05213	Breeding	T13	16/05/2024	11:12	1	PB4	N/A	S	Possible
P05235	Breeding	T21	05/06/2024	10:45	2	PB4	N/A	A	Probable
P05239	Breeding	T20	05/06/2024	11:40	2	PB4	N/A	A	Probable
P05245	Breeding	T20	05/06/2024	12:30	2	PB4	N/A	A	Probable
P05362	Breeding	T13	20/06/2024	10:46	2	PB4	N/A	A	Probable
P05370	Breeding	T17	21/06/2024	10:52	1	PB4	N/A	A	Probable
P05396	Breeding	T10	25/06/2024	12:10	20	PB4	N/A	N/A	N/A
P05406	Breeding	T7	25/06/2024	16:39	1	PB4	N/A	A	Probable
P05414	Breeding	T21	01/07/2024	10:55	2	PB4	N/A	D	Probable
P05417	Breeding	T20	01/07/2024	11:55	2	PB4	N/A	D	Probable
P05420	Breeding	T20	01/07/2024	12:10	22	PB4	N/A	H	Possible
P05508	Breeding	T17	23/07/2024	12:46	1	PB4	N/A	N/A	N/A
P05541	Breeding	T7	29/07/2024	14:24	2	PB4	N/A	N/A	N/A
P05561	Breeding	T21	01/08/2024	10:35	1	PB4	N/A	N/A	N/A
P05564	Breeding	T20	01/08/2024	11:20	2	PB4	N/A	N/A	N/A
P05567	Breeding	T20	01/08/2024	11:30	14	PB4	N/A	N/A	N/A
P05746	Breeding	T5	06/09/2024	10:30	1	PB4	N/A	N/A	N/A

Hinterland (Raptors) Survey & Hen Harrier Roost Watch						
Map Ref.	Season	Location	Date	Abundance	Breeding Code	Breeding Status
P00300	Breeding	HHVP12	13/05/2021	1	N/A	N/A
P00390	Breeding	HHVP4	17/07/2021	1	N/A	N/A
P00407	Breeding	HHVP8	17/07/2021	16	N/A	N/A
P00459	Breeding	HHVP8	05/08/2021	15	N/A	N/A
P00517	Breeding	HHVP8	14/08/2021	38	N/A	N/A
P00579	Breeding	HHVP8	09/09/2021	18	N/A	N/A

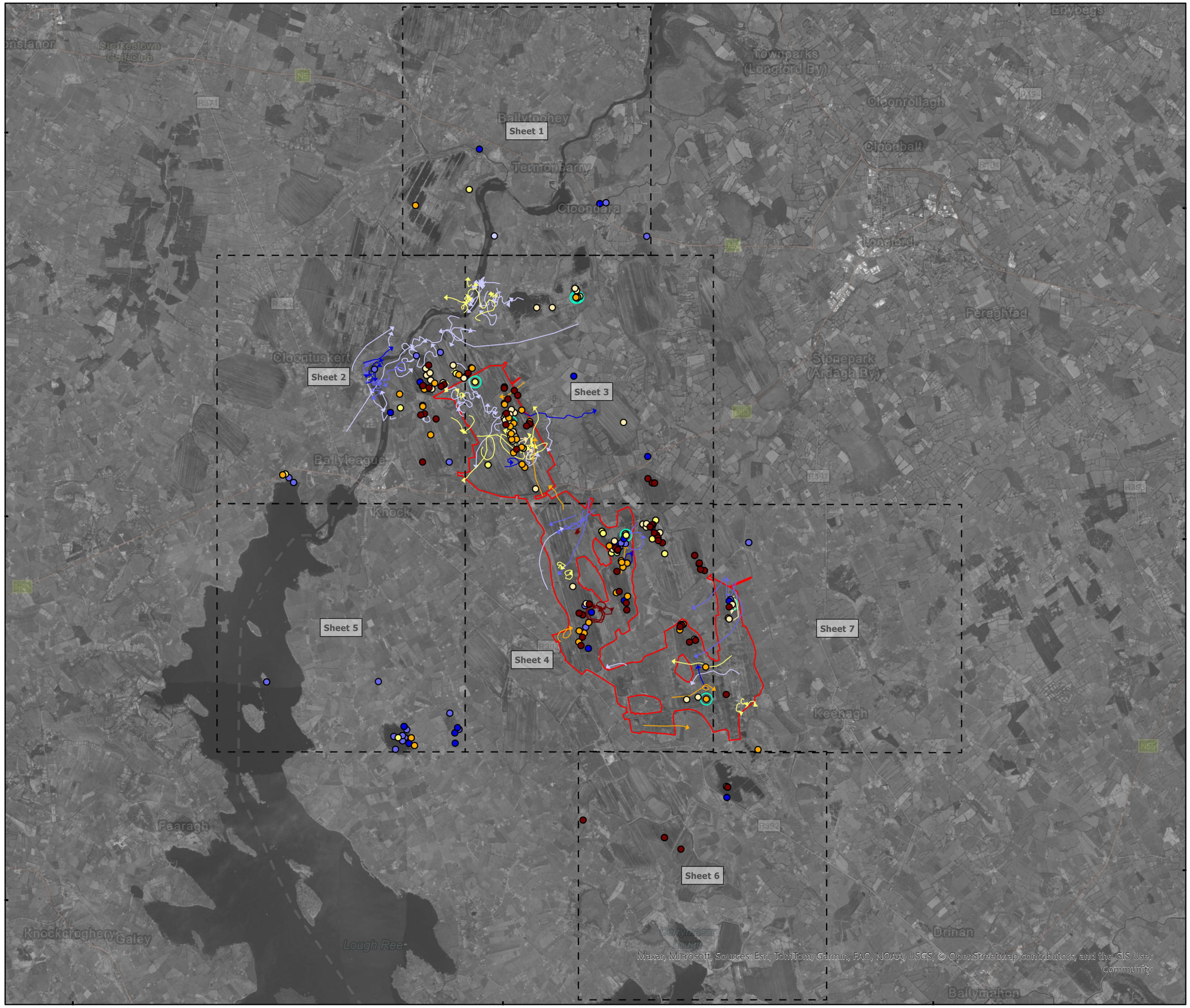
Hinterland (Raptors) Survey & Hen Harrier Roost Watch						
Map Ref.	Season	Location	Date	Abundance	Breeding Code	Breeding Status
P00628	Breeding	HHVP4	30/09/2021	1	N/A	N/A
P00642	Breeding	HHVP8	30/09/2021	44	N/A	N/A
P00693	Non-breeding	HHVP8	26/10/2021	49	N/A	N/A
P00723	Non-breeding	HHVP4	24/11/2021	130	N/A	N/A
P00752	Non-breeding	HHVP12	24/11/2021	12	N/A	N/A
P00761	Non-breeding	HHVP11	24/11/2021	260	N/A	N/A
P00794	Non-breeding	HHVP4	28/02/2022	25	N/A	N/A
P01620	Breeding	RVP1	05/07/2022	13	F	Non-Breeding
P05951	Non-breeding	HHVP3	12/02/2024	13	N/A	N/A
P05957	Non-breeding	HHVP4	18/02/2024	14	N/A	N/A

Incidental Sightings					
Map Ref.	Season	Date	Abundance	Breeding Code	Breeding Status
P03964	Non-breeding	14/10/2022	2	N/A	N/A
P03981	Non-breeding	01/12/2022	2	N/A	N/A
P04018	Non-breeding	16/01/2023	2	N/A	N/A
P04028	Non-breeding	24/01/2023	2	N/A	N/A
P04032	Non-breeding	07/02/2023	4	N/A	N/A
P04035	Non-breeding	10/02/2023	1	N/A	N/A
P04049	Non-breeding	11/02/2023	7	N/A	N/A

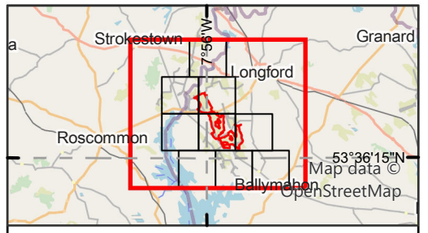
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53°45'0"N 53°40'0"N 53°35'0"N

776000 768000 760000



593600 604000 614400



Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-21
- Breeding-22
- Breeding-23
- Breeding-24
- **Confirmed** Breeding Status*

Flightline observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-21
- Breeding-22
- Breeding-23
- Breeding-24

*should be read with data in Appendix 8.3

0 1.5 3
Kilometres

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	06/05/2025	First issue	S.P	I.H

Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Flight and non-flight observations Northern Lapwing Overview

Scale @ A3: 1:85,000

Prepared by:	Checked by:	Date:
S.Pezzetta	I.Heanue	May 2025

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Map Ref: 11399-045.ApX-SUM-L.-TOB-A

Draft: A

7°53'50"W

53°45'0"N

604000

776000

P06615

P00300,
P00752

P04354, P04491

P02087, P02209

P06518, P06621

P00761

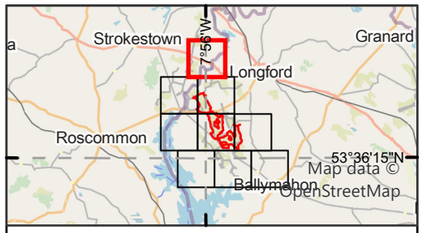
P01988

Ballytoohey

Termonbarry

Cloonda

Maxar, Microsoft, Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community



Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-21
- Breeding-23

*should be read with data in Appendix 8.3

0 0.5 1
Kilometres

NOTES

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A	06/05/2025	First issue	S.P	I.H
Rev	Date	Description	By	Chkd.

Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Flight and non-flight observations
Northern Lapwing
Sheet 1 of 7

Scale @ A3: 1:22,000

Prepared by:	Checked by:	Date:
S.Pezzetta	I.Heanue	May 2025

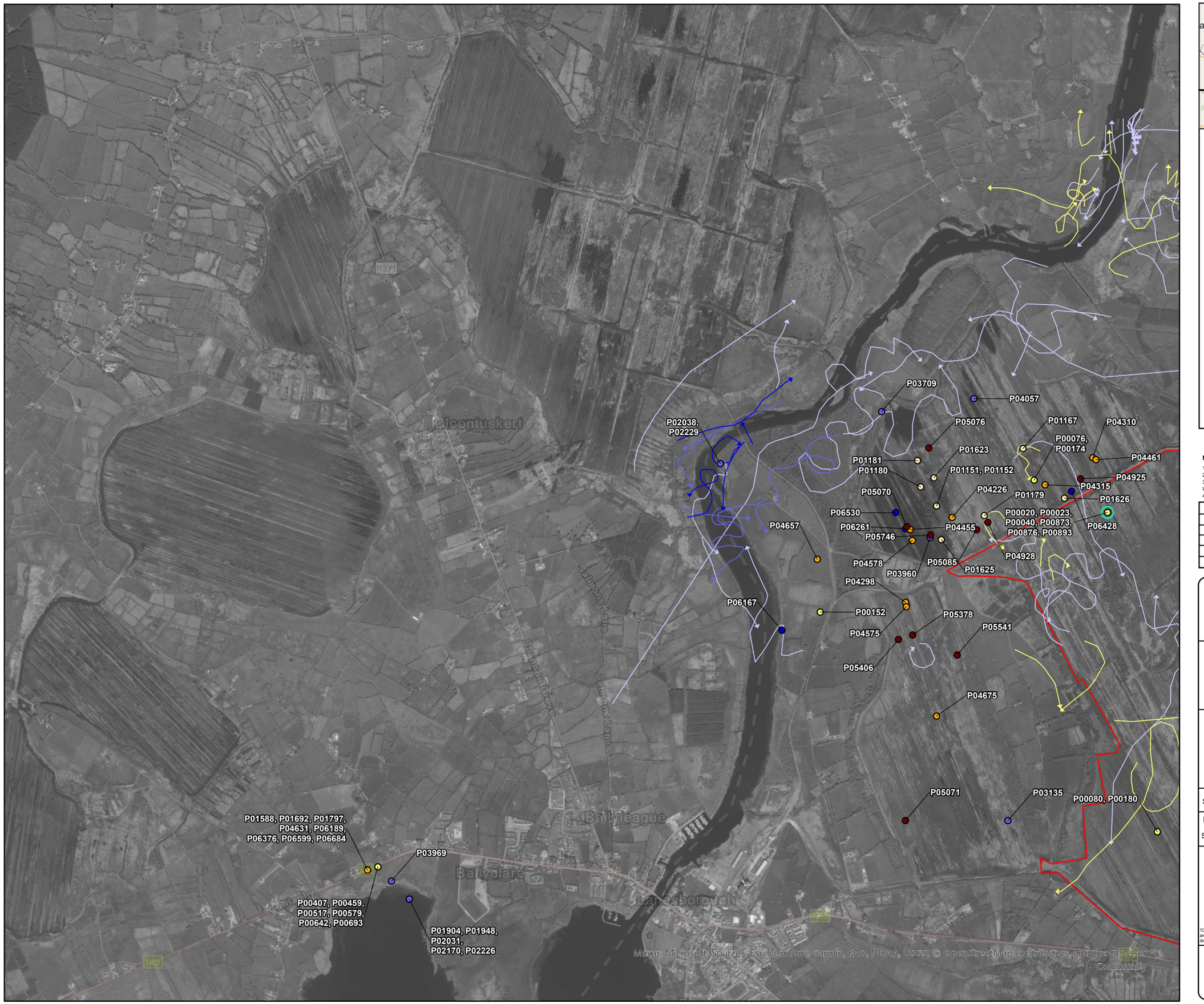
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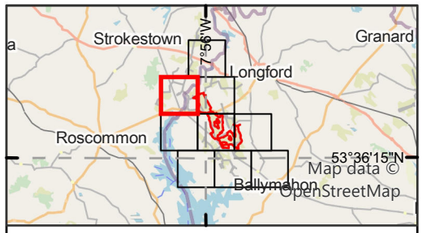
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Map Ref: 11399-045.ApX-SUM-L.-TOB-A

Draft: A

8°2'40"W





Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-21
- Breeding-22
- Breeding-23
- Breeding-24
- **Confirmed** Breeding Status*

Flightline observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-21

*should be read with data in Appendix 8.3

0 0.5 1
Kilometres

NOTES

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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	06/05/2025	First issue	S.P	I.H
Rev	Date	Description	By	Chkd.

Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Flight and non-flight observations
Northern Lapwing
Sheet 2 of 7

Scale @ A3: 1:22,000

Prepared by:	Checked by:	Date:
S.Pezzetta	I.Heanue	May 2025

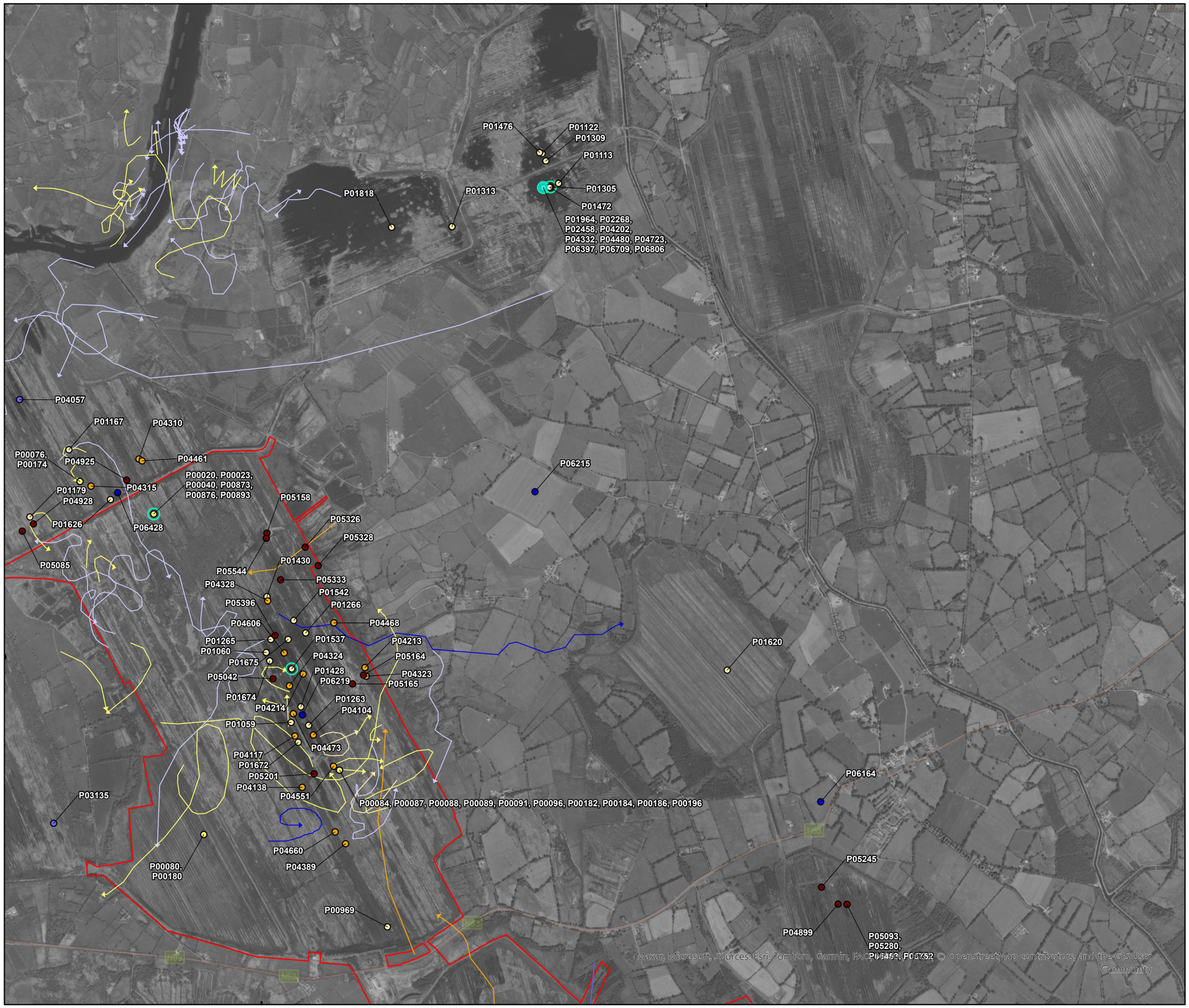
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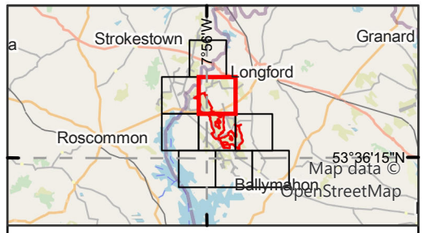
Map Ref: 11399-045.ApX-SUM-L.-TOB-A

Draft: A

7°53'50"W



604000



Legend

- Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-21
- Breeding-22
- Breeding-23
- Breeding-24
- **Confirmed** Breeding Status*

Flightline observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-21
- Breeding-22
- Breeding-23

*should be read with data in Appendix 8.3

0 0.5 1
Kilometres

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Rev	Date	Description	By	Chkd.
A	06/05/2025	First issue	S.P	I.H

Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Flight and non-flight observations Northern Lapwing Sheet 3 of 7

Scale @ A3: 1:22,000

Prepared by:	Checked by:	Date:
S.Pezzetta	I.Heanue	May 2025

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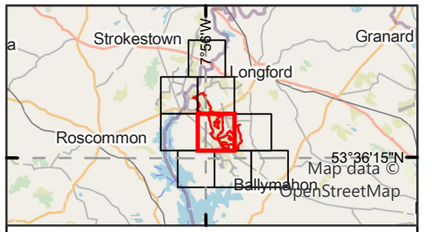
Draft: A

7°53'50"W

53°40'0"N

768000

604000



Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-21
- Breeding-22
- Breeding-23
- Breeding-24
- **Confirmed** Breeding Status*

Flightline observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-21
- Breeding-22
- Breeding-23
- Breeding-24

*should be read with data in Appendix 8.3

0 0.5 1
Kilometres

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Rev	Date	Description	By	Chkd.
A	06/05/2025	First issue	S.P	I.H

Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Flight and non-flight observations
Northern Lapwing
Sheet 4 of 7

Scale @ A3: 1:22,000

Prepared by:	Checked by:	Date:
S.Pezzetta	I.Heanue	May 2025

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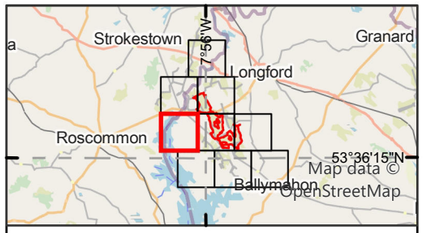
Maxar, Microsoft, Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

8°2'40"W

53°4'0"N

768000





Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-21
- Breeding-22
- Breeding-23

*should be read with data in Appendix 8.3

0 0.5 1
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Rev	Date	Description	By	Chkd.
A	06/05/2025	First issue	S.P	I.H

Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Flight and non-flight observations
Northern Lapwing
Sheet 5 of 7

Scale @ A3: 1:22,000

Prepared by:	Checked by:	Date:
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Map Ref: 11399-045.ApX-SUM-L.-TOB-A

Draft: A

7°53'50"W

53°35'0"N

760000

P04290

P01295, P01488

P05312,
P05782

P06315

P06760

P05116

P04953, P05111,
P05302, P05472

P05774

R392

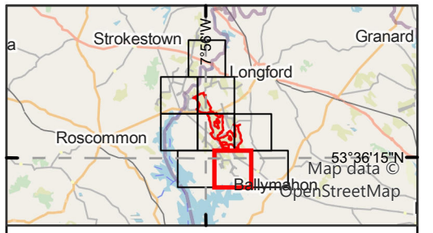
L5236

Estate Road

Fas Road

Derrymacar
Lough

Maxar, Microsoft, Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community



Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-23/24
- Breeding-22
- Breeding-23
- Breeding-24

*should be read with data in Appendix 8.3

0 0.5 1
Kilometres

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Project: Derryadd Wind Farm

Title: Flight and non-flight observations
Northern Lapwing
Sheet 6 of 7

Scale @ A3: 1:22,000

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S.Pezzetta	I.Heanue	May 2025

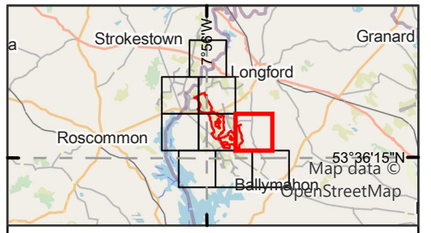
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Draft: A





Legend

- Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-22
- Breeding-23
- Breeding-24
- **Confirmed** Breeding Status*

Flightline observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-21
- Breeding-22
- Breeding-23

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0 0.5 1
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Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Flight and non-flight observations
Northern Lapwing
Sheet 7 of 7

Scale @ A3: 1:22,000

Prepared by:	Checked by:	Date:
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Appendix K.6 NORTHEN SHOVELER

Vantage Point (Flight)									
Season	VP	Date	Time	Abundance	Seconds in Band 1 (0-25m)	Seconds in Band 2 (26-50m)	Seconds in Band 3 (51-150m)	Seconds in Band 4 (151-200m)	Seconds in Band 5 (201+m)
Non-breeding	VP1	02/03/2022	13:45	1	10	0	0	0	0
Non-breeding	VP 1	16/12/2022	10:01	3	4	0	0	0	0

Vantage Point (Non-flight)									
Map Ref.	Season	VP	Date	Time	Abundance	Dominant Habitat	Activity	Breeding Code	Breeding Status
P01856	Non-breeding	VP4	16/01/2023	11:35	2	PB4	On water		

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P01080	Breeding	Ref: 5	20/04/2022	3	Roosting on Inchenagh island.	N/A	N/A
P01087	Breeding	Ref: 4	20/04/2022	8	Roosting.	N/A	N/A
P01115	Breeding	New site	22/04/2022	1	Swimming on open water.	N/A	N/A
P01121	Breeding	New site	22/04/2022	1	Swimming on open water.	N/A	N/A
P01466	Breeding	Ref: 5	10/06/2022	1	Swimming around island.	N/A	N/A
P01901	Non-breeding	Rhynmount Bog	12/10/2022	1	Foraging on wetlands.	N/A	N/A
P01946	Non-breeding	iwebs 1234	31/10/2022	2	With MA and WG	N/A	N/A
P02022	Non-breeding	Near site 4, LeTergullion	06/11/2022	10	Roosting (WN,SV, MA, L)	N/A	N/A
P02046	Non-breeding	Ref No 5	07/12/2022	2	Swimming on open water.	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P02123	Non-breeding	Newpark, turlough slightly to the east of Turlough Site 4 (same complex)	27/12/2022	9	Feeding in mixed group of MA TU and SV WN	N/A	N/A
P02197	Non-breeding	Rhynmount Bog VP3	13/01/2023	12	Foraging on wetland.	N/A	N/A
P02157	Non-breeding	NewPark, Clonmee, west of site 4	29/01/2023	18	Swimming in middle with WN	N/A	N/A
P02337	Non-breeding	NewPark, Clonmee, west of site 4	29/01/2023	18	Swimming in middle with WN	N/A	N/A
P02284	Non-breeding	Lisnacusha turlough/fields	25/02/2023	13	Swimming	N/A	N/A
P02287	Non-breeding	Site 4 Turlough	25/02/2023	28	Swimming and feeding. Dispersed thoughout lough	N/A	N/A
P02298	Non-breeding	East of Site 4, Newpark	25/02/2023	140	Mostly loafing and roosting out of water, some on the water. Most flew up and circled, landing in roughly the same area	N/A	N/A
P02355	Non-breeding	Lisnacusha turlough/fields	25/02/2023	13	Swimming	N/A	N/A
P02358	Non-breeding	Site 4 Turlough	25/02/2023	28	Swimming and feeding. Dispersed thoughout lough	N/A	N/A
P02369	Non-breeding	East of Site 4, Newpark	25/02/2023	140	Mostly loafing and roosting out of water, some on the water.	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
					Most flew up and circled, landing in roughly the same area		
P02420	Non-breeding	Ref No 8	03/03/2023	4	Foraging on open water.	N/A	N/A
P02453	Non-breeding	Rhynmount Bog VP1	16/03/2023	1	Foraging	N/A	N/A
P02457	Non-breeding	Rhynmount Bog VP2	16/03/2023	2	Foraging	N/A	N/A
P02465	Non-breeding	Rhynmount Bog VP3	16/03/2023	7	Foraging	N/A	N/A
P02398	Non-breeding	Carrigens turlough/fields	24/03/2023	8	All roosting with Teal above	N/A	N/A
P02407	Non-breeding	East of Location 4	24/03/2023	42	Roosting on 'bars' in field	N/A	N/A
P04205	Breeding	Rhymount VP2	14/04/2023	1	Foraging	N/A	N/A
P04329	Breeding	Onsite	03/05/2023	4	Swimming	N/A	N/A
P04355	Breeding	Derrycashel Bog	03/05/2023	1	Foraging.	N/A	N/A
P06273	Non-breeding	4	20/11/2023	20	20Shoveler on turlough	N/A	N/A
P06296	Non-breeding	4	23/11/2023	15	15 Shoveler on turlough	N/A	N/A
P06318	Non-breeding	4	27/11/2023	26	26 Shoveler on turlough	N/A	N/A
P06560	Non-breeding	4	06/12/2023	26	26 Shoveler on turlough	N/A	N/A
P06569	Non-breeding	4	18/12/2023	59	59 Shoveler on Turlough	N/A	N/A
P06630	Non-breeding	Rhynmount	12/01/2024	4	N/A	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P06654	Non-breeding	Southern half of site	25/01/2024	45	N/A	N/A	N/A
P06666	Non-breeding	Southern half of site	25/01/2024	14	N/A	N/A	N/A
P06697	Non-breeding	Ref No: 13	06/02/2024	4	N/A	N/A	N/A
P06738	Non-breeding	Southern half of site	19/02/2024	18	On Turlough	N/A	N/A
P06745	Non-breeding	Southern half of site	21/02/2024	20	On Turlough	N/A	N/A
P01080	Breeding	Ref: 5	20/04/2022	3	Roosting on Inchenagh island.	N/A	N/A
P01087	Breeding	Ref: 4	20/04/2022	8	Roosting.	N/A	N/A
P01115	Breeding	New site	22/04/2022	1	Swimming on open water.	N/A	N/A
P01121	Breeding	New site	22/04/2022	1	Swimming on open water.	N/A	N/A
P01466	Breeding	Ref: 5	10/06/2022	1	Swimming around island.	N/A	N/A
P01901	Non-breeding	Rhynmount Bog	12/10/2022	1	Foraging on wetlands.	N/A	N/A
P01946	Non-breeding	iwebs 1234	31/10/2022	2	With MA and WG	N/A	N/A
P02022	Non-breeding	Near site 4, LeTergullion	06/11/2022	10	Roosting (WN,SV, MA, L)	N/A	N/A
P02046	Non-breeding	Ref No 5	07/12/2022	2	Swimming on open water.	N/A	N/A
P02123	Non-breeding	Newpark, turlough slightly to the east of Turlough Site	27/12/2022	9	Feeding in mixed group of MA TU and SV WN	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
		4 (same complex)					
P02197	Non-breeding	Rhynmount Bog VP3	13/01/2023	12	Foraging on wetland.	N/A	N/A
P02157	Non-breeding	NewPark, Clonmee, west of site 4	29/01/2023	18	Swimming in middle with WN	N/A	N/A
P02337	Non-breeding	NewPark, Clonmee, west of site 4	29/01/2023	18	Swimming in middle with WN	N/A	N/A
P02284	Non-breeding	Lisnacusha turlough/fields	25/02/2023	13	Swimming	N/A	N/A
P02287	Non-breeding	Site 4 Turlough	25/02/2023	28	Swimming and feeding. Dispersed thoughout lough	N/A	N/A
P02298	Non-breeding	East of Site 4, Newpark	25/02/2023	140	Mostly loafing and roosting out of water, some on the water. Most flew up and circled, landing in roughly the same area	N/A	N/A
P02355	Non-breeding	Lisnacusha turlough/fields	25/02/2023	13	Swimming	N/A	N/A
P02358	Non-breeding	Site 4 Turlough	25/02/2023	28	Swimming and feeding. Dispersed thoughout lough	N/A	N/A
P02369	Non-breeding	East of Site 4, Newpark	25/02/2023	140	Mostly loafing and roosting out of water, some on the water. Most flew up and circled, landing in roughly the same area	N/A	N/A
P02420	Non-breeding	Ref No 8	03/03/2023	4	Foraging on open water.	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P02453	Non-breeding	Rhynmount Bog VP1	16/03/2023	1	Foraging	N/A	N/A
P02457	Non-breeding	Rhynmount Bog VP2	16/03/2023	2	Foraging	N/A	N/A
P02465	Non-breeding	Rhynmount Bog VP3	16/03/2023	7	Foraging	N/A	N/A
P02398	Non-breeding	Carrigens turlough/fields	24/03/2023	8	All roosting with Teal above	N/A	N/A
P02407	Non-breeding	East of Location 4	24/03/2023	42	Roosting on 'bars' in field	N/A	N/A
P04205	Breeding	Rhymount VP2	14/04/2023	1	Foraging	N/A	N/A
P04329	Breeding	Onsite	03/05/2023	4	Swimming	N/A	N/A
P04355	Breeding	Derrycashel Bog	03/05/2023	1	Foraging.	N/A	N/A
P06273	Non-breeding	4	20/11/2023	20	20Shoveler on turlough	N/A	N/A
P06296	Non-breeding	4	23/11/2023	15	15 Shoveler on turlough	N/A	N/A
P06318	Non-breeding	4	27/11/2023	26	26 Shoveler on turlough	N/A	N/A
P06560	Non-breeding	4	06/12/2023	26	26 Shoveler on turlough	N/A	N/A
P06569	Non-breeding	4	18/12/2023	59	59 Shoveler on Turlough	N/A	N/A
P06630	Non-breeding	Rhynmount	12/01/2024	4	N/A	N/A	N/A
P06654	Non-breeding	Southern half of site	25/01/2024	45	N/A	N/A	N/A
P06666	Non-breeding	Southern half of site	25/01/2024	14	N/A	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P06697	Non-breeding	Ref No: 13	06/02/2024	4	N/A	N/A	N/A
P06738	Non-breeding	Southern half of site	19/02/2024	18	On Turlough	N/A	N/A
P06745	Non-breeding	Southern half of site	21/02/2024	20	On Turlough	N/A	N/A

CBS & Winter Transect Survey									
Map Ref.	Season	Survey Location	Date	Time	Abundance	Dominant Habitat	Activity	Breeding Code	Breeding Status
P04314	Breeding	T5	24/05/2023	09:45	1	PB4	N/A	N/A	N/A

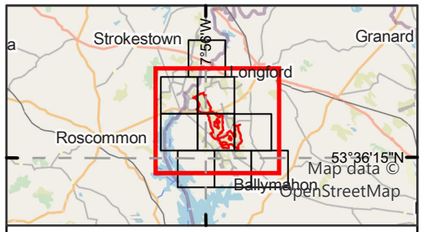
Hinterland (Raptors) Survey & Hen Harrier Roost Watch						
Map Ref.	Season	Location	Date	Abundance	Breeding Code	Breeding Status
P00728	Non-breeding	HHVP4	24/11/2021	18	N/A	N/A
P05952	Non-breeding	HHVP3	12/02/2024	6	N/A	N/A
P05959	Non-breeding	HHVP4	18/02/2024	2	N/A	N/A

8°2'40"W
7°53'50"W
53°40'0"N
53°35'0"N
776000
768000
760000
604000
614400

P04355
P02453
P01121
P01115
P01901, P02197, P02465
P02457, P04205, P06630
P04314
P04329
P01856
P02420
P05952
P05959
P02287, P02358
P06666
P02398
P02046
P01080, P01466
P02284, P02355
P02123
P02022
P02157, P02337
P02407
P06569
P01946
P00728
P06560
P06654
P06738
P06318
P02298, P02369
P06745
P01087
P06273, P06296

Cloondara
Demesne
Longford
City Calling Stadium
Ballyminton
Knockanaw
Feraghta
Lisduff (Ed Longford Rural)
Cloontuskert
Stonepark (Ardaghbeggan Moydow By)
Ballyleague
Ballyclare
Curraghy
Knock
Rathcline
Keenagh
R371
R392
R396
R397
R398
N5
N63

Maxar, Microsoft, Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community



Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-22
- Breeding-23

Flightline observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23

0 1 2
Kilometres

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	24/03/2025	First issue	S.P	I.H

Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Flight and non-flight observations
Northern Shoveler
Sheet 1 of 1

Scale @ A3: 1:60,000

Prepared by:	Checked by:	Date:
S.Pezzetta	I.Heanue	March 2025

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Map Ref: 11399-047.ApX-SUM-SV-TOB-A

Draft: A

Appendix K.7 WHOOPER SWAN

Vantage Point (Flight)									
Season	VP	Date	Time	Abundance	Seconds in Band 1 (0-25m)	Seconds in Band 2 (26-50m)	Seconds in Band 3 (51-150m)	Seconds in Band 4 (151-200m)	Seconds in Band 5 (201+m)
Non-breeding	VP9	02/11/2021	08:38	2	0	30	0	0	0
Non-breeding	VP9	02/11/2021	09:44	4	38	0	0	0	0
Non-breeding	VP10	18/11/2021	14:18	5	45	10	0	0	0
Non-breeding	VP9	19/11/2021	07:52	6	14	0	0	0	0
Non-breeding	VP9	19/11/2021	08:02	6	31	0	0	0	0
Non-breeding	VP2	23/11/2021	12:35	2	0	65	0	0	0
Non-breeding	VP4	25/11/2021	08:01	2	10	30	0	0	0
Non-breeding	VP4	25/11/2021	08:10	8	50	19	0	0	0
Non-breeding	VP4	25/11/2021	08:44	5	60	14	0	0	0
Non-breeding	VP4	25/11/2021	09:29	1	0	27	0	0	0
Non-breeding	VP4	25/11/2021	09:47	4	72	0	0	0	0
Non-breeding	VP4	25/11/2021	10:14	4	75	36	0	0	0
Non-breeding	VP4	25/11/2021	11:00	3	61	0	0	0	0
Non-breeding	VP5	26/11/2021	09:23	1	15	0	0	0	0
Non-breeding	VP5	26/11/2021	10:16	2	5	0	0	0	0
Non-breeding	VP5	26/11/2021	11:48	1	9	20	0	0	0
Non-breeding	VP5	26/11/2021	12:32	7	0	103	0	0	0
Non-breeding	VP7	29/11/2021	11:19	5	16	0	0	0	0
Non-breeding	VP7	29/11/2021	15:21	6	108	0	0	0	0
Non-breeding	VP1	01/12/2021	08:32	2	30	0	0	0	0
Non-breeding	VP1	01/12/2021	09:27	2	0	56	0	0	0
Non-breeding	VP1	01/12/2021	09:58	2	0	50	0	0	0
Non-breeding	VP6	02/12/2021	12:57	1	50	0	0	0	0
Non-breeding	VP1	13/12/2021	09:35	6	6	9	0	0	0
Non-breeding	VP1	13/12/2021	09:55	6	3	12	0	0	0
Non-breeding	VP3	13/12/2021	11:26	6	50	50	0	0	0
Non-breeding	VP3	13/12/2021	11:34	3	30	40	0	0	0
Non-breeding	VP3	13/12/2021	13:39	7	0	0	0	0	180

Vantage Point (Flight)									
Season	VP	Date	Time	Abundance	Seconds in Band 1 (0-25m)	Seconds in Band 2 (26-50m)	Seconds in Band 3 (51-150m)	Seconds in Band 4 (151-200m)	Seconds in Band 5 (201+m)
Non-breeding	VP3	13/12/2021	15:06	8	0	0	180	0	0
Non-breeding	VP2	14/12/2021	09:56	3	0	15	0	0	0
Non-breeding	VP5	14/12/2021	10:30	2	0	0	60	0	0
Non-breeding	VP5	14/12/2021	10:43	4	5	5	70	0	0
Non-breeding	VP5	14/12/2021	11:04	4	0	0	96	0	0
Non-breeding	VP6	16/12/2021	09:58	3	5	0	0	0	0
Non-breeding	VP6	16/12/2021	10:07	3	30	0	0	0	0
Non-breeding	VP6	16/12/2021	10:19	5	5	15	0	0	0
Non-breeding	VP6	16/12/2021	11:07	6	5	10	0	0	0
Non-breeding	VP6	16/12/2021	12:20	3	15	15	0	0	0
Non-breeding	VP6	16/12/2021	12:29	2	10	10	0	0	0
Non-breeding	VP6	16/12/2021	12:29	4	40	20	0	0	0
Non-breeding	VP1	07/01/2022	09:37	7	0	20	20	0	0
Non-breeding	VP1	07/01/2022	14:19	3	0	10	0	0	0
Non-breeding	VP8	11/01/2022	10:15	4	0	0	17	0	0
Non-breeding	VP9	12/01/2022	10:35	7	0	0	0	0	55
Non-breeding	VP9	12/01/2022	10:50	4	10	0	0	0	0
Non-breeding	VP9	12/01/2022	13:13	4	5	10	20	0	0
Non-breeding	VP3	18/01/2022	09:57	1	0	0	30	0	0
Non-breeding	VP5	25/01/2022	09:33	4	20	0	0	0	0
Non-breeding	VP1	01/02/2022	09:53	2	0	0	60	0	0
Non-breeding	VP1	01/02/2022	10:17	4	0	30	0	0	0
Non-breeding	VP3	02/02/2022	11:14	6	0	0	20	0	0
Non-breeding	VP6	25/02/2022	09:41	16	8	0	0	0	0
Non-breeding	VP6	25/02/2022	10:25	2	12	0	0	0	0
Non-breeding	VP6	25/02/2022	11:12	4	60	0	0	0	0
Non-breeding	VP6	25/02/2022	11:54	4	88	0	0	0	0
Non-breeding	VP9	02/03/2022	09:43	5	19	0	0	0	0

Vantage Point (Flight)									
Season	VP	Date	Time	Abundance	Seconds in Band 1 (0-25m)	Seconds in Band 2 (26-50m)	Seconds in Band 3 (51-150m)	Seconds in Band 4 (151-200m)	Seconds in Band 5 (201+m)
Non-breeding	VP9	02/03/2022	10:31	5	9	47	0	0	0
Non-breeding	VP2	07/03/2022	10:37	7	0	0	60	0	0
Non-breeding	VP4	08/03/2022	11:51	2	10	30	50	0	0
Non-breeding	VP10	12/10/2022	10:10	5	30	0	0	0	0
Non-breeding	VP10	12/10/2022	11:25	5	30	25	0	0	0
Non-breeding	VP11	13/10/2022	08:25	6	0	0	55	0	0
Non-breeding	VP11	13/10/2022	08:51	2	65	0	0	0	0
Non-breeding	VP6	18/10/2022	09:59	13	0	12	10	0	0
Non-breeding	VP3	05/11/2022	08:35	5	0	6	0	0	0
Non-breeding	VP9	15/11/2022	11:40	5	0	60	20	0	0
Non-breeding	VP6	21/11/2022	09:16	2	5	0	0	0	0
Non-breeding	VP6	21/11/2022	11:03	1	8	0	0	0	0
Non-breeding	VP5	28/11/2022	08:59	7	7	0	0	0	0
Non-breeding	VP5	28/11/2022	09:12	12	11	0	0	0	0
Non-breeding	VP5	28/11/2022	09:28	15	15	5	0	0	0
Non-breeding	VP5	28/11/2022	10:21	2	18	0	0	0	0
Non-breeding	VP5	28/11/2022	10:26	5	9	0	0	0	0
Non-breeding	VP5	28/11/2022	14:34	4	4	3	0	0	0
Non-breeding	VP9	02/12/2022	14:41	6	170	0	0	0	0
Non-breeding	VP9	02/12/2022	14:41	4	145	0	0	0	0
Non-breeding	VP2	21/12/2022	10:27	6	2	5	0	0	0
Non-breeding	VP2	21/12/2022	11:23	2	10	0	0	0	0
Non-breeding	VP2	13/01/2023	08:51	1	7	0	0	0	0
Non-breeding	VP2	13/01/2023	09:00	6	5	6	0	0	0
Non-breeding	VP2	13/01/2023	09:25	5	4	0	0	0	0
Non-breeding	VP2	13/01/2023	09:40	5	6	0	0	0	0
Non-breeding	VP2	13/01/2023	09:55	11	11	0	0	0	0
Non-breeding	VP2	13/01/2023	10:40	1	6	0	0	0	0

Vantage Point (Flight)									
Season	VP	Date	Time	Abundance	Seconds in Band 1 (0-25m)	Seconds in Band 2 (26-50m)	Seconds in Band 3 (51-150m)	Seconds in Band 4 (151-200m)	Seconds in Band 5 (201+m)
Non-breeding	VP2	13/01/2023	11:05	5	3	0	0	0	0
Non-breeding	VP2	13/01/2023	14:49	7	4	5	0	0	0
Non-breeding	VP4	16/01/2023	10:26	2	7	0	0	0	0
Non-breeding	VP4	16/01/2023	10:20	11	12	0	0	0	0
Non-breeding	VP9	16/01/2023	12:15	5	10	10	0	0	0
Non-breeding	VP9	16/01/2023	12:25	9	0	20	0	0	0
Non-breeding	VP7	19/01/2023	00:00	5	15	10	0	0	0
Non-breeding	VP7	19/01/2023	12:15	2	10	15	0	0	0
Non-breeding	VP7	19/01/2023	14:10	6	10	10	0	0	0
Non-breeding	VP7	19/01/2023	14:20	3	15	15	0	0	0
Non-breeding	VP7	19/01/2023	14:55	4	10	15	0	0	0
Non-breeding	VP7	19/01/2023	16:25	2	10	10	0	0	0
Non-breeding	VP7	19/01/2023	16:55	4	10	10	0	0	0
Non-breeding	VP7	19/01/2023	17:05	18	10	20	0	0	0
Non-breeding	VP5	20/01/2023	10:17	7	18	0	0	0	0
Non-breeding	VP5	20/01/2023	10:38	7	10	10	0	0	0
Non-breeding	VP11	20/01/2023	09:55	7	0	45	0	0	0
Non-breeding	VP11	20/01/2023	11:00	17	0	45	0	0	0
Non-breeding	VP11	20/01/2023	11:01	5	0	45	0	0	0
Non-breeding	VP9	09/02/2023	13:10	4	0	35	0	0	0
Non-breeding	VP9	09/02/2023	14:15	6	30	0	0	0	0
Non-breeding	VP9	09/02/2023	17:05	2	10	20	0	0	0
Non-breeding	VP11	13/02/2023	11:10	2	0	30	0	0	0
Non-breeding	VP4	13/02/2023	14:55	2	3	0	0	0	0
Non-breeding	VP2	17/02/2023	10:43	3	11	0	0	0	0
Non-breeding	VP2	17/02/2023	11:16	7	3	0	0	0	0
Non-breeding	VP4	21/03/2023	10:00	4	4	0	0	0	0
Non-breeding	VP2	08/11/2023	09:25	2	8	0	0	0	0

Vantage Point (Flight)									
Season	VP	Date	Time	Abundance	Seconds in Band 1 (0-25m)	Seconds in Band 2 (26-50m)	Seconds in Band 3 (51-150m)	Seconds in Band 4 (151-200m)	Seconds in Band 5 (201+m)
Non-breeding	VP4	12/11/2023	10:30	4	0	7	0	0	0
Non-breeding	VP4	12/11/2023	11:11	2	16	0	0	0	0
Non-breeding	VP9	22/11/2023	08:11	5	30	15	0	0	0
Non-breeding	VP7	06/12/2023	08:40	11	0	45	0	0	0
Non-breeding	VP7	06/12/2023	08:50	13	0	50	0	0	0
Non-breeding	VP7	06/12/2023	09:05	4	0	20	0	0	0
Non-breeding	VP7	06/12/2023	09:10	6	0	20	0	0	0
Non-breeding	VP7	06/12/2023	09:55	5	0	20	0	0	0
Non-breeding	VP7	06/12/2023	14:05	4	0	25	0	0	0
Non-breeding	VP8	07/12/2023	13:40	2	0	0	35	0	0
Non-breeding	VP8	07/12/2023	13:45	6	0	30	25	0	0
Non-breeding	VP2	15/12/2023	12:03	2	6	0	0	0	0
Non-breeding	VP5	19/12/2023	11:07	5	0	5	0	0	0
Non-breeding	VP10	03/01/2024	10:50	1	15	0	0	0	0
Non-breeding	VP10	03/01/2024	11:05	1	10	0	0	0	0
Non-breeding	VP6	04/01/2024	11:05	4	0	15	0	0	0
Non-breeding	VP6	04/01/2024	12:55	2	5	10	0	0	0
Non-breeding	VP6	04/01/2024	13:30	2	30	45	0	0	0
Non-breeding	VP8	08/01/2024	10:40	7	0	40	0	0	0
Non-breeding	VP8	08/01/2024	16:10	3	0	25	0	0	0
Non-breeding	VP2	12/01/2024	09:47	3	8	0	0	0	0
Non-breeding	VP7	15/01/2024	10:25	4	0	35	0	0	0
Non-breeding	VP1	16/01/2024	15:53	3	4	0	0	0	0
Non-breeding	VP5	17/01/2024	15:07	5	3	4	0	0	0
Non-breeding	VP10	01/02/2024	10:05	2	35	25	0	0	0
Non-breeding	VP7	02/02/2024	10:40	2	5	20	0	0	0
Non-breeding	VP6	07/02/2024	12:40	3	65	0	0	0	0
Non-breeding	VP6	07/02/2024	12:45	8	60	0	0	0	0

Vantage Point (Flight)									
Season	VP	Date	Time	Abundance	Seconds in Band 1 (0-25m)	Seconds in Band 2 (26-50m)	Seconds in Band 3 (51-150m)	Seconds in Band 4 (151-200m)	Seconds in Band 5 (201+m)
Non-breeding	VP6	04/03/2024	12:30	6	25	35	0	0	0
Non-breeding	VP10	05/03/2024	12:55	20	30	40	0	0	0
Non-breeding	VP10	05/03/2024	13:40	20	65	85	0	0	0
Non-breeding	VP5	27/03/2024	11:01	1	6	0	0	0	0

Vantage Point (Non-flight)									
Map Ref.	Season	VP	Date	Time	Abundance	Dominant Habitat	Activity	Breeding Code	Breeding Status
P01845	Non-breeding	VP6	21/11/2022	08:00	50	GS4	Roosting	N/A	N/A
P01843	Non-breeding	VP5	28/11/2022	09:00	180	FL8	Swimming Roosting	N/A	N/A
P01860	Non-breeding	VP4	16/01/2023	09:30	8	PB4	On water	N/A	N/A
P01853	Non-breeding	VP7	19/01/2023	14:00	112	PB4	Roosting.	N/A	N/A
P01866	Non-breeding	VP9	09/02/2023	11:30	7	PB4	Roosting.	N/A	N/A
P01867	Non-breeding	VP9	09/02/2023	14:15	13	PB4	Landed.	N/A	N/A
P01869	Non-breeding	VP7	14/02/2023	11:25	11	PB4	Roosting.	N/A	N/A
P01873	Non-breeding	VP7	14/02/2023	11:25	25	PB4	Foraging.	N/A	N/A
P01887	Non-breeding	VP7	08/03/2023	13:20	14	PB4	Roosting	N/A	N/A
P05869	Non-breeding	VP7	06/12/2023	07:45	74	N/A	Roosting	N/A	N/A
P05872	Non-breeding	VP6	04/01/2024	10:35	2	N/A	Swimming	N/A	N/A
P05873	Non-breeding	VP10	01/02/2024	08:20	6	N/A	Foraging	N/A	N/A
P05874	Non-breeding	VP10	01/02/2024	08:20	7	N/A	Foraging	N/A	N/A
P05877	Non-breeding	VP10	01/02/2024	13:50	15	N/A	Foraging	N/A	N/A
P05882	Non-breeding	VP6	07/02/2024	12:40	11	N/A	Foraging	N/A	N/A
P05883	Non-breeding	VP6	07/02/2024	12:55	3	N/A	Foraging	N/A	N/A
P05884	Non-breeding	VP8	13/02/2024	11:35	117	N/A	Foraging	N/A	N/A
P05890	Non-breeding	VP10	05/03/2024	12:55	20	N/A	Swimming.	N/A	N/A
P01845	Non-breeding	VP6	21/11/2022	08:00	50	GS4	Roosting	N/A	N/A
P01843	Non-breeding	VP5	28/11/2022	09:00	180	FL8	Swimming Roosting	N/A	N/A
P01860	Non-breeding	VP4	16/01/2023	09:30	8	PB4	On water	N/A	N/A
P01853	Non-breeding	VP7	19/01/2023	14:00	112	PB4	Roosting.	N/A	N/A
P01866	Non-breeding	VP9	09/02/2023	11:30	7	PB4	Roosting.	N/A	N/A
P01867	Non-breeding	VP9	09/02/2023	14:15	13	PB4	Landed.	N/A	N/A
P01869	Non-breeding	VP7	14/02/2023	11:25	11	PB4	Roosting.	N/A	N/A

Vantage Point (Non-flight)									
Map Ref.	Season	VP	Date	Time	Abundance	Dominant Habitat	Activity	Breeding Code	Breeding Status
P01873	Non-breeding	VP7	14/02/2023	11:25	25	PB4	Foraging.	N/A	N/A
P01887	Non-breeding	VP7	08/03/2023	13:20	14	PB4	Roosting	N/A	N/A
P05869	Non-breeding	VP7	06/12/2023	07:45	74	N/A	Roosting	N/A	N/A
P05872	Non-breeding	VP6	04/01/2024	10:35	2	N/A	Swimming	N/A	N/A
P05873	Non-breeding	VP10	01/02/2024	08:20	6	N/A	Foraging	N/A	N/A
P05874	Non-breeding	VP10	01/02/2024	08:20	7	N/A	Foraging	N/A	N/A
P05877	Non-breeding	VP10	01/02/2024	13:50	15	N/A	Foraging	N/A	N/A
P05882	Non-breeding	VP6	07/02/2024	12:40	11	N/A	Foraging	N/A	N/A
P05883	Non-breeding	VP6	07/02/2024	12:55	3	N/A	Foraging	N/A	N/A
P05884	Non-breeding	VP8	13/02/2024	11:35	117	N/A	Foraging	N/A	N/A
P05890	Non-breeding	VP10	05/03/2024	12:55	20	N/A	Swimming.	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P01084	Breeding	Ref: 4	20/04/2022	1	Swimming on open water.	N/A	N/A
P01893	Non-breeding	Rhynmount Bog	12/10/2022	24	Foraging and roosting on wetlands.	N/A	N/A
P01967	Non-breeding	Rhynmount Bog	16/11/2022	4	Swimming on wetlands.	N/A	N/A
P01985	Non-breeding	Derrycashel Bog	16/11/2022	102	Roosting on side of wetland.	N/A	N/A
P01999	Non-breeding	Site 23	27/11/2022	7	Standing at water edge on the fllded field, sometimes walking but generally not doing much	N/A	N/A
P02006	Non-breeding	Site 4	27/11/2022	43	2 at same location as L above. 2 more on 'islands' in the turlough	N/A	N/A
P02059	Non-breeding	Rhynmount Bog	08/12/2022	4	Swimming on wetland.	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P02063	Non-breeding	Rhynmount Bog	08/12/2022	1	Roosting on wetlands.	N/A	N/A
P02109	Non-breeding	Site 4, Turlough at LeTergullion	27/12/2022	41	On grassy field to the south	N/A	N/A
P02119	Non-breeding	Site 4, Turlough at LeTergullion	27/12/2022	3	Flew over turlough and settled with large group of WS in field	N/A	N/A
P02120	Non-breeding	Newpark, turlough slightly to the east of Turlough Site 4 (same complex)	27/12/2022	11	On water, close to raod and away from other birds	N/A	N/A
P02186	Non-breeding	53.695868, -7.913023	13/01/2023	52	Foraging on grass field.	N/A	N/A
P02137	Non-breeding	Corlea Bog Amenity Walk	15/01/2023	2	Flew over, headind south, about 10-12 metres high	N/A	N/A
P02317	Non-breeding	Corlea Bog Amenity Walk	15/01/2023	2	Flew over, headind south, about 10-12 metres high	N/A	N/A
P02202	Non-breeding	Ref No 13	23/01/2023	6	Swimming on flooded field.	N/A	N/A
P02153	Non-breeding	Site 4, Turlough	29/01/2023	2	Swimming near CU area	N/A	N/A
P02159	Non-breeding	NewPark, Clonmee, west of site 4	29/01/2023	1	Swimming with MS on west side of lough	N/A	N/A
P02161	Non-breeding	Greenhall Upper	29/01/2023	18	A few on the water, but 15 on grass, either feeding, roosting or loafing about	N/A	N/A
P02168	Non-breeding	Derrymany Bog	29/01/2023	42	N/A	N/A	N/A
P02333	Non-breeding	Site 4, Turlough	29/01/2023	2	Swimming near CU area	N/A	N/A
P02339	Non-breeding	NewPark, Clonmee, west of site 4	29/01/2023	1	Swimming with MS on west side of lough	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P02341	Non-breeding	Greenhall Upper	29/01/2023	18	A few on the water, but 15 on grass, either feeding, roosting or loafing about	N/A	N/A
P02348	Non-breeding	Derrymany Bog	29/01/2023	42	N/A	N/A	N/A
P02279	Non-breeding	Ballyduff	12/02/2023	11	Generally not doing much; standing, preening, walking about, stretching	N/A	N/A
P02281	Non-breeding	Cloontaghmore	12/02/2023	34	Generally not doing much; standing, preening, walking about, stretching	N/A	N/A
P02350	Non-breeding	Ballyduff	12/02/2023	11	Generally not doing much; standing, preening, walking about, stretching	N/A	N/A
P02352	Non-breeding	Cloontaghmore	12/02/2023	34	Generally not doing much; standing, preening, walking about, stretching	N/A	N/A
P02278	Non-breeding	Bunaclay, grass field.	16/02/2023	253	Foraging on grass field.	N/A	N/A
P02295	Non-breeding	Site 4 Turlough	25/02/2023	137	On field adjacent to the field recorded in January. Roosting, Loafing, Stretching	N/A	N/A
P02301	Non-breeding	East of Site 4, Newpark	25/02/2023	8	On water in flooded field	N/A	N/A
P02311	Non-breeding	SW Derryhaun Estate	25/02/2023	38	Loafing around, roosting, preening, Stretching	N/A	N/A
P02366	Non-breeding	Site 4 Turlough	25/02/2023	137	On field adjacent to the field recorded in January. Roosting, Loafing, Stretching	N/A	N/A
P02372	Non-breeding	East of Site 4, Newpark	25/02/2023	8	On water in flooded field	N/A	N/A
P02382	Non-breeding	SW Derryhaun Estate	25/02/2023	38	Loafing around, roosting, preening, Stretching	N/A	N/A
P02461	Non-breeding	Rhynmount Bog VP2	16/03/2023	3	Flyover.	N/A	N/A
P02484	Non-breeding	Bunaclay, grass field 1.	16/03/2023	26	Foraging on grass field.	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P02485	Non-breeding	Bunaclay, grass field 2.	16/03/2023	209	Foraging on grass field.	N/A	N/A
P02386	Non-breeding	Derrylough	23/03/2023	2	Swimming on flooded area	N/A	N/A
P02401	Non-breeding	Location 4, Turlough	24/03/2023	64	SW of turlough. On field.	N/A	N/A
P04624	Breeding	Derrycashel Bog	07/07/2023	1	Swimming	N/A	N/A
P04823	Breeding	Derrycashel Bog	28/09/2023	1	Foraging	N/A	N/A
P06442	Non-breeding	N/A	14/10/2023	6	6 Whooper Swans on turlough	N/A	N/A
P06448	Non-breeding	4	14/10/2023	10	10 Whooper Swans on turlough	N/A	N/A
P06459	Non-breeding	N/A	18/10/2023	4	4 Whooper Swans on flooded area of bog	N/A	N/A
P06206	Non-breeding	Ref No: 17	13/11/2023	1	Swimming	N/A	N/A
P06210	Non-breeding	Rhynmount	13/11/2023	2	Flying/ Landed.	N/A	N/A
P06213	Non-breeding	Grass field	13/11/2023	55	Foraging	N/A	N/A
P06310	Non-breeding	N/A	27/11/2023	3	3 Whooper Swans on small lake/flooded area	N/A	N/A
P06323	Non-breeding	4	27/11/2023	35	35 Whooper Swans on turlough	N/A	N/A
P06491	Non-breeding	Grass field 1	08/12/2023	58	Foraging. 36 Landed at 8:50 coming from the north.	N/A	N/A
P06492	Non-breeding	Grass field 2	08/12/2023	4	Foraging	N/A	N/A
P06575	Non-breeding	4	18/12/2023	3	3 Whooper Swans on turlough	N/A	N/A
P06581	Non-breeding	4	18/12/2023	5	5 Whooper Swans on turlough	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P06585	Non-breeding	N/A	21/12/2023	46	46 Whooper Swans on bog	N/A	N/A
P06586	Non-breeding	N/A	21/12/2023	2	2 Whoopers on flooded area of bog	N/A	N/A
P06588	Non-breeding	N/A	21/12/2023	1	Whooper Swan on small pond in bog.	N/A	N/A
P06639	Non-breeding	Southern half of site	02/01/2024	10	N/A	N/A	N/A
P06644	Non-breeding	Southern half of site	02/01/2024	128	N/A	N/A	N/A
P06602	Non-breeding	Ref No: 8	05/01/2024	5	N/A	N/A	N/A
P06631	Non-breeding	Grass field 1	12/01/2024	121	Foraging. 2 coloured ringed birds	N/A	N/A
P06650	Non-breeding	Southern half of site	25/01/2024	26	N/A	N/A	N/A
P06669	Non-breeding	Southern half of site	26/01/2024	29	N/A	N/A	N/A
P06713	Non-breeding	Grass field 1	14/02/2024	91	N/A	N/A	N/A
P06719	Non-breeding	Onsite	14/02/2024	3	N/A	N/A	N/A
P06721	Non-breeding	Southern half of site	19/02/2024	3	3 Whoopers on wetland	N/A	N/A
P06725	Non-breeding	Southern half of site	19/02/2024	5	5 Whoopers on wetland area of bog	N/A	N/A
P06753	Non-breeding	Southern half of site	21/02/2024	34	On Turlough	N/A	N/A
P06758	Non-breeding	Southern half of site	23/02/2024	2	2 Whooper Swans on wetland area of bog	N/A	N/A
P06810	Non-breeding	Grass field 1	08/03/2024	134	Foraging	N/A	N/A

CBS & Winter Transect Survey									
Map Ref.	Season	Survey Location	Date	Time	Abundance	Dominant Habitat	Activity	Breeding Code	Breeding Status
P02913	Non-breeding	T13	14/11/2022	07:40	26	PB4	Roosting/ Swimming.	N/A	N/A
P02915	Non-breeding	T13	14/11/2022	07:50	38	PB4	Roosting/ Landed	N/A	N/A
P02916	Non-breeding	T13	14/11/2022	08:10	6	PB4	Roosting.	N/A	N/A
P03051	Non-breeding	T20	08/12/2022	10:00	7	PB4	Swimming	N/A	N/A
P03053	Non-breeding	T20	08/12/2022	10:10	119	PB4	Roosting	N/A	N/A
P03071	Non-breeding	T4	09/12/2022	N/A	2	FL1	Swimming	N/A	N/A
P03096	Non-breeding	T5	10/12/2022	N/A	9	FL8	Swimming, Flying	N/A	N/A
P03097	Non-breeding	T5	10/12/2022	N/A	9	FL8	Flying	N/A	N/A
P03158	Non-breeding	T11	18/12/2022	N/A	3	PB4	Flying, Swimming	N/A	N/A
P03171	Non-breeding	T13	19/12/2022	08:40	1	PB4	Flyover	N/A	N/A
P03207	Non-breeding	T10	26/12/2022	N/A	2	N/A	Swimming	N/A	N/A
P03219	Non-breeding	T4	03/01/2023	N/A	11	FL1	Swimmng, Flying	N/A	N/A
P03286	Non-breeding	T1	13/01/2023	N/A	5	GA1	Flying	N/A	N/A
P03399	Non-breeding	T11	21/01/2023	N/A	14	PB4	Swimming, Standing, Flying	N/A	N/A
P03400	Non-breeding	T12	21/01/2023	N/A	74	PB4	Swimming, Feeding, Standing about	N/A	N/A
P03411	Non-breeding	T17	23/01/2023	08:55	31	PB4	Roosting	N/A	N/A

CBS & Winter Transect Survey									
Map Ref.	Season	Survey Location	Date	Time	Abundance	Dominant Habitat	Activity	Breeding Code	Breeding Status
P03426	Non-breeding	T20	23/01/2023	10:00	26	PB4	Roosting	N/A	N/A
P03428	Non-breeding	T20	23/01/2023	10:40	28	PB4	Roosting	N/A	N/A
P03467	Non-breeding	T4	04/02/2023	N/A	32	FL1	Swimming	N/A	N/A
P03596	Non-breeding	T18	14/02/2023	08:50	4	PB4	Foraging	N/A	N/A
P03630	Non-breeding	T11	15/02/2023	08:30	33	PB4	Foraging/ Roosting	N/A	N/A
P03713	Non-breeding	T4	05/03/2023	N/A	10	PB4	Swimming	N/A	N/A
P03837	Non-breeding	T18	08/03/2023	08:55	4	PB4	Foraging	N/A	N/A
P03904	Non-breeding	T12	16/03/2023	11:15	28	PB4	Foraging	N/A	N/A
P04223	Breeding	T5	05/04/2023	14:10	7	PB4	N/A	N/A	N/A
P06424	Non-breeding	T4	18/10/2023	15:30	3	PB4	Flight	N/A	N/A
P06243	Non-breeding	T17	21/11/2023	13:22	3	PB4	Swimming	N/A	N/A
P06258	Non-breeding	T4	27/11/2023	15:25	18	PB4	Swimming	N/A	N/A
P06263	Non-breeding	T4	27/11/2023	15:42	5	PB4	Swimming	N/A	N/A
P06473	Non-breeding	T20	04/12/2023	12:20	1	PB4	Dead on wetland	N/A	N/A
P06521	Non-breeding	T10	06/12/2023	14:12	3	PB4	Swimming	N/A	N/A
P06546	Non-breeding	T11	22/12/2023	10:40	26	PB4	Swimming	N/A	N/A
P05902	Non-breeding	T20	03/01/2024	12:55	3	PB4	N/A	N/A	N/A

CBS & Winter Transect Survey									
Map Ref.	Season	Survey Location	Date	Time	Abundance	Dominant Habitat	Activity	Breeding Code	Breeding Status
P05904	Non-breeding	T20	03/01/2024	13:25	5	PB4	N/A	N/A	N/A
P05919	Non-breeding	T5	03/01/2024	10:10	5	PB4	N/A	N/A	N/A
P05923	Non-breeding	T4	03/01/2024	10:40	3	PB4	N/A	N/A	N/A
P05929	Non-breeding	T4	03/01/2024	11:00	2	PB4	N/A	N/A	N/A
P05931	Non-breeding	T6	03/01/2024	12:28	2	PB4	N/A	N/A	N/A
P05934	Non-breeding	T16	03/01/2024	14:42	2	PB4	N/A	N/A	N/A
P05964	Non-breeding	T21	01/02/2024	11:40	12	PB4	N/A	N/A	N/A
P05965	Non-breeding	T20	01/02/2024	12:55	2	PB4	N/A	N/A	N/A
P05968	Non-breeding	T20	01/02/2024	13:05	8	PB4	N/A	N/A	N/A
P05985	Non-breeding	T4	20/02/2024	08:31	3	PB4	N/A	N/A	N/A
P05987	Non-breeding	T4	20/02/2024	09:12	5	PB4	N/A	N/A	N/A
P05999	Non-breeding	T6	23/02/2024	15:42	3	PB4	N/A	N/A	N/A
P06000	Non-breeding	T11	28/02/2024	10:52	6	PB4	N/A	N/A	N/A
P06032	Non-breeding	21	05/03/2024	10:25	6	PB4	N/A	N/A	N/A
P04987	Breeding	Transect 11	08/04/2024	14:11	3	FL8	N/A	H	Possible
P02913	Non-breeding	T13	14/11/2022	07:40	26	PB4	Roosting/ Swimming.	N/A	N/A
P02915	Non-breeding	T13	14/11/2022	07:50	38	PB4	Roosting/ Landed	N/A	N/A

CBS & Winter Transect Survey									
Map Ref.	Season	Survey Location	Date	Time	Abundance	Dominant Habitat	Activity	Breeding Code	Breeding Status
P02916	Non-breeding	T13	14/11/2022	08:10	6	PB4	Roosting.	N/A	N/A
P03051	Non-breeding	T20	08/12/2022	10:00	7	PB4	Swimming	N/A	N/A
P03053	Non-breeding	T20	08/12/2022	10:10	119	PB4	Roosting	N/A	N/A
P03071	Non-breeding	T4	09/12/2022	N/A	2	FL1	Swimming	N/A	N/A
P03096	Non-breeding	T5	10/12/2022	N/A	9	FL8	Swimming, Flying	N/A	N/A
P03097	Non-breeding	T5	10/12/2022	N/A	9	FL8	Flying	N/A	N/A
P03158	Non-breeding	T11	18/12/2022	N/A	3	PB4	Flying, Swimming	N/A	N/A
P03171	Non-breeding	T13	19/12/2022	08:40	1	PB4	Flyover	N/A	N/A
P03207	Non-breeding	T10	26/12/2022	N/A	2	N/A	Swimming	N/A	N/A
P03219	Non-breeding	T4	03/01/2023	N/A	11	FL1	Swimmng, Flying	N/A	N/A
P03286	Non-breeding	T1	13/01/2023	N/A	5	GA1	Flying	N/A	N/A
P03399	Non-breeding	T11	21/01/2023	N/A	14	PB4	Swimming, Standing, Flying	N/A	N/A
P03400	Non-breeding	T12	21/01/2023	N/A	74	PB4	Swimming, Feeding, Standing about	N/A	N/A
P03411	Non-breeding	T17	23/01/2023	08:55	31	PB4	Roosting	N/A	N/A
P03426	Non-breeding	T20	23/01/2023	10:00	26	PB4	Roosting	N/A	N/A
P03428	Non-breeding	T20	23/01/2023	10:40	28	PB4	Roosting	N/A	N/A
P03467	Non-breeding	T4	04/02/2023	N/A	32	FL1	Swimming	N/A	N/A

CBS & Winter Transect Survey									
Map Ref.	Season	Survey Location	Date	Time	Abundance	Dominant Habitat	Activity	Breeding Code	Breeding Status
P03596	Non-breeding	T18	14/02/2023	08:50	4	PB4	Foraging	N/A	N/A
P03630	Non-breeding	T11	15/02/2023	08:30	33	PB4	Foraging/ Roosting	N/A	N/A
P03713	Non-breeding	T4	05/03/2023	N/A	10	PB4	Swimming	N/A	N/A
P03837	Non-breeding	T18	08/03/2023	08:55	4	PB4	Foraging	N/A	N/A
P03904	Non-breeding	T12	16/03/2023	11:15	28	PB4	Foraging	N/A	N/A
P04223	Breeding	T5	05/04/2023	14:10	7	PB4	N/A	N/A	N/A
P06424	Non-breeding	T4	18/10/2023	15:30	3	PB4	Flight	N/A	N/A
P06243	Non-breeding	T17	21/11/2023	13:22	3	PB4	Swimming	N/A	N/A
P06258	Non-breeding	T4	27/11/2023	15:25	18	PB4	Swimming	N/A	N/A
P06263	Non-breeding	T4	27/11/2023	15:42	5	PB4	Swimming	N/A	N/A
P06473	Non-breeding	T20	04/12/2023	12:20	1	PB4	Dead on wetland	N/A	N/A
P06521	Non-breeding	T10	06/12/2023	14:12	3	PB4	Swimming	N/A	N/A
P06546	Non-breeding	T11	22/12/2023	10:40	26	PB4	Swimming	N/A	N/A
P05902	Non-breeding	T20	03/01/2024	12:55	3	PB4	N/A	N/A	N/A
P05904	Non-breeding	T20	03/01/2024	13:25	5	PB4	N/A	N/A	N/A
P05919	Non-breeding	T5	03/01/2024	10:10	5	PB4	N/A	N/A	N/A
P05923	Non-breeding	T4	03/01/2024	10:40	3	PB4	N/A	N/A	N/A

CBS & Winter Transect Survey									
Map Ref.	Season	Survey Location	Date	Time	Abundance	Dominant Habitat	Activity	Breeding Code	Breeding Status
P05929	Non-breeding	T4	03/01/2024	11:00	2	PB4	N/A	N/A	N/A
P05931	Non-breeding	T6	03/01/2024	12:28	2	PB4	N/A	N/A	N/A
P05934	Non-breeding	T16	03/01/2024	14:42	2	PB4	N/A	N/A	N/A
P05964	Non-breeding	T21	01/02/2024	11:40	12	PB4	N/A	N/A	N/A
P05965	Non-breeding	T20	01/02/2024	12:55	2	PB4	N/A	N/A	N/A
P05968	Non-breeding	T20	01/02/2024	13:05	8	PB4	N/A	N/A	N/A
P05985	Non-breeding	T4	20/02/2024	08:31	3	PB4	N/A	N/A	N/A
P05987	Non-breeding	T4	20/02/2024	09:12	5	PB4	N/A	N/A	N/A
P05999	Non-breeding	T6	23/02/2024	15:42	3	PB4	N/A	N/A	N/A
P06000	Non-breeding	T11	28/02/2024	10:52	6	PB4	N/A	N/A	N/A
P06032	Non-breeding	21	05/03/2024	10:25	6	PB4	N/A	N/A	N/A
P04987	Breeding	Transect 11	08/04/2024	14:11	3	FL8	N/A	H	Possible

Hinterland (Raptors) Survey & Hen Harrier Roost Watch						
Map Ref.	Season	Location	Date	Abundance	Breeding Code	Breeding Status
P00682	Non-breeding	HHVP4	26/10/2021	19	N/A	N/A
P00731	Non-breeding	HHVP4	24/11/2021	2	N/A	N/A
P00765	Non-breeding	HHVP4	25/01/2022	32	N/A	N/A
P06340	Non-breeding	5	22/10/2023	3	N/A	N/A
P06347	Non-breeding	6	31/10/2023	2	N/A	N/A
P06348	Non-breeding	6	31/10/2023	8	N/A	N/A

Hinterland (Raptors) Survey & Hen Harrier Roost Watch						
Map Ref.	Season	Location	Date	Abundance	Breeding Code	Breeding Status
P06350	Non-breeding	6	31/10/2023	11	N/A	N/A
P06228	Non-breeding	6	21/11/2023	2	N/A	N/A
P06229	Non-breeding	6	21/11/2023	10	N/A	N/A
P06230	Non-breeding	6	21/11/2023	2	N/A	N/A
P06231	Non-breeding	6	21/11/2023	16	N/A	N/A
P06232	Non-breeding	6	21/11/2023	32	N/A	N/A
P06233	Non-breeding	6	21/11/2023	5	N/A	N/A
P06236	Non-breeding	5	26/11/2023	23	N/A	N/A
P06462	Non-breeding	HHVP4	22/12/2023	57	N/A	N/A
P06465	Non-breeding	HHVP6	23/12/2023	11	N/A	N/A
P06466	Non-breeding	HHVP5	28/12/2023	14	N/A	N/A
P05892	Non-breeding	5	12/01/2024	21	N/A	N/A
P05894	Non-breeding	6	14/01/2024	7	N/A	N/A
P05895	Non-breeding	6	14/01/2024	11	N/A	N/A
P05897	Non-breeding	3	28/01/2024	24	N/A	N/A
P05898	Non-breeding	4	30/01/2024	27	N/A	N/A
P05962	Non-breeding	HHVP5	28/02/2024	11	N/A	N/A
P06010	Non-breeding	3	07/03/2024	7	N/A	N/A
P06014	Non-breeding	4	14/03/2024	2	N/A	N/A
P06022	Non-breeding	5	23/03/2024	9	N/A	N/A
P06027	Non-breeding	6	28/03/2024	8	N/A	N/A

Incidental Sightings					
Map Ref.	Season	Date	Abundance	Breeding Code	Breeding Status
P03954	Non-breeding	12/10/2022	4	N/A	N/A
P03955	Non-breeding	12/10/2022	4	N/A	N/A
P03956	Non-breeding	12/10/2022	2	N/A	N/A
P03961	Non-breeding	13/10/2022	11	N/A	N/A
P03967	Non-breeding	14/10/2022	6	N/A	N/A
P03968	Non-breeding	14/10/2022	1	N/A	N/A
P03970	Non-breeding	14/11/2022	135	N/A	N/A
P03973	Non-breeding	15/11/2022	3	N/A	N/A
P03979	Non-breeding	27/11/2022	1	N/A	N/A

Incidental Sightings					
Map Ref.	Season	Date	Abundance	Breeding Code	Breeding Status
P03983	Non-breeding	05/12/2022	2	N/A	N/A
P03984	Non-breeding	06/12/2022	2	N/A	N/A
P03987	Non-breeding	08/12/2022	4	N/A	N/A
P03988	Non-breeding	08/12/2022	3	N/A	N/A
P03989	Non-breeding	08/12/2022	6	N/A	N/A
P03990	Non-breeding	08/12/2022	6	N/A	N/A
P03991	Non-breeding	08/12/2022	2	N/A	N/A
P03992	Non-breeding	08/12/2022	5	N/A	N/A
P03993	Non-breeding	08/12/2022	6	N/A	N/A
P03994	Non-breeding	08/12/2022	35	N/A	N/A
P03995	Non-breeding	08/12/2022	60	N/A	N/A
P03996	Non-breeding	08/12/2022	12	N/A	N/A
P03997	Non-breeding	08/12/2022	18	N/A	N/A
P04002	Non-breeding	12/12/2022	3	N/A	N/A
P04003	Non-breeding	16/12/2022	2	N/A	N/A
P04006	Non-breeding	19/12/2022	3	N/A	N/A
P04010	Non-breeding	23/12/2022	4	N/A	N/A
P04011	Non-breeding	09/01/2023	50	N/A	N/A
P04012	Non-breeding	09/01/2023	3	N/A	N/A
P04013	Non-breeding	10/01/2023	7	N/A	N/A
P04015	Non-breeding	11/01/2023	6	N/A	N/A
P04022	Non-breeding	20/01/2023	5	N/A	N/A
P04024	Non-breeding	23/01/2023	28	N/A	N/A
P04025	Non-breeding	23/01/2023	9	N/A	N/A
P04026	Non-breeding	24/01/2023	3	N/A	N/A
P04029	Non-breeding	02/02/2023	3	N/A	N/A
P04030	Non-breeding	02/02/2023	4	N/A	N/A
P04031	Non-breeding	07/02/2023	24	N/A	N/A
P04039	Non-breeding	10/02/2023	2	N/A	N/A
P04040	Non-breeding	10/02/2023	2	N/A	N/A
P04041	Non-breeding	10/02/2023	2	N/A	N/A
P04042	Non-breeding	10/02/2023	11	N/A	N/A
P04043	Non-breeding	10/02/2023	12	N/A	N/A
P04044	Non-breeding	10/02/2023	20	N/A	N/A
P04045	Non-breeding	10/02/2023	29	N/A	N/A

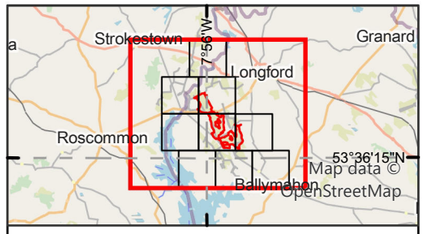
Incidental Sightings					
Map Ref.	Season	Date	Abundance	Breeding Code	Breeding Status
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P04048	Non-breeding	10/02/2023	48	N/A	N/A
P04053	Non-breeding	16/02/2023	17	N/A	N/A
P04056	Non-breeding	16/02/2023	2	N/A	N/A
P04059	Non-breeding	16/02/2023	2	N/A	N/A
P04067	Non-breeding	03/03/2023	15	N/A	N/A
P04072	Non-breeding	10/03/2023	71	N/A	N/A
P04073	Non-breeding	10/03/2023	147	N/A	N/A
P04068	Non-breeding	16/03/2023	20	N/A	N/A
P04069	Non-breeding	16/03/2023	35	N/A	N/A
P04070	Non-breeding	16/03/2023	25	N/A	N/A
P06469	Non-breeding	15/12/2023	21	N/A	N/A
P06470	Non-breeding	16/12/2023	17	N/A	N/A
P06589	Non-breeding	19/12/2023	58	N/A	N/A
P06590	Non-breeding	19/12/2023	28	N/A	N/A
P06467	Non-breeding	23/12/2023	63	N/A	N/A
P06468	Non-breeding	28/12/2023	39	N/A	N/A
P06591	Non-breeding	12/01/2024	78	N/A	N/A
P06592	Non-breeding	04/02/2024	133	N/A	N/A
P06593	Non-breeding	04/02/2024	76	N/A	N/A
P06670	Non-breeding	18/02/2024	39	N/A	N/A
P06671	Non-breeding	18/02/2024	52	N/A	N/A
P06672	Non-breeding	23/02/2024	19	N/A	N/A
P06673	Non-breeding	23/02/2024	62	N/A	N/A
P06674	Non-breeding	29/02/2024	75	N/A	N/A
P06768	Non-breeding	23/03/2024	209	N/A	N/A
P06767	Non-breeding	24/03/2024	205	N/A	N/A
P06769	Non-breeding	28/03/2024	86	N/A	N/A

8°2'40"W
7°53'50"W
7°45'0"W
53°45'0"N
53°40'0"N
53°35'0"N
776000
768000
760000
593600
604000
614400

Sheet 1
Sheet 2
Sheet 3
Sheet 4
Sheet 5
Sheet 6
Sheet 7
Sheet 8

Strokestown Golf Club
Townparks (Longford By)
Enybegs
Ballytoohey
Termonbarry
Cloondara
Cloonrollagh
Cloonbalt
Longford
Feraghfad
Stonepark (Ardagh By)
Cloontuskert
Ballyleague
Knock
Keenagh
Fearagh
Knockcroghery
Galey
Lough Ree
Drinan
Ballymahon

N5
N63
R371
R372
R392
R393
R394
R397
R398
N55



Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-22
- Breeding-23
- Breeding-24

Flightline observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24

0 1.5 3
Kilometres

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Rev	Date	Description	By	Chkd.
A	16/04/2025	First issue	S.P	I.H

Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Flight and non-flight observations Whooper Swan Overview

Scale @ A3:	1:85,000	
Prepared by:	Checked by:	Date:
S.Pezzetta	I.Heanue	April 2025

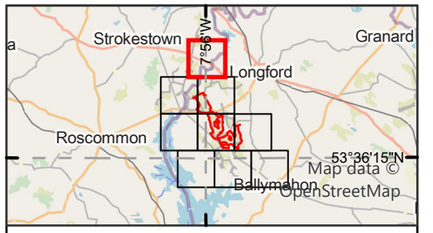
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Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-23

0 0.5 1
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A	16/04/2025	First issue	S.P	I.H
Rev	Date	Description	By	Chkd.

Client:

Bord na Móna

Project:

Derryadd Wind Farm

Title:

Flight and non-flight observations
Whooper Swan
Sheet 1 of 8

Scale @ A3: 1:24,000

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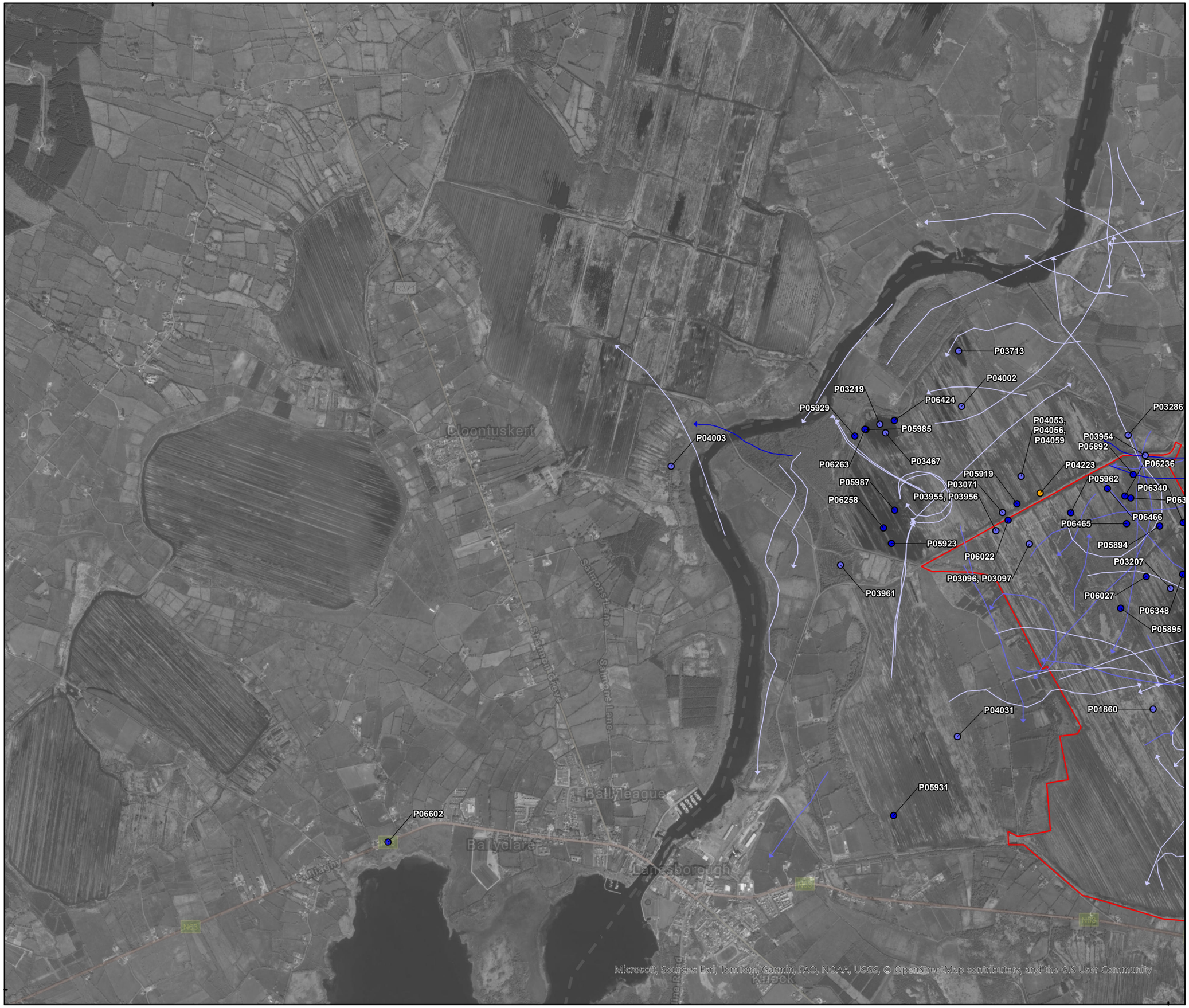
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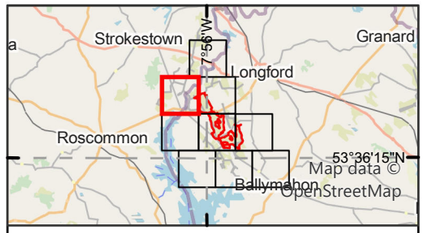
Draft: A

8°2'40"W



53°40'0"N

604000



Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-23

Flightline observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24

0 0.5 1
Kilometres

NOTES

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A	16/04/2025	First issue	S.P	I.H

Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Flight and non-flight observations
Whooper Swan
Sheet 2 of 8

Scale @ A3: 1:24,000

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7°53'50"W



Legend

- Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-23

Flightline observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24

0 0.5 1
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Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Flight and non-flight observations
Whooper Swan
Sheet 3 of 8

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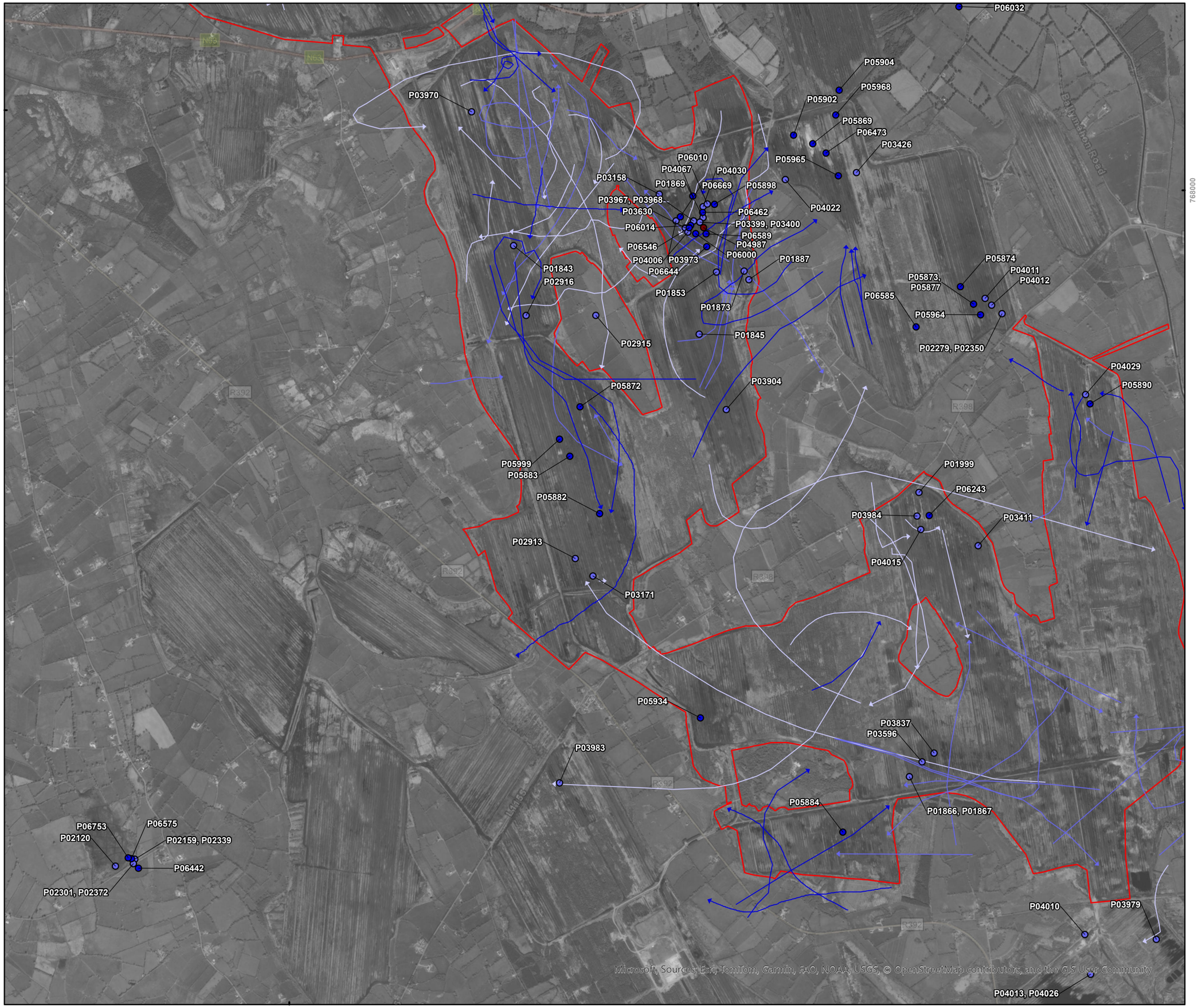
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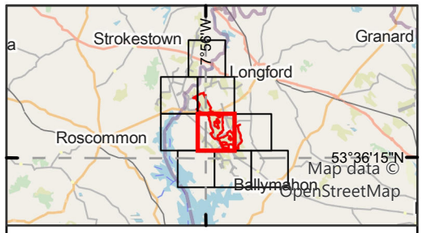
7°53'50"W

53°40'0"N

768000

604000





Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-24

Flightline observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24

0 0.5 1
Kilometres

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Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Flight and non-flight observations
Whooper Swan
Sheet 4 of 8

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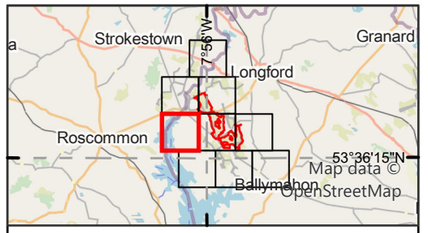
8°2'40"W

53°40'0"N

768000

604000





Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-22

Flightline observations - Seasons

- Non-breeding-21/22

0 0.5 1
Kilometres

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Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Flight and non-flight observations
Whooper Swan
Sheet 5 of 8

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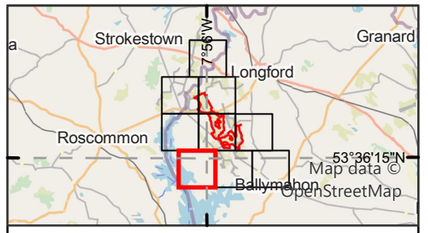
7°53'50"W



53°35'0"N

604000

7600000



Legend

- Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-22

Flightline observations - Seasons

- Non-breeding-23/24

0 0.5 1
Kilometres

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Bord na Móna

Project:

Derryadd Wind Farm

Title:

Flight and non-flight observations
Whooper Swan
Sheet 6 of 8

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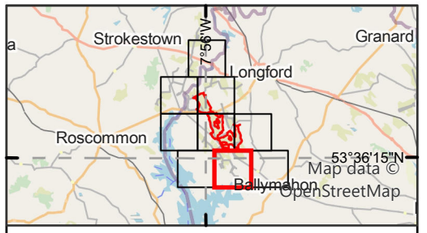
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Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-22/23
- Non-breeding-23/24

Flightline observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24

0 0.5 1
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Client:

Bord na Móna

Project:

Derryadd Wind Farm

Title:

Flight and non-flight observations
Whooper Swan
Sheet 7 of 8

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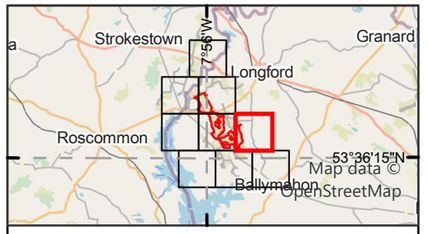
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Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-22/23
- Non-breeding-23/24

Flightline observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24

0 0.5 1
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Rev	Date	Description	By	Chkd.
A	16/04/2025	First issue	S.P	I.H

Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Flight and non-flight observations
Whooper Swan
Sheet 8 of 8

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Appendix K.8 EURASIAN WIGEON

Vantage Point (Flight)									
Season	VP	Date	Time	Abundance	Seconds in Band 1 (0-25m)	Seconds in Band 2 (26-50m)	Seconds in Band 3 (51-150m)	Seconds in Band 4 (151-200m)	Seconds in Band 5 (201+m)
Breeding	VP1	06/05/2021	12:55	1	7	0	0	0	0
Breeding	VP1	01/06/2021	09:43	1	10	0	0	0	0
Non-breeding	VP2	23/11/2021	08:28	2	48	0	0	0	0
Non-breeding	VP1	13/12/2021	10:00	40	5	15	21	0	0
Non-breeding	VP1	13/12/2021	10:12	5	4	2	16	0	0
Non-breeding	VP1	13/12/2021	10:40	2	3	3	21	0	0
Non-breeding	VP3	13/12/2021	12:09	2	10	0	0	0	0
Non-breeding	VP3	13/12/2021	13:20	1	0	0	10	0	0
Non-breeding	VP1	07/01/2022	10:16	67	0	30	0	0	0
Non-breeding	VP3	18/01/2022	11:19	4	0	15	0	0	0
Non-breeding	VP1	01/02/2022	09:59	70	10	20	0	0	0
Non-breeding	VP1	02/03/2022	09:40	19	0	30	0	0	0
Non-breeding	VP1	02/03/2022	13:19	70	0	0	20	0	0
Non-breeding	VP1	02/03/2022	13:30	130	0	0	100	0	0
Non-breeding	VP1	16/12/2022	13:48	3	5	0	0	0	0
Non-breeding	VP5	30/12/2022	10:26	4	4	1	0	0	0
Non-breeding	VP5	30/12/2022	13:10	7	5	0	0	0	0
Non-breeding	VP1	09/01/2023	10:28	9	2	7	0	0	0
Non-breeding	VP1	11/12/2023	14:34	4	6	0	0	0	0
Non-breeding	VP1	25/02/2024	10:17	2	5	0	0	0	0
Non-breeding	VP3	07/03/2024	14:37	2	5	3	0	0	0

Vantage Point (Non-flight)									
Map Ref.	Season	VP	Date	Time	Abundance	Dominant Habitat	Activity	Breeding Code	Breeding Status
P01844	Non-breeding	VP5	28/11/2022	10:42	4	FL8	Swimming Roosting	N/A	N/A
P01878	Non-breeding	VP7	08/03/2023	13:20	32	PB4	Foraging.	N/A	N/A
P05867	Non-breeding	VP1	11/12/2023	10:05	1	N/A	Swimming	N/A	N/A
P05880	Non-breeding	VP7	02/02/2024	08:05	25	N/A	Foraging	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P01815	Breeding	Rhynmount Bog.	14/09/2022	3	Swimming around wetland.	N/A	N/A
P01895	Non-breeding	Rhynmount Bog	12/10/2022	65	Foraging on wetlands.	N/A	N/A
P01907	Non-breeding	Ref No 8	13/10/2022	10	Roosting around shore-line.	N/A	N/A
P01944	Non-breeding	iwebs 1234	31/10/2022	4	towards the centre with MA	N/A	N/A
P02013	Non-breeding	Site 4	06/11/2022	10	Most roosting but 3 on water	N/A	N/A
P02021	Non-breeding	Near site 4, LeTergullion	06/11/2022	16	Roosting (WN,SV, MA, L)	N/A	N/A
P01971	Non-breeding	Rhynmount Bog	16/11/2022	235	Foraging/ Swimming on wetlands.	N/A	N/A
P01981	Non-breeding	Derrycashel Bog	16/11/2022	9	Roosting on wetlands.	N/A	N/A
P02029	Non-breeding	Ref No 8	07/12/2022	155	Foraging/ Swimming on open water.	N/A	N/A
P02039	Non-breeding	Ref No 10	07/12/2022	115	Foraging/ Swimming on open water.	N/A	N/A
P02065	Non-breeding	Rhynmount Bog	08/12/2022	280	Foraging/ Swimming on wetlands.	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P02074	Non-breeding	Ref No 12	08/12/2022	32	Roosting on open water.	N/A	N/A
P02080	Non-breeding	Derrycashel Bog	08/12/2022	4	Swimming on wetland.	N/A	N/A
P02105	Non-breeding	West of Liscacusha, Turlough, North side	27/12/2022	27	Mostly on water but around 7 or 8 roosting and loafing about out of the water	N/A	N/A
P02107	Non-breeding	West of Liscacusha, Turlough, South side	27/12/2022	7	On water in middle of turlough/flooded field	N/A	N/A
P02114	Non-breeding	Site 4, Turlough at LeTergullion	27/12/2022	25	Near road on east side of turlough. Flew off and landed on water	N/A	N/A
P02125	Non-breeding	Newpark, turlough slightly to the east of Turlough Site 4 (same complex)	27/12/2022	21	Feeding in mixed group of MA TU and SV WN	N/A	N/A
P02172	Non-breeding	Ref No 8	10/01/2023	55	Swimming on open water.	N/A	N/A
P02195	Non-breeding	Rhynmount Bog VP3	13/01/2023	320	Foraging on wetland.	N/A	N/A
P02138	Non-breeding	NE of Lisnacusha	29/01/2023	14	Swimming	N/A	N/A
P02148	Non-breeding	Site 4, Turlough	29/01/2023	80	Mostly in one large group on northern edge	N/A	N/A
P02158	Non-breeding	NewPark, Clonmee, west of site 4	29/01/2023	11	Swimming in middle with SV	N/A	N/A
P02164	Non-breeding	Greenhall Upper	29/01/2023	160	Very large group, some on bank but most on water. Seperated into 4 large groups plus some smaller groups	N/A	N/A
P02318	Non-breeding	NE of Lisnacusha	29/01/2023	14	Swimming	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P02328	Non-breeding	Site 4, Turlough	29/01/2023	80	Mostly in one large group on northern edge	N/A	N/A
P02338	Non-breeding	NewPark, Clonmee, west of site 4	29/01/2023	11	Swimming in middle with SV	N/A	N/A
P02344	Non-breeding	Greenhall Upper	29/01/2023	160	Very large group, some on bank but most on water. Seperated into 4 large groups plus some smaller groups	N/A	N/A
P02223	Non-breeding	Ref No 8	03/02/2023	85	Roosting on open water.	N/A	N/A
P02275	Non-breeding	Rhynmount Bog VP3	16/02/2023	95	Foraging on wetland.	N/A	N/A
P02283	Non-breeding	Lisnacusha turlough/fields	25/02/2023	17	Swimming or roosting and loafing at water's edge	N/A	N/A
P02289	Non-breeding	Site 4 Turlough	25/02/2023	70	Swimming and feeding. Dispersed thoughout lough	N/A	N/A
P02302	Non-breeding	East of Site 4, Newpark	25/02/2023	22	On water in flooded field, various locations	N/A	N/A
P02303	Non-breeding	South of Site 4. Flooded field/mini-turlough complex	25/02/2023	150	On small pools, turlough and wet grass	N/A	N/A
P02310	Non-breeding	Loughpark, Site 3	25/02/2023	8	Swimming with TU	N/A	N/A
P02354	Non-breeding	Lisnacusha turlough/fields	25/02/2023	17	Swimming or roosting and loafing at water's edge	N/A	N/A
P02360	Non-breeding	Site 4 Turlough	25/02/2023	70	Swimming and feeding. Dispersed throughout lough	N/A	N/A
P02373	Non-breeding	East of Site 4, Newpark	25/02/2023	22	On water in flooded field, various locations	N/A	N/A
P02374	Non-breeding	South of Site 4. Flooded field/mini-turlough complex	25/02/2023	150	On small pools, turlough and wet grass	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P02381	Non-breeding	Loughpark, Site 3	25/02/2023	8	Swimming with TU	N/A	N/A
P02415	Non-breeding	Ref No 8	03/03/2023	72	Foraging on open water.	N/A	N/A
P02432	Non-breeding	Ref No 5	03/03/2023	7	Foraging on open water.	N/A	N/A
P02464	Non-breeding	Rhynmount Bog VP3	16/03/2023	21	Foraging	N/A	N/A
P02399	Non-breeding	Carrigens turlough/fields	24/03/2023	4	On water	N/A	N/A
P02402	Non-breeding	Location 4, Turlough	24/03/2023	23	Most roosting, a few on water	N/A	N/A
P02409	Non-breeding	East of Location 4	24/03/2023	8	On water	N/A	N/A
P02413	Non-breeding	Field / pool complex	24/03/2023	52	On water but flushed, circled around and landed again	N/A	N/A
P04169	Breeding	Ref No 8	14/04/2023	7	Foraging	N/A	N/A
P04183	Breeding	Derrycashel Bog	14/04/2023	2	Foraging	N/A	N/A
P06184	Non-breeding	Ref No: 10	08/11/2023	25	Foraging	N/A	N/A
P06188	Non-breeding	Ref No: 8	08/11/2023	80	Foraging	N/A	N/A
P06197	Non-breeding	Derrycashel Bog	08/11/2023	24	Foraging	N/A	N/A
P06202	Non-breeding	Ref No: 12	13/11/2023	36	Swimming	N/A	N/A
P06272	Non-breeding	4	20/11/2023	36	36 Wigeon on Turlough	N/A	N/A
P06279	Non-breeding	4	20/11/2023	25	25 Wigeon on turlough	N/A	N/A
P06288	Non-breeding	5	23/11/2023	16	16 Wigeon on lake	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P06295	Non-breeding	4	23/11/2023	35	35 Wigeon on turlough	N/A	N/A
P06303	Non-breeding	4	23/11/2023	32	32 Wigeon on turlough	N/A	N/A
P06317	Non-breeding	4	27/11/2023	48	48 Wigeon on turlough	N/A	N/A
P06321	Non-breeding	4	27/11/2023	24	24 Wigeon on turlough	N/A	N/A
P06548	Non-breeding	5	06/12/2023	12	12 Wigeon on lake	N/A	N/A
P06554	Non-breeding	4	06/12/2023	25	25 Wigeon on lake	N/A	N/A
P06559	Non-breeding	4	06/12/2023	58	58 Wigeon on turlough	N/A	N/A
P06497	Non-breeding	Rhynmount	08/12/2023	4	Swimming	N/A	N/A
P06503	Non-breeding	Ref No: 8	11/12/2023	13	Swimming	N/A	N/A
P06511	Non-breeding	Ref No: 12	11/12/2023	14	Swimming	N/A	N/A
P06570	Non-breeding	4	18/12/2023	43	43 Wigeon on turlough	N/A	N/A
P06578	Non-breeding	4	18/12/2023	22	22 Wigeon on turlough	N/A	N/A
P06584	Non-breeding	5	18/12/2023	5	5 Wigeon in flooded field neasr Lough Ree	N/A	N/A
P06643	Non-breeding	Southern half of site	02/01/2024	5	N/A	N/A	N/A
P06594	Non-breeding	Ref No: 12	05/01/2024	25	N/A	N/A	N/A
P06596	Non-breeding	Ref No: 8	05/01/2024	52	N/A	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P06608	Non-breeding	Derrycashel Bog	05/01/2024	5	N/A	N/A	N/A
P06613	Non-breeding	Ref No: 12	12/01/2024	106	N/A	N/A	N/A
P06619	Non-breeding	Ref No: 17	12/01/2024	30	N/A	N/A	N/A
P06627	Non-breeding	Rhynmount	12/01/2024	16	N/A	N/A	N/A
P06646	Non-breeding	Southern half of site	25/01/2024	83	N/A	N/A	N/A
P06652	Non-breeding	Southern half of site	25/01/2024	78	N/A	N/A	N/A
P06660	Non-breeding	Southern half of site	25/01/2024	56	N/A	N/A	N/A
P06676	Non-breeding	Ref No: 10	06/02/2024	9	N/A	N/A	N/A
P06683	Non-breeding	Ref No: 8	06/02/2024	57	N/A	N/A	N/A
P06690	Non-breeding	Derrycashel Bog	06/02/2024	5	N/A	N/A	N/A
P06692	Non-breeding	Ref No: 12	06/02/2024	23	N/A	N/A	N/A
P06703	Non-breeding	Ref No: 17	14/02/2024	46	N/A	N/A	N/A
P06711	Non-breeding	Rhynmount	14/02/2024	14	N/A	N/A	N/A
P06730	Non-breeding	Southern half of site	19/02/2024	26	On lake	N/A	N/A
P06735	Non-breeding	Southern half of site	19/02/2024	26	On Turlough	N/A	N/A
P06742	Non-breeding	Southern half of site	19/02/2024	26	On Turlough	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P06746	Non-breeding	Southern half of site	21/02/2024	45	On Turlough	N/A	N/A
P06764	Non-breeding	Southern half of site	23/02/2024	12	On Lough Ree	N/A	N/A
P06765	Non-breeding	Southern half of site	23/02/2024	8	On flooded fields near Lough Ree	N/A	N/A
P06773	Non-breeding	Ref No: 10	07/03/2024	15	Swimming	N/A	N/A
P06778	Non-breeding	Ref No: 8	07/03/2024	61	Roosting	N/A	N/A
P06790	Non-breeding	Derrycashel Bog	07/03/2024	2	Swimming	N/A	N/A
P06796	Non-breeding	Ref No: 12	07/03/2024	12	Swimming	N/A	N/A
P06803	Non-breeding	Ref No: 17	08/03/2024	29	Swimming	N/A	N/A

CBS & Winter Transect Survey									
Map Ref.	Season	Survey Location	Date	Time	Abundance	Dominant Habitat	Activity	Breeding Code	Breeding Status
P01161	Breeding	T5	13/04/2022	10:07	2	pb4	h	H	Possible
P03218	Non-breeding	T4	03/01/2023	N/A	9	FL1	On water, Flying	N/A	N/A
P03224	Non-breeding	T5	03/01/2023	N/A	6	FL1	Flying, Swimming	N/A	N/A
P03397	Non-breeding	T11	21/01/2023	N/A	5	PB4	Flying, Circling	N/A	N/A
P03627	Non-breeding	T11	15/02/2023	08:30	12	PB4	Swimming	N/A	N/A
P03716	Non-breeding	T5	12/03/2023	N/A	2	PB4	Both swimming, feeding	N/A	N/A
P06259	Non-breeding	T4	27/11/2023	15:25	22	PB4	Swimming	N/A	N/A

CBS & Winter Transect Survey									
Map Ref.	Season	Survey Location	Date	Time	Abundance	Dominant Habitat	Activity	Breeding Code	Breeding Status
P06529	Non-breeding	T4	19/12/2023	14:48	2	PB4	Swimming	N/A	N/A
P06531	Non-breeding	T4	19/12/2023	15:22	28	PB4	Swimming	N/A	N/A
P05925	Non-breeding	T4	03/01/2024	10:45	10	PB4	N/A	N/A	N/A
P05976	Non-breeding	T2	06/02/2024	11:40	6	FW2	N/A	N/A	N/A
P05988	Non-breeding	T4	20/02/2024	09:12	18	PB4	N/A	N/A	N/A
P06062	Non-breeding	T11	05/03/2024	13:00	16	PB4	N/A	N/A	N/A
P06072	Non-breeding	T4	05/03/2024	15:43	8	PB4	N/A	N/A	N/A

Hinterland (Raptors) Survey & Hen Harrier Roost Watch						
Map Ref.	Season	Location	Date	Abundance	Breeding Code	Breeding Status
P00320	Breeding	HHVP4	12/06/2021	1	N/A	N/A
P00500	Breeding	HHVP5	14/08/2021	1	N/A	N/A
P00655	Breeding	HHVP9	30/09/2021	2	N/A	N/A
P00663	Breeding	HHVP11	30/09/2021	2	N/A	N/A
P00703	Non-breeding	HHVP9	26/10/2021	4	N/A	N/A
P00709	Non-breeding	HHVP11	28/10/2021	18	N/A	N/A
P00724	Non-breeding	HHVP4	24/11/2021	52	N/A	N/A
P00741	Non-breeding	HHVP6	24/11/2021	2	N/A	N/A
P00745	Non-breeding	HHVP8	24/11/2021	210	N/A	N/A
P00749	Non-breeding	HHVP9	24/11/2021	12	N/A	N/A
P00766	Non-breeding	HHVP4	25/01/2022	45	N/A	N/A
P00779	Non-breeding	HHVP8	25/01/2022	10	N/A	N/A
P00786	Non-breeding	HHVP9	25/01/2022	31	N/A	N/A
P00796	Non-breeding	HHVP4	28/02/2022	28	N/A	N/A
P00800	Non-breeding	HHVP5	28/02/2022	12	N/A	N/A
P00809	Non-breeding	HHVP8	28/02/2022	20	N/A	N/A
P00823	Non-breeding	HHVP4	29/03/2022	18	N/A	N/A

Hinterland (Raptors) Survey & Hen Harrier Roost Watch						
Map Ref.	Season	Location	Date	Abundance	Breeding Code	Breeding Status
P00830	Non-breeding	HHVP5	29/03/2022	10	N/A	N/A
P00838	Non-breeding	HHVP8	29/03/2022	4	N/A	N/A

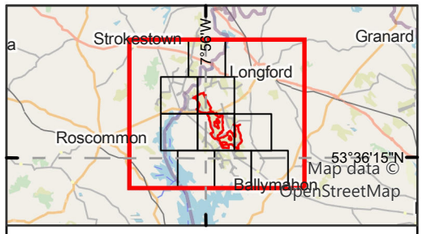
Incidental Sightings					
Map Ref.	Season	Date	Abundance	Breeding Code	Breeding Status
P04009	Non-breeding	19/12/2022	1	N/A	N/A
P04063	Non-breeding	03/03/2023	60	N/A	N/A

8°2'40"W
7°53'50"W
7°45'0"W
53°45'0"N
53°40'0"N
53°35'0"N
776000
768000
760000
593600
604000
614400

Sheet 1
Sheet 2
Sheet 3
Sheet 4
Sheet 5
Sheet 6
Sheet

Strokestown Golf Club
Ballytoohey
Termonbarry
Cloondara
Townparks (Longford By)
Cloonrollagh
Cloonbalt
Longford
Enybegs
Cloontuskert
Ballyleague
Knock
Feraghfad
Stonepark (Ardagh By)
Keenagh
Fearagh
Knockcroghery
Galey
Lough Ree
Drinan
Ballymahon

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Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-21
- Breeding-22
- Breeding-23

Flightline observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-21

0 1.5 3
Kilometres

NOTES

1. FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING\
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4. ALL LEVELS RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD

A	25/03/2025	First issue	S.P	I.H
Rev	Date	Description	By	Chkd.

Client:
Bord na Móna

Project:
Derryadd Wind Farm

Title:
Flight and non-flight observations
Eurasian Wigeon
Overview

Scale @ A3: 1:85,000

Prepared by:	Checked by:	Date:
S.Pezzetta	I.Heanue	March 2025

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Map Ref: 11399-023.ApX-SUM-WN-TOB-A

Draft: A

7°53'50"W

53°45'0"N

Ballytoohey

Termonbarry

Clondra

P06202, P06511, P06594, P06613, P06692, P06796

P02074

P01981, P02080

P04183, P06197, P06608, P06690, P06790

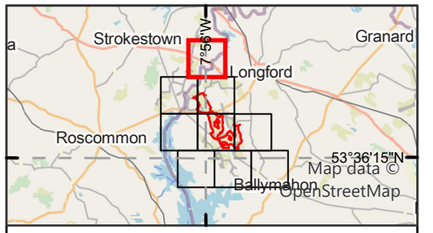
P06619, P06703, P06803

P00663, P00709

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604000

776000



Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-21
- Breeding-23

0 0.5 1
Kilometres

NOTES

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4. ALL LEVELS RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD

Rev	Date	Description	By	Chkd.
A	25/03/2025	First issue	S.P	I.H

Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Flight and non-flight observations
Eurasian Wigeon
Sheet 1 of 7

Scale @ A3: 1:22,000

Prepared by:	Checked by:	Date:
S.Pezzetta	I.Heanue	March 2025

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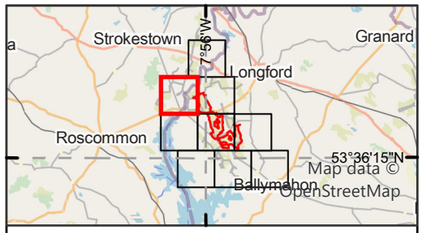
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Map Ref: 11399-023.ApX-SUM-WN-TOB-A

Draft: A

8°2'40"W





Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-22
- Breeding-23

Flightline observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-21

0 0.5 1
Kilometres

NOTES

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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	25/03/2025	First issue	S.P	I.H

Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Flight and non-flight observations
Eurasian Wigeon
Sheet 2 of 7

Scale @ A3: 1:22,000

Prepared by:	Checked by:	Date:
S.Pezzetta	I.Heanue	March 2025

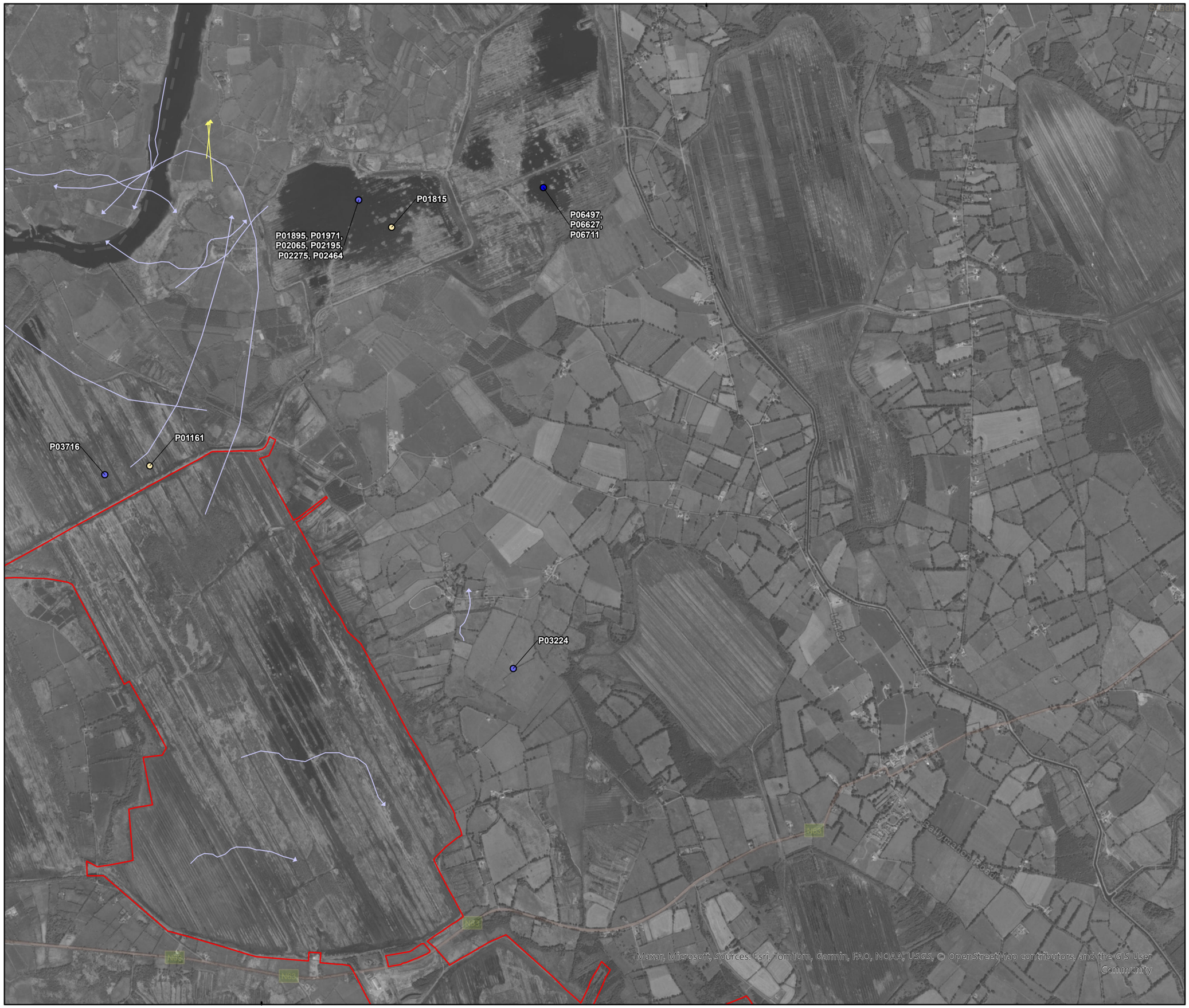
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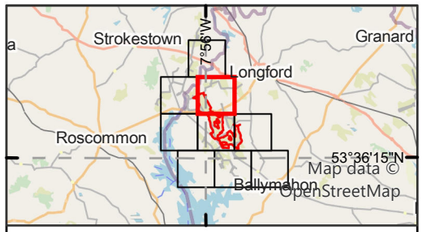
Map Ref: 11399-023.ApX-SUM-WN-TOB-A

Draft: A

7°53'50"W



604000



Legend

- Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-22

Flightline observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Breeding-21

0 0.5 1
Kilometres

NOTES

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Rev	Date	Description	By	Chkd.
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Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Flight and non-flight observations
Eurasian Wigeon
Sheet 3 of 7

Scale @ A3: 1:22,000

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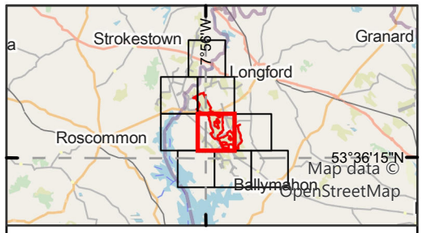
7°53'50"W

53°40'0"N

768000

604000





Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-22/23
- Non-breeding-23/24

Flightline observations - Seasons

- Non-breeding-22/23

0 0.5 1
Kilometres

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Rev	Date	Description	By	Chkd.
A	25/03/2025	First issue	S.P	I.H

Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Flight and non-flight observations
Eurasian Wigeon
Sheet 4 of 7

Scale @ A3: 1:22,000

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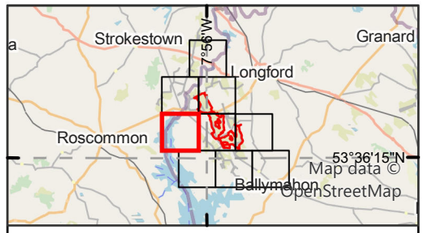
Draft: A

8°2'40"W

53°40'0"N

768000





Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-21

0 0.5 1
Kilometres

NOTES

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Project: Derryadd Wind Farm

Title: Flight and non-flight observations
Eurasian Wigeon
Sheet 5 of 7

Scale @ A3: 1:22,000

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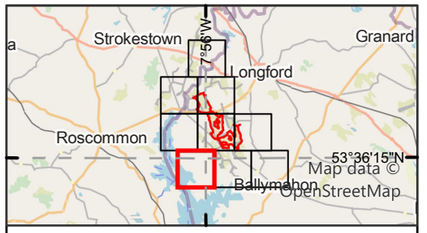
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Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

Non-breeding-22/23

0 0.5 1
Kilometres

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A	25/03/2025	First issue	S.P	I.H
Rev	Date	Description	By	Chkd

Client:

Bord na Móna

Project:

Derryadd Wind Farm

Title:

Flight and non-flight observations
Eurasian Wigeon
Sheet 6 of 7

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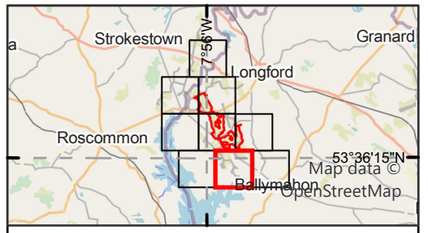
Map Ref:	Draft:
11399-023.ApX-SUM-WN-TOB-A	A

7°53'50"W

53°35'0"N

760000





Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-22/23
- Non-breeding-23/24

0 0.5 1
Kilometres

NOTES

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Rev	Date	Description	By	Chkd.
A	25/03/2025	First issue	S.P	I.H

Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Flight and non-flight observations
Eurasian Wigeon
Sheet 7 of 7

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Appendix K.9 MALLARD

Vantage Point (Flight)									
Season	VP	Date	Time	Abundance	Seconds in Band 1 (0-25m)	Seconds in Band 2 (26-50m)	Seconds in Band 3 (51-150m)	Seconds in Band 4 (151-200m)	Seconds in Band 5 (201+m)
Breeding	VP2	29/04/2021	10:02	3	12	0	0	0	0
Breeding	VP2	29/04/2021	11:00	2	0	0	17	0	0
Breeding	VP2	29/04/2021	14:41	3	9	9	0	0	0
Breeding	VP3	04/05/2021	08:27	3	193	17	0	0	0
Breeding	VP3	04/05/2021	09:40	4	32	33	0	0	0
Breeding	VP3	04/05/2021	16:09	4	88	99	0	0	0
Breeding	VP3	04/05/2021	16:39	3	38	95	0	0	0
Breeding	VP4	05/05/2021	14:36	1	16	0	0	0	0
Breeding	VP5	05/05/2021	18:34	2	10	0	0	0	0
Breeding	VP5	05/05/2021	19:27	2	0	17	55	0	0
Breeding	VP1	06/05/2021	16:33	8	79	0	0	0	0
Breeding	VP1	06/05/2021	17:30	5	24	0	0	0	0
Breeding	VP1	06/05/2021	17:49	2	10	0	0	0	0
Breeding	VP5	06/05/2021	09:51	2	15	0	0	0	0
Breeding	VP9	21/05/2021	11:28	1	25	0	0	0	0
Breeding	VP11	28/05/2021	17:45	2	0	0	48	0	0
Breeding	VP11	28/05/2021	19:00	1	7	0	0	0	0
Breeding	VP2	31/05/2021	09:00	1	11	20	0	0	0
Breeding	VP2	31/05/2021	11:35	1	7	0	0	0	0
Breeding	VP2	31/05/2021	20:15	4	0	27	0	0	0
Breeding	VP1	01/06/2021	10:32	2	35	0	0	0	0
Breeding	VP1	01/06/2021	14:06	3	14	37	0	0	0
Breeding	VP1	01/06/2021	15:00	2	45	0	0	0	0
Breeding	VP9	24/06/2021	13:00	1	12	0	0	0	0
Breeding	VP11	25/06/2021	12:52	1	5	0	0	0	0
Breeding	VP1	06/07/2021	10:23	1	0	8	52	0	0
Breeding	VP1	06/07/2021	14:07	1	10	32	0	0	0
Breeding	VP2	07/07/2021	15:50	1	0	33	0	0	0

Vantage Point (Flight)									
Season	VP	Date	Time	Abundance	Seconds in Band 1 (0-25m)	Seconds in Band 2 (26-50m)	Seconds in Band 3 (51-150m)	Seconds in Band 4 (151-200m)	Seconds in Band 5 (201+m)
Breeding	VP4	07/07/2021	20:26	1	33	0	0	0	0
Breeding	VP4	09/07/2021	16:30	1	20	0	0	0	0
Breeding	VP1	29/07/2021	10:47	1	13	37	0	0	0
Breeding	VP1	29/07/2021	12:03	1	15	18	0	0	0
Breeding	VP1	29/07/2021	16:00	3	23	32	0	0	0
Breeding	VP4	30/07/2021	12:12	1	48	0	0	0	0
Breeding	VP4	30/07/2021	15:07	1	34	0	0	0	0
Breeding	VP4	30/07/2021	17:01	1	11	0	0	0	0
Breeding	VP5	12/08/2021	13:00	3	16	0	0	0	0
Breeding	VP4	13/08/2021	12:22	2	0	46	0	0	0
Breeding	VP4	13/08/2021	15:33	1	54	0	0	0	0
Breeding	VP2	17/08/2021	11:26	1	8	0	0	0	0
Breeding	VP2	17/08/2021	14:09	1	23	0	0	0	0
Breeding	VP1	18/08/2021	09:09	2	22	0	0	0	0
Breeding	VP1	18/08/2021	14:02	1	21	0	0	0	0
Breeding	VP1	18/08/2021	15:34	2	39	0	0	0	0
Breeding	VP1	06/09/2021	08:53	1	15	0	0	0	0
Breeding	VP1	06/09/2021	13:22	1	8	39	0	0	0
Breeding	VP1	06/09/2021	14:19	3	9	10	0	0	0
Breeding	VP4	07/09/2021	14:11	2	13	19	0	0	0
Breeding	VP4	07/09/2021	17:55	1	51	20	0	0	0
Breeding	VP2	12/09/2021	12:11	1	0	0	53	0	0
Breeding	VP2	12/09/2021	18:00	1	32	0	0	0	0
Breeding	VP2	20/09/2021	08:52	1	24	0	0	0	0
Breeding	VP2	20/09/2021	10:46	2	36	0	0	0	0
Breeding	VP2	20/09/2021	12:09	1	37	0	0	0	0
Breeding	VP4	23/09/2021	11:44	2	69	0	0	0	0
Breeding	VP4	23/09/2021	13:47	1	12	55	0	0	0

Vantage Point (Flight)									
Season	VP	Date	Time	Abundance	Seconds in Band 1 (0-25m)	Seconds in Band 2 (26-50m)	Seconds in Band 3 (51-150m)	Seconds in Band 4 (151-200m)	Seconds in Band 5 (201+m)
Breeding	VP1	24/09/2021	18:10	1	17	0	0	0	0
Breeding	VP1	27/09/2021	09:19	2	46	0	0	0	0
Breeding	VP3	28/09/2021	16:11	2	33	0	0	0	0
Non-breeding	VP1	01/10/2021	14:02	1	77	0	0	0	0
Non-breeding	VP1	01/10/2021	10:10	2	38	0	0	0	0
Non-breeding	VP4	02/10/2021	10:22	2	77	0	0	0	0
Non-breeding	VP4	02/10/2021	13:22	1	25	0	0	0	0
Non-breeding	VP2	28/10/2021	11:02	1	27	0	0	0	0
Non-breeding	VP2	28/10/2021	11:08	1	30	0	0	0	0
Non-breeding	VP2	28/10/2021	13:03	1	33	0	0	0	0
Non-breeding	VP10	18/11/2021	13:11	7	0	0	51	0	0
Non-breeding	VP10	18/11/2021	13:15	9	0	0	38	0	0
Non-breeding	VP2	23/11/2021	08:44	5	22	0	0	0	0
Non-breeding	VP2	23/11/2021	08:52	4	44	0	0	0	0
Non-breeding	VP2	23/11/2021	09:15	2	30	0	0	0	0
Non-breeding	VP4	25/11/2021	08:19	2	3600*	0	0	0	0
Non-breeding	VP5	26/11/2021	11:31	2	8	10	40	0	0
Non-breeding	VP5	26/11/2021	11:42	15	50	71	0	0	0
Non-breeding	VP5	26/11/2021	12:22	6	50	50	53	0	0
Non-breeding	VP1	01/12/2021	09:23	1	0	18	0	0	0
Non-breeding	VP1	01/12/2021	10:01	2	13	0	0	0	0
Non-breeding	VP1	13/12/2021	10:30	2	8	0	0	0	0
Non-breeding	VP1	13/12/2021	10:55	1	3	12	10	0	0
Non-breeding	VP1	13/12/2021	11:35	1	0	0	30	0	0
Non-breeding	VP3	13/12/2021	12:11	2	0	0	50	0	0
Non-breeding	VP3	13/12/2021	12:19	2	0	60	0	0	0
Non-breeding	VP3	13/12/2021	13:14	1	0	30	0	0	0
Non-breeding	VP2	14/12/2021	09:40	1	10	5	0	0	0

Vantage Point (Flight)									
Season	VP	Date	Time	Abundance	Seconds in Band 1 (0-25m)	Seconds in Band 2 (26-50m)	Seconds in Band 3 (51-150m)	Seconds in Band 4 (151-200m)	Seconds in Band 5 (201+m)
Non-breeding	VP2	14/12/2021	10:10	4	10	0	0	0	0
Non-breeding	VP1	07/01/2022	10:40	4	10	0	0	0	0
Non-breeding	VP1	07/01/2022	11:45	2	0	5	0	0	0
Non-breeding	VP1	01/02/2022	09:58	15	0	30	0	0	0
Non-breeding	VP1	01/02/2022	12:24	2	0	15	0	0	0
Non-breeding	VP10	01/02/2022	11:39	2	16	22	0	0	0
Non-breeding	VP10	01/02/2022	13:22	4	2	12	0	0	0
Non-breeding	VP2	03/02/2022	10:01	2	0	50	0	0	0
Non-breeding	VP2	03/02/2022	10:05	4	5	15	0	0	0
Non-breeding	VP11	08/02/2022	10:39	2	6	0	0	0	0
Non-breeding	VP11	08/02/2022	11:38	3	7	22	13	0	36
Non-breeding	VP1	02/03/2022	09:46	12	0	0	60	0	0
Non-breeding	VP1	02/03/2022	11:02	9	0	10	0	0	0
Non-breeding	VP4	08/03/2022	10:21	2	10	0	0	0	0
Non-breeding	VP4	08/03/2022	10:42	4	0	0	30	0	0
Non-breeding	VP4	08/03/2022	12:04	6	10	0	0	0	0
Non-breeding	VP5	15/03/2022	10:09	2	0	0	40	0	0
Non-breeding	VP5	15/03/2022	11:42	3	0	10	0	0	0
Non-breeding	VP10	15/03/2022	11:05	2	0	0	27	0	0
Non-breeding	VP3	16/03/2022	09:51	14	0	15	0	0	0
Non-breeding	VP3	16/03/2022	15:30	3	0	35	0	0	0
Non-breeding	VP11	28/03/2022	13:36	3	10	0	0	0	0
Breeding	VP9	11/04/2022	08:15	6	40	0	0	0	0
Breeding	VP8	12/04/2022	08:05	2	20	0	0	0	0
Breeding	VP 1	12/04/2022	15:50	2	25	10	0	0	0
Breeding	VP 1	12/04/2022	16:52	2	20	10	0	0	0
Breeding	VP11	15/04/2022	07:42	1	25	0	0	0	0
Breeding	VP 5	04/05/2022	08:20	3	25	0	0	0	0

Vantage Point (Flight)									
Season	VP	Date	Time	Abundance	Seconds in Band 1 (0-25m)	Seconds in Band 2 (26-50m)	Seconds in Band 3 (51-150m)	Seconds in Band 4 (151-200m)	Seconds in Band 5 (201+m)
Breeding	VP11	04/05/2022	17:15	3	35	0	0	0	0
Breeding	VP8	09/05/2022	19:03	2	10	0	0	0	0
Breeding	VP 1	18/05/2022	08:16	2	15	20	0	0	0
Breeding	VP 2	31/05/2022	06:58	2	5	10	45	0	0
Breeding	VP 4	27/06/2022	16:27	2	10	20	0	0	0
Breeding	VP11	13/07/2022	10:52	2	41	0	0	0	0
Breeding	VP 5	27/07/2022	17:08	2	10	35	0	0	0
Breeding	VP9	08/09/2022	09:35	5	45	0	0	0	0
Breeding	VP11	16/09/2022	11:10	1	0	0	35	0	0
Breeding	VP 4	26/09/2022	18:11	3	0	35	0	0	0
Breeding	VP 1	27/09/2022	17:12	3	15	15	0	0	0
Non-breeding	VP1	09/10/2022	10:11	2	13	0	0	0	0
Non-breeding	VP1	09/10/2022	10:29	3	0	4	0	0	0
Non-breeding	VP5	12/10/2022	11:15	2	2	0	0	0	0
Non-breeding	VP5	17/10/2022	12:33	3	3	0	0	0	0
Non-breeding	VP5	17/10/2022	12:41	20	10	0	0	0	0
Non-breeding	VP4	11/11/2022	11:31	5	12	0	0	0	0
Non-breeding	VP4	13/11/2022	14:07	7	12	5	0	0	0
Non-breeding	VP1	14/11/2022	10:10	4	10	0	0	0	0
Non-breeding	VP5	28/11/2022	08:50	6	10	4	0	0	0
Non-breeding	VP5	28/11/2022	14:41	3	5	0	0	0	0
Non-breeding	VP10	01/12/2022	11:26	12	10	30	0	0	0
Non-breeding	VP 1	16/12/2022	09:00	9	5	0	0	0	0
Non-breeding	VP1	16/12/2022	16:01	2	4	0	0	0	0
Non-breeding	VP4	19/12/2022	10:33	3	10	0	0	0	0
Non-breeding	VP1	09/01/2023	10:21	3	5	0	0	0	0
Non-breeding	VP1	09/01/2023	14:27	7	4	4	0	0	0
Non-breeding	VP10	02/02/2023	10:45	2	0	0	30	0	0

Vantage Point (Flight)									
Season	VP	Date	Time	Abundance	Seconds in Band 1 (0-25m)	Seconds in Band 2 (26-50m)	Seconds in Band 3 (51-150m)	Seconds in Band 4 (151-200m)	Seconds in Band 5 (201+m)
Non-breeding	VP11	13/02/2023	12:30	2	0	35	0	0	0
Non-breeding	VP4	13/02/2023	10:20	3	3	0	0	0	0
Non-breeding	VP7	14/02/2023	15:20	1	0	25	0	0	0
Non-breeding	VP8	15/02/2023	14:25	3	10	20	120	0	0
Non-breeding	VP2	17/02/2023	10:55	2	6	0	0	0	0
Non-breeding	VP2	17/02/2023	14:30	2	5	0	0	0	0
Non-breeding	VP5	24/02/2023	08:15	1	2	8	0	0	0
Non-breeding	VP5	24/02/2023	10:19	5	5	0	0	0	0
Non-breeding	VP1	07/03/2023	08:59	2	4	0	0	0	0
Non-breeding	VP1	07/03/2023	10:38	2	0	3	0	0	0
Non-breeding	VP2	10/03/2023	09:57	3	3	10	0	0	0
Non-breeding	VP2	10/03/2023	14:20	3	5	0	0	0	0
Non-breeding	VP6	28/03/2023	14:05	2	5	0	0	0	0
Non-breeding	VP5	29/03/2023	10:03	8	7	5	0	0	0
Non-breeding	VP5	29/03/2023	15:51	4	6	0	0	0	0
Breeding	VP1	04/04/2023	15:41	2	0	20	0	0	0
Breeding	VP3	05/04/2023	18:36	2	10	20	0	0	0
Breeding	VP10	13/04/2023	15:10	2	0	0	0	0	0
Breeding	VP1	22/05/2023	12:18	4	0	35	0	0	0
Breeding	VP4	08/06/2023	16:15	1	20	0	0	0	0
Breeding	VP10	18/09/2023	14:26	4	15	10	0	0	0
Breeding	VP9	20/09/2023	10:15	1	8	2	0	0	0
Breeding	VP9	20/09/2023	14:25	1	5	0	0	0	0
Breeding	VP5	21/09/2023	15:14	12	13	30	0	0	0
Breeding	VP1	28/09/2023	09:10	11	10	20	0	0	0
Breeding	VP11	29/09/2023	10:15	1	4	0	0	0	0
Breeding	VP11	30/09/2023	15:10	2	0	9	0	0	0
Non-breeding	VP1	03/10/2023	09:55	2	6	0	0	0	0

Vantage Point (Flight)									
Season	VP	Date	Time	Abundance	Seconds in Band 1 (0-25m)	Seconds in Band 2 (26-50m)	Seconds in Band 3 (51-150m)	Seconds in Band 4 (151-200m)	Seconds in Band 5 (201+m)
Non-breeding	VP4	08/10/2023	14:12	4	10	0	0	0	0
Non-breeding	VP1	07/11/2023	15:01	5	0	8	0	0	0
Non-breeding	VP4	12/11/2023	10:46	2	5	0	0	0	0
Non-breeding	VP4	12/11/2023	10:54	10	8	9	0	0	0
Non-breeding	VP4	12/11/2023	10:58	2	7	0	0	0	0
Non-breeding	VP4	08/12/2023	11:03	4	7	1	0	0	0
Non-breeding	VP1	11/12/2023	11:03	1	3	0	0	0	0
Non-breeding	VP1	11/12/2023	15:35	3	9	5	0	0	0
Non-breeding	VP4	06/01/2024	13:52	3	7	1	0	0	0
Non-breeding	VP1	16/01/2024	09:35	3	4	7	0	0	0
Non-breeding	VP1	16/01/2024	09:38	2	4	0	0	0	0
Non-breeding	VP4	16/02/2024	10:56	3	8	4	0	0	0
Non-breeding	VP2	18/02/2024	14:21	2	3	4	0	0	0
Non-breeding	VP1	25/02/2024	10:07	2	7	7	0	0	0
Non-breeding	VP5	26/02/2024	09:45	2	4	4	0	0	0
Non-breeding	VP5	26/02/2024	10:48	1	5	0	0	0	0
Non-breeding	VP5	26/02/2024	14:19	2	10	3	0	0	0
Non-breeding	VP9	07/03/2024	14:48	1	10	0	0	0	0
Non-breeding	VP4	15/03/2024	09:45	1	9	3	0	0	0
Non-breeding	VP4	15/03/2024	11:00	2	4	0	0	0	0
Non-breeding	VP2	24/03/2024	14:41	2	6	2	0	0	0
Non-breeding	VP5	25/03/2024	10:10	4	4	3	0	0	0
Non-breeding	VP5	27/03/2024	10:03	2	4	0	0	0	0
Non-breeding	VP5	27/03/2024	10:59	7	7	6	0	0	0
Breeding	VP11	09/04/2024	20:01	1	10	0	0	0	0
Breeding	VP11	09/04/2024	20:25	1	10	0	0	0	0
Breeding	VP9	10/04/2024	19:21	2	20	0	0	0	0
Breeding	VP2	11/04/2024	17:20	1	6	0	0	0	0

Vantage Point (Flight)									
Season	VP	Date	Time	Abundance	Seconds in Band 1 (0-25m)	Seconds in Band 2 (26-50m)	Seconds in Band 3 (51-150m)	Seconds in Band 4 (151-200m)	Seconds in Band 5 (201+m)
Breeding	VP11	11/04/2024	09:28	2	10	15	0	0	0
Breeding	VP9	11/04/2024	12:03	2	15	0	0	0	0
Breeding	VP1	14/04/2024	11:10	1	5	0	0	0	0
Breeding	VP1	14/04/2024	17:39	3	4	2	0	0	0
Breeding	VP1	14/04/2024	18:58	2	7	0	0	0	0
Breeding	VP5	29/04/2024	10:20	4	8	5	0	0	0
Breeding	VP5	29/04/2024	10:59	3	7	7	0	0	0
Breeding	VP5	29/04/2024	11:47	2	0	6	0	0	0
Breeding	VP5	30/04/2024	08:17	3	6	2	0	0	0
Breeding	VP1	09/05/2024	10:36	2	4	1	0	0	0
Breeding	VP1	09/05/2024	06:19	1	4	0	0	0	0
Breeding	VP1	09/05/2024	08:30	2	3	0	0	0	0
Breeding	VP7	09/05/2024	11:15	3	0	20	30	0	0
Breeding	VP11	09/05/2024	06:12	3	10	20	0	0	0
Breeding	VP9	15/05/2024	07:29	2	25	0	0	0	0
Breeding	VP4	22/05/2024	15:35	4	13	0	0	0	0
Breeding	VP5	28/05/2024	10:44	2	5	2	0	0	0
Breeding	VP9	19/06/2024	17:16	2	20	0	0	0	0
Breeding	VP5	29/07/2024	14:15	3	5	0	0	0	0
Breeding	VP5	29/07/2024	15:06	6	10	7	0	0	0
Breeding	VP1	05/08/2024	08:36	3	5	0	0	0	0
Breeding	VP4	24/09/2024	10:37	7	10	10	4	0	0

*Surveyor sample error – record not included in the collision risk model

Vantage Point (Non-flight)									
Map Ref.	Season	VP	Date	Time	Abundance	Dominant Habitat	Activity	Breeding Code	Breeding Status
P00905	Breeding	VP8	11/04/2022	07:32	2	GA1	Foraging	N/A	N/A
P00906	Breeding	VP8	11/04/2022	10:45	2	GA1	Foraging	N/A	N/A
P00914	Breeding	VP1	12/04/2022	15:12	2	FW2	In suitable breeding habitat	H	Possible
P00924	Breeding	VP1	18/05/2022	08:17	2	FW2	In suitable breeding habitat	H	Possible
P01829	Non-breeding	VP9	06/10/2022	07:25	42	PB4	Roosting.	N/A	N/A
P01834	Non-breeding	VP10	10/10/2022	09:35	4	PB4	Foraging.	N/A	N/A
P01846	Non-breeding	VP10	01/12/2022	07:45	3	PB4	Swimming.	N/A	N/A
P01852	Non-breeding	VP10	09/01/2023	10:45	6	PB4	Roosting.	N/A	N/A
P01857	Non-breeding	VP4	16/01/2023	09:30	17	PB4	On water	N/A	N/A
P01863	Non-breeding	VP10	02/02/2023	08:40	4	PB4	Swimming	N/A	N/A
P01871	Non-breeding	VP7	14/02/2023	11:25	3	PB4	Swimming	N/A	N/A
P01880	Non-breeding	VP7	08/03/2023	13:20	3	PB4	Foraging.	N/A	N/A
P04085	Breeding	VP9	07/04/2023	14:55	2	N/A	Foraging	N/A	N/A
P04094	Breeding	VP5	13/04/2023	18:47	4	N/A	feeding	N/A	N/A
P04101	Breeding	VP4	24/05/2023	06:35	3	N/A	Roosting	N/A	N/A
P04125	Breeding	VP1	22/06/2023	12:56	5	N/A	feeding	N/A	N/A
P04834	Breeding	VP10	18/09/2023	N/A	4	N/A	Resting on water	N/A	N/A
P05864	Non-breeding	VP10	02/11/2023	09:45	8	N/A	Roosting	N/A	N/A
P05879	Non-breeding	VP7	02/02/2024	08:05	16	N/A	Foraging	N/A	N/A
P05886	Non-breeding	VP6	04/03/2024	07:10	3	N/A	Swimming.	N/A	N/A
P06102	Breeding	VP9	10/04/2024	20:03	2	N/A	N/A	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P00009	Breeding	N/A	21/05/2021	4	N/A	N/A	N/A
P00011	Breeding	N/A	21/05/2021	1	N/A	N/A	N/A
P01072	Breeding	New site	19/04/2022	8	Swimming on open water.	N/A	N/A
P01081	Breeding	Ref: 5	20/04/2022	2	Swimming around and roosting on Inchenagh island.	N/A	N/A
P01092	Breeding	Ref: 4	20/04/2022	7	Roosting.	N/A	N/A
P01098	Breeding	Ref: 8	21/04/2022	1	Swimming on open water.	N/A	N/A
P01109	Breeding	Ref: 18	21/04/2022	1	Swimming on south side of bridge.	N/A	N/A
P01112	Breeding	New site	22/04/2022	4	4 males swimming on open water.	N/A	N/A
P01116	Breeding	New site	22/04/2022	4	Swimming on open water.	N/A	N/A
P01125	Breeding	New site	22/04/2022	2	Pair swimming on open water.	N/A	N/A
P01299	Breeding	Rhynmount Bog.	10/05/2022	2	Swimming on lake.	N/A	N/A
P01302	Breeding	Rhynmount Bog.	10/05/2022	3	Swimming on lake.	N/A	N/A
P01335	Breeding	Ref: 4	12/05/2022	6	Roosting on field.	N/A	N/A
P01211	Breeding	VP Number 8	17/05/2022	4	4 mallard on lake	H	Possible
P01471	Breeding	Rhynmount Bog.	14/06/2022	2	Swimming on lake around reeds.	N/A	N/A
P01480	Breeding	Ref: 12	14/06/2022	2	Swimming together on river.	N/A	N/A
P01582	Breeding	ref: 8	11/07/2022	2	Roosting around the shoreline.	N/A	N/A
P01691	Breeding	ref: 7	10/08/2022	4	Swimming on open water.	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P01696	Breeding	ref: 8	10/08/2022	6	Roosting around the shoreline.	N/A	N/A
P01713	Breeding	Rhynmount Bog.	11/08/2022	4	Swimming around wetland.	N/A	N/A
P01795	Breeding	Ref No: 8	13/09/2022	15	Roosting around the shoreline.	N/A	N/A
P01807	Breeding	Rhynmount Bog.	14/09/2022	5	Swimming around wetland.	N/A	N/A
P01808	Breeding	Rhynmount Bog.	14/09/2022	4	Swimming around wetland.	N/A	N/A
P01813	Breeding	Rhynmount Bog.	14/09/2022	35	Swimming around wetland.	N/A	N/A
P01819	Breeding	Ref No: 15	14/09/2022	6	Swimming around river.	N/A	N/A
P01889	Non-breeding	Rhynmount Bog	12/10/2022	16	Roosting on wetlands.	N/A	N/A
P01894	Non-breeding	Rhynmount Bog	12/10/2022	36	Foraging and roosting on wetlands.	N/A	N/A
P01906	Non-breeding	Ref No 8	13/10/2022	21	Roosting/ foraging around shore-line.	N/A	N/A
P01910	Non-breeding	Ref No 9	13/10/2022	27	Roosting around shore-line.	N/A	N/A
P01919	Non-breeding	Ref No 12	14/10/2022	5	Roosting on field.	N/A	N/A
P01924	Non-breeding	Derrycashel Bog	14/10/2022	3	Swimming on open water.	N/A	N/A
P01941	Non-breeding	iwebs 1234	31/10/2022	12	Mostly swimming with occassional short flights by some individuals	N/A	N/A
P02014	Non-breeding	Site 4	06/11/2022	15	On water with T	N/A	N/A
P02023	Non-breeding	Near site 4, LeTergullion	06/11/2022	8	Roosting (WN,SV, MA, L)	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P01956	Non-breeding	Ref No 5	08/11/2022	6	Flyover	N/A	N/A
P01983	Non-breeding	Derrycashel Bog	16/11/2022	4	Swimming on wetlands.	N/A	N/A
P01990	Non-breeding	Ref No 18	17/11/2022	5	Swimming on flodded field.	N/A	N/A
P02009	Non-breeding	Site 4	27/11/2022	3	In vegetation at western edge of turlough	N/A	N/A
P02011	Non-breeding	Corlea Bog Amenity Walk	27/11/2022	2	Swimming on open water	N/A	N/A
P02044	Non-breeding	Ref No 5	07/12/2022	6	Roosting on open water.	N/A	N/A
P02050	Non-breeding	Ref No 9	07/12/2022	8	Roosting around shore-line.	N/A	N/A
P02054	Non-breeding	Rhynmount Bog	08/12/2022	7	Swimming on wetland.	N/A	N/A
P02069	Non-breeding	Rhynmount Bog	08/12/2022	12	Foraging/ Swimming on wetlands.	N/A	N/A
P02078	Non-breeding	Derrycashel Bog	08/12/2022	6	Swimming on wetland.	N/A	N/A
P02106	Non-breeding	West of Liscacusha, Turlough, South side	27/12/2022	5	On water	N/A	N/A
P02108	Non-breeding	Site 4, Turlough at LeTergullion	27/12/2022	4	Swimming on northside of turlough	N/A	N/A
P02116	Non-breeding	Site 4, Turlough at LeTergullion	27/12/2022	5	Swimming at the SE end	N/A	N/A
P02121	Non-breeding	Newpark, turlough slightly to the	27/12/2022	6	Feeding in mixed group of MA TU and SV WN	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
		east of Turlough Site 4 (same complex)					
P02129	Non-breeding	Corlea Bog Amenity Walk Southside	27/12/2022	10	Flew in and landed on water	N/A	N/A
P02177	Non-breeding	Ref No 10	10/01/2023	2	Roosting	N/A	N/A
P02188	Non-breeding	Rhynmount Bog VP1	13/01/2023	12	Foraging on wetland.	N/A	N/A
P02191	Non-breeding	Rhynmount Bog VP2	13/01/2023	2	Foraging on wetland.	N/A	N/A
P02194	Non-breeding	Rhynmount Bog VP3	13/01/2023	25	Foraging on wetland.	N/A	N/A
P02134	Non-breeding	Corlea Bog Amenity Walk	15/01/2023	8	Swimming	N/A	N/A
P02135	Non-breeding	Corlea Bog Amenity Walk	15/01/2023	18	Hidden bedind reed, took off, circled and landed in same area	N/A	N/A
P02314	Non-breeding	Corlea Bog Amenity Walk	15/01/2023	8	Swimming	N/A	N/A
P02315	Non-breeding	Corlea Bog Amenity Walk	15/01/2023	18	Hidden bedind reed, took off, circled and landed in same area	N/A	N/A
P02205	Non-breeding	Derrycashel Bog	23/01/2023	1	Foraging on wetland.	N/A	N/A
P02144	Non-breeding	NE of Lisnacusha	29/01/2023	5	Flew in and landed near TU	N/A	N/A
P02150	Non-breeding	Site 4, Turlough	29/01/2023	5	Swimming near centre	N/A	N/A
P02163	Non-breeding	Greenhall Upper	29/01/2023	11	(as above)	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P02324	Non-breeding	NE of Lisnacusha	29/01/2023	5	Flew in and landed near TU	N/A	N/A
P02330	Non-breeding	Site 4, Turlough	29/01/2023	5	Swimming near centre	N/A	N/A
P02343	Non-breeding	Greenhall Upper	29/01/2023	11	(as above)	N/A	N/A
P02224	Non-breeding	Ref No 8	03/02/2023	8	Roosting on open water.	N/A	N/A
P02245	Non-breeding	Ref No 12	10/02/2023	4	Swimming on open water.	N/A	N/A
P02248	Non-breeding	Derrycashel Bog	10/02/2023	7	Swimming on wetland.	N/A	N/A
P02261	Non-breeding	Rhynmount Bog VP1	16/02/2023	5	Swimming on wetland.	N/A	N/A
P02273	Non-breeding	Rhynmount Bog VP3	16/02/2023	12	Foraging on wetland.	N/A	N/A
P02416	Non-breeding	Ref No 8	03/03/2023	5	Foraging on open water.	N/A	N/A
P02429	Non-breeding	Ref No 10	03/03/2023	2	Foraging on open water.	N/A	N/A
P02436	Non-breeding	Ref No 5	03/03/2023	2	Foraging on open water.	N/A	N/A
P02451	Non-breeding	Rhynmount Bog VP1	16/03/2023	2	Swimming on wetland.	N/A	N/A
P02456	Non-breeding	Rhynmount Bog VP2	16/03/2023	2	Swimming on wetland.	N/A	N/A
P02470	Non-breeding	Rhynmount Bog VP3	16/03/2023	6	Foraging	N/A	N/A
P02473	Non-breeding	Ref No 13	16/03/2023	2	Foraging	N/A	N/A
P02477	Non-breeding	Ref No 12	16/03/2023	2	Foraging	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P02480	Non-breeding	Derrycashel Bog	16/03/2023	5	Foraging	N/A	N/A
P02385	Non-breeding	Corlea Walkway	23/03/2023	7	3 on water, 4 flying over	N/A	N/A
P02388	Non-breeding	Derrylough	23/03/2023	2	M and F flew over and off site	N/A	N/A
P02391	Non-breeding	Site 23, Stewart Family Farm	23/03/2023	1	Flew in and landed in small pool near car park	N/A	N/A
P02392	Non-breeding	South of Lanesboro	24/03/2023	2	On water, ascended and landed again	N/A	N/A
P02397	Non-breeding	Carrigens turlough/fields	24/03/2023	4	On water	N/A	N/A
P02412	Non-breeding	East of Location 4	24/03/2023	3	Swimming	N/A	N/A
P02414	Non-breeding	Field / pool complex	24/03/2023	12	On water but flushed, circled around and landed again	N/A	N/A
P04160	Breeding	Ref No 8	14/04/2023	9	Foraging	N/A	N/A
P04171	Breeding	Gortgallan Bog	14/04/2023	3	Swimming	N/A	N/A
P04177	Breeding	Derrycashel Bog	14/04/2023	12	6 adults, 6 chicks.	FL	Confirmed
P04186	Breeding	Ref No 12	14/04/2023	2	Foraging	N/A	N/A
P04199	Breeding	Rhymount VP1	14/04/2023	1	Foraging	N/A	N/A
P04203	Breeding	Rhymount VP2	14/04/2023	3	Foraging	N/A	N/A
P04275	Breeding	Lough Ree	27/04/2023	2	2 mallard on lake	H	Possible
P04282	Breeding	Corlea lake	27/04/2023	4	4 mallard on lake	H	Possible
P04320	Breeding	Onsite	03/05/2023	3	Swimming	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P04330	Breeding	Rhynmount VP1	03/05/2023	3	Swimming	N/A	N/A
P04335	Breeding	Rhynmount VP2	03/05/2023	3	Swimming	N/A	N/A
P04340	Breeding	Rhynmount VP3	03/05/2023	3	Swimming	N/A	N/A
P04347	Breeding	Ref No: 12	03/05/2023	3	Swimming	N/A	N/A
P04353	Breeding	Derrycashel Bog	03/05/2023	7	2 adults, 5 ducklings	FL	Confirmed
P04415	Breeding	5 KM radius	26/05/2023	4	4 Mallard fedding on lake	H	Possible
P04422	Breeding	5 KM radius	26/05/2023	8	8 Mallard on lake	H	Possible
P04427	Breeding	5 KM radius	26/05/2023	18	18 Mallard on Turlough, Adults and 8 young	FL	Confirmed
P04470	Breeding	Onsite	02/06/2023	4	Foraging	N/A	N/A
P04483	Breeding	Rhynmount VP2	02/06/2023	6	Swimming	N/A	N/A
P04501	Breeding	Ref No: 8	02/06/2023	1	Roosting	H	Possible
P04517	Breeding	Lough Ree	09/06/2023	12	12 Mallard on lake	H	Possible
P04522	Breeding	5 KM radius	09/06/2023	16	16 Mallard on Turlough, Adults and 8 young	FL	Confirmed
P04529	Breeding	5 KM radius	09/06/2023	4	4 Mallard on lake	H	Possible
P04595	Breeding	Onsite	07/07/2023	5	Swimming Adults, juvs.	P	Probable
P04604	Breeding	Onsite	07/07/2023	3	Swimming	N/A	N/A
P04623	Breeding	Derrycashel Bog	07/07/2023	2	Swimming	N/A	N/A
P04650	Breeding	01832 63178	19/07/2023	4	4 Mallard on Turlough	N/A	N/A
P04654	Breeding	09200 61800	19/07/2023	6	6 Mallard on lake	N/A	N/A
P04716	Breeding	Onsite	03/08/2023	7	Flushed from cover.	N/A	N/A
P04726	Breeding	Rhynmount VP2	03/08/2023	1	Swimming	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P04733	Breeding	Ref No: 8	03/08/2023	21	Juvenile swimming.	N/A	N/A
P04753	Breeding	Lough Ree	10/08/2023	8	8 Mallard on Lough Ree	N/A	N/A
P04840	Breeding	01724 63197	07/09/2023	8	8 Mallard on Turlough	N/A	N/A
P04812	Breeding	Ref No: 8	28/09/2023	12	Foraging	N/A	N/A
P04819	Breeding	Gortgallan Bog	28/09/2023	27	Swimming	N/A	N/A
P04821	Breeding	Derrycashel Bog	28/09/2023	11	Swimming	N/A	N/A
P04830	Breeding	Onsite	29/09/2023	10	Flushed from cover.	N/A	N/A
P06430	Non-breeding	5	06/10/2023	6	6 Mallard on lake	N/A	N/A
P06437	Non-breeding	N/A	06/10/2023	2	2 Mallard on turlough	N/A	N/A
P06438	Non-breeding	4	06/10/2023	8	8 Mallard on turlough	N/A	N/A
P06372	Non-breeding	Ref No: 10	10/10/2023	6	Foraging	N/A	N/A
P06378	Non-breeding	Ref No: 8	10/10/2023	6	Foraging	N/A	N/A
P06387	Non-breeding	Derrycashel Bog	10/10/2023	6	Swimming	N/A	N/A
P06389	Non-breeding	Ref No: 12	11/10/2023	9	Foraging	N/A	N/A
P06392	Non-breeding	Ref No: 13	11/10/2023	11	Swimming	N/A	N/A
P06394	Non-breeding	Ref No: 17	11/10/2023	7	Swimming	N/A	N/A
P06396	Non-breeding	Rhynmount	11/10/2023	12	Swimming	N/A	N/A
P06401	Non-breeding	Onsite	11/10/2023	6	Flyover	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P06443	Non-breeding	N/A	14/10/2023	2	2 Mallard on turlough	N/A	N/A
P06452	Non-breeding	4	14/10/2023	10	10 Mallard on turlough	N/A	N/A
P06458	Non-breeding	N/A	18/10/2023	3	3 Mallard on lake	N/A	N/A
P06460	Non-breeding	N/A	18/10/2023	8	8 Mallard on flooded area of bog.	N/A	N/A
P06201	Non-breeding	Ref No: 12	13/11/2023	15	Swimming	N/A	N/A
P06207	Non-breeding	Ref No: 17	13/11/2023	88	Roosting	N/A	N/A
P06211	Non-breeding	Rhynmount	13/11/2023	4	Swimming	N/A	N/A
P06218	Non-breeding	Onsite	13/11/2023	4	Swimming	N/A	N/A
P06269	Non-breeding	Corlea lake	20/11/2023	4	4 Mallard on lake/flooded bog	N/A	N/A
P06276	Non-breeding	4	20/11/2023	6	6 Mallard on turlough	N/A	N/A
P06287	Non-breeding	5	20/11/2023	4	4 Mallard on Lough Ree	N/A	N/A
P06291	Non-breeding	5	23/11/2023	4	4 Mallard on lake/flooded bog	N/A	N/A
P06301	Non-breeding	4	23/11/2023	6	6 Mallard on turlough	N/A	N/A
P06308	Non-breeding	N/A	23/11/2023	4	4 Mallard on flooded bog/small lake	N/A	N/A
P06322	Non-breeding	4	27/11/2023	8	8 Mallard on turlough	N/A	N/A
P06330	Non-breeding	5	27/11/2023	8	8 Mallard on Lough Ree	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P06556	Non-breeding	4	06/12/2023	18	18 Mallard on lake	N/A	N/A
P06562	Non-breeding	4	06/12/2023	6	6 Mallard on turlough	N/A	N/A
P06566	Non-breeding	N/A	06/12/2023	4	4 Mallard on Corlea lake/flooded area of bog	N/A	N/A
P06495	Non-breeding	Rhynmount	08/12/2023	17	Swimming	N/A	N/A
P06504	Non-breeding	Ref No: 8	11/12/2023	7	Swimming	N/A	N/A
P06509	Non-breeding	Derrycashel Bog	11/12/2023	12	Swimming	N/A	N/A
P06513	Non-breeding	Ref No: 13	11/12/2023	8	Swimming	N/A	N/A
P06568	Non-breeding	Corlea	18/12/2023	16	16 Mallard on Corlea lake/flooded bog	N/A	N/A
P06571	Non-breeding	4	18/12/2023	12	12 Mallard on turlough	N/A	N/A
P06636	Non-breeding	Southern half of site	02/01/2024	55	N/A	N/A	N/A
P06641	Non-breeding	Southern half of site	02/01/2024	4	N/A	N/A	N/A
P06607	Non-breeding	Derrycashel Bog	05/01/2024	6	N/A	N/A	N/A
P06626	Non-breeding	Rhynmount	12/01/2024	10	N/A	N/A	N/A
P06635	Non-breeding	Onsite	12/01/2024	12	N/A	N/A	N/A
P06649	Non-breeding	Southern half of site	25/01/2024	8	N/A	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P06687	Non-breeding	Gortgallan Bog	06/02/2024	4	N/A	N/A	N/A
P06688	Non-breeding	Derrycashel Bog	06/02/2024	6	N/A	N/A	N/A
P06694	Non-breeding	Ref No: 12	06/02/2024	2	N/A	N/A	N/A
P06706	Non-breeding	Rhynmount	14/02/2024	12	N/A	N/A	N/A
P06714	Non-breeding	Onsite	14/02/2024	4	N/A	N/A	N/A
P06722	Non-breeding	Southern half of site	19/02/2024	8	8 Mallard on Wetland	N/A	N/A
P06732	Non-breeding	Southern half of site	19/02/2024	12	On lake	N/A	N/A
P06736	Non-breeding	Southern half of site	19/02/2024	12	On Turlough	N/A	N/A
P06741	Non-breeding	Southern half of site	19/02/2024	12	On Turlough	N/A	N/A
P06749	Non-breeding	Southern half of site	21/02/2024	12	On Turlough	N/A	N/A
P06752	Non-breeding	Southern half of site	21/02/2024	12	On Turlough	N/A	N/A
P06757	Non-breeding	Southern half of site	23/02/2024	12	12 Mallard on wetland area of bog	N/A	N/A
P06763	Non-breeding	Southern half of site	23/02/2024	6	On Lough Ree	N/A	N/A
P06779	Non-breeding	Ref No: 8	07/03/2024	3	Roosting	N/A	N/A
P06792	Non-breeding	Derrycashel Bog	07/03/2024	5	Swimming	N/A	N/A
P06816	Non-breeding	Onsite	08/03/2024	3	Swimming	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P04936	Breeding	Ref No:2	08/04/2024	4	Flushed from cover.	N/A	N/A
P04957	Breeding	Ref No:12	15/04/2024	1	Roosting.	N/A	N/A
P04962	Breeding	2 km North of site	16/04/2024	2	2 Mallard took flight from wetland	P	Probable
P04965	Breeding	2 km North of site	17/04/2024	3	3 Mallard took flight from wetland	H	Possible
P04968	Breeding	2 km North of site	17/04/2024	5	5 Mallards took flight from wetland	H	Possible
P04974	Breeding	2 km North of site	18/04/2024	3	3 Mallard took flight from wetland	H	Possible
P04978	Breeding	2 km North of site	18/04/2024	2	2 Mallard took flight from wetland area of bog.	H	Possible
P05098	Breeding	Ref No:2	10/05/2024	3	Flushed from cover.	N/A	N/A
P05159	Breeding	2Km Buffer	14/05/2024	1	Mallard took flight from wetland	N/A	N/A
P05161	Breeding	2Km Buffer	14/05/2024	2	2 Mallard took flight from wetland	N/A	N/A
P05177	Breeding	2KM Buffer	15/05/2024	2	2 Mallard took flight from wetland	N/A	N/A
P05183	Breeding	2KM Buffer	15/05/2024	4	4 Mallard in suitable habitat	H	Possible
P05186	Breeding	2KM Buffer	15/05/2024	2	2 Mallard in suitable habitat	H	Possible
P05192	Breeding	2KM Buffer	16/05/2024	2	Pair of mallard on stream/river	P	Probable
P05194	Breeding	2KM Buffer	16/05/2024	3	3 Mallard took flight from wetland	N/A	N/A
P05314	Breeding	Ref No:12	11/06/2024	6	Swimming.	N/A	N/A
P05330	Breeding	2km buffer	17/06/2024	2	2 Mallard took flight from wetland	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P05337	Breeding	2km buffer	17/06/2024	3	3 Mallard took flight from wetland	N/A	N/A
P05345	Breeding	2km buffer	18/06/2024	4	4 Mallard on lake	H	Possible
P05351	Breeding	2km buffer	18/06/2024	6	6 Mallard on lake	N/A	N/A
P05355	Breeding	2km buffer	18/06/2024	3	3 Mallard on flooded area of bog.	N/A	N/A
P05376	Breeding	2KM buffer	24/06/2024	4	2 Mallard took flight from wetland	N/A	N/A
P05458	Breeding	Ref No:1	03/07/2024	6	Swimming.	N/A	N/A
P05461	Breeding	Ref No:2	03/07/2024	2	Swimming.	N/A	N/A
P05481	Breeding	Ref No:11	05/07/2024	6	Flushed from cover.	N/A	N/A
P05484	Breeding	Ref No:12	05/07/2024	6	Swimming.	N/A	N/A
P05519	Breeding	2km buffer	24/07/2024	4	4 Mallard on lake	N/A	N/A
P05522	Breeding	2km buffer	24/07/2024	5	5 Mallard feeding on lake	N/A	N/A
P05525	Breeding	2km buffer	24/07/2024	4	4 Mallard on flooded area of bog.	N/A	N/A
P05532	Breeding	2km buffer	29/07/2024	2	2 Mallard took flight from wetland.	N/A	N/A
P05534	Breeding	2km buffer	29/07/2024	6	6 Mallard on wetland	N/A	N/A
P05538	Breeding	2km buffer	29/07/2024	2	2 Mallard took flight from wetland.	N/A	N/A
P05545	Breeding	2KM Buffer	30/07/2024	5	5 Mallard took flight from wetland.	N/A	N/A
P05548	Breeding	2KM Buffer	30/07/2024	3	3 Mallard took flight from wetland.	N/A	N/A
P05626	Breeding	Ref No:12	09/08/2024	6	Foraging	N/A	N/A
P05665	Breeding	2 Km buffer	20/08/2024	6	6 Mallard took flight from wetland	N/A	N/A
P05669	Breeding	2 Km buffer	20/08/2024	8	8 Mallard took flight from wetland	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P05672	Breeding	2 Km buffer	20/08/2024	15	15 Mallard took flight from wetland	N/A	N/A
P05690	Breeding	2 km buffer	21/08/2024	5	5 Mallard took flight from wetland	N/A	N/A
P05765	Breeding	Ref No:7	02/09/2024	4	Swimming.	N/A	N/A
P05792	Breeding	2km buffer	03/09/2024	2	2 Mallard on wetland area	N/A	N/A
P05794	Breeding	2km buffer	03/09/2024	8	8 Mallard on wetland area	N/A	N/A
P05809	Breeding	2km buffer	04/09/2024	3	3 Mallard on lake	N/A	N/A
P05811	Breeding	2km buffer	04/09/2024	5	5 Mallards on lake	N/A	N/A
P05772	Breeding	Ref No:10	06/09/2024	3	Flushed from cover.	N/A	N/A
P05777	Breeding	Ref No:11	06/09/2024	4	Swimming.	N/A	N/A
P05783	Breeding	Ref No:12	06/09/2024	1	Swimming.	N/A	N/A
P05845	Breeding	2km buffer	16/09/2024	4	4 Mallard took flight from wetland	N/A	N/A
P05851	Breeding	2km buffer	16/09/2024	6	6 Mallard took flight from wetland	N/A	N/A
P05853	Breeding	2km buffer	16/09/2024	4	4 Mallard took flight from wetland	N/A	N/A

CBS & Winter Transect Survey									
Map Ref.	Season	Survey Location	Date	Time	Abundance	Dominant Habitat	Activity	Breeding Code	Breeding Status
P00051	Breeding	T1	12/05/2021	N/A	1	N/A	N/A	N/A	N/A
P00064	Breeding	T4	12/05/2021	N/A	1	N/A	N/A	N/A	N/A
P00066	Breeding	T4	12/05/2021	N/A	1	N/A	N/A	N/A	N/A
P00068	Breeding	T4	12/05/2021	N/A	1	N/A	N/A	N/A	N/A
P00074	Breeding	T5	12/05/2021	N/A	1	N/A	N/A	N/A	N/A
P00077	Breeding	T6	12/05/2021	N/A	1	N/A	N/A	N/A	N/A
P00085	Breeding	T10	12/05/2021	N/A	1	N/A	N/A	N/A	N/A

CBS & Winter Transect Survey									
Map Ref.	Season	Survey Location	Date	Time	Abundance	Dominant Habitat	Activity	Breeding Code	Breeding Status
P00092	Breeding	T10	12/05/2021	N/A	1	N/A	N/A	N/A	N/A
P00094	Breeding	T10	12/05/2021	N/A	1	N/A	N/A	N/A	N/A
P00059	Breeding	T2	13/05/2021	N/A	1	N/A	N/A	N/A	N/A
P00111	Breeding	T13	13/05/2021	N/A	1	N/A	N/A	N/A	N/A
P00101	Breeding	T11	14/05/2021	N/A	1	N/A	N/A	N/A	N/A
P00104	Breeding	T11	14/05/2021	N/A	1	N/A	N/A	N/A	N/A
P00115	Breeding	T18	14/05/2021	N/A	1	N/A	N/A	N/A	N/A
P00132	Breeding	T1	11/06/2021	N/A	1	N/A	N/A	N/A	N/A
P00156	Breeding	T4	11/06/2021	N/A	1	N/A	N/A	N/A	N/A
P00183	Breeding	T10	11/06/2021	N/A	1	N/A	N/A	N/A	N/A
P00188	Breeding	T10	11/06/2021	N/A	1	N/A	N/A	N/A	N/A
P00191	Breeding	T10	11/06/2021	N/A	1	N/A	N/A	N/A	N/A
P00195	Breeding	T10	11/06/2021	N/A	1	N/A	N/A	N/A	N/A
P00199	Breeding	T10	11/06/2021	N/A	1	N/A	N/A	N/A	N/A
P00207	Breeding	T11	12/06/2021	N/A	1	N/A	N/A	N/A	N/A
P00208	Breeding	T11	12/06/2021	N/A	1	N/A	N/A	N/A	N/A
P00210	Breeding	T11	12/06/2021	N/A	1	N/A	N/A	N/A	N/A
P00218	Breeding	T13	12/06/2021	N/A	1	N/A	N/A	N/A	N/A
P00138	Breeding	T2	13/06/2021	N/A	1	N/A	N/A	N/A	N/A
P01007	Breeding	T14	08/04/2022	N/A	2	PB4	Flushed from cover	N/A	N/A
P01150	Breeding	T4	12/04/2022	09:49	4	pb4	H	H	Possible
P01154	Breeding	T4	12/04/2022	09:54	2	pb4	H	H	Possible
P01163	Breeding	T5	13/04/2022	10:08	2	pb4	p	P	Probable
P01165	Breeding	T5	13/04/2022	10:12	2	pb4	p	P	Probable
P01023	Breeding	T18	19/04/2022	N/A	1	PB4	Flushed from cover	N/A	N/A
P01025	Breeding	T18	19/04/2022	N/A	3	PB4	Flushed from cover	N/A	N/A
P01029	Breeding	T13	19/04/2022	N/A	2	PB4	Flushed from cover	N/A	N/A
P01031	Breeding	T16	19/04/2022	N/A	1	PB4	Flushed from cover	N/A	N/A
P01035	Breeding	T12	20/04/2022	N/A	2	PB4	Flushed from cover	N/A	N/A
P01043	Breeding	T17	21/04/2022	N/A	3	PB4	Flushed from cover	H	Possible
P01049	Breeding	T6	21/04/2022	N/A	2	PB4	Flying over.	F	Non-Breeding
P01056	Breeding	T10	22/04/2022	N/A	1	PB4	Flushed from cover	N/A	N/A
P01220	Breeding	T14	05/05/2022	N/A	1	PB4	N/A	N/A	N/A
P01239	Breeding	T17	11/05/2022	N/A	2	PB4	N/A	N/A	N/A

CBS & Winter Transect Survey									
Map Ref.	Season	Survey Location	Date	Time	Abundance	Dominant Habitat	Activity	Breeding Code	Breeding Status
P01251	Breeding	T11	12/05/2022	N/A	2	PB4	Flushed.	N/A	N/A
P01264	Breeding	T10	13/05/2022	N/A	9	PB4	Flushed.	N/A	N/A
P01174	Breeding	T5	17/05/2022	07:08	4	pb4	h	H	Possible
P01190	Breeding	T4	17/05/2022	08:29	1	pb4	H	H	Possible
P01195	Breeding	T2	17/05/2022	N/A	2	GS4	H	H	Possible
P01349	Breeding	T5	09/06/2022	11:12	1	pb4	N/A	F	Non-Breeding
P01351	Breeding	T5	09/06/2022	11:25	4	pb4	N/A	H	Possible
P01354	Breeding	T5	09/06/2022	11:40	2	pb4	N/A	H	Possible
P01358	Breeding	T4	09/06/2022	N/A	13	pb4	N/A	F	Non-Breeding
P01401	Breeding	T20	09/06/2022	N/A	5	PB4	Flushed.	N/A	N/A
P01409	Breeding	T11	10/06/2022	N/A	12	PB4	Flushed.	N/A	N/A
P01423	Breeding	T10	14/06/2022	N/A	8	PB4	Flushed.	N/A	N/A
P01518	Breeding	T11	07/07/2022	N/A	23	PB4	Flushed	N/A	N/A
P01547	Breeding	T20	12/07/2022	N/A	6	PB4	Flushed	N/A	N/A
P01652	Breeding	T13	08/08/2022	N/A	1	PB4	Flushed	N/A	N/A
P01653	Breeding	T16	08/08/2022	N/A	2	PB4	Swimming	N/A	N/A
P01658	Breeding	T11	09/08/2022	N/A	1	PB4	Flushed	N/A	N/A
P01661	Breeding	T11	09/08/2022	N/A	2	PB4	Flushed	N/A	N/A
P01663	Breeding	T20	09/08/2022	N/A	2	PB4	Flushed	N/A	N/A
P01668	Breeding	T10	10/08/2022	N/A	6	PB4	Flushed	N/A	N/A
P01683	Breeding	T17	17/08/2022	N/A	1	PB4	Flushed	N/A	N/A
P01637	Breeding	T4	24/08/2022	N/A	2	pb4	N/A	N/A	N/A
P01743	Breeding	T14	05/09/2022	N/A	2	PB4	Flushed	N/A	N/A
P01747	Breeding	T19	05/09/2022	N/A	2	PB4	Flushed	N/A	N/A
P01756	Breeding	T11	12/09/2022	N/A	3	PB4	Flushed	N/A	N/A
P01763	Breeding	T20	12/09/2022	N/A	36	PB4	Flushed	N/A	N/A
P01768	Breeding	T20	12/09/2022	N/A	7	PB4	Flushed	N/A	N/A
P01774	Breeding	T10	13/09/2022	N/A	7	PB4	Flushed	N/A	N/A
P01778	Breeding	T18	14/09/2022	N/A	21	PB4	Flushed	N/A	N/A
P01788	Breeding	T7	26/09/2022	N/A	135	PB4	Flushed	N/A	N/A
P01731	Breeding	Transect 4	27/09/2022	09:28	3	pb4	flying over	N/A	N/A
P01735	Breeding	Transect 5	27/09/2022	N/A	13	pb4	F	N/A	N/A

CBS & Winter Transect Survey									
Map Ref.	Season	Survey Location	Date	Time	Abundance	Dominant Habitat	Activity	Breeding Code	Breeding Status
P01740	Breeding	Transect 2	29/09/2022	12:12	2	pb4	h	N/A	N/A
P02580	Non-breeding	T21	05/10/2022	11:00	7	PB4	Flushed	N/A	N/A
P02597	Non-breeding	T20	05/10/2022	12:20	44	PB4	Flushed	N/A	N/A
P02649	Non-breeding	T16	06/10/2022	12:20	4	PB4	Flyover	N/A	N/A
P02663	Non-breeding	T18	06/10/2022	13:35	22	PB4	Foraging	N/A	N/A
P02798	Non-breeding	T14	03/11/2022	08:20	2	PB4	Flushed.	N/A	N/A
P03159	Non-breeding	T11	18/12/2022	N/A	6	PB4	Flying, Swimming	N/A	N/A
P03172	Non-breeding	T13	19/12/2022	08:45	1	PB4	Flyover	N/A	N/A
P03179	Non-breeding	T16	19/12/2022	09:25	3	PB4	Swimming	N/A	N/A
P03206	Non-breeding	T10	26/12/2022	N/A	11	N/A	Swimming, Flying	N/A	N/A
P03220	Non-breeding	T4	03/01/2023	N/A	2	FL1	Swimming	N/A	N/A
P03396	Non-breeding	T11	21/01/2023	N/A	11	PB4	Flying, Circling	N/A	N/A
P03469	Non-breeding	T4	04/02/2023	N/A	2	FL1	Swimming, Flying	N/A	N/A
P03509	Non-breeding	T19	09/02/2023	09:55	2	PB4	Flyover.	N/A	N/A
P03524	Non-breeding	T17	09/02/2023	10:20	2	PB4	Swimming	N/A	N/A
P03569	Non-breeding	T20	13/02/2023	15:05	10	PB4	Flushed	N/A	N/A
P03626	Non-breeding	T11	15/02/2023	08:30	4	PB4	Swimming	N/A	N/A

CBS & Winter Transect Survey									
Map Ref.	Season	Survey Location	Date	Time	Abundance	Dominant Habitat	Activity	Breeding Code	Breeding Status
P03788	Non-breeding	T14	03/03/2023	09:40	2	PB4	Flushed	N/A	N/A
P03710	Non-breeding	T4	05/03/2023	N/A	6	PB4	Swimming	N/A	N/A
P03715	Non-breeding	T5	12/03/2023	N/A	7	PB4	On water	N/A	N/A
P03850	Non-breeding	T17	14/03/2023	10:10	4	PB4	Swimming	N/A	N/A
P03884	Non-breeding	T11	16/03/2023	09:10	9	PB4	Foraging	N/A	N/A
P03903	Non-breeding	T12	16/03/2023	10:30	2	PB4	Foraging	N/A	N/A
P03919	Non-breeding	T20	20/03/2023	09:40	3	PB4	Flushed	N/A	N/A
P03927	Non-breeding	T20	20/03/2023	10:30	4	PB4	Foraging	N/A	N/A
P04220	Breeding	T5	05/04/2023	13:40	2	PB4	N/A	F	Non-Breeding
P04221	Breeding	T5	05/04/2023	13:52	1	PB4	N/A	H	Possible
P04224	Breeding	T5	05/04/2023	14:10	2	PB4	N/A	H	Possible
P04230	Breeding	T10	06/04/2023	10:50	3	PB4	N/A	H	Possible
P04254	Breeding	T11	13/04/2023	17:25	5	PB4	N/A	F	Non-Breeding
P04259	Breeding	T7	25/04/2023	10:27	4	PB4	N/A	H	Possible
P04391	Breeding	T10	23/05/2023	14:06	4	PB4	N/A	H	Possible
P04301	Breeding	T4	24/05/2023	08:20	3	PB4	N/A	H	Possible
P04305	Breeding	T4	24/05/2023	08:25	9	PB4	N/A	N/A	N/A
P04313	Breeding	T5	24/05/2023	09:45	3	PB4	N/A	N/A	N/A
P04396	Breeding	T11	25/05/2023	08:50	4	PB4	N/A	H	Possible
P04404	Breeding	T12	25/05/2023	15:00	1	PB4	N/A	H	Possible
P04408	Breeding	T12	25/05/2023	15:13	4	PB4	N/A	H	Possible
P04431	Breeding	T19	26/05/2023	12:50	2	fl1	N/A	H	Possible
P04433	Breeding	T16	26/05/2023	17:13	2	PB4	N/A	F	Non-Breeding
P04445	Breeding	T7	30/05/2023	N/A	4	FL1	N/A	H	Possible
P04453	Breeding	T4	21/06/2023	15:20	1	PB4	N/A	N/A	N/A
P04460	Breeding	T4	21/06/2023	16:10	4	PB4	N/A	N/A	N/A

CBS & Winter Transect Survey									
Map Ref.	Season	Survey Location	Date	Time	Abundance	Dominant Habitat	Activity	Breeding Code	Breeding Status
P04462	Breeding	T5	21/06/2023	17:20	4	PB4	N/A	N/A	N/A
P04466	Breeding	T5	21/06/2023	17:40	5	PB4	N/A	FL	Confirmed
P04552	Breeding	T10	26/06/2023	16:33	4	PB4	N/A	F	Non-Breeding
P04559	Breeding	T11	28/06/2023	09:35	4	PB4	N/A	H	Possible
P04565	Breeding	T12	28/06/2023	10:46	4	FL8	N/A	H	Possible
P04589	Breeding	T5	05/07/2023	14:05	8	PB4	N/A	N/A	N/A
P04661	Breeding	T10	21/07/2023	14:23	15	FL8	N/A	N/A	N/A
P04683	Breeding	T18	31/07/2023	09:21	4	PB4	N/A	N/A	N/A
P04688	Breeding	T17	31/07/2023	11:30	2	PB4	N/A	N/A	N/A
P04758	Breeding	T10	11/08/2023	12:28	8	PB4	N/A	N/A	N/A
P04768	Breeding	T18	16/08/2023	12:31	2	PB4	N/A	N/A	N/A
P04776	Breeding	T17	18/08/2023	13:25	2	PB4	N/A	N/A	N/A
P04781	Breeding	T19	23/08/2023	16:50	2	FL1	N/A	N/A	N/A
P04786	Breeding	T7	31/08/2023	09:42	2	FL1	N/A	N/A	N/A
P04849	Breeding	T7	07/09/2023	13:40	2	fl1	N/A	N/A	N/A
P04855	Breeding	T10	19/09/2023	10:53	8	PB4	N/A	N/A	N/A
P04857	Breeding	T11	20/09/2023	09:26	2	PB4	N/A	N/A	N/A
P04864	Breeding	T17	20/09/2023	17:30	13	pb4	N/A	N/A	N/A
P04793	Breeding	T4	25/09/2023	11:00	6	PB4	N/A	N/A	N/A
P04797	Breeding	T5	25/09/2023	12:00	31	PB4	N/A	N/A	N/A
P04808	Breeding	T6	29/09/2023	11:45	5	PB4	N/A	N/A	N/A
P06353	Non-breeding	T20	03/10/2023	11:10	2	PB4	Flushed from cover.	N/A	N/A
P06404	Non-breeding	T10	06/10/2023	15:40	5	PB4	Swimming	N/A	N/A
P06368	Non-breeding	T1	11/10/2023	13:30	6	PB4	Swimming.	N/A	N/A
P06370	Non-breeding	T1	11/10/2023	13:55	3	PB4	Swimming.	N/A	N/A
P06409	Non-breeding	T17	12/10/2023	12:00	6	PB4	Swimming	N/A	N/A
P06412	Non-breeding	T18	13/10/2023	09:22	4	PB4	Swimming	N/A	N/A

CBS & Winter Transect Survey									
Map Ref.	Season	Survey Location	Date	Time	Abundance	Dominant Habitat	Activity	Breeding Code	Breeding Status
P06416	Non-breeding	T11	13/10/2023	14:20	2	PB4	Swimming	N/A	N/A
P06421	Non-breeding	T4	18/10/2023	15:12	2	PB4	Roosting	N/A	N/A
P06423	Non-breeding	T4	18/10/2023	15:25	2	FL1	Swimming	N/A	N/A
P06160	Non-breeding	T19	03/11/2023	10:10	3	PB4	Swimming.	N/A	N/A
P06181	Non-breeding	T1	13/11/2023	16:40	4	PB4	Swimming.	N/A	N/A
P06240	Non-breeding	T11	21/11/2023	10:32	2	PB4	Swimming	N/A	N/A
P06244	Non-breeding	T17	21/11/2023	13:58	2	PB4	Swimming	N/A	N/A
P06246	Non-breeding	T15	22/11/2023	12:56	5	PB4	Swimming	N/A	N/A
P06247	Non-breeding	T18	23/11/2023	14:25	2	PB4	Swimming	N/A	N/A
P06265	Non-breeding	T13	28/11/2023	08:17	4	PB4	Swimming	N/A	N/A
P06480	Non-breeding	T7	07/12/2023	12:05	6	PB4	Flushed from cover	N/A	N/A
P06485	Non-breeding	T1	08/12/2023	09:35	6	PB4	Swimming	N/A	N/A
P06523	Non-breeding	T13	19/12/2023	09:40	5	PB4	Swimming	N/A	N/A
P06528	Non-breeding	T4	19/12/2023	14:48	4	PB4	Swimming	N/A	N/A
P06534	Non-breeding	T4	19/12/2023	15:22	4	PB4	Swimming	N/A	N/A
P06542	Non-breeding	T18	20/12/2023	13:23	2	PB4	Swimming	N/A	N/A
P06544	Non-breeding	T5	22/12/2023	09:22	4	PB4	Swimming	N/A	N/A

CBS & Winter Transect Survey									
Map Ref.	Season	Survey Location	Date	Time	Abundance	Dominant Habitat	Activity	Breeding Code	Breeding Status
P05920	Non-breeding	T5	03/01/2024	10:20	6	PB4	N/A	N/A	N/A
P05927	Non-breeding	T4	03/01/2024	10:45	4	PB4	N/A	N/A	N/A
P05930	Non-breeding	T4	03/01/2024	11:00	4	PB4	N/A	N/A	N/A
P05946	Non-breeding	T17	25/01/2024	14:35	2	PB4	N/A	N/A	N/A
P05986	Non-breeding	T4	20/02/2024	08:31	2	PB4	N/A	N/A	N/A
P05991	Non-breeding	T5	20/02/2024	09:45	2	PB4	N/A	N/A	N/A
P05992	Non-breeding	T17	20/02/2024	11:15	5	PB4	N/A	N/A	N/A
P06001	Non-breeding	T11	28/02/2024	10:52	4	PB4	N/A	N/A	N/A
P06007	Non-breeding	T10	29/02/2024	09:18	4	PB4	N/A	N/A	N/A
P06029	Non-breeding	19	04/03/2024	14:10	2	PB4	N/A	N/A	N/A
P06034	Non-breeding	21	05/03/2024	10:30	2	PB4	N/A	N/A	N/A
P06035	Non-breeding	20	05/03/2024	11:35	2	PB4	N/A	N/A	N/A
P06037	Non-breeding	20	05/03/2024	12:20	4	PB4	N/A	N/A	N/A
P06063	Non-breeding	T11	05/03/2024	13:00	6	PB4	N/A	N/A	N/A
P06066	Non-breeding	T11	05/03/2024	13:18	2	PB4	N/A	N/A	N/A
P06070	Non-breeding	T4	05/03/2024	15:43	18	PB4	N/A	N/A	N/A
P06081	Non-breeding	T10	06/03/2024	10:12	2	PB4	N/A	N/A	N/A

CBS & Winter Transect Survey									
Map Ref.	Season	Survey Location	Date	Time	Abundance	Dominant Habitat	Activity	Breeding Code	Breeding Status
P06084	Non-breeding	T13	06/03/2024	12:08	2	PB4	N/A	N/A	N/A
P06086	Non-breeding	T17	06/03/2024	15:35	7	PB4	N/A	N/A	N/A
P06049	Non-breeding	1	08/03/2024	13:05	6	PB4	N/A	N/A	N/A
P06092	Non-breeding	T5	13/03/2024	10:46	4	PB4	N/A	N/A	N/A
P04888	Breeding	T21	02/04/2024	15:30	3	PB4	Flushed	N/A	N/A
P04893	Breeding	T20	02/04/2024	16:35	6	PB4	N/A	N/A	N/A
P04901	Breeding	T20	02/04/2024	17:20	3	PB4	N/A	N/A	N/A
P04906	Breeding	T6	03/04/2024	16:40	6	PB4	N/A	N/A	N/A
P04982	Breeding	T7	08/04/2024	12:03	6	pb4	N/A	H	Possible
P04990	Breeding	T11	08/04/2024	14:11	5	FL8	N/A	H	Possible
P04992	Breeding	T11	08/04/2024	14:23	1	pb4	N/A	H	Possible
P05006	Breeding	T16	09/04/2024	11:14	1	pb4	N/A	H	Possible
P05014	Breeding	T17	09/04/2024	14:28	2	pb4	N/A	P	Probable
P05018	Breeding	T15	09/04/2024	16:09	1	fw4	N/A	H	Possible
P05022	Breeding	T18	10/04/2024	10:55	2	pb4	N/A	P	Probable
P05026	Breeding	T18	10/04/2024	12:15	2	pb4	N/A	P	Probable
P05028	Breeding	T10	10/04/2024	15:38	2	pb4	N/A	P	Probable
P05035	Breeding	T10	10/04/2024	15:58	2	pb4	N/A	P	Probable
P04921	Breeding	T4	15/04/2024	08:35	1	PB4	N/A	N/A	N/A
P04924	Breeding	T1	15/04/2024	09:55	2	PB4	N/A	N/A	N/A
P04930	Breeding	T5	15/04/2024	11:50	4	PB4	N/A	N/A	N/A
P05062	Breeding	T6	09/05/2024	09:45	3	PB4	N/A	N/A	N/A
P05062	Breeding	T6	09/05/2024	09:45	3	PB4	N/A	N/A	N/A
P05072	Breeding	T4	10/05/2024	07:55	6	PB4	N/A	N/A	N/A
P05141	Breeding	T17	10/05/2024	14:32	3	pb4	N/A	N/A	N/A
P05143	Breeding	T11	11/05/2024	15:58	2	pb4	N/A	N/A	N/A
P05146	Breeding	T11	11/05/2024	16:09	2	pb4	N/A	H	Possible
P05149	Breeding	T11	11/05/2024	16:12	2	pb4	N/A	N/A	N/A
P05168	Breeding	T7	14/05/2024	15:14	2	pb4	N/A	N/A	N/A
P05197	Breeding	T10	16/05/2024	10:05	5	PB4	N/A	N/A	N/A

CBS & Winter Transect Survey									
Map Ref.	Season	Survey Location	Date	Time	Abundance	Dominant Habitat	Activity	Breeding Code	Breeding Status
P05199	Breeding	T10	16/05/2024	10:11	4	PB4	N/A	N/A	N/A
P05214	Breeding	T13	16/05/2024	11:28	2	PB4	N/A	N/A	N/A
P05240	Breeding	T20	05/06/2024	11:40	2	PB4	N/A	N/A	N/A
P05278	Breeding	T5	11/06/2024	11:10	1	PB4	N/A	N/A	N/A
P05357	Breeding	T18	19/06/2024	10:15	2	PB4	N/A	N/A	N/A
P05368	Breeding	T15	20/06/2024	14:43	2	pb4	N/A	N/A	N/A
P05387	Breeding	T10	25/06/2024	11:35	6	PB4	N/A	N/A	N/A
P05401	Breeding	T11	25/06/2024	14:12	3	PB4	N/A	N/A	N/A
P05422	Breeding	T20	01/07/2024	12:10	1	PB4	N/A	N/A	N/A
P05442	Breeding	T4	05/07/2024	08:35	4	PB4	N/A	N/A	N/A
P05490	Breeding	T10	22/07/2024	15:39	13	PB4	N/A	N/A	N/A
P05497	Breeding	T11	22/07/2024	17:27	5	PB4	N/A	N/A	N/A
P05510	Breeding	T17	23/07/2024	12:46	2	PB4	N/A	N/A	N/A
P05566	Breeding	T20	01/08/2024	11:20	4	PB4	N/A	N/A	N/A
P05630	Breeding	T15	06/08/2024	15:21	5	PB4	N/A	N/A	N/A
P05632	Breeding	T15	06/08/2024	15:54	1	PB4	N/A	N/A	N/A
P05639	Breeding	T10	07/08/2024	13:45	4	PB4	N/A	N/A	N/A
P05642	Breeding	T10	07/08/2024	13:59	2	PB4	N/A	N/A	N/A
P05645	Breeding	T11	07/08/2024	15:46	4	PB4	N/A	N/A	N/A
P05579	Breeding	T4	09/08/2024	07:40	3	PB4	N/A	N/A	N/A
P05582	Breeding	T4	09/08/2024	08:15	2	PB4	N/A	N/A	N/A
P05587	Breeding	T5	09/08/2024	10:00	3	PB4	N/A	N/A	N/A
P05682	Breeding	T7	20/08/2024	13:31	2	PB4	N/A	N/A	N/A
P05694	Breeding	T18	21/08/2024	16:02	1	pb4	N/A	N/A	N/A
P05800	Breeding	T11	03/09/2024	14:55	14	PB4	N/A	N/A	N/A
P05723	Breeding	T20	04/09/2024	11:15	11	PB4	N/A	N/A	N/A
P05734	Breeding	T4	06/09/2024	07:45	4	PB4	N/A	N/A	N/A
P05737	Breeding	T4	06/09/2024	08:10	2	PB4	N/A	N/A	N/A
P05740	Breeding	T5	06/09/2024	09:35	7	PB4	N/A	N/A	N/A
P05835	Breeding	T7	12/09/2024	16:08	2	pb4	N/A	N/A	N/A
P05836	Breeding	T7	12/09/2024	16:19	4	pb4	N/A	N/A	N/A
P05842	Breeding	T16	13/09/2024	12:57	2	PB4	N/A	N/A	N/A
P05856	Breeding	T15	16/09/2024	16:08	2	PB4	N/A	N/A	N/A

Hinterland (Raptors) Survey & Hen Harrier Roost Watch						
Map Ref.	Season	Location	Date	Abundance	Breeding Code	Breeding Status
P00261	Breeding	HHVP5	12/05/2021	18	N/A	N/A
P00264	Breeding	HHVP6	12/05/2021	3	N/A	N/A
P00272	Breeding	HHVP7	12/05/2021	12	N/A	N/A
P00288	Breeding	HHVP10	12/05/2021	1	N/A	N/A
P00301	Breeding	HHVP12	13/05/2021	2	N/A	N/A
P00303	Breeding	HHVP13	13/05/2021	1	N/A	N/A
P00278	Breeding	HHVP8	14/05/2021	22	N/A	N/A
P00323	Breeding	HHVP4	12/06/2021	8	N/A	N/A
P00339	Breeding	HHVP6	12/06/2021	1	N/A	N/A
P00347	Breeding	HHVP8	12/06/2021	44	N/A	N/A
P00358	Breeding	HHVP10	12/06/2021	2	N/A	N/A
P00387	Breeding	HHVP4	17/07/2021	3	N/A	N/A
P00396	Breeding	HHVP5	17/07/2021	7	N/A	N/A
P00403	Breeding	HHVP7	17/07/2021	8	N/A	N/A
P00410	Breeding	HHVP8	17/07/2021	9	N/A	N/A
P00433	Breeding	HHVP11	17/07/2021	1	N/A	N/A
P00441	Breeding	HHVP2	05/08/2021	1	N/A	N/A
P00444	Breeding	HHVP4	05/08/2021	4	N/A	N/A
P00451	Breeding	HHVP5	05/08/2021	14	N/A	N/A
P00461	Breeding	HHVP8	05/08/2021	24	N/A	N/A
P00471	Breeding	HHVP9	05/08/2021	10	N/A	N/A
P00476	Breeding	HHVP10	05/08/2021	1	N/A	N/A
P00485	Breeding	HHVP15	05/08/2021	1	N/A	N/A
P00492	Breeding	HHVP20	05/08/2021	2	N/A	N/A
P00494	Breeding	HHVP1	14/08/2021	1	N/A	N/A
P00507	Breeding	HHVP5	14/08/2021	15	N/A	N/A
P00513	Breeding	HHVP6	14/08/2021	2	N/A	N/A
P00524	Breeding	HHVP8	14/08/2021	8	N/A	N/A
P00535	Breeding	HHVP9	14/08/2021	11	N/A	N/A
P00541	Breeding	HHVP10	14/08/2021	1	N/A	N/A
P00542	Breeding	HHVP11	14/08/2021	1	N/A	N/A
P00547	Breeding	HHVP12	14/08/2021	1	N/A	N/A
P00556	Breeding	HHVP1	09/09/2021	4	N/A	N/A
P00569	Breeding	HHVP5	09/09/2021	13	N/A	N/A
P00582	Breeding	HHVP8	09/09/2021	22	N/A	N/A

Hinterland (Raptors) Survey & Hen Harrier Roost Watch						
Map Ref.	Season	Location	Date	Abundance	Breeding Code	Breeding Status
P00595	Breeding	HHVP9	09/09/2021	12	N/A	N/A
P00602	Breeding	HHVP10	09/09/2021	2	N/A	N/A
P00604	Breeding	HHVP11	09/09/2021	1	N/A	N/A
P00612	Breeding	HHVP15	09/09/2021	1	N/A	N/A
P00619	Breeding	HHVP1	30/09/2021	1	N/A	N/A
P00624	Breeding	HHVP4	30/09/2021	3	N/A	N/A
P00631	Breeding	HHVP5	30/09/2021	24	N/A	N/A
P00646	Breeding	HHVP8	30/09/2021	24	N/A	N/A
P00656	Breeding	HHVP9	30/09/2021	10	N/A	N/A
P00659	Breeding	HHVP9	30/09/2021	30	N/A	N/A
P00666	Breeding	HHVP11	30/09/2021	1	N/A	N/A
P00669	Breeding	HHVP14	30/09/2021	1	N/A	N/A
P00675	Non-breeding	HHVP1	26/10/2021	1	N/A	N/A
P00677	Non-breeding	HHVP2	26/10/2021	1	N/A	N/A
P00681	Non-breeding	HHVP4	26/10/2021	2	N/A	N/A
P00685	Non-breeding	HHVP5	26/10/2021	10	N/A	N/A
P00690	Non-breeding	HHVP7	26/10/2021	2	N/A	N/A
P00704	Non-breeding	HHVP9	26/10/2021	10	N/A	N/A
P00708	Non-breeding	HHVP10	28/10/2021	1	N/A	N/A
P00713	Non-breeding	HHVP11	28/10/2021	1	N/A	N/A
P00715	Non-breeding	HHVP14	28/10/2021	3	N/A	N/A
P00725	Non-breeding	HHVP4	24/11/2021	7	N/A	N/A
P00740	Non-breeding	HHVP6	24/11/2021	4	N/A	N/A
P00746	Non-breeding	HHVP8	24/11/2021	2	N/A	N/A
P00769	Non-breeding	HHVP4	25/01/2022	11	N/A	N/A
P00771	Non-breeding	HHVP5	25/01/2022	11	N/A	N/A
P00774	Non-breeding	HHVP6	25/01/2022	3	N/A	N/A
P00783	Non-breeding	HHVP9	25/01/2022	6	N/A	N/A
P00793	Non-breeding	HHVP4	28/02/2022	4	N/A	N/A
P00799	Non-breeding	HHVP5	28/02/2022	12	N/A	N/A
P00812	Non-breeding	HHVP8	28/02/2022	12	N/A	N/A
P00822	Non-breeding	HHVP4	29/03/2022	4	N/A	N/A
P00828	Non-breeding	HHVP5	29/03/2022	16	N/A	N/A
P00839	Non-breeding	HHVP8	29/03/2022	6	N/A	N/A
P00853	Non-breeding	HHVP16	29/03/2022	1	N/A	N/A

Hinterland (Raptors) Survey & Hen Harrier Roost Watch						
Map Ref.	Season	Location	Date	Abundance	Breeding Code	Breeding Status
P06334	Non-breeding	3	17/10/2023	2	N/A	N/A
P06222	Non-breeding	3	19/11/2023	11	N/A	N/A
P05955	Non-breeding	HHVP4	18/02/2024	7	N/A	N/A
P05963	Non-breeding	HHVP6	29/02/2024	3	N/A	N/A
P06013	Non-breeding	3	07/03/2024	2	N/A	N/A
P06016	Non-breeding	4	14/03/2024	2	N/A	N/A
P06018	Non-breeding	4	14/03/2024	2	N/A	N/A
P06021	Non-breeding	5	23/03/2024	2	N/A	N/A
P06024	Non-breeding	5	23/03/2024	2	N/A	N/A
P06028	Non-breeding	6	28/03/2024	3	N/A	N/A

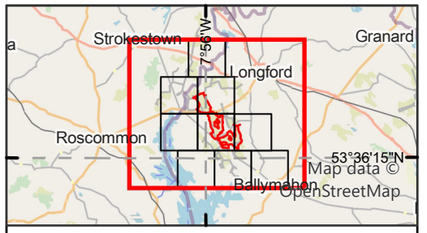
Incidental Sightings					
Map Ref.	Season	Date	Abundance	Breeding Code	Breeding Status
P03952	Non-breeding	12/10/2022	5	N/A	N/A
P03966	Non-breeding	14/10/2022	5	N/A	N/A
P04008	Non-breeding	19/12/2022	7	N/A	N/A
P04019	Non-breeding	16/01/2023	5	N/A	N/A
P04033	Non-breeding	07/02/2023	5	N/A	N/A
P04036	Non-breeding	10/02/2023	3	N/A	N/A
P04052	Non-breeding	11/02/2023	3	N/A	N/A
P04055	Non-breeding	16/02/2023	3	N/A	N/A
P04064	Non-breeding	03/03/2023	4	N/A	N/A
P06151	Breeding	11/08/2024	1	N/A	N/A
P06153	Breeding	25/08/2024	1	N/A	N/A

8°2'40"W
7°53'50"W
7°45'0"W
53°45'0"N
53°40'0"N
53°35'0"N
776000
768000
760000
593600
604000
614400

Sheet 1
Sheet 2
Sheet 3
Sheet 4
Sheet 5
Sheet 6
Sheet 7
Sheet 8
Sheet 9

Strokestown Golf Club
Townparks (Longford By)
Enybegs
Ballytoohey
Termonbarry
Cloondara
Cloonrollagh
Cloonbalt
Longford
Feraghfad
Stonepark (Ardagh By)
Cloontuskert
Ballyleague
Knock
Keenagh
Fearagh
Knockcroghery
Galey
Lough Ree
Derrymacar Lough
Drinan
Ballymahon

R371
N5
R194
N63
R392
R387
R368
N55



Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-21
- Breeding-22
- Breeding-23
- Breeding-24
- **Confirmed** Breeding Status*

Flightline observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-21
- Breeding-22
- Breeding-23
- Breeding-24

*should be read with data in Appendix 8.3

0 1.5 3
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Rev	Date	Description	By	Chkd.
A	06/05/2025	First issue	S.P	I.H

Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Flight and non-flight observations
Mallard
Overview

Scale @ A3: 1:85,000

Prepared by:	Checked by:	Date:
S.Pezzetta	I.Heanue	May 2025

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Draft: A

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7°53'50"W

53°45'0"N

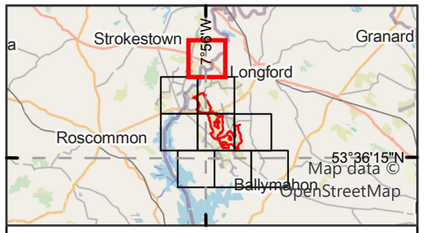
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P04962
P01889, P02054, P02188, P02261, P02451, P04199, P04330
P01299
P01471
P01112
P01807

Ballytoohey
Termonbarry
Cloondara

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Legend

- Proposed wind farm site boundary
- **Confirmed** Breeding Status*

Non-flight observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-21
- Breeding-22
- Breeding-23
- Breeding-24

Flightline observations - Seasons

- Non-breeding-21/22

*should be read with data in Appendix 8.3

0 0.5 1
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Rev	Date	Description	By	Chkd.
A	06/05/2025	First issue	S.P	I.H

Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Flight and non-flight observations Mallard Sheet 1 of 9

Scale @ A3: 1:24,000

Prepared by:	Checked by:	Date:
S.Pezzetta	I.Heanue	May 2025

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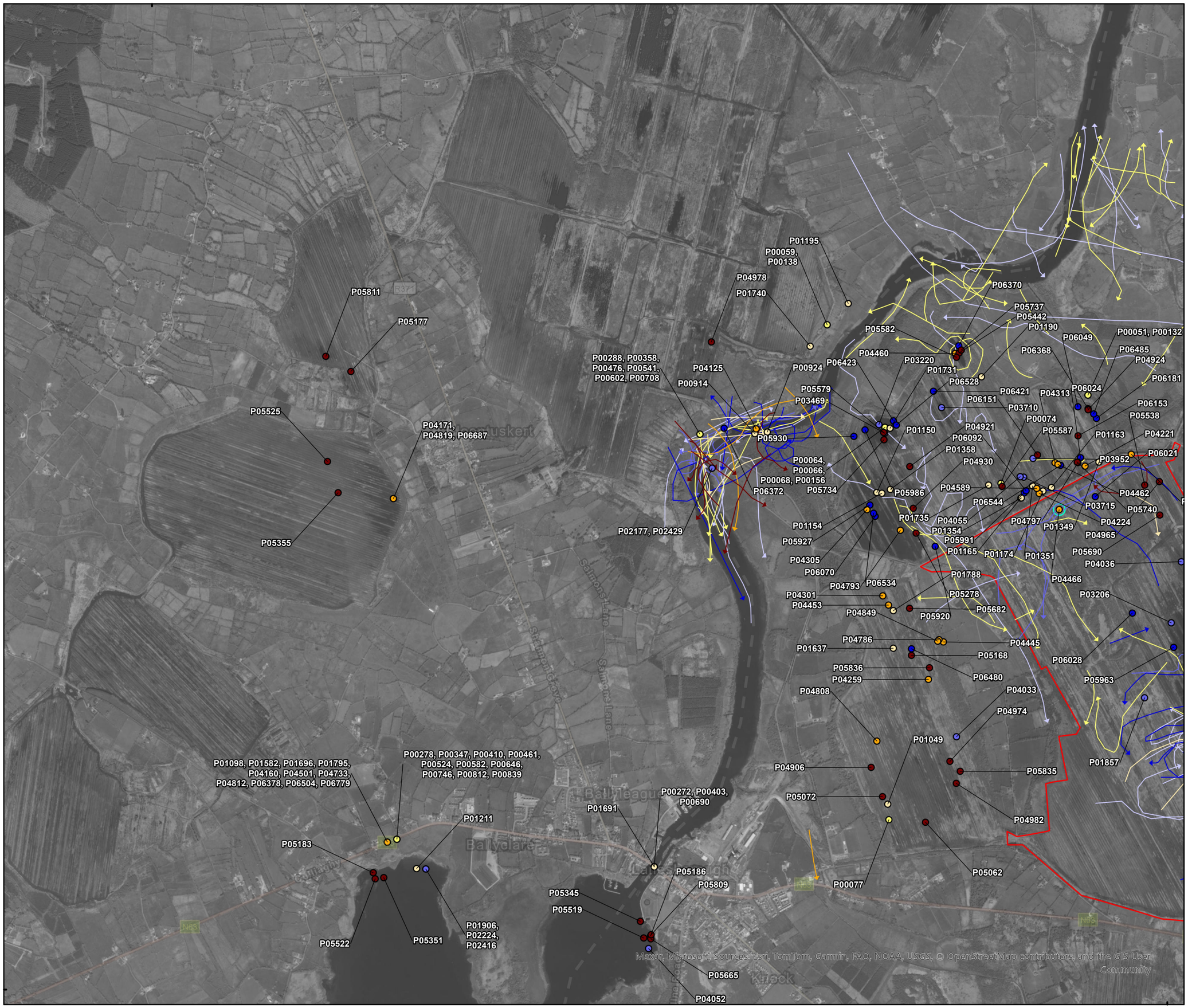
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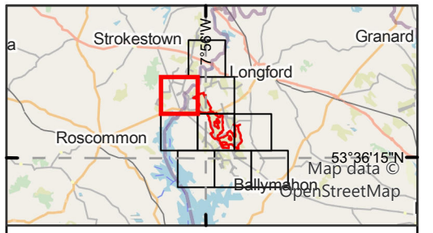
Draft: A

8°2'40"W

53°40'0"N

604000





Legend

- Proposed wind farm site boundary
- **Confirmed** Breeding Status*

Non-flight observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-21
- Breeding-22
- Breeding-23
- Breeding-24

Flightline observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-21
- Breeding-22
- Breeding-23
- Breeding-24

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0 0.5 1
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Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Flight and non-flight observations
Mallard
Sheet 2 of 9

Scale @ A3: 1:24,000

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S.Pezzetta	I.Heanue	May 2025

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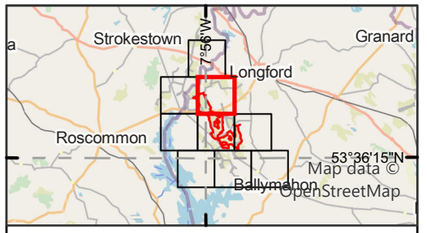
Draft: A

7°53'50"W

53°40'0"N

604000





Legend

- Proposed wind farm site boundary
- **Confirmed** Breeding Status*

Non-flight observations - Seasons

- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-21
- Breeding-22
- Breeding-23
- Breeding-24

Flightline observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-21
- Breeding-22
- Breeding-23
- Breeding-24

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0 0.5 1
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Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Flight and non-flight observations
Mallard
Sheet 3 of 9

Scale @ A3: 1:24,000

Prepared by:	Checked by:	Date:
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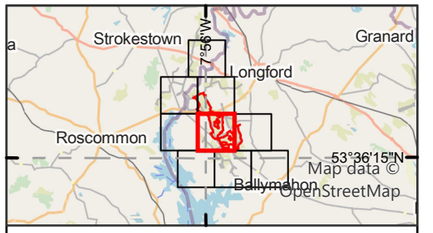
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7°53'50"W

53°40'0"N

768000

604000



Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-21
- Breeding-22
- Breeding-23
- Breeding-24

Flightline observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-21
- Breeding-22
- Breeding-23
- Breeding-24

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0 0.5 1
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Project: Derryadd Wind Farm

Title: Flight and non-flight observations
Mallard
Sheet 4 of 9

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8°2'40"W

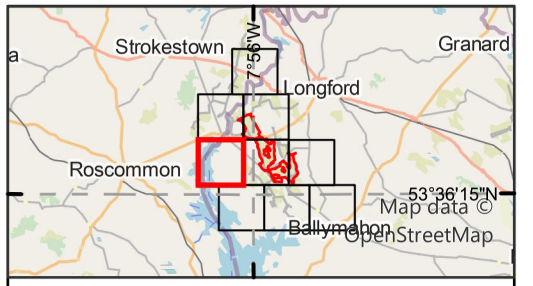
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Legend

- Proposed wind farm site boundary
- **Confirmed** Breeding Status*

Non-flight observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-21
- Breeding-22
- Breeding-23
- Breeding-24

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0 0.5 1
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Rev	Date	Description	By	Chkd.
A	06/05/2025	First issue	S.P	I.H

Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Flight and non-flight observations
Mallard
Sheet 5 of 9

Scale @ A3: 1:24,000

Prepared by:	Checked by:	Date:
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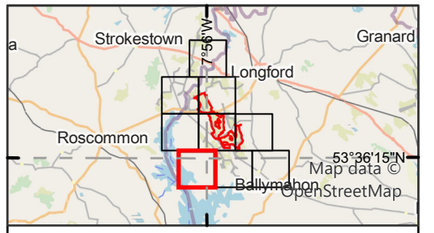
7°53'50"W



53°35'0"N

604000

760000



Legend

- Proposed wind farm site boundary
- **Confirmed** Breeding Status*

Non-flight observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
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Project: Derryadd Wind Farm

Title: Flight and non-flight observations
Mallard
Sheet 6 of 9

Scale @ A3: 1:24,000

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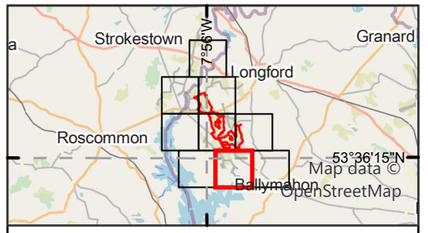
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Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-21
- Breeding-22
- Breeding-23
- Breeding-24

Flightline observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Breeding-22
- Breeding-23

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0 0.5 1
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Client:

Bord na Móna

Project:

Derryadd Wind Farm

Title:

Flight and non-flight observations
Mallard
Sheet 7 of 9

Scale @ A3: 1:24,000

Prepared by:	Checked by:	Date:
S.Pezzetta	I.Heanue	May 2025

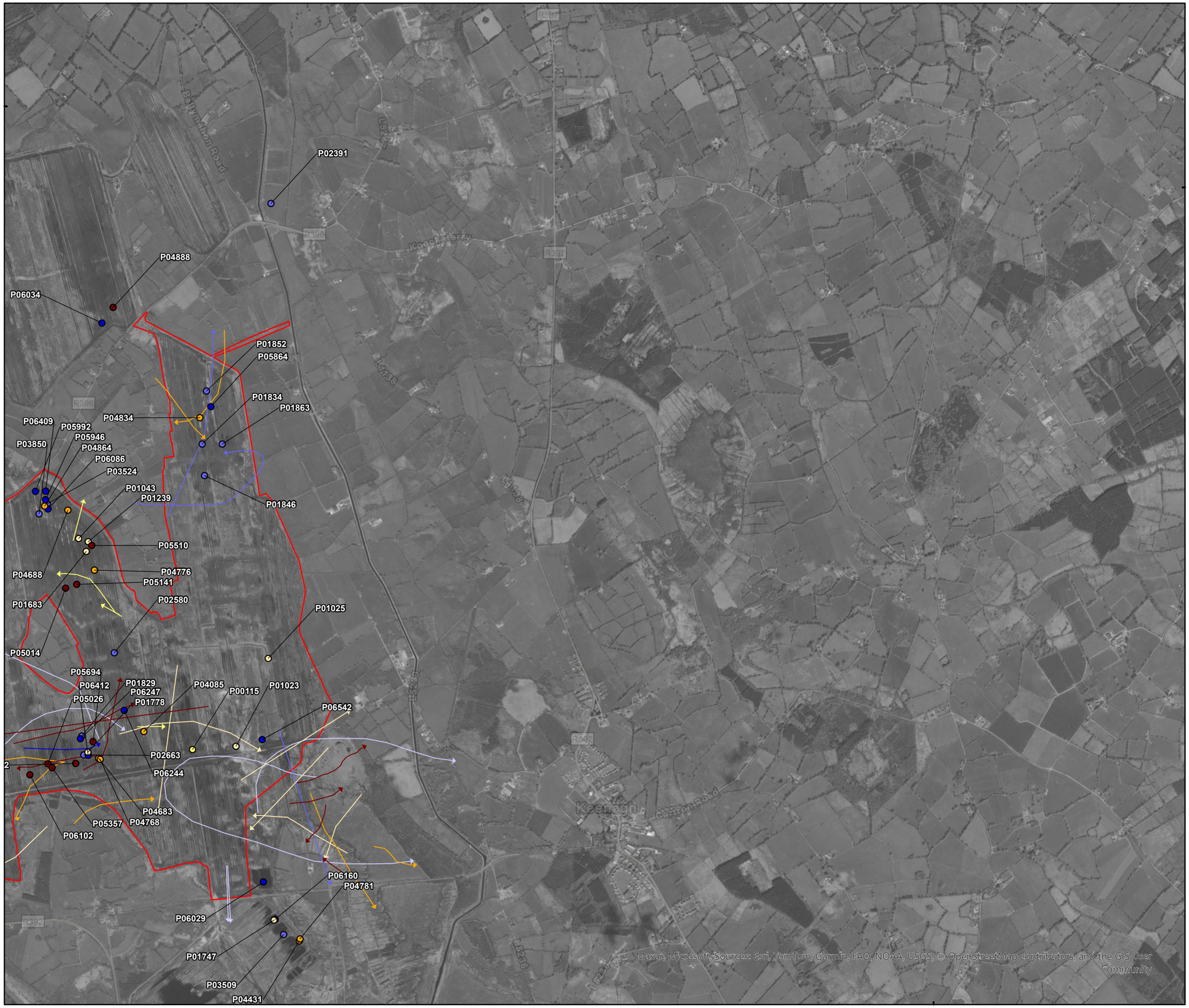
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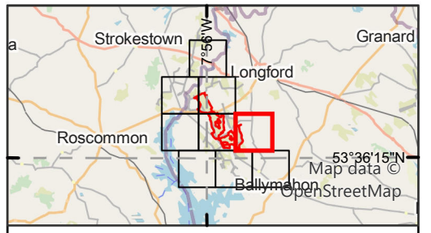
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Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-21
- Breeding-22
- Breeding-23
- Breeding-24

Flightline observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-21
- Breeding-22
- Breeding-23
- Breeding-24

*should be read with data in Appendix 8.3

0 0.5 1
Kilometres

NOTES

1. FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING\
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4. ALL LEVELS RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD

Rev	Date	Description	By	Chkd.
A	06/05/2025	First issue	S.P	I.H

Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Flight and non-flight observations
Mallard
Sheet 8 of 9

Scale @ A3: 1:24,000

Prepared by:	Checked by:	Date:
S.Pezzetta	I.Heanue	May 2025

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Map Ref: 11399-041.ApX-SUM-MA-TOB-A

Draft: A

7°45'0"W

53°36'15"N

53°30'0"N

614400

760000

P00441,
P00677

P00494,
P00556,
P00619, P00675

R397

R392

R236

R235

N55

Barry Road

Drinan

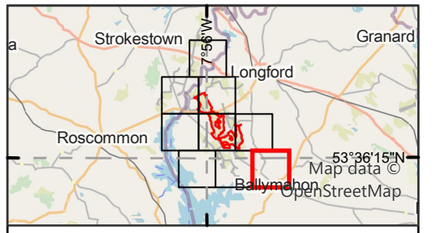
Royal Canal

Ballymahon

Main Street

Creevaghbeg

Maxar, Microsoft, Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community



Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-21/22
- Breeding-21

*should be read with data in Appendix 8.3

0 0.5 1
Kilometres

NOTES

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Rev	Date	Description	By	Chkd.
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Client: Bord na Móna

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Mallard
Sheet 9 of 9

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Map Ref: 11399-041.ApX-SUM-MA-TOB-A

Draft: A

Appendix K.10 EURASIAN TEAL

Vantage Point (Flight)									
Season	VP	Date	Time	Abundance	Seconds in Band 1 (0-25m)	Seconds in Band 2 (26-50m)	Seconds in Band 3 (51-150m)	Seconds in Band 4 (151-200m)	Seconds in Band 5 (201+m)
Breeding	VP3	04/05/2021	16:23	1	23	0	0	0	0
Breeding	VP1	06/07/2021	15:06	4	0	0	119	0	0
Non-breeding	VP2	23/11/2021	08:50	18	16	0	0	0	0
Non-breeding	VP4	25/11/2021	08:18	3	20	0	0	0	0
Non-breeding	VP4	25/11/2021	10:50	15	3600*	0	0	0	0
Non-breeding	VP5	26/11/2021	10:44	21	8	40	0	0	0
Non-breeding	VP5	26/11/2021	11:37	7	15	32	0	0	0
Non-breeding	VP5	26/11/2021	11:42	32	50	71	0	0	0
Non-breeding	VP1	13/12/2021	10:13	1	2	5	13	0	0
Non-breeding	VP6	16/12/2021	12:03	18	3	0	0	0	0
Non-breeding	VP1	07/01/2022	11:00	11	5	0	0	0	0
Non-breeding	VP1	07/01/2022	15:11	7	10	0	0	0	0
Non-breeding	VP5	25/01/2022	09:36	2	10	0	0	0	0
Non-breeding	VP1	01/02/2022	09:58	11	10	0	0	0	0
Non-breeding	VP4	28/02/2022	12:04	15	0	15	0	0	0
Non-breeding	VP1	02/03/2022	10:05	9	5	0	0	0	0
Non-breeding	VP4	08/03/2022	11:57	1	5	0	0	0	0
Breeding	VP 1	12/04/2022	18:25	4	10	15	0	0	0
Non-breeding	VP5	17/10/2022	12:41	3	4	0	0	0	0
Non-breeding	VP5	28/11/2022	10:00	15	4	6	0	0	0
Non-breeding	VP 1	16/12/2022	11:13	3	2	0	0	0	0
Non-breeding	VP5	30/12/2022	13:10	8	5	0	0	0	0
Non-breeding	VP11	20/03/2023	13:50	3	10	0	0	0	0
Non-breeding	VP9	12/10/2023	09:02	3	10	0	0	0	0
Non-breeding	VP1	07/11/2023	08:55	7	6	0	0	0	0
Non-breeding	VP4	12/11/2023	10:58	1	6	0	0	0	0
Non-breeding	VP5	25/03/2024	10:42	2	10	5	0	0	0
Non-breeding	VP5	25/03/2024	11:28	1	4	2	0	0	0

Vantage Point (Flight)									
Season	VP	Date	Time	Abundance	Seconds in Band 1 (0-25m)	Seconds in Band 2 (26-50m)	Seconds in Band 3 (51-150m)	Seconds in Band 4 (151-200m)	Seconds in Band 5 (201+m)
Breeding	VP10	04/09/2024	08:15	3	0	30	0	0	0
Breeding	VP4	24/09/2024	11:05	4	4	6	0	0	0

*Surveyor sample error – record not included in the collision risk model

Vantage Point (Non-flight)									
Map Ref.	Season	VP	Date	Time	Abundance	Dominant Habitat	Activity	Breeding Code	Breeding Status
P00915	Breeding	VP1	12/04/2022	18:26	4	FW2	In suitable breeding habitat	H	Possible
P01879	Non-breeding	VP7	08/03/2023	13:20	17	PB4	Foraging.	N/A	N/A
P04113	Breeding	VP1	22/05/2023	N/A	2	N/A	Feeding	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P01796	Breeding	Ref No: 8	13/09/2022	12	Roosting around the shoreline.	N/A	N/A
P01814	Breeding	Rhynmount Bog.	14/09/2022	12	Swimming around wetland.	N/A	N/A
P01942	Non-breeding	iwebs 1234	31/10/2022	13	Seen swimming towards the centre	N/A	N/A
P02018	Non-breeding	Site 4	06/11/2022	15	On water with MA	N/A	N/A
P02020	Non-breeding	Near site 4, LeTergullion	06/11/2022	20	Swimming on open water	N/A	N/A
P01984	Non-breeding	Derrycashel Bog	16/11/2022	3	Flyover	N/A	N/A
P02030	Non-breeding	Ref No 8	07/12/2022	35	Foraging/ Swimming on open water.	N/A	N/A
P02040	Non-breeding	Ref No 10	07/12/2022	90	Foraging/ Swimming on open water.	N/A	N/A
P02068	Non-breeding	Rhynmount Bog	08/12/2022	45	Foraging/ Swimming on wetlands.	N/A	N/A
P02072	Non-breeding	Ref No 13	08/12/2022	2	Swimming on flooded field.	N/A	N/A
P02178	Non-breeding	Ref No 10	10/01/2023	15	Swimming on flooded field.	N/A	N/A
P02198	Non-breeding	Rhynmount Bog VP3	13/01/2023	150	Foraging on wetland.	N/A	N/A
P02203	Non-breeding	Derrycashel Bog	23/01/2023	2	Foraging on wetland.	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P02247	Non-breeding	Derrycashel Bog	10/02/2023	4	Swimming on wetland.	N/A	N/A
P02262	Non-breeding	Rhynmount Bog VP1	16/02/2023	3	Roosting on wetland.	N/A	N/A
P02274	Non-breeding	Rhynmount Bog VP3	16/02/2023	40	Foraging on wetland.	N/A	N/A
P02417	Non-breeding	Ref No 8	03/03/2023	15	Foraging on open water.	N/A	N/A
P02435	Non-breeding	Ref No 5	03/03/2023	9	Foraging on open water.	N/A	N/A
P02469	Non-breeding	Rhynmount Bog VP3	16/03/2023	5	Foraging	N/A	N/A
P02472	Non-breeding	Ref No 13	16/03/2023	8	Foraging	N/A	N/A
P02476	Non-breeding	Ref No 12	16/03/2023	19	Foraging	N/A	N/A
P02395	Non-breeding	Carrigens turlough/fields	24/03/2023	11	Most roosting on ground, 2 in water	N/A	N/A
P02408	Non-breeding	East of Location 4	24/03/2023	21	Most roosting, a few on water	N/A	N/A
P04168	Breeding	Ref No 8	14/04/2023	6	Foraging	N/A	N/A
P04178	Breeding	Derrycashel Bog	14/04/2023	4	Foraging	N/A	N/A
P04191	Breeding	Ref No 12	14/04/2023	6	Foraging	N/A	N/A
P04352	Breeding	Derrycashel Bog	03/05/2023	3	Swimming	N/A	N/A
P04608	Breeding	Onsite	07/07/2023	2	Swimming	N/A	N/A
P04622	Breeding	Derrycashel Bog	07/07/2023	1	Swimming	N/A	N/A
P04721	Breeding	Onsite	03/08/2023	1	Flushed from cover.	N/A	N/A
P04724	Breeding	Rhynmount VP2	03/08/2023	3	Swimming	N/A	N/A
P04813	Breeding	Ref No: 8	28/09/2023	6	Foraging	N/A	N/A
P04831	Breeding	Onsite	29/09/2023	6	Flushed from cover.	N/A	N/A
P06185	Non-breeding	Ref No: 10	08/11/2023	5	Foraging	N/A	N/A
P06192	Non-breeding	Ref No: 8	08/11/2023	3	Swimming	N/A	N/A
P06294	Non-breeding	4	23/11/2023	16	16 Teal on Turlough	N/A	N/A
P06316	Non-breeding	4	27/11/2023	12	12 Teal on turlough	N/A	N/A
P06555	Non-breeding	4	06/12/2023	38	38 Teal on lake	N/A	N/A
P06561	Non-breeding	4	06/12/2023	22	22 Teal on turlough	N/A	N/A
P06498	Non-breeding	Rhynmount	08/12/2023	6	Swimming	N/A	N/A
P06502	Non-breeding	Ref No: 8	11/12/2023	35	Swimming	N/A	N/A
P06572	Non-breeding	4	18/12/2023	18	18 Teal on turlough	N/A	N/A
P06579	Non-breeding	4	18/12/2023	12	12 Teal on turlough	N/A	N/A
P06595	Non-breeding	Ref No: 12	05/01/2024	12	N/A	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P06598	Non-breeding	Ref No: 8	05/01/2024	14	N/A	N/A	N/A
P06609	Non-breeding	Derrycashel Bog	05/01/2024	4	N/A	N/A	N/A
P06620	Non-breeding	Ref No: 17	12/01/2024	26	N/A	N/A	N/A
P06628	Non-breeding	Rhynmount	12/01/2024	6	N/A	N/A	N/A
P06648	Non-breeding	Southern half of site	25/01/2024	12	N/A	N/A	N/A
P06653	Non-breeding	Southern half of site	25/01/2024	15	N/A	N/A	N/A
P06662	Non-breeding	Southern half of site	25/01/2024	15	N/A	N/A	N/A
P06677	Non-breeding	Ref No: 10	06/02/2024	4	N/A	N/A	N/A
P06681	Non-breeding	Ref No: 8	06/02/2024	4	N/A	N/A	N/A
P06689	Non-breeding	Derrycashel Bog	06/02/2024	2	N/A	N/A	N/A
P06704	Non-breeding	Ref No: 17	14/02/2024	16	N/A	N/A	N/A
P06712	Non-breeding	Rhynmount	14/02/2024	6	N/A	N/A	N/A
P06727	Non-breeding	Southern half of site	19/02/2024	3	3 Teal took flight from small bog pool	N/A	N/A
P06737	Non-breeding	Southern half of site	19/02/2024	19	On Turlough	N/A	N/A
P06743	Non-breeding	Southern half of site	19/02/2024	12	On Turlough	N/A	N/A
P06748	Non-breeding	Southern half of site	21/02/2024	16	On Turlough	N/A	N/A
P06761	Non-breeding	Southern half of site	23/02/2024	6	6 Teal took flight from flooded area of bog	N/A	N/A
P06772	Non-breeding	Ref No: 10	07/03/2024	10	Swimming	N/A	N/A
P06777	Non-breeding	Ref No: 8	07/03/2024	22	Roosting	N/A	N/A
P06804	Non-breeding	Ref No: 17	08/03/2024	16	Swimming	N/A	N/A
P04941	Breeding	Ref No:2	08/04/2024	1	Male. Flushed from cover.	N/A	N/A
P05166	Breeding	2Km Buffer	14/05/2024	2	2 Teal took flight from wetland.	N/A	N/A
P05671	Breeding	2 Km buffer	20/08/2024	3	3 Teal took flight from wetland	N/A	N/A
P05677	Breeding	2 Km buffer	20/08/2024	18	18 Teal took flight from wetland	N/A	N/A
P05810	Breeding	2km buffer	04/09/2024	2	2 Teal on lake	N/A	N/A
P05776	Breeding	Ref No:11	06/09/2024	6	Swimming.	N/A	N/A
P05846	Breeding	2km buffer	16/09/2024	12	12 Teal took flight from wetland	N/A	N/A

CBS & Winter Transect Survey									
Map Ref.	Season	Survey Location	Date	Time	Abundance	Dominant Habitat	Activity	Breeding Code	Breeding Status
P01149	Breeding	T4	12/04/2022	09:48	12	pb4	H	H	Possible
P01176	Breeding	T5	17/05/2022	07:20	2	pb4	h	H	Possible
P01184	Breeding	T4	17/05/2022	08:14	2	pb4	H	H	Possible
P01353	Breeding	T5	09/06/2022	11:25	1	pb4	N/A	H	Possible
P01757	Breeding	T11	12/09/2022	N/A	9	PB4	Flushed	N/A	N/A
P01764	Breeding	T20	12/09/2022	N/A	22	PB4	Flushed	N/A	N/A
P01767	Breeding	T20	12/09/2022	N/A	6	PB4	Flushed	N/A	N/A
P01775	Breeding	T10	13/09/2022	N/A	2	PB4	Flushed	N/A	N/A
P01779	Breeding	T18	14/09/2022	N/A	18	PB4	Flushed	N/A	N/A
P02598	Non-breeding	T20	05/10/2022	12:20	7	PB4	Flushed	N/A	N/A
P02601	Non-breeding	T20	05/10/2022	12:55	7	PB4	Flushed	N/A	N/A
P03680	Non-breeding	T1	17/02/2023	N/A	1	FL1	Swimming	N/A	N/A
P03926	Non-breeding	T20	20/03/2023	10:30	22	PB4	Foraging	N/A	N/A
P04231	Breeding	T10	06/04/2023	10:50	1	PB4	N/A	H	Possible
P04662	Breeding	T10	21/07/2023	14:23	4	FL8	N/A	N/A	N/A
P04785	Breeding	T7	31/08/2023	09:42	2	FL1	N/A	N/A	N/A
P04848	Breeding	T7	07/09/2023	13:40	2	fl1	N/A	N/A	N/A
P04794	Breeding	T4	25/09/2023	11:00	2	PB4	N/A	N/A	N/A
P04800	Breeding	T5	25/09/2023	12:35	15	PB4	N/A	N/A	N/A
P06405	Non-breeding	T10	06/10/2023	15:45	15	PB4	Swimming	N/A	N/A
P06249	Non-breeding	T18	23/11/2023	14:58	5	PB4	Swimming	N/A	N/A
P06260	Non-breeding	T4	27/11/2023	15:25	36	PB4	Swimming	N/A	N/A
P06532	Non-breeding	T4	19/12/2023	15:22	26	PB4	Swimming	N/A	N/A
P05921	Non-breeding	T4	03/01/2024	10:30	3	PB4	N/A	N/A	N/A
P05922	Non-breeding	T4	03/01/2024	10:40	60	PB4	N/A	N/A	N/A
P05989	Non-breeding	T4	20/02/2024	09:12	26	PB4	N/A	N/A	N/A
P06005	Non-breeding	T10	29/02/2024	09:18	12	PB4	N/A	N/A	N/A
P06067	Non-breeding	T11	05/03/2024	13:18	2	PB4	N/A	N/A	N/A
P06071	Non-breeding	T4	05/03/2024	15:43	21	PB4	N/A	N/A	N/A
P06078	Non-breeding	T10	06/03/2024	10:08	10	PB4	N/A	N/A	N/A
P05029	Breeding	Transect 10	10/04/2024	15:41	2	pb4	N/A	P	Probable

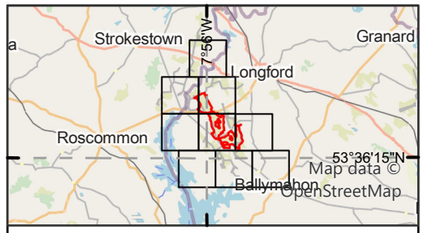
CBS & Winter Transect Survey									
Map Ref.	Season	Survey Location	Date	Time	Abundance	Dominant Habitat	Activity	Breeding Code	Breeding Status
P05030	Breeding	Transect 10	10/04/2024	15:48	3	pb4	N/A	P	Probable
P05036	Breeding	Transect 10	10/04/2024	15:58	2	pb4	N/A	P	Probable
P05077	Breeding	T4	10/05/2024	08:25	1	PB4	N/A	A	Probable
P05638	Breeding	T10	07/08/2024	13:45	6	PB4	N/A	N/A	N/A
P05643	Breeding	T10	07/08/2024	13:59	4	PB4	N/A	N/A	N/A
P05647	Breeding	T11	07/08/2024	16:15	2	PB4	N/A	N/A	N/A
P05797	Breeding	T11	03/09/2024	14:50	18	PB4	N/A	N/A	N/A
P05816	Breeding	T10	04/09/2024	16:40	3	PB4	N/A	N/A	N/A
P05819	Breeding	T10	04/09/2024	16:42	2	PB4	N/A	N/A	N/A
P05747	Breeding	T5	06/09/2024	10:30	4	PB4	N/A	N/A	N/A

Hinterland (Raptors) Survey & Hen Harrier Roost Watch						
Map Ref.	Season	Location	Date	Abundance	Breeding Code	Breeding Status
P00581	Breeding	HHVP8	09/09/2021	1	N/A	N/A
P00645	Breeding	HHVP8	30/09/2021	6	N/A	N/A
P00695	Non-breeding	HHVP8	26/10/2021	10	N/A	N/A
P00730	Non-breeding	HHVP4	24/11/2021	13	N/A	N/A
P00744	Non-breeding	HHVP7	24/11/2021	5	N/A	N/A
P00767	Non-breeding	HHVP4	25/01/2022	29	N/A	N/A
P00777	Non-breeding	HHVP8	25/01/2022	48	N/A	N/A
P00792	Non-breeding	HHVP4	28/02/2022	6	N/A	N/A
P00801	Non-breeding	HHVP5	28/02/2022	16	N/A	N/A
P00810	Non-breeding	HHVP8	28/02/2022	8	N/A	N/A
P00825	Non-breeding	HHVP4	29/03/2022	12	N/A	N/A
P00827	Non-breeding	HHVP5	29/03/2022	20	N/A	N/A
P00837	Non-breeding	HHVP8	29/03/2022	6	N/A	N/A

Incidental Sightings					
Map Ref.	Season	Date	Abundance	Breeding Code	Breeding Status
P04037	Non-breeding	10/02/2023	4	N/A	N/A
P04054	Non-breeding	16/02/2023	2	N/A	N/A
P04065	Non-breeding	03/03/2023	11	N/A	N/A

8°2'40"W
7°53'50"W
7°45'0"W
53°45'0"N
53°40'0"N
53°35'0"N
776000
768000
760000
593600
604000
614400

Sheet 1
Sheet 2
Sheet 3
Sheet 4
Sheet 5
Sheet 6
Sheet 7



Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-21
- Breeding-22
- Breeding-23
- Breeding-24

Flightline observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-21
- Breeding-22
- Breeding-24

0 1.5 3
Kilometres

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Rev	Date	Description	By	Chkd.
A	25/03/2025	First issue	S.P	I.H

Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Flight and non-flight observations Eurasian Teal Overview

Scale @ A3: 1:85,000

Prepared by:	Checked by:	Date:
S.Pezzetta	I.Heanue	March 2025

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Draft: A

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7°53'50"W

53°45'0"N

604000

776000

P02072,
P02472

P04191, P06595

P02476

P01984,
P02203,
P02247

P04178, P04352,
P04622,
P06609, P06689

P06620,
P06704,
P06804

Ballytoohey

Termonbarry

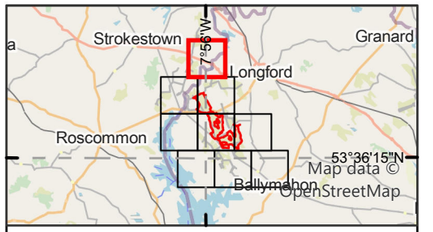
Clondra

M5

N5

N63

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Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-23

0 0.5 1
Kilometres

NOTES

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A	25/03/2025	First issue	S.P	I.H
Rev	Date	Description	By	Chkd

Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Flight and non-flight observations
Eurasian Teal
Sheet 1 of 7

Scale @ A3: 1:22,000

Prepared by:	Checked by:	Date:
S.Pezzetta	I.Heanue	March 2025

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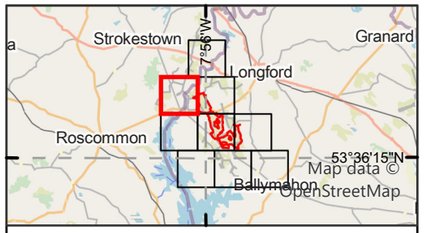
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8°2'40"W





Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-21
- Breeding-22
- Breeding-23
- Breeding-24

Flightline observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-21
- Breeding-22

0 0.5 1
Kilometres

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Rev	Date	Description	By	Chkd.
A	25/03/2025	First issue	S.P	I.H

Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Flight and non-flight observations
Eurasian Teal
Sheet 2 of 7

Scale @ A3: 1:22,000

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S.Pezzetta	I.Heanue	March 2025

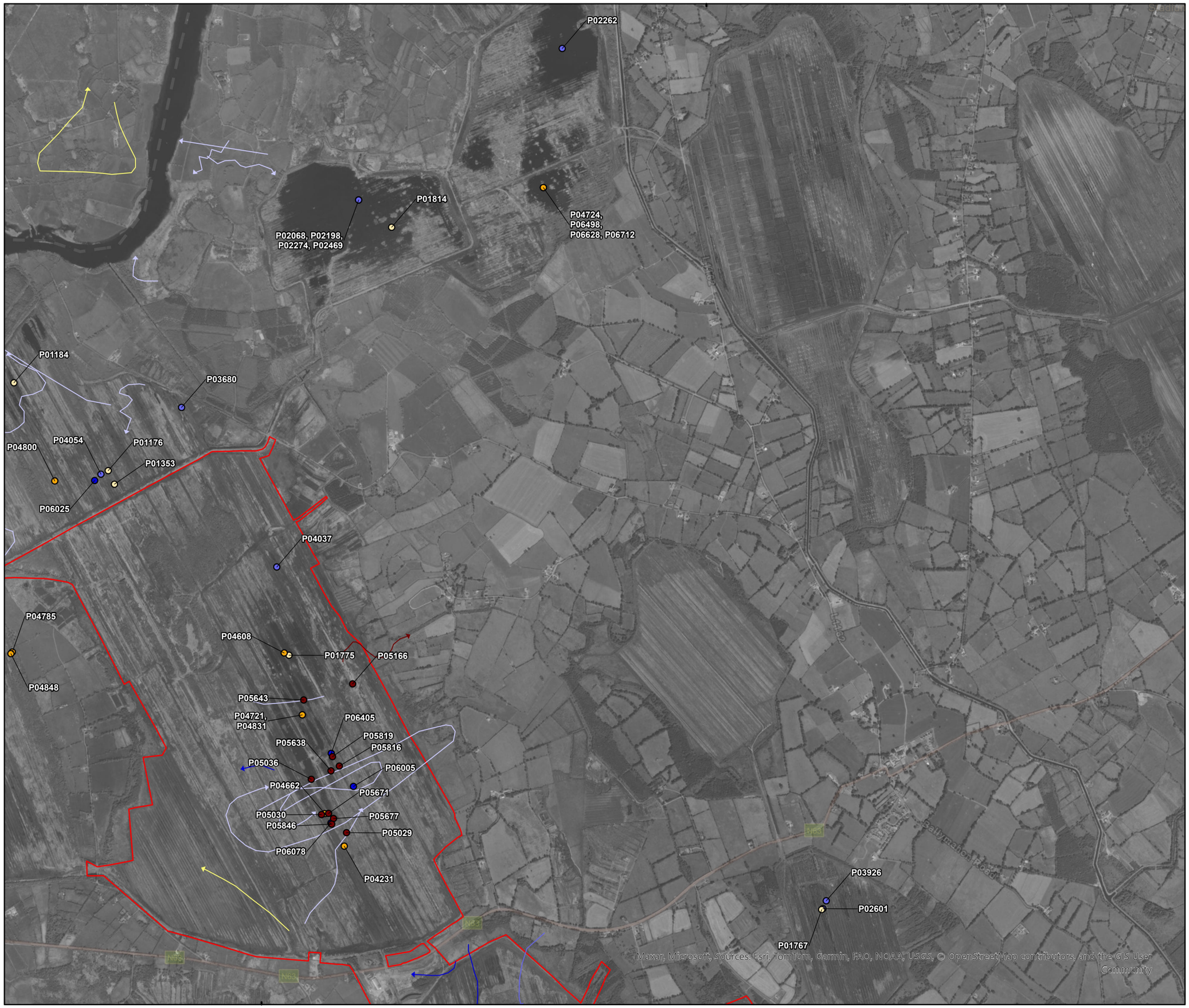
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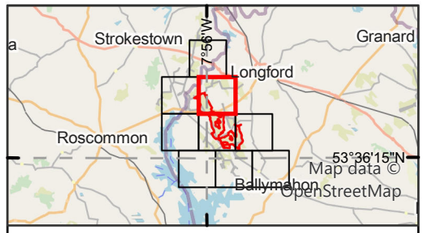
Map Ref: 11399-021.ApX-SUM-T.-TOB-A

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7°53'50"W



604000



Legend

- Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-22
- Breeding-23
- Breeding-24

Flightline observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-21
- Breeding-24

0 0.5 1
Kilometres

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Rev	Date	Description	By	Chkd.
A	25/03/2025	First issue	S.P	I.H

Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Flight and non-flight observations
Eurasian Teal
Sheet 3 of 7

Scale @ A3: 1:22,000

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7°53'50"W

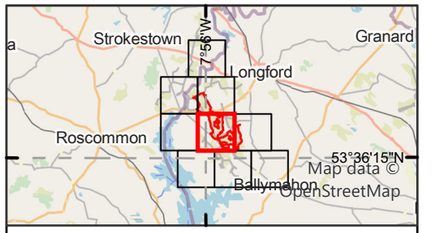
53°40'0"N

768000

604000

P06067
P05647
P05899
P04941
P01764
P02598
P01757
P05797
P01879
P06017
P04065
P06224
P01779
P02020
P02408
P06572
P06653
P06748
P06316
P06737
P06561

N63
R392
R398
L4435
Ballymahon Road



Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-22
- Breeding-24

Flightline observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-24

0 0.5 1
Kilometres

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Project: Derryadd Wind Farm

Title: Flight and non-flight observations
Eurasian Teal
Sheet 4 of 7

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8°2'40"W

53°4'0"N

768000

N63

Rockwood

Curreen

Rathcline Road

Kylock

R392

Rathcline

P00801, P00827

P02435

P06662

P02395

P06555, P06743

P06579

P01942

P06648

P02018

P06294

P00730, P00767, P00792, P00825

P02020

P02408

P06572

P06653

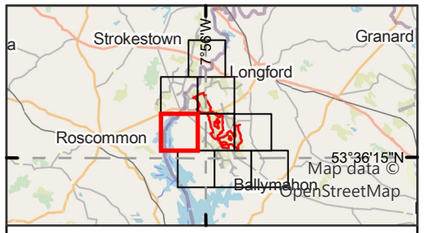
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P06316

P06737

P06561

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Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24

0 0.5 1

Kilometres

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A	25/03/2025	First issue	S.P	I.H

Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Flight and non-flight observations
Eurasian Teal
Sheet 5 of 7

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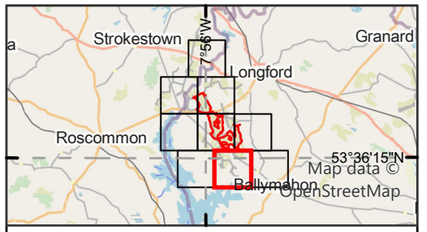
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Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-23/24
- Breeding-24

0 0.5 1
Kilometres

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Rev	Date	Description	By	Chkd.

Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Flight and non-flight observations
Eurasian Teal
Sheet 6 of 7

Scale @ A3: 1:22,000

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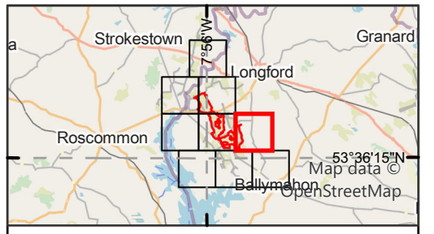
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Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-23/24
- Breeding-22

Flightline observations - Seasons

- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-24

0 0.5 1
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Rev	Date	Description	By	Chkd.

Client:

Bord na Móna

Project:

Derryadd Wind Farm

Title:

Flight and non-flight observations
Eurasian Teal
Sheet 7 of 7

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Appendix K.11 GREAT WHITE-FRONTED GOOSE

Vantage Point (Flight)									
Season	VP	Date	Time	Abundance	Seconds in Band 1 (0-25m)	Seconds in Band 2 (26-50m)	Seconds in Band 3 (51-150m)	Seconds in Band 4 (151-200m)	Seconds in Band 5 (201+m)
Non-breeding	VP4	08/10/2022	15:14	16	0	0	0	0	20

8°2'40"W

7°53'50"W

53°40'0"N

53°35'0"N

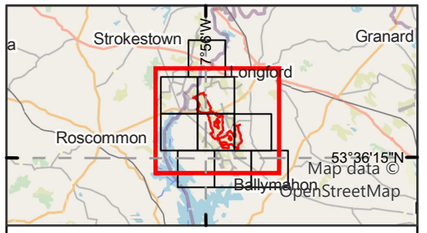
604000

614400

776000

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Legend

Proposed wind farm site boundary

Flightline observations - Seasons

Non-breeding-22/23

0 1 2

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A	16/04/2025	First issue	S.P	I.H
Rev	Date	Description	By	Chkd.

Client:

Bord na Móna

Project:

Derryadd Wind Farm

Title:

Flight and non-flight observations
Greater White-fronted Goose
Sheet 1 of 1

Scale @ A3: 1:60,000

Prepared by:	Checked by:	Date:
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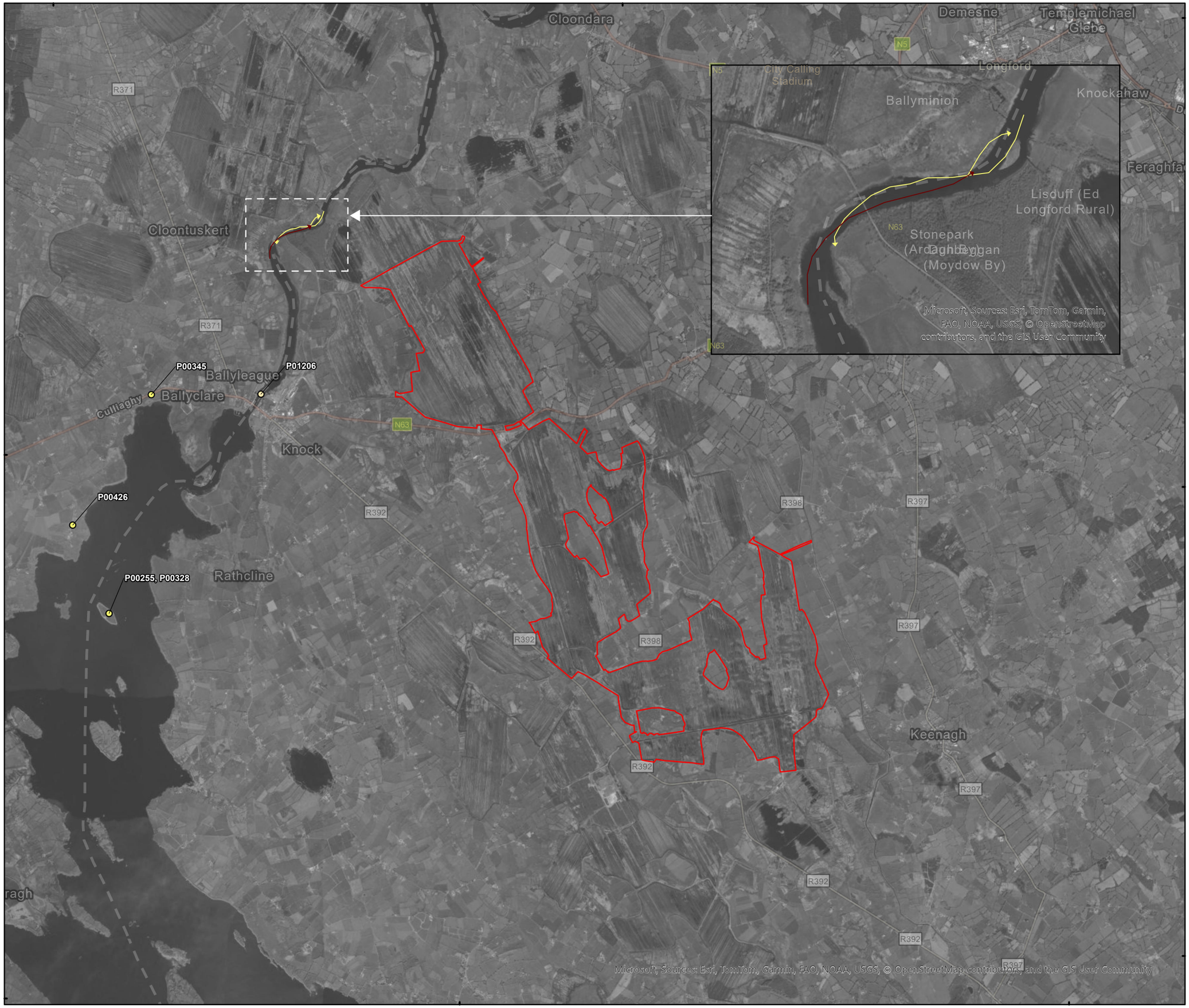
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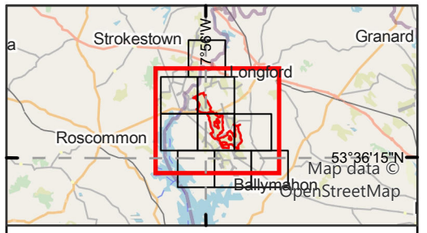
Appendix K.12 COMMON TERN

Vantage Point (Flight)									
Season	VP	Date	Time	Abundance	Seconds in Band 1 (0-25m)	Seconds in Band 2 (26-50m)	Seconds in Band 3 (51-150m)	Seconds in Band 4 (151-200m)	Seconds in Band 5 (201+m)
Breeding	VP2	07/07/2021	16:00	1	73	0	0	0	0
Breeding	VP2	07/07/2021	17:43	1	25	0	0	0	0
Breeding	VP1	15/07/2024	11:36	1	12	6	0	0	0

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P01206	Breeding	VP Number 7	17/05/2022	1	Common Tern flying over river/feeding	H	Possible

Hinterland (Raptors) Survey & Hen Harrier Roost Watch						
Map Ref.	Season	Location	Date	Abundance	Breeding Code	Breeding Status
P00255	Breeding	HHVP5	12/05/2021	2	N/A	N/A
P00328	Breeding	HHVP5	12/06/2021	2	N/A	N/A
P00345	Breeding	HHVP8	12/06/2021	1	N/A	N/A
P00426	Breeding	HHVP9	17/07/2021	1	N/A	N/A





Legend

- Proposed wind farm site boundary

Non-flight observations - Seasons

- Breeding-21
- Breeding-22

Flightline observations - Seasons

- Breeding-21
- Breeding-24

0 1 2
Kilometres

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Rev	Date	Description	By	Chkd.
A	16/04/2025	First issue	S.P	I.H

Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Flight and non-flight observations
Common Tern
Sheet 1 of 1

Scale @ A3: 1:60,000

Prepared by:	Checked by:	Date:
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Appendix K.13 TUFTED DUCK

Vantage Point (Flight)									
Season	VP	Date	Time	Abundance	Seconds in Band 1 (0-25m)	Seconds in Band 2 (26-50m)	Seconds in Band 3 (51-150m)	Seconds in Band 4 (151-200m)	Seconds in Band 5 (201+m)
Non-breeding	VP1	09/01/2023	14:40	3	6	0	0	0	0

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P01097	Breeding	Ref: 8	21/04/2022	2	Pair swimming on open water.	P	Possible
P01120	Breeding	New site	22/04/2022	4	2 pairs swimming on open water.	P	Possible
P01308	Breeding	Rhynmount Bog.	10/05/2022	2	Pair swimming on lake together.	N/A	N/A
P01322	Breeding	Ref: 5	12/05/2022	19	5 pairs, rest are males swimming around lake.	P	Probable
P01210	Breeding	VP Number 8	17/05/2022	2	2 tufted duck on lake	H	Possible
P01465	Breeding	Ref: 5	10/06/2022	3	Swimming around island.	N/A	N/A
P01585	Breeding	ref: 8	11/07/2022	12	Swimming on open water.	N/A	N/A
P01896	Non-breeding	Rhynmount Bog	12/10/2022	7	Foraging on wetlands.	N/A	N/A
P01914	Non-breeding	Ref No 5	13/10/2022	5	Foraging on open water.	N/A	N/A
P02017	Non-breeding	Site 4	06/11/2022	3	On water feeding/diving	N/A	N/A
P01973	Non-breeding	Rhynmount Bog	16/11/2022	9	Foraging on wetlands.	N/A	N/A
P02007	Non-breeding	Site 4	27/11/2022	10	In middle of turlough, swimming and diving	N/A	N/A
P02067	Non-breeding	Rhynmount Bog	08/12/2022	16	Foraging/ Swimming on wetlands.	N/A	N/A
P02111	Non-breeding	Site 4, Turlough at LeTergullion	27/12/2022	7	On water	N/A	N/A
P02115	Non-breeding	Site 4, Turlough at LeTergullion	27/12/2022	8	Second group to the south of previous group	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P02122	Non-breeding	Newpark, turlough slightly to the east of Turlough Site 4 (same complex)	27/12/2022	7	Feeding in mixed group of MA TU and SV WN	N/A	N/A
P02173	Non-breeding	Ref No 8	10/01/2023	2	Swimming on open water.	N/A	N/A
P02196	Non-breeding	Rhynmount Bog VP3	13/01/2023	45	Foraging on wetland.	N/A	N/A
P02142	Non-breeding	NE of Lisnacusha	29/01/2023	31	Swimming and feeding in middle of water	N/A	N/A
P02149	Non-breeding	Site 4, Turlough	29/01/2023	55	In teo groups 30/25, east/west side of turlough	N/A	N/A
P02165	Non-breeding	Greenhall Upper	29/01/2023	10	With WN on water	N/A	N/A
P02167	Non-breeding	Site 3 on map	29/01/2023	11	N/A	N/A	N/A
P02322	Non-breeding	NE of Lisnacusha	29/01/2023	31	Swimming and feeding in middle of water	N/A	N/A
P02329	Non-breeding	Site 4, Turlough	29/01/2023	55	In teo groups 30/25, east/west side of turlough	N/A	N/A
P02345	Non-breeding	Greenhall Upper	29/01/2023	10	With WN on water	N/A	N/A
P02347	Non-breeding	Site 3 on map	29/01/2023	11	N/A	N/A	N/A
P02221	Non-breeding	Ref No 8	03/02/2023	17	Foraging on open water.	N/A	N/A
P02236	Non-breeding	Ref No 5	03/02/2023	24	Foraging on open water.	N/A	N/A
P02272	Non-breeding	Rhynmount Bog VP3	16/02/2023	25	Foraging on wetland.	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P02288	Non-breeding	Site 4 Turlough	25/02/2023	27	Swimming and feeding. Dispersed thoughout lough	N/A	N/A
P02306	Non-breeding	Loughpark, Site 3	25/02/2023	10	Feeding/ Diving on water	N/A	N/A
P02359	Non-breeding	Site 4 Turlough	25/02/2023	27	Swimming and feeding. Dispersed thoughout lough	N/A	N/A
P02377	Non-breeding	Loughpark, Site 3	25/02/2023	10	Feeding/ Diving on water	N/A	N/A
P02418	Non-breeding	Ref No 8	03/03/2023	16	Foraging on open water.	N/A	N/A
P02433	Non-breeding	Ref No 5	03/03/2023	21	Foraging on open water.	N/A	N/A
P02466	Non-breeding	Rhynmount Bog VP3	16/03/2023	11	Foraging	N/A	N/A
P02400	Non-breeding	Carrigens turlough/fields	24/03/2023	4	On water	N/A	N/A
P02403	Non-breeding	Location 4, Turlough	24/03/2023	5	Feeding/diving on water	N/A	N/A
P04167	Breeding	Ref No 8	14/04/2023	5	Foraging	N/A	N/A
P04204	Breeding	Rhymount VP2	14/04/2023	2	Foraging	N/A	N/A
P04210	Breeding	Rhymount VP3	14/04/2023	5	Foraging	N/A	N/A
P04274	Breeding	Lough Ree	27/04/2023	19	19 Tufted duck on lake	H	Possible
P04420	Breeding	5 KM radius	26/05/2023	8	8 Tufted duck feeding on lake	H	Possible
P04486	Breeding	Rhynmount VP3	02/06/2023	1	Swimming	N/A	N/A
P04515	Breeding	Lough Ree	09/06/2023	20	20 Tufted duck feeding on lake	H	Possible
P04734	Breeding	Ref No: 8	03/08/2023	15	Juvenile swimming.	N/A	N/A
P06433	Non-breeding	5	06/10/2023	8	8 Tufted Duck on lake	N/A	N/A
P06379	Non-breeding	Ref No: 8	10/10/2023	2	Foraging	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P06280	Non-breeding	4	20/11/2023	10	10 Tufted duck on turlough	N/A	N/A
P06283	Non-breeding	5	20/11/2023	40	40 Tufted Duck on Lough Ree	N/A	N/A
P06289	Non-breeding	5	23/11/2023	30	30 Tufted duck on lake	N/A	N/A
P06320	Non-breeding	4	27/11/2023	136	136 Tufted Duck on turlough	N/A	N/A
P06329	Non-breeding	5	27/11/2023	35	35 Tufted Duck on Lough Ree	N/A	N/A
P06496	Non-breeding	Rhynmount	08/12/2023	32	Swimming	N/A	N/A
P06505	Non-breeding	Ref No: 8	11/12/2023	18	Swimming	N/A	N/A
P06577	Non-breeding	4	18/12/2023	38	38 Tufted Duck on turlough	N/A	N/A
P06582	Non-breeding	5	18/12/2023	5	5 Tufted duck on Lough Ree	N/A	N/A
P06642	Non-breeding	Southern half of site	02/01/2024	22	N/A	N/A	N/A
P06604	Non-breeding	Ref No: 8	05/01/2024	16	N/A	N/A	N/A
P06629	Non-breeding	Rhynmount	12/01/2024	9	N/A	N/A	N/A
P06647	Non-breeding	Southern half of site	25/01/2024	54	N/A	N/A	N/A
P06659	Non-breeding	Southern half of site	25/01/2024	130	N/A	N/A	N/A
P06680	Non-breeding	Ref No: 8	06/02/2024	2	N/A	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P06728	Non-breeding	Southern half of site	19/02/2024	70	On lake	N/A	N/A
P06751	Non-breeding	Southern half of site	21/02/2024	45	On Turlough	N/A	N/A
P06776	Non-breeding	Ref No: 8	07/03/2024	13	Roosting	N/A	N/A
P04970	Breeding	2 km North of site	17/04/2024	8	8 Tufted Duck on Lough Ree	H	Possible
P05340	Breeding	2km buffer	17/06/2024	4	Tufted Duck with 3 chicks on wetland	FL	Confirmed
P05348	Breeding	2km buffer	18/06/2024	4	4 Tufted Duck on lake	N/A	N/A
P05517	Breeding	2km buffer	24/07/2024	5	Tufted Duck with 4 ducklings	FL	Confirmed
P05536	Breeding	2km buffer	29/07/2024	4	Adult and 3 ducklings on wetland.	FL	Confirmed

Hinterland (Raptors) Survey & Hen Harrier Roost Watch						
Map Ref.	Season	Location	Date	Abundance	Breeding Code	Breeding Status
P00246	Breeding	HHVP4	12/05/2021	2	N/A	N/A
P00257	Breeding	HHVP5	12/05/2021	8	N/A	N/A
P00277	Breeding	HHVP8	14/05/2021	4	N/A	N/A
P00284	Breeding	HHVP9	14/05/2021	5	N/A	N/A
P00319	Breeding	HHVP4	12/06/2021	2	N/A	N/A
P00330	Breeding	HHVP5	12/06/2021	9	N/A	N/A
P00394	Breeding	HHVP5	17/07/2021	6	N/A	N/A
P00413	Breeding	HHVP8	17/07/2021	22	N/A	N/A
P00419	Breeding	HHVP9	17/07/2021	2	N/A	N/A
P00454	Breeding	HHVP5	05/08/2021	7	N/A	N/A
P00458	Breeding	HHVP8	05/08/2021	124	N/A	N/A
P00475	Breeding	HHVP9	05/08/2021	3	N/A	N/A
P00503	Breeding	HHVP5	14/08/2021	2	N/A	N/A
P00519	Breeding	HHVP8	14/08/2021	111	N/A	N/A
P00538	Breeding	HHVP9	14/08/2021	4	N/A	N/A
P00644	Breeding	HHVP8	30/09/2021	14	N/A	N/A

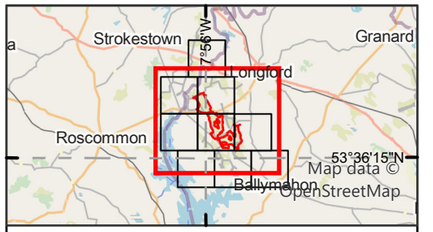
Hinterland (Raptors) Survey & Hen Harrier Roost Watch						
Map Ref.	Season	Location	Date	Abundance	Breeding Code	Breeding Status
P00653	Breeding	HHVP9	30/09/2021	20	N/A	N/A
P00692	Non-breeding	HHVP8	26/10/2021	26	N/A	N/A
P00702	Non-breeding	HHVP9	26/10/2021	45	N/A	N/A
P00733	Non-breeding	HHVP4	24/11/2021	2	N/A	N/A
P00748	Non-breeding	HHVP8	24/11/2021	45	N/A	N/A
P00768	Non-breeding	HHVP4	25/01/2022	1	N/A	N/A
P00781	Non-breeding	HHVP8	25/01/2022	4	N/A	N/A
P00782	Non-breeding	HHVP9	25/01/2022	4	N/A	N/A
P00791	Non-breeding	HHVP4	28/02/2022	15	N/A	N/A
P00811	Non-breeding	HHVP8	28/02/2022	4	N/A	N/A
P00819	Non-breeding	HHVP4	29/03/2022	20	N/A	N/A
P00826	Non-breeding	HHVP5	29/03/2022	55	N/A	N/A
P00842	Non-breeding	HHVP8	29/03/2022	8	N/A	N/A
P00845	Non-breeding	HHVP9	29/03/2022	6	N/A	N/A

8°2'40"W
7°53'50"W
53°40'0"N
53°35'0"N
776000
768000
760000
604000
614400

P05536
P01308
P01120
P05340
P04204, P06496, P06629
P01896, P01973, P02067, P02196, P02272, P02466, P04210, P04486
P01097, P01585, P04167, P04734, P06379, P06505, P06604, P06680, P06776
P04970
P00277, P00413, P00458, P00519, P00644, P00692, P00748, P00781, P00811, P00842
P02173, P02221, P02418
P05348
P01210
P05517
P00284, P00419, P00475, P00538, P00653, P00702, P00782, P00845
P00257, P00330, P00394, P00454, P00503, P00826
P01914, P02236, P02433
P01322, P01465, P04274, P04420, P04515, P06283, P06289, P06329, P06433, P06582, P06642, P06659, P06728
P02400
P02142, P02322
P06577
P06320
P02122
P06751
P02007
P02017
P06647
P02111, P02115
P06280
P02149, P02329, P02403
P00246, P00319, P00733, P00768, P00791, P00819
P02165, P02345
P02288, P02359

Cloondara
Demesne
Longford
City Calling Stadium
Ballyminion
Knockanaw
Feraghta
Lisduff (Ed Longford Rural)
Cloontuskert
Stonepark (Ardaghbeggan (Moydow By))
Ballyclare
Knock
Rathcline
Keenagh
R371
N5
N63
R392
R398
R397

Maxar, Microsoft, Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community



Legend

- Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-21
- Breeding-22
- Breeding-23
- Breeding-24
- **Confirmed** Breeding Status*

Flightline observations - Seasons

- Non-breeding-22/23

*should be read with data in Appendix 8.3

0 1 2
Kilometres

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	06/05/2025	First issue	S.P	I.H

Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Flight and non-flight observations
Tufted Duck
Sheet 1 of 1

Scale @ A3: 1:60,000

Prepared by:	Checked by:	Date:
S.Pezzetta	I.Heanue	May 2025

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Map Ref: 11399-052.ApX-SUM-TU-TOB-A

Draft: A

Appendix K.14 LITTLE GREBE

Vantage Point (Flight)									
Season	VP	Date	Time	Abundance	Seconds in Band 1 (0-25m)	Seconds in Band 2 (26-50m)	Seconds in Band 3 (51-150m)	Seconds in Band 4 (151-200m)	Seconds in Band 5 (201+m)
Breeding	VP7	03/04/2024	13:25	4	0	0	35	0	0
Breeding	VP7	03/04/2024	18:05	6	0	0	40	0	0

Vantage Point (Non-flight)									
Map Ref.	Season	VP	Date	Time	Abundance	Dominant Habitat	Activity	Breeding Code	Breeding Status
P00935	Breeding	VP10	12/05/2022	15:20	1	PB4	Swimming	N/A	N/A
P00948	Breeding	VP10	08/06/2022	13:20	2	PB4	Foraging	N/A	N/A
P00958	Breeding	VP10	07/07/2022	10:55	7	PB4	Swimming/ Foraging.	N/A	N/A
P00987	Breeding	VP10	05/08/2022	10:50	3	PB4	Foraging	N/A	N/A
P00988	Breeding	VP10	05/08/2022	10:50	4	PB4	Foraging	N/A	N/A
P00993	Breeding	VP10	05/09/2022	10:40	7	PB4	Foraging	N/A	N/A
P01832	Non-breeding	VP10	10/10/2022	08:00	5	PB4	Foraging.	N/A	N/A
P01847	Non-breeding	VP1	16/12/2022	00:00	1	FW2	Swimming	N/A	N/A
P01858	Non-breeding	VP4	16/01/2023	11:30	1	PB4	On water	N/A	N/A
P01882	Non-breeding	VP7	08/03/2023	13:20	2	PB4	Foraging.	N/A	N/A
P04102	Breeding	VP4	24/05/2023	06:35	2	N/A	Foraging	N/A	N/A
P05865	Non-breeding	VP10	02/11/2023	10:10	1	N/A	Foraging.	N/A	N/A
P06137	Breeding	VP10	07/05/2024	05:20	2	N/A	On nest.	ON	Confirmed
P06111	Breeding	VP10	05/06/2024	07:40	1	N/A	Foraging	N/A	N/A
P06122	Breeding	VP10	01/07/2024	07:40	2	N/A	Foraging	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P01070	Breeding	New site	19/04/2022	3	Male singing and birds seen in suitable nesting habitat	S	Possible
P01090	Breeding	Ref: 4	20/04/2022	5	Suitable nesting habitat	H	Possible
P01119	Breeding	New site	22/04/2022	2	Suitable nesting habitat, calling Male.	S	Possible
P01123	Breeding	New site	22/04/2022	1	Male singing not seen. Suitable nesting habitat.	S	Possible
P01293	Breeding	Corlea Wetlands	05/05/2022	1	Suitable nesting habitat	H	Possible
P01306	Breeding	Rhynmount Bog.	10/05/2022	1	Male calling. heard in suitable habitat.	S	Possible
P01474	Breeding	Rhynmount Bog.	14/06/2022	3	Calling from cover.	S	Possible
P01485	Breeding	Corlea Wetlands	20/06/2022	6	Swimming around wetland.	N/A	N/A
P01583	Breeding	ref: 8	11/07/2022	2	Foraging on open water.	N/A	N/A
P01598	Breeding	Rhynmount Bog.	11/07/2022	1	Male calling from cover.	S	Possible
P01604	Breeding	Corlea Wetlands	14/07/2022	3	Male calling, foraging on open water	S	Possible
P01708	Breeding	Corlea Wetlands	10/08/2022	14	Foraging around the wetland.	N/A	N/A
P01799	Breeding	Ref No: 8	13/09/2022	2	Foraging on lake.	N/A	N/A
P01811	Breeding	Rhynmount Bog.	14/09/2022	1	Calling from cover.	N/A	N/A
P01817	Breeding	Rhynmount Bog.	14/09/2022	1	Swimming around wetland.	N/A	N/A
P01823	Breeding	Corlea Wetlands	14/09/2022	3	Foraging around the wetland.	N/A	N/A
P01898	Non-breeding	Rhynmount Bog	12/10/2022	2	Foraging on wetlands.	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P01905	Non-breeding	Ref No 8	13/10/2022	3	Foraging on open water.	N/A	N/A
P02155	Non-breeding	NewPark, Clonmee, west of site 4	29/01/2023	1	Smimming near CO	N/A	N/A
P02335	Non-breeding	NewPark, Clonmee, west of site 4	29/01/2023	1	Smimming near CO	N/A	N/A
P02220	Non-breeding	Ref No 8	03/02/2023	5	Foraging on open water.	N/A	N/A
P02252	Non-breeding	Derrycashel Bog	10/02/2023	1	Calling from cover.	N/A	N/A
P02263	Non-breeding	Rhynmount Bog VP1	16/02/2023	1	Calling from cover.	N/A	N/A
P02270	Non-breeding	Rhynmount Bog VP3	16/02/2023	1	Calling from cover.	N/A	N/A
P02296	Non-breeding	Site 4 Turlough	25/02/2023	2	Swimming on open water near centre	N/A	N/A
P02367	Non-breeding	Site 4 Turlough	25/02/2023	2	Swimming on open water near centre	N/A	N/A
P02424	Non-breeding	Ref No 8	03/03/2023	2	Foraging on open water.	N/A	N/A
P02483	Non-breeding	Derrycashel Bog	16/03/2023	1	Flyover.	N/A	N/A
P04163	Breeding	Ref No 8	14/04/2023	1	Foraging	N/A	N/A
P04188	Breeding	Ref No 12	14/04/2023	2	Foraging	N/A	N/A
P04283	Breeding	Corlea lake	27/04/2023	2	2 Little Grebe on lake, probably breeding	H	Possible
P04288	Breeding	Turlough	27/04/2023	2	Pair of Little Grebe, probably breeding	P	Probable

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P04321	Breeding	Onsite	03/05/2023	2	Male calling	S	Possible
P04326	Breeding	Onsite	03/05/2023	2	Male calling	S	Possible
P04349	Breeding	Ref No: 12	03/05/2023	1	Calling.	S	Possible
P04351	Breeding	Derrycashel Bog	03/05/2023	2	Male calling	S	Possible
P04413	Breeding	5 KM radius	26/05/2023	4	4 Little Grebe feeding on lake	H	Possible
P04477	Breeding	Onsite	02/06/2023	1	Male calling	S	Possible
P04495	Breeding	Derrycashel Bog	02/06/2023	1	Male calling	S	Possible
P04527	Breeding	5 KM radius	09/06/2023	4	4 Little Grebe feeding on lake	H	Possible
P04599	Breeding	Onsite	07/07/2023	2	Male calling	S	Possible
P04615	Breeding	Rhynmount VP2	07/07/2023	1	Male calling	S	Possible
P04629	Breeding	Ref No: 8	07/07/2023	1	Roosting	N/A	N/A
P04653	Breeding	09200 61800	19/07/2023	7	3 Adults and 4 young on lake	FL	Confirmed
P04712	Breeding	Onsite	03/08/2023	2	Foraging, Adult, Juv.	N/A	N/A
P04717	Breeding	Onsite	03/08/2023	4	Foraging, Adult, Juv.	N/A	N/A
P04735	Breeding	Ref No: 8	03/08/2023	1	Foraging	N/A	N/A
P04837	Breeding	09232 61917	07/09/2023	2	2 Little Grebeheard calliing on Corlea lake	N/A	N/A
P04839	Breeding	01724 63197	07/09/2023	2	2 Little Grebe on Turlough	N/A	N/A
P04815	Breeding	Ref No: 8	28/09/2023	1	Foraging	N/A	N/A
P06381	Non-breeding	Ref No: 8	10/10/2023	2	Foraging	N/A	N/A
P06402	Non-breeding	Onsite	11/10/2023	3	Foraging	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P06453	Non-breeding	4	14/10/2023	1	Little Grebe on turlough	N/A	N/A
P06457	Non-breeding	N/A	18/10/2023	2	2 Little Grebe feeding on lake	N/A	N/A
P06191	Non-breeding	Ref No: 8	08/11/2023	3	Swimming	N/A	N/A
P06286	Non-breeding	5	20/11/2023	2	2 Little Grebe on Lough Ree	N/A	N/A
P06293	Non-breeding	5	23/11/2023	3	3 Little Grebe on lake	N/A	N/A
P06307	Non-breeding	N/A	23/11/2023	1	1 Little Grebe on flooded bog/small lake	N/A	N/A
P06313	Non-breeding	N/A	27/11/2023	2	2 Little Grebe on lake	N/A	N/A
P06332	Non-breeding	5	27/11/2023	3	3 Little Grebe on Lough Ree	N/A	N/A
P06500	Non-breeding	Rhynmount	08/12/2023	2	Swimming	N/A	N/A
P06576	Non-breeding	4	18/12/2023	15	1 Little Grebe on turlough	N/A	N/A
P06708	Non-breeding	Rhynmount	14/02/2024	2	N/A	N/A	N/A
P06717	Non-breeding	Onsite	14/02/2024	2	N/A	N/A	N/A
P06723	Non-breeding	Southern half of site	19/02/2024	4	4 Little Grebe on wetland	N/A	N/A
P06733	Non-breeding	Southern half of site	19/02/2024	4	On lake	N/A	N/A
P06759	Non-breeding	Southern half of site	23/02/2024	2	2 Little Grebe on wetland area of bog	N/A	N/A
P06809	Non-breeding	Rhynmount	08/03/2024	1	Calling	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P06814	Non-breeding	Onsite	08/03/2024	1	Calling	N/A	N/A
P04966	Breeding	2 km North of site	17/04/2024	1	Little Grebe on wetland area.	H	Possible
P04967	Breeding	2 km North of site	17/04/2024	4	4 Little Grebe in suitable breeding habitat	H	Possible
P05104	Breeding	Ref No:5	10/05/2024	2	Pair, 1 bird on nest.	ON	Confirmed
P05113	Breeding	Ref No:9	13/05/2024	1	Signing Male.	S	Possible
P05122	Breeding	Ref No:11	13/05/2024	2	Signing Male.	S	Possible
P05125	Breeding	Ref No:12	13/05/2024	3	Swimming.	N/A	N/A
P05125	Breeding	Ref No:12	13/05/2024	3	Swimming.	N/A	N/A
P05184	Breeding	2KM Buffer	15/05/2024	1	Little Grebe calling	S	Possible
P05294	Breeding	Ref No:5	07/06/2024	2	Foraging, adults.	N/A	N/A
P05305	Breeding	Ref No:9	11/06/2024	1	Alarm Call display, on suitable breeding ground	A	Probable
P05308	Breeding	Ref No:11	11/06/2024	2	2 juv foraging.	FL	Confirmed
P05317	Breeding	Ref No:12	11/06/2024	3	1 Adult, 2 juv foraging.	FL	Confirmed
P05329	Breeding	2km buffer	17/06/2024	1	Little Grebe on wetland area.	N/A	N/A
P05338	Breeding	2km buffer	17/06/2024	1	Little Grebe heard calling	S	Possible
P05341	Breeding	2km buffer	17/06/2024	2	2 Little Grebe feeding on wetland	N/A	N/A
P05346	Breeding	2km buffer	18/06/2024	2	2 Little Grebe on lake	H	Possible
P05375	Breeding	2KM buffer	24/06/2024	2	2 Little Grebe on wetland	H	Possible
P05479	Breeding	Ref No:11	05/07/2024	1	Foraging adult.	N/A	N/A
P05486	Breeding	Ref No:12	05/07/2024	1	Foraging	N/A	N/A
P05518	Breeding	2km buffer	24/07/2024	2	2 Little Grebes feeding on lake	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P05523	Breeding	2km buffer	24/07/2024	2	2 Little Grebe feeding on lake	N/A	N/A
P05533	Breeding	2km buffer	29/07/2024	1	Little Grebe calling	S	Possible
P05612	Breeding	Ref No:8	08/08/2024	1	Foraging	N/A	N/A
P05618	Breeding	Ref No:11	09/08/2024	3	Foraging Juveniles	N/A	N/A
P05624	Breeding	Ref No:12	09/08/2024	4	Foraging	N/A	N/A
P05663	Breeding	2 Km buffer	20/08/2024	2	2 Little Grebe on lake	N/A	N/A
P05675	Breeding	2 Km buffer	20/08/2024	1	Little Grebe calling	N/A	N/A
P05757	Breeding	Ref No:2	02/09/2024	1	Alarm call	N/A	N/A
P05780	Breeding	Ref No:11	06/09/2024	3	Foraging	N/A	N/A
P05784	Breeding	Ref No:12	06/09/2024	6	Foraging	N/A	N/A
P05849	Breeding	2km buffer	16/09/2024	1	Little Grebe on wetland	N/A	N/A
P05125	Breeding	Ref No:12	13/05/2024	3	Swimming.	N/A	N/A
P05184	Breeding	2KM Buffer	15/05/2024	1	Little Grebe calling	S	Possible
P05294	Breeding	Ref No:5	07/06/2024	2	Foraging, adults.	N/A	N/A
P05305	Breeding	Ref No:9	11/06/2024	1	Alarm Call display, on suitable breeding ground	A	Probable
P05308	Breeding	Ref No:11	11/06/2024	2	2 juv foraging.	FL	Confirmed
P05317	Breeding	Ref No:12	11/06/2024	3	1 Adult, 2 juv foraging.	FL	Confirmed
P05329	Breeding	2km buffer	17/06/2024	1	Little Grebe on wetland area.	N/A	N/A
P05338	Breeding	2km buffer	17/06/2024	1	Little Grebe heard calling	S	Possible
P05341	Breeding	2km buffer	17/06/2024	2	2 Little Grebe feeding on wetland	N/A	N/A
P05346	Breeding	2km buffer	18/06/2024	2	2 Little Grebe on lake	H	Possible
P05375	Breeding	2KM buffer	24/06/2024	2	2 Little Grebe on wetland	H	Possible
P05479	Breeding	Ref No:11	05/07/2024	1	Foraging adult.	N/A	N/A
P05486	Breeding	Ref No:12	05/07/2024	1	Foraging	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P05518	Breeding	2km buffer	24/07/2024	2	2 Little Grebes feeding on lake	N/A	N/A
P05523	Breeding	2km buffer	24/07/2024	2	2 Little Grebe feeding on lake	N/A	N/A
P05533	Breeding	2km buffer	29/07/2024	1	Little Grebe calling	S	Possible
P05612	Breeding	Ref No:8	08/08/2024	1	Foraging	N/A	N/A
P05618	Breeding	Ref No:11	09/08/2024	3	Foraging Juveniles	N/A	N/A
P05624	Breeding	Ref No:12	09/08/2024	4	Foraging	N/A	N/A
P05663	Breeding	2 Km buffer	20/08/2024	2	2 Little Grebe on lake	N/A	N/A
P05675	Breeding	2 Km buffer	20/08/2024	1	Little Grebe calling	N/A	N/A
P05757	Breeding	Ref No:2	02/09/2024	1	Alarm call	N/A	N/A
P05780	Breeding	Ref No:11	06/09/2024	3	Foraging	N/A	N/A
P05784	Breeding	Ref No:12	06/09/2024	6	Foraging	N/A	N/A
P05849	Breeding	2km buffer	16/09/2024	1	Little Grebe on wetland	N/A	N/A

CBS & Winter Transect Survey									
Map Ref.	Season	Survey Location	Date	Time	Abundance	Dominant Habitat	Activity	Breeding Code	Breeding Status
P00065	Breeding	T4	12/05/2021	N/A	1	N/A	N/A	N/A	N/A
P00069	Breeding	T4	12/05/2021	N/A	1	N/A	N/A	N/A	N/A
P00124	Breeding	T19	14/05/2021	N/A	1	N/A	N/A	N/A	N/A
P00158	Breeding	T4	11/06/2021	N/A	1	N/A	N/A	N/A	N/A
P00162	Breeding	T4	11/06/2021	N/A	1	N/A	N/A	N/A	N/A
P01008	Breeding	T19	11/04/2022	N/A	1	PB4	Male singing	S	Possible
P01147	Breeding	T4	12/04/2022	09:32	1	pb4	H	H	Possible
P01158	Breeding	T1	13/04/2022	09:11	2	pb4	p	P	Probable
P01160	Breeding	T5	13/04/2022	10:05	2	pb4	p	P	Probable
P01024	Breeding	T18	19/04/2022	N/A	1	PB4	Male singing	S	Possible
P01262	Breeding	T10	13/05/2022	N/A	1	PB4	Male calling.	S	Possible
P01172	Breeding	T5	17/05/2022	07:05	2	pb4	h	H	Possible
P01350	Breeding	T5	09/06/2022	11:16	1	pb4	N/A	H	Possible

CBS & Winter Transect Survey									
Map Ref.	Season	Survey Location	Date	Time	Abundance	Dominant Habitat	Activity	Breeding Code	Breeding Status
P01355	Breeding	T5	09/06/2022	11:43	4	pb4	N/A	A	Probable
P01357	Breeding	T4	09/06/2022	N/A	4	pb4	N/A	A	Probable
P01362	Breeding	T4	09/06/2022	N/A	1	pb4	N/A	H	Possible
P01413	Breeding	T11	10/06/2022	N/A	1	PB4	Alarm calling	A	Probable
P01429	Breeding	T10	14/06/2022	N/A	1	PB4	Alarm calling	A	Probable
P01452	Breeding	T18	20/06/2022	N/A	1	PB4	Foraging.	N/A	N/A
P01503	Breeding	T19	05/07/2022	N/A	2	PB4	Swimming	N/A	N/A
P01516	Breeding	T11	07/07/2022	N/A	1	PB4	Male singing	S	Possible
P01628	Breeding	T5	08/07/2022	N/A	1	pb4	N/A	H	Possible
P01532	Breeding	T10	11/07/2022	N/A	1	PB4	Alarm call	A	Probable
P01666	Breeding	T10	10/08/2022	N/A	2	PB4	Alarm call	N/A	N/A
P01671	Breeding	T10	10/08/2022	N/A	1	PB4	Alarm call	N/A	N/A
P03508	Non-breeding	T19	09/02/2023	09:55	1	PB4	Calling	N/A	N/A
P03677	Non-breeding	T1	17/02/2023	N/A	3	FL1	Flying, Swimming	N/A	N/A
P03775	Non-breeding	T19	03/03/2023	07:45	1	PB4	Foraging	N/A	N/A
P04222	Breeding	T5	05/04/2023	13:55	2	PB4	N/A	S	Possible
P04233	Breeding	T10	06/04/2023	10:52	2	PB4	N/A	S	Possible
P04262	Breeding	T7	25/04/2023	10:31	2	PB4	N/A	P	Probable
P04390	Breeding	T10	23/05/2023	14:05	1	PB4	N/A	S	Possible
P04302	Breeding	T4	24/05/2023	08:20	2	PB4	N/A	H	Possible
P04317	Breeding	T5	24/05/2023	10:05	2	PB4	N/A	S	Possible
P04399	Breeding	T11	25/05/2023	09:20	1	PB4	N/A	S	Possible
P04432	Breeding	T19	26/05/2023	12:52	1	fl1	N/A	H	Possible
P04446	Breeding	T7	30/05/2023	N/A	2	FL1	N/A	H	Possible
P04451	Breeding	T4	21/06/2023	15:20	1	PB4	N/A	N/A	N/A
P04548	Breeding	T10	26/06/2023	16:23	2	PB4	N/A	H	Possible
P04577	Breeding	T4	05/07/2023	12:35	1	PB4	N/A	N/A	N/A
P04584	Breeding	T5	05/07/2023	13:45	1	PB4	N/A	S	Possible
P04663	Breeding	T10	21/07/2023	14:50	2	FL8	N/A	S	Possible
P04692	Breeding	T4	02/08/2023	11:10	3	PB4	N/A	N/A	N/A
P04702	Breeding	T5	02/08/2023	12:25	1	PB4	N/A	N/A	N/A

CBS & Winter Transect Survey									
Map Ref.	Season	Survey Location	Date	Time	Abundance	Dominant Habitat	Activity	Breeding Code	Breeding Status
P04742	Breeding	T11	08/08/2023	17:02	1	FL8	N/A	N/A	N/A
P04757	Breeding	T10	11/08/2023	12:28	2	PB4	N/A	N/A	N/A
P04782	Breeding	T19	23/08/2023	16:50	1	FL1	N/A	N/A	N/A
P04854	Breeding	T10	19/09/2023	10:51	2	PB4	N/A	N/A	N/A
P04803	Breeding	T5	25/09/2023	12:35	2	PB4	N/A	N/A	N/A
P06355	Non-breeding	T20	03/10/2023	11:10	3	PB4	Foraging	N/A	N/A
P06407	Non-breeding	T10	06/10/2023	15:46	2	PB4	Feeding	N/A	N/A
P06369	Non-breeding	T1	11/10/2023	13:30	1	PB4	Foraging	N/A	N/A
P06414	Non-breeding	T18	13/10/2023	10:02	1	PB4	Swimming	N/A	N/A
P06254	Non-breeding	T10	27/11/2023	12:42	2	PB4	Swimming	N/A	N/A
P06522	Non-breeding	T10	06/12/2023	14:12	1	PB4	Calling	N/A	N/A
P06533	Non-breeding	T4	19/12/2023	15:22	2	PB4	Foraging	N/A	N/A
P06006	Non-breeding	T10	29/02/2024	09:18	2	PB4	N/A	N/A	N/A
P06031	Non-breeding	19	04/03/2024	14:20	1	PB4	N/A	N/A	N/A
P06077	Non-breeding	T10	06/03/2024	10:01	1	PB4	N/A	N/A	N/A
P06080	Non-breeding	T10	06/03/2024	10:08	1	PB4	N/A	N/A	N/A
P04894	Breeding	T20	02/04/2024	16:35	1	PB4	N/A	S	Possible
P04900	Breeding	T20	02/04/2024	17:20	1	PB4	N/A	N/A	N/A
P04914	Breeding	T19	04/04/2024	13:15	2	PB4	N/A	S	Possible
P04916	Breeding	T19	04/04/2024	13:25	2	PB4	N/A	S	Possible
P05025	Breeding	T18	10/04/2024	11:32	1	FL8	N/A	H	Possible
P05032	Breeding	T10	10/04/2024	15:50	2	pb4	N/A	P	Probable
P05039	Breeding	T10	10/04/2024	16:05	2	pb4	N/A	P	Probable

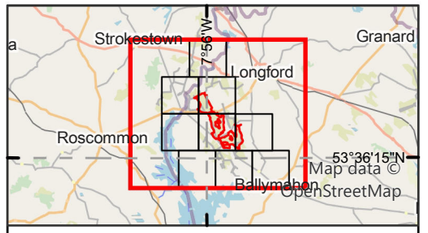
CBS & Winter Transect Survey									
Map Ref.	Season	Survey Location	Date	Time	Abundance	Dominant Habitat	Activity	Breeding Code	Breeding Status
P05060	Breeding	T19	08/05/2024	12:25	1	PB4	N/A	S	Possible
P05073	Breeding	T4	10/05/2024	07:55	2	PB4	N/A	N/A	N/A
P05148	Breeding	T11	11/05/2024	16:12	1	pb4	N/A	S	Possible
P05191	Breeding	T18	15/05/2024	18:30	2	PB4	N/A	N/A	N/A
P05196	Breeding	T10	16/05/2024	10:03	1	PB4	N/A	S	Possible
P05198	Breeding	T10	16/05/2024	10:11	2	PB4	N/A	S	Possible
P05202	Breeding	T10	16/05/2024	10:29	1	PB4	N/A	H	Possible
P05241	Breeding	T20	05/06/2024	11:40	3	PB4	N/A	FL	Confirmed
P05246	Breeding	T20	05/06/2024	12:30	1	PB4	N/A	S	Possible
P05257	Breeding	T19	06/06/2024	14:50	4	PB4	N/A	FL	Confirmed
P05360	Breeding	T18	19/06/2024	10:46	1	PB4	N/A	N/A	N/A
P05395	Breeding	T10	25/06/2024	11:53	2	PB4	N/A	N/A	N/A
P05402	Breeding	T11	25/06/2024	14:15	1	PB4	N/A	S	Possible
P05418	Breeding	T20	01/07/2024	11:55	1	PB4	N/A	N/A	N/A
P05434	Breeding	T19	04/07/2024	14:50	1	PB4	N/A	N/A	N/A
P05436	Breeding	T19	04/07/2024	14:55	2	PB4	N/A	FL	Confirmed
P05491	Breeding	T10	22/07/2024	15:39	1	PB4	N/A	S	Possible
P05577	Breeding	T19	07/08/2024	13:50	3	PB4	N/A	N/A	N/A
P05646	Breeding	T11	07/08/2024	15:51	1	PB4	N/A	N/A	N/A
P05722	Breeding	T20	04/09/2024	11:10	2	PB4	N/A	N/A	N/A
P05725	Breeding	T20	04/09/2024	12:05	1	PB4	N/A	N/A	N/A

Hinterland (Raptors) Survey & Hen Harrier Roost Watch						
Map Ref.	Season	Location	Date	Abundance	Breeding Code	Breeding Status
P00247	Breeding	HHVP4	12/05/2021	12	N/A	N/A
P00466	Breeding	HHVP8	05/08/2021	3	N/A	N/A
P00506	Breeding	HHVP5	14/08/2021	2	N/A	N/A
P00520	Breeding	HHVP8	14/08/2021	6	N/A	N/A
P00536	Breeding	HHVP9	14/08/2021	3	N/A	N/A
P00573	Breeding	HHVP5	09/09/2021	6	N/A	N/A
P00584	Breeding	HHVP8	09/09/2021	4	N/A	N/A
P00598	Breeding	HHVP9	09/09/2021	2	N/A	N/A
P00636	Breeding	HHVP5	30/09/2021	4	N/A	N/A
P00648	Breeding	HHVP8	30/09/2021	1	N/A	N/A
P00658	Breeding	HHVP9	30/09/2021	2	N/A	N/A
P00688	Non-breeding	HHVP5	26/10/2021	12	N/A	N/A
P00706	Non-breeding	HHVP9	26/10/2021	6	N/A	N/A
P00737	Non-breeding	HHVP6	24/11/2021	1	N/A	N/A
P00807	Non-breeding	HHVP6	28/02/2022	2	N/A	N/A
P05960	Non-breeding	HHVP4	18/02/2024	2	N/A	N/A
P06019	Non-breeding	HHVP4	14/03/2024	2	N/A	N/A

Incidental Sightings					
Map Ref.	Season	Date	Abundance	Breeding Code	Breeding Status
P03951	Non-breeding	12/10/2022	1	N/A	N/A
P04038	Non-breeding	10/02/2023	2	N/A	N/A
P06770	Non-breeding	15/03/2024	2	N/A	N/A

8°2'40"W
7°53'50"W
7°45'0"W
53°45'0"N
53°40'0"N
53°35'0"N
776000
768000
760000
593600
604000
614400

Sheet 1
Sheet 2
Sheet 3
Sheet 4
Sheet 5
Sheet 6
Sheet 7



Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-21
- Breeding-22
- Breeding-23
- Breeding-24
- **Confirmed** Breeding Status*

Flightline observations - Seasons

- Breeding-24

*should be read with data in Appendix 8.3

0 1.5 3
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NOTES

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4. ALL LEVELS RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD

Rev	Date	Description	By	Chkd.
A	06/05/2025	First issue	S.P	I.H

Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Flight and non-flight observations
Little Grebe
Overview

Scale @ A3: 1:85,000

Prepared by:	Checked by:	Date:
S.Pezzetta	I.Heanue	May 2025

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www.tobin.ie

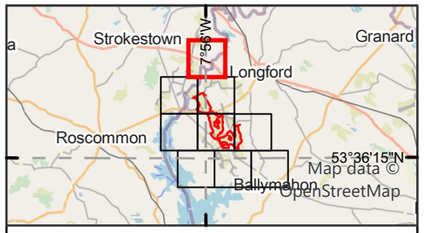
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Map Ref: 11399-039.ApX-SUM-LG-TOB-A

Draft: A

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Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-22/23
- Breeding-23

*should be read with data in Appendix 8.3

0 0.5 1
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A	06/05/2025	First issue	S.P	I.H
Rev	Date	Description	By	Chkd.

Client:

Bord na Móna

Project:

Derryadd Wind Farm

Title:

Flight and non-flight observations
Little Grebe
Sheet 1 of 7

Scale @ A3: 1:24,000

Prepared by:	Checked by:	Date:
S.Pezzetta	I.Heanue	May 2025

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Map Ref:	Draft:
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8°2'40"W

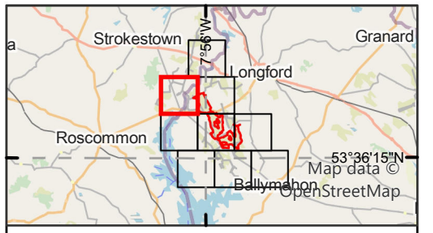
53°40'0"N

604000

P05663
P01847
P00065, P00069, P00158, P00162
P01158
P03677
P04222
P01160
P04966
P01362
P04803
P01147
P03951
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P06533
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P00466, P00520, P00584, P00648
P05184
P05523
P01905, P02220, P02424
P05518
P05346

Loontuskert
Ballyleague
Ballydara
Lanesborough
Knock
Callaghy
Shannon Grove
Salmons Lane
R371
N63

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Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-21
- Breeding-22
- Breeding-23
- Breeding-24

*should be read with data in Appendix 8.3

0 0.5 1
Kilometres

NOTES

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Rev	Date	Description	By	Chkd.
A	06/05/2025	First issue	S.P	I.H

Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Flight and non-flight observations
Little Grebe
Sheet 2 of 7

Scale @ A3: 1:24,000

Prepared by:	Checked by:	Date:
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Map Ref: 11399-039.ApX-SUM-LG-TOB-A

Draft: A

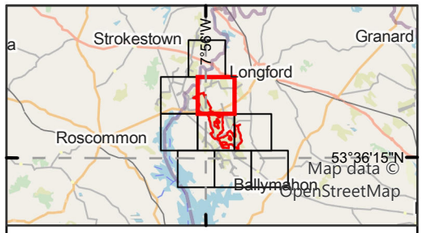
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P05196
P06077
P05246
P06355
P04900
P05725

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53°40'0"N

604000



Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-21
- Breeding-22
- Breeding-23
- Breeding-24

Flightline observations - Seasons

- Breeding-24

*should be read with data in Appendix 8.3

0 0.5 1
Kilometres

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	06/05/2025	First issue	S.P	I.H

Client: Bord na Móna

Project: Derryadd Wind Farm

Title: Flight and non-flight observations
Little Grebe
Sheet 3 of 7

Scale @ A3: 1:24,000

Prepared by:	Checked by:	Date:
S.Pezzetta	I.Heanue	May 2025

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7°53'50"W

53°40'0"N

768000

604000

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P05722
P05418
P05241
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P01516

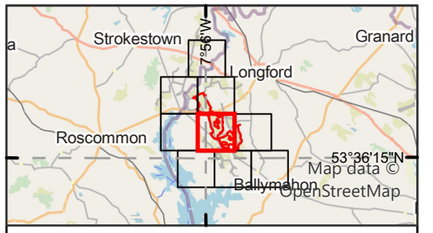
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P02367
P00958

P05025
P01024
P06414
P05191
P01452
P05360
P05612
P01008
P05577
P04914
P04432
P01503
P03508
P04916
P03775
P05060
P05257
P05436
P00124

P06576
P02155, P02335

R392
R398
N63
Ballymahon Road

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Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-21
- Breeding-22
- Breeding-23
- Breeding-24
- **Confirmed** Breeding Status*

Flightline observations - Seasons

- Breeding-24

*should be read with data in Appendix 8.3

0 0.5 1
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A	06/05/2025	First issue	S.P	I.H

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Project: Derryadd Wind Farm

Title: Flight and non-flight observations
Little Grebe
Sheet 4 of 7

Scale @ A3: 1:24,000

Prepared by: S.Pezzetta | Checked by: I.Heanue | Date: May 2025

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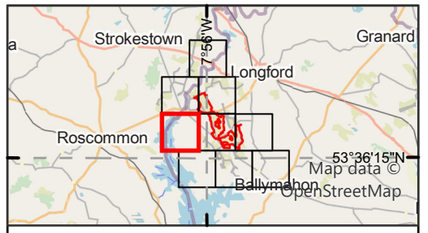
8°2'40"W

53°40'0"N

768000

604000





Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-21
- Breeding-22
- Breeding-23
- Breeding-24

*should be read with data in Appendix 8.3

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Project: Derryadd Wind Farm

Title: Flight and non-flight observations
Little Grebe
Sheet 5 of 7

Scale @ A3: 1:24,000

Prepared by:	Checked by:	Date:
S.Pezzetta	I.Heanue	May 2025

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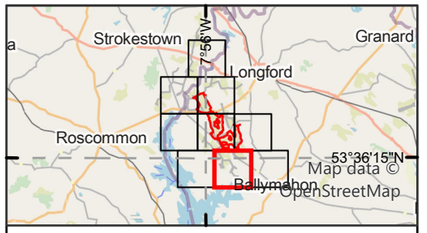
Draft: A

7°53'50"W

53°35'0"N

760000

P01008
P04782
P01503
P05577
P05434
P04432
P04914
P03775
P05436
P03508
P04916
P06031
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P06759
P05122, P05308, P05479, P05618, P05780
P05113, P05305
R392
L5226
Estate Road
Fas Road
Derrymacan Lough
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Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-21
- Breeding-22
- Breeding-23
- Breeding-24
- **Confirmed** Breeding Status*

*should be read with data in Appendix 8.3

0 0.5 1
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Client: Bord na Móna

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Title: Flight and non-flight observations
Little Grebe
Sheet 6 of 7

Scale @ A3: 1:24,000

Prepared by:	Checked by:	Date:
S.Pezzetta	I.Heanue	May 2025

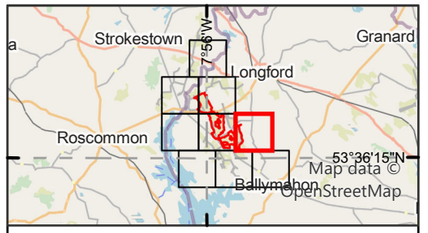
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Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-21
- Breeding-22
- Breeding-23
- Breeding-24
- **Confirmed** Breeding Status*

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Kilometres

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Project: Derryadd Wind Farm

Title: Flight and non-flight observations
Little Grebe
Sheet 7 of 7

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Appendix K.15 EURASIAN COOT

Vantage Point (Non-flight)									
Map Ref.	Season	VP	Date	Time	Abundance	Dominant Habitat	Activity	Breeding Code	Breeding Status
P04080	Breeding	VP4	06/04/2023	16:30	1	N/A	Foraging	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P01085	Breeding	Ref: 4	20/04/2022	16	Suitable nesting habitat	H	Possible
P01323	Breeding	Ref: 5	12/05/2022	6	2 adults with 4 chicks foraging on island.	FL	Confirmed
P01336	Breeding	Ref: 4	12/05/2022	2	Swimming around the wetland.	N/A	N/A
P01209	Breeding	VP Number 8	17/05/2022	2	2 coot near lake edge	H	Possible
P01468	Breeding	Ref: 4	10/06/2022	1	Swimming around wetland.	N/A	N/A
P01570	Breeding	ref: 5	06/07/2022	36	Foraging around the shoreline of island.	N/A	N/A
P01576	Breeding	ref: 9	06/07/2022	13	Foraging around the shoreline of island.	N/A	N/A
P01694	Breeding	ref: 8	10/08/2022	12	Swimming on open water.	N/A	N/A
P01703	Breeding	ref: 5	10/08/2022	46	Foraging around the shoreline.	N/A	N/A
P01800	Breeding	Ref No: 8	13/09/2022	3	Foraging on lake.	N/A	N/A
P01803	Breeding	Ref No: 5	13/09/2022	191	Swimming on open water.	N/A	N/A
P01816	Breeding	Rhynmount Bog.	14/09/2022	1	Swimming around wetland.	N/A	N/A
P01900	Non-breeding	Rhynmount Bog	12/10/2022	4	Foraging on wetlands.	N/A	N/A
P01969	Non-breeding	Rhynmount Bog	16/11/2022	5	Foraging on wetlands.	N/A	N/A
P02174	Non-breeding	Ref No 8	10/01/2023	1	Swimming on open water.	N/A	N/A
P02154	Non-breeding	NewPark, Clonmee, west of site 4	29/01/2023	3	Swimming in and out of reeds	N/A	N/A
P02162	Non-breeding	Greenhall Upper	29/01/2023	4	Swimming with MA	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P02334	Non-breeding	NewPark, Clonmee, west of site 4	29/01/2023	3	Swimming in and out of reeds	N/A	N/A
P02342	Non-breeding	Greenhall Upper	29/01/2023	4	Swimming with MA	N/A	N/A
P02219	Non-breeding	Ref No 8	03/02/2023	6	Foraging on open water.	N/A	N/A
P02235	Non-breeding	Ref No 5	03/02/2023	8	Foraging on open water.	N/A	N/A
P02285	Non-breeding	Lisnacusha turlough/fields	25/02/2023	4	In reeds on west side, ventured out occasiionally	N/A	N/A
P02290	Non-breeding	Site 4 Turlough	25/02/2023	3	Near reeds on west side of lough	N/A	N/A
P02309	Non-breeding	Loughpark, Site 3	25/02/2023	4	Swimming in open water	N/A	N/A
P02356	Non-breeding	Lisnacusha turlough/fields	25/02/2023	4	In reeds on west side, ventured out occasiionally	N/A	N/A
P02361	Non-breeding	Site 4 Turlough	25/02/2023	3	Near reeds on west side of lough	N/A	N/A
P02380	Non-breeding	Loughpark, Site 3	25/02/2023	4	Swimming in open water	N/A	N/A
P02423	Non-breeding	Ref No 8	03/03/2023	9	Foraging on open water.	N/A	N/A
P02438	Non-breeding	Ref No 5	03/03/2023	4	Foraging on open water.	N/A	N/A
P02468	Non-breeding	Rhynmount Bog VP3	16/03/2023	3	Foraging	N/A	N/A
P02405	Non-breeding	Location 4, Turlough	24/03/2023	3	In reeds and open water	N/A	N/A
P04157	Breeding	Ref No 8	14/04/2023	7	Foraging	N/A	N/A
P04185	Breeding	Ref No 12	14/04/2023	4	Foraging	N/A	N/A
P04193	Breeding	Ref No 13	14/04/2023	2	Foraging	N/A	N/A
P04198	Breeding	Rhymount VP1	14/04/2023	1	Foraging	N/A	N/A
P04285	Breeding	Turlough	27/04/2023	35	35 Coot on Turlough, some on nests	ON	Confirmed

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P04289	Breeding	Turlough	27/04/2023	20	20 Coot on small turlough, some on nests	ON	Confirmed
P04348	Breeding	Ref No: 12	03/05/2023	2	Pair nest building	B	Probable
P04362	Breeding	Ref No: 8	03/05/2023	5	Foraging.	N/A	N/A
P04421	Breeding	5 KM radius	26/05/2023	12	12 Coot feeding on lake	H	Possible
P04426	Breeding	5 KM radius	26/05/2023	25	25 Coot on Turlough, some on nests	ON	Confirmed
P04516	Breeding	Lough Ree	09/06/2023	30	30 Coot feeding on lake	H	Possible
P04521	Breeding	5 KM radius	09/06/2023	20	20 Coot on Turlough, some on nests	ON	Confirmed
P04530	Breeding	5 KM radius	09/06/2023	2	2 coot on lake	H	Possible
P04628	Breeding	Ref No: 8	07/07/2023	10	Foraging	N/A	N/A
P04643	Breeding	Lough Ree	19/07/2023	20	20 Coot feeding on lake	N/A	N/A
P04648	Breeding	01832 63178	19/07/2023	12	12 Coot on Turlough	N/A	N/A
P04715	Breeding	Onsite	03/08/2023	2	Foraging, Adult.	N/A	N/A
P04754	Breeding	Lough Ree	10/08/2023	52	52 Coot feeding on Lough Ree	N/A	N/A
P04841	Breeding	01724 63197	07/09/2023	6	6 Coot on Turlough	N/A	N/A
P06431	Non-breeding	5	06/10/2023	10	10 Coot on lake	N/A	N/A
P06440	Non-breeding	4	06/10/2023	6	6 Coot feeding on turlough.	N/A	N/A
P06451	Non-breeding	4	14/10/2023	8	8 Coot on turlough	N/A	N/A
P06278	Non-breeding	4	20/11/2023	64	64 Coot on turlough	N/A	N/A
P06285	Non-breeding	5	20/11/2023	55	55 Coot on Lough Ree	N/A	N/A
P06302	Non-breeding	4	23/11/2023	25	25 Coot on turlough	N/A	N/A
P06324	Non-breeding	4	27/11/2023	56	56 Coot on turlough	N/A	N/A
P06328	Non-breeding	5	27/11/2023	20	20 Coot on Lough Ree	N/A	N/A

I-WeBS & Breeding Waders Survey							
Map Ref.	Season	Location	Date	Abundance	Notes	Breeding Code	Breeding Status
P06573	Non-breeding	4	18/12/2023	2	2 Coot on turlough	N/A	N/A
P06655	Non-breeding	Southern half of site	25/01/2024	4	N/A	N/A	N/A
P06667	Non-breeding	Southern half of site	25/01/2024	2	N/A	N/A	N/A
P06682	Non-breeding	Ref No: 8	06/02/2024	3	N/A	N/A	N/A
P06744	Non-breeding	Southern half of site	19/02/2024	8	On Turlough	N/A	N/A
P06750	Non-breeding	Southern half of site	21/02/2024	4	On Turlough	N/A	N/A
P06775	Non-breeding	Ref No: 8	07/03/2024	2	Foraging	N/A	N/A
P05182	Breeding	2KM Buffer	15/05/2024	3	3 Coot in suitable habitat	H	Possible
P05187	Breeding	2KM Buffer	15/05/2024	1	Coot in suitable habitat	H	Possible
P05350	Breeding	2km buffer	18/06/2024	3	3 Coot on lake	N/A	N/A
P05520	Breeding	2km buffer	24/07/2024	6	6 Coot on lake	N/A	N/A
P05807	Breeding	2km buffer	04/09/2024	1	1 Coot on lake	N/A	N/A

CBS & Winter Transect Survey									
Map Ref.	Season	Survey Location	Date	Time	Abundance	Dominant Habitat	Activity	Breeding Code	Breeding Status
P05031	Breeding	Transect 10	10/04/2024	15:48	1	pb4	N/A	H	Possible
P05038	Breeding	Transect 10	10/04/2024	16:05	1	pb4	N/A	H	Possible
P05204	Breeding	T10	16/05/2024	10:35	1	PB4	N/A	N/A	N/A
P05389	Breeding	T10	25/06/2024	11:42	1	PB4	N/A	N/A	N/A

Hinterland (Raptors) Survey & Hen Harrier Roost Watch						
Map Ref.	Season	Location	Date	Abundance	Breeding Code	Breeding Status
P00249	Breeding	HHVP4	12/05/2021	14	N/A	N/A
P00325	Breeding	HHVP4	12/06/2021	5	N/A	N/A
P00336	Breeding	HHVP5	12/06/2021	8	N/A	N/A
P00350	Breeding	HHVP8	12/06/2021	2	N/A	N/A
P00355	Breeding	HHVP9	12/06/2021	2	N/A	N/A
P00384	Breeding	HHVP4	17/07/2021	3	N/A	N/A
P00443	Breeding	HHVP4	05/08/2021	3	N/A	N/A
P00453	Breeding	HHVP5	05/08/2021	9	N/A	N/A
P00463	Breeding	HHVP8	05/08/2021	20	N/A	N/A
P00473	Breeding	HHVP9	05/08/2021	15	N/A	N/A
P00496	Breeding	HHVP4	14/08/2021	2	N/A	N/A
P00504	Breeding	HHVP5	14/08/2021	14	N/A	N/A
P00521	Breeding	HHVP8	14/08/2021	6	N/A	N/A
P00539	Breeding	HHVP9	14/08/2021	4	N/A	N/A
P00571	Breeding	HHVP5	09/09/2021	12	N/A	N/A
P00600	Breeding	HHVP9	09/09/2021	2	N/A	N/A
P00632	Breeding	HHVP5	30/09/2021	10	N/A	N/A
P00660	Breeding	HHVP9	30/09/2021	2	N/A	N/A
P00686	Non-breeding	HHVP5	26/10/2021	2	N/A	N/A
P00770	Non-breeding	HHVP4	25/01/2022	2	N/A	N/A
P00780	Non-breeding	HHVP8	25/01/2022	4	N/A	N/A
P00790	Non-breeding	HHVP4	28/02/2022	4	N/A	N/A
P00804	Non-breeding	HHVP6	28/02/2022	4	N/A	N/A
P00814	Non-breeding	HHVP10	28/02/2022	1	N/A	N/A
P00821	Non-breeding	HHVP4	29/03/2022	8	N/A	N/A
P00841	Non-breeding	HHVP8	29/03/2022	2	N/A	N/A

Incidental Sightings					
Map Ref.	Season	Date	Abundance	Breeding Code	Breeding Status
P04050	Non-breeding	11/02/2023	4	N/A	N/A

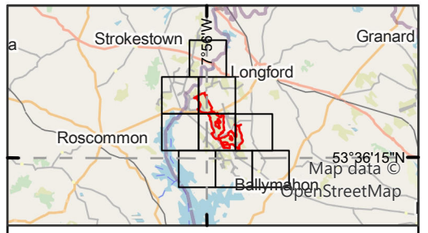
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7°53'50"W
7°45'0"W
53°45'0"N
53°40'0"N
53°35'0"N
776000
768000
760000
593600
604000
614400

Sheet 1
Sheet 2
Sheet 3
Sheet 4
Sheet 5
Sheet 6
Sheet 7

Strokestown Golf Club
Townparks (Longford By)
Enybegs
Ballytoohey
Termonbarry
Cloondara
Cloonrollagh
Cloonbalt
Longford
Feraghfad
Stonepark (Ardagh By)
Cloontuskert
Ballyleague
Knock
Keenagh
Fearagh
Knockdroghew
Galey
Lough Ree
Derrynacar Lough
Drinan
Ballymahon

N5
N63
N55
R371
R372
R194
R392
R397
R368

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Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-21
- Breeding-22
- Breeding-23
- Breeding-24
- **Confirmed** Breeding Status*

0 1.5 3
Kilometres

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Project: Derryadd Wind Farm

Title: Flight and non-flight observations Eurasian Coot Overview

Scale @ A3: 1:85,000

Prepared by:	Checked by:	Date:
S.Pezzetta	I.Heanue	May 2025

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7°53'50"W

53°45'0"N

604000

776000

P04193

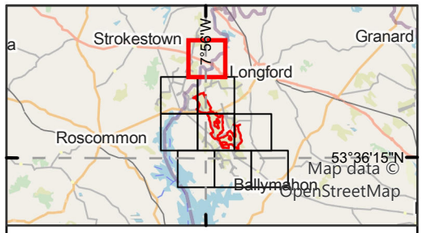
P04185, P04348

Ballytoohey

Termonbarry

Cloondara

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Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

Breeding-23

0 0.5 1

Kilometres

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Rev	Date	Description	By	Chkd.

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Bord na Móna

Project:

Derryadd Wind Farm

Title:

Flight and non-flight observations
Eurasian Coot
Sheet 1 of 7

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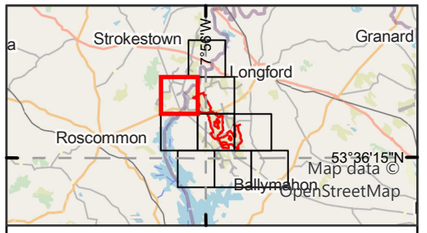
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8°2'40"W





Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-21
- Breeding-22
- Breeding-23
- Breeding-24

0 0.5 1
Kilometres

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Project: Derryadd Wind Farm

Title: Flight and non-flight observations
Eurasian Coot
Sheet 2 of 7

Scale @ A3: 1:22,000

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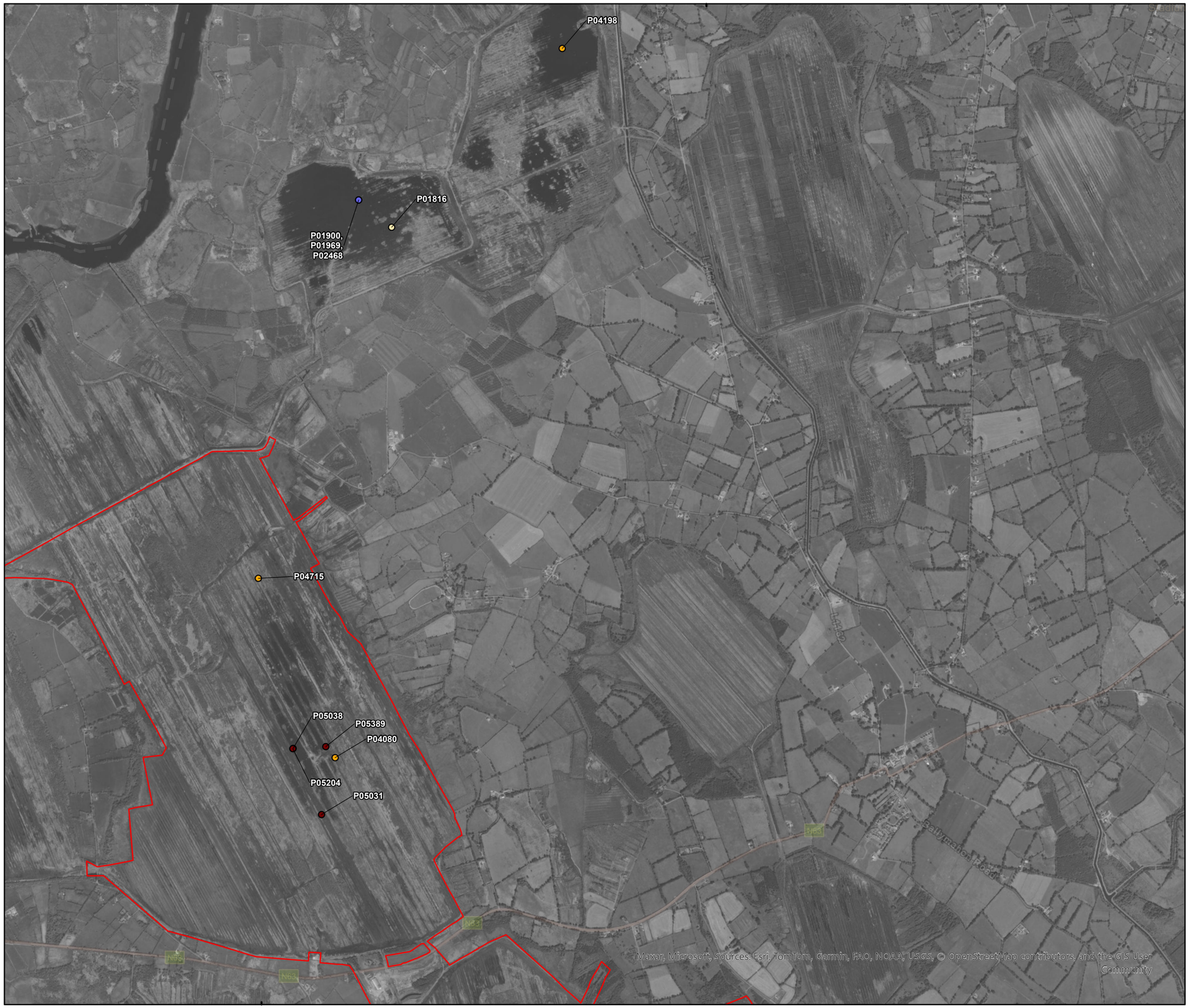
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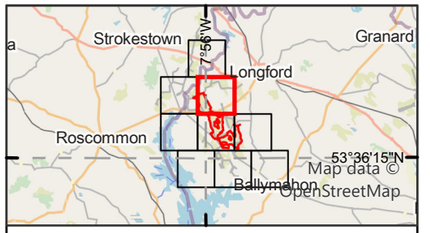
Map Ref: 11399-017.ApX-SUM-CO-TOB-A

Draft: A

7°53'50"W



604000



Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-22/23
- Breeding-22
- Breeding-23
- Breeding-24

0 0.5 1
Kilometres

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Project: Derryadd Wind Farm

Title: Flight and non-flight observations
Eurasian Coot
Sheet 3 of 7

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7°53'50"W

53°40'0"N

768000

604000

N63

R392

R398

Ballymahon Road

L4185

P02290,
P02361

P04289

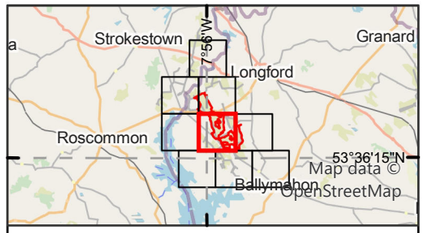
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P02334

P06750

P06655

P06278,
P06302



Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-23
- **Confirmed** Breeding Status*

0 0.5 1
Kilometres

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Title: Flight and non-flight observations
Eurasian Coot
Sheet 4 of 7

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8°2'40"W

53°40'0"N

768000

P05187

P04050

P00804

P00355, P00473,
P00539,
P00600, P00660

P00336, P00453,
P00504, P00571,
P00632, P00686

P01576

P02285,
P02356

P02235,
P02438

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P04289

P06744

P06324

P06573

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P00443, P00496,
P00770, P00790, P00821

P02405

P06750

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P02334

P04426, P04521

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P06278,
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P06440,
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Rockwood

Curreen

Rathcline Road

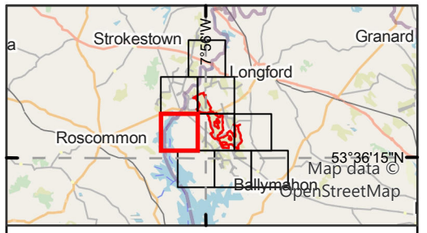
Kilock

Rathcline

R392

N63

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Legend

- Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-21/22
- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-21
- Breeding-22
- Breeding-23
- Breeding-24
- **Confirmed** Breeding Status*

0 0.5 1
Kilometres

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Project: Derryadd Wind Farm

Title: Flight and non-flight observations
Eurasian Coot
Sheet 5 of 7

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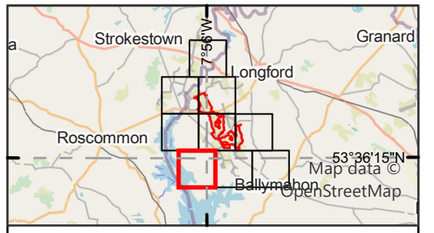
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Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-22/23
- Breeding-22
- Breeding-23
- **Confirmed** Breeding Status*

0 0.5 1
Kilometres

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Project:

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Title:

Flight and non-flight observations
Eurasian Coot
Sheet 6 of 7

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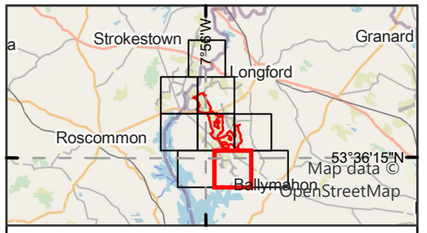
Draft: A

7°53'50"W

53°35'0"N

760000





Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

- Non-breeding-22/23
- Non-breeding-23/24
- Breeding-23

0 0.5 1
Kilometres

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Project: Derryadd Wind Farm

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Eurasian Coot
Sheet 7 of 7

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Appendix K.16 GADWALL

Hinterland (Raptors) Survey & Hen Harrier Roost Watch						
Map Ref.	Season	Location	Date	Abundance	Breeding Code	Breeding Status
P00256	Breeding	HHVP5	12/05/2021	2	N/A	N/A
P00327	Breeding	HHVP5	12/06/2021	1	N/A	N/A
P00393	Breeding	HHVP5	17/07/2021	2	N/A	N/A
P00409	Breeding	HHVP8	17/07/2021	31	N/A	N/A
P00422	Breeding	HHVP9	17/07/2021	8	N/A	N/A

8°2'40"W

7°53'50"W

53°40'0"N

53°35'0"N

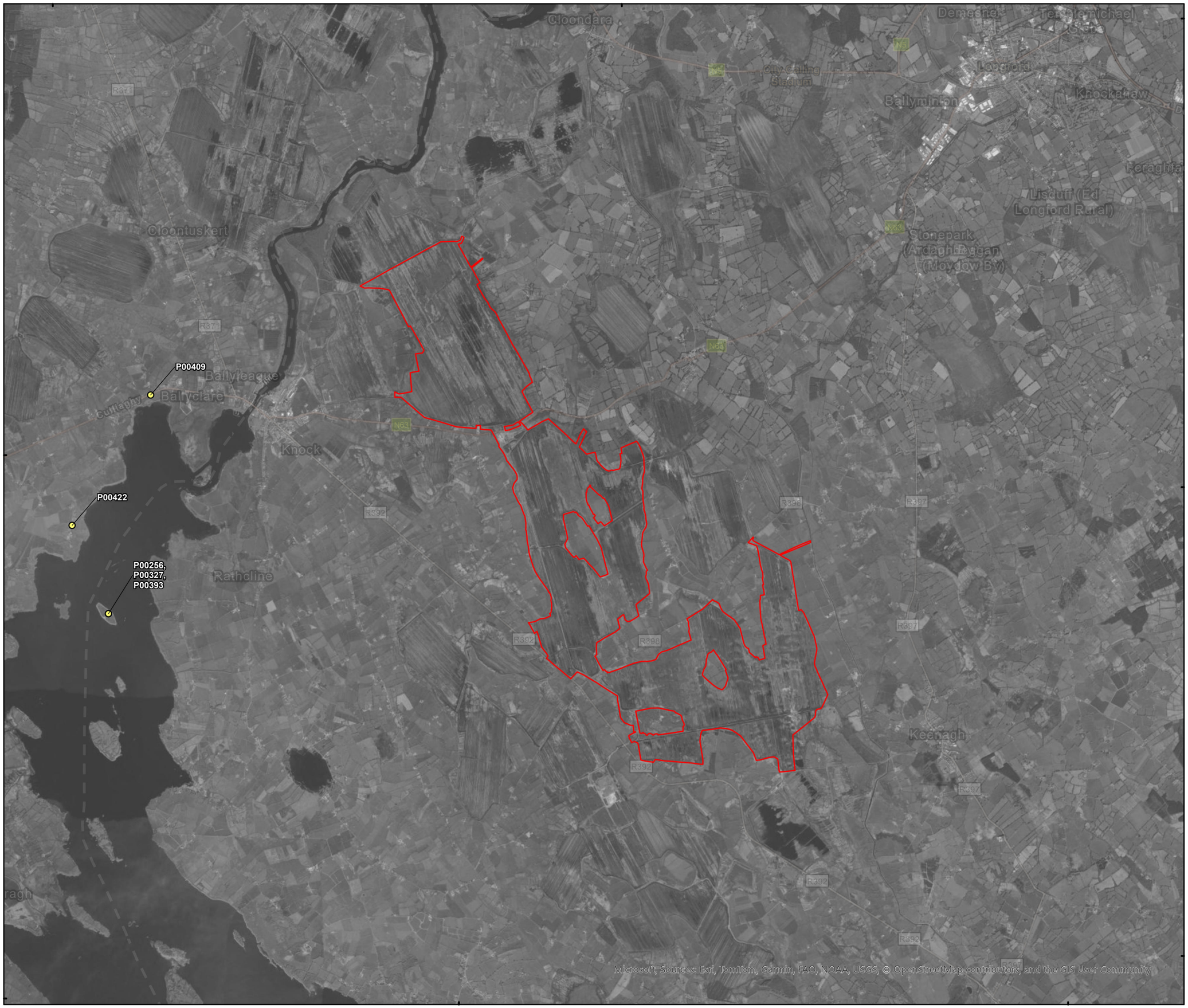
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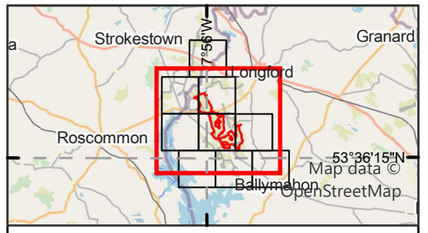
614400

776000

768000

760000





Legend

Proposed wind farm site boundary

Non-flight observations - Seasons

Breeding-21

0 1 2

Kilometres

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Gadwall
Sheet 1 of 1

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APPENDIX L DERRYADD WIND FARM: COLLISION RISK MODELLING REPORT (GITTINGS, 2024)

DERRYADD WIND FARM: COLLISION RISK MODELLING REPORT

Tom Gittings BSc, PhD, MCIEEM
Ecological Consultant
3 Coastguard Cottages
Roches Point
Whitegate
CO. CORK
www.gittings.ie

REPORT NUMBER: 2501-F1
STATUS OF REPORT: Revision 2
DATE OF REPORT: 06 May 2025

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SUMMARY

This report presents the results of collision risk modelling for the proposed Derryadd Wind Farm, Co. Longford. The proposed wind farm will comprise 22 turbines. The turbines will have a hub height of 107.5 m and a rotor diameter of 165 m, which creates a potential collision height airspace of 25 -190 m.

The collision risk model was based on seven seasons of vantage point survey data from nine vantage points with a survey effort of around six hours / month / vantage point. The NatureScot model was used. As well calculating predicted collision risks, the uncertainty ranges around the estimates were quantified. Collision risks that would cause a 1% or greater increase in mortality to the affected population were considered potentially significant and assessed further.

The predicted collision risks generated increases in mortality rate that substantially exceeded the 1% threshold for the local Golden Plover wintering population, the local Lapwing breeding population and the County Longford breeding population. However, in each case there were a number of factors that suggested that the increase in mortality rate was over-estimated.

The predicted increases in annual mortality to the Lough Ree Whooper Swan wintering population, the Lough Ree Cormorant and Lesser Black-backed Gull breeding populations, and the County Longford Sparrowhawk breeding population only just exceeded the 1% threshold. Given the precautionary nature of the 1% threshold, and the precautionary assumptions made in the calculations of these increases, while allowing for the potential under-detection of Cormorant and Black-headed Gull commuting flights, the predicted collision risk is unlikely to have significant impacts on these populations.

1. INTRODUCTION

1.1. SCOPE

This report presents the collision risk modelling and collision risk assessment for the proposed Derryadd Wind Farm, Co. Longford. The proposed wind farm will comprise 22 turbines. The site location and proposed site layout is shown in Map 1.1. The turbines will have a hub height of 107.5 m and a rotor diameter of 165 m, which creates a potential collision height airspace of 25-190 m.

The collision risk modelling methodology was based on the NatureScot guidance on collision risk modelling (NatureScot, 2024), and current practice in collision risk modelling.

This work was commissioned by TOBIN. The collision risk modelling, assessment and reporting was carried out by Tom Gittings.

1.2. COLLISION RISK MODELLING

Collision risk modelling uses statistical modelling techniques to predict the likely collision risk. It uses flight activity data from before the construction of a wind farm to calculate the likely risk of birds colliding with turbines in the operational wind farm. The flight activity data is used to calculate flight activity densities at potential collision height within the risk area of the wind farm. These densities are then used to predict the number of transits of the rotor swept volume in the wind farm based on the proportion of the total air space that is occupied by the rotor swept volume. However, most transits of the rotor swept volume will not result in a collision, because, for the duration of a transit, most of the rotor swept volume is not occupied by the turbine blades. Therefore, the probability that a bird will collide with a turbine blade when it transits the rotor swept volume is calculated. Most birds try to avoid the turbine blades, either by avoiding the wind farm area altogether, or by taking evasive action if they are likely to collide with a blade while transiting the wind farm, so it is also necessary to factor in an avoidance rate. The final collision risk is calculated by multiplying the number of predicted transits by the probability of a collision on a single transit and correcting for the avoidance rate and other relevant factors.

1.3. COLLISION RISK ASSESSMENT

The potential impact of the predicted collision risk depends on the size of the affected population and their demographics. The collision risk assessment examines whether the level of the predicted collision risk could have a significant effect on the dynamics of the affected population.

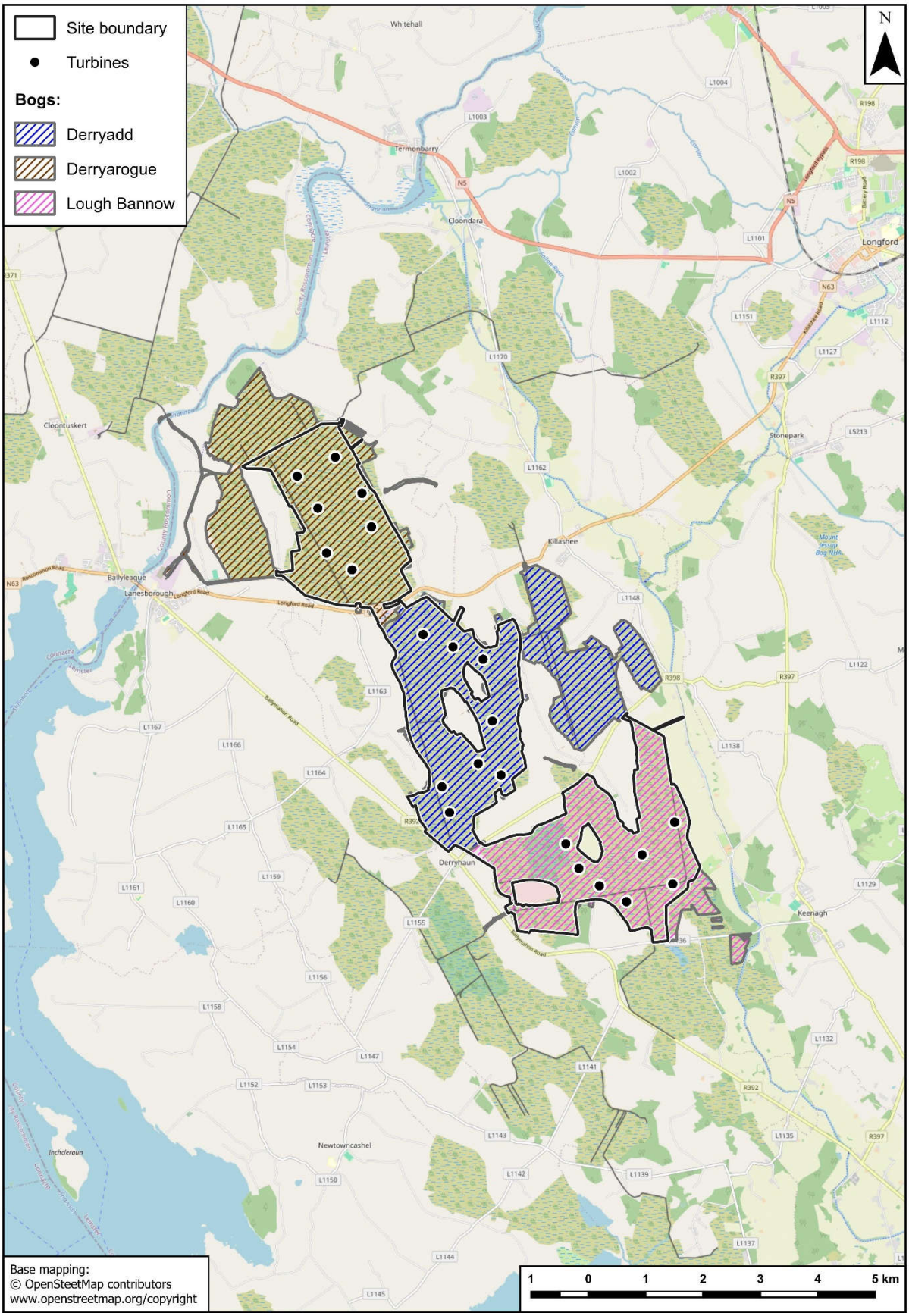
1.4. NATURE SCOT GUIDANCE

NatureScot (2024) provides detailed guidance for carrying of collision risk modelling for onshore wind farm projects. This guidance was developed by Band (2024) from the original Scottish collision risk model (SNH, 2000) and the refinement of this model by Band (2012). The basic methods remain the same, but the NatureScot guidance introduces a number of new components. It deals with issues not covered by the previous guidance, such as how to combine data from multiple vantage points and how to account for nocturnal flight activity. It also includes a specific requirement to assess the uncertainty around the collision risk estimates, which is an issue that has been poorly dealt with in Irish collision risk modelling. There is a spreadsheet that accompanies the guidance that can be used to implement the collision risk model.

1.5. STATEMENT OF COMPETENCE

Tom Gittings has a BSc in Ecology, a PhD in Zoology and is a member of the Chartered Institute of Ecology and Environmental Management. He has 29 years' experience in professional ecological consultancy work and research. He has specific expertise in ornithological assessments for wind energy projects and has been involved in numerous wind energy projects. His input to these projects has variously included field surveys (including vantage point surveys, breeding wader and raptor surveys and wintering waterbird surveys), collision risk modelling,

writing the ornithological sections of EIS/EIAR and NIS reports, expert witness services at oral hearings, and provision of scoping advice and peer review services.



Map 1.1. Site location and proposed site layout.

2. METHODOLOGY

2.1. INTRODUCTION

The collision risk modelling methodology was based on the NatureScot guidance on collision risk modelling (NatureScot, 2024), additional guidance provided by Band (2024), and current practice in collision risk modelling.

2.2. SPECIES

All the waterbird and raptor species recorded flying at potential collision height during the surveys, apart from Snipe, were included in the modelling of predicted transits. Snipe was not included because vantage point surveys are not an effective method of sampling their flight activity, so the results from collision risk modelling would not be very meaningful.

2.3. DATA SOURCES

2.3.1. Flight activity data

The flight activity data used for the collision risk model comprised a seven-season vantage point survey carried out between summer 2021 and summer 2024.

The survey was carried out by two separate survey teams: the Fehily Timoney survey team between April 2021 and March 2022 and the TOBIN survey team between April 2022 and September 2024. Both survey teams used eleven vantage points. However, the vantage point locations and viewsheds differed between the two survey teams. The vantage points and viewsheds used by the Fehily Timoney survey team are shown in Map 2.1. The vantage points and viewsheds used by the TOBIN survey team are shown in Map 2.2.

The viewsheds were mapped by TOBIN using QGIS© 3.28. The viewsheds were mapped to show visibility from the vantage points at a minimum elevation of 25 m above ground level.

The raw viewshed mapping that was supplied to me included a large number of very small outlying segments: the mapping for each set of viewsheds included over 10,000 discrete polygons with over 94% of the polygons having areas of < 0.01 ha. For the analyses in this report, I generated simplified viewshed maps. I first removed all viewshed segments with areas of less than 10 ha. I then used the *st_simplify* function with a dTolerance value of 10 from the R package *sf* (Pebesma and Bivand, 2023) to simplify the remaining polygons. I then used the *fill_holes* function from the R package *smoothr* (Strimas-Mackey, 2023) to remove gaps smaller than 10 ha within the polygons. Finally, I used the *smooth* function from the *smoothr* package, with the ksmooth method and a smoothness parameter of 1.5, to smooth the boundaries of the polygons. This process resulted in deletion of all the viewshed segments for the Fehily Timoney VP1 and VP2 viewsheds.

A minimum of 36 hours of vantage point watches were completed at each vantage point in each season, apart from VP1, VP7 and VP9 in the winter of 2021/22, VP8 on the summer of 2023, and VP6 in the winter of 2023/24 (Table 2.1). The survey effort was usually evenly distributed across months (six hours per vantage point per month). However, there were occasional months where no surveys were carried out at some vantage points, with the hours being made up in a subsequent month. The higher overall survey effort in the summer of 2021 was due to an extra set of six-hour migration watches that were carried out in September 2021.

Table 2.1. Total number of vantage point survey hours per vantage point per season.

Season	VP1	VP2	VP3	VP4	VP5	VP6	VP7	VP8	VP9	VP10	VP11
2021 summer	42	42	42	41.5	42	42	42	42	42	42	42
2021/22 winter	30	36	36	36.5	36	36	35.5	36	34	36	36
2022 summer	36	36	36	36	36	36	36	36	36	36	36
2022/23 winter	36	36	36	36	36	36	36	36	36	36	36
2023 summer	36	36	36	36	36	36	36	30	36	36	36
2023/24 winter	36	36	36	36	36	34	36	42	36	36	36
2024 summer	36	36	36	36	36	36	36	36	36	36	36

Seasons: summer = April – September; winter = October – March. Note that the vantage point locations used for first two seasons differed from those used for the last two seasons (see text).

The survey recorded timed flight activity of all raptor and waterbird species in various height bands. The Fehily Timoney survey team used the following height bands: 0-30 m, 30-50 m, 50-185 m and above 185 m. The TOBIN survey team used the following height bands: 0-25 m, 25-50 m, 50-150 m, 150-190 m and above 190 m.

The full vantage point survey data is included in the relevant appendices to the Environmental Impact Assessment Report Ornithology chapter.

2.3.2. Turbine specifications

The turbine specifications used for the collision risk model (apart from mean pitch angle; see Section 2.6.4) were supplied by TOBIN and are shown in Table 2.2.

Table 2.2. Turbine parameters used for the collision risk model.

Parameter	Value
Hub height	107.5 m
Rotor diameter	165 m
Max chord	4.0 m
Rotor speed (nominal)	9.7 m/sec
Mean pitch angle	0°

Sources: data supplied by TOBIN, except for mean pitch for which see Section 2.6.4.

2.3.3. Bird biometrics

The bird biometric parameters used for the collision risk model are shown in Table 2.3.

2.3.4. Seasonal periods

The seasonal periods used in the collision risk model and assessment are shown in Table 2.4. For the species not included in this table the collision risk was calculated and assessed for the whole year.

Table 2.3. Bird biometric parameters used for the collision risk model.

Species	Length (m)	Wingspan (m)	Flight speed (m/sec)
Mute Swan	1.525	2.180	16.2
Whooper Swan	1.520	2.300	17.3
Greylag Goose	0.820	1.640	17.1
Wigeon	0.480	0.805	20.6
Teal	0.360	0.610	19.7
Mallard	0.580	0.900	18.5
Cormorant	0.900	1.450	15.2
Little Egret	0.600	0.915	10.2
Grey Heron	0.940	1.850	11.2
Marsh Harrier	0.520	1.225	11.2
Hen Harrier	0.480	1.100	9.1
Sparrowhawk	0.330	0.620	11.3
Buzzard	0.540	1.200	11.6
Golden Plover	0.280	0.720	17.9
Lapwing	0.295	0.845	12.8
Whimbrel	0.410	0.820	16.3
Curlew	0.550	0.900	16.3
Black-headed Gull	0.360	1.050	11.9
Lesser Black-backed Gull	0.580	1.420	13.1
Kestrel	0.340	0.760	10.1
Merlin	0.280	0.560	10.1
Peregrine	0.420	1.020	12.1

Length and wingspan from BirdFacts (www.bto.org/understanding-birds/birdfacts); flight speed from Alerstam *et al.* (2007). For Little Egret, Great White Egret speed used; for Golden Plover, Grey Plover speed used.

Table 2.4. Seasonal periods used in the collision risk modelling and assessment.

Species	Season	Months
Whooper Swan	winter	October – March
Wigeon	winter	October – March
Cormorant	breeding	April – July
	non-breeding	August – March
Hen Harrier	non-breeding	September – March
Golden Plover	summer	May - September
	winter	October – April
Lapwing	breeding	April – July
	autumn	August – October
	winter	November – March
Whimbrel	migration	April – May and July – September
Curlew	breeding	April – July
	non-breeding	August – March
Black-headed Gull	breeding	April – July
	non-breeding	August – March
Lesser Black-backed Gull	breeding	April – July
	autumn	August – October
	winter	November – March

2.4. DATA MANAGEMENT

Before beginning the analyses, I audited the flight activity data for data entry errors and missing data. I also removed non-flight records.

2.5. EXPLORATORY ANALYSES

2.5.1. Scope

Before beginning the development of the collision risk model, I carried out a review of the vantage point survey coverage and results. This helped to assess the degree of spatial and temporal variability in the recorded flight activity, which needed to be taken into account in the development of the collision risk model. Note that spatial and temporal variability can only be assessed for the regularly occurring species. With species that were only recorded occasionally, it is not possible to distinguish between sampling effects and true spatial and temporal variability.

I also reviewed breeding bird survey data to generate estimates of the local Lapwing breeding population for the collision risk assessment.

Details of the specific methodologies used for some of these exploratory analyses are provided in the following sections.

2.5.2. Distance effects

Declines in detection rates with distance from vantage points is a common issue in vantage point surveys, and the guidance on vantage point surveys (SNH, 2017) recommends considering corrections for detectability effects. Therefore, I carried out analyses to assess the relationships between distance from the vantage point locations and the flightline detections.

The analyses assumed that flight activity is randomly distributed in relation to distance from the vantage point locations. At individual vantage points, habitat associations and / or topography may affect the relationship between distance from the vantage point location and flight activity. Averaging across a number of vantage points is likely to minimise these biases, because the habitat / topographic effects will differ between vantage points. However, very strong habitat / topographic effects affecting a lot of the flight activity at a vantage point could still bias these analyses.

As detectability will be strongly affected by body size, I divided the species recorded in the vantage point surveys into three size groups, based on their cross-sectional indices (the body length multiplied by the wingspan). The small species included Wigeon, Teal, Sparrowhawk, Golden Plover, Lapwing, Whimbrel, Black-headed Gull, Kestrel and Merlin with body lengths of 0.17-0.48 m and wingspans of 0.25-1.05 m. The medium species included Mallard, Little Egret, Marsh Harrier, Hen Harrier, Buzzard, Lesser Black-backed Gull and Peregrine with body lengths of 0.41-0.71 m and wingspans of 0.80-1.42 m. The large group included Mute Swan, Whooper Swan, Greylag Goose and Grey Heron with body lengths of 0.72-1.53 m and wingspans of 1.45-2.30 m.

In addition to the exclusion of the Fehily Timoney VPs 1 and 2 and the TOBIN VPs 1 and 3 (see Section 3.1), I also excluded the Fehily Timoney VP7: the viewshed for this vantage point had almost no coverage of the distance bands greater than 1000 m from the vantage point.

I divided each viewshed into eight bands, representing increasing distance from the vantage point, from 0-250 m to 1750-200 m. However, some of the viewsheds in the Fehily Timoney dataset had limited coverage of distance bands greater than 1250 m from the vantage point. Therefore, for the analysis of the Fehily Timoney dataset, I grouped the 1250-1500, 1500-1750 and 1750-2000 m distance bands into a single 1250-2000 m distance band.

I then calculated the total length of flightlines for each species group in each band. Flightlines that only occurred in the 0-25 m height band were excluded, because the viewsheds had been derived using a minimum height of 25 m.

I then calculated the flightline density for each distance band in each viewshed using Equation EX1. This equation standardises the flightline density in each distance band by the total amount

of flight activity recorded at that vantage point, to avoid the analyses being biased by vantage points where large amounts of flight activity were recorded.

Equation EX1: $FD_{i*} = \sum(FD_i / FD_{VP}) \times FD_{mean}$

FD_{i*} = weighted flightline density in band i; FD_i = raw flightline density in band i; FD_{VP} = summed flightline densities across all bands in the viewshed containing grid square i; FD_{mean} = mean of FD_{VP} = across all the vantage points included in the analysis.

For the Tobin dataset, I used the ratio of the weighted flightline density in each band to the maximum weighted flightline density across all bands to calculate weightings for each distance band. These weightings indicate the degree of under-recording in each distance band, based on the assumption that all flightlines were detected in the band with the maximum density. The latter was 0-250 m, or the 250-500 m distance band.

The analyses of the Fehily Timoney data only showed distance effects beyond 1250 m. Therefore, I used the mean weighted flightline density across 0-250 m, 250-500 m, 500-750 m, 750-1000 m and 1000-1250 m distance bands to calculate a weighting for the 1250-2000 m distance band.

2.5.3. Species-specific spatial structure

The basic model assumes random distribution of flight activity across the wind farm site, or across portions of it. Therefore, in addition to considering the distance effects on detectability, it is also necessary to consider whether deviations from this assumption are likely to significantly bias the model. In large wind farm sites, such as the Derryadd Wind Farm site, species are likely to show significant deviations from this assumption.

I investigated spatial structure for species / populations of conservation importance that had strong associations with the wind farm site. These included breeding populations within the wind farm site, non-breeding populations regularly using the wind farm site, and populations regularly commuting over the wind farm site.

For Whooper Swan, Cormorant (breeding population), Golden Plover, Lapwing (breeding population), Lapwing (wintering population) and Black-headed Gull (breeding population), I investigated spatial structure by direct examination of the flightline mapping.

For the Lesser Black-backed Gull (breeding population), Lesser Black-backed Gull (autumn) and Kestrel, which had high levels of flight activity, I mapped flightline densities across the wind farm site to investigate whether there was species-specific spatial structure in flight activity. The method that I used included corrections for overlapping viewsheds and for reduced detection of distant flightlines.

For all the species assessed, I also examined the distributions of flight activity densities at potential collision height between vantage points, which were generated in Stage A of the collision risk model.

Flightline density mapping methods

I used a 250 x 250 m grid to map flightline densities and carried out separate analyses for the Fehily Timoney and TOBIN datasets.

I intersected the flightline mapping with the viewsheds to exclude flightlines, or portions of flightlines, that were outside the viewsheds. I then intersected the flightline mapping with the grid and calculated the number of unique flightlines, and the total flightline length in each grid square. I excluded flightlines where all the flight activity was in the lowest height band as these flights would have been below the minimum height covered by the viewsheds.

I generated 250 m distance bands for each viewshed and intersected these distance bands with the grid. I then calculated the weighted viewshed area in each distance band as the sum of the viewshed areas in each distance band multiplied by the weighting for the distance band.

I then calculated the densities of flightline numbers and flightline lengths in each grid square by dividing the flightline numbers and flightline lengths by the weighted viewshed areas. I excluded

grid squares where the weighted viewshed area was less than 1 ha to avoid the analyses being biased by very high densities created by grid squares with very small weighted viewshed areas.

After carrying out separate analyses for the Fehily Timoney and TOBIN datasets, I generated densities for the combined dataset by calculating the mean densities for each grid square covered by the density maps for both datasets, weighted by the number of seasons included in each dataset.

2.5.4. Lapwing breeding population

I defined the local population as the population occupying Derryarogue Bog, Derryadd Bog (including the eastern section outside the wind farm site) and Lough Bannow Bog.

I used the records from breeding wader surveys, breeding season transect surveys, and breeding season vantage point surveys to map the distribution of Lapwing breeding season activity and calculate the number of territories for the local population in the 2022-2024 breeding season. The available data was not sufficient to carry out this exercise for the 2021 breeding season.

I classified the breeding evidence associated with each record using the standard BTO codes (see Table 2.2 in Balmer *et al.*, 2013). I also included an additional code (PB) to categorise flocks of Lapwing recorded in July that may have represented post-breeding aggregations, or early migrants.

In some cases, I reclassified records that had been allocated a different code in the dataset supplied. In particular, there were several records that were classified as recently fledged young (FL). However, for nidifugous species like Lapwing that leave their nest shortly after hatching, this code should only be applied to downy young and detecting young at this stage is difficult. The detail available for most of these records either did not make clear the status of the young or indicated that they were too advanced for such a classification.

I interpreted records with probable or confirmed breeding evidence (excluding pairs observed in suitable nesting habitat) as indicating occupied territories. I used a separation distance of 500 m to define separate territories (Brown and Sheppard, 1993). Lapwing often breed in loose neighbourhood groups (Cramp and Simmons, 2004). Therefore, I classified some territories as being occupied by multiple pairs if there were records indicating this (e.g., two pairs recorded displaying in a single record).

2.6. COLLISION RISK MODELLING METHODOLOGY

2.6.1. General

I followed the NatureScot guidance for the collision risk modelling methodology.

The NatureScot guidance includes a spreadsheet that can be used to implement the collision risk model. However, use of spreadsheets for complex modelling is not best practice due to the difficulty of auditing the code. Also, in this case, where there were multiple species to model, and where I was running multiple variants of the model, use of spreadsheets would be very cumbersome. Therefore, I implemented the NatureScot methodology using custom scripts in R version 4.4.1 (R Core Team, 2024). I audited the scripts against the spreadsheet to ensure that they produced identical results. The scripts used for the modelling can be provided on request.

2.6.2. Stage A: flight activity

NatureScot methodology

Stage A involves calculating the density of flight activity in the area where collision risk will be generated by the installation of wind turbines. It also includes ranking nocturnal activity and calculating the distribution of daytime and nighttime hours.

Flight activity density

For onshore wind farms, calculations of flight activity density are usually based on flight durations recorded by vantage point surveys. This involves adjusting the total amount of flight activity

recorded in the vantage point surveys by the area surveyed and the survey duration. Where data from multiple vantage points is available, it is also necessary to consider how to combine the data.

The NatureScot methodology for Stage A first calculates the mean areal density of flight activity in the viewshed of each vantage point:

Equation A1: $D1 = b / (t \times A)$ birds m^{-2}

b = total flight activity (bird-seconds); t = total duration of vantage point watches (seconds); A = viewshed area (km^2).

Note that flight activity is expressed as the sum of the duration of each flight multiplied by the number of birds: e.g., a record of 20 birds flying for 10 seconds = 200 bird-seconds.

The flight activity density is then averaged across all the vantage points. The NatureScot guidance presents two methods for doing this.

Where there were significant differences in survey effort between the vantage points, the flight activity density can be averaged by weighting for the viewshed area and the duration of the vantage point survey at each vantage point. This reflects the fact that, in principle, larger survey areas and/or survey durations will sample more flights and will, therefore, be less affected by sampling effects. However, note that there are some issues with this weighting method (see Section 4.7.3).

Equation A2: $D^* = \Sigma(D_i \sqrt{(t_i \times A_i)}) / \Sigma \sqrt{(t_i \times A_i)}$

D_i = flight activity areal density at VP i ; t = total duration of vantage point watches at VP i (seconds); A = viewshed area at VP i (km^2).

Where the variation in flight activity density between vantage points is likely to reflect real differences in flight activity, the flight activity density can be averaged by weighting for the number of turbines within the viewshed of each vantage point. However, before applying the weighting it is important to consider whether apparent variation between vantage points could be due to sampling effects.

Equation A3: $D^* = \Sigma(N_i \times D_i) / \Sigma N_i$

D_i = flight activity areal density at VP i ; N_i= the number of turbines in the viewshed of VP i.

Although not discussed in the NatureScot guidance, the weightings in Equations A2 and A3 can be combined to weight for both differences in survey effort and real differences in flight activity between vantage points.

Daytime and nighttime hours

The NatureScot methodology uses the formula in Forsythe *et al.* (1995) to calculate daytime and nighttime hours.

Nocturnal flight activity

Vantage point surveys only record flight activity during daylight hours (normally sunrise to sunset). Therefore, for species that also fly at night, it is necessary to adjust the flight activity densities to allow for nocturnal flight activity.

The NatureScot methodology adjusts for nocturnal flight activity by using a nocturnal activity ranking to categorise each species by its degree of nocturnal activity on a scale of 1-5, where 1 = hardly any nocturnal activity and 5 = as active at night as by day. It then uses this categorisation to include nocturnal flight activity in the calculation of predicted transits in Stage B.

To illustrate the effect of nocturnal flight activity on the collision risk predictions, I calculated nocturnal correction factors for species with non-zero nocturnal flight activity (nocturnal activity rankings of more than one), as shown in Equation A4.

Equation A4: $NCF = 1 + ((NAR - 1) \times 0.25) \times h_{night^*} / h_{day^*}$

NAR = nocturnal activity ranking (see text); h_{night^*} = mean night-time hours across seasonal period of occurrence; h_{day^*} = mean day-time hours across seasonal period of occurrence.

The nocturnal correction factor represents the increase in flight activity densities that is generated by the adjustment for nocturnal flight activity in the calculation of predicted transits in Stage B.

Data sources and preparation

Parameters

The parameters required for the Stage A modelling of flight activity densities using Equation A1 are the flight activity duration (b), the vantage point survey duration (t) and the viewshed area (A).

Stage A also requires classifications of nocturnal activity rankings for all species included in the model and calculations of monthly totals of daytime and nighttime hours.

The derivation of the data required for these parameters is described in the following sections.

Vantage points

I used flight activity data from the Fehily Timoney VPs 3-11 and the TOBIN Vantage Points 2 and 4-11. The excluded vantage points had very small viewsheds and were outside the wind farm site.

Flight activity duration (b)

The flight activity durations included in Equation A1 comprise the sum of the duration of each flightline multiplied by the number of birds recorded on the flightline: e.g., a flock of 100 Golden Plover recorded flying for 10 seconds would generate a flight activity duration (b) value of 1000 bird-secs.

The flight activity durations were obtained from the vantage point survey datasets. These contain timed durations of flight activity for each record in specified height bands.

In the Fehily Timoney dataset, I used the data from all the height bands. The inclusion of the data from the 0-30 m and > 185 m Fehily Timoney height bands will have caused some overestimation of the flight activity density at potential collision height. However, this was necessary as these height bands included part of the potential collision height zone (25-185 m).

In the TOBIN dataset, I used the data from the 25-185 m height bands.

Equation A1 uses the viewshed area to derive the density of flight activity recorded during the vantage point surveys. Therefore, flight activity that occurred outside the viewshed of the vantage point being surveyed should be excluded from the analyses.

I excluded flightlines that occurred entirely outside the relevant viewshed.

Where a flightline occurred partly outside the relevant viewshed, I adjusted its duration by the proportion of the flightline length that occurred in the viewshed. The flightline was clipped by the viewshed. The duration was then recalculated by multiplying the original value by (clipped flightline length) / (original flightline length). It should be noted that, this recalculation procedure assumes that the flight speed and flight height distribution were similar between the segments used for the recalculation.

Vantage point survey duration (t)

The vantage point survey duration parameter represents the total vantage point survey effort over the seasonal period used for the collision risk modelling. I calculated this duration separately for each vantage point and each month in each dataset.

Viewshed area (A)

The viewshed area represents the spatial extent of the area covered by the vantage point survey. I calculated raw viewshed areas from the mapped viewsheds for each vantage point. I also calculated corrected viewshed areas that were adjusted to allow for the effects of under-estimation

of distant flightlines. For each viewshed, I multiplied the area in each 250 m distance band by the band weightings derived from the analyses of distance effects (see Section 2.5.2).

Daytime and nighttime hours

I used the formula in Forsythe *et al.* (1995) to calculate day-time and night-time hours. I used the latitude of the centroid of the turbine locations and a p-value of 0.8333. The p-value represents the position of the sun relative to the horizon at sunrise and sunset.

Nocturnal activity ranking

The nocturnal activity ranking is an estimation of the degree of nocturnal activity ranked on a scale from 1 (hardly any nocturnal activity) to 5 (as active at night as by day). I applied nocturnal activity rankings of more than one to Wigeon, Teal, Mallard, Little Egret, Grey Heron, Golden Plover, Lapwing and Whimbrel.

The Whimbrel overflying the wind farm are likely to be on direct migration, which is probably equally likely to occur by night as by day. So, the nocturnal flight activity rate for Whimbrel was set as 5.

For Mallard, visual inspection of Figure 2 in Korner *et al.* (2016) suggests that nocturnal activity is around half that of diurnal activity, so the nocturnal activity ranking was set as 3. The same rate was applied to the ecologically similar Wigeon and Teal.

For Golden Plover, a figure of 25% of the day-time activity levels across the night-time hours is often used in collision risk modelling (e.g., MKOS, 2019), so the nocturnal activity ranking was set as 2. The same rate was applied to the ecologically similar Lapwing.

Flight activity patterns for Grey Heron from Vessem and Draulans (1987) indicate low levels of nocturnal flight activity, so the nocturnal activity ranking was set at the same rate as Golden Plover. The same rate was applied to the ecologically similar Little Egret.

I used nocturnal activity rankings of 1 for all the other species. This resulted in no nocturnal flight activity being included in the model for these species.

Implementation

Flight activity densities

The NatureScot spreadsheet requires the user to enter mean flight activity densities for each month. I used custom scripts in R to calculate these densities.

I calculated flight activity densities separately for each vantage point in each month in each dataset. I calculated two sets of flight activity densities: one using the raw viewshed areas and the other using the viewshed areas that were corrected for distance effects.

I used the weighted averaging method in Equation A2 to calculate mean flight activity densities for each month across all the vantage points. This method down weighted the contribution of the Fehily Timoney vantage points reflecting the lower survey effort at these vantage points (two seasons) compared to the TOBIN vantage points (five seasons).

Based on the review of the flightline distributions and flightline densities and consideration of the likely habitat dynamics over the lifetime of the wind farm site (see Section 2.5.3), I did not consider that weighting for uneven distribution of flight activity between vantage points (Equation A3) was appropriate.

Daytime and nighttime hours

The NatureScot spreadsheet requires the user to enter the latitude of the wind farm site, and nocturnal activity rankings for each species. It then uses the formula from Forsythe *et al.* (1995) to calculate the day-time and night-time hours. The correction for nocturnal flight activity is applied in Stage B.

I used a custom script in R to implement the formula from Forsythe *et al.* (1995) and calculate the day-time and night-time hours.

Nocturnal correction factors

I used a custom script in R to implement Equation A4 to calculate the nocturnal correction factors.

2.6.3. Stage B: transits

NatureScot methodology

Stage B involves calculating the number of bird transits through the turbine rotors. It uses the flight activity densities, distribution of daylight and nighttime hours, and nocturnal activity rankings derived in Stage A.

The NatureScot guidance does not provide details of the calculation procedure for Stage B, but Band (2024) includes an equation (Equation B1).

Equation B1: $v \times (D \times Q_{2R} / 2R) \times (T \times \pi R^2) \times (t_{day} + f_{night} \times t_{night})$

v = bird flight speed; D = flight activity density; Q_{2R} = proportion of flight activity at potential collision height; R = rotor radius; T = number of turbines; t_{day} = total daylight hours; f_{night} = nocturnal activity ranking - 1 × 0.25; t_{night} = total night-time hours.

The equation converts the areal density to a volumetric density by dividing the flight activity density by the rotor diameter and adjusting for the proportion of flight activity at potential collision height ($D \times Q_{2R} / 2R$). It then converts the density to a flux rate by multiplying by the rotor area ($T \times \pi R^2$) and the bird flight speed (v). It converts the flux rate to an absolute number of transits by multiplying by the total number of hours available for flight activity, including a correction for nocturnal flight activity ($t_{day} + f_{night} \times t_{night}$).

Data sources and preparation

The parameters required for the Stage B modelling are the bird flight speed (v), the flight activity density (D), the vantage point survey duration (t), the proportion of flight activity at potential collision height (Q_{2R}), the rotor area (R), the number of turbines (T), the total daylight and nighttime hours (t_{day} and t_{night}) and the nocturnal activity ranking.

The flight activity density, total daylight and nighttime hours and nocturnal activity ranking were derived in Stage B. The derivation of the data required for the remaining parameters is described in the following sections.

Bird flight speed

The NatureScot guidance states that for bird flight speed, "a typical mean flight speed as given in standard references will usually be adequate" but consideration should be given to exploring "the collision risk arising from different types of bird behaviour involving very different flight speeds".

Most collision risk modelling for onshore wind farms uses the mean bird flight speeds from Alerstam *et al.* (2007). This source covers most species relevant to collision risk modelling for Irish onshore wind farms. I have used the mean bird flight speeds from this source. The values used in this collision risk model are shown in Table 2.3.

Proportion of flight activity at potential collision height (Q_{2R})

The NatureScot methodology involves calculating the total areal flight activity density across all height bands and then adjusting for the proportion of flight activity at potential collision height. However, this may introduce biases in the calculations due to variation between viewsheds in the proportion of viewshed that was visible below the height used to map the viewshed. In this collision risk model. I have only used the flight activity at potential collision height to calculate the flight activity density. Therefore, for Equation B1, the value of the Q_{2R} parameter is 1.

Turbine parameters

The proposed number of turbines (T) is 22 and the proposed rotor radius (R) is 82.5 m.

Implementation

The NatureScot spreadsheet automatically calculates the projected number of transits per month from the bird density and hours per month values calculated in Stage A and data entered by the user for the other parameters.

I implemented Equation B1 through a custom script in R to calculate the predicted number of transits per month.

2.6.4. Stage C: single transit collision risk

NatureScot methodology

Stage C involves calculating the probability of a collision when a bird makes a transit of the rotor swept volume (the single transit collision risk).

The NatureScot methodology for Stage C is based on the Scottish Natural Heritage collision risk model (SNH, 2000; Band *et al.*, 2007; Band, 2012). This calculates the probability, p (r, φ), of collision for a bird at radius r from the hub and at a position along the radius that is at angle φ from the vertical. This probability is then integrated over the entire rotor disc, assuming that the bird transit may be anywhere at random within the area of the disc. Separate calculations are made for flapping and gliding birds and for upwind and downwind transits. This method assumes that: birds are of a simple cruciform shape; they fly through turbines in straight lines with a perpendicular approach to the plane of the rotor; their flight is not affected by the slipstream of the turbine blade; and that the turbine blades have width and pitch angle, but no thickness.

Parameters

The parameters required for Stage C are the bird body length, wingspan, flight speed and flight type, the percentage of flights upwind/downwind, and the turbine rotation speed, rotor radius, mean blade width, pitch angle and blade profile.

Turbine parameters

The turbine rotation speed, rotor radius, mean blade width and pitch angle values used for the modelling are shown in Table 2.2. The default blade profile values from the NatureScot spreadsheet were used for the modelling.

One of the turbine parameters used to calculate collision probability is the mean pitch angle of the turbine blade. This parameter specifies the angle of the blade from the horizontal, so the collision probability will increase as the mean pitch angle increases. Data on mean pitch angle can be difficult to obtain so generic values are often used in collision risk models. The NatureScot guidance states that a mean pitch angle of "15-30 degrees is reasonable for a typical large turbine". However, monitoring at an onshore wind farm (Meenwaun, Co. Offaly) indicated that much lower pitch angles are typical for onshore turbines (MKOS, 2019). This monitoring found that over a continuous 12-month period at this site the pitch angle was between -3° and 9° for approximately 90% of the time.

I modelled single transit collision risks using three values for mean pitch angle: 0°, 15 ° and 30°. The pitch value of 0° was the value within the -3° to 9° range that produced the highest collision probability values for most species in sensitivity analyses (see Section 2.6.7).

Bird parameters

The bird body length and wingspan values were obtained from Cramp and Simmons (2004). The bird flight speed values were obtained from Alerstam *et al.* (2007). The values used in the modelling are shown in Table 2.3.

The review of the vantage point survey flightlines did not show any consistent directional bias. Therefore, the percentages of flights upwind/downwind was set at 50%.

Implementation

I carried out all the calculations of single transit collision risks in R, using an adapted version of the R code provided by Masden (2015). This code implements the methodology of Band (2012) and provides identical values to the spreadsheet provided by that source and to the values generated by the NatureScot spreadsheet.

I carried out separate sets of calculations using pitch angle values of 0°, 15° and 30°.

I calculated separate values for upwind and downwind flapping and gliding flight.

The NatureScot spreadsheet only allows values for either flapping or gliding flight to be used. I used the values for flapping flight, as these were slightly higher.

The spreadsheet uses the mean of values for upwind and downwind flight weighted by the relative proportion of these flight direction. As there was no indication of consistent bias in flight directions for any species included in the collision risk model, I used a simple mean of the upwind and downwind single transit collision risks (i.e., a 50/50 weighting).

2.6.5. Stage D: non-avoidance collision risk

NatureScot methodology

Stage D multiplies the number of predicted transits from Stage B and the single transit collision risk from Stage C to provide an estimate of the overall predicted collision risk before avoidance. It also includes a correction for the proportion of time that the turbines are operational.

Equation D1: collision rate before avoidance = transits × stcr × Q_{op}

transits = predicted transits from Stage B; stcr = single transit collision risk from Stage C; Q_{op} = proportion of time that the turbines are operational.

Parameters

The parameters required for Stage D are the predicted transits from Stage B, the single transit collision risk values from Stage C, and the proportion of time that the turbines are operational (Q_{op}).

Site-specific values for Q_{op} were not available for this project. Therefore, I used a value of 0.85 for all the species in the model, which is a widely value for this parameter in collision risk modelling for onshore wind farms in Ireland.

Implementation

The NatureScot spreadsheet automatically calculates the projected number of transits per month from the bird density and hours per month values calculated in Stage A and data entered by the user for the other parameters.

I implemented Equation D1 through a custom script in R to calculate the collision rate before avoidance.

2.6.6. Stage E: collision risk after avoidance

NatureScot methodology

Stage E applies an avoidance rate to the non-avoidance collision risk to reflect the fact that most potential collisions are avoided due to birds taking evasive action (SNH, 2010).

Equation E1: collision rate after avoidance = collision rate before avoidance × (1 – A)

collision rate before avoidance = predicted rates from Stage D; A = avoidance rate.

The avoidance rate includes both behavioural avoidance (micro-avoidance) and behavioural displacement (macro-avoidance).

Behavioural avoidance is “action taken by a bird, when close to an operational wind farm, which prevents a collision”. Behavioural displacement refers to the process by which a “bird may (possibly over time) change its home range, territory, or flight routes between roosting areas and

feeding areas, so that its range use (or flight paths) no longer brings the bird into the vicinity of an operational wind farm".

The NatureScot guidance for Stage E also notes that "consideration should be given to whether any habitat changes associated with developing the wind farm may result in attracting bird species". This issue is considered in Section 4.7.2.

Stage E can also include a large turbine array correction factor. This reflects the fact that "where the overall probability of a bird colliding is appreciable, it may be appropriate to take account of the fact that a declining proportion of the birds will survive passage through early rows of turbines and will thus be exposed to collision risk in later rows". However, this correction factor is only likely to be significant for wind farms with much larger numbers of turbines than are proposed for the Derryadd Wind Farm. Therefore, I did not apply this correction factor.

The NatureScot spreadsheet sums the monthly collision risks to provide a total annual collision risk. However, for some species it is more appropriate to calculate seasonal collision risks (e.g., to differentiate between separate breeding and wintering populations).

Parameters

The parameters required for Stage E are the non-avoidance collision risks from Stage D and avoidance rates for each species included in the model. In addition, definitions of the months included in seasonal periods are required if seasonal collision risks are to be calculated.

Avoidance rates

The default set-up in the NatureScot spreadsheet calculates the predicted collision risk after avoidance using four avoidance rates: 95%, 98%, 99% and 99.5%. However, the guidance states "if possible, use avoidance rates which have been established from previous monitoring studies for this species, and an appropriate range to cover the uncertainties involved".

Scottish Natural Heritage provides guidance on avoidance rates to use in collision risk modelling for onshore wind farms (SNH, 2010, 2018). For some species, including Whooper Swan, Hen Harrier and Kestrel, there is some evidence available that has been used to specify species-specific avoidance rates (SNH, 2018). In addition, a recent review for Scottish Natural Heritage has recommended the use of an avoidance rate of 0.992 for small gulls (including Black-headed Gull and Common Gull) and 0.995 for large gulls (including Lesser Black-backed Gull) at onshore wind farms (Furness, 2019).

For Golden Plover, my review of collision monitoring data from four UK wind farms recommended that collision risk modelling for wintering Golden Plover populations should use two avoidance rate values: 99.6% and 99.8% (Gittings, 2022).

For the other species included in this collision risk model, the Scottish Natural Heritage guidance specifies a default avoidance rate of 98%.

Seasonal periods

The periods used to calculate seasonal collision risks are defined in Table 2.4. For the species not included in this table the final collision risk was calculated for the whole year.

Implementation

The NatureScot spreadsheet automatically calculates the collision rate after avoidance per month from the collision rate before avoidance values calculated in Stage D and the avoidance rate values entered by the user.

I implemented Equation E1 through a custom script in R to calculate the collision rate after avoidance. This produced monthly predicted collision risks for various avoidance rates and for pitch angles of 0°, 15 ° and 30°.

For the final predicted collision risks used in the collision risk assessments, I summed the monthly predicted collision risks for the recommended avoidance rate and a pitch angle of 0° to produce annual or seasonal collision risks, as appropriate.

2.6.7. Stage F: assessing uncertainty

Stage F involves assessing the level of uncertainty that applies to the collision risk predictions.

In this assessment, I carried out analyses to provide some degree of quantification of the potential uncertainty in the flight activity data due to sampling effects, variability in flight height estimates, and imprecision of the estimates of nocturnal flight activity. Another source of potential uncertainty in the flight activity data is incomplete detection of flightlines, which is already accounted for in this collision risk model (see Section 2.5.2).

I also carried out analyses to quantify potential uncertainty in the single transit collision risk predictions due to variation in pitch angle and rotation speed.

I carried out qualitative assessments of other sources of potential uncertainty.

Sampling effects

The standard vantage point survey effort of 36 hours per season only samples around 1.5-2% of the total daylight hours across the season. The temporal distribution of flight activity is often highly aggregated, while a small number of long duration flightlines can make a large contribution to the overall collision risk. Therefore, sampling effects are likely to strongly influence the collision risk predictions.

I assessed the potential influence of sampling effects on the collision risk predictions by using a simulation model. This model used the observed distribution of flight activity to simulate flight activity across the entire season. This simulated distribution was then sampled to generate samples of vantage point survey data. I then compared the flight activity densities in the samples to the flight activity densities across the entire season.

I first calculated the total duration of daylight hours across the season using the R package *suncalc* (Thiermel and Elmarhraoui, 2022) and divided this duration by three to set up a dataframe representing all 3-hour periods of daylight hours at each vantage point across the season.

I used the negative binomial distribution to simulate the distribution of records in each 3-hour period across the entire season at each vantage point and the distribution of flock sizes per record (excluding simulated zero values for flock sizes). I used the *fitdist* function with the maximum likelihood estimation method in the R package *fitdistplus* (Muller and Dutang, 2015) to fit these negative binomial distributions. I used the exponential distribution to simulate the distribution of flight durations at potential collision height per record. I used the *rexp* function in the R package *stats* (R Core Team, 2024), with a rate that was the reciprocal of the mean duration of observed flights potential collision height, to fit the exponential distributions.

For each species / season, I compared the distribution of the simulated values with the observed values to assess the validity of the simulated data.

I then took 1000 sets of random samples without replacement of twelve 3-hour periods to simulate vantage point survey samples.

I calculated the flight activity densities for the entire season, and for each set of vantage point survey samples, by summing the bird-secs per record, dividing by the total duration of daylight hours (for the entire season dataset) or 36 hours (for the vantage point survey datasets).

I used the distribution of the vantage point survey datasets to calculate 95% confidence intervals for the vantage point survey samples, where the lower limit was the 2.5% percentile of the distribution, and the upper limit was the 97.5% of the distribution.

I assessed the potential influence of sampling effects by comparing the upper and lower confidence interval limits of the flight activity densities in the simulated vantage point survey samples with the overall flight activity density in the complete dataset. This provides an indication

of the potential maximum over- or underestimation of the true flight activity density if the sampling effects happen to result in the vantage point survey sample representing the upper or lower limits of the 95% confidence interval of the true flight activity density distribution. For example, if the lower limit was half the value of overall flight activity density, then the true collision risk would be twice the value of the predicted collision risk calculated from a vantage point survey sample representing this limit.

I carried out these analyses using a single year and using three or four years (the numbers of winter or summer seasons, respectively, covered by the vantage point surveys for this project).

Height distribution

The collision risk model used data from all height bands in the Fehily Timoney dataset. Therefore, uncertainty in flight height estimates is not an issue for the component of the collision risk predictions derived from this dataset.

I assessed the potential influence of uncertainty in flight height estimates in the TOBIN dataset on the collision risk predictions by comparing the recorded height distributions of the three surveyors involved in the TOBIN vantage point surveys. If three independent surveyors produced broadly similar distributions of flight height estimates, then it would be reasonable to assume that there was low uncertainty. Conversely if there were large differences in the distributions, that would indicate significant inaccuracies in flight height estimates by one or more of the surveyors.

I compared the numbers and durations of flights recorded in the 0-25 m height band, with the numbers and durations of flights recorded across the 25-185 m height bands. I restricted the comparisons to species with a total of at least 50 records included in the TOBIN dataset.

I found that one observer consistently recorded low flight height estimates across all the species analysed. I used the ratio of flight durations between the two height bands assessed recorded by the other two observers to correct the flight durations recorded by this observer for all records with non-zero durations in the 0-25 m height band. I then re-ran the calculations of flight activity densities in Stage A and transits in Stage B using the corrected flight durations. The ratio of the corrected transits to the uncorrected transits provides an indication of the potential effect on the predicted collision risks of this observer's under-estimation of flight heights.

Nocturnal flight activity

The collision risk model uses a crude ranking of the degree of nocturnal flight activity to calculate nocturnal correction factors and the information available about the degree of nocturnal flight activity for most species is very limited. I examined the effects of uncertainty about nocturnal flight activity for each species with a nocturnal activity ranking of more than one. I did this by calculating nocturnal correction factors using nocturnal activity rankings of ±1 of the values used in the model. The ratio of these nocturnal correction factors to the nocturnal correction factor value used in the collision risk model indicates the potential effect on the predicted collision risk: e.g., if the nocturnal correction factor calculated using the NAR+1 value is 1.25 times the nocturnal correction factor using the NAR value, the true collision risk could be 25% higher than the predicted collision risk.

Single transit collision risk

I carried out analyses to quantify potential uncertainty in the single transit collision risk predictions due to variation in pitch angle and rotation speed. These involved calculating single transit collision risk values for each 1° increment in pitch angle between -5° and 90° and each 0.1 rpm increment in rotor speed between values of 5.0 and 12.5 rpm. I used the nominal rotor speed value for the pitch calculations and a pitch angle value of 0° for the rotor speed calculations. The range used for the rotor speed analyses was based on typical rotor speed ranges for onshore wind turbines in Ireland.

2.7. COLLISION RISK ASSESSMENT

The significance of the predicted collision risk is a function of the size of the predicted collision risk, the size of the affected population, and the typical level of background mortality in the affected population. The same predicted collision risk will have larger impacts in small populations and/or populations with low levels of annual mortality, compared to large populations and/or populations with high levels of annual mortality. Therefore, the significance can be assessed by calculating the percentage increase in annual mortality that would be generated by the predicted collision risk.

A threshold level of a 1% increase in annual mortality has been suggested to determine whether the impact is nonnegligible (Percival, 2003). Note that this refers to the increase in absolute mortality not the increase in the percentage mortality rate. This 1% threshold is widely used in UK wind farms assessments as a threshold for assessing significance. However, this is likely to be a very conservative threshold, and in some cases, such as small populations with low mortality rates, biologically implausible.

I assessed the potential increase in annual mortality, as a percentage of the background annual mortality, for most species / populations, with a predicted risk that would result in at least one collision within the 30 year lifespan of the wind farm. The species / populations with this level of risk that I did not assess were Buzzard, the migrant Whimbrel population and the autumn Lesser Black-backed Gull population. I did not assess Buzzard because this species has been rapidly increasing in Ireland and there are no recent national or county population estimates available. I did not assess the migrant Whimbrel population and the autumn Lesser Black-backed Gull population because no relevant data on national or county population sizes is available.

For each of the species / populations, I assessed the impact at the national scale. I also assessed the impact at regional and/or local scales where relevant population data was available or could be estimated.

The sources of the population data are listed in Table 2.1.

For Whooper Swan, I used data from the 2020 International Swan Census (Burke *et al.*, 2021). I defined the regional population as the totals for Lough Ree and County Longford; all the non-Lough Ree sites in Longford were in the western part of the county close to Lough Ree. I defined the local population as the totals for the sites within 5 km of the wind farm site; 5 km is the core foraging range from roost sites for Whooper Swan defined by SNH (2016).

For Mallard, Little Egret and Grey Heron, there are national estimates available for both the breeding and non-breeding populations. These species were recorded throughout the year in the vantage point surveys. Their local breeding populations are likely to be resident, although the populations may be supplemented in the non-breeding season. Mallard and Grey Heron are poorly covered by the Irish-Wetland Bird Survey (the source for the non-breeding population estimate) as they are widespread outside the monitored sites. Therefore, while their national populations are likely to be larger in the non-breeding season, the estimates of their national breeding populations are larger than the estimates of their national non-breeding populations. Therefore, for Mallard and Grey Heron, I used the estimates of their breeding populations for the national population. For Little Egret, I used the estimates of its non-breeding population for the national population. This species is increasing in Ireland, and the estimate of its breeding population is probably out of date.

Sparrowhawk and Kestrel are widespread species that are not likely to show highly aggregated distribution patterns. I estimated the Longford population sizes of these species using the Bird Atlas dataset from the National Biodiversity Data Centre[1]. This included hectad presence-absence data covering the whole of the Republic of Ireland, and tetrad data of relative abundance for samples of tetrads from most of the hectads. I used the hectad data to estimate the proportion of the Republic of Ireland breeding range of each species that occurs in Longford. I then used the

[1] BirdWatch Ireland, Bird Atlas 2007 - 2011, National Biodiversity Data Centre, Ireland, accessed 07 September 2022, https://maps.biodiversityireland.ie/Dataset/220.

tetrad data to estimate the mean relative abundance of the species in Longford as a percentage of its mean relative abundance throughout its range in the Republic of Ireland. I then used the product of these two factors to multiply the Republic of Ireland population figure to give an estimate for the Longford population.

For the local Golden Plover population, I used the mean annual peak Irish Wetland Bird Survey counts for Lough Ree subsites from the winters of 2018/19, 2019/20, 2021/22 and 2022/23[2]. This data is likely to underestimate the size of the local population because it is likely that the birds at collision risk will include some from other local populations outside the Lough Ree wintering populations.

For the local Lapwing breeding population, I used the mean number of Lapwing territories recorded in Derryaroge Bog, Derryadd Bog and Lough Bannow Bog in 2022-2024 (see Section 2.5.4).

For Black-headed Gull, I only assessed the impact on the national population. There is, or at least was, a large breeding colony in Lough Ree but no recent data appears to be available for it. The breeding data for Longford in Burnell *et al.* (2003) refers to a breeding colony at Lough Gowna. This colony is 30 km from the wind farm site, while the Lough Ree colony sites are around 5-10 km from the wind farm site.

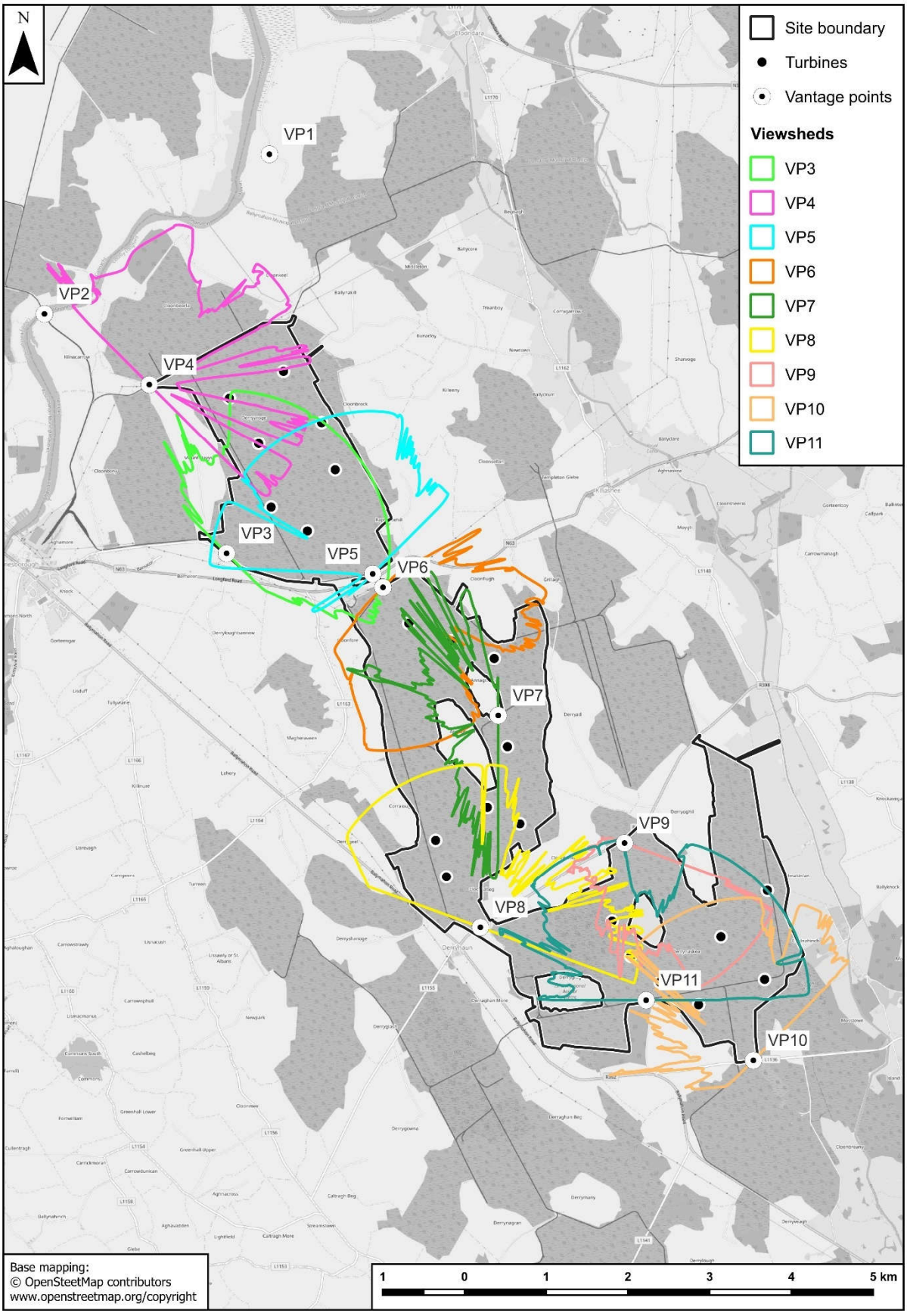
The background mortality rates that I used were derived from the adult survival rates on the BirdFacts website[3]. Where separate rates were given for males and females, I used the mean of the rates.

[2] Data were supplied by the Irish Wetland Bird Survey (I-WeBS), a scheme coordinated by BirdWatch Ireland under contract to the National Parks and Wildlife Service of the Department of Housing, Local Government and Heritage.
[3] www.bto.org/understanding-birds/birdfacts; accessed 19/02/2024.

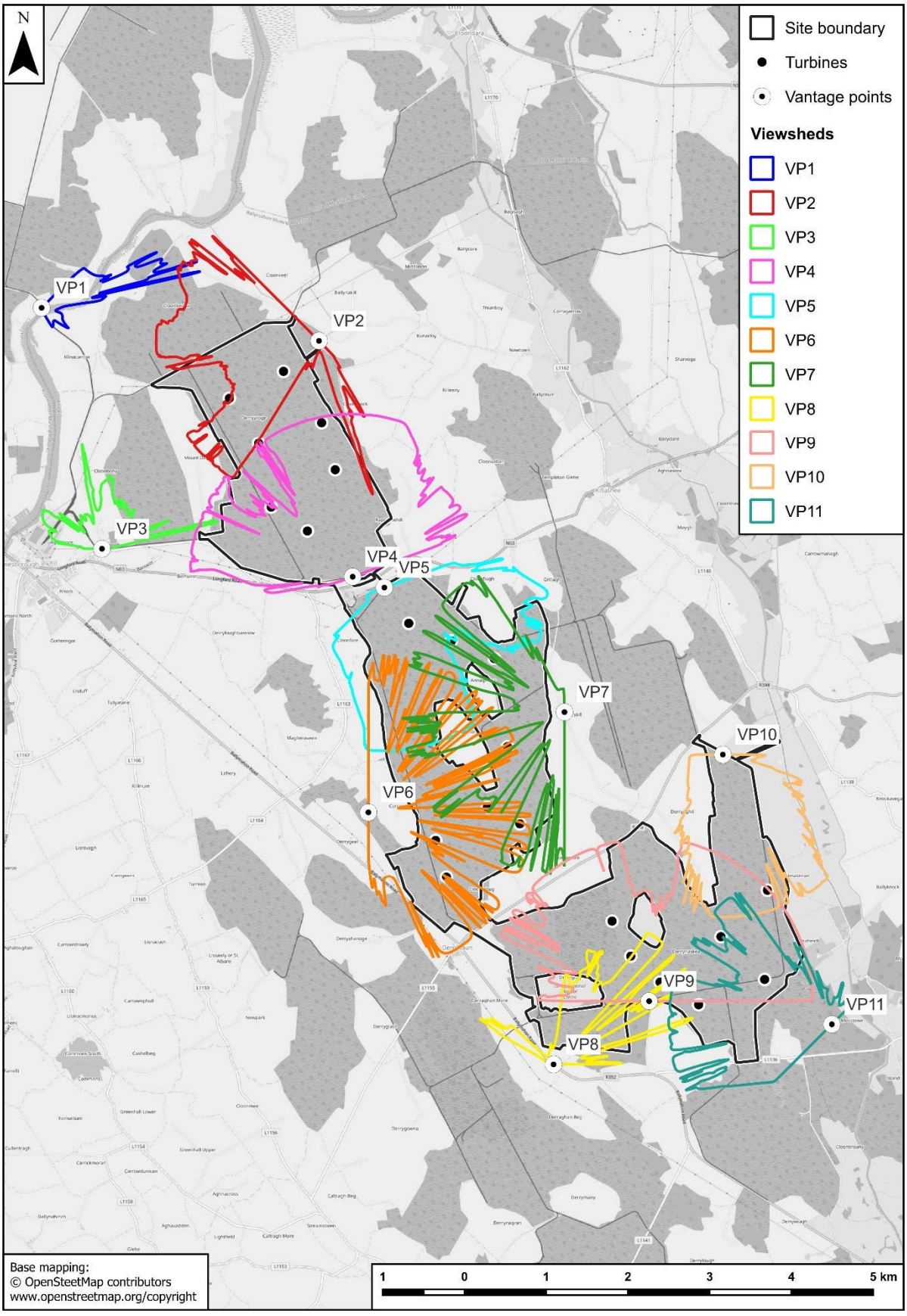
Table 2.5. Population data used for the collision risk assessment.

Species	Population	Scale	Geographic extent	Value	Units	Period / Source
Whooper Swan	winter	national	all-Ireland	19,111	individuals	1
	winter	county	Longford / Lough Ree	394	individuals	1
	winter	local	5 km buffer	247	individuals	1
Teal	winter	national	all-Ireland	35,740	individuals	3
Mallard	breeding	national	Republic of Ireland	15,400	pairs	4
	winter	national	all-Ireland	28,230	individuals	3
Cormorant	breeding	national	all-Ireland	4,685	AON	5
	breeding	local	Lough Ree	144	AON	5
Little Egret	breeding	national	Republic of Ireland	375	pairs	4
	non-breeding	national	all-Ireland	1,390	individuals	3
Grey Heron	breeding	national	Republic of Ireland	3,087	pairs	4
	non-breeding	national	all-Ireland	2,610	individuals	3
Sparrowhawk	breeding	national	all-Ireland	17,580	individuals	6
	breeding	county	Longford	134	individuals	7
Golden Plover	winter	national	all-Ireland	92,060	individuals	3
	winter	local	Lough Ree	1,225	individuals	2
Lapwing	breeding	national	Republic of Ireland	2,000	pairs	8
	breeding	national	Northern Ireland	860	pairs	9
	breeding	local	local area	15.7	pairs	10
	winter	national	all-Ireland	84,690	individuals	3
Black-headed Gull	breeding	national	all-Ireland	19,611	AON	5
Lesser Black-backed Gull	breeding	national	all-Ireland	16,389	AON	5
	breeding	local	Lough Ree	1,009	AON	5
Kestrel	breeding	national	all-Ireland	19,970	individuals	6
	breeding	county	Longford	283	individuals	7

Sources: 1 = 2020, Burke *et al.* (2021); 2 = mean annual Irish Wetland Bird Survey peak counts, 2018/19, 2019/20, 2021/22 and 2022/23; 3 = 2011/12-2015/16, Burke *et al.* (2018); 4 = 2008-2011, NPWS (undated); 5 = 2015-2021, Burnell *et al.* (2023); 6 = 2006-2011, Crowe *et al.* (2014); 7 = 2006-2011, derived from Crowe *et al.* (2014) and Bird Atlas data (see text); 8 = 2008, Lauder and Donaghy (2008); 9 = 2013, Colhoun *et al.* (2015); 10 = 2022-2024, see text.



Map 2.1. Vantage points and viewsheds used by the Fehily Timoney survey team.



Map 2.2. Vantage points and viewsheds used by the TOBIN survey team.

3. REVIEW OF THE VANTAGE POINT SURVEY COVERAGE AND RESULTS

3.1. SPATIAL COVERAGE AND VIEWSHEDS

The processing of the viewshed mapping to generate simplified viewsheds (see Section 2.3.1) resulted in the deletion of all segments for the viewsheds for the Fehily Timoney VP1 and VP2. The viewsheds for the TOBIN VP1 and VP3 were also very small. These vantage point locations were all at the northern end of the wind farm site and their raw viewsheds did not include any turbine locations. Therefore, these vantage points were excluded from the collision risk model. The collision risk model was based on flight activity data from the Fehily Timoney VPs 3-11 and the TOBIN VPs 2 and 4-11.

The simplified Fehily Timoney viewsheds used for the collision risk model covered 15 of the 22 turbine locations and 80% of the 500 m buffer around the turbine locations (Map 2.1). The simplified TOBIN viewsheds used for the collision risk model covered 18 of the 22 turbine locations and 82% of the 500 m buffer around the turbine locations (Map 2.2). However, while there is incomplete coverage of the turbine locations and the 500 m buffer around the turbine locations, the gaps in coverage are small and there are not any significant areas lacking coverage. The gaps in coverage do not affect the reliability of the collision risk estimates.

3.2. SPATIAL PATTERNS OF FLIGHT ACTIVITY

3.2.1. Distance effects

The analyses of the Fehily Timoney dataset did not show strong distance effects on detection rates (Figure 3.1). The flightline densities in the 0-250 m to 1000-1250 m distance bands did not show any strong variation with wide overlaps of the confidence intervals for each of these bands. The flightline densities in the 1250-2000 m distance band were smaller than the other distance bands. This difference was stronger for the small and medium-sized species (Groups 1 and 2), with little overlap of the confidence intervals between the 1250-2000 m distance band and the other distance bands. For the large species (Group 3), the flightline density in the 1250-2000 m distance band was only marginally smaller than several of the other distance bands and there was almost complete overlap of confidence intervals.

The analyses of the TOBIN dataset showed much stronger distance effects on detection rates (Figure 3.2). There were strong declines in detection rates at distances of greater than 500 m for small (Group 1) species, and at distances greater than 750 m for medium-sized (Group 2) species. The large (Group 3) species showed more a gradual decline in detection rates, but all three groups had very low detection rates at distances of greater than 1250 m.

The correction factors calculated from the weighted viewshed areas are shown in Table 3.1. These indicate the increase in collision risk that results from correcting for under-detection of distant flightlines. The SNH correction factors were derived using the theoretical maximum possible viewshed that complies with Scottish Natural Heritage guidance (SNH, 2017). The Derryadd correction factors were derived using the actual viewsheds from the relevant datasets. The SNH correction factors allow comparison of the detectability effects across datasets. The Derryadd correction factors indicate the approximate values of the corrections for under-detection of distant flightlines that were applied in the collision risk modelling. Note, that for each species, the actual correction factor that was applied will vary depending on the species distribution between the vantage points included in the model.

Table 3.1. Correction factors.

Correction factor	Dataset	Group 1	Group 2	Group 3
SNH correction	Fehily Timoney	1.28	1.25	1.19
	TOBIN			
Derryadd correction	Fehily Timoney	1.68	1.66	1.61
	TOBIN			

3.2.2. Species-specific spatial structure

Assessment

The Whooper Swan flightlines were widely distributed across the wind farms without any obvious spatial structure (Map 3.1). The flight activity densities at potential collision height did not show obvious concentrations at individual vantage points (Table 3.2).

There was a strong concentration of Cormorant breeding season flightlines along the River Shannon (Map 3.2). However, these flightlines were outside the wind farm site and were recorded from vantage points that are not included in the collision risk model. Within the wind farm site, there was some indication of a concentrations of flightlines along a corridor through the middle of Derryaroge Bog in 2021 (Map 3.2), which was reflected in the distribution of flight activity densities at potential collision height between the Fehily Timoney vantage points (Table 3.2). However, the number of flightlines was small, and this pattern was not repeated in 2022-2024, when very few flightlines were recorded across the wind farm site.

There was a concentration of Golden Plover flightlines in Lough Bannow Bog in all three winters (Map 3.3), which was reflected in the distribution of flight activity densities at potential collision height between the vantage points (Table 3.2).

The Lapwing breeding season map (Map 3.4) shows some indication of a concentration of flight activity in the central / eastern section of Derryaroge Bog in 2021. However, this was not repeated in subsequent years when the flightlines were widely scattered around the wind farm site.

There was a concentration of Lapwing winter flightlines along the River Shannon (Map 3.5), but, as discussed for Whooper Swan, this is not relevant to the collision risk model. Elsewhere, the small number of flightlines were widely distributed across the wind farm site without any obvious spatial structure (Map 3.5). There were large differences between vantage points in the flight activity densities at potential collision height (Table 3.2) but, given the small number of flightlines, this was most likely due to sampling effects.

The Black-headed Gull breeding season flightlines were widely distributed across the wind farm site, but there was a concentration in the northern section of Derryadd Bog (Map 3.6). This was reflected in the high flight activity at potential collision height in the relevant TOBIN vantage point (VP5), but not in the relevant Fehily Timoney vantage point (VP6) (Table 3.2).

The Lesser Black-backed Gull breeding season flight activity was widely distributed across the wind farm site with generally little evidence of significant spatial structure (Map 3.7). There was an area of high Lesser Black-backed Gull flightline density across the middle / southern section of Derryaroge Bog, which was apparent in both breeding season datasets. However, this was not reflected in the distribution between vantage points of flight activity densities at potential collision height (Table 3.2).

The Lesser Black-backed Gull autumn flightlines are shown in Map 3.8. The flight activity in the autumn of 2021 did not show strong spatial structure. There were low numbers of flightlines recorded in the autumn of 2022, so the flightline density map should not be interpreted as showing strong evidence of spatial structure. There were large differences in flight activity densities at potential collision height between the Fehily Timoney vantage points, but the vantage points with high flight activity densities were not spatially clustered (Table 3.2).

Table 3.2. Mean flight activity densities at potential collision height (birds/km^2/month).

Species	Season	Dataset	Derryaroge Bog				Derryadd Bog				Lough Bannow Bog			
			VP2	VP3	VP4	VP5	VP5	VP6	VP7	VP8	VP8	VP9	VP10	VP11
Whooper Swan	winter	FT		399	234	100		129	236	573		139	0	0
		TB	14		3		21	57	274		124	83	523	312
Cormorant	breeding	FT		161	270	528		64	0	330		0	0	71
		TB	93		8		4	0	0		0	0	13	14
Golden Plover	non-breeding	FT		221	4	415		0	0	0		2,848	126	242
		TB	0		0		681	10,599	17		6,512	22,220	4,373	38,478
Lapwing	breeding	FT		569	55	1,678		65	0	0		0	84	0
		TB	18		99		4	486	58		170	64	291	0
	winter	FT		34	497	11		95	0	8		0	0	14
		TB	0		1,933		4	0	3,255		0	208	13,556	0
Black-headed Gull	breeding	FT		3,944	255	696		791	1,792	1,779		732	133	175
		TB	79		237		3,391	334	456		157	63	373	96
Lesser Black-backed Gull	breeding	FT		2,926	2,114	1,680		10,968	1,584	9,086		4,856	1,986	4,264
		TB	8,135		1,239		5,213	2,366	1,372		1,200	898	687	2,381
	autumn	FT		229	493	360		888	3,004	1,848		5,888	839	953
		TB	32		313		425	112	298		165	276	596	99
Kestrel	all year	FT		191	82	223		664	357	22		434	324	176
		TB	293		304		141	319	927		467	553	257	1,203

The flight activity densities in this table are the values generated in Stage A of the collision risk model. The vantage point positions and viewsheds differed between the two datasets. The vantage points are grouped in this table by the bog that their viewsheds covered. The viewshed for the Fehily Timoney VP8 was divided between Derryadd Bog and Lough Bannow Bog. The Fehily Timoney VPs 1 and 2 and the TOBIN VPs 1 and 3 were not included in the collision risk model (see Section 3.1).

Kestrel flight activity was widely distributed across the wind farm site (Map 3.9). There were concentrations of flight activity in certain areas of the wind farm site in each dataset, but these were not consistent between datasets. The distribution of flight activity densities at potential collision height between vantage points did not show obvious spatial structure (Table 3.2).

Conclusions (Whooper Swan, Golden Plover, Lapwing and Kestrel)

The most obvious spatial structure was shown by the distribution of Golden Plover flightlines and flight activity densities at potential collision height, which were strongly concentrated in Lough Bannow Bog. However, in the winters of 2016/17-2018/19, Golden Plover flightlines were widely distributed across the wind farm site without a significantly higher concentration in Lough Bannow Bog (Gittings, 2019). These differences may reflect differences between winters in habitat conditions. The distribution of Golden Plover flight activity across the wind farm site is likely to reflect the distribution of suitable roosting habitat within the bogs, and the distribution of suitable feeding habitat in agricultural lands outside the bog. The former is likely to show large changes over the operational life of the wind farm due to management of drainage in the bogs and vegetation succession in areas of recently worked-out bog. The latter is likely to vary from winter to winter, probably to a lesser degree, due to year-to-year variation in conditions of individual fields.

The distribution of Whooper Swan, Lapwing and Kestrel flight activity did not show strong spatial structure. These are also species where the distribution of their flight activity operational life of the wind farm may show strong changes due to vegetation succession and, in the case of Whooper Swan and Lapwing, drainage management.

For Whooper Swan, Golden Plover, Lapwing and Kestrel, to build in spatial structure into collision risk model in a realistic way would require developing model of how the habitat suitability for these species is likely to change over the lifespan of the wind farm.

Conclusions (Cormorant, Black-headed Gull and Lesser Black-backed Gull)

The Cormorant, Black-headed Gull and Lesser Black-backed Gull flight activity largely involved birds commuting across the wind farm site probably to/from breeding colonies / roost sites in Lough Ree. Therefore, the distribution of the flight activity across the wind farm site is not likely to be affected by habitat changes and may not vary significantly over the operational life of the wind farm.

For Cormorant, there was some indication of a concentration of flight activity in Derryaroge Bog in 2021, which was associated with high levels of flight activity along the River Shannon outside the wind farm site. However, this was not reflected in subsequent years when the level of flight activity was much lower.

There was no evidence of consistent spatial structure in the distribution of Black-headed Gull breeding season flight activity, or Lesser Black-backed Gull breeding season and autumn flight activity.

3.3. TEMPORAL PATTERNS OF FLIGHT ACTIVITY

3.3.1. Seasonal patterns

The recording rates of regularly occurring species across the seven seasons of vantage point surveys are compared in Table 3.3. The recording rates are used, rather than actual number of records, to standardise comparisons across seasons with variable survey effort.

There were higher recording rates of several species in the summer of 2021, compared to subsequent summers. This may reflect differences in vantage point positions and recording protocols between the surveys carried out by the Fehiley Timoney and TOBIN survey teams, although there weren't any consistent differences in the winter recording rates between the winter of 2021/22 and the subsequent winters.

Table 3.3. Seasonal recording rates (records / 330 hours) of flightline records during the vantage point survey.

Species	2021 summer	2021/22 winter	2022 summer	2022/23 winter	2023 summer	2023/24 winter	2024 summer
Mute Swan	0	8	1	10	1	7	0
Whooper Swan	0	49	0	52	0	32	0
Teal	1	8	0	4	0	4	2
Mallard	23	24	13	23	8	18	19
Cormorant	24	1	2	1	6	5	4
Little Egret	48	27	11	14	3	10	7
Grey Heron	69	26	15	7	8	10	21
Hen Harrier	0	10	0	0	1	7	0
Sparrowhawk	27	10	14	20	11	8	10
Buzzard	215	41	61	41	52	42	59
Golden Plover	0	27	4	14	2	22	0
Lapwing	20	12	4	10	7	4	7
Snipe	22	7	5	5	0	6	4
Black-headed Gull	51	0	21	4	28	1	17
Lesser Black-backed Gull	263	1	104	11	90	12	82
Kestrel	94	38	66	39	76	41	41
Peregrine	4	7	2	5	6	1	2

The data in this table is derived from all the flightline records during timed watches at vantage points included in the collision risk model, including records outside viewsheds. The recording rate is shown as the number of records per 330 hours as this represents the mean vantage point survey effort per season. Additional species recorded with a total of less than 10 records: White-fronted Goose, Greylag Goose, Wigeon, Little Grebe, Marsh Harrier, Whimbrel, Curlew, Common Gull, Merlin.

3.3.2. Monthly variation

The monthly recording rates of regularly occurring species are compared in Table 3.3. The recording rates are used, rather than actual number of records, to standardise comparisons across months with variable survey effort.

For species with low numbers of records, any apparent seasonal variation in recording rates may not be reliable, as this variation may just reflect random sampling effects. Of the more frequently recorded species, several show clear seasonal patterns of variation.

Whooper Swan and Golden Plover are winter visitors and their main seasonal occurrence patterns were typical for these species in Ireland: October – March for Whooper Swan and October – April for Golden Plover. There was also a single Golden Plover record in September.

Lesser Black-backed Gull mainly occurred in summer and autumn (April – August). This probably reflects birds commuting to/from the Lesser Black-backed Gull breeding colony on Lough Ree, as well as autumn migration. The seasonal patterns of the Cormorant and Black-headed Gull recording rates may also reflect birds commuting to/from their Lough Ree breeding colonies.

Lapwing is likely to have two distinct populations using the wind farm site: a breeding population and a wintering population. This is reflected in the recording rates for the Lapwing breeding season (April – July) and main wintering period (November – March). While the recording rates for the breeding and wintering populations were similar, the total bird-secs at potential collision height were much higher in winter.

Table 3.4. Monthly recording rates (records / 60 hours) of flightline records during the vantage point survey.

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mute Swan	1.1	4.0	1.9	0.4	0.0	0.3	0.0	0.0	0.0	1.4	0.4	0.4
Whooper Swan	15.5	5.8	3.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8	12.3	10.5
Teal	0.4	0.4	1.5	0.0	0.3	0.0	0.0	0.0	0.5	0.7	2.3	0.7
Mallard	0.4	6.5	7.8	5.2	5.6	1.4	2.3	0.7	3.4	2.2	4.6	2.2
Cormorant	0.0	0.7	1.5	1.9	3.1	2.5	2.3	0.5	0.9	0.4	0.0	0.0
Little Egret	3.4	1.1	2.2	1.1	10.0	2.8	0.5	2.6	3.2	1.8	3.5	6.5
Grey Heron	0.8	0.7	3.0	3.7	5.6	3.9	5.4	4.8	8.6	6.5	3.1	1.5
Hen Harrier	1.1	1.1	2.2	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.8	1.1
Sparrowhawk	3.4	1.8	2.2	1.9	3.9	1.7	3.8	4.1	2.0	2.5	0.8	3.3
Buzzard	4.2	8.3	10.0	8.9	20.3	21.9	22.8	18.1	16.6	8.3	7.7	6.5
Golden Plover	1.1	1.1	4.4	1.9	0.0	0.0	0.0	0.0	0.2	8.3	4.6	3.3
Lapwing	1.1	2.5	2.6	0.4	4.2	4.7	1.8	0.2	0.0	0.4	2.3	0.7
Snipe	1.5	0.7	0.0	0.0	0.0	1.7	3.3	0.0	3.4	1.1	2.3	1.1
Black-headed Gull	0.0	0.4	1.1	4.4	8.3	14.7	6.2	1.0	0.0	0.0	0.0	0.4
Lesser Black-backed Gull	0.0	0.0	7.8	23.0	30.8	24.4	39.5	33.6	3.2	0.4	0.4	0.4
Kestrel	5.7	5.4	3.3	12.2	12.5	10.8	15.9	11.5	13.4	11.6	10.8	6.2
Peregrine	0.4	0.4	0.7	0.4	0.3	0.8	0.8	0.2	1.1	0.4	0.8	2.2

The data in this table is derived from all the flightline records during timed watches at vantage points included in the collision risk model, including records outside viewsheds. The recording rate is shown as the number of records per 60 hours as this represents the mean vantage point survey effort per month. Additional species recorded with a total of less than 10 records: White-fronted Goose, Greylag Goose, Wigeon, Little Grebe, Marsh Harrier, Whimbrel, Curlew, Common Gull, Merlin.

3.3.3. Diel patterns

The diel distribution of the survey effort is compared to the diel distribution of total daylight hours in Table 3.5 and Table 3.6. There was a fairly even spread of survey effort across most of the day. However, survey effort was lower in the early morning and evening, particularly in summer.

The variation in the diel recording rates of the species included in the collision risk assessment (Section 5) is summarised in Figure 3.3 and Figure 3.4.

The Whooper Swan recording rate and Golden Plover recording rates were higher in the early and mid-morning, which could reflect birds commuting from night roosts. However, there was no corresponding increase in recording rates during the evening commuting period.

The species that were commuting to/from breeding colonies in Lough Ree (Cormorant, Black-headed Gull and Lesser Black-backed Gull) and the raptors (Sparrowhawk and Kestrel) generally had higher recording rates in the middle of the day.

Table 3.5. Diel distribution of survey effort during the summer (April – September) vantage point surveys.

Hour	Daylight hours	VP minutes	VP minutes / daylight hour
Sunrise - 1	183	77	0.4
Sunrise	183	495	2.7
Sunrise + 1	183	647	3.5
Sunrise + 2	183	976	5.3
Sunrise + 3	183	968	5.3
Sunrise + 4	183	1185	6.5
Sunrise + 5	183	1234	6.8
Sunrise + 6	160	1011	6.3
Sunrise + 7	129	930	7.2
Solar Noon			
Sunset - 7	129	1227	9.5
Sunset - 6	160	1540	9.6
Sunset - 5	183	2060	11.3
Sunset - 4	183	1814	9.9
Sunset - 3	183	1511	8.3
Sunset - 2	183	1135	6.2
Sunset - 1	183	1175	6.4
Sunset	183	812	4.4
Sunset + 1	183	283	1.5

The Sunrise + 7 and Sunset – 7 hours included all the time between seven hours after sunrise, or seven hours before sunset, and solar noon. Sunrise and sunset times were calculated using the suncalc package (Thieurmel and Elmarhraoui, 2022) in R version 4.4.4 (R Core Team, 2024).

Table 3.6. Diel variation in survey effort during the winter (October – April) vantage point surveys.

Hour	Daylight hours	VP minutes	VP minutes / daylight hour
Sunrise - 1	182	487	2.7
Sunrise	182	1347	7.4
Sunrise + 1	182	2033	11.2
Sunrise + 2	182	2292	12.6
Sunrise + 3	173	2062	11.9
Sunrise + 4	138	1704	12.4
Solar Noon			
Sunset - 4	138	2276	16.5
Sunset - 3	173	1911	11.0
Sunset - 2	182	1692	9.3
Sunset - 1	182	1804	9.9
Sunset	182	1538	8.5
Sunset + 1	182	622	3.4

The Sunrise + 4 and Sunset - 4 hours included all the time between four hours after sunrise, or four hours before sunset, and solar noon. Sunrise and sunset times were calculated using the suncalc package (Thieurmel and Elmarhraoui, 2022) in R version 4.4.4 (R Core Team, 2024).

3.4. HEIGHT BAND DISTRIBUTION OF FLIGHT ACTIVITY

The height band distribution of the flight activity recorded in the vantage point surveys is summarised in Figure 3.5 and Figure 3.6.

Figure 3.5 shows the distribution of the number of unique records in each height band and includes data from all the vantage points. This indicates the overall height distribution of flight activity.

Figure 3.6 shows the distribution of the total bird-minutes in each height band and only includes data from the vantage points used for the collision risk modelling. This indicates the potential influence of the height band distribution on the collision risk modelling.

Whooper Swan, Little Egret, Grey Heron and Kestrel mainly occurred in the lower height bands (below 50 m), while Cormorant, Sparrowhawk, Golden Plover, Lapwing, Black-headed Gull, Lesser Black-backed Gull and Peregrine often occurred in Band 3 (50-185/190 m).

For Golden Plover, Lapwing and Lesser Black-backed Gull, the bird-minutes were much more concentrated in Band 3 compared to the number of records. This was mainly due to longer flight durations / recorded in Band 3 compared to the lower height bands, while, for Golden Plover, larger flock sizes tended to occur in Band 3.

Very little flight activity was recorded above potential collision height (Band 4).

3.5. LAPWING BREEDING SEASON RECORDS

The Lapwing breeding season records in 2022, 2023 and 2024 are shown in Map 3.10-Map 3.12. Table 3.7 shows the estimated number of breeding pairs, based on the distribution of these records and the numbers of birds observed.

The breeding wader surveys were designed to cover the 500 m buffer around the wind farm site. Therefore, there may have been incomplete and variable coverage of bog sections outside this buffer (the peripheral areas of Derryarouge Bog and most of the eastern section of Derryadd Bog).

Table 3.7. Estimated number of local Lapwing breeding pairs in 2022, 2023 and 2024.

Year	Derryaroge	Derryadd (main)	Derryadd (eastern)	Lough Bannow	Total
2022	5	3	2	3	13
2023	4	7	0	3	14
2024	10	5	3	2	20

Derryadd (main) is the section of Derryadd Bog included in the wind farm site. Derryadd (eastern) is the eastern section of Derryadd Bog outside the wind farm site.

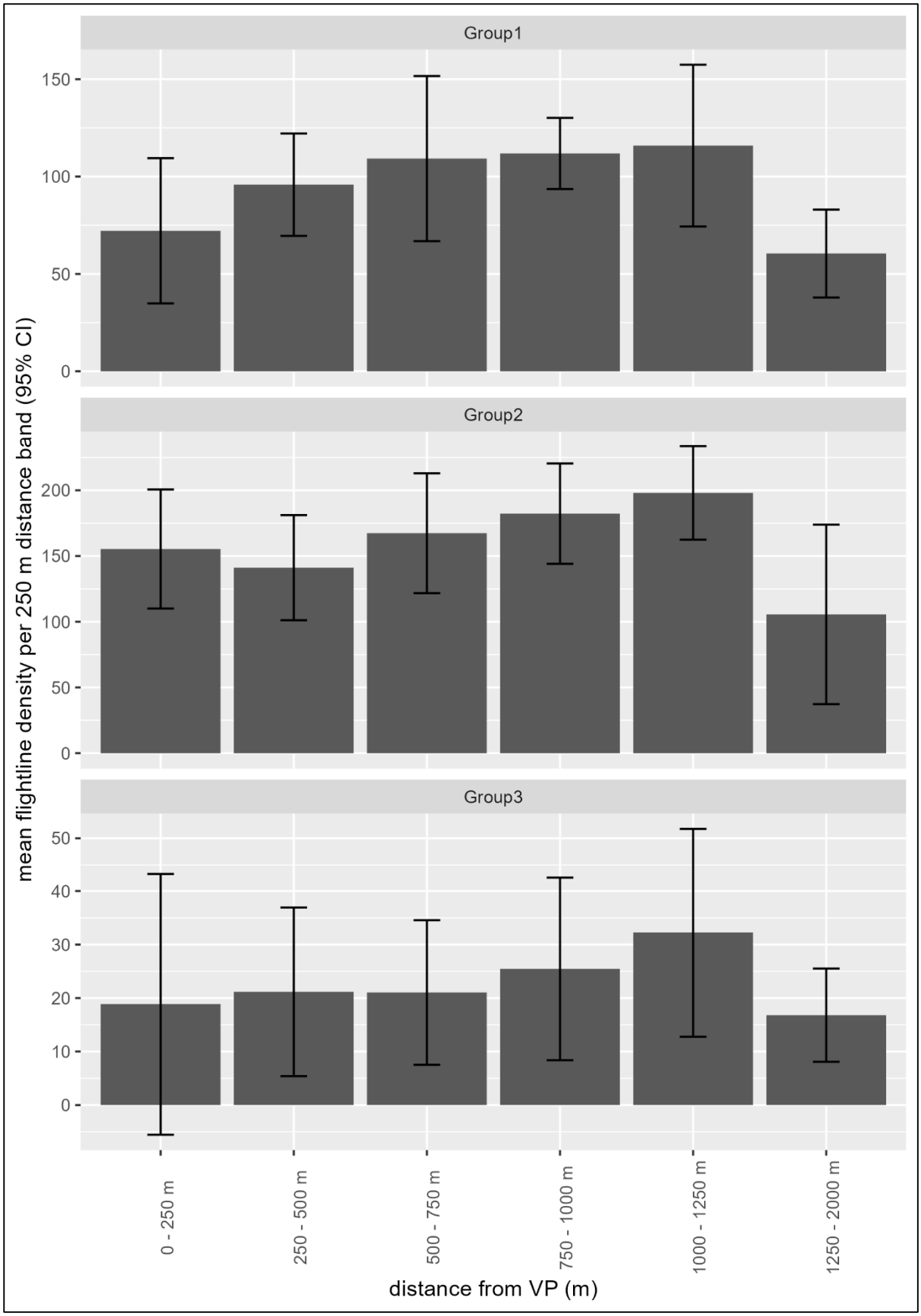


Figure 3.1. Relationship between flightline density and distance from vantage point location in the Fehily Timoney dataset for small (Group 1), medium (Group 2) and large (Group 3) species.

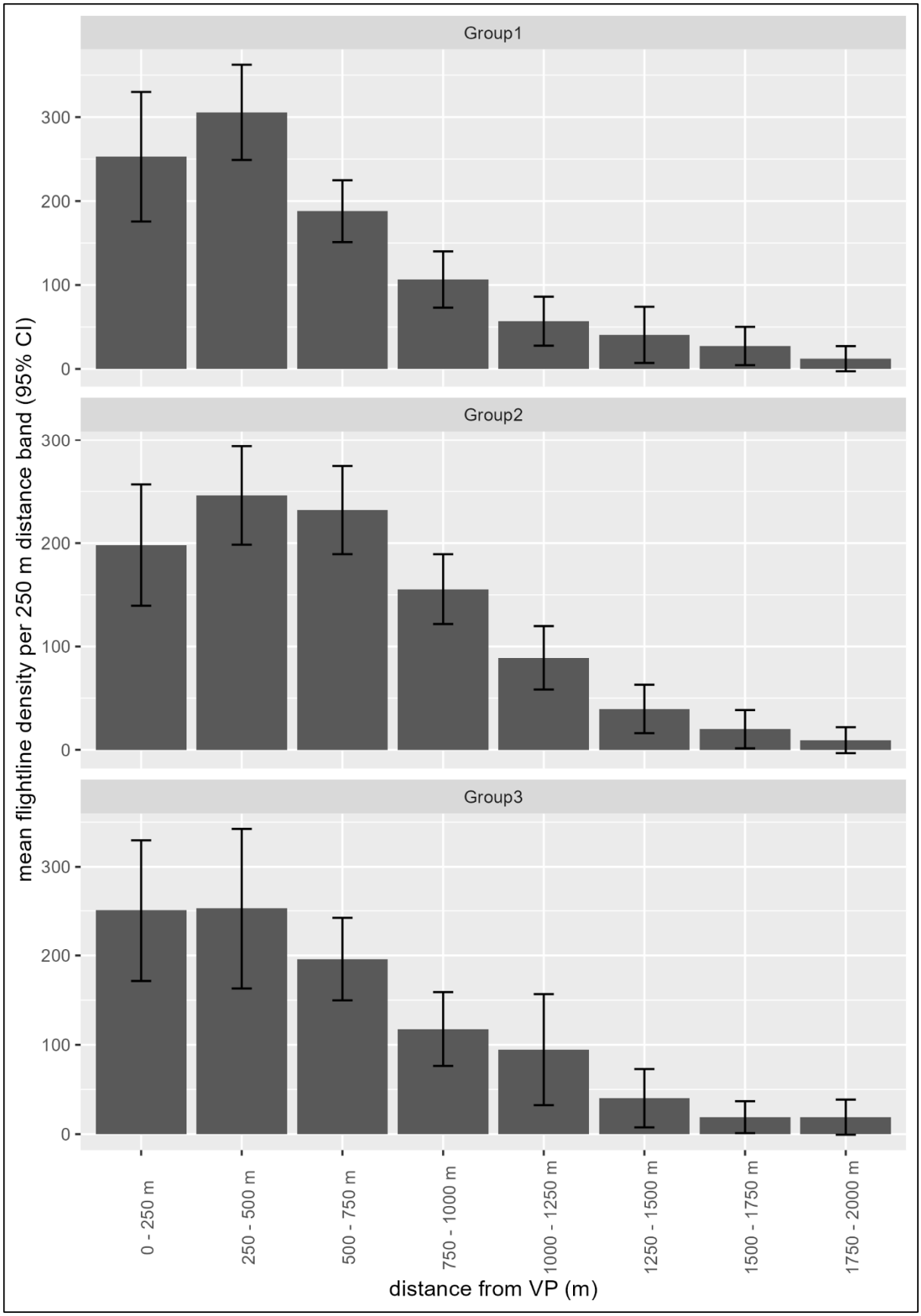
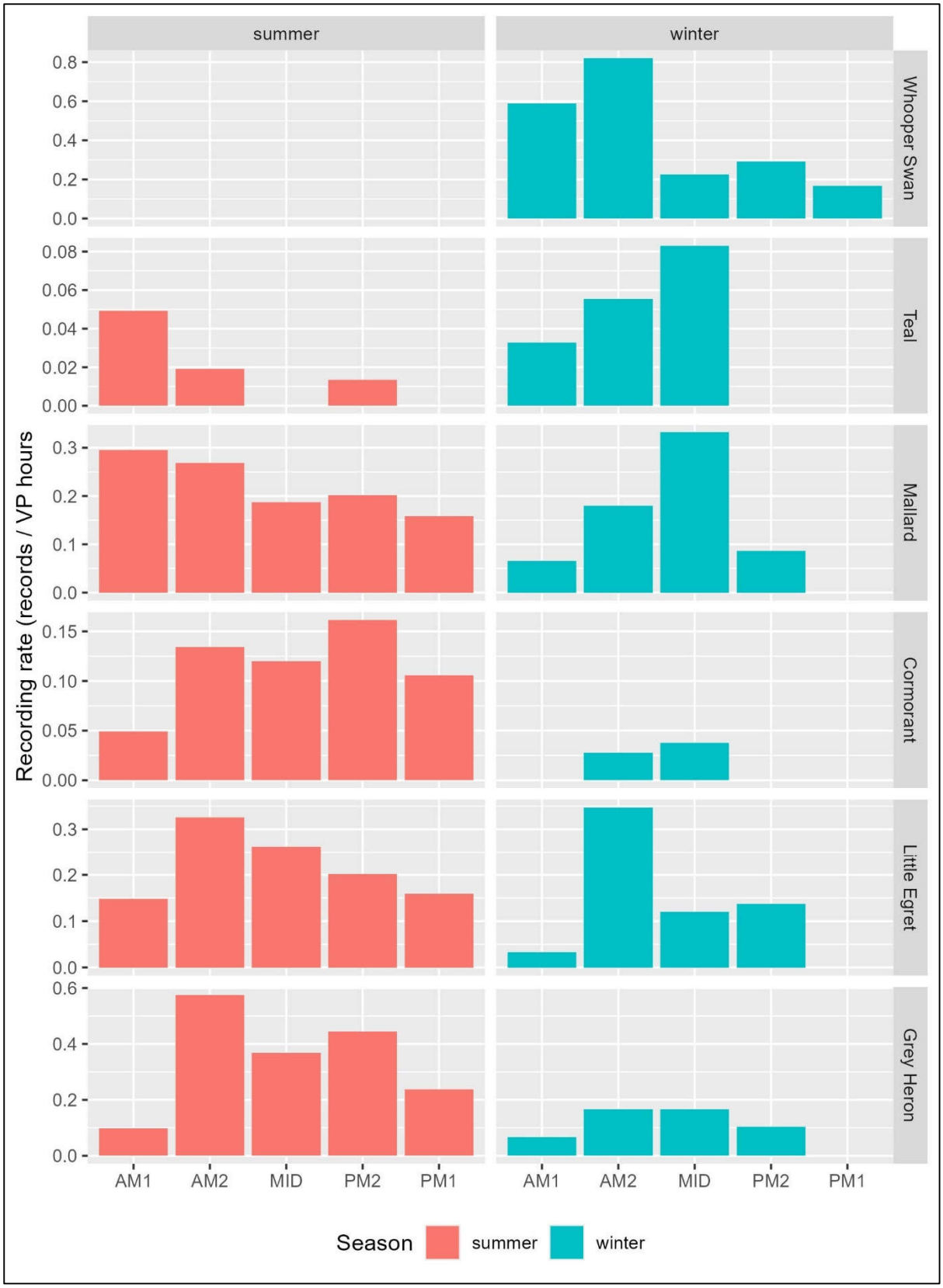


Figure 3.2. Relationship between flightline density and distance from vantage point location in the TOBIN dataset for small (Group 1), medium (Group 2) and large (Group 3) species.



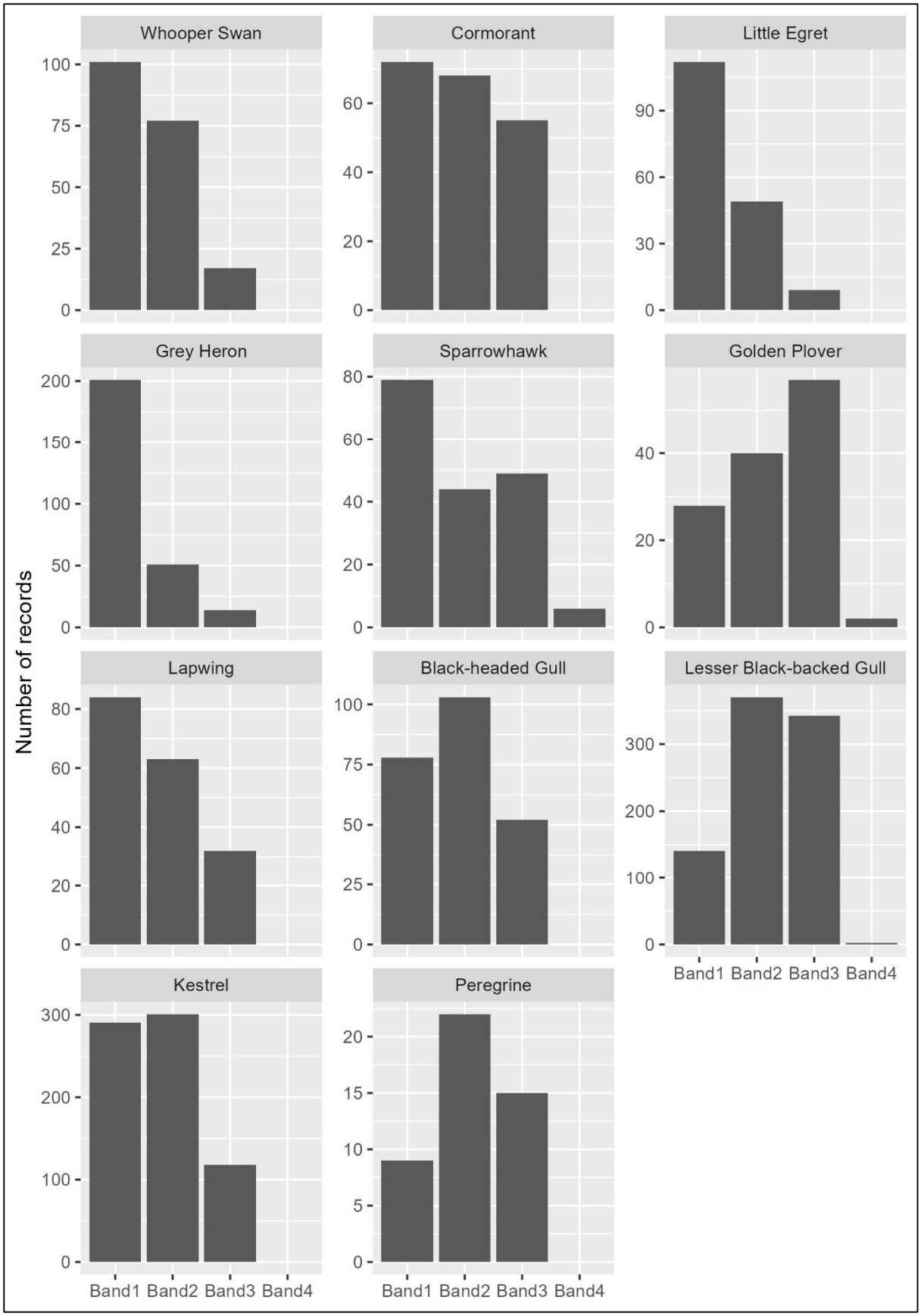
Summer: AM1 = 1 hour before sunrise to 2 hours after sunrise; AM2 = 2 hours after sunrise to 6 hours after sunrise; MID = 6 hours after sunrise to 6 hours before sunset; PM2 = 6 hours before sunset to 2 hours before sunset; PM1 = 2 hours before sunset to 1 hour after sunset. Winter: AM1 = 1 hour before sunrise to 1 hour after sunrise; AM2 = 1 hour after sunrise to 3 hours after sunrise; MID = 3 hours after sunrise to 3 hours before sunset; PM2 = 3 hours before sunset to 1 hour before sunset; PM1 = 1 hour before sunset to 1 hour after sunset.

Figure 3.3. Recording rates of Whooper Swan, Teal, Mallard, Cormorant Little Egret and Grey Heron during the early morning, mid-morning, midday, mid-afternoon and evening periods.



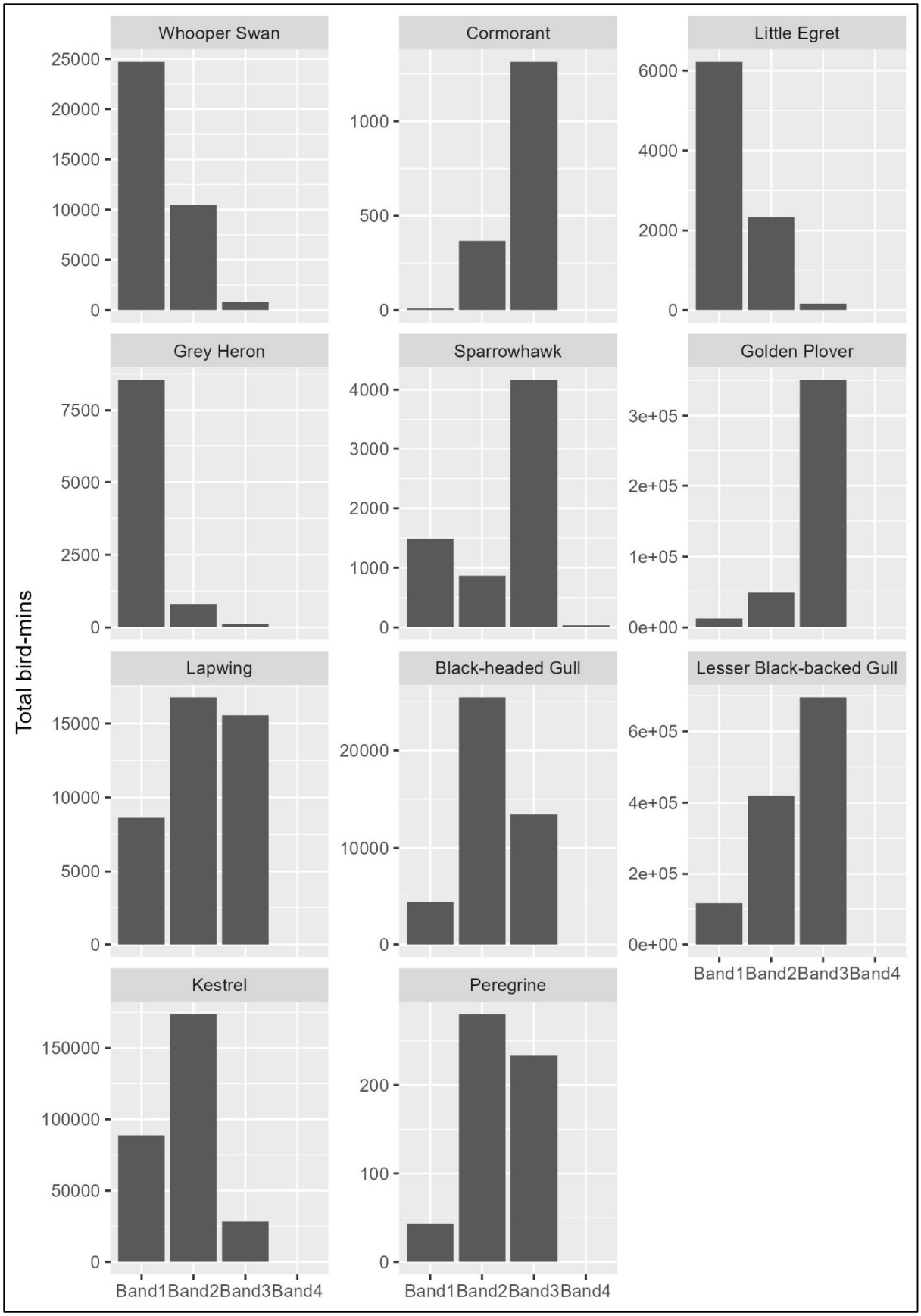
Summer: AM1 = 1 hour before sunrise to 2 hours after sunrise; AM2 = 2 hours after sunrise to 6 hours after sunrise; MID = 6 hours after sunrise to 6 hours before sunset; PM2 = 6 hours before sunset to 2 hours before sunset; PM1 = 2 hours before sunset to 1 hour after sunset. Winter: AM1 = 1 hour before sunrise to 1 hour after sunrise; AM2 = 1 hour after sunrise to 3 hours after sunrise; MID = 3 hours after sunrise to 3 hours before sunset; PM2 = 3 hours before sunset to 1 hour before sunset; PM1 = 1 hour before sunset to 1 hour after sunset.

Figure 3.4. Recording rates of Sparrowhawk, Golden Plover, Lapwing, Black-headed Gull Lesser Black-backed Gull and Kestrel during the early morning, day and evening periods.



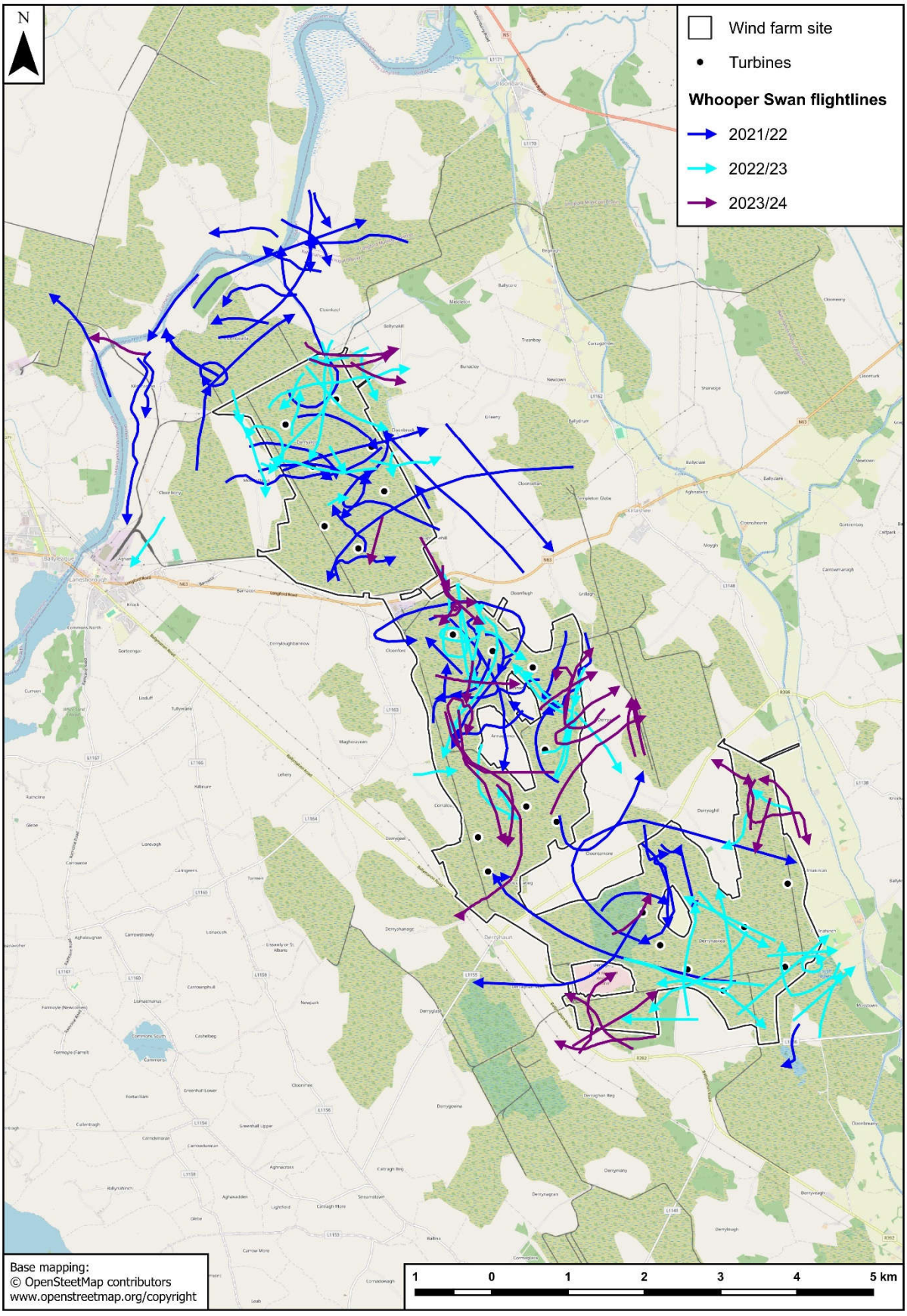
Analyses included all records. Bands: Band1 = 0-25/30 m; Band2 = 25/30-50 m; Band3 = 50-185/190 m; Band4 = > 185/190 m.

Figure 3.5. Height distribution of vantage point survey records.

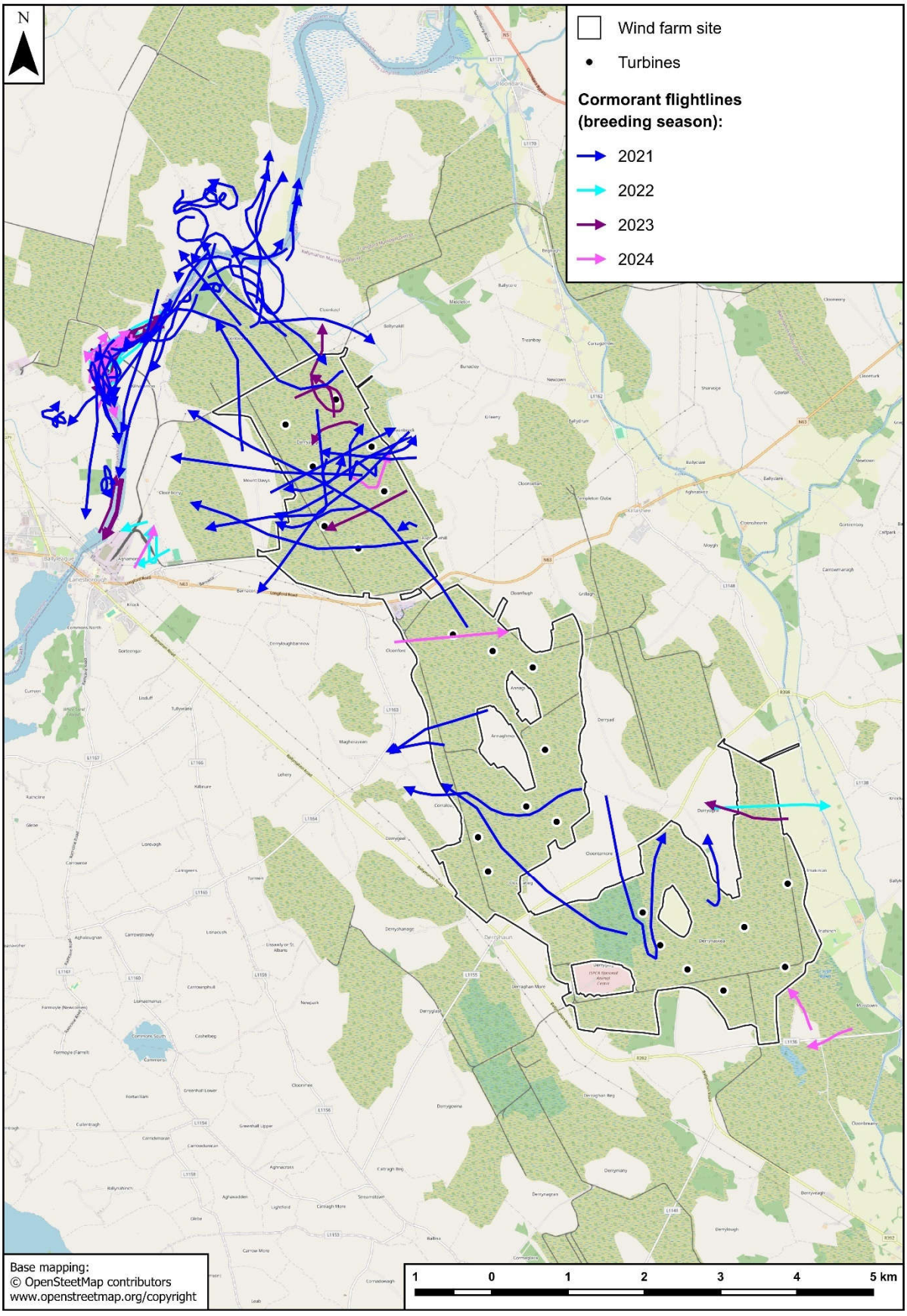


Analyses only included records from the vantage points included in the collision risk modelling. Bands: Band1 = 0-25/30 m; Band2 = 25/30-50 m; Band3 = 50-185/190 m; Band4 = > 185/190 m.

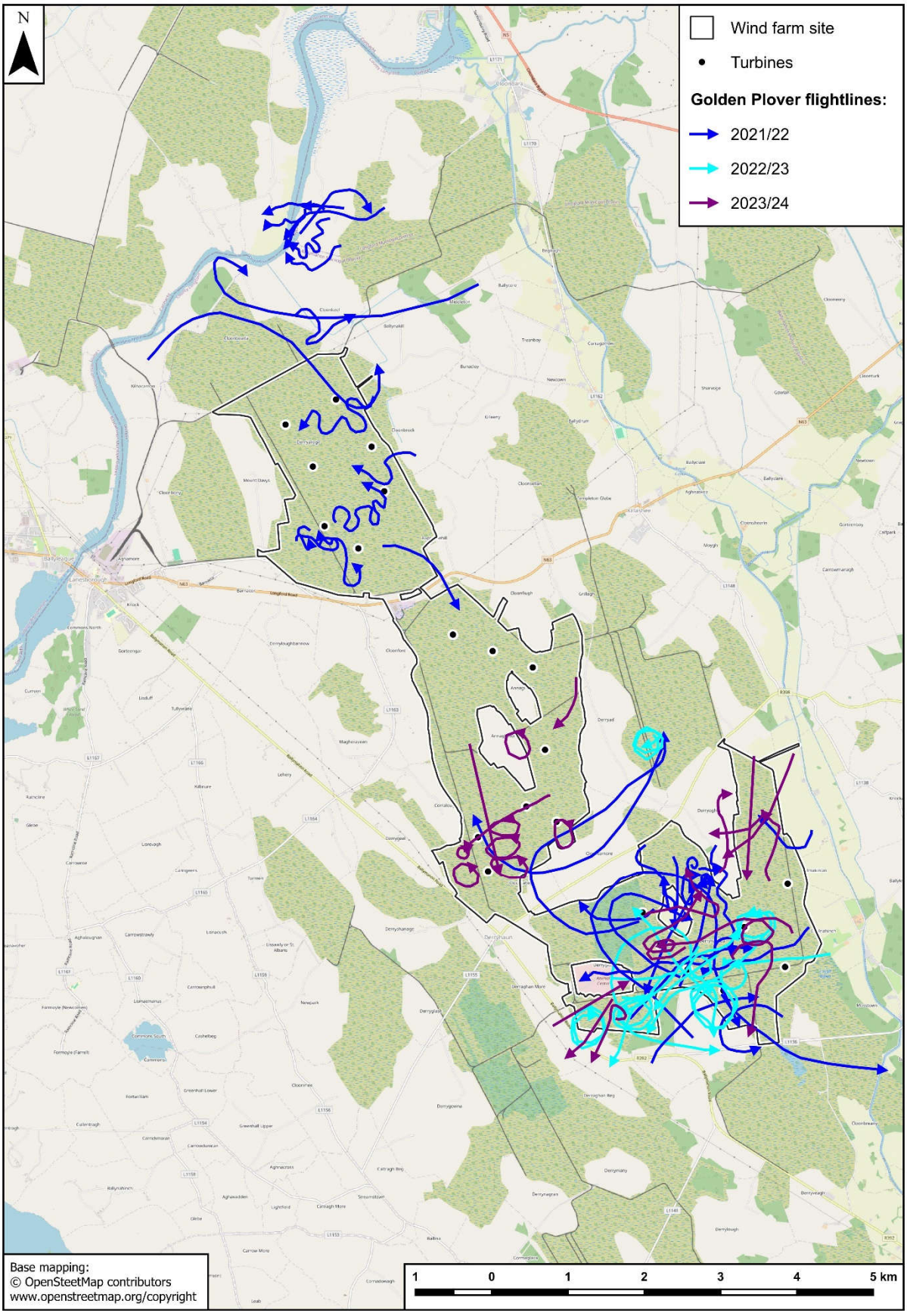
Figure 3.6. Height distribution of the total bird-minutes recorded in the vantage point surveys.



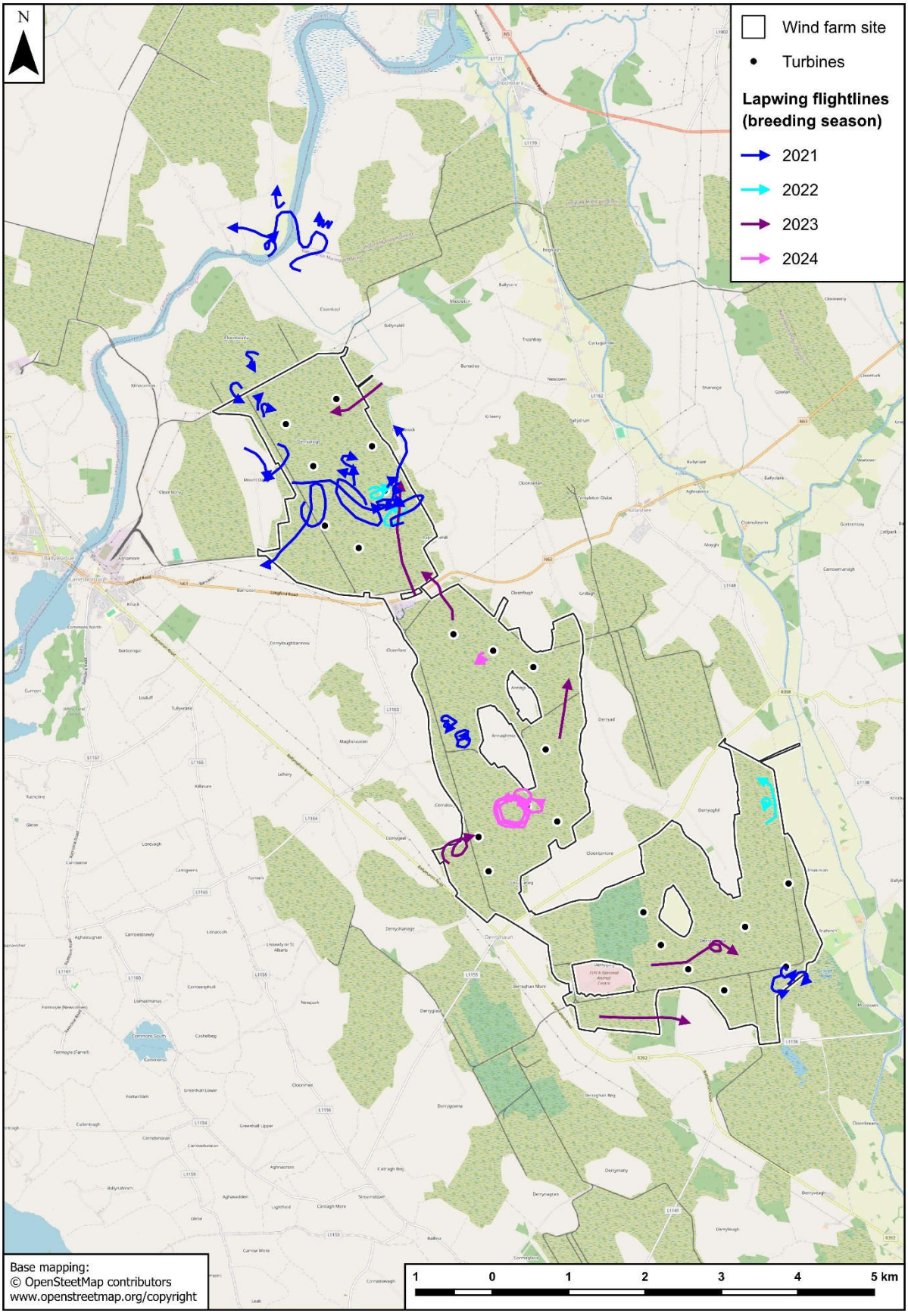
Map 3.1. Whooper Swan flightlines.



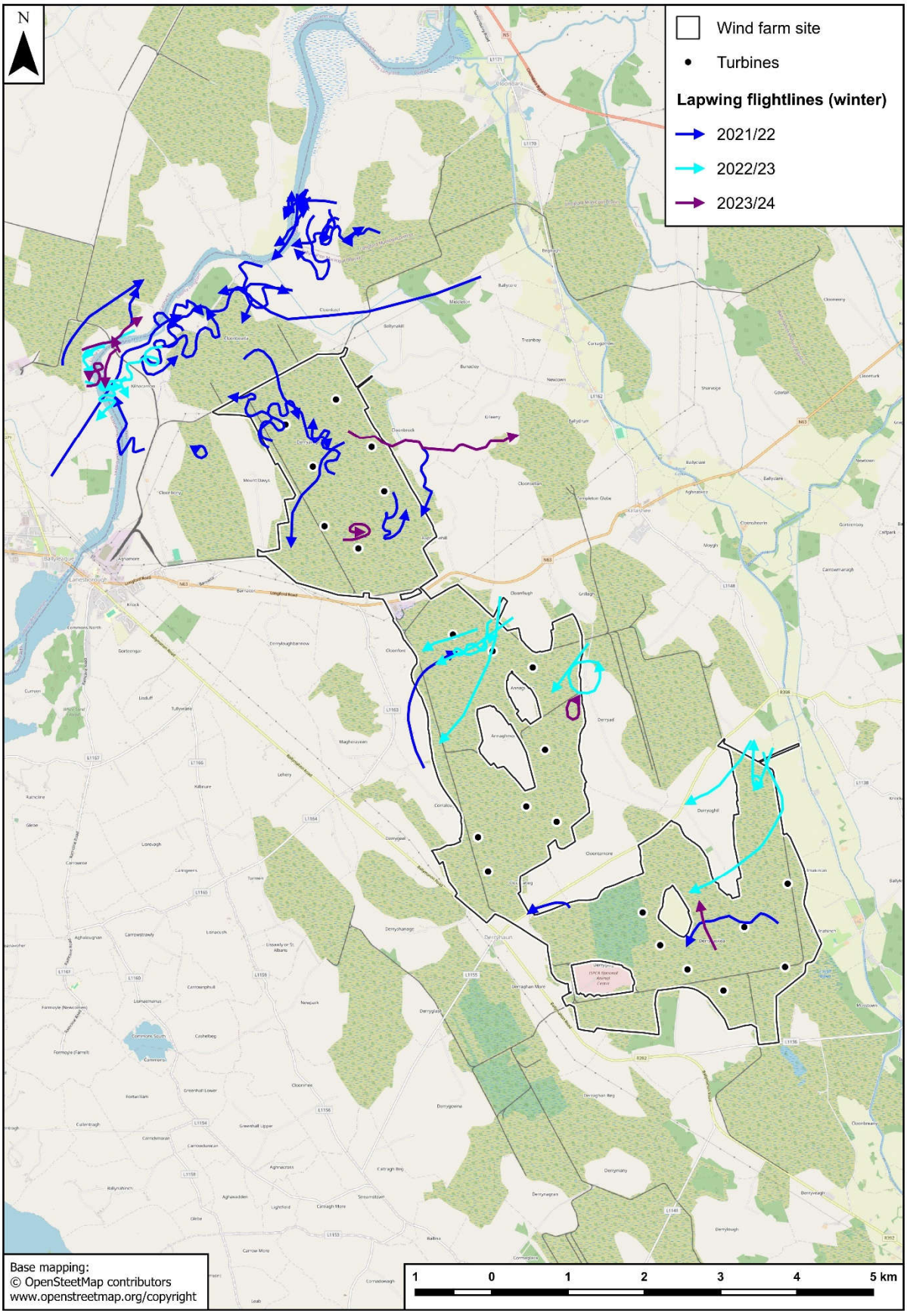
Map 3.2. Cormorant flightlines (breeding season).



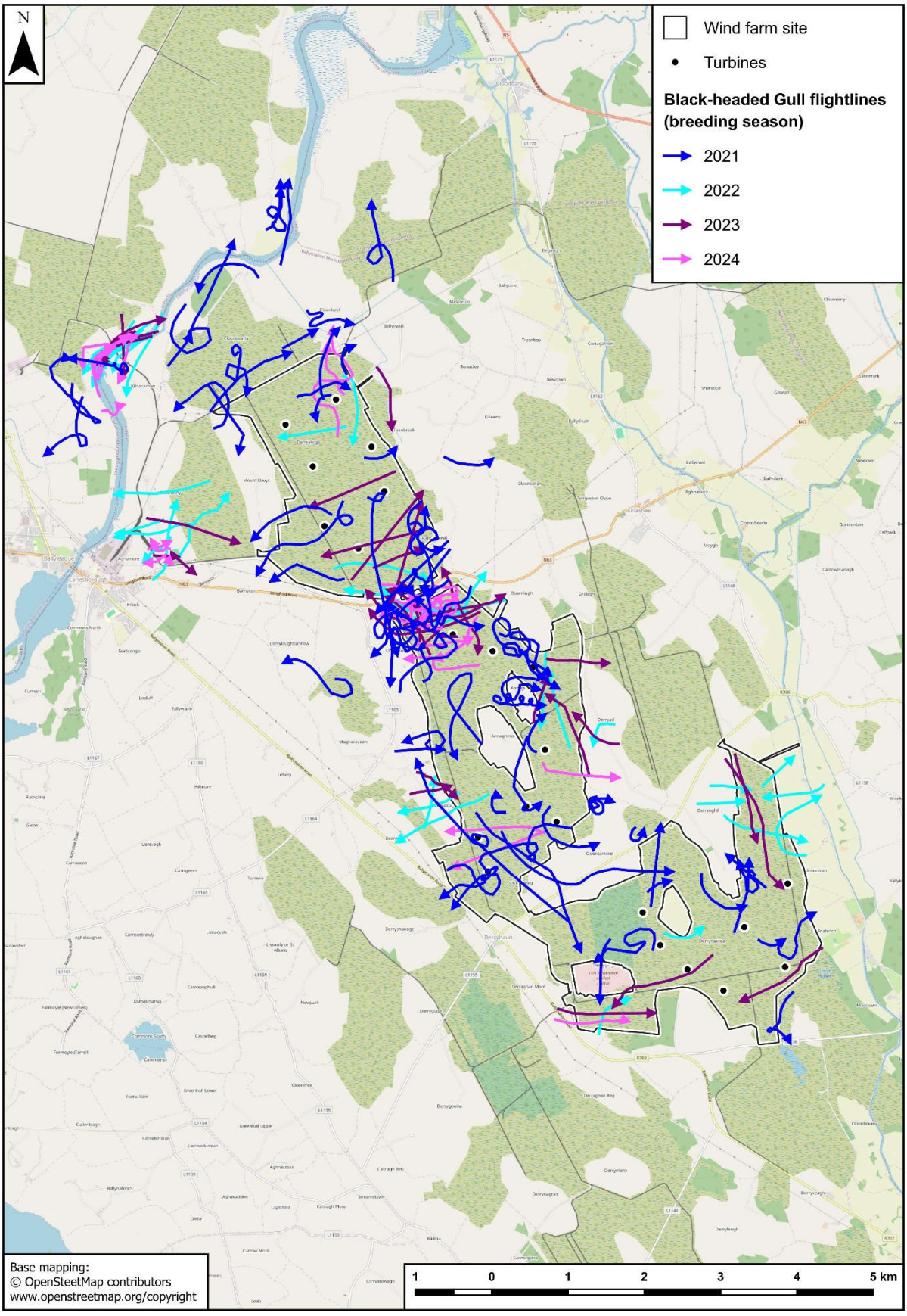
Map 3.3. Golden Plover flightlines.



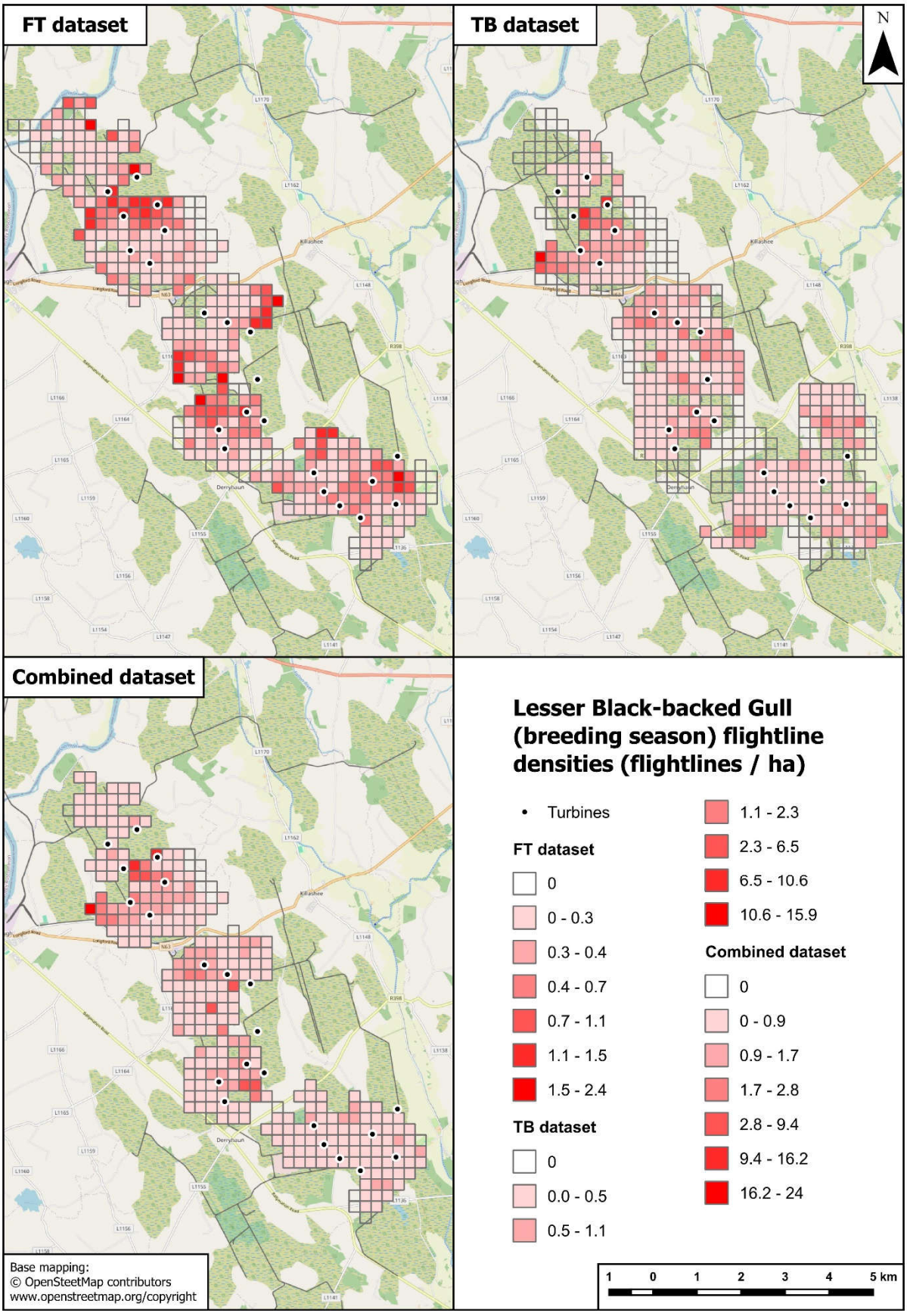
Map 3.4. Lapwing flightlines (breeding season).



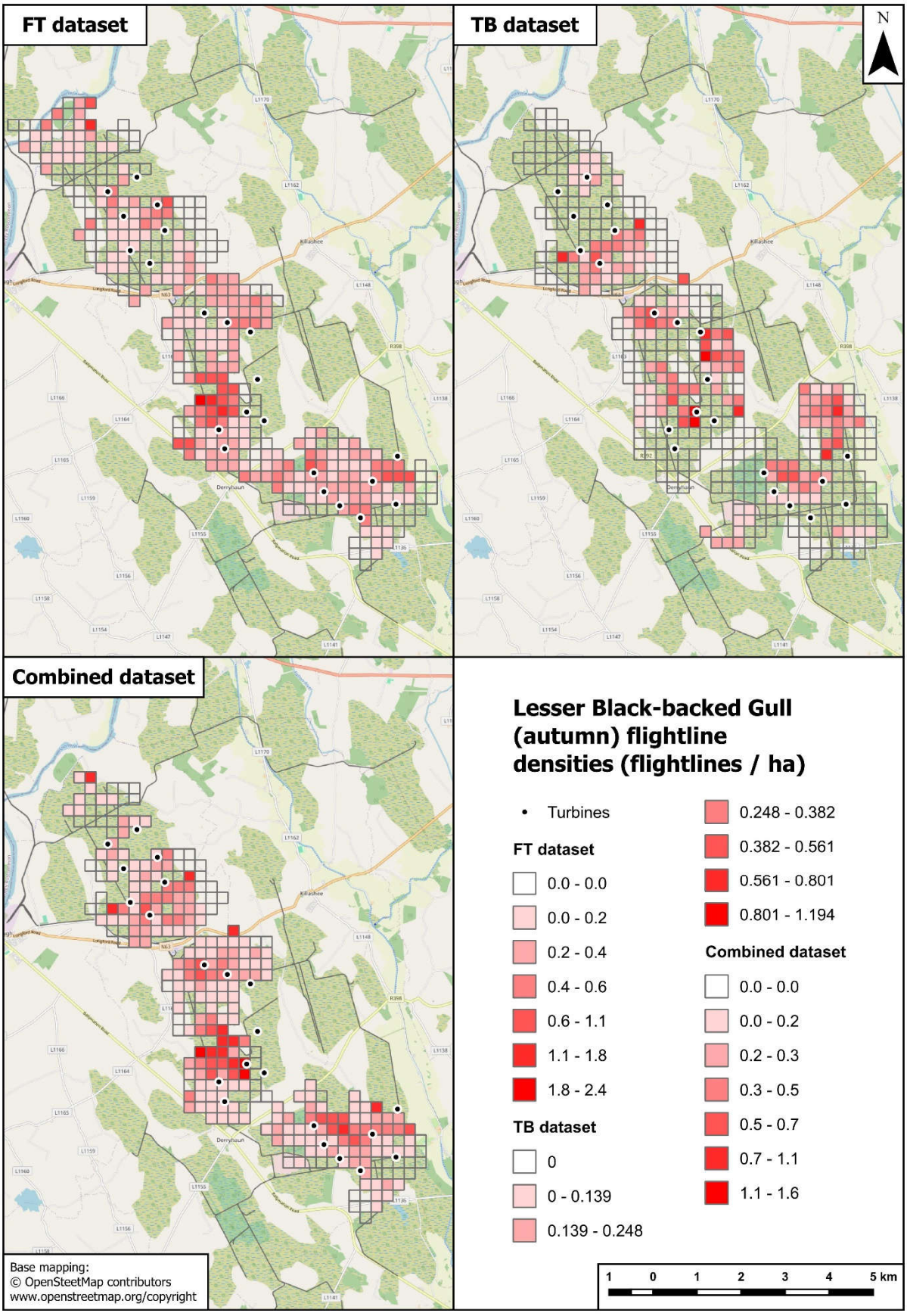
Map 3.5. Lapwing flightlines (winter).



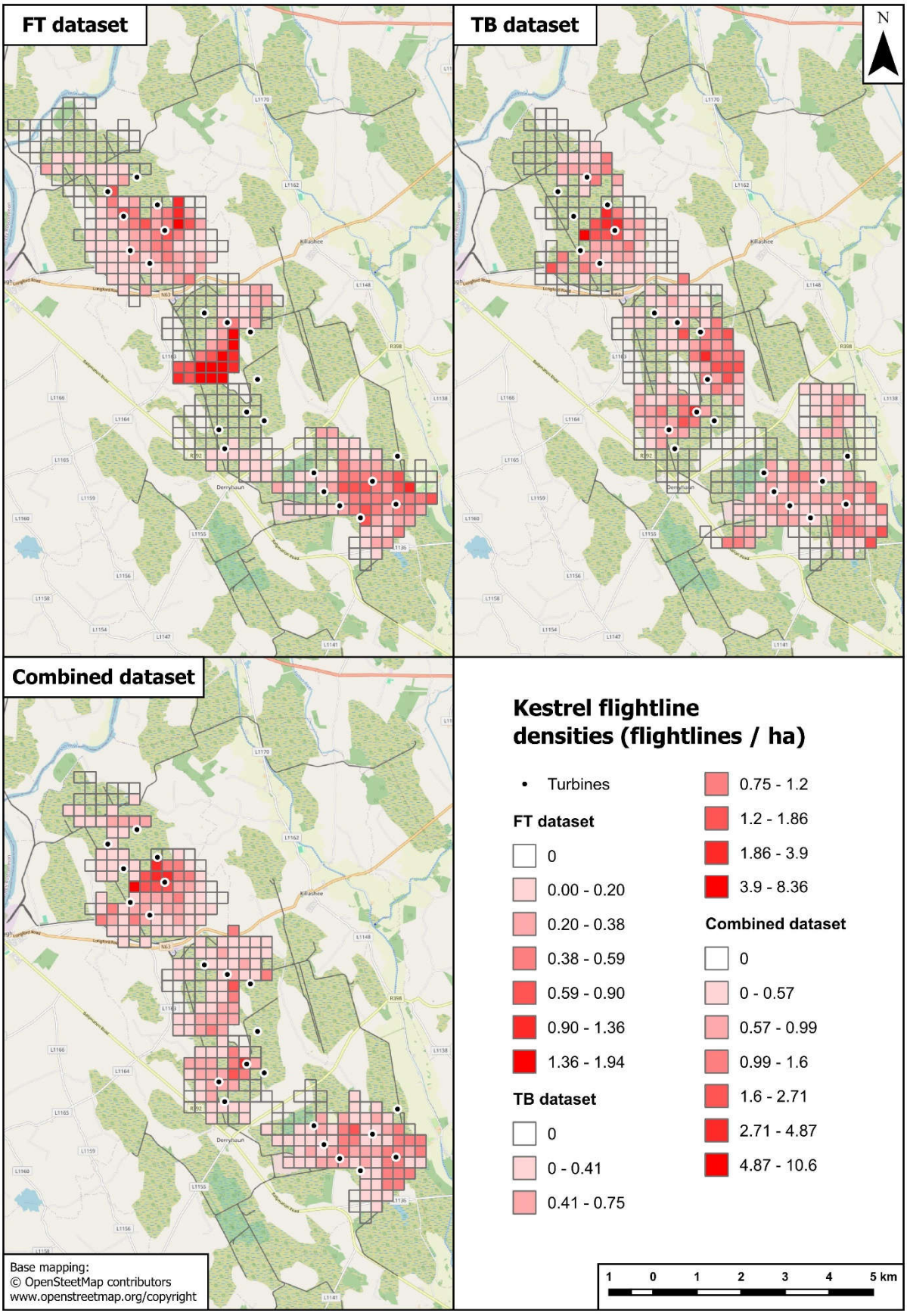
Map 3.6. Black-headed Gull flightlines (breeding season).



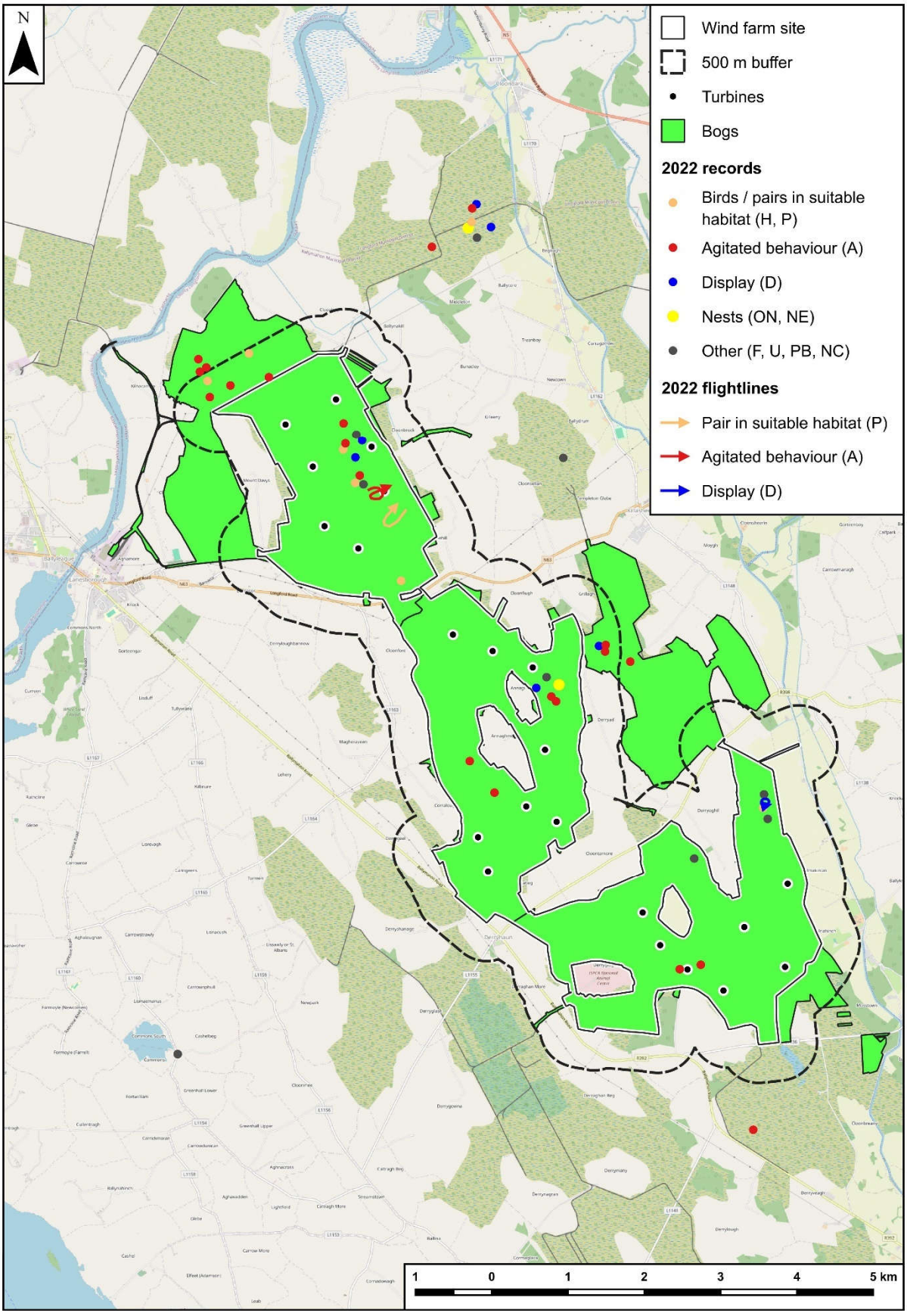
Map 3.7. Lesser Black-backed Gull flightline densities (breeding season).



Map 3.8. Lesser Black-backed Gull flightline densities (autumn).

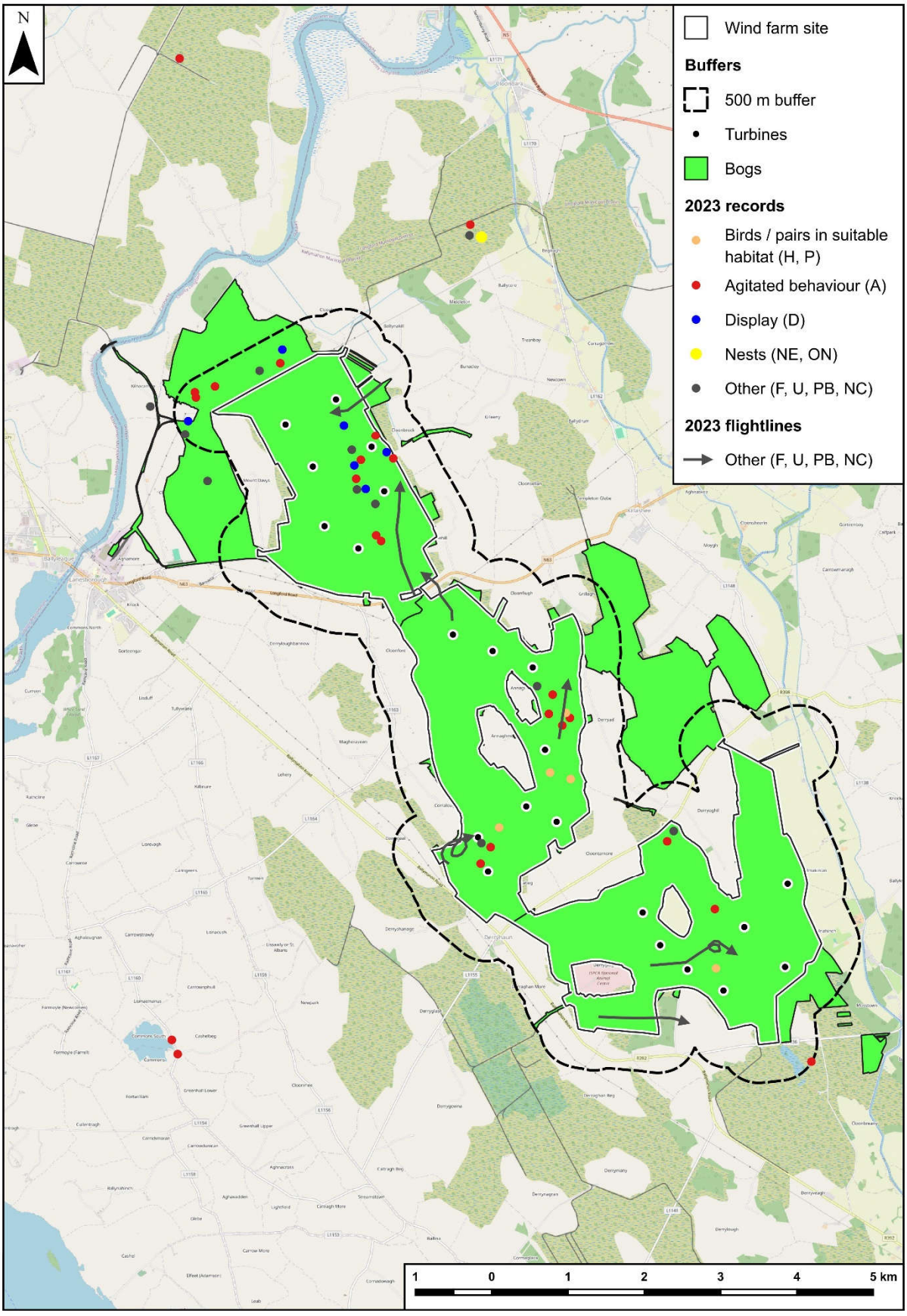


Map 3.9. Kestrel flightline densities.



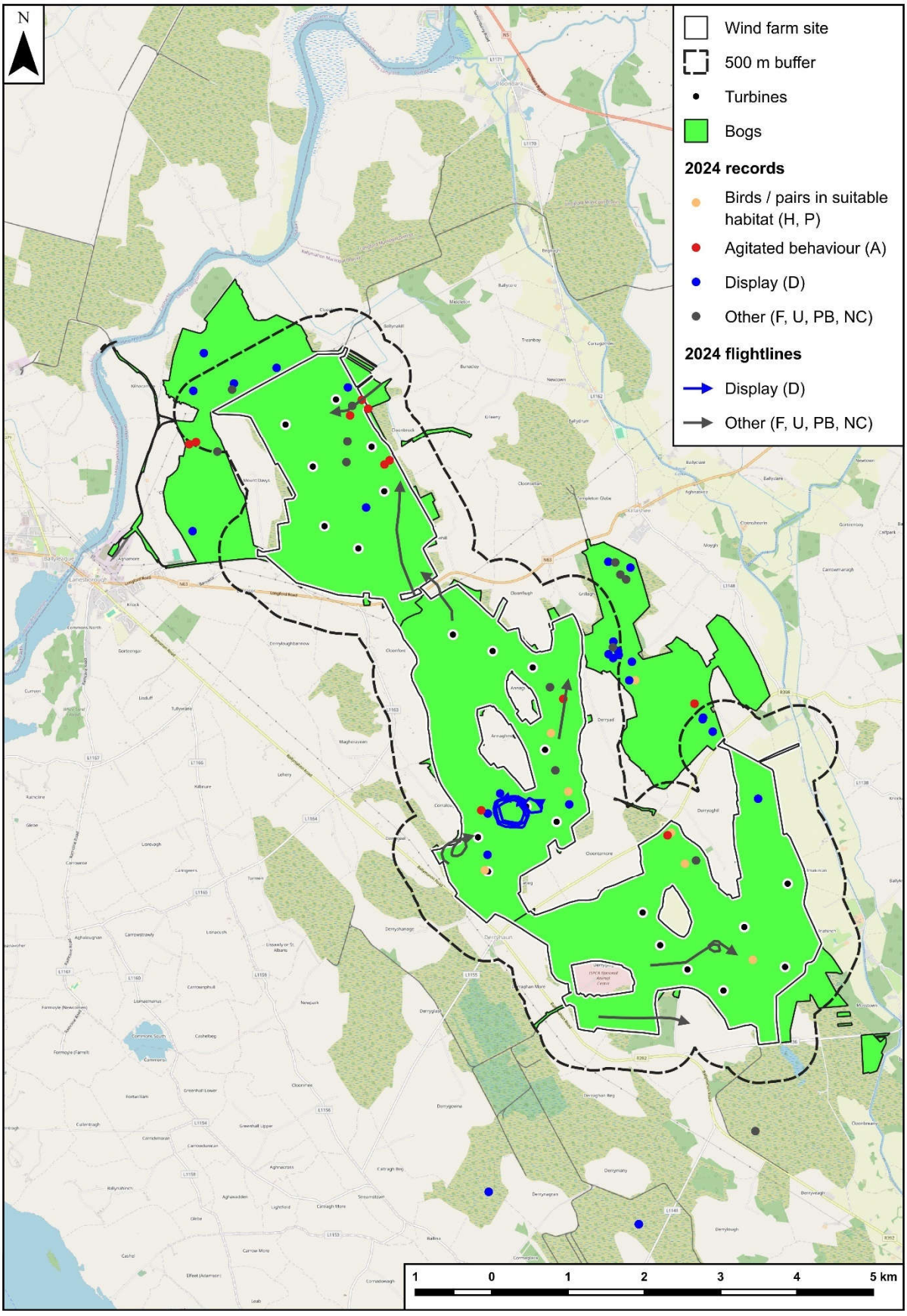
Some records were jittered by distances of up to 150 m to allow display of overlapping records.

Map 3.10. Lapwing breeding season records, 2022.



Some records were jittered by distances of up to 150 m to allow display of overlapping records.

Map 3.11. Lapwing breeding season records, 2023.



Some records were jittered by distances of up to 150 m to allow display of overlapping records.

Map 3.12. Lapwing breeding season records, 2024.

4. COLLISON RISK MODELLING RESULTS

4.1. INTRODUCTION

The results from the sequential stages of the NatureScot collision risk model are described below. The detailed results tables for the intermediate stages are included in Appendix 1, with the final collision risk estimates used for the collision risk assessment presented in this chapter.

4.2. STAGE A: FLIGHT ACTIVITY

4.2.1. Flight activity densities

The monthly daytime flight activity densities calculated in Stage A of the collision risk model are shown in Table A2.1 in Appendix 1. These are the values that would be entered in the *Daytime bird density* row in the Stage A section of the NatureScot spreadsheet if the spreadsheet was being used for the modelling.

There are two sets of values in Table A2.1: one set used the raw viewshed areas and did not correct for distance effects; the other set used viewshed areas that were corrected for distance effects (see Section 2.5.2).

The daytime flight activity densities in Table A2.1 are weighted averages of the flight activity densities for each vantage point. These were calculated using the formula provided in the NatureScot guidance (Equation A2). The weightings included in the averaging did not have large effects on the mean densities. Across all species, using the uncorrected viewshed areas, the weighted averages were a mean of 0.93 times lower than the raw averages (range 0.80 -1.18), while using the corrected viewshed areas, the weighted averages were a mean of 1.02 times higher than the raw averages (range 0.92 -1.22).

4.2.2. Daylight and nighttime hours

The daylight and nighttime hours per month calculated in Stage A of the collision risk model are shown in Table A2.2 in Appendix 1. These are the values that would be entered in the *Daylight hours per month* and *Nighttime hours per month* rows in the Stage A section of the NatureScot spreadsheet if the spreadsheet was being used for the modelling.

4.3. STAGE B: TRANSITS

4.3.1. Nocturnal correction factors

The nocturnal correction factors for species with nocturnal activity rankings greater than one are shown in Table A2.3 in Appendix 1. These represent the correction for nocturnal flight activity that is applied by $f_{night} \times t_{night}$ term in Equation B1. That is the formula that generates the *Projected number of rotor transits* values in the Stage B section of the NatureScot spreadsheet.

4.3.2. Transits

The monthly number of predicted transits calculated in Stage B of the collision risk model are shown in Table A2.4 in Appendix 1. These are the values that are produced in the *Projected number of rotor transits* row in Stage B section of the NatureScot spreadsheet.

4.4. STAGE C: SINGLE TRANSIT COLLISION RISK

4.4.1. Single transit collision risk values

The single transit collision risk values calculated in Stage C of the collision risk model are shown in Table A2.5 in Appendix 1. These are the values that are produced in the *Single transit risk* rows in the Stage C section of the NatureScot spreadsheet.

All the single transit collision risk values used in the collision risk model were calculated using flapping flight (see Section 2.6.4). The single transit collision risks generated by gliding flight were a mean of 97% lower (range 95-99%).

The upwind and downwind single transit collision risks were the same with a pitch angle of 0° but were around 2.1 times higher (range 1.5-2.7) with pitch angles of 15° and 30°.

The single transit collision risks calculated with a pitch angle of 15° were a mean of 1.02 times higher than those calculated with a pitch angle of 0° (range 0.98-1.12). The values calculated with a pitch angle of 30° were a mean of 1.26 times higher than those calculated with a pitch angle of 0° (range 1.05-1.56).

4.4.2. Interpretation of single transit collision risk values

Single transit collision risk values are often misinterpreted. They represent the probability of a collision on a single transit of the rotor airspace. While they contribute to the calculation of the predicted collision risk, they should not be interpreted as providing any information about the likely magnitude of the predicted collision risk. The predicted transits have a much larger influence of the predicted collision risk and a species with a relatively high single transit collision risk may have a very low predicted collision risk if the number of predicted transits is low.

4.5. STAGE D: NON-AVOIDANCE COLLISION RISK

The non-avoidance collision risk values calculated in Stage D of the collision risk model are shown in Table A2.6 in Appendix 1. These are the values that are produced in the *Collision rates before avoidance* row in the Stage D section of the NatureScot spreadsheet.

4.6. STAGE E: COLLISION RISK AFTER AVOIDANCE

4.6.1. Monthly collision risks

The monthly collision risk after avoidance values calculated in Stage E of the collision risk model are shown in Table A2.7 in Appendix 1. These are the values that are produced in the *Collision rates allowing for avoidance* rows in the Stage E section of the NatureScot spreadsheet.

The values in Table A2.7 are shown rounded to two decimal places (following the formatting of the NatureScot spreadsheet. Note that for some cells, non-zero collision risks < 0.005 are shown as 0.00 due to the rounding. All the monthly collision risks for Hen Harrier and Marsh Harrier were less than < 0.005, so these species are not included in Table A2.7.

The annual / seasonal collision risks used for the collision risk assessment were calculated from the unrounded monthly collision risks.

4.6.2. Annual / seasonal collision risks

The annual or seasonal totals of the collision risks are shown in Table A2.8 in Appendix 1.

4.6.3. Collision risks used for the collision risk assessment

The predicted collision risks used for the collision risk assessment are shown in Table 4.1. These are the collision risks that were generated by the most suitable avoidance rate for each species using the single transit collision risk values for a pitch angle of 0°.

4.7. STAGE F: ASSESSING UNCERTAINTY

4.7.1. General

The NatureScot guidance lists three broad categories to consider:

- *uncertainty or variability in flight activity data, including imprecision on flight height estimates and lack of knowledge about night-time behaviour;*
- *uncertainty due to the limitations of the collision model, including the variability of bird dimensions and flight speed, the simplification in shape of a bird and turbine blades; and*

- *uncertainty arising from turbine options yet to be decided, in number, size and speed. These options should include a 'worst case' in terms of the option likely to present greatest bird collision risk.*

In addition, the discussion about Stage F in the NatureScot guidance also refers to the influence of sampling effects and natural variability in bird populations. Other factors that should also be considered are the effects of sampling biases, behavioural effects, and uncertainty about avoidance rates. There are also some issues with aspects of the NatureScot guidance and the design of the NatureScot spreadsheet.

4.7.2. Uncertainty or variability in flight activity data

Sampling effects

The results of the simulations that examined the influence of sampling effects are summarised in Table 4.2.

The under-estimation ratios in this table indicate the potential effect if the vantage point survey happened to sample low levels of flight activity relative to the overall distribution of flight activity across the season: e.g., an under-estimation ratio of 3 indicates that the true collision risk is three times higher than the collision risk estimated from the vantage point survey data.

The over-estimation ratios in this table indicate the potential effect if the vantage point survey happened to sample high levels of flight activity relative to the overall distribution of flight activity across the season: e.g., an over-estimation ratio of 0.5 indicates that the true collision risk is only half the value of the collision risk estimated from the vantage point survey data.

The range from the predicted collision risk multiplied by the over-estimation ratio to the predicted collision risk multiplied by the under-estimation ratio provides an indication of the confidence interval due to sampling effects around the predicted collision risk.

The species with higher under-estimation ratios and lower over-estimation ratios were species with relatively low numbers of records (Mallard, Little Egret and Sparrowhawk) and species that occurred in large flocks (Golden Plover and Lapwing).

For all species, the degree of under- and over-estimation decreased when the simulation was carried out across multiple years, compared to simulations over a single year. While the sampling rate remained the same, the absolute size of the samples increased, which increased the probability of generating more representative samples.

In reality, species populations and/or usage of the wind farm site are likely to vary from year-to-year. This type of variation was not included in the simulations. Therefore, the true potential uncertainty due to sampling effects is likely to fall somewhere between the ranges indicated by the one-year and multiple year simulations. For this assessment, I have used the median of the one-year and multiple year ranges to quantify the potential uncertainty due to sampling effects.

Height distribution

The distribution of flight height estimates is compared between the three surveyors that contributed to the TOBIN dataset in Figure 4.1 and Figure 4.2. Surveyor A consistently recorded lower flight heights than Surveyors B and C.

The potential effects on the predicted collision risks of the apparent under-recording of flight activity at potential collision height by Surveyor A are shown in Table 4.3. This compares the predicted transits from the baseline collision risk model with predicted transits generated by a model that included corrections for the under-recording. The collision risk is directly proportional to the predicted transits.

For Lesser Black-backed Gull, the corrections increased the predicted transits by around 30%. However, for the other species, the corrections had little effect on the number of predicted transits. This reflects the fact that, for many records, the flight durations below potential collision height

recorded by Surveyor A were small, while for some species, the data from Surveyor A had a negligible contribution to the collision risk model.

Nocturnal flight activity

The effects on the nocturnal correction factors of increasing or decreasing the nocturnal activity rankings by one unit caused potential variation in the predicted collision risks of around 10-30% (Table 4.4). The largest effects occurred to the Golden Plover and Lapwing winter populations, while the smallest effects occurred to the Lapwing breeding population and Whimbrel migrating population. This reflected the larger proportion of nighttime hours in winter compared to summer, and, for Whimbrel, the fact that the nocturnal activity ranking value used in the collision risk model was the maximum value.

Natural variability

Species populations show natural variability from year to year due to stochastic effects and external factors (such as cold winters), while some populations may show longer term increasing or decreasing trends.

If the usage of the wind farm site tracks the population variation, the collision risk will change but the significance of the collision risk should remain the same as the population against which the risk is assessed will increase or decrease in line with the changes in the collision risk.

Even if the population remains the same, there may be variation in usage of the wind farm site due to habitat changes within the wind farm site. In the Derryadd Wind Farm site, vegetation succession and changes in drainage management are likely to cause large changes in habitat conditions over the lifetime of the wind farm project. In general, these are likely to favour species such as Sparrowhawk and Kestrel for which the later stages of vegetation succession are likely to provide better habitat conditions. Habitat conditions are likely to be become less suitable for species that exploit recently worked out bog, where vegetation is just beginning to colonise the bare peat, such as Whooper Swan, Golden Plover and Lapwing. However, drainage management may impede vegetation succession if areas are kept wet, while bat mitigation measures may keep areas open around the turbine locations.

Sampling biases

Sampling biases could arise if the survey effort has uneven spatial, seasonal or diel coverage in relation to factors that affect species occurrence.

Uneven spatial coverage is difficult to avoid in vantage point surveys of large wind farm sites due to overlapping viewsheds and the under-detection of distant flightlines. The weighting of viewshed areas and the averaging across vantage points used in Stage A of the collision risk model account to a large degree for these effects.

The survey effort was distributed more or less uniformly across the survey months.

The diel distribution of the survey effort was uneven with lower coverage in the early morning and evening, particularly in summer. This may have resulted in some under-detection of Whooper Swan, flight activity as this species seemed to show higher levels of flight activity in the early – mid-morning, compared to later in the day. Conversely, it may have resulted in over-detection of several other species that showed low levels of flight activity in the early morning and evening.

Behavioural effects

The equation for calculating predicted transits (Equation B1) includes the mean bird flight speed as part of the numerator. However, for Kestrel, a significant proportion of their flight activity will typically involve hovering birds. The flight speed of a hovering Kestrel is close to zero (a small amount of drift in position will often occur during long bouts of hovering). Therefore, using the mean flight speed for Kestrel (10.1 m/sec; Alerstam *et al.*, 2007) in Equation 1 to predict transits of hovering Kestrel is clearly inappropriate and will result in highly inflated estimates.

In the collision risk model for the Castlebanny Wind Farm (Gittings, 2021), I used data collected during the vantage point survey on the duration of hovering flight, and the mean number of hovering positions per second, to calculate separate predicted transits for hovering Kestrels, with the standard collision risk model only used for direct Kestrel flight activity. This resulted in a predicted collision risk that was less than half the value of the collision risk that would have been generated by using the standard model for all Kestrel flight activity.

4.7.3. Uncertainty due to collision risk model limitations

Stage A

The weighted averaging procedure used to calculate mean flight activity densities in Stage A (Equation A2) assumes that longer durations of vantage point surveys and large viewsheds will produce more reliable estimates. This will be true for longer durations of vantage point surveys. However, in general, there is likely to be an increased risk of under-detection of all flightlines in larger viewsheds. More specifically, larger viewsheds usually have higher proportions of their survey area occupied by the more distant parts of the viewshed (Figure 4.3), which is likely to result in increased under-detection of distant flightlines. The adjusted viewshed areas used to correct for distance effects addresses the latter issue.

Stage B

Monthly calculations

Stage B calculates transits separately for each month. By combining Equations A1 and B1, it can be seen that the predicted transits are proportional to the ratio of the total daylight hours to the vantage point survey effort (t_{day}/ t). As vantage point survey effort is usually more or less constant between months the ratio will vary between months with the highest values in mid-winter and the lowest values in mid-summer.

If variation in the distribution of flight activity densities between months reflects real differences in flight activity, the variation in the t_{day}/ t ratio will not affect the reliability of the predicted collision risk. However, in practice, the variation in flight activity densities between months is likely to include a large component that is due to sampling effects. This means that calculating transits separately for each month is likely to exacerbate the influence of sampling effects on the degree of uncertainty around the predicted collision risk. The effects will be reduced for species with non-zero nocturnal flight activity included in the model.

A better procedure would be to calculate flight activity densities for groups of months where there are unlikely to be real differences in flight activity: e.g., across the entire winter period for wintering species. This is the procedure that I have followed in previous collision risk modelling. In fact, the worked example that is provided in Annex 1 of the NatureScot guidance uses this procedure. However, it is not possible to implement this method using the NatureScot spreadsheet. Therefore, as I have tried to implement the calculation procedures in the NatureScot spreadsheet, I have used the monthly calculation of predicted transits, despite the above issues.

Proportion of flight activity at potential collision height

The height bands used for the Fehily Timoney surveys did not exactly match the range of potential collision heights. The lowest and highest height bands each included 5 m within the potential collision height range. To account for the mismatch between the Fehily Timoney height bands and the range of potential collision heights, I included all the flight activity recorded by the Fehily Timoney surveys in the lowest and highest height bands in the modelling of bird transits. This will have caused some over-estimation of the collision risk.

The over-estimation of the collision risk will be most significant for species with high proportions of flight activity in the lowest height band, particularly Whooper Swan, Little Egret and Grey Heron, and, to a lesser extent, Lapwing and Kestrel. However, the effects will have been reduced by the weighting procedure used to calculate mean bird densities cross vantage points. This down-

weighted the contribution of the Fehily Timoney vantage points due to the lower survey effort at these vantage points.

The inclusion of all the flight activity recorded by the Fehily Timoney surveys in the highest height band will have had a negligible effect on the predicted collision risk as very little flight activity was recorded in this height band.

Stage C

Pitch angle

The relationships between single transit collision risks and pitch angles are shown in Figure 4.4 for a selection of the species included in the collision risk model. The single transit collision risk values showed little variation up to pitch values of around 10-20°, after which they increased sharply with increasing pitch. The inflection point was related to flight speed (Figure 4.4): the start of the increase in single transit collision risk with pitch angle occurred at around 8-10° in the species with the slowest flight speeds (Kestrel and Little Egret), and at around 15-20° in the species with the fastest flight speeds (Golden Plover and Teal).

As discussed above, monitoring data indicates that pitch angles at onshore wind farms in Ireland rarely exceed 9°. In the pitch angle range from -5° to 9°, the maximum collision probability for most species occurred at a pitch angle of 0° (Figure 4.6). The exceptions were Kestrel and Little Egret, where the inflection point occurred before 9° and the collision probability with a pitch angle of 9° was slightly higher than the collision probability at 0°. However, the difference was marginal.

Rotation speed

The relationships between single transit collision risks and rotation speeds are shown in Figure 4.4 for the species included in the collision risk model.

The effects of variation in rotation speed generally increased with body size, but species with slow flight speeds (Sparrowhawk, Kestrel and Little Egret) were exceptions to this pattern. For small species like Golden Plover, the variation in rotation speed, within the operational speed ranges, had negligible effects on the single transit collision risks. However, for large species like Whooper Swan and Cormorant, there was a 2-3% variation in single transit collision risks across the operational speed ranges. For these two species, this variation would result in an increase in the predicted collision risk of up to 1.5 times between the minimum and maximum rotation speeds.

Overall effects

There are a number of other sources of potential uncertainty in the calculations of single transit collision risks. Band (2024) notes that “having regard for the various simplifications in the model, and the potential sources of under- and over-estimation …, it is judged that [Stage C] of the model should be regarded as indicative of collision probability within around ± 20%”.

Stage E

The avoidance rates that are applied in the Stage E of the collision risk model have large effects, causing 20-fold to 500-fold decreases in the predicted collision risk. However, the evidence for most avoidance rates used in collision risk modelling for onshore wind farms is very limited.

The default avoidance rate of 98% was applied when species-specific avoidance rates are not available. In most cases, the latter were higher: 99% for Hen Harrier, 99.2% for Black-headed Gull and Common Gull, 99.5% for Mute Swan, Whooper Swan and Lesser Black-backed Gull, 99.6-99.8% for Golden Plover, and 99.8% for Greylag Goose. Increasing the avoidance rate from 98% to 99% halves the predicted collision risk, while increasing the avoidance rate from 98% to 98.8% causes a 10-fold reduction in the predicted collision risk.

The exception was Kestrel, which has a recommended avoidance rate of 95% (SNH, 2018). This causes a 2.5-fold increase in the collision risk compared to the default avoidance rate of 98%. However, the evidence for the Kestrel avoidance rate is weak. The avoidance rate is described as being based on: “sufficient evidence from flight behaviour (including hovering) and collision

monitoring studies for vulnerability to collisions". The cited source (Whitfield and Madders, 2006) is, in fact, a review of avoidance rates for Red Kite. The information on Kestrel is derived from an analysis which finds a significant correlation between the "numbers of individuals seen" against numbers of carcasses found for 16 raptor species at a single wind farm in Spain. Kestrel is a large outlier above the regression line, and this appears to be the only empirical evidence that has been used by Scottish Natural Heritage to support the 95% avoidance rate for Kestrel. However, even taken at face value, all this analysis does is indicate that Kestrel has a lower avoidance rate than other raptor species, but it does not provide any quantitative data that can be used to estimate the avoidance rate. More seriously, this analysis does not account for behavioural and ecological differences between species that may affect the relationship between bird activity and collisions. It is also subject to the perennial problem with analyses of collision rates: the small absolute numbers of collisions which means that random sampling error may have significant effects.

4.7.4. Uncertainty due to turbine options

This collision risk model is based on a fixed turbine model so there is no uncertainty due to turbine options.

4.7.5. Overall uncertainty

Table 4.5 summarises the quantitative uncertainty estimates discussed above and provides an overall quantitative uncertainty estimate. It also indicates where there are other significant factors, which couldn't be quantified, that are likely to affect the uncertainty around the predicted collision risk.

Table 4.1. Collision risks used for the collision risk assessment.

Species	Season	Avoidance rate	Collision risks with distance effects	
			uncorrected	corrected
Mute Swan	all year	0.995	0.00	0.01
Whooper Swan	winter	0.995	0.17	0.30
Greylag Goose	all year	0.998	0.00	0.00
Wigeon	winter	0.980	0.00	0.01
Teal	all year	0.980	0.23	0.32
Mallard	all year	0.980	0.38	0.64
Cormorant	breeding	0.980	0.14	0.22
	non-breeding	0.980	0.01	0.02
Little Egret	all year	0.980	0.20	0.34
Grey Heron	all year	0.980	0.13	0.21
Little Grebe	all year	0.980	0.00	0.01
Marsh Harrier	all year	0.980	0.00	0.00
Hen Harrier	non-breeding	0.990	0.00	0.00
Sparrowhawk	all year	0.980	0.13	0.24
Buzzard	all year	0.980	1.36	2.57
Golden Plover	summer	0.996	0.02	0.04
	summer	0.998	0.01	0.02
	winter	0.996	2.33	6.84
	winter	0.998	1.16	3.42
Lapwing	breeding	0.980	0.23	0.39
	autumn	0.980	0.05	0.07
	winter	0.980	0.66	1.68
Whimbrel	migration	0.980	2.21	3.08
Curlew	breeding	0.980	0.01	0.02
	non-breeding	0.980	0.01	0.01
Black-headed Gull	breeding	0.992	0.31	0.56
	non-breeding	0.992	0.00	0.01
Common Gull	all year	0.992	0.00	0.00
Lesser Black-backed Gull	breeding	0.995	0.98	1.82
	autumn	0.995	0.22	0.38
	winter	0.995	0.01	0.02
Kestrel	all year	0.950	1.69	3.44
Merlin	all year	0.980	0.00	0.00
Peregrine	all year	0.980	0.03	0.05

Table 4.2. Potential under- and over-estimation of the true collision risks due to sampling effects in the flight activity data.

Species	Season	Years	Under-estimation ratio	Over-estimation ratio
Whooper Swan	winter	1	1.92	0.61
		3	1.42	0.76
Mallard	all year	1	2.26	0.56
		3	1.46	0.71
Cormorant	breeding	1	2.08	0.62
		4	1.42	0.79
Little Egret	all year	1	3.64	0.49
		3	1.81	0.66
Grey Heron	all year	1	1.95	0.60
		3	1.42	0.74
Sparrowhawk	all year	1	2.55	0.55
		3	1.71	0.65
Golden Plover	winter	1	3.36	0.46
		3	1.82	0.61
Lapwing	breeding	1	5.44	0.42
		4	1.93	0.61
	winter	1	3.48	0.40
		3	1.86	0.57
Black-headed Gull	breeding	1	1.73	0.69
		4	1.31	0.79
Lesser Black-backed Gull	breeding	1	1.34	0.79
		4	1.15	0.88
Kestrel	all year	1	1.58	0.68
		3	1.29	0.78

The under-estimation ratio is the ratio of the lower limit of the 95% confidence interval of the mean flight activity density in the sampled flight activity distributions to the mean flight activity density in the overall dataset. The over-estimation ratio is the ratio of the upper limit of the 95% confidence interval of the mean flight activity density in the sampled flight activity distributions to the mean flight activity density in the overall dataset.

Table 4.3. Predicted transits calculated using flight activity data with the height band distribution recorded by Surveyor A in the TOBIN dataset corrected for potential under-estimation of flight activity at potential collision height, compared to the predicted transits calculated using uncorrected data.

Species	Predicted transits		Increase factor
	uncorrected	corrected	
Whooper Swan	506	517	1.02
Mallard	476	492	1.03
Cormorant	112	112	1.00
Little Egret	200	201	1.00
Grey Heron	105	106	1.01
Sparrowhawk	115	115	1.00
Buzzard	1383	1390	1.01
Lapwing	1299	1299	1.00
Black-headed Gull	975	1037	1.06
Lesser Black-backed Gull	5101	6651	1.30
Kestrel	831	842	1.01

Table 4.4. Variation in nocturnal correction factors generated by decreasing or increasing the nocturnal activity rankings by one unit, and the range of effects on the predicted collision risks generated by this variation.

Species	Season	NAR value	Nocturnal correction factors calculated using			Range of effects on collision risk
			NAR-1	NAR	NAR+1	
Wigeon	winter	3	1.39	1.78	2.16	0.78-1.21
Teal	all year	3	1.24	1.48	1.71	0.84-1.16
Mallard	all year	3	1.24	1.48	1.71	0.84-1.16
Little Egret	all year	2	1.00	1.24	1.48	0.81-1.19
Grey Heron	all year	2	1.00	1.24	1.48	0.81-1.19
Golden Plover	winter	2	1.00	1.35	1.69	0.74-1.25
Lapwing	breeding	2	1.00	1.13	1.26	0.88-1.12
Lapwing	winter	2	1.00	1.40	1.81	0.71-1.29
Whimbrel	migration	5	1.43	1.57	-	0.91-1.00

For Whimbrel, the maximum potential value of the nocturnal activity ranking was used, so a NAR+1 nocturnal correction factor is not included in this table.

Table 4.5. Overall uncertainty factors that should be applied to the predicted collision risks.

Species	Season	Sampling effects	Height bands	Nocturnal activity	Single transit risk	Overall	Other factors
Whooper Swan	winter	0.69-1.67	1.02	1.00	0.8-1.2	0.55-2.04	
Teal	winter	-	-	0.84-1.16	0.8-1.2	-	↓
Mallard	all year	0.64-1.86	1.03	0.84-1.16	0.8-1.2	0.43-2.67	↓
Cormorant	breeding	0.71-1.75	1.00	1.00	0.8-1.2	0.57-2.10	↓
Little Egret	all year	0.58-2.73	1.00	0.81-1.19	0.8-1.2	0.38-3.90	↓
Grey Heron	all year	0.67-1.69	1.01	0.81-1.19	0.8-1.2	0.43-2.44	↓
Sparrowhawk	all year	0.60-2.13	1.00	1.00	0.8-1.2	0.48-2.56	↓
Golden Plover	winter	0.54-2.59	1.00	0.74-1.25	0.8-1.2	0.32-3.89	
Lapwing	breeding	0.52-3.69	1.00	0.88-1.12	0.8-1.2	0.37-4.96	
	winter	0.49-2.67	1.00	0.71-1.29	0.8-1.2	0.28-4.13	
Black-headed Gull	breeding	0.74-1.52	1.06	1.00	0.8-1.2	0.59-1.93	
Lesser Black-backed Gull	breeding	0.84-1.25	1.30	1.00	0.8-1.2	0.67-1.95	
Kestrel	all year	0.73-1.44	1.01	1.00	0.8-1.2	0.58-1.75	↓

The uncertainty factors indicate the degree by which the predicted collision risk should be increased or decreased to indicate the range of uncertainty around the estimate. A value of 1.00 means that the relevant issue did not cause measurable uncertainty.

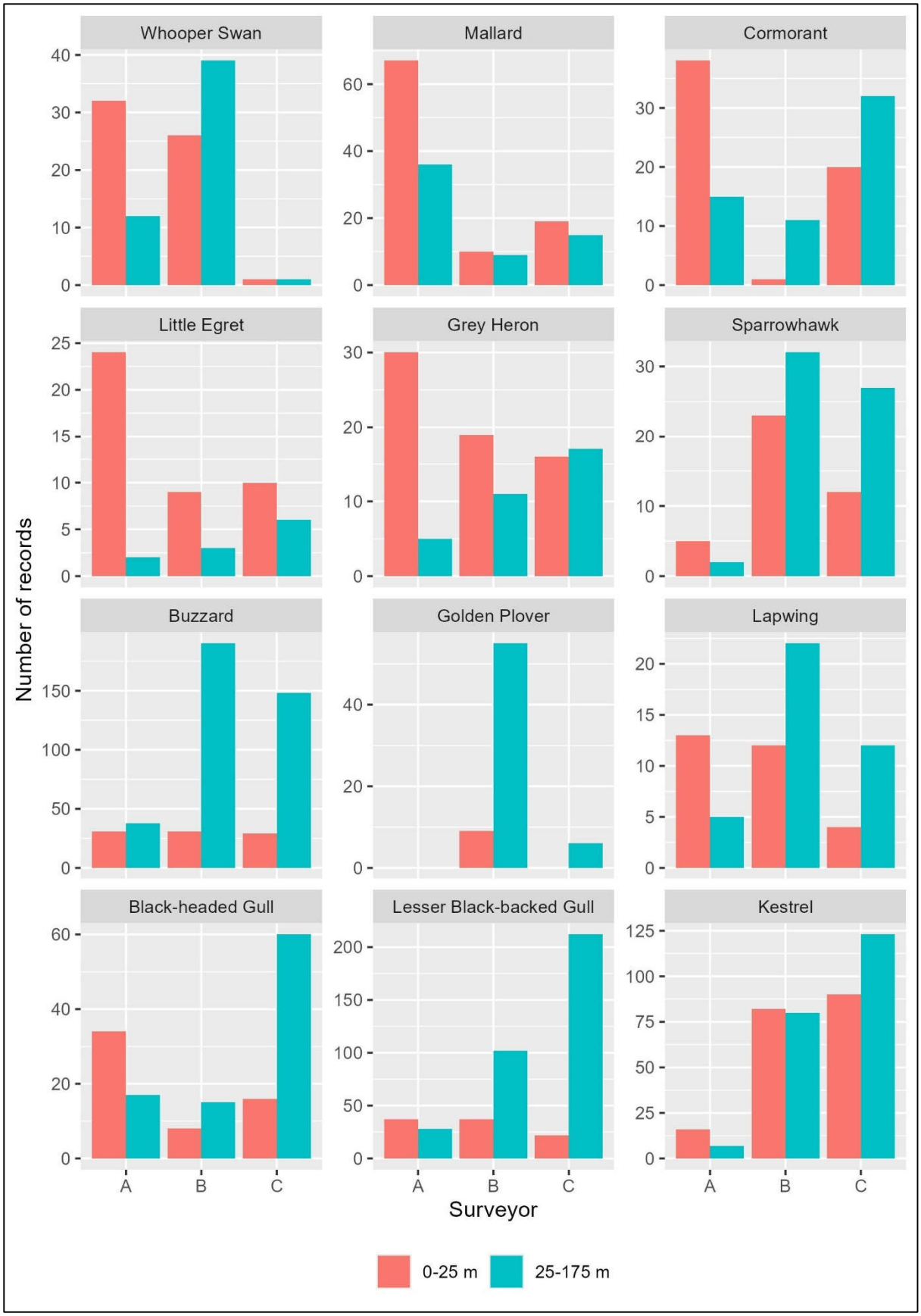


Figure 4.1. Comparison of height band distribution of flightline records between surveyors in the TOBIN dataset.

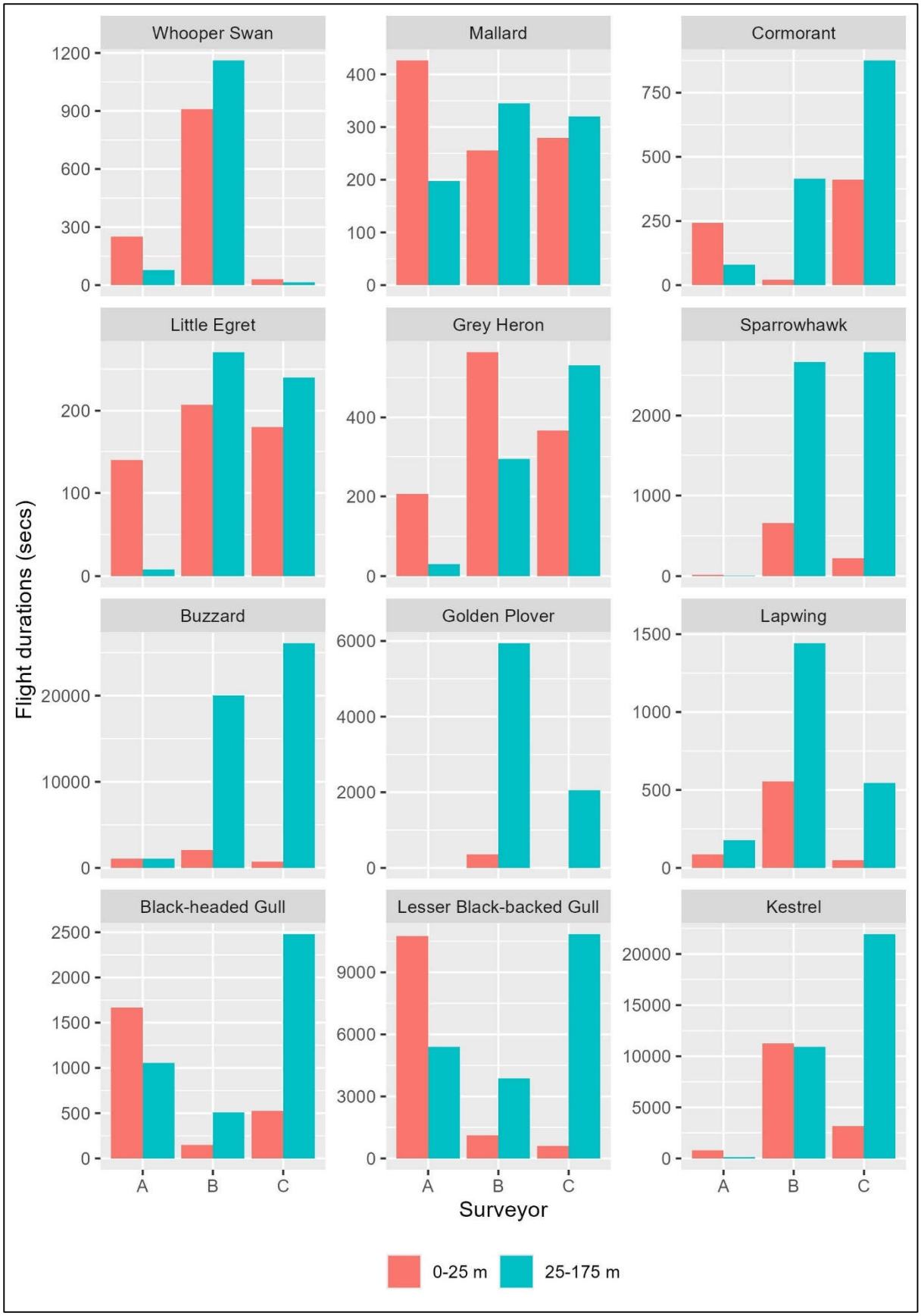


Figure 4.2. Comparison of height band distribution of flightline durations between surveyors in the TOBIN dataset.

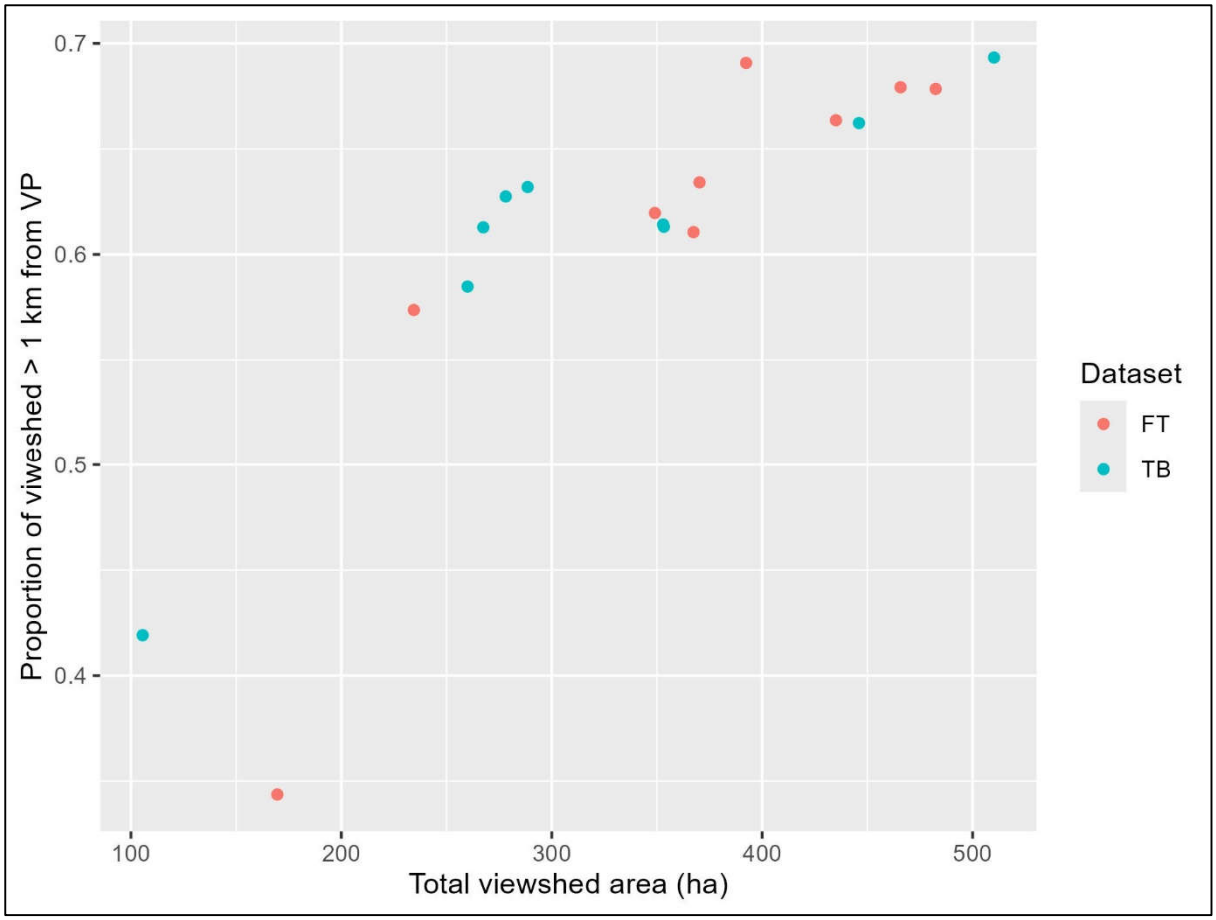


Figure 4.3. Relationship between the total viewshed area and the proportion of the viewshed more than 1km from the vantage point for the vantage points included in the collision risk model.

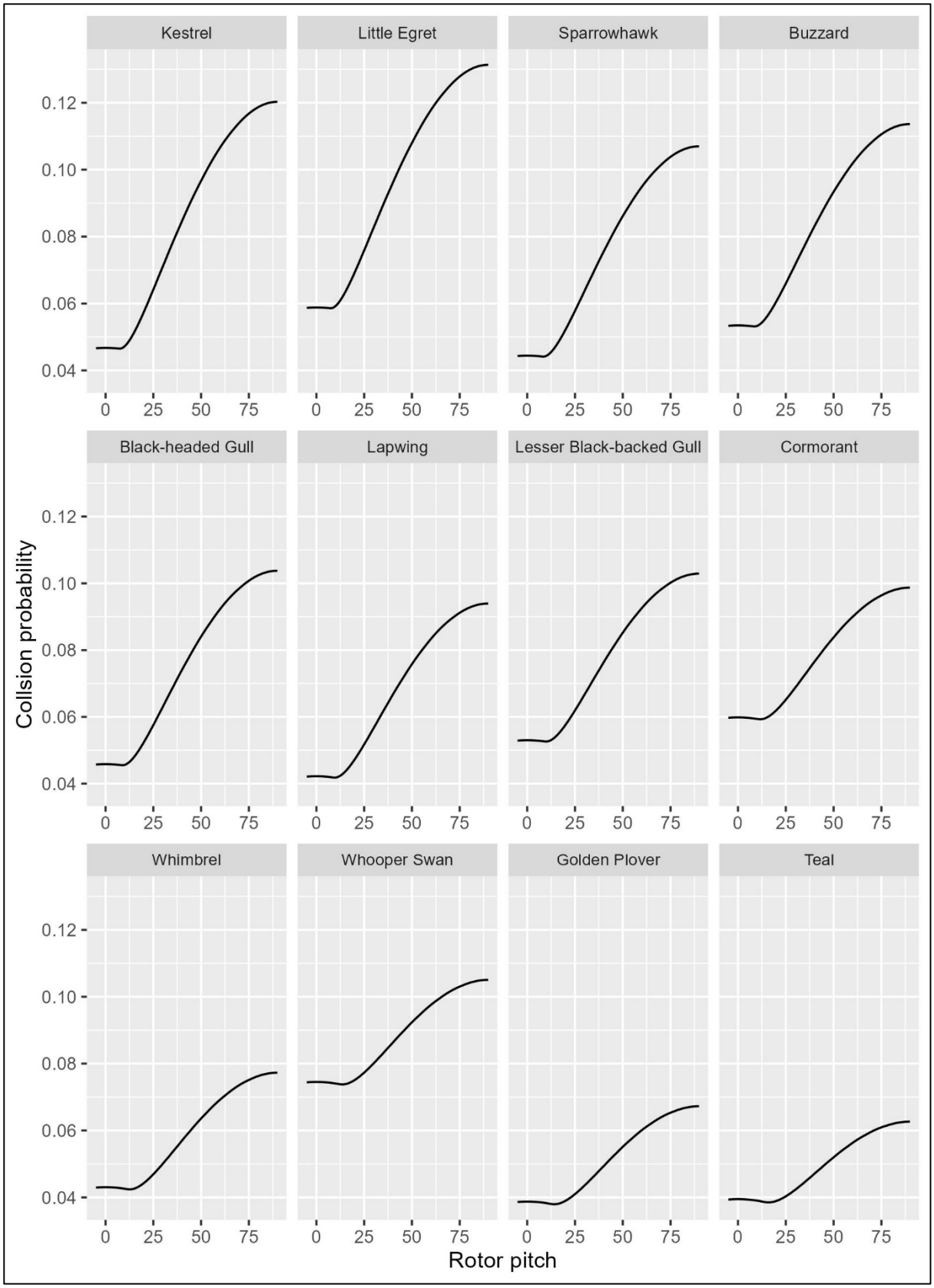


Figure 4.4. Relationship between pitch angle and single transit collision risk, with species arranged in order of increasing flight speed.

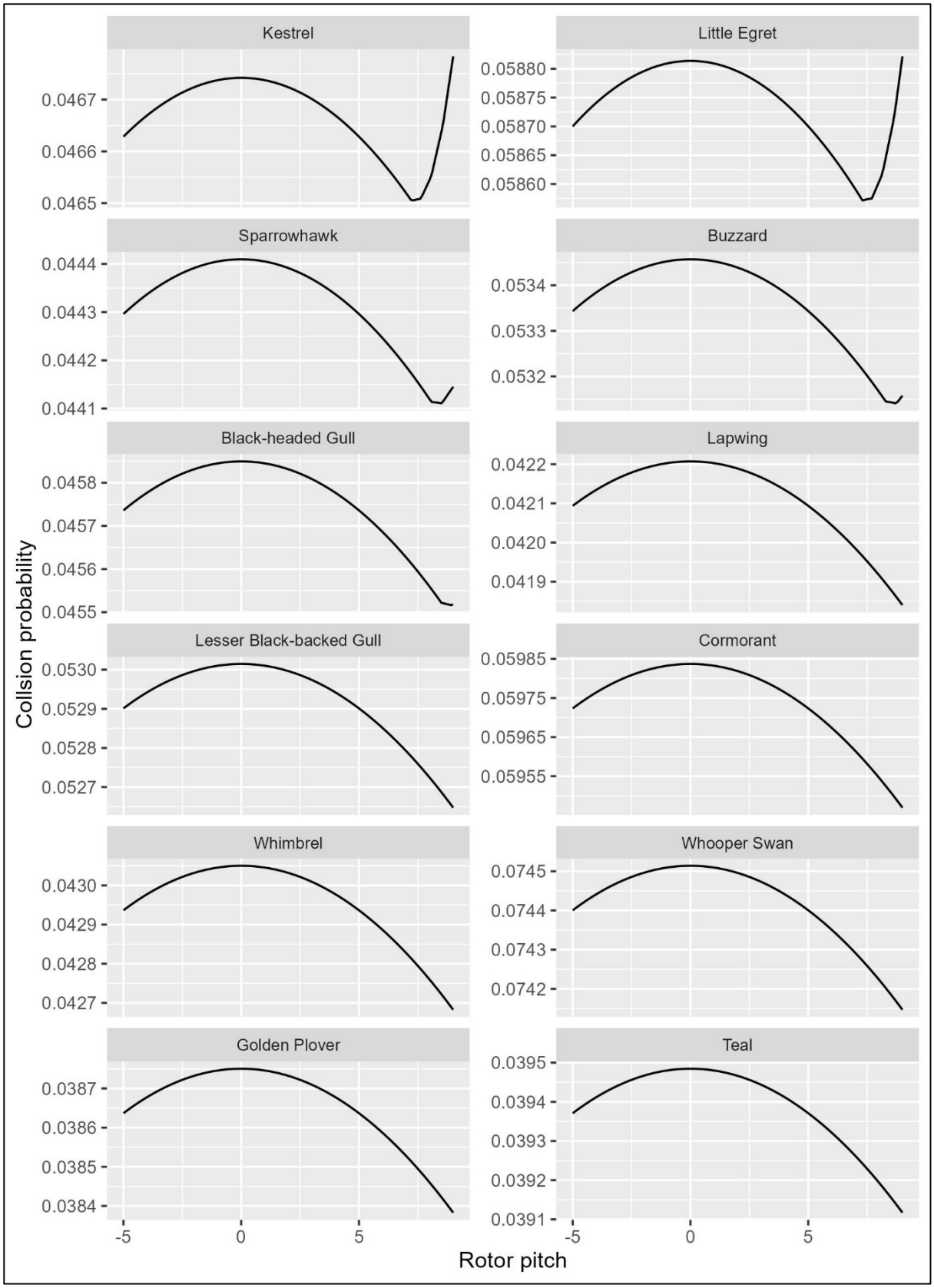


Figure 4.5. Maximum single transit collision risks with pitch angle of between -5 and 9°, with species arranged in order of increasing flight speed.

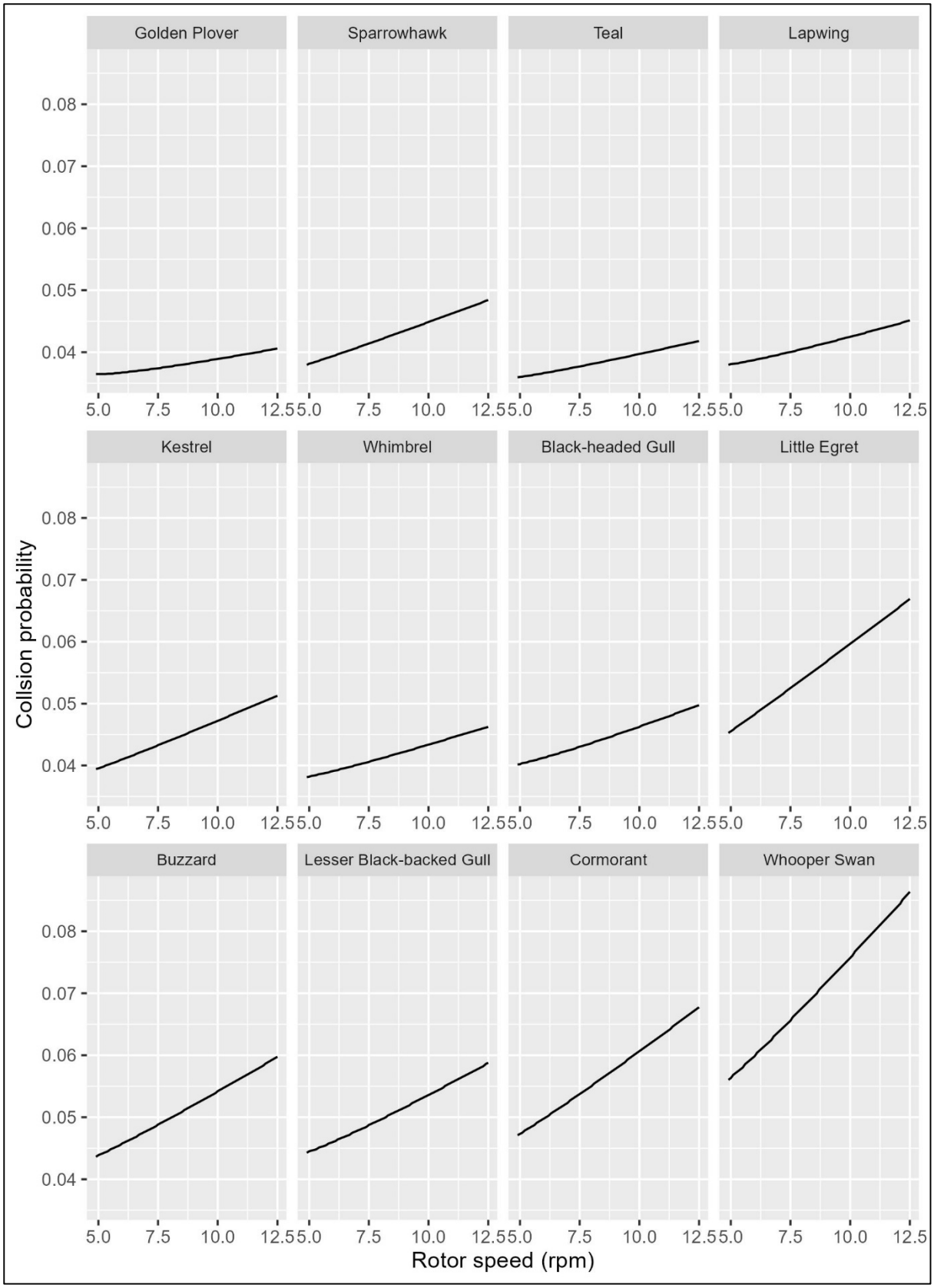


Figure 4.6. Relationship between rotor speed and single transit collision risk, with species arranged in order of increasing body size (body length × wingspan).

5. COLLISION RISK ASSESSMENT

5.1.1. Overall results

The results of the collision risk assessment are shown in Table 5.1. For each population, two sets of estimates of increases in annual mortality rates are included: one generated by the collision risk modelling that did not correct for distance effects (under-detection of distant flightlines) and one generated by the modelling that did correct for these effects. The range of uncertainty around the mortality increases due to the calculated uncertainty in the predicted collision risk is also shown.

Table 5.1. Potential increase in annual mortality rates due to the predicted collision risk from the Derryadd Wind Farm.

Species	Season	Scale	Distance effects	
			uncorrected	corrected
Whooper Swan	winter	national	0.0% (0.0% - 0.0%)	0.0% (0.0% - 0.0%)
		regional	0.2% (0.1% - 0.4%)	0.4% (0.2% - 0.8%)
		local	0.4% (0.2% - 0.7%)	0.6% (0.3% - 1.2%)
Teal	winter	national	0.0%	0.0%
Mallard	winter	national	0.0% (0.0% - 0.0%)	0.0% (0.0% - 0.0%)
Cormorant	breeding	national	0.0% (0.0% - 0.0%)	0.0% (0.0% - 0.0%)
		local	0.4% (0.2% - 0.8%)	0.6% (0.4% - 1.3%)
Little Egret	non-breeding	national	0.1% (0.0% - 0.2%)	0.1% (0.0% - 0.3%)
Grey Heron	breeding	national	0.0% (0.0% - 0.0%)	0.0% (0.0% - 0.0%)
Sparrowhawk	breeding	national	0.0% (0.0% - 0.0%)	0.0% (0.0% - 0.0%)
		regional	0.3% (0.1% - 0.8%)	0.6% (0.3% - 1.5%)
Golden Plover (99.6%)	winter	national	0.0% (0.0% - 0.0%)	0.0% (0.0% - 0.1%)
		local	0.7% (0.2% - 2.7%)	2.1% (0.7% - 8.0%)
Golden Plover (99.8%)	winter	national	0.0% (0.0% - 0.0%)	0.0% (0.0% - 0.1%)
		local	0.4% (0.1% - 1.4%)	1.0% (0.3% - 4.0%)
Lapwing	breeding	national	0.0% (0.0% - 0.1%)	0.0% (0.0% - 0.1%)
		local	2.5% (0.9% - 12.6%)	4.2% (1.6% - 21.0%)
	winter	national	0.0% (0.0% - 0.0%)	0.0% (0.0% - 0.0%)
Black-headed Gull	breeding	national	0.0% (0.0% - 0.0%)	0.0% (0.0% - 0.0%)
Lesser Black-backed Gull	breeding	national	0.0% (0.0% - 0.1%)	0.1% (0.0% - 0.1%)
		local	0.6% (0.4% - 1.1%)	1.0% (0.7% - 2.0%)
Kestrel	breeding	national	0.0% (0.0% - 0.0%)	0.1% (0.0% - 0.1%)
		regional	1.9% (1.1% - 3.4%)	3.9% (2.3% - 6.9%)

Separate estimates of mortality increases are included for Golden Plover using avoidance rates of 99.6% and 99.8%. The values in parentheses indicate the range of uncertainty around the mortality increases due to uncertainty in the predicted collision risk. No range is shown for Teal as it was not possible to quantify the uncertainty due to sampling effects.

The central estimates of the potential increase in annual mortality due to the predicted collision risk calculated without correcting for distance effects exceeded the 1% threshold for the local Lapwing breeding population and the County Longford Kestrel breeding population, while the upper limit of the uncertainty range exceeded the threshold for the local Golden Plover wintering population and the Lough Ree Lesser Black-backed Gull breeding population. When corrections for distance effects were included, the central estimates also exceeded the 1% threshold for the local Golden Plover wintering population and the Lough Ree Lesser Black-backed Gull breeding population, while the upper limits of the uncertainty range exceeded the threshold for the local Whooper Swan wintering population, the Lough Ree Cormorant breeding population and the County Longford Sparrowhawk breeding population.

As discussed in Section 2.7, the 1% threshold is likely to be very precautionary. The calculations of the increase in annual mortality also made strong precautionary assumptions that all the collision fatalities were adult birds, and that the collision mortality was additive not compensatory. Therefore, substantial increases in annual mortality well above the 1% threshold are likely to be required to cause significant impacts on the affected populations.

5.2. LAPWING

The largest predicted increase in annual mortality was to the local breeding Lapwing population with central estimates of 2.5-4.2% and upper limits of 13-21%. The wide range of uncertainty around the estimates was due mainly to sampling effects, which reflected the low number of records that contributed to the collision risk model.

The inclusion of all the flight activity in the lowest height band from the Fehily Timoney vantage point surveys will have caused some over-estimation of the collision risk (see Section 4.7.2).

There may have been some under-recording of the local population due to limited survey effort in the sections of the bogs outside the 500 m buffer. Also, the scale used to define the local population was based on the survey area; it is arguable that a larger area, including adjacent bogs to the west and south should be used to define the local population.

Over 50% of the total flight activity included in the model was generated by a single record of a flock of 26 birds in late July. This could have referred to post-breeding dispersing / migrating birds that were not associated with the local population. There were also three other records included in the collision risk model of flocks of 8-24 birds in July.

Two of the records included in the collision risk model included fledged juveniles, while the age composition of many of the records (including the flock of 26 birds in late July) were not specified. Therefore, the precautionary assumption that all the collision fatalities generated by the predicted collision risk will be adult birds was violated. Juveniles have higher annual mortality rates, so the percentage increase in mortality generated by a collision risk will be smaller.

The collision risk was calculated using the default avoidance rate of 98%. Species-specific avoidance rates are usually higher than the default avoidance rate. However, this may not be the case for breeding Lapwing because they do not appear to be displaced by turbines.

5.3. KESTREL

The predicted increase in annual mortality to the County Longford breeding population was sizeable with central estimates of 1.9-3.9% and upper limits of 3.4-6.9%. The relatively narrow range of uncertainty around the estimates, reflected the high record rate, and the fact that variation in flock size and uncertainty around nocturnal flight activity are not issues.

Standard collision risk modelling techniques will tend to overestimate Kestrel collision risk due to the high incidence of hovering flight activity (see Section 4.7.3). If such flight activity was accounted for in the model, it is likely that there would be a large decrease in the potential impact on mortality rates. The inclusion of all the flight activity in the lowest height band from the Fehily Timoney vantage point surveys will also have caused some over-estimation of the collision risk (see Section 4.7.2).

A lot of the collision risk was generated in late summer (Table A2.7) when the local Kestrel population was likely to have included a large component of juvenile birds. The Kestrel juvenile survival rate is around double the adult survival rate. Accounting for juvenile flight activity in the collision risk assessment would be likely to cause a significant decrease in the potential impact on mortality rates.

As with all the populations assessed, the mortality increases were higher when the collision risks that accounted for distance effects were used. The data used to calculate the correction factors included large components of Kestrel flight activity, while their size and flight behaviour makes them particularly susceptible to under-detection at long distances.

The recommended avoidance rate of 95% for Kestrel results in a non-avoidance rate that is 2.5 times higher than for the default 98% avoidance rate. The evidence supporting the Kestrel avoidance rate is weak (Section 4.7.3). However, there are anecdotal reports of relatively high levels of Kestrel fatalities from post-construction monitoring of Irish wind farms, although this data has not been published.

5.4. GOLDEN PLOVER

The predicted increase in annual mortality to the local Golden Plover wintering population was sizeable with central estimates of 0.4-2.1% and upper limits of 1.4-8.0%. The wide range of uncertainty around the estimates was due mainly to sampling effects, which reflected the large variation in flock sizes and flight durations.

The correction for distance effects may have resulted in an over-estimation of the Golden Plover collision risk. Most of the collision risk was generated by records of large flocks. It is likely that the under-detection of distant flightlines is much less of an issue for large flocks compared to small groups and individual birds. Therefore, the smaller collision risk generated by the uncorrected model may be more reliable in this case.

The local population was estimated from Irish Wetland Bird Survey data. As many Golden Plover occur away from wetland sites, the size of the local population used for the collision risk assessment may have been a significant under-estimate.

Golden Plover is a quarry species with an open season from September and January. The Irish Government does not regulate the hunting of this species: there are no bag limits, and no published data on annual hunting mortality. This means that there is no restriction on the number of Golden Plover that can be shot between September and January each winter. Therefore, given this apparent lack of concern about harvest levels, presumably the Irish Government considers that low levels of mortality from anthropogenic sources are likely to be compensatory rather than additive and are, therefore, unlikely to affect the conservation status of the wintering Golden Plover population.

5.5. WHOOPER SWAN, CORMORANT, SPARROWHAWK AND LESSER BLACK-BACKED GULL

The predicted increases in annual mortality to the Lough Ree Whooper Swan wintering population, the Lough Ree Cormorant and Lesser Black-backed Gull breeding populations, and the County Longford Sparrowhawk breeding population only just exceeded the 1% threshold. Given the precautionary nature of the 1% threshold, and the precautionary assumptions made in the calculations of these increases, the predicted collision risk is unlikely to have significant impacts on these populations.

6. CONCLUSIONS

The predicted collision risks would result in multiple collision fatalities for a number of species over the 30-year lifespan of the wind farm. However, in most cases, these collision rates would not result in significant impacts to the relevant populations of conservation significance.

The predicted collision risk to Lapwing during the breeding season could potentially cause an increase in mortality rate to the local Lapwing breeding population of 2.5-4.2%, with an uncertainty range of 0.9-21%. However, the increase in mortality rate may have been over-estimated due to the inclusion of records of juveniles and presumed non-local post-breeding / migrating Lapwing flocks in the data used for the collision risk model, and incomplete coverage of the local area in the surveys used to generate estimates of the local population.

The predicted collision risk for Kestrel could potentially cause an increase in mortality rate to the County Longford breeding population of 1.9-3.9%, with an uncertainty range of 1.1-6.9%. However, the increase in mortality rate may have been over-estimated due to inclusion of hovering flight activity in the calculation of predicted transits, and the inclusion of records of juveniles in the data used for the collision risk model.

The predicted collision risk to Golden Plover could potentially cause an increase in mortality rate to the local Golden Plover wintering population of 0.4-2.1%, with an uncertainty range of 0.1-8.0%. However, the corrections for distance effects that generated the higher end of these ranges may not be appropriate for Golden Plover due to the high contribution of flight activity by large flocks to the predicted collision risk. Under-estimation of the local population, and the likely significant occurrence of juveniles are other factors that may have caused over-estimation of the increase in mortality rate.

The predicted increases in annual mortality to the Lough Ree Whooper Swan wintering population, the Lough Ree Cormorant and Lesser Black-backed Gull breeding populations, and the County Longford Sparrowhawk breeding population only just exceeded the 1% threshold. Given the precautionary nature of the 1% threshold, and the precautionary assumptions made in the calculations of these increases, the predicted collision risk is unlikely to have significant impacts on these populations.

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Appendix 1 Results tables for intermediate stages of the collision risk model.

Table A2.1. Monthly daytime flight activity densities (bird/km^2).

Species	Distance effects	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mute Swan	uncorrected	0.0000	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mute Swan	corrected	0.0001	0.0003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Whooper Swan	uncorrected	0.0012	0.0005	0.0014	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0003	0.0050	0.0028
Whooper Swan	corrected	0.0025	0.0008	0.0029	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0006	0.0078	0.0046
Greylag Goose	uncorrected	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
Greylag Goose	corrected	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
Wigeon	uncorrected	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Wigeon	corrected	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Teal	uncorrected	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0032	0.0000
Teal	corrected	0.0000	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0045	0.0000
Mallard	uncorrected	0.0000	0.0004	0.0003	0.0000	0.0011	0.0000	0.0001	0.0000	0.0003	0.0001	0.0021	0.0003
Mallard	corrected	0.0000	0.0006	0.0005	0.0001	0.0018	0.0000	0.0001	0.0001	0.0005	0.0001	0.0035	0.0005
Cormorant	uncorrected	0.0000	0.0000	0.0001	0.0001	0.0009	0.0005	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000
Cormorant	corrected	0.0000	0.0000	0.0002	0.0002	0.0014	0.0007	0.0004	0.0001	0.0001	0.0001	0.0000	0.0000
Little Egret	uncorrected	0.0000	0.0000	0.0003	0.0001	0.0023	0.0002	0.0000	0.0002	0.0001	0.0001	0.0001	0.0001
Little Egret	corrected	0.0001	0.0000	0.0004	0.0002	0.0039	0.0003	0.0001	0.0004	0.0002	0.0001	0.0002	0.0002
Grey Heron	uncorrected	0.0000	0.0000	0.0001	0.0000	0.0004	0.0002	0.0002	0.0002	0.0002	0.0004	0.0001	0.0000
Grey Heron	corrected	0.0000	0.0000	0.0001	0.0001	0.0006	0.0003	0.0003	0.0004	0.0004	0.0006	0.0001	0.0000
Little Grebe	uncorrected	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Little Grebe	corrected	0.0000	0.0000	0.0000	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Marsh Harrier	uncorrected	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Marsh Harrier	corrected	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hen Harrier	uncorrected	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000
Hen Harrier	corrected	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
Sparrowhawk	uncorrected	0.0001	0.0001	0.0001	0.0002	0.0008	0.0003	0.0005	0.0006	0.0001	0.0004	0.0000	0.0001
Sparrowhawk	corrected	0.0003	0.0002	0.0003	0.0006	0.0012	0.0005	0.0008	0.0010	0.0003	0.0010	0.0000	0.0003
Buzzard	uncorrected	0.0004	0.0018	0.0032	0.0029	0.0046	0.0043	0.0043	0.0032	0.0018	0.0006	0.0012	0.0004
Buzzard	corrected	0.0008	0.0035	0.0066	0.0068	0.0081	0.0079	0.0078	0.0058	0.0031	0.0011	0.0023	0.0007

Species	Distance effects	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Golden Plover	uncorrected	0.0007	0.0000	0.0195	0.0662	0.0000	0.0000	0.0000	0.0000	0.0014	0.0448	0.0704	0.0180
Golden Plover	corrected	0.0013	0.0001	0.0499	0.2402	0.0000	0.0000	0.0000	0.0000	0.0039	0.1183	0.1772	0.0471
Lapwing	uncorrected	0.0086	0.0035	0.0006	0.0000	0.0004	0.0009	0.0030	0.0010	0.0000	0.0000	0.0024	0.0033
Lapwing	corrected	0.0223	0.0078	0.0014	0.0002	0.0008	0.0015	0.0048	0.0014	0.0000	0.0000	0.0068	0.0085
Whimbrel	uncorrected	0.0000	0.0000	0.0000	0.0000	0.0236	0.0000	0.0000	0.0002	0.0001	0.0000	0.0000	0.0000
Whimbrel	corrected	0.0000	0.0000	0.0000	0.0000	0.0329	0.0000	0.0000	0.0003	0.0001	0.0000	0.0000	0.0000
Curlew	uncorrected	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000
Curlew	corrected	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0003	0.0002	0.0000	0.0000	0.0000	0.0000
Black-headed Gull	uncorrected	0.0000	0.0000	0.0000	0.0016	0.0037	0.0084	0.0022	0.0002	0.0000	0.0000	0.0000	0.0000
Black-headed Gull	corrected	0.0000	0.0001	0.0001	0.0052	0.0058	0.0132	0.0051	0.0005	0.0000	0.0000	0.0000	0.0000
Common Gull	uncorrected	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Common Gull	corrected	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Lesser Black-backed Gull	uncorrected	0.0000	0.0000	0.0006	0.0099	0.0353	0.0086	0.0110	0.0156	0.0003	0.0000	0.0003	0.0000
Lesser Black-backed Gull	corrected	0.0000	0.0000	0.0011	0.0240	0.0633	0.0152	0.0192	0.0262	0.0005	0.0000	0.0005	0.0000
Kestrel	uncorrected	0.0006	0.0006	0.0005	0.0011	0.0035	0.0016	0.0024	0.0026	0.0029	0.0018	0.0013	0.0009
Kestrel	corrected	0.0015	0.0016	0.0011	0.0036	0.0064	0.0031	0.0045	0.0052	0.0050	0.0032	0.0034	0.0024
Merlin	uncorrected	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Merlin	corrected	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Peregrine	uncorrected	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002	0.0000	0.0001	0.0000	0.0000	0.0001
Peregrine	corrected	0.0000	0.0000	0.0000	0.0001	0.0002	0.0001	0.0003	0.0000	0.0001	0.0000	0.0000	0.0002

Table A2.2. Daylight and nighttime hours per month.

Month	Daylight hours (t_{day})	Nighttime hours (t_{night})
Jan	250.3	493.7
Feb	273.0	399.0
Mar	366.3	377.7
Apr	419.2	300.8
May	492.7	251.3
Jun	508.9	211.1
Jul	511.7	232.3
Aug	459.9	284.1
Sept	382.8	337.2
Oct	329.3	414.7
Nov	260.0	460.0
Dec	234.1	509.9

Table A2.3. Nocturnal correction factors.

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Wigeon	1.99	1.73	1.52	1.36	1.26	1.21	1.23	1.31	1.44	1.63	1.88	2.09
Teal	1.99	1.73	1.52	1.36	1.26	1.21	1.23	1.31	1.44	1.63	1.88	2.09
Mallard	1.99	1.73	1.52	1.36	1.26	1.21	1.23	1.31	1.44	1.63	1.88	2.09
Little Egret	1.49	1.37	1.26	1.18	1.13	1.10	1.11	1.15	1.22	1.31	1.44	1.54
Grey Heron	1.49	1.37	1.26	1.18	1.13	1.10	1.11	1.15	1.22	1.31	1.44	1.54
Golden Plover	1.49	1.37	1.26	1.18	1.13	1.10	1.11	1.15	1.22	1.31	1.44	1.54
Lapwing	1.49	1.37	1.26	1.18	1.13	1.10	1.11	1.15	1.22	1.31	1.44	1.54
Whimbrel	2.97	2.46	2.03	1.72	1.51	1.41	1.45	1.62	1.88	2.26	2.77	3.18

Table A2.4. Projected number of rotor transits.

Species	Distance effects	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Mute Swan	uncorrected	2	9	1	0	0	1	0	0	0	0	0	0
Mute Swan	corrected	4	15	1	0	0	3	0	0	0	0	0	0
Whooper Swan	uncorrected	54	23	93	0	0	0	0	0	0	17	229	118
Whooper Swan	corrected	113	40	191	0	0	0	0	0	0	35	359	189
Greylag Goose	uncorrected	0	0	0	0	0	0	0	0	0	0	2	3
Greylag Goose	corrected	0	0	0	0	0	0	0	0	0	0	5	4
Wigeon	uncorrected	3	0	0	0	0	0	0	0	0	0	0	1
Wigeon	corrected	5	0	0	0	0	0	0	0	0	0	0	2
Teal	uncorrected	1	13	0	0	1	0	0	0	3	0	314	2
Teal	corrected	2	17	1	0	2	0	0	0	7	0	444	3
Mallard	uncorrected	0	33	31	4	128	2	9	5	30	9	199	28
Mallard	corrected	0	57	52	11	216	5	16	8	55	15	328	50
Cormorant	uncorrected	0	0	4	5	71	36	20	3	2	2	0	0
Cormorant	corrected	0	0	9	12	110	58	30	6	3	3	0	0
Little Egret	uncorrected	2	1	13	4	137	11	3	12	5	3	4	5
Little Egret	corrected	3	2	21	11	228	18	4	20	9	5	7	8
Grey Heron	uncorrected	0	1	3	2	22	12	14	15	13	19	3	1
Grey Heron	corrected	0	1	5	6	37	18	22	23	21	29	5	1
Little Grebe	uncorrected	0	0	0	5	0	0	0	0	0	0	0	0
Little Grebe	corrected	0	0	0	16	0	0	0	0	0	0	0	0
Marsh Harrier	uncorrected	0	0	2	0	0	0	0	0	0	0	0	0
Marsh Harrier	corrected	0	0	3	0	0	0	0	0	0	0	0	0
Hen Harrier	uncorrected	1	1	1	0	0	0	0	0	0	0	1	1
Hen Harrier	corrected	2	1	1	0	0	0	0	0	0	0	2	1
Sparrowhawk	uncorrected	4	3	4	9	44	18	30	30	6	15	0	4
Sparrowhawk	corrected	9	7	12	31	66	31	50	54	15	38	0	8
Buzzard	uncorrected	13	58	138	144	272	259	261	177	82	24	37	12
Buzzard	corrected	25	112	287	341	478	478	475	317	142	42	72	20

Species	Distance effects	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Golden Plover	uncorrected	51	2	1651	6012	0	0	0	0	124	3561	4848	1196
Golden Plover	corrected	90	4	4226	21818	0	0	0	0	334	9410	12211	3132
Lapwing	uncorrected	424	173	35	3	28	66	225	69	0	2	116	158
Lapwing	corrected	1092	381	84	11	56	110	361	94	0	3	335	404
Whimbrel	uncorrected	0	0	0	0	2943	0	0	24	10	0	0	0
Whimbrel	corrected	0	0	0	0	4101	0	0	32	13	0	0	0
Curlew	uncorrected	0	0	0	0	0	0	13	8	0	0	0	1
Curlew	corrected	0	0	0	0	0	0	25	13	0	0	0	1
Black-headed Gull	uncorrected	0	1	1	81	224	520	138	10	0	0	0	0
Black-headed Gull	corrected	0	2	2	268	350	818	318	28	0	0	0	0
Common Gull	uncorrected	0	0	0	0	0	2	1	0	0	0	0	0
Common Gull	corrected	0	0	0	0	0	3	2	0	0	0	0	0
Lesser Black-backed Gull	uncorrected	0	0	28	559	2339	590	757	962	15	0	11	0
Lesser Black-backed Gull	corrected	0	0	54	1354	4195	1037	1323	1621	24	1	19	0
Kestrel	uncorrected	16	18	20	46	179	82	126	124	113	61	35	23
Kestrel	corrected	40	45	43	156	329	163	236	248	198	109	93	58
Merlin	uncorrected	0	0	0	0	0	0	0	0	0	0	0	1
Merlin	corrected	1	0	0	0	0	0	0	0	0	0	0	1
Peregrine	uncorrected	0	0	1	1	7	3	13	0	3	0	1	3
Peregrine	corrected	0	0	1	3	12	7	22	1	5	0	1	6

Table A2.5. Collision probabilities for flapping flight.

Species	Pitch	Single transit collision risks		
		upwind	downwind	weighted mean
Mute Swan	0	0.078	0.078	0.078
	15	0.094	0.062	0.078
	30	0.107	0.065	0.086
Whooper Swan	0	0.076	0.076	0.076
	15	0.091	0.060	0.075
	30	0.102	0.061	0.082
Greylag Goose	0	0.057	0.057	0.057
	15	0.071	0.040	0.056
	30	0.083	0.042	0.062
Wigeon	0	0.043	0.043	0.043
	15	0.055	0.029	0.042
	30	0.064	0.026	0.045
Teal	0	0.040	0.040	0.040
	15	0.053	0.025	0.039
	30	0.062	0.023	0.043
Mallard	0	0.047	0.047	0.047
	15	0.060	0.031	0.046
	30	0.071	0.031	0.051
Cormorant	0	0.061	0.061	0.061
	15	0.077	0.044	0.061
	30	0.091	0.048	0.070
Little Egret	0	0.059	0.059	0.059
	15	0.085	0.043	0.064
	30	0.106	0.060	0.083
Grey Heron	0	0.073	0.073	0.073
	15	0.096	0.056	0.076
	30	0.115	0.070	0.093
Little Grebe	0	0.039	0.039	0.039
	15	0.056	0.022	0.039
	30	0.069	0.026	0.048
Marsh Harrier	0	0.054	0.054	0.054
	15	0.077	0.037	0.057
	30	0.097	0.051	0.074
Hen Harrier	0	0.057	0.057	0.057
	15	0.085	0.041	0.063
	30	0.110	0.063	0.086
Sparrowhawk	0	0.045	0.045	0.045
	15	0.068	0.028	0.048
	30	0.087	0.041	0.064
Buzzard	0	0.054	0.054	0.054
	15	0.076	0.037	0.057
	30	0.095	0.050	0.072

Species	Pitch	Single transit collision risks		
		upwind	downwind	weighted mean
Golden Plover	0	0.040	0.040	0.040
	15	0.054	0.024	0.039
	30	0.065	0.024	0.044
Lapwing	0	0.043	0.043	0.043
	15	0.063	0.026	0.044
	30	0.080	0.035	0.057
Whimbrel	0	0.044	0.044	0.044
	15	0.059	0.027	0.043
	30	0.072	0.030	0.051
Curlew	0	0.048	0.048	0.048
	15	0.063	0.031	0.047
	30	0.076	0.034	0.055
Black-headed Gull	0	0.047	0.047	0.047
	15	0.068	0.029	0.049
	30	0.087	0.041	0.064
Common Gull	0	0.048	0.048	0.048
	15	0.067	0.030	0.048
	30	0.083	0.038	0.060
Lesser Black-backed Gull	0	0.054	0.054	0.054
	15	0.074	0.037	0.055
	30	0.090	0.046	0.068
Kestrel	0	0.047	0.047	0.047
	15	0.073	0.031	0.052
	30	0.095	0.048	0.072
Merlin	0	0.044	0.044	0.044
	15	0.070	0.027	0.049
	30	0.092	0.045	0.068
Peregrine	0	0.048	0.048	0.048
	15	0.070	0.031	0.050
	30	0.088	0.042	0.065

Table A2.6. Collision risk before avoidance.

Species	Distance effects	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Mute Swan	uncorrected	0.13	0.6	0.07	0	0	0.07	0	0	0	0	0	0
Mute Swan	corrected	0.27	1	0.07	0	0	0.2	0	0	0	0	0	0
Whooper Swan	uncorrected	3.49	1.49	6.02	0	0	0	0	0	0	1.1	14.81	7.63
Whooper Swan	corrected	7.31	2.59	12.36	0	0	0	0	0	0	2.26	23.22	12.23
Greylag Goose	uncorrected	0	0	0	0	0	0	0	0	0	0	0.1	0.14
Greylag Goose	corrected	0	0	0	0	0	0	0	0	0	0	0.24	0.19
Wigeon	uncorrected	0.11	0	0	0	0	0	0	0	0	0	0	0.04
Wigeon	corrected	0.18	0	0	0	0	0	0	0	0	0	0	0.07
Teal	uncorrected	0.03	0.44	0	0	0.03	0	0	0	0.1	0	10.66	0.07
Teal	corrected	0.07	0.58	0.03	0	0.07	0	0	0	0.24	0	15.07	0.1
Mallard	uncorrected	0	1.31	1.23	0.16	5.07	0.08	0.36	0.2	1.19	0.36	7.88	1.11
Mallard	corrected	0	2.26	2.06	0.44	8.55	0.2	0.63	0.32	2.18	0.59	12.98	1.98
Cormorant	uncorrected	0	0	0.21	0.26	3.66	1.85	1.03	0.15	0.1	0.1	0	0
Cormorant	corrected	0	0	0.46	0.62	5.67	2.99	1.55	0.31	0.15	0.15	0	0
Little Egret	uncorrected	0.1	0.05	0.65	0.2	6.88	0.55	0.15	0.6	0.25	0.15	0.2	0.25
Little Egret	corrected	0.15	0.1	1.05	0.55	11.45	0.9	0.2	1	0.45	0.25	0.35	0.4
Grey Heron	uncorrected	0	0.06	0.19	0.12	1.36	0.74	0.87	0.93	0.8	1.18	0.19	0.06
Grey Heron	corrected	0	0.06	0.31	0.37	2.29	1.11	1.36	1.42	1.3	1.8	0.31	0.06
Little Grebe	uncorrected	0	0	0	0.17	0	0	0	0	0	0	0	0
Little Grebe	corrected	0	0	0	0.53	0	0	0	0	0	0	0	0
Marsh Harrier	uncorrected	0	0	0.09	0	0	0	0	0	0	0	0	0
Marsh Harrier	corrected	0	0	0.14	0	0	0	0	0	0	0	0	0
Hen Harrier	uncorrected	0.05	0.05	0.05	0	0	0	0	0	0	0	0.05	0.05
Hen Harrier	corrected	0.1	0.05	0.05	0	0	0	0	0	0	0	0.1	0.05
Sparrowhawk	uncorrected	0.15	0.11	0.15	0.34	1.67	0.68	1.14	1.14	0.23	0.57	0	0.15
Sparrowhawk	corrected	0.34	0.27	0.46	1.18	2.51	1.18	1.9	2.05	0.57	1.44	0	0.3
Buzzard	uncorrected	0.6	2.67	6.36	6.64	12.53	11.94	12.03	8.16	3.78	1.11	1.71	0.55
Buzzard	corrected	1.15	5.16	13.23	15.71	22.03	22.03	21.89	14.61	6.54	1.94	3.32	0.92

Species	Distance effects	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Golden Plover	uncorrected	1.71	0.07	55.44	201.89	0	0	0	0	4.16	119.58	162.8	40.16
Golden Plover	corrected	3.02	0.13	141.91	732.68	0	0	0	0	11.22	316	410.06	105.18
Lapwing	uncorrected	15.47	6.31	1.28	0.11	1.02	2.41	8.21	2.52	0	0.07	4.23	5.76
Lapwing	corrected	39.84	13.9	3.06	0.4	2.04	4.01	13.17	3.43	0	0.11	12.22	14.74
Whimbrel	uncorrected	0	0	0	0	109.2	0	0	0.89	0.37	0	0	0
Whimbrel	corrected	0	0	0	0	152.17	0	0	1.19	0.48	0	0	0
Curlew	uncorrected	0	0	0	0	0	0	0.53	0.32	0	0	0	0.04
Curlew	corrected	0	0	0	0	0	0	1.01	0.53	0	0	0	0.04
Black-headed Gull	uncorrected	0	0.04	0.04	3.22	8.9	20.66	5.48	0.4	0	0	0	0
Black-headed Gull	corrected	0	0.08	0.08	10.65	13.9	32.49	12.63	1.11	0	0	0	0
Common Gull	uncorrected	0	0	0	0	0	0.08	0.04	0	0	0	0	0
Common Gull	corrected	0	0	0	0	0	0.12	0.08	0	0	0	0	0
Lesser Black-backed Gull	uncorrected	0	0	1.29	25.69	107.48	27.11	34.78	44.2	0.69	0	0.51	0
Lesser Black-backed Gull	corrected	0	0	2.48	62.22	192.76	47.65	60.79	74.49	1.1	0.05	0.87	0
Kestrel	uncorrected	0.64	0.72	0.8	1.84	7.17	3.29	5.05	4.97	4.53	2.44	1.4	0.92
Kestrel	corrected	1.6	1.8	1.72	6.25	13.18	6.53	9.46	9.94	7.93	4.37	3.73	2.32
Merlin	uncorrected	0	0	0	0	0	0	0	0	0	0	0	0.04
Merlin	corrected	0.04	0	0	0	0	0	0	0	0	0	0	0.04
Peregrine	uncorrected	0	0	0.04	0.04	0.29	0.12	0.54	0	0.12	0	0.04	0.12
Peregrine	corrected	0	0	0.04	0.12	0.49	0.29	0.91	0.04	0.21	0	0.04	0.25

Table A2.7. Collision risk after avoidance.

Species	Distance effects	Avoidance rate	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Mute Swan	uncorrected	0.950	0.01	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	corrected	0.950	0.01	0.05	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
	uncorrected	0.980	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	corrected	0.980	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	uncorrected	0.990	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	corrected	0.990	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	uncorrected	0.995	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	corrected	0.995	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Whooper Swan	uncorrected	0.950	0.17	0.07	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.74	0.38
	corrected	0.950	0.37	0.13	0.62	0.00	0.00	0.00	0.00	0.00	0.00	0.11	1.16	0.61
	uncorrected	0.980	0.07	0.03	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.30	0.15
	corrected	0.980	0.15	0.05	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.46	0.24
	uncorrected	0.990	0.03	0.01	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.15	0.08
	corrected	0.990	0.07	0.03	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.23	0.12
	uncorrected	0.995	0.02	0.01	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.07	0.04
	corrected	0.995	0.04	0.01	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.12	0.06
Greylag Goose	uncorrected	0.950	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	corrected	0.950	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01
	uncorrected	0.980	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	corrected	0.980	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	uncorrected	0.990	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	corrected	0.990	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	uncorrected	0.995	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	corrected	0.995	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Species	Distance effects	Avoidance rate	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Wigeon	uncorrected	0.950	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	corrected	0.950	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	uncorrected	0.980	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	corrected	0.980	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	uncorrected	0.990	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	corrected	0.990	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	uncorrected	0.995	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	corrected	0.995	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Teal	uncorrected	0.950	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.53	0.00
	corrected	0.950	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.75	0.01
	uncorrected	0.980	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.21	0.00
	corrected	0.980	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.00
	uncorrected	0.990	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.00
	corrected	0.990	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.00
	uncorrected	0.995	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00
	corrected	0.995	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.00
Mallard	uncorrected	0.950	0.00	0.07	0.06	0.01	0.25	0.00	0.02	0.01	0.06	0.02	0.39	0.06
	corrected	0.950	0.00	0.11	0.10	0.02	0.43	0.01	0.03	0.02	0.11	0.03	0.65	0.10
	uncorrected	0.980	0.00	0.03	0.02	0.00	0.10	0.00	0.01	0.00	0.02	0.01	0.16	0.02
	corrected	0.980	0.00	0.05	0.04	0.01	0.17	0.00	0.01	0.01	0.04	0.01	0.26	0.04
	uncorrected	0.990	0.00	0.01	0.01	0.00	0.05	0.00	0.00	0.00	0.01	0.00	0.08	0.01
	corrected	0.990	0.00	0.02	0.02	0.00	0.09	0.00	0.01	0.00	0.02	0.01	0.13	0.02
	uncorrected	0.995	0.00	0.01	0.01	0.00	0.03	0.00	0.00	0.00	0.01	0.00	0.04	0.01
	corrected	0.995	0.00	0.01	0.01	0.00	0.04	0.00	0.00	0.00	0.01	0.00	0.06	0.01

Species	Distance effects	Avoidance rate	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Cormorant	uncorrected	0.950	0.00	0.00	0.01	0.01	0.18	0.09	0.05	0.01	0.01	0.01	0.00	0.00
	corrected	0.950	0.00	0.00	0.02	0.03	0.28	0.15	0.08	0.02	0.01	0.01	0.00	0.00
	uncorrected	0.980	0.00	0.00	0.00	0.01	0.07	0.04	0.02	0.00	0.00	0.00	0.00	0.00
	corrected	0.980	0.00	0.00	0.01	0.01	0.11	0.06	0.03	0.01	0.00	0.00	0.00	0.00
	uncorrected	0.990	0.00	0.00	0.00	0.00	0.04	0.02	0.01	0.00	0.00	0.00	0.00	0.00
	corrected	0.990	0.00	0.00	0.00	0.01	0.06	0.03	0.02	0.00	0.00	0.00	0.00	0.00
	uncorrected	0.995	0.00	0.00	0.00	0.00	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00
	corrected	0.995	0.00	0.00	0.00	0.00	0.03	0.01	0.01	0.00	0.00	0.00	0.00	0.00
Little Egret	uncorrected	0.950	0.01	0.00	0.03	0.01	0.34	0.03	0.01	0.03	0.01	0.01	0.01	0.01
	corrected	0.950	0.01	0.01	0.05	0.03	0.57	0.05	0.01	0.05	0.02	0.01	0.02	0.02
	uncorrected	0.980	0.00	0.00	0.01	0.00	0.14	0.01	0.00	0.01	0.01	0.00	0.00	0.01
	corrected	0.980	0.00	0.00	0.02	0.01	0.23	0.02	0.00	0.02	0.01	0.01	0.01	0.01
	uncorrected	0.990	0.00	0.00	0.01	0.00	0.07	0.01	0.00	0.01	0.00	0.00	0.00	0.00
	corrected	0.990	0.00	0.00	0.01	0.01	0.11	0.01	0.00	0.01	0.00	0.00	0.00	0.00
	uncorrected	0.995	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	corrected	0.995	0.00	0.00	0.01	0.00	0.06	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Grey Heron	uncorrected	0.950	0.00	0.00	0.01	0.01	0.07	0.04	0.04	0.05	0.04	0.06	0.01	0.00
	corrected	0.950	0.00	0.00	0.02	0.02	0.11	0.06	0.07	0.07	0.07	0.09	0.02	0.00
	uncorrected	0.980	0.00	0.00	0.00	0.00	0.03	0.01	0.02	0.02	0.02	0.02	0.00	0.00
	corrected	0.980	0.00	0.00	0.01	0.01	0.05	0.02	0.03	0.03	0.03	0.04	0.01	0.00
	uncorrected	0.990	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00
	corrected	0.990	0.00	0.00	0.00	0.00	0.02	0.01	0.01	0.01	0.01	0.02	0.00	0.00
	uncorrected	0.995	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00
	corrected	0.995	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00

Species	Distance effects	Avoidance rate	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Little Grebe	uncorrected	0.950	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	corrected	0.950	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	uncorrected	0.980	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	corrected	0.980	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	uncorrected	0.990	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	corrected	0.990	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	uncorrected	0.995	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	corrected	0.995	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sparrowhawk	uncorrected	0.950	0.01	0.01	0.01	0.02	0.08	0.03	0.06	0.06	0.01	0.03	0.00	0.01
	corrected	0.950	0.02	0.01	0.02	0.06	0.13	0.06	0.10	0.10	0.03	0.07	0.00	0.02
	uncorrected	0.980	0.00	0.00	0.00	0.01	0.03	0.01	0.02	0.02	0.00	0.01	0.00	0.00
	corrected	0.980	0.01	0.01	0.01	0.02	0.05	0.02	0.04	0.04	0.01	0.03	0.00	0.01
	uncorrected	0.990	0.00	0.00	0.00	0.00	0.02	0.01	0.01	0.01	0.00	0.01	0.00	0.00
	corrected	0.990	0.00	0.00	0.00	0.01	0.03	0.01	0.02	0.02	0.01	0.01	0.00	0.00
	uncorrected	0.995	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.00
	corrected	0.995	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.00	0.00
Buzzard	uncorrected	0.950	0.03	0.13	0.32	0.33	0.63	0.60	0.60	0.41	0.19	0.06	0.09	0.03
	corrected	0.950	0.06	0.26	0.66	0.79	1.10	1.10	1.09	0.73	0.33	0.10	0.17	0.05
	uncorrected	0.980	0.01	0.05	0.13	0.13	0.25	0.24	0.24	0.16	0.08	0.02	0.03	0.01
	corrected	0.980	0.02	0.10	0.26	0.31	0.44	0.44	0.44	0.29	0.13	0.04	0.07	0.02
	uncorrected	0.990	0.01	0.03	0.06	0.07	0.13	0.12	0.12	0.08	0.04	0.01	0.02	0.01
	corrected	0.990	0.01	0.05	0.13	0.16	0.22	0.22	0.22	0.15	0.07	0.02	0.03	0.01
	uncorrected	0.995	0.00	0.01	0.03	0.03	0.06	0.06	0.06	0.04	0.02	0.01	0.01	0.00
	corrected	0.995	0.01	0.03	0.07	0.08	0.11	0.11	0.11	0.07	0.03	0.01	0.02	0.00

Species	Distance effects	Avoidance rate	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Golden Plover	uncorrected	0.950	0.09	0.00	2.77	10.09	0.00	0.00	0.00	0.00	0.21	5.98	8.14	2.01
	corrected	0.950	0.15	0.01	7.10	36.63	0.00	0.00	0.00	0.00	0.56	15.80	20.50	5.26
	uncorrected	0.980	0.03	0.00	1.11	4.04	0.00	0.00	0.00	0.00	0.08	2.39	3.26	0.80
	corrected	0.980	0.06	0.00	2.84	14.65	0.00	0.00	0.00	0.00	0.22	6.32	8.20	2.10
	uncorrected	0.990	0.02	0.00	0.55	2.02	0.00	0.00	0.00	0.00	0.04	1.20	1.63	0.40
	corrected	0.990	0.03	0.00	1.42	7.33	0.00	0.00	0.00	0.00	0.11	3.16	4.10	1.05
	uncorrected	0.995	0.01	0.00	0.28	1.01	0.00	0.00	0.00	0.00	0.02	0.60	0.81	0.20
	corrected	0.995	0.02	0.00	0.71	3.66	0.00	0.00	0.00	0.00	0.06	1.58	2.05	0.53
Lapwing	uncorrected	0.950	0.77	0.32	0.06	0.01	0.05	0.12	0.41	0.13	0.00	0.00	0.21	0.29
	corrected	0.950	1.99	0.69	0.15	0.02	0.10	0.20	0.66	0.17	0.00	0.01	0.61	0.74
	uncorrected	0.980	0.31	0.13	0.03	0.00	0.02	0.05	0.16	0.05	0.00	0.00	0.08	0.12
	corrected	0.980	0.80	0.28	0.06	0.01	0.04	0.08	0.26	0.07	0.00	0.00	0.24	0.29
	uncorrected	0.990	0.15	0.06	0.01	0.00	0.01	0.02	0.08	0.03	0.00	0.00	0.04	0.06
	corrected	0.990	0.40	0.14	0.03	0.00	0.02	0.04	0.13	0.03	0.00	0.00	0.12	0.15
	uncorrected	0.995	0.08	0.03	0.01	0.00	0.01	0.01	0.04	0.01	0.00	0.00	0.02	0.03
	corrected	0.995	0.20	0.07	0.02	0.00	0.01	0.02	0.07	0.02	0.00	0.00	0.06	0.07
Whimbrel	uncorrected	0.950	0.00	0.00	0.00	0.00	5.46	0.00	0.00	0.04	0.02	0.00	0.00	0.00
	corrected	0.950	0.00	0.00	0.00	0.00	7.61	0.00	0.00	0.06	0.02	0.00	0.00	0.00
	uncorrected	0.980	0.00	0.00	0.00	0.00	2.18	0.00	0.00	0.02	0.01	0.00	0.00	0.00
	corrected	0.980	0.00	0.00	0.00	0.00	3.04	0.00	0.00	0.02	0.01	0.00	0.00	0.00
	uncorrected	0.990	0.00	0.00	0.00	0.00	1.09	0.00	0.00	0.01	0.00	0.00	0.00	0.00
	corrected	0.990	0.00	0.00	0.00	0.00	1.52	0.00	0.00	0.01	0.00	0.00	0.00	0.00
	uncorrected	0.995	0.00	0.00	0.00	0.00	0.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	corrected	0.995	0.00	0.00	0.00	0.00	0.76	0.00	0.00	0.01	0.00	0.00	0.00	0.00

Species	Distance effects	Avoidance rate	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Curlew	uncorrected	0.950	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.02	0.00	0.00	0.00	0.00
	corrected	0.950	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.03	0.00	0.00	0.00	0.00
	uncorrected	0.980	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00
	corrected	0.980	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.01	0.00	0.00	0.00	0.00
	uncorrected	0.990	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
	corrected	0.990	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00
	uncorrected	0.995	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	corrected	0.995	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
Black-headed Gull	uncorrected	0.950	0.00	0.00	0.00	0.16	0.44	1.03	0.27	0.02	0.00	0.00	0.00	0.00
	corrected	0.950	0.00	0.00	0.00	0.53	0.70	1.62	0.63	0.06	0.00	0.00	0.00	0.00
	uncorrected	0.980	0.00	0.00	0.00	0.06	0.18	0.41	0.11	0.01	0.00	0.00	0.00	0.00
	corrected	0.980	0.00	0.00	0.00	0.21	0.28	0.65	0.25	0.02	0.00	0.00	0.00	0.00
	uncorrected	0.990	0.00	0.00	0.00	0.03	0.09	0.21	0.05	0.00	0.00	0.00	0.00	0.00
	corrected	0.990	0.00	0.00	0.00	0.11	0.14	0.32	0.13	0.01	0.00	0.00	0.00	0.00
	uncorrected	0.995	0.00	0.00	0.00	0.02	0.04	0.10	0.03	0.00	0.00	0.00	0.00	0.00
	corrected	0.995	0.00	0.00	0.00	0.05	0.07	0.16	0.06	0.01	0.00	0.00	0.00	0.00
Common Gull	uncorrected	0.950	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	corrected	0.950	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
	uncorrected	0.980	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	corrected	0.980	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	uncorrected	0.990	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	corrected	0.990	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	uncorrected	0.995	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	corrected	0.995	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Species	Distance effects	Avoidance rate	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Lesser Black-backed Gull	uncorrected	0.950	0.00	0.00	0.06	1.28	5.37	1.36	1.74	2.21	0.03	0.00	0.03	0.00
	corrected	0.950	0.00	0.00	0.12	3.11	9.64	2.38	3.04	3.72	0.06	0.00	0.04	0.00
	uncorrected	0.980	0.00	0.00	0.03	0.51	2.15	0.54	0.70	0.88	0.01	0.00	0.01	0.00
	corrected	0.980	0.00	0.00	0.05	1.24	3.86	0.95	1.22	1.49	0.02	0.00	0.02	0.00
	uncorrected	0.990	0.00	0.00	0.01	0.26	1.07	0.27	0.35	0.44	0.01	0.00	0.01	0.00
	corrected	0.990	0.00	0.00	0.02	0.62	1.93	0.48	0.61	0.74	0.01	0.00	0.01	0.00
	uncorrected	0.995	0.00	0.00	0.01	0.13	0.54	0.14	0.17	0.22	0.00	0.00	0.00	0.00
	corrected	0.995	0.00	0.00	0.01	0.31	0.96	0.24	0.30	0.37	0.01	0.00	0.00	0.00
Kestrel	uncorrected	0.950	0.03	0.04	0.04	0.09	0.36	0.16	0.25	0.25	0.23	0.12	0.07	0.05
	corrected	0.950	0.08	0.09	0.09	0.31	0.66	0.33	0.47	0.50	0.40	0.22	0.19	0.12
	uncorrected	0.980	0.01	0.01	0.02	0.04	0.14	0.07	0.10	0.10	0.09	0.05	0.03	0.02
	corrected	0.980	0.03	0.04	0.03	0.13	0.26	0.13	0.19	0.20	0.16	0.09	0.07	0.05
	uncorrected	0.990	0.01	0.01	0.01	0.02	0.07	0.03	0.05	0.05	0.05	0.02	0.01	0.01
	corrected	0.990	0.02	0.02	0.02	0.06	0.13	0.07	0.09	0.10	0.08	0.04	0.04	0.02
	uncorrected	0.995	0.00	0.00	0.00	0.01	0.04	0.02	0.03	0.02	0.02	0.01	0.01	0.00
	corrected	0.995	0.01	0.01	0.01	0.03	0.07	0.03	0.05	0.05	0.04	0.02	0.02	0.01
Merlin	uncorrected	0.950	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	corrected	0.950	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	uncorrected	0.980	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	corrected	0.980	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	uncorrected	0.990	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	corrected	0.990	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	uncorrected	0.995	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	corrected	0.995	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Species	Distance effects	Avoidance rate	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Peregrine	uncorrected	0.950	0.00	0.00	0.00	0.00	0.01	0.01	0.03	0.00	0.01	0.00	0.00	0.01
	corrected	0.950	0.00	0.00	0.00	0.01	0.02	0.01	0.05	0.00	0.01	0.00	0.00	0.01
	uncorrected	0.980	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00
	corrected	0.980	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.00	0.00	0.00	0.00	0.00
	uncorrected	0.990	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
	corrected	0.990	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
	uncorrected	0.995	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	corrected	0.995	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table A2.8. Annual / seasonal collision risks.

Species	Season	Distance effects	Avoidance rate			
			0.95	0.98	0.99	0.995
Mute Swan	all year	uncorrected	0.04	0.02	0.01	0.00
	all year	corrected	0.08	0.03	0.02	0.01
Whooper Swan	winter	uncorrected	1.73	0.69	0.35	0.17
	winter	corrected	3.00	1.20	0.60	0.30
Greylag Goose	all year	uncorrected	0.01	0.00	0.00	0.00
	all year	corrected	0.02	0.01	0.00	0.00
Wigeon	winter	uncorrected	0.01	0.00	0.00	0.00
	winter	corrected	0.01	0.01	0.00	0.00
Teal	all year	uncorrected	0.57	0.23	0.11	0.06
	all year	corrected	0.81	0.32	0.16	0.08
Mallard	all year	uncorrected	0.95	0.38	0.19	0.09
	all year	corrected	1.61	0.64	0.32	0.16
Cormorant	breeding	uncorrected	0.34	0.14	0.07	0.03
	breeding	corrected	0.54	0.22	0.11	0.05
	non-breeding	uncorrected	0.03	0.01	0.01	0.00
	non-breeding	corrected	0.05	0.02	0.01	0.01
Little Egret	all year	uncorrected	0.50	0.20	0.10	0.05
	all year	corrected	0.84	0.34	0.17	0.08
Grey Heron	all year	uncorrected	0.33	0.13	0.07	0.03
	all year	corrected	0.52	0.21	0.10	0.05
Little Grebe	all year	uncorrected	0.01	0.00	0.00	0.00
	all year	corrected	0.03	0.01	0.01	0.00
Marsh Harrier	all year	uncorrected	0.00	0.00	0.00	0.00
	all year	corrected	0.01	0.00	0.00	0.00
Hen Harrier	non-breeding	uncorrected	0.01	0.00	0.00	0.00
	non-breeding	corrected	0.02	0.01	0.00	0.00
Sparrowhawk	all year	uncorrected	0.32	0.13	0.06	0.03
	all year	corrected	0.61	0.24	0.12	0.06
Buzzard	all year	uncorrected	3.40	1.36	0.68	0.34
	all year	corrected	6.43	2.57	1.29	0.64
Golden Plover	summer	uncorrected	0.21	0.08	0.04	0.02
	summer	corrected	0.56	0.22	0.11	0.06
	winter	uncorrected	29.08	11.63	5.82	2.91
	winter	corrected	85.45	34.18	17.09	8.54
Lapwing	breeding	uncorrected	0.59	0.23	0.12	0.06
	breeding	corrected	0.98	0.39	0.20	0.10
	autumn	uncorrected	0.13	0.05	0.03	0.01
	autumn	corrected	0.18	0.07	0.04	0.02
	winter	uncorrected	1.65	0.66	0.33	0.17
	winter	corrected	4.19	1.68	0.84	0.42
Whimbrel	migration	uncorrected	5.52	2.21	1.10	0.55
	migration	corrected	7.69	3.08	1.54	0.77

Species	Season	Distance effects	Avoidance rate			
			0.95	0.98	0.99	0.995
Curlew	breeding	uncorrected	0.03	0.01	0.01	0.00
	breeding	corrected	0.05	0.02	0.01	0.01
	non-breeding	uncorrected	0.02	0.01	0.00	0.00
	non-breeding	corrected	0.03	0.01	0.01	0.00
Black-headed Gull	breeding	uncorrected	1.91	0.77	0.38	0.19
	breeding	corrected	3.48	1.39	0.70	0.35
	non-breeding	uncorrected	0.02	0.01	0.00	0.00
	non-breeding	corrected	0.06	0.03	0.01	0.01
Common Gull	all year	uncorrected	0.01	0.00	0.00	0.00
	all year	corrected	0.01	0.00	0.00	0.00
Lesser Black-backed Gull	breeding	uncorrected	9.75	3.90	1.95	0.98
	breeding	corrected	18.17	7.27	3.63	1.82
	autumn	uncorrected	2.24	0.90	0.45	0.22
	autumn	corrected	3.78	1.51	0.76	0.38
	winter	uncorrected	0.09	0.04	0.02	0.01
	winter	corrected	0.17	0.07	0.03	0.02
Kestrel	all year	uncorrected	1.69	0.68	0.34	0.17
	all year	corrected	3.44	1.38	0.69	0.34
Merlin	all year	uncorrected	0.00	0.00	0.00	0.00
	all year	corrected	0.00	0.00	0.00	0.00
Peregrine	all year	uncorrected	0.07	0.03	0.01	0.01
	all year	corrected	0.12	0.05	0.02	0.01

APPENDIX M DERRYADD WIND FARM: COLLISION RISK MODELLING REPORT (GITTINGS, 2026)

1 - Background

1.1 - FI Item 1D

An Coimisiún Pleanála (ACP) required clarification of the exact population levels used in the collision risk assessment in the estimation of the potential increase in mortality by wind turbine collisions to the Lough Ree Special Protection Area (SPA) [Site code: 004064] population of Whooper Swan (*Cygnus cygnus*) [Species code: A038]. It was noted by ACP that the "population reference level used for Lough Ree appears to incorporate a wider area" and requested an updated estimate of mortality thresholds for "the relevant species listed for Lough Ree as defined by the SPA population cited in the conservation objectives".

To address the ACP request the collision risk assessment has been updated using the baseline and recent population estimates contained in the conservation objectives for Lough Ree SPA (NPWS, 2025). Revised mortality thresholds and corresponding increases in annual mortality are presented below.

1.1.1 - Population data

The collision risk assessment in the collision risk modelling (CRM) report included two populations relevant to Special Conservation Interests (SCIs) of the Lough Ree SPA:

- the Whooper Swan population at the county scale, which was defined as including Lough Ree and County Longford, and
- the Golden Plover (*Pluvialis apricaria*) [Species code: A140] population at the local scale, which was defined as Lough Ree.

1.1.1.1 - Whooper Swan

The Whooper Swan populations covered by the collision risk assessment are listed in Table 2.5 of the CRM report in Appendix L. Lough Ree was included as part of the regional population, which also included all other sites in County Longford. The data was obtained from the 2020 International Swan Census (ISC) and included a total of 195 birds from Lough Ree.

The Site Specific Conservation Objectives (SSCOs) for the Lough Ree SPA (NPWS 2025) define the baseline population for Lough Ree as 139 Whooper Swans. This is the three-year mean of peak counts for the winters of 1997/98–1999/2000. The objectives also define the recent population as 126 Whooper Swans. This is the four-year mean of peak counts from the winters of 2018/19–2020/21 and 2022/23 (there was no data for the winter of 2021/22). The 2019/20 peak was taken from the ISC data, while the peaks for the other winters were taken from Irish Wetland Bird Survey (I-WeBS) data.

The actual peak counts for the winters of 2018/19–2020/21 and 2022/23 were 73–122 for the three winters where they were derived from I-WeBS data and 195 for the winter derived from ISC data. The higher count in the latter winter may reflect more comprehensive species-specific survey coverage in the ISC compared with standard I-WeBS counts. In this context, the 9% decline between 1997/98–1999/2000 and 2018/19–2022/23 referred to in the conservation objectives should be interpreted with caution because differences in survey methodology and coverage may account for some or all of the apparent change.

1.1.1.2 - Golden Plover

The Lough Ree Golden Plover population is shown as 1,225 birds in Table 2.5 of the CRM report in Appendix L. This differs from the recent population figure of 927 birds in the conservation objectives. The reason for the discrepancy is the inclusion of an additional winter (2023/24) in the data used for the CRM report: i.e. the recent population in the conservation objectives is for the period 2018/19–2022/23, while the CRM population estimate is for the period 2018/19–2023/24[1] Both estimates excluded the peak count for the winter of 2019/20, which was only 30 birds and clearly reflected coverage issues.

[1] The source details for the Golden Plover local population in the footnote to Table 2.5 in the CRM report should read: mean annual Irish Wetland Bird Survey peak counts, 2018/19, 2021/22, 2022/23 and 2023/24.

1.1.2 - Updated mortality thresholds

The 1% mortality thresholds used in the collision risk assessment were derived from the population estimates multiplied by the estimates of the background mortality rates.

Updated 1% mortality thresholds are shown in Table 1 below for all of the Lough Ree SCI species included in the collision risk assessment. The conservation objectives define both a baseline population (used to assess long-term conservation status) and a recent population (reflecting current monitoring). Mortality thresholds are therefore shown for both population estimates.

1.1.3 - Updated collision risk assessment for the Lough Ree SPA populations

The updated collision risk assessments for the baseline and recent Lough Ree population estimates from the conservation objectives are shown in Table 1. As with the mortality thresholds, the mortality increases are shown for both the baseline and recent population estimates.

Note that for any given values of collision risk and background mortality, the increases in annual mortality rates are a linear function of population size. So potential increases in annual mortality rates can be estimated from the data in Tables 2.5 and 5.1 of the CRM report in Appendix L. for populations of any size (subject to a possible ± 0.1% error, due to rounding).

Table 1: Mortality thresholds and potential increases in annual mortality rates due to the predicted collision risk from the Derryadd Wind Farm to the Lough Ree SPA non-breeding Whooper Swan, Teal, Mallard, Golden Plover and Lapwing populations, based on the population estimates in the Lough Ree SPA conservation objectives.

Species	Period	1% threshold	Mortality increases with distance effects	
			uncorrected	corrected
Whooper Swan (*Cygnus cygnus*) [A038]	baseline	0.3	0.6% (0.3%–1.3%)	1.1% (0.6%–2.2%)
	recent	0.3	0.7% (0.4%–1.4%)	1.2% (0.7%–2.4%)
Teal (*Anas crecca*) [A052]	baseline	6.9	0.0%	0.0%
	recent	1.5	0.2%	0.2%
Mallard (*Anas platyrhynchos*) [A053]	baseline	4.1	0.1% (0.0%–0.2%)	0.2% (0.1%–0.4%)
	recent	2.0	0.2% (0.1%–0.5%)	0.3% (0.1%–0.9%)

Species	Period	1% threshold	Mortality increases with distance effects	
			uncorrected	corrected
Golden Plover (*Pluvialis apricaria*) [A140] (avoidance = 99.6%)	baseline	8.3	0.3% (0.1%–1.1%)	0.8% (0.3%–3.2%)
	recent	2.5	0.9% (0.3%–3.6%)	2.7% (0.9%–10.6%)
Golden Plover (*Pluvialis apricaria*) [A140] (avoidance = 99.8%)	baseline	8.3	0.1% (0.0%–0.5%)	0.4% (0.1%–1.6%)
	recent	2.5	0.5% (0.1%–1.8%)	1.4% (0.4%–5.3%)
Lapwing Lapwing (*Vanellus vanellus*) [A142]	baseline	17.1	0.0% (0.0%–0.2%)	0.1% (0.0%–0.4%)
	recent	3.9	0.2% (0.0%–0.7%)	0.4% (0.1%–1.8%)

The increases in annual mortality rates are shown separately for collision risk estimates from models with distance effects uncorrected or corrected, with uncertainty ranges in parentheses (see CRM report in Appendix L for more details). Separate estimates of mortality increases are included for Golden Plover using avoidance rates of 99.6% and 99.8%.

1.1.4 - Discussion

The standard caveats that apply to collision risk assessments should be considered. These include the precautionary assumptions that all the collision fatalities were adult birds, and that the collision mortality was additive rather than compensatory, and the fact that the 1% threshold is likely to be very precautionary. Therefore, substantial increases in annual mortality well above the 1% threshold are likely to be required to cause significant impacts on the affected populations.

1.1.4.1 - Whooper Swan

The potential increases in annual mortality rates shown in Table 1 are based on the estimates of the Lough Ree SPA Whooper Swan population from the Lough Ree SPA conservation objectives. However, these estimates are based on daytime I-WeBS and ISC counts. If, as seems likely, birds are using Lough Ree as a nocturnal roost and commuting to surrounding bogland and fields to feed during the day, such counts will only record a partial component of the population using Lough Ree. In this context, it is notable that the ISC counts from sites within 5 km of the wind farm site recorded more birds than those from Lough Ree (247 versus 195 birds) and almost twice the recent population estimate for Lough Ree.

Given its size and the estimated core foraging range for Whooper Swan of 5 km (SNH 2016), Lough Ree may host several discrete Whooper Swan populations of which only some are likely to interact with the wind farm site. The analysis of Whooper Swan movement patterns for the 2019 planning application (Gittings 2019) indicated that a large component of the Whooper Swan flight and ground activity within the wind farm site appeared to be associated with a local population centred on a presumed night roost location along the Shannon to the north of the site and had little connectivity with the Lough Ree SPA. Therefore, allocating the entire predicted collision risk to the Lough Ree SPA population is likely to overestimate the impact on that population.

Accordingly, the potential increases in annual mortality rates shown in Table 1 should be regarded as precautionary estimates of impact on the Lough Ree SPA population.

1.1.4.2 - Golden Plover

Wintering Golden Plover generally have larger winter home ranges than Whooper Swans, so there is more justification in using Lough Ree data to estimate the population likely to be at risk from the wind farm. However, as noted in the CRM report, the local population was estimated from Irish Wetland Bird Survey data. As many Golden Plover occur away from wetland sites, the size of the local population used for the collision risk assessment may have been a significant underestimate. Also, the large change in the estimate caused by inclusion of data from an additional winter (see Section 1.1.1.2) indicates that there is considerable uncertainty around these estimates, reflecting the difficulties in accurately censusing this mobile and dispersed species.

The CRM report also noted that the correction for distance effects may have resulted in an overestimation of the Golden Plover collision risk. Most of the collision risk was generated by records of large flocks. It is likely that the under-detection of distant flightlines is much less of an issue for large flocks compared to small groups and individual birds. Therefore, the smaller collision risk generated by the uncorrected model may be more reliable in this case.

1.1.4.3 - Other species

The degree of connectivity between the wind farm site and Lough Ree for Mallard and Teal is not known. However, both these species are likely to have local wintering populations in the wind farm site that are not dependent on Lough Ree. Consequently, applying the full predicted collision mortality to the Lough Ree SPA populations is likely to represent a precautionary assumption.

Lapwing is similar to Golden Plover in having wide-ranging and mobile wintering populations.

References

Gittings, T. (2019). Derryadd Wind Farm, Co. Longford: Whooper Swan Summary Report.

NPWS (2025). Conservation Objectives: Lough Ree SPA 004064. Version 1. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage.

SNH. (2016). Assessing connectivity with Special Protection Areas (SPAs). Scottish Natural Heritage.

APPENDIX N CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN (CEMP)

TOBIN

Bord na Móna

Derryadd Wind Farm

Construction Environmental Management Plan (CEMP)



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1.0 INTRODUCTION

Bord na Móna Powergen Ltd. and hereafter referred to as the Applicant), intend to apply to An Bord Pleanála (ABP) for planning permission to develop a wind farm and all associated infrastructure across three bogs (Derryaroge, Derryadd and Lough Bannow) within the Mountdillon Bog Group in Co. Longford. There are works as part of the proposed development which will take place outside of the wind farm site along the turbine delivery route (TDR). TOBIN are the Lead Planning and Environmental Consultants for the planning application of the proposed development.

The proposed wind farm and all associated infrastructure, including works which will take place outside of the wind farm site along the Turbine Delivery Route (TDR), will hereafter be referred to as the proposed development.

The lands associated with the wind farm and supporting infrastructure (excluding the TDR and lands where works are required outside of the wind farm site) are owned by Bord na Móna. and are hereafter referred to as the proposed wind farm site. The proposed wind farm site encompasses a total of approximately 1,900 hectares (ha), is generally flat and consists predominantly of bare, locally re-vegetated cutaway peat, shallow peat, with an established drainage network throughout the peatland which is managed under IPC licence P0504-01 Mountdillon Bog Group, as well as a small number of manmade elements associated with previous peat extraction, including BnM buildings and railway lines.

The proposed wind farm is located approximately 1.9 km east of Lanesborough Town, County Longford. Longford Town is situated approximately 9 km northeast of the proposed wind farm site.

The proposed development comprises of the construction of 22 no. wind turbines and ancillary works including works along the TDR. The turbines will have a blade tip height of 190 m above the top of the foundation level and will be accessible from internal access routes within the Bord na Móna site. The proposed wind farm will have an estimated installed capacity of approximately 132 MW.

A description of the key elements of the proposed development is outlined in Section 2 of this CEMP. A full description of the proposed development is provided in Chapter 3 (Description of the Proposed Development) of the Environmental Impact Assessment Report (EIAR).

The proposed development refers only to the elements of this for which planning permission is being sought as part of this application.

The planning application for the proposed development will be submitted to An Bord Pleanála (ABP) under Section 37E of the Planning and Development Act 2000 (as amended). An Environmental Impact Assessment Report (hereafter referred to as the EIAR) and Natura Impact Statement (hereafter referred to as the NIS) have been prepared to accompany the planning application and incorporate all elements of the proposed development works including the main wind farm site, the electrical grid connection, and the road/junction accommodation works to facilitate the abnormal load deliveries.

This Construction Environmental Management Plan (CEMP) has been prepared to present the proposed management and administration of site activities for the construction phase of the

proposed development, to ensure that all construction activities are undertaken in an environmentally responsible manner. This CEMP summarises the environmental commitments related to the construction of the proposed development, and the measures to ensure compliance with legislation and the requirements of statutory bodies, all as detailed in the EIAR and NIS.

This CEMP will be a live document and will be reviewed and updated, as necessary. Upon appointment, the main Contractor for construction of the proposed development will update this document to produce an updated version of the CEMP (i.e., the appointed main Contractor's CEMP) which will account for any additional requirements set out in Planning Conditions.

The CEMP provides a summary of the requirements from relevant guidance, standards, and codes of practice applicable to the work being undertaken as part of the proposed development. The following is a non-exhaustive list of relevant guidance/standards/codes referenced in the preparation of this CEMP:

- Environmental Protection Agency (EPA), Guidelines on the Information to be contained in Environmental Impact Assessment Reports (May 2022);
- Department of Housing, Planning and Local Government (DHPLG), Draft Revised Wind Energy Development Guidelines (December 2019);
- Department of Environment, Heritage and Local Government (DEHLG), Wind Energy Development Guidelines (December 2006);
- EPA Best Practice Guidelines for the preparation of resource & waste management plans for construction & demolition projects (November 2021);
- Inland Fisheries Ireland (IFI) Guidelines on the Protection of Fisheries During Construction Works in and Adjacent to Waters (IFI, 2016);
- Construction Industry Research and Information Association (CIRIA) C532 publication 'Control of Water Pollution from Construction Sites: Guidance for Consultants and Contractors' (CIRIA, 2001);
- CIRIA C648 publication 'Control of water pollution from linear construction projects' (CIRIA, 2006);
- CIRIA C741 publication 'Environmental Good Practice on Site' (4th Edition) (CIRIA, 2015);
- CIRIA C750, 'Groundwater control: design and practice' (2nd Edition) (CIRIA, 2016);
- British Standard BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise;
- BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Vibration;
- Scottish Natural Heritage (SNH) (2019) 'Good Practice during Wind Farm Construction' (4th edition). Scottish Natural Heritage;
- The Institute of Air Quality Management (IAQM) publication '*Guidance on the Assessment of Dust from Demolition and Construction*' (2014);
- Eastern Regional Fisheries Board (2004) guidance document "Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites".

1.1 SCOPE OF THE CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN (CEMP)

The purpose of this document is to communicate the key environmental obligations that apply to all Contractors, their sub-Contractors and personnel while carrying out any form of construction activity for the proposed development.

This CEMP should be read in conjunction with the Planning Documents & Drawings, the EIAR, NIS, and the construction phase elements of the Traffic Management Plan (TMP) (see Appendix 15-2).

This CEMP provides a mechanism for ensuring compliance with environmental legislation and statutory consents. It defines the approach to environmental management at the site during the construction phase and addresses all relevant environmental aspects of the management of site preparation and construction work within the development works area (as set out in Section 3.1 'The Proposed Development – Overview' of Chapter 3 (Description of the Proposed Development) of the EIAR).

The scope of the CEMP includes:

- All construction elements of the development;
- The proposed implementation and management of environmental controls and mitigation measures during each phase of construction works; and
- A documented process to ensure measures identified through the planning phase of the proposed development will be applied in practice.

At a minimum, this CEMP will be developed further by the appointed main Contractor at construction phase to form a construction phase CEMP will contain:

- A statement of the environmental aims and policy objectives of the proposed development;
- Roles and Responsibilities of key individuals;
- Environmental management and reporting structure;
- Site management and construction activity details;
- Environmental mitigation measures;
- Environmental awareness training programmes;
- Environmental monitoring programmes and requirements;
- Inspection and auditing programmes; and
- Emergency response plans and procedures for any environmental incidents.

1.1.1 Objectives of the CEMP

The key aims of the CEMP are:

- To set out the client's expectations to guide contractors on their requirements with regards to environmental commitments and environmental management;
- To ensure the proposed development is undertaken in accordance with best practice guidance for the management of the environment during construction works;
- To ensure that mitigation measures to protect all aspects of the environment as set out in the EIAR and the NIS are put in place;

- To ensure compliance with legislation and identify where it would be necessary to obtain authorisation from relevant statutory bodies;
- To ensure that construction activities are carried out in accordance with all planning conditions for the development;
- Ensure that appropriate proposed development monitoring and reporting will be in place;
- To carry out the works with minimal impact on the environment; and
- To ensure procedures are in place so that there is a prompt response to effects requiring remediation, including reporting and any additional mitigation measures required to prevent a recurrence.

The primary objectives to ensure the above aims are achieved during the construction phase are:

- Appointment and delegation of responsibility to an individual for monitoring environmental compliance and adherence to the appointed main Contractor's CEMP;
- Updating the appointed main Contractor's CEMP on a continuous basis in accordance with regular environmental auditing and site inspections. This will confirm the efficacy and implementation of all relevant mitigation measures and commitments identified in the planning application documentation;
- Providing adequate environmental training and awareness to all proposed development personnel;
- Establishing documented schedules and records for monitoring and inspections;
- Establishing reporting procedures for any incidents on site with potential to impact on the environment;
- Provide a framework for reporting, compliance auditing and inspection to ensure environmental aims would be met.
- Provide an outline of the content that would be supplied in the construction method statements and strategies that would be prepared in order to secure mitigation measures in relation to different design aspects of the proposed development
- Providing opportunities for community feedback and submission of complaints; and
- Adopting a sustainable and socially responsible approach to construction.

1.1.2 Implementation and control of the CEMP

This CEMP will be accessible and displayed in the site office for reference by all personnel working on the site. The measures set out in this plan will form part of the site induction and will also be discussed with those working on site during informal 'toolbox' talks.

Where appropriate, the CEMP, or plans within the CEMP, will form part of the site induction which would be mandatory for all employees, contractors and visitors attending the site. All employees and contractors will need to familiarise themselves with the relevant contents of the CEMP and supporting appendices as directed.

Compliance with the CEMP is the key control measure required during construction to ensure mitigation is appropriately addressed. The appointed main Contractor would be required to prepare a series of site / task specific method statements providing detail on how the contractor intends to implement the mitigation set out in the CEMP.

The CEMP would be used by the appointed main Contractor to ensure appropriate environmental management is implemented throughout the construction phase of the proposed development. The CEMP documents the commitment to safeguarding the environment through the identification, avoidance and mitigation of the potential negative environmental impacts associated with the proposed development. The CEMP aims to define good practice as well as specific actions requited to implement mitigation requirements.

In terms of overall environmental responsibility, all personnel on site are responsible for ensuring that their actions constitute good environmental practice. All site personnel are charged with following good practice and encouraged to provide feedback and suggestions for improvements. All site personnel are also required to ensure compliance with the requirements of the CEMP.

Compliance with the CEMP, the procedure, work practices and controls will be mandatory and must be adhered to by the appointed main Contractor, all site personnel, and sub-contractors employed during the construction phase.

The CEMP seeks to:

- Provide a basis for achieving and implementing the construction related mitigation measures identified in the EIAR and NIS; and
- Promote best environmental on-site practices for the duration of the construction phase.

It is important to note that the CEMP is considered to be a live document that will continue to be developed further and / or amended throughout all phases in the lifetime of the proposed development.

1.1.3 Revisions to the CEMP

As mentioned above, the CEMP is a 'live' document and as such will be reviewed on a regular basis to allow any changes to construction programme, operations or unforeseen issues be incorporated at any stage throughout the proposed development t as deemed necessary by the Applicant, their agents, or relevant authorities. The CEMP will be subject to continual review to address. For example:

- Any conditions required in the planning permission;
- Any requirements/issues highlighted through consultations prior to works e.g. by the National Parks and Wildlife Service (NPWS), Longford County Council etc.;
- To ensure it reflects best practice at the time of construction;
- To ensure it incorporates the findings of any pre-construction site investigations;
- Changes resulting from the construction methods used by the contractor(s);
- Unforeseen conditions encountered during construction.

This CEMP will be provided to the appointed main Contractor who will have responsibility for updating the document as necessary through the construction phase. The appointed main Contractor's CEMP will incorporate the conditions associated with any grant of planning for the proposed development. This CEMP will be subject to ongoing review (throughout the construction phase of the development), through regular environmental auditing and site inspections. This will confirm the efficacy and implementation of all relevant mitigation measures and commitments identified in the application documentation.

The appointed main Contractor is required to include further details and/or confirmation in the updated version of the CEMP which will include:

- Details of emergency plan including personnel and contact numbers;
- Site and traffic signage; and
- Method statements.

The appointed main Contractor will also agree and implement monitoring measures to monitor the effectiveness of the CEMP.

2.0 SITE LOCATION AND PROPOSED DEVELOPMENT DETAILS

2.1 LOCATION OF THE PROPOSED DEVELOPMENT

The proposed wind farm (i.e., the no. 22 turbines and associated infrastructure within the proposed wind farm site boundary) will be located on Derryaroge, Derryadd, and Lough Bannow bogs within the Mountdillon bog group in County Longford. The site of the proposed wind farm is illustrated in Figure 1.1 of Chapter 1 (Introduction) of the EIAR. The closest settlements to the proposed wind farm are Derraghan village and Lanesborough town located approximately 200 m and 500 m west, respectively.

Other nearby settlements to the proposed wind farm include Keenagh 1.6 km east and Killashee 700 m northeast, while the main urban centre in the region, Longford Town, is located 9 km to the northeast from its nearest point. Derryaroge Bog is approximately 1.20 km south of the River Shannon which runs in a northwest direction to the proposed wind farm site and Lough Bannow Bog is approximately 0.5 km to the west of the Royal Canal which runs in a northwest to east direction.

There are 5 no. locations along the TDR requiring minor temporary accommodation works in order to facilitate the delivery of turbine components to the proposed wind farm site. These are detailed further in Section 3.3.15 of Chapter 3 (Description of the Proposed Development) of the EIAR.

The proposed development is located within the townlands of Annaghbeg, Annaghmore, Ards, Ballynakill, Barnacor, Ballypheasan, Bogganfin, Cloonbearla, Cloonybeirne, Cloonbony, Cloonbrock, Clonfinfy, Cloonfiugh, Cloonfore, Cloonkeel, Cloontabeg, Cloontamore, Coolnahinch, Corlea, Corralough, Derraghan Beg, Derraghan More, Derryad, Derryaroge, Derryart, Derrygeel, Derryglogher, Derrynaskea, Derryoghil, Derryshannoge, Grillagh, Kilmakinlan, Monksland, Mosstown, Mount Davys, Rappareehill.

The proposed wind farm site boundary encompasses an area of approximately 1,900 ha and measures approximately 12.1 km in length from north to south and approximately 3.8 km from east to west at its widest point.

The proposed wind farm site is situated to the east of Lough Ree and west of the Royal Canal while the River Shannon is located to the north and west.

A network of grid infrastructure exists in the area, including the Lanesborough/Richmond line 110 kV overhead line, which traverses the proposed wind farm site along the boundary of the Derryadd and Derryaroge bogs near the existing Mountdillon works buildings.

2.1.1 Designated Sites

Full details of the Sites of International Importance (European Sites: Special Areas of Conservation (SACs) and Special Protected Areas (SPAs)) and Sites of National Importance (Natural Heritage Areas (NHA) and proposed Natural Heritage Areas (pNHA)) within 15 km of the Wind farm site are outlined in the Chapter 7 (Biodiversity) of the EIAR and the NIS.

Sites of International Importance

Figure 7.4 of Chapter 7 (Biodiversity) of the EIAR shows the designated European sites around the proposed wind farm. Considering the hydrological and hydrogeological connectivity source-pathway-receptor via hydrological linkages associated with the proposed wind farm site, two European Sites are considered as potentially connected with the proposed wind farm site:

- Lough Ree SAC [Site code: 00440] (NPWS, 2016; 2019);
- Lough Ree SPA [Site code: 004064] (NPWS, 2015; 2022a).

Sites of National Importance

Figure 7.5 of Chapter 7 (Biodiversity) of the EIAR shows the National designated sites around the proposed wind farm. Considering hydrological and hydrogeological flow associated with the proposed wind farm site, four Nationally important sites are considered as potentially connected with the proposed wind farm site:

- Lough Bawn pNHA [Site code: 001819] (NPWS, 2009a);
- Lough Bannow pNHA [Site code: 000449] (NPWS, 2009b);
- Lough Ree pNHA (see site synopsis for Lough Ree SAC [Site code: 00440] (NPWS, 2019);
- Derry Lough pNHA [Site code: 001444] (NPWS, 2009c).

2.2 DESCRIPTION OF THE PROPOSED DEVELOPMENT

The proposed development will comprise the following:

- 22 no. wind turbines with a blade tip height of 190 m, blade rotor diameter of 165 m, hub height of 107.5 m and the associated infrastructure including tower sections, nacelle, hub, and rotor blades and all associated foundations and hard-standing areas in respect of each turbine;
- New internal site access roads, approximately 27,500 m in length including passing bays and associated drainage;
- 2 no. permanent Meteorological Masts, both of which will be 120 m in height, and associated hardstanding areas for both masts, as well as the decommissioning and removal of an existing 100 m Meteorological Mast on site in Lough Bannow Bog;
- 4 No. Borrow pits in Derryadd Bog; All works associated with the opening, gravel and spoil extraction, and decommissioning of the borrow pits;
- 4 No. temporary construction compounds, including material storage, site welfare facilities, and site offices;
- 4 No. temporary security cabins at the main construction site entrances as well as at a number of access points around the proposed wind farm site;

- 1 no. 110 kV electrical substation compound in Derryaroge Bog. The substation will consist of 2 No. control buildings, a 36 m high telecommunications tower, associated electrical plant and equipment, ground water well, wastewater holding tank and welfare facilities;
- All associated underground electrical and communications cabling connecting the turbines and masts to the proposed electrical substation, including road crossing at N63 and associated grid connection via a 110 kV loop-in connection to the existing Lanesborough-Richmond 110 kV overhead line which traverses the proposed wind farm site;
- 1 No. 16 MW battery storage facility;
- 2 No. Peat Deposition Area, one to the north of the proposed substation compound in Derryaroge Bog and one in Derryadd Bog;
- New site access entrances, temporary improvements and modifications to existing public road infrastructure to facilitate delivery of abnormal loads including locations on N6 Eastbound Slip Road, N6/N61 Roundabout at Athlone, N61/N63 Roundabout at Roscommon, N63 Roscommon Arts Centre Roundabout and N61/N63 Roundabout, Northeast of Roscommon;
- Hinge 3 No. permanent lighting fixtures in Folio RN40465F in Roscommon town to facilitate the delivery of abnormal loads (i.e. turbine blades);
- Approximately 7,500 m of dedicated amenity access tracks to provide linkages between the proposed wind farm site roads and the existing royal canal greenway (to the east), Corlea visitor centre and amenity areas (to the south) and the Midlands Trail Networks project (to the north);
- 3 No. permanent amenity carparks, one of which is situated in Derryaroge Bog (19 no. car parking spaces in total) and two carparks in Derryadd Bog (19 no. car parking spaces in each carpark);
- All associated site work and ancillary works including new drainage and upgrading existing drainage, access road, earthworks, site reinstatement and erosion control, which will be aligned with the existing and future site rehabilitation plans; and,
- A 10-year planning permission is being sought with a 30-year operational life from the date of commissioning of the entire wind farm.

2.3 KEY ROLES AND RESPONSIBILITIES

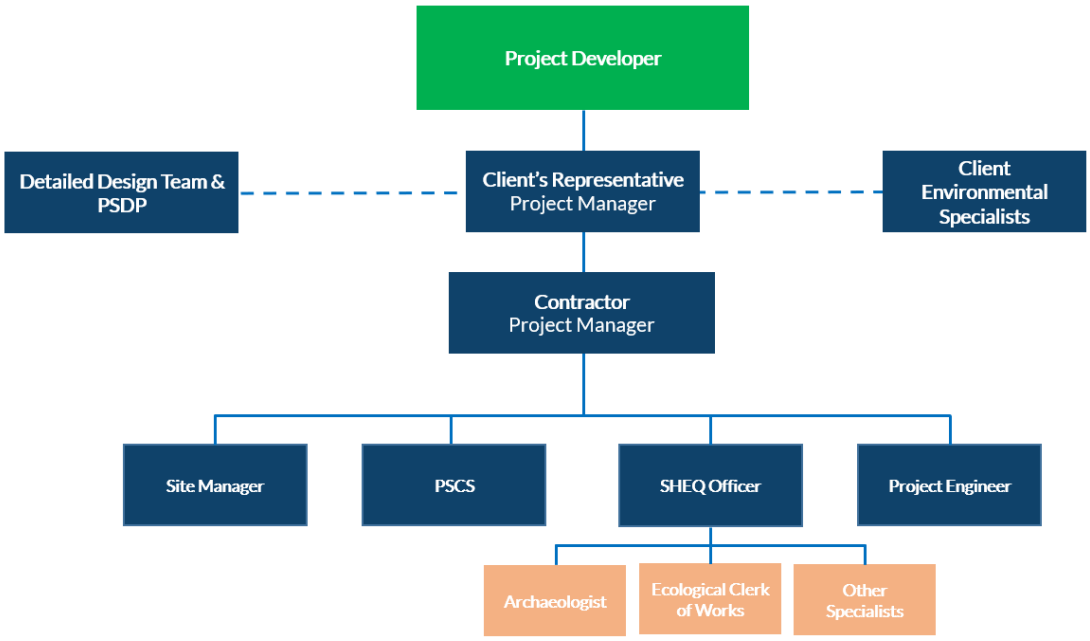
At this stage it is envisaged that the following roles will be appointed for the construction phase of the proposed development; Construction / Site Manager; Project Supervisor Construction Stage (PSCS); Environmental Manager, Safety, Health, Environment and Quality (SHEQ) Advisor; Ecological Clerk of Works (ECoW); Project Ecologist/Ornithologist; Project Hydrologist; Project Geotechnical Engineer / Geologist; and Project Archaeologist.

The names and contact details of the individuals with responsibility for implementation and supervision of mitigation measures during all phases of the development will be clearly identified and set out in documents such as the appointed main Contractor's CEMP and site-specific method statements as appropriate.



Summary details of these roles are outlined in the following sections. At construction phase, the appointed main Contractor's CEMP will confirm roles and finalise responsibilities and contact details once appointed.

Figure 2-1 Example Project Development Organisational Chart



2.3.1 Construction / Site Manager

A suitably qualified Construction / Site Manager will be appointed by the main Contractor for the duration of the construction period. The Construction / Site Manager will have overall responsibility for the organisation and execution of all related environmental activities as appropriate, in accordance with regulatory and project environmental requirements.

2.3.2 Project Supervisor Construction Stage (PSCS)

A suitably qualified PSCS will be appointed by the main Contractor for the duration of the construction period. The duties and responsibilities of the PSCS are detailed in Section 2.4.1.1 Safety and Security of this CEMP.

2.3.3 Safety, Health, Environment & Quality (SHEQ) Advisor

A suitably qualified Safety, Health, Environment and Quality (SHEQ) Advisor will be appointed by the appointed main Contractor for the duration of the construction period. The SHEQ will ensure compliance with all relevant Health and Safety regulations, environmental regulations, and quality control on-site during the construction phase. The SHEQ will be on-site full time during the construction phase. The SHEQ will be responsible for:

- The daily implementation of the CEMP and any other monitoring/mitigation proposals required under the planning consent;
- Ensuring that the objectives of the CEMP are achieved and maintained;

- Informing the appointed contractor(s) of the CEMP and ensuring that appropriate training and awareness materials are developed and implemented on-site;
- Co-ordinating and monitoring the inputs from the ECoW, Project Geotechnical Engineer and Project Archaeologist;
- Implementing appropriate measures in the event of any environmental incidents and managing communications with relevant authorities; and
- Regular communication with the Construction/Site Manager detailing the execution and progress of environmental activities on-site.

2.3.4 Ecological Clerk of Works (ECoW)

A suitably qualified Ecological Clerk of Works (ECoW) will be appointed by the main Contractor for the duration of the construction period. The Ecological Clerk of Works will ensure that all relevant mitigation measures in this CEMP are implemented.

The role of the ECoW is defined by British Standard BS 42020:2013[1] as *"person who has the ecological qualifications, training, skills and relevant experience to undertake appropriate monitoring and to provide specialist advice to "development" site personnel on necessary working practices required to i) safeguard ecological features on site and ii) aid compliance with any consents and relevant wildlife legislation related to the works."*.

The duties of the ECoW will include review of method statements; supervision of the installation, operation and removal of construction phase mitigation measures such as sediment control traps; compliance checks; supervision of the peat replacement plan; and liaison with relevant statutory bodies.

Typically, the requirements of the ECoW role is largely fulfilled by a single individual, with support and assistance provided by technical specialists and senior colleagues when required, and will include:

- The ECoW (individual or team of individuals) must therefore have appropriate qualifications, training and experience to meet the requirements of the role and in addition, where needed, can access support from senior ecologists within the company with the required qualifications, training and experience;
- The ECoW will have the power to "Stop Works" at any time they deem it necessary to do so;
- The ECoW will be responsible for monitoring compliance with the mitigation measures and construction phase monitoring requirements relating to ecology / biodiversity as set out in the proposed development EIAR, NIS and supporting documents such as this CEMP etc.;
- The ECoW will be responsible for the day to day management and interaction with the project SHEQ;
- The ECoW will have authority over the content of routine reports and will act independently in determining instances of non-compliance with the consents and licenses or any breaches of environmental legislation;
- The ECoW will provide the main Contractor's team with advice on environmental issues and compliance with planning conditions, commitments etc. as required. This includes managing certain activities that may be required in discharging consent conditions. The ECoW will inform the main Contractor and Project Developer Teams of any information

that could increase the risk of a non-compliance and/ or require a new licence, consent or approval.

During construction there will be occasions when the ECoW will be required to rapidly respond to unplanned events such as any wildlife incidents, pollution incidents, etc. The ECoW will have a very specific role within the emergency response teams responding to these incidents. The ECoW will also be expected to support the project team in resolving any other unplanned events that are not classified as emergency responses or incidents.

Non-Compliance Events

The ECoW will produce a procedure setting out the sequence of actions to be completed and the lines of communication required to resolve and appropriately report on a non-compliance event relating to ecology/biodiversity, should one occur.

This procedure will be approved by the Project Developers Team prior to construction commencing. The ECoW, and any other individual present on-site, has a duty of care to report any wildlife crime or breach of environmental legislation to the Project Developer. The Project Developer must report such breaches to the relevant authorities.

Reporting and Follow up

After the ECoW has responded to an incident or non-compliance event the ECoW will produce a report to the SHEQ Officer for approval before it is issued to the Project Developer. The report will set out the following information as a minimum;

- Precise details of the event and those involved;
- Assessment of impact and severity (method for assessment to be developed by ECoW);
- Mitigation introduced;
- Subsequent revision of risk assessments and construction method statements and/or construction programme; and
- Lessons learnt.

Ad-Hoc Advice and Support

The ECoW will provide the main Contractor's Team, with advice on environmental issues and compliance with planning conditions, commitments etc. as required. This includes managing certain activities that may be required in discharging consent conditions.

2.3.5 Project Archaeologist

The Project Archaeologist will report to the ECoW and is responsible for inspection and review of geotechnical aspects associated with construction of the wind farm. The Geotechnical Engineer will be full time on site during the site preparation/groundworks and will visit site at least once a month during the remainder of the construction phase.

2.3.6 Other Specialists

Project Ecologist / Ornithologist

The Project Ecologist / Ornithologist is responsible for the protection of sensitive habitats and species encountered during the construction phase of the proposed development will report to

the ECoW. The Project Ecologist will not be full time on site but will visit the site at agreed periods during construction.

Project Hydrologist

The Project Hydrologist will report to the Environmental Clerk of Works and is responsible for inspection and review of drainage and water quality aspects associated with construction of the wind farm. The Project Hydrologist will review and input to the final construction phase CEMP in respect of drainage and water quality management. The Project Hydrologist will complete ongoing inspection and monitoring of the development, particularly in areas of drainage control, through all phases of construction (including pre, during and post construction) and ensure construction is carried out as specified in the EIAR, and in relevant planning conditions. The Project Hydrologist will not be full time on-site but will regularly visit the site at agreed periods during construction and on weekly basis during site preparation/groundworks.

Project Geotechnical Engineer / Geologist

The Geotechnical Engineer / Project Geologist will report to the ECoW and is responsible for inspection and review of geotechnical aspects associated with construction phase of the proposed development. The Geotechnical Engineer will be responsible for ongoing inspection and monitoring of the development, particularly in areas of peatland and the peat deposition areas, through all phases of construction (including pre, during and post construction) and ensure construction is carried out as specified in the EIAR, and in relevant planning conditions. The Geotechnical Engineer will be full time on-site during the site preparation and groundworks and will visit site regularly at agreed periods during the construction phase.

2.4 FACILITIES, SAFETY AND SECURITY

The proposed Derryadd Wind Farm will be constructed, in accordance with all relevant Health and Safety Legislation, including:

- Safety, Health and Welfare at Work Act 2005 - 2014 (as amended);
- Safety, Health and Welfare at Work (General Application) Regulations 2007 to 2023 (as amended);
- Safety, Health and Welfare at Work (Construction) Regulations 2013 – 2021 (as amended).

Aspects of the proposed development that will present health and safety risks include:

- Health and safety aspects of construction activities;
- General construction site safety (e.g. slip/trip, moving vehicles etc);
- On site traffic safety (during construction phase) associated with high road embankments;
- Traffic safety during the transport of oversized loads to the site;
- Lifting of heavy loads overhead using cranes;
- Working at heights; and
- Working with electricity during commissioning.

A (Preliminary) Health and Safety (H&S) Plan covering all aspects of the construction process will address the Health and Safety requirements in detail. This will be prepared on a preliminary basis at the procurement stage and developed further at construction phase by the PSDP.

Rigorous safety checks will be conducted on the turbines during construction. Signs will be erected at suitable locations across the site as required. Further details regarding signage are provided in Section 2.4.3 of this CEMP.

2.4.1 Safety and Security

All activities carried out by the appointed contractor(s) on the proposed development will be in accordance with the requirements of the *Safety, Health and Welfare at Work Act 2005* as amended and Regulations made under this Act.

The scale and scope of the proposed development will require the appointment of a Project Supervisor Design Process (PSDP) and Project Supervisor Construction Stage (PSCS) in accordance with the provisions of the *Safety, Health and Welfare at Work (Construction) Regulations 2013 (S.I. No.291 of 2103)*, as amended. These persons will be appointed by the Applicant and notified to the Health and Safety Authority (HSA) prior to commencement of detailed design works (in the case of the PSDP) and prior to commencement of construction (in the case of the PSCS).

The PSDP appointed for the construction phase will be required to perform their duties as prescribed in the Safety, Health and Welfare at Work (Construction) Regulations. These duties include (but are not limited to):

- Identify hazards arising from the design or from the technical, organisational, planning or time related aspects of the proposed development;
- Where possible, eliminate the hazards or reduce the risks;
- Communicate necessary control measures, design assumptions or remaining risks to the PSCS so they can be dealt with in the Safety and Health Plan;
- Ensure that the work of designers is coordinated to ensure safety;
- Organise co-operation between designers;
- Prepare a written Safety and Health Plan;
- Prepare a safety file for the completed structure and give it to the client; and
- Notify the Authority and the client of non-compliance with any written directions issued.

The PSCS appointed for the construction phase will be required to perform their duties as prescribed in the Safety, Health and Welfare at Work (Construction) Regulations. These duties include (but are not limited to):

- Development of the Safety and Health Plan for the construction phase with updating where required as work progresses;
- Compile and develop safety file information;
- Reporting of accidents / incidents;
- Weekly site meeting with PSCS;
- Coordinate arrangements for checking the implementation of safe working procedures. Ensure that the following are being carried out;
- Induction of all site staff including any new staff enlisted for the proposed development from time to time;
- Toolbox talks as necessary;

- Maintenance of a file which lists personnel on site, their name, nationality, current Safe Pass number, current Construction Skills Certification Scheme (CSCS) card (where relevant) and induction date;
- Report on site activities to include but not limited to information on accidents and incidents, disciplinary action taken and PPE compliance;
- Monitor the compliance of contractors and others and take corrective action where necessary; and
- Notify the Authority and the client of non-compliance with any written directions issued.

As mentioned, the PSDP will prepare a Preliminary H&S Plan which will identify any particular risks, residual risks and particular sequences of work that are envisaged during the design of the works.

Prior to commencement of construction, this Preliminary H&S Plan will be provided to the main Contractor and the PSCS will further develop the document to prepare a Construction Stage H&S Plan addressing all aspects of the construction process and providing relevant contact details and emergency response procedures for the proposed development. This H&S Plan will be developed at the procurement stage and developed further at construction phase to the satisfaction of the Applicant. The H&S Plan will identify the potential safety hazards associated with the site and the works and assess the associated risks. Mitigation and control measures will be implemented to minimise the identified risks.

Evidence of completion of construction safety training, typically in the form of a Safepass Card, will be required for all construction personnel prior to commencing on site. A record of Safepass Cards and personnel approved for entrance to site will be completed as part of a site induction process. The main Contractor's H&S Plan will detail the site induction and access requirements. Where relevant, equipment operators or specialist works will require personnel to hold a valid appropriately certified for its intended purposes. The Applicant will ensure that only competent contractors are appointed to carry out the construction works on the site.

2.4.2 Site Access and Public Safety

Public safety will be addressed by restricting site access during construction works and the erection of security fencing as appropriate at construction work areas. The entrance to the proposed wind farm construction site will be controlled by the main Contractor.

The proposed wind farm site will be accessed primarily via the main site access A to the southern part of Derryadd Bog, off the R392 and will facilitate both materials delivery (stone, steel and concrete) as well as large oversize components such as turbine blades, tower sections and substation components. Additional access points for HGVs and LGVs are provided on the N63 National Road to Derryaroge and Derryadd bogs (Existing Mountdillon access and site Access C). Site Access B will provide access to Lough Bannow bog off the R398 and from Derryadd bog.

2.4.3 Compound and Facilities

Four temporary construction compounds are included as part of the proposed development. The four temporary compounds strategically situated to serve wind farm construction on all bogs (i.e., south of Derryaroge, south of Derryadd and north of Lough Bannow bogs).

Table 2-1: Construction Compounds

Compound	Townland	Dimensions	Total Area (m^2)
Compound No. 1: Existing Mountdillon Works Yard	Cloonfore	130 m x 75 m	9,750 m^2
Compound No. 2: West of proposed onsite substation in Derryaroge Bog and North of Mountdillon Works	Cloonfore	100 m x 40 m	4,000 m^2
Compound No. 3: South of proposed T15 in Derryadd Bog	Derraghan More	100 m x 40 m	4,000 m^2
Compound No. 4: West of proposed T16 in Lough Bannow Bog	Cloontabeg	100 m x 40 m	4,000 m^2

The location of the proposed construction compounds is shown on the site layout Planning Drawing 11399-2010 to 11399-2016. The construction compounds will typically consist of temporary site offices, staff welfare facilities, storage areas (including waste and recycling areas), and car-parking areas for staff and visitors. The layout of the temporary construction compounds is shown on Planning Drawings 11399 – 2029 to 2030.

Temporary toilets will be used during the construction phase as part of the welfare facilities for site staff and visitors. Wastewater from toilets will be directed to a sealed storage tank, which will be collected and tankered off site by an appropriately consented and licensed waste collector to wastewater treatment plants.

2.4.4 Signage

Warning Signs will be erected at the construction work areas clearly stating that construction works are underway. A notice board will be erected at the site entrance and at the construction compound gates with the information on the contact details for site management, PPE requirements for the site and any other information deemed necessary in accordance with the H&S Plan.

Signage will be erected on both sides of the local, regional and national, roads associated with the four proposed the site entrances to warn approaching vehicles of the construction site entrance locations and the potential presence of slow-moving vehicles. The four proposed site accesses are as follows:

- New proposed main site access (Site Access A) to the southern part of Derryadd Bog, off the R392;
- New proposed site crossing (Site Access B) from the South of Derryadd Bog to the northern part of Lough Bannow Bog, off the R398;
- Proposed new temporary site crossing (Site Access C) from the northern part of Derryadd Bog (Machine pass from Mountdillon Works yard), off the N63 will also be required for large component transport across the N63 into Derryaroge;
- Existing Mountdillon Access (off the N63) will be utilised by Light Vehicles (LVs) and Heavy Vehicles (HVs).

On the internal site access roads, prior to exit from the site out onto the aforementioned roads, signage will be erected to inform construction traffic that they are leaving the site and directing them in the correct direction.

Road signage on the public road will be in accordance with the current Traffic Signs Manual1 (see Chapter 15 (Traffic and Transport) of the EIAR) and associated best practice guidelines. Signage in respect of traffic management is discussed in the TMP in Appendix 15-2 and will be in accordance with the Local Authority recommendations and relevant planning conditions. Within the site, maximum speed signage will be erected along the access roads for construction vehicles and health and safety signage will be erected at borrow pits and where deep excavations, or other areas of increased risk, are occurring. Signage will also be erected as a reminder to concrete delivery drivers that concrete truck wash-out is not permitted on-site and identifying the area(s) where concrete chute wash-out is permitted.

2.4.5 Emergency Response Plan

The appointed main Contractor will be responsible for developing a detailed Emergency Response Plan (ERP) for the proposed works, to cover health and safety emergencies as well as environmental emergencies, as part of the H&S Plan. Details related to the ERP are outlined in Section 4.0 (Emergency Response Plan / Procedures) of this CEMP.

Further information relating to the management of spills or leaks is outlined in Section 3.1.6.4.

2.4.6 Incidents / Complaints

All safety or environmental incidents associated with the proposed development will be reported and investigated in line with the ERP. Details related to the Incidents / Complaints are outlined in Section 4.0 (Emergency Response Plan / Procedures) of this CEMP.

3.0 CONSTRUCTION METHODOLOGY

3.1 CONSTRUCTION PROGRAMME (DURATION AND PHASING OF THE PROPOSED DEVELOPMENT)

It is estimated that the construction phase will take approximately 24 - 30 months from starting onsite to completion of commissioning of the turbines.

All vegetation clearance that is required during construction works will commence outside the breeding bird season, which runs from the 1st of March to the 31st of August.

The construction phase can be broken down into three main phases as follows (there will be overlap of these phases):

1. Civil engineering works: approximately 18 months;
2. Electrical works: approximately 18 months (will commence shortly after the civil works and will then run in parallel); and
3. Turbine erection and commissioning: approximately 9 months.

[1] Department of Transport, Tourism and Sport, *Traffic Signs Manual - Chapter 8 Temporary Traffic Measures and Signs for Roadworks* (August 2019)

The main tasks under each phase are outlined below.

Civil Engineering Works:

- Create new entrance(s) and hardcore existing entrances (where required);
- Construct new internal site roads, drainage ditches and culverts. The internal site roads will be a mixture of permanent (construction/operational and amenity) roads and amenity tracks;
- Construct site access roads to borrow pit locations and open borrow pits;
- Clear and hardcore area for temporary construction compounds, including material storage, site welfare facilities, and site offices and install;
- Construct turbine hard-standings and crane pads;
- Construct substation compound and associated drainage ditches and culverts;
- Construct electrical apparatus bases/plinths and bund for transformer;
- Excavate/pile as required for turbine bases. Sidecast or store soil/peat locally for backfilling and re-use, if deemed feasible;
- Place blinding concrete to turbine bases using either a piled solution or on competent strata. Fix reinforcing steel and anchorage system for tower section. Construct shuttering. Fix any ducts etc. to be cast in. Pour concrete bases. Cure concrete. Remove shutters after 1-2 days;
- Decommission existing 100 m high meteorological mast at Lough Bannow bog;
- Install new 120 m high permanent meteorological masts;
- Excavate cable trenches and install electrical ducting.

Electrical Works

- Install external electrical equipment at substation;
- Install transformer at substation compound;
- Erect stock proof and palisade fencing around substation area;
- Install internal collector network and communication cabling;
- Construct grid connection.

Turbine Erection and Commissioning

- Backfill tower foundations and cover with suitable material;
- Erect towers, nacelles and blades;
- Complete electrical installation;
- Commission and test turbines;
- Complete site works and reinstate site;
- Remove temporary construction compounds including material storage, site welfare facilities, and site offices. Construct permanent amenity parking in location of temporary compounds no. 1 and 3;
- Provide any gates, landscaping, signs, etc. which may be required.

The phasing and scheduling of the main construction task items are outlined in Table 3-8 (Indicative Construction Schedule) of Chapter 3 (Description of the Proposed Development) of the EIAR, where January 2027 has been selected as an arbitrary start date for construction

activities. Refer to the Peat and Spoil Management Plan (PSMP) (Appendix 9.2) for further details on the construction methodology.

3.2 CONSTRUCTION HOURS

The hours of construction activity will be limited to avoid unsociable hours where possible. Construction operations will generally be restricted to between 08:00 hrs and 20:00 hrs weekdays and between 08:00 hrs and 13:00 hrs on Saturdays.

However, to ensure that optimal use is made of good weather period or at critical periods within the programme (i.e. concrete pours) or to accommodate delivery of large turbine component along public routes it could be necessary on occasion to work outside of these hours. Any such out of hours working will be agreed in advance with the local Planning Authority. Employment

Approximately 100-120 persons will be employed during the peak construction period and it is estimated that the construction phase will take approximately 24 - 30 months from starting onsite to completion of turbine commissioning. A reduction in construction staff on site is expected when the construction activities are more technical and less labour intensive.

It is assumed that some staff will arrive to the site by LVs (10 staff) and the remaining via mini bus with approximately 15 persons per vehicle to limit traffic movements.

3.3 OVERVIEW OF THE CONSTRUCTION METHODOLOGY

The proposed construction methodology is summarised in the following sections, however further detail is found in Chapter 3 (Description of the Proposed Development) and drawings in Appendix 1-2 of the EIAR.

3.3.1 Internal Site Access Roads and Passing Bays

Internal site access roads will be constructed as part of the initial phase of the construction of the wind farm. Material will either be won from the proposed borrow pits, if deemed suitable based on testing, or imported into the site to provide the required base of the internal roads. The internal roads will be a mixture of permanent (construction/operational and amenity) roads, and amenity pathways/cycleways (permanent). The internal site access road layout and types are shown in Planning Drawing 11399-2033.

New internal site roads for construction traffic and shared vehicular road ((Type 1 to 4) as shown in Planning Drawing 11399-2033) will have a running width of approximately 6 m, with wider section at corners and on the approaches to turbine locations. The amenity access tracks (Type 5 and 6) will be 3 m in width as shown in Planning Drawing 11399-2033. All new roadways will be constructed with a 2.5% camber to aid drainage and surface water runoff. The proposed new roadways incorporate passing bays to allow traffic to pass easily while traveling around the site.

Two road construction methodologies will be used:

- Floating Roads; and
- Founded Roads.

Typical road construction details are included in Planning Drawing 11399-2033 and detailed further in Section 3.9.3 of Chapter 3 (Description of the Proposed Development) of the EIAR.

3.3.2 Road Construction - Permanent Roads, including Amenity Tracks (founded/floating)

Internal site roads will be constructed as part of the initial phase of the construction of the wind farm. Roads will generally be constructed as floating roads except in areas with shallow peat and highly trafficked areas (e.g., site entrances and access roads in and out of borrow pits).

The construction methodology for founded roads/ amenity tracks, is summarised as follows:

- Interceptor drains will be installed upslope of the access road alignment to divert any surface water away from the construction area;
- Excavation of roads will be to the line and level given in the detailed design requirements. Excavation will take place to a competent stratum beneath the peat (as agreed with the site designer);
- All excavated peat will be placed/spread and profiled for temporary storage or side-cast alongside the excavations where possible;
- Side slopes of the excavations will be battered as the excavation progresses;
- The surface of the excavated road will be developed using granular fill. The depth will vary based on the depth of peat and on the designer requirements;
- A layer of geogrid/geotextile may be required at the surface of the competent stratum (to be confirmed by the designer);
- A final unbound surface layer will be placed over the excavated road, as per design requirements, to provide a road profile and graded to accommodate wind turbine construction and delivery traffic;
- An additional 50 mm surface of quarry dust will be placed over the roads selected for use as amenity access tracks;
- Permanent founded roads for wind farm access will be designed to a running width of approximately 6 m, while permanent tracks for amenity use will be designed to approximately 3 m in width;
- During the operational phase of the proposed development all surface water run-off from hardstanding areas within the proposed wind farm site will be collected and discharge to settlement ponds prior to entering existing drainage system within the bogs. This treated water will then move into the existing bog drainage network.

The construction methodology for permanent floating roads/amenity tracks, is summarised as follows:

- A geotextile separation layer is placed on the existing ground surface;
- A biaxial geogrid is then placed over the geotextile;
- Where the California Bearing Ratio (CBR) of the underlying material is >1%, 400 mm of class 1A/6F2/6I/6J material followed by 100 mm of a compacted Clause 804 will be used for a running layer to give a total road thickness of 500 m;
- Where CBR of the underlying material is <1%, 300 mm of Class 1A/6F2/6I/6J material will be placed, followed by a second layer of biaxial geogrid, followed by 300 mm of Class 1A/6F2/6I/6J material, followed by a 100 mm of a compacted Clause 804 running layer for a total road thickness of 700 mm;



- Permanent floating roads for wind farm access will be designed to a running width of approximately 6 m, while permanent tracks for amenity use will be designed to approximately 3 m in width;
- Over the edge (OTE) drainage will be used along sections of proposed floating road between turbine infrastructure. OTE drainage will only occur where topography allows, and it is only proposed in areas of low risk and remote from outfall locations. Over the edge drainage allows runoff from site roads/access tracks to flow into local field drains and be managed via the existing site drainage system.

Typical sections of a new roads are shown on Planning Drawing 11399-2033. Where shown on the planning drawings, the road widths will be increased to form the indicated passing bays.

3.3.3 Proposed Culverts

Culverts will be required where site roads, crane pads and turbine hardstands cross main bog drainage networks. Indicative locations of the culverts are shown on 20852-NOD-01-XX-DR-C-08002 to 20852-NOD-01-XX-DR-C-08015. Culverts of 600 mm and 1200 mm in diameter will be provided, a typical detail of which is shown on Planning Drawing 11399-2035. The proposed culverts and any diversion of the existing main drainage network across the proposed wind farm site are specified in the site layout Planning Drawings 20852-NOD-01-XX-DR-C-08002 to 20852-NOD-01-XX-DR-C-08015. All culverts will be inspected regularly to ensure they are not blocked by debris, vegetation or any other material that may impede conveyance.

3.3.4 Borrow Pits

There are four borrow pit locations identified to produce excavated material to provide fill material for roads/tracks (for permanent roadways and amenity), passing bays, hardstands, upfill to foundations and temporary compounds, dependent on testing results. The borrow pits are all located within Derryadd Bog (i.e., centre of the proposed wind farm site as per Planning Drawing 11399-2010) and are at advantageous locations with regards to the hauling of materials within the site.

Approximate volumes of materials available on site are summarised in Table 3-2 of Chapter 3 (Description of the Proposed Development) of the EIAR. The estimates are based upon specific dimensions to provide a safe working zone and to minimise land take.

3.3.5 Rock Extraction – Rock Breaking

Rock breaking, crushing and screening will be required for some of the material won from borrow pits, with some limited rock ripping. Material will be extracted using excavators. No blasting will be carried out at any borrow pits. Extraction from borrow pits will be from above and below the water table.

3.3.6 Tree Removal / Felling

There will be a requirement to remove / fell some individual trees in the areas immediately surrounding the footprint of the wind farm infrastructure, and associated with the proposed temporary accommodation works required along the TDR.

Trees requiring removal along the TDR are outlined in Section 3.3.15 and Table 3-5 of Chapter 3 (Description of the Proposed Development) of the EIAR.

3.3.7 Peat and Spoil Management

The quantity of peat and non-peat material (spoil) requiring management for the proposed development has been calculated, as presented in Table 3-7 of Chapter 3 (Description of the Proposed Development) of the EIAR. These quantities were calculated as part of the PSMPin Appendix 9.2 of this EIAR.

The proposed methodology for the management of peat and spoil, as outlined in the PSMP(Appendix 9-2 of the EIAR), is summarised in Section 3.1.16 of this CEMP.

3.3.8 Proposed Site Drainage

The proposed development is located within a former peat extraction site. An extensive network of drainage channels are present throughout the peatland which is managed under IPC licence P0504-01 Mountdillon Bog Group.

Temporary (for the duration of the construction phase) and permanent drainage infrastructure will be installed as part of the proposed development

These features include site drains and silt control measures, including; interceptors drains, swales, temporary settlement ponds, silt bags, check dams, silt fences, and over the edge drainage (OTE). Site drainage measures will be installed from the outset, being constructed at the same time as the initial civils works (site roads, hardstands, etc.). This will ensure that there is no uncontrolled runoff from the site during proposed works. Excavators will be used to construct the main drainage features (drains, temporary construction settlement ponds, etc.), while small items such as silt bags and check dams will be constructed manually. Silt fences which trap suspended particles will be erected manually ahead of civil works as required on particularly steep ground, or near watercourses.

The existing and preliminary site drainage concept for the proposed wind farm is outline in Sections 3.6 (Surface Water Management) of Chapter 3 (Description of the Proposed Development) of the EIAR.

A Surface Water Management Plan (SWMP) has been developed and is included as Appendix 10-3 of the EIAR.

3.3.9 Turbine Hardstand, Foundations and Erection

Construction of the turbine bases will require excavation of the surrounding soil or peat from the foundation and crane hardstanding area to founding level with access being provided from adjacent tracks at or near the surrounding ground level.

Each wind turbine will require piled foundations, bored foundations or a gravity foundation of reinforced concrete (RC) foundation comprising a base slab bearing onto rock or other competent substrata with a central upstand to support the tower. The foundations for each turbine will be designed by the appointed Civil Designer. Piled foundation, bored foundations and gravity foundation bases are generally 24-26 m in diameter with detailed foundation design being dictated by the local ground conditions.

Each wind turbine is secured to a reinforced concrete foundation that is installed below the finished ground surface. The size of the foundation will be dictated by the turbine manufacturer, and the final turbine selection will be the subject of a competitive procurement process. Different turbine manufacturers use different shaped turbines foundations, ranging from



circular to hexagonal and square, depending on the requirements of the final turbine supplier. The turbine foundation transmits any load on the wind turbine into the ground. After the foundation level of each turbine has been formed using piled foundations, bored foundations or a gravity foundation, the bottom section of the turbine tower or "cage" is levelled. Reinforcing steel is then built up around and through the cage, and the outside of the foundation is shuttered with demountable formwork to allow the pouring of concrete.

Piled foundations, bored foundations and gravity foundations are shown on Planning Drawings 11399-2042 to 2044.

Hardstand areas consisting of levelled, compacted hardcore and are required around each turbine base to facilitate access, turbine assembly and turbine erection. The hard-standing areas are typically to accommodate cranes used in the assembly and erection of the turbine, offloading and storage of turbine components, and generally provide a safe, level working area around each turbine position. The hard-standing areas are extended to cover the turbine foundations once the turbine foundation is in place.

The turbine hardstanding areas are shown on Planning Drawing 11399-2031 and shown on the site layout drawings (Planning Drawing 11399-2010 to 2016) included with the Planning Application in Appendix 1-2 of the EIAR. The hardstanding areas shown represent a design based on manufacturer's requirements and seeks to accommodate a number of different turbine types and models.

3.3.10 Grid Connection

The proposed 110 kV substation will be connected to the national electricity grid via a loop-in connection to the nearby Lanesborough-Richmond 110kV Overhead Line (OHL) Network, located approximately 250 m south of the proposed substation. The loop-in connection will comprise of high voltage underground cables connecting the substation to the Lanesborough-Richmond 110kV OHL.

All new build transmission infrastructure required for the proposed development is contained within the proposed wind farm site, while the proposed underground cables will cross under the N63 National Road which is located between the substation and Lanesborough-Richmond OHL. The proposed grid connection requires approximately 460 m of 110 kV underground cable (UGC) installation from the 110 kV onsite substation to the existing OHL to the south. The entire UGC has been assessed throughout this EIAR.

The 110 kV cable route as shown on Planning Drawing 11399- 2017 from the proposed substation to the existing Lanesborough-Richmond 11 0kV OHL requires both trenching and horizontal directional drilling (HDD) construction methods. The location, description and methodology amendments are summarised in Table 3-9 below and detailed in Appendix 3-3 (TLI Outline Construction Methodology_110kV Substation and connections).

Further detail on the grid connection methodologies is provided in Section 3.9.5 of Chapter 3 (Description of the Proposed Development) of the EIAR. Refer to Planning Drawings 11399-2024 and 11399-2017. The various elements of the grid connection are summarised below.

3.3.11 Electrical Substation Compound

It is proposed to construct a 110 kV substation compound within the site to house the two control buildings; Transmission System Operator (TSO) substation and the Independent Power Producer (IPP), at the location shown on Planning Drawing 11399-2018 (refer to Section 3.3.7),



and electrical apparatus necessary to facilitate the generated power from the wind turbines to export onto the transmission system. The layout of the proposed substation is shown on Planning Drawing 11399-2018. The construction and electrical components of the substations will be to ESB and EirGrid specifications within the parameters assessed. Further details regarding the connection between the substation and the national electricity grid are provided in Section 3.3.9. The footprint of the proposed substation compound is approximately 132 m in length by approximately 101 m. Refer to Planning Drawings 11399-2020 for the substation elevations.

3.3.12 Battery Storage

Provision has been made for a battery energy storage system. This includes 20 no. containerised modules with the following dimensions 13.5 m x 4.7 m x 2.8 m. The containerised modules will be similar in appearance to shipping containers and will be mounted on concrete foundations. Based on existing technology each of the containers could have a storage capacity of 2MW. Refer to Planning Drawing 11399-2019 and 11399-2021 for details.

3.3.13 Substation Control Buildings

Two control buildings (TSO and IPP control buildings) will be constructed using traditional techniques for constructing small buildings (i.e. concrete block walls, timber and slate tile roof). Foundations will be built for all of the proposed electrical infrastructure. All the electrical equipment will be installed to EirGrid/ESB requirements. Perimeter fencing will be constructed around the substation compound for security and safety purposes.

The TSO and IPP control buildings will be located within the substation compound. The TSO control building will measure approximately 25 m x 18 m and approximately 9.7 m in height. The IPP control building will measure approximately 19 m x 12 m and approximately 7.0 m in height. Layout drawings of the control buildings are shown on Planning Drawings 11399-2022 and 11399-2023.

Both control buildings will include welfare facilities for the staff. Toilet facilities will be installed with a low-flush cistern and low-flow wash basin. Due to the specific nature of the proposed development, there will be a very small water requirement for occasional toilet flushing and hand washing and therefore the water requirement of the proposed development is minimal. It is proposed to install a groundwater well adjacent to the substation in accordance with the Institute of Geologists Ireland, Guide for Drilling Wells for Private Water Supplies (IGI, 2007). The well will be flushed to the ground and covered with a standard manhole.

A pump house is not currently required as an in-well pump will direct water to a water tank within the roof space of the control building (subject to final design). It is proposed to manage wastewater from the staff welfare facilities in the control buildings by means of a sealed storage tank, with all wastewater being tankered off-site by a permitted waste collector to a wastewater treatment plant. It is not proposed to treat wastewater on-site.

The proposed wastewater storage tank will be fitted with an automated alarm system that will provide sufficient notice that the tank requires emptying. The wastewater storage tank alarm will be integrated with the on-site electrical equipment for alarm notification that will be monitored remotely 24 hours a day, 7 days per week. Only waste collectors holding valid waste collection permits under the Waste Management (Collection Permit) Regulations, 2007 (as amended), will be employed to transport wastewater away from the site.

Each turbine will be connected to the proposed on-site 110 kV substation via underground Medium Voltage (MV) cables. Fibre-optic cables will also connect each wind turbine to the wind turbine control system located within the IPP Control Building. The electrical and fibre-optic cables running from the turbines to the substation compound will be run in cable ducts approximately 1.2 m bgl within the proposed wind farm internal roadways, as shown on Planning Drawing 11399-2025.

Further information and drawings of the substation and electrical infrastructure are provided Appendix 3-3 (TLI Outline Construction Methodology - 110kV Substation and connections) of the EIAR.

3.3.14 Crossing Methodology – Horizontal Directional Drilling (HDD)

The proposed underground cables will cross under the N63 National Road which is located between the substation and Lanesborough-Richmond OHL. The 110 kV cable route as shown on Planning Drawing 11399- 2017 from the proposed substation to the existing Lanesborough-Richmond 110 kV OHL requires both trenching and horizontal directional drilling (HDD) construction methods. A launch and reception pit are required for directional drilling, with each measuring approximately 1 m x 1 m x 2 m. A specialised directional drill machine will be anchored to the ground and will drill at a suitable shallow angle to allow it to achieve the required depth for the bore. If ground conditions are unfavourable, the drilling process may need to be repeated using progressively larger drill heads until the required size is achieved.

Further details of the HDD crossing method are provided in Section 3.1.6.5 of this CEMP, Section 3.9.6 in Chapter 3 (Description of the Proposed Development) of the EIAR and Appendix 3-3 (TLI Outline Construction Methodology – 110 kV Substation and connections) of the EIAR.

3.3.15 110kV Underground Cable Trenches

The cables will be installed primarily within the site as indicated on the detailed site layout drawings included in Planning Drawings 11399-2010 – 11399-2016, Volume 3, Appendix 1-2 of the EIAR. It should be noted that works within the public road corridor will also be subject to further consents/agreements with local authorities, for example a Road Opening Licence as appropriate. The methodology and management of the installation of the underground cables and trenching is outlined in Section 3.1.15 of this CEMP.

Further details on the design for the grid connection cable trenches are provided in Appendix 3-3 (TLI Outline Construction Methodology - 110kV Substation and connections) of the EIAR.

3.3.16 Turbine Delivery Accommodation Work Areas

Where works are needed along the public road corridor to facilitate deliveries to site, they will be agreed in advance with the local authority and carried out to the appropriate standard (TII, purple book, etc.).

Where a temporary surface is needed for the turbine delivery route, works will start with the clearing of any vegetation, and the topsoil will be stripped and used locally for landscaping purposes/bermed for later use in reinstatement. Where local use for landscaping does occur, it will be smoothed off with the back of a bucket and seeded with a suitable grass seed mix. Silt control curtains will also be employed within 50 m of a stream. Topsoil material will not be used locally within 50 m of a stream, and peat material will not be used if found to be present at any location. It is anticipated that the majority of material will be taken to the wind farm site for



borrow pit reinstatement. It may also be taken to a local licensed/permitted waste facility if found to contain any contaminants such as bitumen. Suitable fill material (broken stone and clause 804) will be used to create a firm running area for the passage of turbine delivery vehicles. After the delivery of turbines to site, the points of interest (POI) along the TDR route will be re-instated to the original condition with removal of the temporary surface, and any removed vegetation will be reseeded/replanted with a similar native species composition.

3.3.17 Permanent Meteorological Mast

Two permanent meteorological masts are proposed as part of the proposed development; one within Derryaroge bog and another within Lough Bannow bog. The met masts will be equipped with wind monitoring equipment at various heights. The masts will be located as shown on the site layout drawing in Figure 3-1 of Chapter 3 (Description of the Proposed Development) of the EIAR. Each mast will be a slender, free- standing lattice structure, each 120 m in height, as shown in Planning Drawing 11399-2038.

The masts will be constructed on a hardstanding area of approximately 744 m^2, sufficiently large to accommodate the crane that will be used to erect the mast, adjacent to the proposed site road.

The installation of the two meteorological masts will be carried out by a small crew, following a typical installation sequence as follows:

- An access road will be extended towards the mast location from the internal site road. Associated drainage infrastructure will be extended also;
- A small aggregate crane pad will be constructed in front of the proposed mast locations;
- General construction methods for the above site access roads and hard standing will match those described for wind farm access rods and hard standings however the dimensions and stone depth requirements of the infrastructure will be considerably less than that required for that serving the wind turbine construction;
- The foundation will be excavated followed by shuttering, steel fixing and finally concrete pouring by ready mix truck. The foundation shall be circa. 10m x 10 m;
- Following crane setup, the mast sections will be delivered and unloaded by truck;
- In accordance with an agreed lifting plan, mast sections will be lifted by crane into place. Wind speeds will be monitored at all times during lifting operations by the lead climber and crane operator;
- Mast sections will be bolted together by climbers; and
- Following erection of main mast sections, lightning protection and other ancillary components will be fixed to the mast.

Decommissioning of Existing Meteorological Mast

The proposed development will include the decommissioning of the existing 100 m high meteorological mast on the site. This work will include the following steps:

- Day One:
    - Mobilise on site with one tractor and trailer and one 13 tonne + excavator. Excavated soil will be appropriately tested and transported off site by a licensed waste transfer hauler as required;

  - Establish safe working area around mast; and
  - Climb mast and remove instruments and logger box.
- Day Two:
  - On one side of the mast, transfer guy ropes from ground anchors to the 13 Tonne + excavator;
  - Cut guy rope attached to 13 T+ excavator to allow mast to fall; and
  - Excavate mast anchors and anchor bases making good the ground.
- Day Three:
  - Dismantle and remove mast components and accessories from site using trailer; and
  - Demobilise from the site.

3.3.18 Amenity Car Parks and Access Tracks

Three new permanent amenity car parks will be provided. Two of these car parks are located within the construction compounds (Compound No.1 and Compound No. 3) which will be converted into permanent amenity carparks following completion of the construction phase. The remaining carpark is located along the local access road on the Western boundary of Derryaroge bog as shown in Figure 3-2 of Chapter 3 (Description of the Proposed Development) of the EIAR and Planning Drawing 11399-2050. The existing amenity carpark area at Corlea Bog (L1136 Local Road) adjacent to the proposed amenity track in Lough Bannow Bog will accommodate amenity car parking access to the proposed development. Additionally, the carpark of the Midlands Trail Networks project (Planning Reference No: 24/60132), which is located across the local road, will connect to the proposed amenity access track north of Derryaroge Bog and will accommodate for amenity car parking access to the proposed development.

Planning Drawing 11399-2050 illustrates the configuration of the proposed car parks, which includes for 15 no. car parking spaces, 3 no. disabled parking spaces, 1 no. bus parking area and suitable signage at each location.

A total of approximately 18 km of wind farm site roads within the proposed wind farm site will provide permanent amenity access (including pedestrian and cyclist access) once the proposed development construction phase has concluded. An additional approximately 7.5 km of dedicated amenity track is also proposed to provide connectivity to local roads and allow local access to the wind farm amenity areas. These amenity access tracks will have a gravel/crushed stone finish surface and will be approximate 3 m in width on average. Figure 3-1 (Site Layout Plan) of Chapter 3 (Description of the Proposed Development) of the EIAR outlines the final configuration of the wind farm site road with the additional dedicated amenity access tracks included in the layout plan.

The approximate 7.5 km of dedicated amenity access tracks will provide linkages between the proposed wind farm site roadways, royal canal greenway (to the east of the proposed wind farm site) and the Corlea Visitor Centre and amenity areas (to the south) and the Midlands Trail Networks project (Planning Reference No: 24/60132 (to the north).

The amenity access points to the proposed wind farm site are illustrated in the Amenity Plan in Appendix 3-1 and in Figure 3-2 (Construction/Operational and Amenity Access Location Map) of Chapter 3 (Description of the Proposed Development) of the EIAR.

Biodiversity Enhancement Measures

Habitat enhancement measures are recommended to increase the biodiversity value of the proposed wind farm site. The recommended enhancement measures are compliant with the objectives of the Longford County Development Plan 2021-2027 (LCC, 2021), as well as adhering to targets for plans by 2030 set in Ireland's 4th National Biodiversity Action Plan 2023-2030 (NPWS, 2024). The habitat enhancement measures proposed are set out in Chapter 7 (Biodiversity) of the EIAR, and include:

- Habitat Management;
  - Hedgerows;
  - Grassland areas.

4.0 ENVIRONMENTAL MANAGEMENT

Good construction practice will be implemented throughout the construction phase of the proposed development, which will assist in the management of the risks for this site. The following sections detail the approach to good construction practice and environmental management during the construction phase of the proposed development.

4.1 ENVIRONMENTAL TRAINING AND AWARENESS

In order to ensure that environmental awareness and compliance is communicated effectively at the start and throughout the construction works, this CEMP and its contents will be communicated to all site personnel, including management staff, operatives and sub-contractors. The key elements of this CEMP will form part of the site induction which will be mandatory for all employees, contractors and visitors attending the site.

A site induction will be provided to all construction staff before they commence work on site. Where appropriate, the Contractor will identify specific training needs for the construction workforce and will ensure that appropriate training requirements are fulfilled. A baseline level of environmental awareness will be established though the site induction programme. Site inductions will cover the following as a minimum:

- Introduction to the Environmental Manager;
- The requirements of the CEMP and consequences of non-compliance;
- The requirements of due diligence and duty of care;
- Identification of environmental constraints and potential impacts of the work;
- Procedures associated with incident notification and reporting including procedures for dealing with damage to the environment; and
- The benefits of improved environmental and sustainability performance; and the potential consequences of departure from specified procedures, work instructions and method statements.

Environmental toolbox talks will be provided to all site personnel and sub-consultants on a regular basis. These will be targeted at particularly sensitive environmental issues such as:

- Protection of sensitive ecological habitats and key ecological receptors;
- Works close to sensitive water bodies;
- Areas of peat;

- Invasive species management;
- Water pollution and silt control;
- Water pollution in relation to cement and concrete handling;
- Spill prevention and control; and
- Dust management.

The Contractor (and their sub-contractors) would be selected with due consideration of relevant qualifications and experience. The Contractor will be required to employ construction staff with appropriate skills, qualifications and experience appropriate to the needs of the works to be carried out during construction.

4.2 MEETINGS

The Environmental Manager will be responsible for arranging and holding monthly meetings with the Employer and/or the Employer's Representative. The Environmental Manager would develop and distribute minutes on monthly meetings accordingly.

4.3 MONITORING AND INSPECTIONS

For the duration of the contract, the environmental performance of the Contractor will be monitored through site inspections and audits. The programme for monitoring, inspections and audits will be specified in the contract. The Contractor will develop, implement and maintain an Environmental Inspections and Monitoring Plan.

Record of all inspections carried out should be recorded and all actions should be closed out in a reasonable time. If additional monitoring and inspections are required due to any subsequent planning conditions, these will be added to the CEMP.

4.3.1 Monitoring

Mitigation and monitoring will be carried out so that construction activities are undertaken in a manner that does not give rise to significant negative effects. Suitable monitoring programmes will need to be developed, implemented, documented and assessed in accordance with the specification outlined in the CEMP. Monitoring will be carried out as detailed within the EIAR, NIS and CEMP.

The results of all environmental monitoring activities would be reviewed by the Environmental Manager on an ongoing basis to enable trends or exceedance of criteria to be identified and corrective actions to be implemented as necessary.

4.3.2 Inspections

Inspections of construction activities will be carried out by the Environmental Manager on a daily basis to ensure all necessary environmental measures relevant to the construction activities are being effectively implanted by construction staff, ensuring legal and contractual conformity.

Daily Inspections

The daily inspections should include, but not be limited to, checking that:



- The site boundary is marked out and respected;
- All waste is appropriately stored and segregated;
- Waste skips are covered to prevent wind-blown litter;
- Drip trays are in place for all stored equipment and plant;
- All chemicals/fuels are stored with appropriate containment/bunds/cover;
- Construction noise is within permitted limits and does not create a nuisance;
- Dust does not create a nuisance; and
- Fencing/hoarding is secure.

Weekly Inspections

The inspections should include, but not be limited to confirming that:

- Daily checklists have been completed;
- Waste storage areas have been checked and there is no build-up of waste materials;
- Spill kits have been checked and contain all relevant materials;
- The performance of all pollution control equipment has been checked and the equipment is working effectively;
- Noise reduction/monitoring equipment has been checked and is operating effectively;
- Septic tanks are not overfull/discharging; and
- Special control measures identified in Permit/Planning Conditions and CEMP are adhered to

4.3.3 Non-conformity and Corrective and Preventive Action

The Contractor will establish, implement and maintain procedures to deal with actual and potential non-conformities and for taking corrective and preventative action.

- Non-conformities may be identified through:
- Internal contractor audits;
- Audits by the Employer and/or the Employer's Representative;
- Audits undertaken by external certification bodies;
- Audits undertaken by regulatory authorities; and
- General observations.

The Contractor procedures will define the requirements for:

- Identifying and correcting non-conformities;
- Mitigating the environmental impacts of non-conformities;
- Investigating non-conformities including identify root causes and implementing appropriate actions to avoid their reoccurrence;
- Evaluating the need for actions to prevent non-conformities and implementing appropriate actions designed to avoid their reoccurrence;
- Setting realistic timeframes for undertaking effective corrective and preventative actions;

- Recording the results of corrective and preventative actions taken;
- Reviewing the effectiveness of corrective and preventative actions; and
- All actions identified should be appropriate to the nature and magnitude of the issue and the environmental impacts encountered.

4.4 VEHICLE MANAGEMENT

Vehicles will be kept on site access roads for the vast majority of the construction phase, however in the initial construction phases, there will be some requirement for off-road vehicle movements (for ground works, etc.).

For ground works and other off-road activity, the use of specialist vehicles that are tracked or use large low ground pressure tyres or bog mats which distribute their weight evenly across a large surface area will be used. These will minimise ground disturbance, particularly where there is a presence of peat (albeit very shallow on this site) and therefore minimise the risk of sediment entering downstream watercourses.

All vehicles will be restricted to the areas where works are required, and unnecessary off-road movements around the wider site will be avoided. Where there are any sensitive habitats present around a proposed work area, these areas will be marked out so that vehicles will not enter and damage them.

4.4.1 Traffic Management

Traffic management measures will be implemented in accordance with those included in the Chapter 15 (Traffic and Transportation) of the EIAR and a Traffic Management Plan (TMP (Appendix 15-2 of the EIAR) will be agreed with Longford County Council. Mitigation measures set out with Chapter 15 (Traffic and Transportation) of the EIAR are included in Table 5.1 in Section 5.0 of this CEMP.

4.5 NOISE AND VIBRATION CONTROL

The appointed Contractor undertaking the construction of the works will be obliged to take specific noise abatement measures when deemed necessary to comply with the recommendations of British Standard BS 5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites* – Noise and BS 5228-2:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites* – Vibration[2].

During the construction phase of the proposed development, supervision of the works will include ensuring compliance with the limits detailed in Chapter 12 (Noise and Vibration) the EIAR using methods outlined in the aforementioned BS 5228-1. This approach calls for the designation of an Noise Sensitive Location (NSL) into a specific category (A, B or C) based on existing ambient noise levels in the absence of construction noise. A threshold noise value is applied to each category. Exceedances (construction noise only) of the threshold value, at the facade of a NSL during construction, indicates a potential significant noise impact associated with the construction activities. The threshold values recommended by BS 5228-1 are depicted in Table 4-1.

[2] British Standards Institute (BSI), *BS 5228-1:2009+A1:2014 Code of Practice for noise and vibration control on construction and open sites* (2008)

Table 4-1: Example Threshold Potential Significant Effect at Dwellings

Assessment category and threshold value period (T)	Threshold value, in $L_{Aeq,T}$ dB		
	Category A [Note A]	Category B [Note B]	Category C [Note C]
Night-time (23:00 to 08:00hrs)	45	50	55
Evenings and weekends [Note D]	55	60	65
Daytime (08:00 – 20:00hrs) and Saturdays (08:00 – 13:00hrs)	65	70	75

Note A Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values.

Note B Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values.

Note C Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than category A values.

Note D 20:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays.

It should be noted that this method is only valid for residential properties. The following method should be followed: For the appropriate period (e.g., daytime) the ambient noise level is determined and rounded to the nearest 5 Db. At some properties, particularly those located close to busy roads, the ambient noise levels are expected to be relatively high. However, given the rural nature of the site in general, daytime noise levels are below 65Db $L_{Aeq,T}$. Therefore, for the purposes of the management of construction noise, as a worst case, all properties will be afforded a Category A designation. If the specific construction noise level exceeds the appropriate category value (e.g., 65 Db $L_{Aeq,T}$ during daytime periods) then a significant effect is deemed to occur.

Vibration from construction activities will be managed in accordance with the guidance relevant to acceptable vibration limits within buildings is contained in the following documents:

- BS 7385 – Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from ground borne vibration (BSI, 1993) (BS7385): BS7385 states that there should typically be no cosmetic damage if transient vibration does not exceed 15 mm/s at low frequencies rising to 20 mm/s at 15 Hz and 50 mm/s at 40 Hz and above. These guidelines relate to relatively modern buildings and should be reduced to 50% or less for more critical buildings.
- BS 5228-2:2009+A1:2014 – Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration (BSI, 2014) (BS5228-2): BS5228-2 recommends that, for a soundly constructed residential properties and similar structures that are generally in good repair, a threshold for minor or cosmetic (i.e., non-structural) damage should be taken as a peak particle velocity of 15 mm/s for transient vibration at frequencies below 15 Hz and 20 mm/s at frequencies above than 15 Hz. Below these vibration magnitudes minor damage is unlikely, although the standard notes that where there is existing damage these limits may be reduced by up to 50%. In addition, where continuous vibration is such that resonances are excited within structures the limits discussed above may need to be reduced by 50%.

The Transport Infrastructure Ireland (TII) (formerly National Roads Authority (NRA)) publication *Guidelines for the Treatment of Noise and Vibration in National Road Schemes* (NRA, 2004) also contains information on the permissible construction vibration levels during the construction phase, these levels are depicted in Table 3-2 below.

Table 4-2: Allowable Vibration at Sensitive Properties (NRA, 2004)

Allowable vibration (in terms of peak particle velocity) at the closest part of sensitive property to the source of vibration, at a frequency of		
Less than 10Hz	**10 to 50Hz**	**50 to 100Hz (and above)**
8 mm/s	12.5 mm/s	20 mm/s

It should be noted that these limits / levels are not absolute but provide guidance as to magnitudes of vibration that are very unlikely to cause cosmetic damage. Magnitudes of vibration slightly greater than those in the table are normally unlikely to cause cosmetic damage, but construction work creating such magnitudes should proceed with caution. Where there is existing damage, these limits may need to be reduced by up to 50%.

The SHEQ Officer, or equivalent, will supervise the works to ensure compliance with the noise and vibration limits set out in the Standards document referred above and the EIAR. The following list of measures will be considered, where necessary, to ensure compliance with the relevant construction noise criteria:

- No plant used on site will be permitted to cause an on-going public nuisance due to noise;
- Regular and proper maintenance of plant and machinery, will be employed to minimise the noise produced by on site operations;
- Plant with low inherent potential for generation of noise and/ or vibration will be selected where practicable;
- Noisy / vibratory plant will be placed as far away from sensitive properties as permitted by site constraints;
- Where practicable, all vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of the contract;
- Compressors will be attenuated models, fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools will be fitted with suitable silencers.
- Machinery that is used intermittently will be shut down or throttled back to a minimum during periods when not in use.
- Any plant, such as generators or pumps, which is required to operate before 08:00 hrs or after 20:00 hrs will be surrounded by an acoustic enclosure or portable screen.
- Channels of communication will be established between the contractor/applicant, Local Authority, and residents;
- A site representative responsible for matters relating to noise and vibration will be appointed.

Where rock breaking is employed, the following are examples of measures that will be considered, where necessary, to mitigate noise emissions from these activities:

- Fit suitably designed muffler or sound reduction equipment to the rock breaking tool to reduce noise without impairing machine efficiency;
- Ensure all leaks in air lines are sealed;
- Erect acoustic screen between compressor or generator and noise sensitive area. When possible, line of sight between top of machine and reception point needs to be obscured;
- Enclose breaker or rock drill in portable or fixed acoustic enclosure with suitable ventilation.

Mitigation measures set out with Chapter 15 (Traffic and Transportation) of the EIAR are included in Table 5.1 of Section 5.0 below.

4.6 DUST SUPPRESSION / MANAGEMENT

There will be some temporary dust and exhaust emissions from construction activities during the construction phase.

Contractor(s) will have due regard to relevant guidance such as *The Control of Dust and Emissions during Construction and Demolition published by the Greater London Authority (GLA)* in 2014 and *Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes* published by the NRA (now TII) in 2011.

During the construction phase, dust or air pollutants generated from the proposed development will typically arise from:

- Movement of construction vehicles;
- Laying hardstanding areas and access tracks (i.e. roads);
- Transportation of turbines and construction materials to and within the site;
- Excavation and crushing of rock for use as a base material for internal roads and hardstanding areas;
- Excavation, movement and placement of soil stockpiles (excavated soils / fill materials); and
- Wind generated dust from stockpiles, exposed unconsolidated soils and roads.

Potential effects arising from dust and exhaust emissions will be minimised through the implementation of the following best practice measures:

- Minimisation of extent of working areas;
- Stockpiling of excavated materials will be limited to the volumes required to practically meet the construction schedule;
- Drop heights of excavated materials into haulage vehicles will be minimised to a practicable level;
- Daily inspections by site personnel to identify potential sources of dust generation along with implementation measures to remove causes where found;
- Provision of dust suppression measures (e.g., sweeps/covers/water bowsers) will be used on stockpiles and the road surface during periods of extended dry weather;
- If necessary, water will be taken from settling ponds in the site's drainage system and will be pumped into a bowser or water spreader to dampen down haul roads and site compounds to prevent the generation of dust;

- Silty or oily water will not be used for dust suppression, because this will transfer the pollutants to the haul roads and generate polluted runoff or more dust;
- Water bowser movements will be carefully monitored, as the application of too much water may lead to increased runoff;
- Traffic coming to site will only use the specified haul routes;
- Onsite borrow pits will be used to minimise quantities of stone material being brought to site;
- Best practice (including industry recognised dust suppression techniques/equipment) will be used to minimise the potential for dust production during the extraction of rock from the borrow pits and excavations elsewhere;
- Vehicles and plant will be routinely serviced to minimise the exhaust emissions during construction;
- Vehicles will not be left running unnecessarily and low emission fuels will be used where possible;
- A wheel wash will be provided near the main site entrance and used to prevent the transfer of dust from vehicles used during construction works on to public roads - The drawings in Appendix 1-2 of the EIAR include typical details and proposed location of a proposed self-contained wheel-wash system;
- A road sweeper will be available if any section of the surrounding public roads becomes soiled by vehicles associated with the proposed development.

In periods of extended dry weather, dust suppression may be necessary along haul roads and around the borrow pit area(s) to ensure dust does not cause a nuisance. If necessary, water will be taken from settlement ponds in the site's drainage system and will be pumped into a bowser or water spreader to dampen down haul roads and site compounds to prevent the generation of dust. Silty or oily water will not be used for dust suppression, because this would transfer the pollutants to the haul roads and generate polluted runoff or more dust. Water bowser movements will be carefully monitored, as the application of too much water may lead to increased runoff.

The TA Luft/VDI 2119/Bergerhoff Method of dust emission monitoring has become the most commonly used method. This method involves using a direct collection pot to standardised dimensions of either glass or plastic. The system benefits from being a direct collection method i.e. less transferring of material and consequent reduction in sampling errors. This method is defined as an internationally recognised standard and has been adopted by the Environmental Protection Agency (EPA) as the method of choice for licensed facilities. The compliance threshold limit is 350mg/m2/day as recommended by the TA Luft/VDI 2119/Bergerhoff Method. Dust monitoring will be carried out pre-construction to establish the baseline dust environment and during construction to monitor any potential increases in dust emissions.

4.7 PRE-EMPTIVE SITE-DRAINAGE MANAGEMENT

The works programme for the initial construction phase of the proposed development will take account of weather forecasts and predicted rainfall in particular. Large excavations and movements of subsoil or vegetation stripping will be suspended or scaled back if heavy rain is forecast. The extent to which works will be scaled back or suspended will relate directly to the amount of rainfall forecast.

The following forecasting systems are available and will be used on a daily basis at the site to direct proposed construction activities:



- General Forecasts: Available on a national, regional and county level from the Met Eireann website (www.met.ie/forecasts). These provide general information on weather patterns including rainfall, wind speed and direction but do not provide any quantitative rainfall estimates;
- MeteoAlarm: Alerts to the possible occurrence of severe weather for the next 2 days. Less useful than general forecasts as only available on a provincial scale;
- 3-hour Rainfall Maps: Forecast quantitative rainfall amounts for the next 3 hours but does not account for possible heavy localised events;
- Rainfall Radar Images: Images covering the entire country are freely available from the Met Eireann website (www.met.ie/latest/rainfall_radar.asp). The images are a composite of radar data from Shannon and Dublin airports and give a picture of current rainfall extent and intensity. Images show a quantitative measure of recent rainfall. A 3-hour record is given and is updated every 15 minutes. Radar images are not predictive; and
- Consultancy Service: Met Eireann provide a 24-hour telephone consultancy service. The forecaster will provide interpretation of weather data and give the best available forecast for the area of interest. Using the safe threshold rainfall values will allow work to be safely controlled (from a water quality perspective) in the event of forecasting of an impending high rainfall intensity event.

Works will be suspended if the following is likely to occur:

- >10 mm/hr (i.e., high intensity local rainfall events);
- >25 mm in a 24-hour period (heavy frontal rainfall lasting most of the day); or,
- >half monthly average rainfall in any 7 days.

Prior to works being suspended the following control measures will be completed:

- Secure all open excavations;
- Provide temporary or emergency drainage to prevent back-up of surface runoff; and,
- Avoid working during heavy rainfall and for up to 24 hours after heavy events to ensure drainage systems are not overloaded; and
- Provide cover to material storage areas i.e., adequate tarpaulin over stockpile areas if material cannot be reinstated prior to suspension.

4.8 REFUELLING – FUEL AND OIL MANAGEMENT

Any easily manoeuvrable road-going vehicles (i.e. cars, jeeps, lorries etc) will be refuelled off-site. For any vehicles which are slow moving or tracked or those for whom regular trips off-site to refuel will not be practical, on-site fuelling will be required.

No refuelling of machinery will occur within 50 m of surface water features. Refuelling of machinery will be carried out using a mobile double skinned fuel bowser to allow for ease of work. The fuel bowser will be re-filled off site or at the contractors site compound and will be towed around the site by a 4x4 jeep to where machinery is located. Spill kits (fuel absorbent material and pads) will be stored in the event of any accidental spillages. Mobile measures such as drip trays and fuel absorbent mats will be used during all refuelling operations. Only designated trained and competent operatives will be authorised to refuel plant on site.

A limited amount of fuel will need to be stored on the site within the construction compounds for this purpose, and this will be within a double skinned and bunded mobile tank. This will be stored in the construction compound when not in use.

A spill kit in the form of a supply of fuel absorbent material and mats and a drip tray will be kept with the tank at all times. The drip tray and fuel absorbent mats will be used at all times during refuelling. Similar spill kits will be stored in each construction compound, and at the on-site substation in case of emergency.

No refuelling of machinery will occur within 50 m of surface water features. Refuelling of machinery will be carried out using a mobile double skinned fuel bowser to allow for ease of work. The fuel bowser will be re-filled off site or at the contractors site compound and will be towed around the site by a 4x4 jeep to where machinery is located. Spill kits (fuel absorbent material and pads) will be stored in the event of any accidental spillages. Mobile measures such as drip trays and fuel absorbent mats will be used during all refuelling operations. Only designated trained and competent operatives will be authorised to refuel plant on site. The fuel bowser will be parked on a level impermeable area in either of the construction compounds when not in use.

Oils, lubricants and other hazardous liquids required for maintenance of equipment during the construction phase will be stored on the dedicated impermeable storage platform in the construction compounds. Any additional fuel containers, other than the fuel bowser, used for smaller equipment (such as generators, lights etc.) will be stored within additional secondary containment e.g. bund for static tanks or drip trays for smaller mobile containers. Taps/nozzles for fuels and storage containers for oils will be fitted with locks to ensure their use is controlled. Only designated trained and competent operatives will be authorised to refuel plant on site.

New clean ancillary machinery equipment such as hoses, pipes and fittings required on-site will be contained within a bunded area, however any used or damaged parts will not be stored on-site and will be removed immediately. Any repair works required on machinery involving fuel and oil control will be carried out off-site where practical, or in the construction compounds over an impermeable surface. Unless unavoidable, repair works carried out in the field where machinery is operational will use spill trays and absorbent materials to prevent release of contaminants to the ground. Maintenance and repair works will be carried out at least 50 m from any stream.

At least daily checks prior to start-up of plant and machinery will minimise the risk of break-down and associated contamination risks for on-site repairs. Records of daily pre-start checks will be maintained and kept in the site office. A clean site policy and diligent housekeeping will also reduce the potential of hydrocarbon release on-site.

4.9 SPILL CONTROL AND RESPONSE

Emergency spill kits with oil boom and absorbent materials will be kept on-site in the event of an accidental spill. Spill kits will be stored in each construction compound, and at the on-site substation in case of emergency and with the 4x4 vehicle transporting the fuel bowser, smaller spill control kits will also be kept in all construction machinery. All construction personnel will be notified of where the spill kits are located as part of the site induction and will be trained on the site procedures for dealing with spills.

In the event of a leak or accidental fuel spill in the field, the source of the spill will be fixed, and the fuel will be contained and cleaned as quickly as possible using the spill kits to contain and absorb the pollutant and prevent any further potential contamination. The absorbed pollutants and contaminated materials will be placed into leak proof containers and transferred to a



suitable waste container for hazardous materials in the construction compounds. Where a leak has occurred from machinery, the equipment will not be permitted to be used further until the issue has been resolved. The incident will be reported to the Construction/Site Manager and Environmental Manager, and appropriate remediation will be carried out i.e. soil removal for safe disposal by licensed waste collectors.

The SHEQ Officer (or equivalent appointed person) will be notified of any spills on-site and will determine the requirement to notify the authorities as set out in Section 4.3.2 (Incidents / Complaints).

4.10 HORIZONTAL DIRECTIONAL DRILLING

Horizontal Directional Drilling (HDD) will be required for the two circuits of underground cable to cross the N63 road.

The drilling process involves pumping a drilling fluid through the drill head, which is inert, natural and biodegradable (e.g., Clear BoreTM). This fluid will be used sparingly and only as required to avoid an excess and will be appropriately stored when not in use. This fills voids locally around the drill head and enables the drill to progress without the hole collapsing. Should any excess drilling fluid occur, it will be contained and removed for disposal at a licensed waste facility. The duct will be positioned, and the launch and reception pits will be refilled.

The construction methodology for the HDD crossing is summarised as follows:

- Work areas will be fenced on both sides of the HDD away from the N63 road;
- The drilling rig and fluid handling units located on one side of the crossing will be stored on double bunded 0.5 mm PVC bunds which will contain any accidental fluid spills and storm water run-off;
- Entry and exit pits (1 m x 1 m x 2 m) will be excavated; the excavated material will be temporarily stored within the works area and used for reinstatement or disposed of to a licensed facility;
- A 1 m x 1 m x 2 m steel box will be placed in each pit. This box will capture any drilling fluid returns from the borehole;
- The drill bit will be set up by a surveyor, and the driller will push the drill string into the ground and will steer the bore path under the stream-ways and the forestry;
- A surveyor will monitor drilling works to ensure that the modelled stresses and collapse pressures are not exceeded;
- The drilled cuttings will be flushed back by drilling fluid to the steel box in the entry pit;
- Once the first pilot hole has been completed a hole-opener or back reamer will be fitted in the exit pit and will pull a drill pipe back through the bore to the entry side;
- When all bore holes have been completed, a towing assembly will be set up on the drill and this will pull the ducting into the bore;
- The steel boxes will be removed, and the drilling fluid disposed of to a licensed facility;
- The ducts will be cleaned and proven and their installed location surveyed;
- The entry and exit pits will be reinstated as per the landowners' requirements.

Further details of this crossing method are provided in Appendix 3-3 (TLI Outline Construction Methodology - 110kV Substation and connections) of the EIAR.



4.11 UNDERGROUND CABLE TRENCHING

The underground cable required to facilitate the grid connection will be laid beneath the ground surface and/or public road using the following methodology:

- The main Contractor, and their appointed Site Manager, will prepare a targeted Method Statement concisely outlining the construction methodology and incorporating all mitigation and control measures included within the planning application and accompanying reports and as required by planning conditions where relevant;
- All existing underground services will be identified on site prior to the commencement of construction works: The area where excavations are planned will be the subject of a confirmatory survey, prior to the commencement of works, with a cable locating tool;
- A verification condition survey will be carried out for all parts of the route within the public road. Details of this survey will be agreed with the local authority in advance of the survey;
- A trench will be opened using an excavator to accommodate the formation required;
- At watercourse crossings, contractor(s) will be required to adhere to the environmental control measures outlined within the planning application and accompanying reports, and this CEMP, and best practice construction methodologies;
- Where the cable route intersects with culverts, the culvert will remain in place (where possible) and the ducting will be installed either above or below the culvert to provide minimum separation distances in accordance with ESB and Irish Water specifications;
- In the event that culverts require removal for ducting installation, it is proposed that a suitable method of damming the water source and pumping the water around the work area would be set out in a method statement and agreed with the relevant stakeholders. Once the ducts are installed the culvert will be reinstated to match existing levels and dimensions. If works of this nature are required, the appointed main Contractor will liaise with Inland Fisheries Ireland in advance of works;
- Traffic management measures will be implemented in accordance with those included in the Traffic Management Plan will be prepared and agreed with Longford County Council;
- Excavated material will be employed to backfill the trench where appropriate and any surplus material will be stockpiled in the peat deposition area. This material will not be stored in the vicinity of any watercourse and will be smoothed with the back of an excavator bucket to minimise runoff. It will be cast on the upgradient side of the trench, so if any runoff did occur it will run into the down gradient trench. Excess material will be used on the site of the proposed development for local landscaping, borrow pit reinstatement;
- The excavated trench will be dewatered if required, from a sump installed within the low section of the opened trench. Where dewatering is required, dirty water will be fully and appropriately attenuated, through silt bags, before being appropriately discharged to vegetation or surface water drainage feature;
- Silt fences will be installed alongside the road/works areas as required near watercourses;
- Clay dams/plugs will be installed at regular intervals (depending on the gradient) to prevent conduit flow of water within the trench;



- Works will not be carried out during periods of heavy precipitation. In the event that some surface water does accumulate in the trench, this will be allowed to percolate into the ground naturally;
- The trench will be surfaced as per the road surface specifications of the local public road, the wind farm road or (in the case of off road section) an EirGrid/ESB specification gravel access track capable of supporting maintenance vehicles if required;
- It is anticipated that construction will be carried out by a single team (with plant items likely to include excavators and dumpers) along the route, but there is a possibility to use two separate teams to speed up the construction. The excavation, installation and reinstatement process will take on average of 1 no. day to complete a 100 m section;
- No more than a 100 m section of trench will be opened at any one time. The second 100 m will only be excavated once the majority of reinstatement has been completed on the first;
- Where required, grass will be reinstated by either seeding or by replacing with grass turves.

4.12 PEAT AND SPOIL MANAGEMENT

The site which is generally flat consists predominantly of bare, locally re-vegetated cutaway peat and shallow peat with an established drainage network. The site has historically been harvested by Bord na Móna using mechanical harvesting equipment. Bord na Móna has experience managing peat in similar terrain, both during peat extraction operations and during wind farm construction projects, which have demonstrated safe and effective methods for peat management and storage.

The proposed methodology for the management of peat and spoil, as outlined in the PSMP (Appendix 9-2 of the EIAR).

The following general guidelines for good construction practice as per the PSMP:

Inappropriate handling and management of excavated peat and overburden, as well as uncontrolled loading of peat material, is considered one of the leading causes of peat instability and landslide event triggers during the wind farm construction process. Managing and controlling these activities is key to de-risking peat stability at the wind farm site. It is required that the construction method statements for the proposed development t also take into account, but not be limited to, the guidance documents listed in Section 1 and the recommendations and requirements outlined throughout this document. The general requirements for the management of peat and spoil materials and the mitigation of peat instability at the site will be:

- A Project Geotechnical Engineer will be appointed for the construction stage to oversee peat excavation and management;
- Placement of peat and spoil material, including temporary and side casting, be carried out in the permitted areas only;
- Excavated peat and spoil will not be stored on-site and will be immediately moved to the designated Peat Deposition Area or borrow pit areas with the exception of the deposition required for the opening of the initial borrow pit as outlined in Section 7.1. Acrotelm (upper) peat material will be used as landscaping material where topography allows, and the detail designer has assessed the stability risk;



- Peat and spoil will only be placed in the proposed deposition areas or re-used for landscaping purposes. The velocity of water flows within drainage systems will be controlled using check damns, and the uncontrolled release of water onto slopes can create a landslide risk and must be avoided;
- All construction requiring cut and fill earthworks requires a robust monitoring and inspection programme. The details of this inspection programme will depend on the purpose and methodologies of the works and the ground conditions;
- A method statement and risk assessment (RAMS), which considers the potential causes and mitigations of peat instabilities and landslides, is required and must be regularly communicated to all site staff. An observational approach by all site staff to the ground conditions and the risks will be promoted, and any changes in the ground or site conditions will be reported and the risk dynamically assessed.

Regular briefing of all site staff (e.g. toolbox talks) to provide feedback on construction and ground performance and to promote reporting any observed change in ground conditions.

Specific measures regarding the handling and placement of excavated peat and spoil are outlined in the PSMP (Appendix 9-2 of the EIAR) and are included in Table 5-1 (Table of Mitigation Measures), Section 5.0 of this CEMP.

The quantity of peat and non-peat material (spoil) requiring management for the proposed development has been calculated, as presented in Table 3-7 of Chapter 3 (Description of the Proposed Development) of the EIAR. These quantities were calculated as part of the PSMP in Appendix 9-2 of the EIAR.

4.13 BORROW PITS

There are four borrow pit locations identified to produce excavated material to provide fill material for roads (for permanent roadways and amenity), passing bays, hardstands, upfill to foundations and temporary compounds, dependent on testing results. The borrow pits are all located within Derryadd Bog (i.e., centre of the proposed wind farm site as per Planning Drawing 11399-2010).

Using the average borrow pit depth of 5.5 m bgl, the available volumes of useable material is 648,379 m^3, which includes sand, gravel and stone. Refer to Chapter 9 (Land, Soils and Geology) of the EIAR for details. No blasting is proposed for extracting material from these borrow pits. Rock breaking, crushing and screening will be required for some of the material won from borrow pits, with some limited rock ripping. Extraction from borrow pits will be from above and below the water table.

No refuelling of machinery will occur within 50 m of surface water features. Mobile measures such as drip trays and fuel absorbent mats will be used during all refuelling operations.

Given the volumes of material available from these borrow pits, it is possible that they will fulfil a large portion of the material requirements for the proposed development. The use of on-site borrow pits will reduce the environmental effect of other aspects of the development by reducing the need to transport material to the site.

Post-construction, the borrow pit area will be partially backfilled with overburden and excavated material from elsewhere on the site and permanently secured. A 2.4 m high chain-link security fence will be erected around the perimeter to prevent access as necessary, as per

Planning Drawing 11399-2060 to 11399-2063. Appropriate health and safety signage will also be erected on the security fence and at locations around the borrow pits.

In summary, the construction of the borrow pits will follow a standard sequence as follows:

- Prior to work commencing, an extensive GPR scan for hidden services will be carried out and services will be relocated where required;
- The working area will be cordoned using temporary fencing;
- Extraction plant and vehicles on low loaders will be mobilised to site;
- An interceptor drain will be installed upslope of the borrow pit, where necessary. This drain will divert any surface water away from the borrow pit and hence prevent water from ponding and lodging during construction and when reinstated;
- Peat layer will be stripped and stored in the peat deposition area adjacent to the borrow pit. Other extracted materials deemed unsuitable following testing, for re-use will be temporary stored in the adjacent deposition area;
- Peat and spoil materials will be stored separately but spoil material can be used in cell berms to contain excavated peat material. Slopes of a maximum of 1(H):3(V) will be used in peat material and 1(H):2(V) in spoil material. However suitable drainage will be required;
- Material will be extracted using excavators:
    - A large rock breaking excavator progressively breaks out the solid rock from the ground in the borrow pit areas;
    - A smaller rock breaker, in the 30-40 tonne size range, then breaks the rocks down to a size that can then be fed into a crusher;
    - Other extracted materials deemed unsuitable following testing, for re-use will be reinstated within the borrow pits.
- Material will be processed to crush cobbles and boulders by using a mobile crusher and screener. The extracted, broken rock is loaded into a mobile crusher using a wheeled loading shovel and crushed down to the necessary size of graded stone required for the on-site civil works;
- The processed material will be stockpiled in designated areas within the borrow pit;
- A site access road to the borrow pit will be constructed to tie in with the internal site road infrastructure;
- Processed material will be loaded into lorries or articulated dumpers and transported to areas within the site for the construction of internal roads, hardstand, compound and other infrastructure which require stone fill;
- Temporary excavation side slopes will be designed by a geotechnical engineer;
- Temporary control of groundwater within the borrow pits may be required and measures will be determined as part of the ground investigation programme. A temporary pump and suitable outfall locations will be required during construction;
- Settlement ponds have been designed at the lower side/outfall location of the borrow pits;
- Upon completion, all faces of excavation will be constructed to safe permanent side slopes to be designed by a geotechnical engineer;
- Infilling of the peat and spoil will commence at the back edge of the borrow pit and progress towards the borrow pit entrance;

- The acrotelm layer will be placed with the vegetation part of the sod facing the right way up to encourage growth of plants and vegetation at the surface of the peat and spoil;
- Extraction plant and vehicles on low loaders will be demobilised via internal site roads and main site entrance.

4.14 CONCRETE DELIVERIES AND POURING

Only ready-mixed concrete will be used during the construction phase, with all concrete being delivered from local batching plants in sealed concrete delivery trucks. The use of ready-mixed concrete deliveries will eliminate any potential environmental risks of on-site batching. When concrete is delivered to site, only the chute of the delivery truck will require cleaning, using the smallest volume of water necessary, before leaving the site. Concrete trucks will be washed out fully at the batching plant, where facilities are already in place.

The small volume of water that will be generated from washing of the concrete lorry's chute will be directed into a temporary lined impermeable containment area, or a concrete wash unit. This type of unit catches the solid concrete and filters and holds wash liquid for pH adjustment and further solids separation. The residual liquids and solids can be disposed of off-site at an appropriate waste facility. Where temporary lined impermeable containment areas are used, such containment areas are excavated and lined with an impermeable membrane.

The areas are generally covered when not in use to prevent infill of rainwater. In periods of dry weather, the areas can be uncovered to allow much of the water to be lost to evaporation. At the end of the concrete pours, any of the remaining liquid contents is tankered off-site. Any solid contents that will have been cleaned down from the chute will have solidified and can be broken up and disposed of along with other construction waste.

Due to the volume of concrete required for each turbine foundation (approximately 950 m^3), and the requirement for the concrete pours to be continuous, deliveries are often carried out outside normal working hours in order to limit the traffic impact on other road users, particularly peak period school and work commuter traffic. Such activities are limited to the day of turbine foundation concrete pours.

The risks of pollution arising from concrete deliveries will be further reduced by the following:

- Concrete trucks will not be washed out on the site but will be directed back to their batching plant for washout other than the delivery chutes;
- Site roads will be constructed to a high standard to allow transport of the turbine components around the site, and hence, concrete delivery trucks will be able to access all areas where the concrete will be needed. No concrete will be transported around the site in open trailers or dumpers so as to avoid spillage while in transport. All concrete used in the construction of turbine bases will be pumped directly into the shuttered formwork from the delivery truck. If this is not practical, the concrete will be pumped from the delivery truck into a hydraulic concrete pump or into the bucket of an excavator, which will transfer the concrete to the location where it is needed;
- The arrangements for concrete deliveries to the site will be discussed with suppliers before work starts, agreeing routes, prohibiting on-site full washout and discussing emergency procedures;
- Clearly visible signage will be placed in prominent locations close to concrete pour areas specifically stating washout of concrete lorries is not permitted on the site.

Because of the scale of the main concrete pours that will be required to construct the proposed wind farm, the main pours will be planned weeks in advance, and refined in the days leading up to the pour. Special procedures will be adopted in advance of and during all concrete pours to minimise the risk of pollution. These may include:

- Using weather forecasting to assist in planning large concrete pours and avoiding large pours where prolonged periods of heavy rain is forecast;
- Restricting concrete pumps and machine buckets from slewing over watercourses while placing concrete;
- Ensuring that excavations are sufficiently dewatered before concreting begins and that dewatering continues while concrete sets;
- Ensuring that covers are available for freshly placed concrete to avoid the surface washing away in heavy rain;
- Disposing of surplus concrete after completion of a pour will be off-site.

4.15 WORKS NEAR WATERBODIES

The construction works will involve some works within 50 m of streams (such as site access tracks). However, no instream works are proposed, and a suite of measures are in place to avoid any adverse effects on streams.. Trees will be cut manually inside the 50 m buffer. During the near stream construction work, silt traps and a double row silt fences will be placed immediately down-gradient of the construction area for the duration of the construction phase.

Near-stream construction work will only be carried out during the period permitted by Inland Fisheries Ireland for in-stream works according to the Eastern Regional Fisheries Board (2004) guidance document "Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites", that is, May to September inclusive. This time period coincides with the period of lowest expected rainfall and, therefore, minimum runoff rates. This will minimise the risk of entrainment of suspended sediment in surface water runoff, and transport via this pathway to surface watercourses.

Runoff will be maintained at Greenfield (pre-development) runoff rates. The layout of the development has been designed to collect surface water runoff from hardstanding areas within the development and discharge to associated surface water attenuation lagoons adjacent to the proposed infrastructure. It will then be managed by gravity flow at Greenfield runoff rates.

It is proposed, that during the ground clearance of the proposed development, the appointed main Contractor will implement water control measures to limit the effect on water quality using standards measures as set out in the. Brash will be used along harvesting and extraction routes for soil protection. The forwarder will be loaded to the manufacturer's maximum specification and no more to avoid overloading and unnecessary soil compaction.

Suspended solid (silt) removal features will be implemented in accordance with CIRIA C697 SuDS Manual, and CIRIA C648 Control of water pollution from linear construction projects.

All temporary and permanent drainage from the site will be designed to have as a minimum three stages of treatment, as defined in the SuDS Manual. Management of runoff will include the following:

- Filtration of water through filter media (sand / stone check dam, silt fence);
- Detention / settlement in settlement ponds or behind check dam in swales; and
- Conveyance of shallow depths of water in vegetated swale.



4.15.1 Monitoring

Local surface water features in the immediate vicinity of the site boundary will be monitored at the pre-construction phase and during construction to take account of any variations in the quality of the local surface water and groundwater environment as a result of activities related to the proposed development.

Inspections of silt control measures are critical after prolonged or intense rainfall while maintenance will ensure maximum effectiveness of the proposed measures. A programme of inspection and maintenance will be designed, and dedicated construction personnel assigned to manage this programme. A checklist of the inspection and maintenance control measures will be developed, and records kept.

During the construction phase, field testing and laboratory analysis of a range of parameters will be undertaken at adjacent watercourses, specifically following heavy rainfall events (i.e., weekly, monthly and event based as appropriate).

Regular visual inspections of all watercourses (flow conditions, discolouration, collection of debris, fish in distress or floating), presented in a monthly report on water quality, is advised by an independent, suitably qualified ECoW with particular emphasis placed on:

- Streams downstream of site activities;
- At times when heavy traffic is frequenting the site;
- During and after periods of heavy or prolonged rainfall and during winter months;
- During fish migration and spawning periods; and
- Stream crossings to ensure that the existing mitigation measures are effective in preventing any sediment reaching streams.

4.16 WASTE MANAGEMENT

Best practice in waste management will be employed during all phases of the proposed development, with a view to reducing, reusing, recycling and recovering waste produced, in that order of preference. Waste disposal will be avoided where possible. The following sections outline the Resources and Waste Management Plan (RWMP) and waste management practices associated with the proposed development, which will be in accordance with relevant provisions of the Waste Framework Directive (Directive 2008/98/EC on waste), the Waste Management Act 1996 as well as all other Irish and EU legislation.

4.16.1 Waste Management Plan

All waste generated from the Derryadd Wind Farm development construction phase will be managed in accordance with the provisions of the Waste Management Act 1996 as amended and associated Regulations. Prior to construction commencement, the appointed Contractor will prepare a detailed C&D Resource and Waste Management Plan (RWMP) in accordance with the relevant following guidance 'Best Practice Guidelines for the preparation of resource & waste management plans for construction & demolition projects' (EPA, 2021). The Construction RWMP will provide a mechanism for monitoring and auditing waste management performance and compliance for the duration of the proposed development. The document will also provide a detailed overview of key waste management considerations for the proposed development and will be fully implemented onsite for the duration of the construction phase of the proposed development.

The Waste Management Act 1996 and its subsequent amendments provide for measures to improve performance in relation to waste management, recycling and recovery. The Act also provides a regulatory framework for meeting higher environmental standards set out by other national and EU legislation.

The Act requires that any waste related activity has to have all necessary licenses and authorisations. The main Contractor will appoint a Resource and Waste Manager. It will be the duty of the Resource and Waste Manager on the site of the development to ensure that all contractors hired to remove waste from the site have valid Waste Collection Permits for any waste streams they are removing from site and to ensure that the waste is delivered to an appropriately licensed or permitted waste facilities. The hired waste contractors and subsequent receiving facilities must adhere to the conditions set out in their respective permits/licenses and authorisations.

The Resource and Waste Manager will also ensure that all parts of the RWMP will be implemented onsite. The RWMP will provide systems that will enable all arisings, movements and treatments of construction waste to be recorded. This system will enable the main Contractor to measure and record the quantity of waste being generated. It will highlight the areas from which most waste occurs and allows the measurement of arisings against performance targets. The RWMP can then be adapted with changes that are seen through record keeping.

Measures outlined in the RWMP will be implemented on site by the appointed main Contractor and Resource and Waste Manager for the duration of construction, and will typically include:

- The appointed main Contractor will ensure all excavated topsoil and subsoils will be reused within the site boundary, insofar as possible, primarily for reinstatement of the borrow pits. Any excess material which cannot be reused in creating berms or reinstating the borrow pits will be transferred off-site to a licensed waste facility. Similarly, any excess or unsuitable rock material which cannot be reinstated in the borrow pits will be transferred off-site. However, it is not anticipated that any excess material will not be suitable for reuse within the site;
- The appointed main Contractor will ensure that any excess material which cannot be reused will be transferred off-site to a suitable licensed waste facility. Similarly, any excess or unsuitable soil / rock material which cannot be reinstated will be transferred off-site. However, it is not anticipated that any excess material will not be suitable for reuse within the site;
- The appointed main Contractor will ensure typical waste streams (such as metals, paper, cardboard, plastics, wood, rubber, textiles, bio-waste, packaging, WEEE (electronic waste, batteries, accumulators and construction waste) will be managed, collected, segregated and stored in separate area(s) at the site before being removed off site by a licensed waste management contractor at regular intervals for the duration of the construction works;
- The appointed main Contractor will provide skips and bins of appropriate sizes onsite in a designated area(s) and used to maximise source segregation of waste materials. This will include food and packaging waste from canteen and welfare facilities. Appropriate control of food waste in the compound will minimise the potential for pests and rodents to visit the area;

- Any contaminated materials used for spills and equipment maintenance works will be separately stored in a suitable container for collection by the appointed authorised hazardous waste contractor(s);
- The appointed main Contractor will encourage all staff to minimise waste generation and to maximise the segregation of waste at source. Material wastage will be avoided by delivering only the required quantities of material to site and utilising off-site manufacturing of materials as much as possible;
- The appointed main Contractor will establish 'just-in-time deliveries to avoid excess material storage at the site which can lead to waste generation. Delivery drivers will be encouraged to remove any excess packaging from materials delivered to site and remove unused timber pallets where possible;
- Reusable formwork for concrete pouring will be used where possible, in preference of non-reusable options. Other opportunities for material reuse across the site will be sought by the appointed main Contractor;
- Due to the current nature / use of the site, it is not anticipated that there will be contaminated soils or materials encountered during the excavation works. No contaminated soils were identified during the site investigation works;
- Where illegal dumping is discovered, appropriate communication and measures will be taken to try and identify the source of the illegal waste. The appropriate authorities will be notified, and the materials will be removed from site by authorised waste collection contractors and transferred to suitably licensed waste facilities;
- The Environmental Manager / SHEQ Officer, or other appropriate person, will be chosen by the appointed main Contractor as the Resource and Waste Manager for the duration of the proposed development in accordance with the general guidance set out in the *Best Practice Guidelines for the Preparation of Resource & Waste Management Plans for Construction & Demolition Projects*[3], published by the EPA in November 2021;
- At the pre-construction phase, the appointed construction and demolition (C&D) Waste Manager will be in a position to require fellow designers to take full advantage of all reasonable C&D waste prevention, reuse and recycling opportunities;
- During construction, the practicalities of waste prevention, salvaging re-useable materials, and the need to synchronise the recycling of waste materials through the timing of their use in the new construction works will be emphasised by the appointed Resource and Waste Manager; and
- The appointed Resource and Waste Manager will be responsible for auditing waste handling and storage, and all waste collections and records of waste movement throughout the proposed development, and for advising construction personnel on best practices.

[3] EPA *Best Practice Guidelines for the Preparation of Resource & Waste Management Plans for Construction & Demolition Projects* (November 2021) - https://www.epa.ie/publications/circular-economy/resources/CDWasteGuidelines.pdf

4.17 VEHICLE WASHING

Wheels or vehicle underbodies are often washed before leaving sites to prevent the build-up of mud on public (and site) roads. Internal site roads will be already formed using on-site materials before other road- going vehicles begin to make regular or frequent deliveries to the site (e.g., with steel, ducting or concrete). The site roads will be well finished with compacted hardcore, and so the public road-going vehicles will not be travelling over soft or muddy ground where they might pick up mud or dirt. Refer to Planning Drawing 11399-2041 for details.

However, in the interest of best practice and to avoid the potential for the transfer of invasive plant species into the site, it is proposed to install a self-contained wheelwash systems at the proposed wind farm site. Planning Drawing 11399-2041 includes typical details of a proposed self-contained wheelwash system which will be installed as part of the construction phase of works. Wheelwash systems will be located at all construction and delivery entrances of the site (Site Access A, B and C), off the R392, N63 and R398, as shown on Planning Drawings 11399-2012 and 11399- 2015.

A road sweeper will be available if any section of the surrounding public roads becomes soiled by vehicles associated with the proposed development.

5.0 EMERGENCY RESPONSE PLAN / PROCEDURES

5.1 HAZARD IDENTIFICATION

In order to establish the type of potential emergencies that may occur, the hazards outlined in Table 4-1 have been identified as being potential situations that may require an emergency response they occur.

Table 5-1: Potential Hazards Identified

Hazard Type	Emergency Incident
Plant / Machinery/tools causing damage	Accident resulting in injury / power failure / loss of critical infrastructure
Spillages / Leaks	Accidental spill / leak leading to significant environmental contamination
Flooding	Accident leading to injury / damage to site infrastructure
Severe Weather	Accident leading to injury / damage to site infrastructure
Fire / Explosion	Accident leading to injury / damage to site infrastructure
Turbine Collapse	Accident leading to injury / damage to site infrastructure
Peat Stability	Excessive movement of peat on-site / onset of peat slide leading to: accident / injury / damage to site infrastructure
Landslide	Accident leading to injury / damage to site infrastructure
On-site/Construction Traffic – plant/machinery and construction vehicle movements	Traffic accident leading to injury / damage to site infrastructure
Wind Turbine Rotational Failure	Accident leading to injury / damage to site infrastructure

5.2 ROLES AND RESPONSIBILITIES

An indicative organisational chart which identifies the typical roles and associated responsibilities for the construction of the proposed development is provided in Section 2.3 of this CEMP. This will be subject to specific contractual agreements upon appointment of a Main



Contractor and any additional/further appointments required in compliance with a grant of permission.

The Project Manager will have overall responsibility for environmental management and compliance during the construction works. He/she will be supported in this role by an SHEQ Officer, or equivalent as appropriate, who will liaise directly with the relevant regulatory bodies and stakeholders throughout the construction phase. Additional specialist input will be included from an ecological clerk of works, archaeologist or other disciplines as required.

5.3 EMERGENCY RESPONSE PROCEDURES

Every effort will be made to prevent health and safety emergencies and environmental incidents during the construction and operational phase of the proposed development.

The appointed main Contractor will be responsible for developing a detailed Emergency Response Plan (ERP) for the proposed construction works, to cover health and safety emergencies as well as environmental emergencies, as part of the H&S Plan.

This ERP will be activated in the event of an emergency such as an accident, fire, spillage, collapse etc. and will provide details on who is required to be notified, first aid facilities and closest hospitals. The ERP will also include details of all personnel inducted and authorised to work on the site as well as next of kin contact details and relevant medical information.

In the event of an emergency, SHEQ Officer and Project Manager will be notified immediately and will determine the scale of the emergency and the requirement for the assistance of emergency services. Works will cease in the area of the incident and contact will be maintained with the emergency services to direct them to the scene of the incident as required.

As part of the ERP, an evacuation drill will be carried out on a regular basis to make all personnel aware of the procedure to be followed in the event of an emergency where a full site evacuation is required. Emergency muster point(s) will be identified at suitable locations in the construction compounds and the ERP will outline the persons responsible for checking names at the safety muster points. Records will be maintained of such drills.

The ERP must include contact names and telephone numbers for the relevant local authorities (all sections/departments) including ambulance, fire brigade, An Garda Siochána and the HSA. Reporting of environmental emergencies to the local authority will be required as well as other relevant stakeholders such as IFI, NPWS or the EPA.

5.4 SITE EVACUATION AND FIRE DRILLS

A site evacuation/fire drill procedure will be developed to provide basis for carrying out the immediate evacuation of all site personnel in the event of an emergency. At induction, all personnel will be made aware of the evacuation procedure. The Fire Services Acts of 1981 and 2003 require the holding of fire safety evacuation drills at specific intervals and maintaining records of such drills. The details of this procedure will be finalised in the appointed main Contractor's CEMP at construction phase and will include:

- Details regarding the notification of emergency situations to all those on site including use of a siren/horn to notify all personnel;
- Details of assembly point(s) and signage;
- Details of the roll call procedure to account for all personnel on site;



- Communication process between the Site Security Officer and the Site Manager during the procedure (i.e. notification of roll count etc.);
- Course of action to be undertaken by the Site Manager.

5.5 SPILL RESPONSE AND CONTROL

A detailed spill response and control procedure will be developed and finalised in the appointed main Contractor's CEMP at construction phase, outlining the steps that will be followed in the event of an oil / fuel spill occurring, including:

- Identification and blocking of the source of the spill;
- Alerting personnel in the vicinity of the spill and any possible dangers;
- Elimination of any potential ignition sources in the vicinity of the spill;
- Spill containment approach and spill control materials;
- Covering or bunding off of any vulnerable areas where appropriate (i.e. drains, streams, sensitive habitats);
- Clean up using the spill control materials;
- Containment and disposal of used spill control materials;
- Communication with the ECoW – providing relevant information on the location, type and extent of the spill so that they can take appropriate action;
- ECoW actions including inspection of the site, making certain necessary measures are in place to manage the spill and prevent further spillage;
- ECoW notification to the appropriate regulatory body if necessary.

5.6 OTHER ENVIRONMENTAL INCIDENTS

Environmental incidents are not only limited to spills. Any environmental incident must be investigated and the ECoW notified immediately. If necessary, the ECoW will inform the appropriate regulatory authority depending on the nature of the incident. Details of the incident will be recorded (e.g. cause, extent, actions and remedial measures). Recommendations made to avoid reoccurrence will be recorded also. The ECoW will liaise with the Project Ecologist or Project Archaeologist regarding any incidents as required. A record of all environmental incidents will be kept on file by the ECoW and the main Contractor. These records will be made available to the relevant authorities if required. Furthermore, the ECoW will be responsible for any outlining corrective actions required and will advise the main Contractor as appropriate.

5.6.1 Excessive Peat Movement

A detailed procedure will be developed and finalised within the appointed main Contractor's CEMP at construction phase outlining the steps to be followed in the event of excessive or continuing peat movement being recorded or identified, including details on suspension of construction activities within the affected area, increasing monitoring activity at the identified location; limited construction activity beginning again only once there has been a cessation of movement and a geotechnical risk assessment having been undertaken by a geotechnical engineer.

5.6.2 Peat Slide

A detailed procedure will be developed and finalised within the appointed main Contractor's CEMP at construction phase outlining the steps to be followed in the event of the onset of or detachment of peat onsite, which will include details regarding, alert of peat slide, cessation of



construction, diversion of resources, mitigation procedures, actions to prevent a peat slide reaching watercourses via on-land prevention measures (e.g. installation of check barrages), watercourse check barrages, stabilisation by rock infill where applicable/required. The procedure will also detail assessment requirements to be undertaken by the geotechnical engineer and stabilisation procedures implemented, as well as monitoring, as appropriate, until such time as movements have stopped.

5.7 INCIDENTS / COMPLAINTS

All safety or environmental incidents associated with the proposed development will be reported and investigated in line with the ERP. Typically, the following procedures will be followed in the event of an incident:

- Works will stop immediately where safe to do so;
- The SHEQ Officer will be contacted;
- The size of the incident will be assessed and determined if it can be controlled by site staff or if emergency services are required to attend;
- The appropriate enforcing authority will be contacted;
- The SHEQ Officer will investigate after the incident;
- The findings will be sent to the appropriate authority; and
- An action plan will be prepared to set out any modifications to working practices required to prevent a recurrence.

This section sets out a procedure to manage and resolve any complaints received from members of the public during the construction phase of the proposed development. The following measures will be adopted and refined, as necessary, taking account of any relevant planning conditions.

The following measures will be implemented to deal with complaints and the appointed main Contractor's CEMP will contain more specific details with regard to phone numbers to contact:

- Clearly display a notice board at the site entrance so that the public know whom to contact if they have a complaint or comment;
- Personnel on site, including sub-contractors are required to perform their duties in accordance with this CEMP, and in such a way as to minimise the risk of complaints from third parties;
- All complaints received regarding the construction works will be recorded and categorised (e.g. noise, property damage, traffic, dust etc.) within a central Site Complaints Log. This complaints log will include the following key details:
    - Name, address and contact details of the complainant (with the complainant's permission);
    - Brief outline of the complaint;
    - Date of Complaint;
    - Name of person receiving complaint details; and
    - Agreed timeline for response to complaint.
- All complaints will be communicated to the Project Manager and the Applicant immediately;
- All complaints will be followed up and resolved in so far as is practicable; and

- The complainant, Applicant and other stakeholders will be kept informed of the progress in resolving the complaint.

5.8 EMERGENCY CONTACT DETAILS

A provisional list of emergency contacts based on a review of the locality is presented in Table 4-2 below. The appointed contractor will review this list and update accordingly prior to construction commencing. A copy of these contacts will be included in the Site Safety Manual and in the site offices and the various site welfare facilities.

Table 5-2: List of Emergency Contacts

Contact	Telephone
Emergency Services – Ambulance, Fire, Gardaí	112 / 999
Lanesborough Garda Station	0433321102
Kenagh Garda Station	0433322102
Longford Garda Station	0433350570
Lanesborough Fire Brigade	0433347136
Longford County Fire & Rescue Service	(043)3347136
Health Centre, Rathcline Road, Lanesborough	043 3321832
College Medical Centre, Longford Town	043 3348884
Centenary Medical Centre, Longford Town	043 3341879
Station Medical Centre	043 3336182
Ballymahon Medical Centre	0906432146
Primary Care Centre (Longford)	0433339701
Primary Care Centre (Roscommon)	0906665000
Longford Health Centre	043 335 0169
Roscommon University Hospital	0906626200
ESB Faults / Emergencies	1850 372 999
Gas Networks Ireland 24hr Emergency Line	1850 20 50 50
Site Manager / Construction Manager / Site Supervisor	TBC
Client: Derryadd Wind Farm / Bord na Móna	TBC
Ecological Clerk of Works (ECoW)	TBC
SHEQ Officer	TBC
Project Supervisor Design Stage (PSDS)	TBC
Project Supervisor Construction Stage (PSCS)	TBC
Health and Safety Authority Ireland (HSA)	TBC
Inland Fisheries Ireland (IFI)	TBC
Project Engineer	TBC
Project Ecologist	TBC
Project Hydrologist	TBC
Project Geotechnical Engineer / Geologist	TBC
Project Archaeologist	TBC

5.9 EMERGENCY COMMUNICATION PROCEDURE

The appointed main Contractor's CEMP will be updated with an agreed Emergency Communication Response Procedure following appointment of the Contractor.

5.10 PERSONNEL TRACKING PROCEDURE

All personnel on site will be required to undergo a site induction where they will be required to provide personal contact details (including contact information for next of kin). In the event that a member of personnel is involved in an emergency situation where serious injury has occurred and hospitalisation has followed, the Site Manager, or next in command if unavailable, will be responsible for contacting and informing the next of kin.

5.11 INDUCTION CHECKLIST

Table 4-3 below provides a list of items highlighted in the Emergency Response Procedure (ERP) which must be included in the induction or gathered from all personnel that will work on the proposed development during the mandatory site induction. This will be revised throughout the various stages of the proposed development. This list will be updated and expanded on within the appointed main Contractor's CEMP.

Table 5-3: Site Induction Checklist

Emergency Response Plan – Site Induction Items TBC	Status
Site Induction (all personnel must undergo the site induction prior to commencing work on-site)	
All personnel must be made aware of site evacuation and fire drill procedures	
All personnel must be made aware of the spill response and control procedure	
All personnel must be made aware of environmental incident procedures	
All personnel must be made aware of procedures relating to peat movement and peat slides	
All personnel must be made aware of incident and complaints procedures	
All personnel must be made aware of the emergency communication procedure and Emergency Contact Details for the proposed development	
All personnel must be made aware and have access to the Site Safety Manual	
All personnel must be made aware of the personnel tracking procedure and provide their contact details at induction	
TBC	
TBC	
TBC	

6.0 MITIGATION PROPOSALS

All mitigation measures relating to the pre-construction and construction phases of the proposed development were set out in the various sections of the EIAR, and NIS prepared as part of the planning application.

This section of the CEMP groups together all of the mitigation measures presented in the EIAR and NIS respectively. The Mitigation Measures are outlined in the table in the following pages.

By presenting the mitigation proposals in this format, it is intended to provide a review list that can be easily checked and reported on during the future phases of the proposed development. The use of a table to present the information be further expanded upon over the course of the proposed development to provide a template for use during site compliance audit.



Table 5.1: Table of Mitigation Measures

Ref No.	Related to	Location	Mitigation Measure
			Pre-construction Phase
MM1	Construction Phase Monitoring and Oversight	EIAR Chapter 3 / CEMP	This CEMP will be updated prior to the commencement of the construction of the wind farm, to ensure that all mitigation measures, conditions and / or alterations to the EIAR and application documents that may emerge during the course of the planning process are included. Following the update, the CEMP will be submitted to the Planning Authority for written approval. All of the mitigation measures specified in the EIAR, NIS, CEMP and any other documents enclosed in the planning submission will be implemented, and the construction contractor will be responsible for actioning and communicating the requirements with all staff on-site. The implementation of the mitigation measures will be overseen by the supervising Ecological Clerk of Works (ECoW), ecologists, archaeologists and/or geotechnical engineers, as appropriate.
MM2	Health and Safety	EIAR Chapter 3	A Health and Safety Plan covering all aspects of the construction process will address the Health and Safety requirements in detail. This will be prepared on a preliminary basis at the procurement stage and developed further at construction phase. All hazards will be identified, and risks assessed. Where elimination of the risk is not feasible, appropriate mitigation and/or control measures will be established. The contractor will be obliged under the construction contract and current health and safety legislation to adequately provide for all hazards and risks associated with the construction phase of the project. Safepass registration cards are required for all construction, delivery and security staff. Construction operatives will hold a valid Construction Skills Certificate Scheme card where required. The developer is required to ensure a competent contractor is appointed to carry out the construction works. The contractor will be responsible for the implementation of procedures outlined in the Safety and Health Plan. Public safety will be addressed by restricting site access during construction. Appropriate warning signs will be posted, directing all visitors to the site manager.
MM3	Health and Safety: PSDP	EIAR Chapter 3	The PSDP appointed for the construction stage shall be required to perform their duties as prescribed in the Safety, Health and Welfare at Work (Construction) Regulations. These duties include (but are not limited to): • Identify hazards arising from the design or from the technical, organisational, planning or time related aspects of the project; • Where possible, eliminate the hazards or reduce the risks; • Communicate necessary control measures, design assumptions or remaining risks to the PSCS so they can be dealt with in the Safety and Health Plan; • Ensure that the work of designers is coordinated to ensure safety; • Organise co-operation between designers; • Prepare a written Safety and Health Plan; • Prepare a safety file for the completed structure and give it to the client; and • Notify the Authority and the client of non-compliance with any written directions issued.
MM4	Traffic Management	EIAR Chapter 15 and 19 / TMP	Road traffic accidents will be mitigated by the Traffic Management Plan (TMP) developed as part of the EIAR assessment (Appendix 15-2 of the EIAR). The TMP Outlines minimum road safety measures to be undertaken at site access / egress locations, during the works and including approaches to such access / egress locations. The Contractor shall prepare/develop a Construction Stage Traffic Management Plan (CSTMP) which will take account of the commitments imposed within the TMP and further develop such measures with agreement from the Roads authorities prior to works commencing on site.

MM5	Pre-Construction Pavement Surveys	EIAR Chapter 15	The proposed development will result in slight increase in traffic volume in particular HVs during the construction phase. The weighted loading of the HVs to the proposed wind farm site has the potential to impact on the road network surface (i.e. the N63) causing deterioration of the road pavement. To capture suitable mitigation works the developer will undertake pre-construction visual pavement surveys on the N63. Where the surveys conclude that damage to the road surface is attributable to the construction phase of the proposed development, the developer will fund the appropriate reinstatement works to bring the road surface back to pre-construction condition as a minimum, details for which will be agreed with the Local Authorities Roads Department.
MM6	Biodiversity: Badger	EIAR Chapter 7	**Pre-construction survey -** • No more than 10-12 months ahead of any construction works, a survey of Badger setts will be undertaken within 50 m of either side of the construction works area boundary to determine the current status of known badger setts (i.e. active or inactive), and/or to determine the establishment of any new setts; • Badger surveys are most effective when undertaken between November and April, although they can be carried out at any time of the year. However, until mid-January, Badger is less active (i.e. during colder weather) and setts can appear less well-used (NRA, 2009); • The survey results will be kept on file, in the form of a summary report.
MM7	Invasive Alien Plant Species (IAPS): Pre-construction survey	EIAR Chapter 7	**All construction works in the proximity of the Rhododendron stand:** **Pre-construction survey -** • A pre-construction dedicated IAPS survey at the proposed wind farm site will be undertaken by the appointed ECoW, particularly focused to the areas near the Mount Dillon Works, where the Rhododendron stand has been identified. All IAPS individual plants/stands present at the site will be identified, counted and georeferenced.
MM8	Ornithology: Pre-construction Survey	EIAR Chapter 8	**Pre-construction survey -** • If it will not be possible to avoid the breeding bird nesting season, the ECoW will undertake a pre-construction survey of all the areas for vegetation clearance; • The ECoW will particularly search for 'Confirmed' breeding activity (see Table 8.4 of Chapter 8 of the EIAR) within the areas to be cleared of vegetation, with particular regard for ground-nesting species; • If any active nest is found, the nest will be clearly marked, and a protection zone with a radius equal to the respective MAD extent (Table 8.20 of Chapter 8 of the EIAR) will be clearly demarked, if possible; • Where avoidance of the nest is not possible, the nest will only be removed once the chicks have fledged, or the ECoW has confirmed the nesting has failed; • The ECoW will keep a log of the pre-construction survey findings, number of nests, their locations (on a map, or with coordinates), species, and actions undertaken for the protection of nests found (e.g. demarcation of a protection zone, approximate dimension of the protection zone).
MM9	Underground Services	EIAR Chapter 19	A confirmatory survey of all existing services will be carried out prior to construction to verify the assumptions in Chapter 16 (Material assets - Telecommunications, Aviation & Other) of the EIAR and identify the precise locations of any services. Liaising with the service providers will occur prior to construction where such services are identified. Digging around existing services, if present, will be carried out by hand to minimise the potential for accidental damage. Where the works would directly impact on an asset, diversion strategies would be developed and agreed with asset Owners.

MM10	Ground Investigation	EIAR Chapter 19	Extensive and detailed ground investigation will be undertaken by the appointed Contractor to inform the detailed design and appropriate construction technologies and plant to be deployed. Contractors with a proven track record in delivering work of the scope required by the works will be appointed.
MM11	Cultural Heritage: Pre-Construction /Post Consent Advance Works Stage	EIAR Chapter 14	Some parts of the bog are overgrown preventing a full assessment (Section 14.3.10 of Chapter 14 (Cultural Heritage) of the EIAR). The following mitigation measures involve; • Clearance of drains to allow for a full inspection of potential archaeology; • Archaeological monitoring of tree felling; • Archaeological resolution of archaeological feature identified in Lough Bannow Bog; and • Archaeological pre-development testing in areas where large excavations will be undertaken (turbine hardstands, construction compounds, substation, battery storage, entrances to the bogs and amenity carparks) with peat depths greater than 0.5 m, see Chapter 9 (Land, Soils and Geology) of the EIAR for details of peat depths. These works will require monitoring by a suitably qualified archaeologist working under licence as issued by the minister (DHLGH) under section 26 of the National Monuments Acts (1994-2014). In the event of archaeological features, finds and/or deposits been encountered during the course of the monitoring and/or testing, the relevant authorities should be notified immediately. Preservation by record (through archaeological excavation) will only occur if it is established that preservation in situ cannot be achieved, and such excavations are agreed with National Monuments Service.
Construction Phase			
MM12	Health and Safety	EIAR Chapter 3 and Chapter 6 / CEMP Section 2.4	All activities carried out by the appointed Contractor on the proposed development will be in accordance with the requirements of the *Safety, Health and Welfare at Work Act 2005* as amended and Regulations made under this Act. Health and safety plans will be developed before any construction commences. A Health and Safety Plan covering all aspects of the construction process will address the Health and Safety requirements in detail. This will be prepared on a preliminary basis at the procurement stage and developed further at construction stage. All hazards will be identified, and risks assessed. The proposed TDR to allow for the transport of the turbines to the wind farm site will involve some minor works as discussed in Chapter 3 (Description of the Proposed Development) of the EIAR. These works will be carried out to the relevant construction and road safety guidelines. When the turbine components are being transported, they will have a Garda escort and will be carried out at night when there is less traffic on the road. The proposed turbine delivery works will allow for the proposed turbine dimensions. Once appropriate health and safety guidelines are adhered to and the CEMP is complied with throughout the construction phase, the potential for health and safety related issues are greatly minimised.
			The proposed development will be designed, constructed, operated and decommissioned in accordance with all relevant Health and Safety Legislation, including: • Safety, Health and Welfare at Work Acts 2005 to 2014; • Safety, Health and Welfare at Work (General Application) Regulations 2007 to 2020; • Safety, Health and Welfare at Work (Construction) Regulations 2013; and • Safety, Health and Welfare at Work (Work at Height) Regulations 2006. Aspects of the proposed development that will present health and safety risks include:

			• Health and safety aspects of construction activities; • General construction site safety (e.g. slip/trip, moving vehicles etc); • On site traffic safety (during construction and operational phases) associated with high road embankments; • Traffic safety during the transport of oversized loads to the site; • Lifting of heavy loads overhead using cranes; • Working at heights; and Working with electricity during commissioning.
MM13	Health and Safety: PSDP	EIAR Chapter 3 / CEMP Section 2.3	The PSCS appointed for the construction stage shall be required to perform their duties as prescribed in the Safety, Health and Welfare at Work (Construction) Regulations. These duties include (but are not limited to): • Development of the Safety and Health Plan for the construction stage with updating where required as work progresses; • Compile and develop safety file information; • Reporting of accidents / incidents; • Weekly site meeting with PSCS; • Coordinate arrangements for checking the implementation of safe working procedures. Ensure that the following are being carried out; • Induction of all site staff including any new staff enlisted for the project from time to time; • Toolbox talks as necessary; • Maintenance of a file which lists personnel on site, their name, nationality, current Safe Pass number, current Construction Skills Certification Scheme (CSCS) card (where relevant) and induction date; • Report on site activities to include but not limited to information on accidents and incidents, disciplinary action taken and PPE compliance; • Monitor the compliance of contractors and others and take corrective action where necessary; and • Notify the Authority and the client of non-compliance with any written directions issued.
Biodiversity / Ecology			
MM14	Best Practice/Industry Standards/Guidance	EIAR Chapter 7 / NIS	All works and activities to be undertaken during the proposed development's Construction and Operation Phases will fully comply with Best Practice/Industry Standards, such as from IFI (2016), Irish Wind Energy Association (Fehily Timoney & Company, 2012), Construction Industry Research and Information Association (CIRIA) , and 'Guidance for Pollution Prevention' documents (GPPs) , particularly in respect of the protection of water quality, and the reduction of emissions, such as: • CIRIA Report C502 Environmental Good Practice on Site; • CIRIA Report C532 Control of Water Pollution from Construction Sites; • CIRIA Report C648 Control of Pollution from Linear Construction Project; Technical Guidance; • CIRIA Handbook C650 Environmental good practice on site; • CIRIA Handbook C651 Environmental good practice on site checklist; • CIRIA Report C609 – SuDS – hydraulic, structural & water quality advice; • CIRIA Report C697 – The SuDS Manual; • GPP 1: Understanding your environmental responsibilities – good environmental practices;

			• GPP 2: Above ground oil storage tanks; • GPP 5: Works and maintenance in or near water; • GPP 6: Working at construction and demolition sites; • GPP 8: Safe storage and disposal of used oils; • GPP 13: Vehicle Washing and Cleaning; • GPP 21: Pollution incident response planning; and • GPP 22: Dealing with spills.
MM15	Ecological Clerk of Works (ECoW)	EIAR Chapter 7 / NIS	An Ecological Clerk of Works (ECoW), experienced in the management of peatland habitats, will be employed by the appointed contractor to oversee construction works and monitor any possible sources for significant effects on European sites. The ECoW will guarantee the Construction Phase of the proposed development will be undertaken in strict agreement with the methods described in Appendix A of the NIS, and the mitigation measures in set out in Chapter 7 (Biodiversity) of the EIAR, the NIS and the CEMP, and will have the power to stop the works in case any activities/works are not compliant. The supervision and implementation of all of these mitigation measures will be supervised, noted, and approved by the assigned ECoW.
MM16	Aquatic Ecology - Contamination	EIAR Chapter 7 / NIS	**Storage of contaminants at the Construction Compounds - Designation of Storage Area:** • Fuels storage will be minimised onsite; • However, because it might not be practical to refuel all vehicles and machinery offsite, areas will be designated for contaminant storage at each Construction Compound; • The designated areas for contaminant storage will be enclosed, appropriately signed, and demarked from the remainder areas of the Construction Compounds; • Any diesel, fuel, hydraulic oils, paints or any other type of contaminant that will require to be kept onsite, will be stored in bunded storage tanks, only at the designated areas within each of the four Construction Compounds; • Each bund area will have a volume of at least 110% of the volume of the respective stored contaminant(s); • Each container within the bund area will be appropriately labelled and sealed; • Only authorised and appropriately trained personnel may access the contaminant storage designated area; • The designated area for contaminant storage will be provided with a log book. The log book will be a register of: o the number of containers for each contaminant; o volume of each container; o approximate volume of each contaminant stored; o date/time contaminants are taken off/stored in the designated area, and respective destination; o Signature of the authorised person responsible for the log entry; o Stock of spillage containment material (e.g. spill kits). • The ECoW will make a daily verification of the log books, confirming the accuracy of the information logged in; • The designated contaminant storage areas will also keep a stock of absorbent materials (e.g. oil binder granules), pads/mats, and drip trays to be made available if needed.

			Refuelling at the Construction Compounds: • At each Construction Compound, an area will be designated as "Refuelling Area"; • The Refuelling Area will be delineated at an easily accessible location by vehicles and mobile machinery, and in the immediate vicinity of the designated area for contaminant storage; • The Refuelling Area will be appropriately demarked and signed, for easy identification; • When refuelling, drip trays and fuel absorbent mats will be used to capture any potential spills.

			Refuelling with mobile bowser - Specific Characteristics:
			• The mobile bowser will be custom-built, and consist of a double skinned, double-axel fuel bowser;
			• It will be towed around the site by a 4x4 vehicle to where machinery is located;
			• It will be re-filled at the designated Refuelling Area at the Construction Compound, or off site;
			• The 4x4 vehicle will be provided with a log book, where every refuelling operation will be noted:
			  ○ Date and time;
			  ○ Refuelled vehicle/machinery unique identification;
			  ○ Description of any spillages;
			  ○ Description of containment measures;
			  ○ Any inspection of the bowser itself.

			Refuelling with mobile bowser -Operation Conditions: • The fuel bowser will be parked on a level area in the construction compound when not in use; • The fuel bowser will be inspected by the ECoW at the end of each day for leaks and fitness for purpose; • No refuelling of machinery will occur within 50 m of surface water features. Refuelling of machinery will be carried out using a mobile double skinned fuel bowser to allow for ease of work. The fuel bowser will be re-filled off site or at the contractors site compound and will be towed around the site by a 4x4 jeep to where machinery is located; • Only designated, trained and competent operatives will be authorised to refuel vehicles and machinery on site; • The 4x4 vehicle will carry fuel absorbent material (e.g. oil binder granules) and pads/mats in the event of any accidental spillages; • While refuelling, drip trays and fuel absorbent mats will be used to capture any spills; • The vehicle logbook will be inspected by the ECoW every day, and any spillage incidents will be verified by the ECoW as soon as possible. The ECoW will determine the efficacy of the containment measures employed, or decide if further measures are required.
			Machinery and vehicle movement and operation: **Regular Maintenance of vehicles and machinery -** • The ECoW will undertake weekly checks for spillages to all machinery and vehicles used onsite;

			• The ECoW will maintain a logbook to register all checks undertaken, and required maintenance to eliminate leaks, **Spill containment equipment -** • All vehicles and machinery will be provided with emergency drip trays and spill kits.
MM17	Habitat Loss	EIAR Chapter 7	**Earthworks, excavations, general construction - Creation and management of alternative habitat:** • As compensation for the loss of Hedgerow and Treelines habitats, the edges of the tracks will be planted with native shrub and tree species, i.e. Blackthorn, Grey Alder, Grey Willow , Elder, Hawthorn, Holly, Hazel; • The new linear habitat should have a minimum extension of 1,200m in total; • These linear habitats will be managed and maintained until the end of the Construction Phase, or until the planted shrubs and trees will be considered sustainable by the ECoW; • No fertilisers will be used.
MM18	Spread of IAPS	EIAR Chapter 7	**All construction works in the proximity of the Rhododendron stand:** **Biosecurity Area -** • A strict biosecurity demarcation area will be installed by the ECoW within the zone where scheduled IAPS (e.g. Rhododendron) are present - 10m from each stand (unless it is not feasible for Health & Safety reasons – e.g. roadside); • Only works outside the biosecurity area will be allowed to proceed. **Invasive Species Management Plan (ISMP) -** • If any of the proposed works will be required to break the biosecurity area mentioned above, a specific and detailed Invasive Species Management Plan (ISMP) will be developed by the contractor; • The ISMP will detail a strategy of uprooting the Rhododendron plants, currently present at the proposed wind farm site, the most effective management measure for the control of this species (NRA, 2010).
			Vehicles and machinery accessing the site: **Vehicle and machinery cleaning -** • Prior to arrival on site, the contractor's vehicles and equipment will be thoroughly cleaned and then dried using high-pressure steam cleaning, with water >65 °C, in addition to the removal of all vegetative material; • Items difficult to soak/spray will be wiped down with a suitable disinfectant (e.g. solution of 1% Virkon® Aquatic); • The contractor will establish and clearly delineate a bunded cleaning/washing areas at the Construction Compounds, where gravity will not drive untreated washed material towards local drains; • Evidence that all machinery has been cleaned will be required to be on file for review by the statutory authorities and the appointed ECoW. The level of evidence required of the Contractor will be, registration plates of vehicles onsite and a register of when, how and where each of these were cleaned before they arrived on site; • Spot checks on the adequacy of cleaning will be carried out by the ECoW.

MM19	Badger Habitat Loss	EIAR Chapter 7	**Any construction works - Monitoring, exclusion and/or evacuation:** • In case a Badger sett is found during the pre-construction survey (or at any time during the Construction Phase), confirmation of its activity will be carried out. Trial camera(s) pointing at the sett entrance(s) will be placed for a minimum of 7 days. • For the setts recorded during the field surveys, or if a sett is recorded during the pre-construction survey, the methodology prescribed by the NRA (2009b) will be followed, in which: • If within the period between July to November (inclusive), and the sett recorded during the pre-construction survey is deemed inactive, the sett will then be 'soft-blocked', i.e. the sett entrance will be lightly blocked with vegetation and a light application of soil. If after a minimum of five days the vegetation and soil have not been moved, the sett will be destroyed using a mechanical digger; • If still in the period between July to November, but the sett recorded during the pre-construction survey is deemed active, the sett will need to be evacuated. One-way gates (system that allows individuals to exit, but not to get in) will be installed at any active entrances for three days, while inactive entrances will be soft (initially) and they hard-blocked (as above); • If a sett is recorded during the period of January to May, or deemed active (upon confirmation with the trial cameras) during this period, any construction works within 150m of the sett will be halted until the end of this period. In the following June, trial camera(s) will be installed to confirm the sett's activity, and one of the procedures detailed above will be followed. • All monitoring, exclusion and/or evacuation actions will be undertaken by the ECoW, who will report any actions and findings to the contractor, and file them in the form of a report.
MM20	Otter - Pollution, Siltation/Contamination	EIAR Chapter 7	**Refuelling:** • Similar to measures proposed to prevent effects to aquatic ecology. **Movement of vehicles and machinery:** • Similar to measures proposed to prevent effects to aquatic ecology. **Storage of contaminants:** • Similar to measures proposed to prevent effects to aquatic ecology.

MM21	Otter – Direct mortality	EIAR Chapter 7 / NIS	**Movement of vehicles and machinery - Onsite speed limit:**
			• A temporary speed limit of 20km/h will be set for all vehicles transiting the proposed wind farm site for the duration of the Construction Phase;
			• Appropriate signs will be placed at the tracks used by vehicles and machinery, with the following specifications (adapted from Department of Transport, 2024):
			  ○ Sign reference: RUS 065;
			  ○ Normal sign diameter: 450mm;
			  ○ Repeater sign diameter: 300mm;
			  ○ Spacing between repeaters: 500m.

MM22	Bats - Collison risk	EIAR Chapter 7	**Buffer Zone around Turbines:** • A zone of >92.76m around the wind turbines (from the tip of the blade) will be cleared of tall vegetation (shrubs, trees, scrub, etc.) to reduce favourability of this zone for foraging and commuting bats (see Figure 7.20 of Chapter 7 (Biodiversity) of this EIAR). The vegetation clearance as a mitigation measure for the prevention of likely significant effects on bats requires further assessment of the significance of the loss of these habitats for bats; • Complete clearance works at least six months prior to installation of wind turbines. Studies have shown that bats are attracted to clear felled forestry areas due to increase insect loading. This has been shown to occur for a period of 3-6 months before the insect loading reduces to pre-cleared felled levels (Kirkpatrick *et al.*, 2017).
			Bat Roost Survey: • The ECoW will undertake a Potential Bat Roost (PBR) survey of any trees proposed to be felled.
			Curtailment: • Operate the High Risk wind turbines from 30 minutes prior to sunset to 30 minutes after sunrise at a cut-in speed of 5.5 m/s during specified weather conditions and during the active bat season (April to October) when air temperatures are 10oC or more at the nacelle; • Undertake a carcass search for 3 years post operation of the wind farm to determine whether a higher cut-in speed of the blades is required.
Ornithology			
MM23	Ornithology: General	EIAR Chapter 8	The proposed development has been designed to incorporate current industry best practice with regards to construction and operation of wind farms, which is described in detail in Chapter 3 (Description of the Proposed Development) of this EIAR. Best practice measures incorporated into the design aim to avoid significant effects on the surrounding biodiversity. A CEMP has been developed to provide a framework for how significant effects on the environment will be avoided during the construction phase. A suitably qualified Ecological Clerk of Works (ECoW) with extensive experience in ornithology, will be appointed by the Contractor and will be required full time on site during the construction works. The ECoW will ensure that all mitigation measures outlined within this Chapter are implemented correctly during the construction phase. Regular toolbox talks with construction staff on disturbance to relevant bird species during construction will be organised. These will be of mandatory presence to staff members and will be run at the beginning of each season: in February, in preparation to the breeding season; and in August, in preparation to the non-breeding season. These toolbox talks will include the description of the main ecological features staff should note, particularly the identification of KARs and signs of proximity to sensitive locations (e.g. raising awareness to alarm calls during the breeding season; description of ground-nesting species), and the processes of reporting any findings to the ECoW.
MM24	Habitat Loss; Disturbance/ displacement	EIAR Chapter 8	**Restriction of period for vegetation clearance -** The vegetation clearance during the Construction Phase of the proposed wind farm will be timed to avoid the breeding birds nesting season, from 1st of March to 31st of August, if possible;
			Interruption of works -

			• In the event of any bird nest(s) being found within the works areas during the Construction Phase, the finding will be immediately reported to the ECoW; • The works will immediately cease, and the ECoW will survey the nest(s) (avoiding disturbance); • The nest will be clearly marked, and a protection zone with a radius equal to the respective MAD extent (Table 8.20 of Chapter 8 of the EIAR) will be clearly demarked, if possible; • The ECoW will report the survey findings to the competent authority and the developer will engage with NPWS; • The ECoW will log the finding(s0 in the logbook.
			Development of grassland habitat (Section 8.9.2.1.1) - ~100ha • A total of approximately 100ha will be managed for grassland habitat creation (Figure 7.25 of Chapter 7 of the EIAR), in line with McCorry et al. (2012): • Any scrub will be cleared from these areas. No vegetation will be cleared outside the areas in Figure 7.25 of Chapter 7 of the EIAR: • Scrub clearance will be undertaken yearly, in September, extending into the Operation Phase; • In the first year, the scrub clearance will be undertaken with the use of an excavator (for larger shrubs/trees), and chainsaw (form smaller plants); • Felled scrub will be placed in existing onsite drains, and on the boundaries of the plots; • The clearance works will be carried out under the supervision of the ECoW/Suitably qualified Ecologist. The ECoW/Suitably qualified Ecologist will identify the plants to be removed, direct the excavator/chainsaw operator, and the staff transporting the felled scrub to the drains and boundaries; and • The ECoW/Suitably qualified Ecologist will also confirm the requirement of the excavator use in subsequent years, having in consideration that manual/chainsaw clearance would be a preferable method to avoid ground disturbance.
			Development of Hedgerows (~1,300m) • Hedgerows (Figure 7.24) will be planted with native shrub and tree species, i.e. Blackthorn, Grey Alder, Grey Willow , Elder, Hawthorn, Holly, Hazel; • The new linear habitat will have a total extension of 1,337m; • These linear habitats are managed and maintained until the end of the Construction Phase, or until the planted shrubs and trees will be considered as fully established by the ECoW/Suitably qualified Ecologist (if it extends into the Operation Phase); • No fertilisers will be used.
			Development of woodland habitat (~3.20ha) • An area of 3.23ha in the Lough Bannow bog is selected for the management of 'Oak-ash-hazel woodland' habitat: • Only Pedunculate Oak (Quercus robur), Ash (Fraxinus excelsior), and Hazel (Corylus avellana) trees will be planted; • All planting material must be derived from seed sources within Ireland and accompanied by a Plant Passport attesting the good health status of the plant(s), compliant to the EU Plant Health Regulation (2016/2031). This measure is of particular importance in view of the control of the Ash dieback disease (DAFM, 2022);

			• However, if it is not possible t source planting material from within Ireland, acceptable plant origins must follow the order of preference set by the Department of Agriculture, Food and the Marine (DAFM, 2024b, sec. 2.7.1); • The planting material (bare-rooted trees - whips) will be 0.45 to 100cm tall; • The planting procedure will be a simple process, consisting of: • Digging a hole sufficiently large and deep (i.e. planting depth is indicated by the soil on the root collar) as to allow the whole root of the plant to be spread out evenly. Topsoil will be placed aside; and • Place the soil over the roots ensuring no roots or bark are damaged. • If the location of the hole for plantation is occupied by ruderal scrub species (e.g. Holly, Bramble), these plants will be cleared before the tree plantation; • No other trees and/or vegetation will be cleared to accommodate the tree plantation; • No herbicides and/or fertilisers will be used.
			Screen Fencing ▪ Visual screening fences will be installed at selected locations along the amenity roads and tracks (illustrated in Figure 8.11 of Chapter 8 of this EIAR), to prevent disturbance to breeding and non-breeding birds using the site during the operation phase (occasional movement of people, dogs); ▪ The screen fences will be specifically targeted to stretches of the tracks holding no screening vegetation (e.g. hedgerows); ▪ The screening fence will be approximately 1m high, mounted with Willow and Chainlink; The screening fence will be regularly inspected regularly by a Suitably qualified Ecologist, who will determine necessary maintenance actions to be employed (e.g. erection of fallen posts; reinstating of damaged mounted panels).
MM25	Habitat Loss: TDR	EIAR Chapter 8	**Restriction of period for vegetation clearance -** • The vegetation/tree clearance for the works at the POIs of the TDR will be timed to avoid the breeding birds nesting season, from 1st of March to 31st of August.
Land, Soils and Earthworks			
MM26	General Construction Mitigation	EIAR Chapter 9	Many of the mitigation measures have been based on CIRIA (Construction Industry Research and Information Association, UK) technical guidance on water pollution control and on current accepted best practice, (CIRIA report ref. C532, 2001). General construction mitigation includes: • Good site practice will be applied to ensure no fuels, oils, wastes or any other substances are stored in a manner on site in which they may spill and enter the ground; • Dedicated, bunded storage areas will be used for all fuels or hazardous substances; and • All works will be managed and carried out in accordance with this Construction and Environmental Management Plan (CEMP), which will be updated by the civil engineering contractor and agreed prior to any site works commencing.
MM27	Vehicle Washing	EIAR Chapter 3	Wheels or vehicle underbodies are often washed before leaving sites to prevent the build-up of mud on public (and site) roads. Site roads will be already formed using on-site materials before other road- going vehicles begin to make regular or frequent deliveries to the site (e.g., with steel, ducting or concrete). The site roads will be well finished with compacted hardcore, and so the

			public road-going vehicles will not be travelling over soft or muddy ground where they might pick up mud or dirt. Refer to Planning Drawing 11399-2041 for details. However, in the interest of best practice and to avoid the potential for the transfer of invasive plant species into the site, it is proposed to install a self-contained wheelwash systems at the proposed wind farm site. Planning Drawing 11399-2041 includes typical details of a proposed self-contained wheelwash system which will be installed as part of the construction phase of works. Wheelwash systems will be located at all construction and delivery entrances of the site (Site Access A, B and C), off the R392, N63 and R398, as shown on Planning Drawings 11399-2012 and 11399- 2015. A road sweeper will be available if any section of the surrounding public roads becomes soiled by vehicles associated with the proposed development.
MM28	Peat Stability Risk Assessment (PSRA)	EIAR Chapter 9	Risks are outlined in the Peat Stability Risk Assessment (PSRA) and CEMP and any identified risks will be minimised by applying the principles of avoidance, prevention and protection. Slope stability will be addressed in greater detail with site specific measures identified during the detailed design phase. A detailed method statement will be prepared prior to any element of work being carried out and the methods are outlined in the CEMP. A bespoke Peat Stability Risk Assessment (PSRA) has been carried out for the proposed development and is included in Appendix 9.3 of the EIAR. This document has used the site investigation information, topographic mapping information and site walkover observations to assess the stability of the peat across the site and identify any hazardous conditions. The findings of this report including any proposed mitigation measures and/or works exclusion areas are outlined in the PSRA report in Appendix 9.3 of the EIAR. The peat stability risk assessment has yielded a negligible risk rating for each infrastructure location. The Scottish Government Best Practice Guidelines (2017) states the following for areas with negligible risk level: "Project should proceed with monitoring and mitigation of peat landslide hazards at these locations as appropriate." All earthworks shall be designed by a competent geotechnical designer which shall be informed where necessary by a post consent detailed ground investigation campaign which will need to include intrusive methods such as trial pitting and borehole locations with a specified suite of insitu and geotechnical laboratory testing to further assessment the engineering characteristics of the infrastructure locations. Possible mitigation measures in relation to peat instability are considered below. Additional mitigation measures relating the handling and deposition of peat are outlined in the Peat and Spoil Management Plan (PSMP) in Appendix 9.2 of the EIAR.
MM29	Movement or Instability Observed in Monitoring Areas	EIAR Chapter 9	Where excessive movement has been observed in the installed monitoring, the following measures will be taken; • All construction activities will be suspended in the area; • The Contractors Geotechnical Engineer shall carry out an assessment of the peat instability including drainage. The Contractors Geotechnical Engineer shall compile a report outlining the surveys undertaken, the potential cause of the instability, assessment of any increased risk caused by the instability, and the further measures required to manage this risk; • An increased monitoring regime shall be specified including increase in number of monitoring post lines, decrease on monitoring post spacing and an increase in the frequency of monitoring post observations; • Should no further movement be detected, construction activities will be recommenced while maintaining the increased monitoring regime;

			• Should further excessive movement be detected, the Contractors design and project geotechnical engineer will need to be informed and the design of further reinstatement works will be required such as excavation of the disturbed material, installation of a granular berms or similar.
MM30	Emergency Response to a Landslide Event	EIAR Chapter 9	If the scenario of a landslide, bog burst or peat slide occurring at the site the following steps shall be carried out by the contractor: • All member of the project will be alerted immediately or as it is safe to do so; • All site works will be ceased, and all available resources will be used for the management and mitigation of the risks posed by the event; • The key initial activity will be to prevent displaced materials from reaching any watercourses or sensitive environments. Given the terrain of the Proposed Development Site, the key risk is the development of a propagation landslide or slip within topographic valleys and watercourses. Where possible, check barrage structures or catch ditches on land or within these topographic valley and watercourses shall be constructed to aid prevent further run out of the disturbed peat or spoil material.
MM31	Check Barrages / Catch Ditches	EIAR Chapter 9	Check barrages are permeable granular structures constructed within the path of a landslide to prevent the further downhill or downstream movement of the disturbed material. Typically, these will be constructed of locally generated stone material, often of large sizing. The large material sizing will allow water to pass through the check barrage material, avoiding a build-up in hydrostatic pressure while containing the debris within the slide. Check barrage will typically be a dam structure between 1 and 1.5m high, with slopes between 1(V):1.5(H) or 2(H), and constructed across the full section of topographic valley and/or water course. The check barrage is an emergency preventative measure only to restrict or reduce the movement of displaced material downslope and away from a watercourse. Further assessment and reinstatement works will likely be required should a landslide occur, and engagement and reporting of the incident will be required by all parties involved in the project. Should the check barrage no longer be required it may be removed and the area reinstated. The use of check barrages is only proposed for use in the unlikely event of a large landslide event. The proposed locations are only indicative, targeting potential topographic channels but will vary depending on the location and nature of the slide event. The Contractors will need to include an assessment of potential check barrage locations and method for their construction within the emergency procedures in their associated Method Statement documentation. Similarly, ditches may also slow or halt runout, although it is preferable that they are cut in non-peat material. Simple earthwork ditches can form a useful low-cost defence. Paired ditches and barrages have been observed (Tobin, 2003) to slow peat landslide runout at failure sites.
MM32	Vehicular Movements	EIAR Chapter 9	Vehicular movements will be restricted to the footprint of the proposed development boundary, particularly with respect to the newly constructed access roads. Vehicular movements will not be permitted outside of the proposed wind farm site boundary and will not move onto areas that are not permitted for the development. The soft ground nature of the site will inhibit vehicles deviating from access roads and tracks due to the low bearing capacity of the peat. Vehicular traffic on site is reduced through the use of extracting material from borrow pits on site as opposed to sourcing from external quarries.
MM33	General Site Management	EIAR Chapter 9 / CEMP Section 3.0	The CEMP will also include the checking of assets (plant, vehicles, fuel bowsers) on a regular basis during the construction phase of the proposed development. The purpose of this management control is to ensure that the measures in place are operating effectively, prevent accidental leakages, and identify potential breaches in the protective retention and attenuation network

			during earthworks operations. The use of ready-mixed concrete deliveries will eliminate any potential environmental risks of on-site batching. When concrete is delivered to site, only the chute of the delivery truck will require cleaning, using the smallest volume of water necessary, before leaving the site. Concrete trucks will be washed out fully at the batching plant, where facilities are already in place.
MM34	Management of Fuel and Oil	EIAR Chapter 9 / CEMP Section 3.0	Fuel management measures have been prepared (and included in this CEMP) which incorporates the following elements: • Mobile bowsers, tanks and drums will be stored in secure, impermeable storage area, away from drains and open watercourses; • Fuel containers will be stored within a secondary containment system e.g. bund for static tanks or a drip tray for mobile stores; • Fuels, lubricants and hydraulic fluids for equipment used within the proposed development, as well as any solvents, oils, and paints will be carefully handled to avoid spillage, properly secured against unauthorised access or vandalism, and provided with spill containment according to best codes of practice. All materials will be sufficiently bunded; • Ancillary equipment such as hoses, pipes will be contained within the bund; • Taps, nozzles or valves will be fitted with a lock system; • Fuel and oil stores including tanks and drums will be regularly inspected for leaks and signs of damage; • The contractor will have a dedicated area within the compound for refuelling plant or any other equipment that is bunded and has the necessary spill kit equipment and adsorbents available as and when required in line with any statutory IEPA & H&S legislations. Refuelling of machinery will be carried out using a mobile double skinned fuel bowser to allow for ease of work. The fuel bowser will be re-filled off site or at the contractors site compound and will be towed around the site by a 4x4 jeep to where machinery is located. Mobile measures such as drip trays and fuel absorbent mats will be used during all refuelling operations; • All machinery will be serviced before being mobilised to the proposed development; • Only designated trained operators will be authorised to refuel plant on site; • Procedures and contingency plans will to be set up to deal with an emergency accidents or spills; • An emergency spill kit with oil boom and absorbers will be kept on site in the event of an accidental spill. All site operatives will be trained in its use; • Strict supervision of contractors will be adhered to in order to ensure that all plant and equipment utilised in the proposed development are in good working condition. Any equipment not meeting the required standard will not be permitted for use within the proposed development. This will minimise the risk of soils and bedrock becoming contaminated through the proposed development activities; • The highest standards of site management will be maintained, and utmost care and vigilance followed to prevent accidental contamination or unnecessary disturbance to the Site and surrounding environment during construction. A named person will be given the task of overseeing the pollution prevention measures agreed for the Site to ensure that they are operating safely and effectively; and • In the highly unlikely event that ground contamination is encountered beneath the site during the construction works, all works will cease. Advice will be sought from an experienced contaminated land specialist and a phased environmental

			risk assessment (specifically to assess any associated potential environmental and/ or human health risks) will be undertaken in accordance with relevant EPA guidance *'Guidance On The Management Of Contaminated Land And Groundwater At EPA Licensed Sites'* (EPA, 2013) and UK Environment Agency Guidance *'Land contamination risk management (LCRM)'* (UK EA, 2021).
MM35	Drainage and the Management of Sediment and Geological material	EIAR Chapter 9	The permanent road works will require a drainage network to be in place for the construction and operation phases of the proposed wind farm site. Fundamental to any construction phase is the need to keep water (i.e. runoff from adjacent ground upslope of the permitted development footprint) clean and manage all other run off and water from construction in an appropriate manner. This will necessitate the implementation of a Sediment and Erosion Control Plan, with associated settlement ponds and silt traps. The Sediment and Erosion Plan is part of the CEMP for the site. The good management of material on site will reduce any indirect risk to water. Drainage measures are considered in further detail in Chapter 10 (Hydrology and Hydrogeology) of the EIAR. The handling, storage and re-use of excavated materials are of importance during the construction phase of the proposed wind farm. Excavated topsoil will not be stored in excessive mounds on the site. Seeding of the work affected areas with indigenous species will occur, only where natural revegetation or the reuse of the upper vegetated layer is unsuccessful. The revegetation of these areas promotes stability, reduces desiccation, run-off erosion and susceptibility to freeze/thaw action.
MM36	Hydrocarbon Release	EIAR Chapter 9	Wherever there are vehicles and plant in use, there is the potential for a hydro-carbon release in the form of a spill that has the potential to directly pollute soil, and indirectly pollute water. This is due to the fact that soil may act as a pathway for the contamination. Any spill of fuel or oil would potentially present a moderate, long-term negative effect on the soil and geological environment. Good site practice as outlined in 9.5.3.7 above will mitigate any effect. Good site management by means of regular checks on plant, and diligent housekeeping of machinery reduce the potential of hydrocarbon release on site. It is important for personnel on site to have the correct training and expertise in the event that a hydrocarbon leak occurs.
MM37	Borrow Pits	EIAR Chapter 9	The PSMP attached as Appendix 9.2 of the EIAR sets out the guidelines for the construction and reinstatement of the on-site borrow pits. Upon the removal of the required volumes of granular material (for the construction of the infrastructure elements at the wind farm) from the borrow pits it is proposed to reinstate the pits using excavated peat and spoil. The borrow pits are designed and will be constructed in a way which will allow the excavated peat and spoil to be placed safely, with areas within the borrow pits designated for the storage of excavated peat. Other mitigation measures included in the design of the borrow pits are as follows: • Borrow pits will be developed with stable ground inclinations; • Exposed slopes will be left with irregular faces to promote re-vegetation; and, • Infilling of peat should commence at the back of the borrow pit and progress towards the pit entrance.
MM38	Natural Resources	EIAR Chapter 9	Bord na Móna has permanently ceased peat extraction at Derryadd since 2019. The potential for long term sterilisation of the borrow pit resource will be mitigated by diligent borrow pit design and appropriate material management. This would include detailed assessment of the material resource and borrow extent to ensure efficient exploitation of any borrow pits.
MM39	Drainage Measures	EIAR Chapter 9 / Chapter 10	The drainage measures outlined in Chapter 10 (Hydrology and hydrogeology) of the EIAR. Surface water drainage plans will be implemented to account for modified flows created by construction, which in turn may affect peat stability, pollution and wildlife interests. Drainage measures need to be carefully planned to minimise any negative impacts.

			Runoff will be maintained at the existing runoff rates. Controlled discharge will be maintained at existing pumping rates. The layout of the proposed wind farm site has been designed to collect surface water runoff from hard standing areas within the development and discharge to associated surface water attenuation lagoons adjacent to the proposed infrastructure. It will then make its way into the existing field drains and existing settlement ponds infrastructure before being discharged through existing discharge points by pump or gravity flow. From here the water will outfall at the appropriate existing run off rates. Where temporary excavations for turbines and borrow pits, water will be stored within the existing topographical depressions.
MM40	Karst Risk	EIAR Chapter 9	If karstic void features are identified within the footprint of infrastructure, the following mitigation measures will be implemented: **Access Road/Track Cuttings** • Slope Buttressing; • Choking and infilling of fissures and small sinkholes; • High strength geotextiles for larger sinkholes; • Bolting and meshing. **Access Road/Track Embankments** • Choking and infilling of fissures and small sinkholes; • High strength geotextiles for larger sinkholes. **Turbine/Substation Foundations** • Piling through the void / karstified zone; • Foundations to span voids.
MM41	Soil and Excavations Management	EIAR Chapter 9	The disturbance of soil, subsoil and bedrock is an unavoidable effect of the proposed wind farm, but every effort will be made to ensure that the amount of earth materials excavated is kept to a minimum to limit the effect on the geological aspects of the site. The management of geological materials is an important component of controlling dust, and sediment and erosion control. The following mitigation measures will be implemented: • Excavated peat will only be moved short distances from the point of extraction and will be used locally for landscaping; • Landscaping areas will be sealed and levelled using the back of an excavator bucket to prevent erosion. Where possible, the upper vegetative layer will be stored with the vegetation part of the sod facing the right way up to encourage growth of plants and vegetation at the surface of the landscaped peat. These measures will prevent the erosion of peat in the short and long term; • Construction of settlement ponds will be volume neutral, and all excess material will be used locally to form pond bunds and surrounding landscaping; and • Peat, overburden, and rock will be reused where possible on site to reinstate borrow pits and other excavations where appropriate. A PSMP has been prepared for the proposed development which is included in Appendix 9.2 of the EIAR.
MM42	Excavations (Turbine, Hardstands, and Substation Foundations)	EIAR Chapter 9	**Excavation for Turbine Foundations** Three main foundation solutions have been identified: • Gravity Foundations; • Concrete driven piles; and • Bored piles.

			Mitigation measures to be adopted during excavation for the turbine foundations include: • A temporary works design for foundation excavations will be carried out by a competent designer; • The materials encountered in the trial pits across the GI phases are likely to be unstable during the excavation for the turbine bases. Where battering back of excavations to a safe angle (as determined by a detailed slope stability assessment by the competent designer) is not feasible, a physical barrier will be applied where required between the excavations and the potentially unstable material in the form of a granular berm or sheet piles. • The long-term stability of the area around the wind turbine foundations will be achieved by filling the area back up to existing ground level following installation of the foundation; • The design will be carried out by a suitably qualified and experienced geotechnical engineer and the management of the ground stability will be ongoing throughout the construction phase; • Each turbine foundation will be investigated before and during construction to identify any potential karst features; • Excavation works will be monitored by a suitably qualified and experienced geotechnical engineer or engineering geologist; • The earthworks will not be scheduled to be carried out during severe weather conditions; and • Any piling works will not produce significant volumes of spoil as the proposed piling system will be driven or bored piles. **Excavation for Hardstanding Foundations** The mitigation strategies for the hardstanding foundations follow similar procedures as the excavations for turbine and substation foundations (see Section 9.5.2.8 of Chapter 9 (Land, Soils and Geology) of the EIAR). All works will be monitored by suitably qualified and experienced geotechnical engineer or engineering geologist. **Excavation for Substation Foundations** The mitigation strategies for the substation foundations follow similar procedures as the excavations for turbine and hardstanding foundations (see Section 9.5.2.8 of Chapter 9 (Land, Soils and Geology) of the EIAR). All works will be monitored by suitably qualified and experienced geotechnical engineer or engineering geologist.
MM43	Peat and Spoil Management Plan	EIAR Chapter 9 / Peat and Spoil Management Plan Appendix 9.2	Inappropriate storage of excavated peat and overburden, as well as uncontrolled loading of peat material is considered one of the main causes of peat instability and landslide event triggers during the wind farm construction process. The management and control of these activities is key to de-risking peat stability at the proposed wind farm site. It is required that the construction method statements for the project also take into account, but not be limited, to the guidance documents listed and the recommendations and requirements outlined throughout Chapter 9 (Land, Soils and Geology) of the EIAR. A PSMP has been developed and is included in Appendix 9.2 of the EIAR. The PSMP outlines the guidelines and methodologies for the careful management, handling and storage of peat on the site. These mitigation measures include: • Appointment of experienced and competent contractors and designers - A competent Project Geotechnical Engineer shall be appointed for the construction phase to oversee peat excavation and management; • The construction works on site will be supervised by experienced and qualified personnel; • Allocate sufficient time for the project to be constructed safely with all peat stability mitigation measures included in the programme; • Prevent undercutting of slopes and unsupported excavations;

			• Prevent placement of loads/overburden on marginal ground; • Peat related works will be subject to additional detailed designed and checked by the relevant professionals, for example by a qualified geotechnical engineer, hydrologist, and/or drainage engineer; • Manage and maintain a robust drainage system. This will be the responsibility of the appointed contractor and their designer; • Uncontrolled placement of peat or loading of peat material must be avoided; • Placement of peat and spoil material, including temporary and side casting, will be carried out in the permitted peat deposition areas only; • Storage of peat material including temporary and side casting be carried out in the permitted areas only. • Excavated peat and spoil will be immediately moved short distances to the designated peat deposition area or borrow pit areas with the exception of the storage required for the opening of the initial borrow pit. Acrotelm (upper) peat material will be used as landscaping material where the topography allows, and the detail designer has assessed the stability risk; • Peat and spoil will only be placed in the proposed deposition area or re-used for landscaping purposes. Peat deposition areas are outlined in the PSMP in Appendix 9.2 of the EIAR and have been located only in areas where the peat instability risk allows; • Water flows within drainage systems will be controlled. The velocity of water flows within drainage systems will be controlled using check dams, and the uncontrolled release of water onto slopes can create a landslide risk and must be avoided; • All construction requiring cut and fill earthworks requires a robust monitoring and inspection programme. The details of this inspection programme will depend on the purpose and methodologies of the works and the ground conditions; • A method statement and risk assessment (RAMS), which considers the potential causes and mitigations of peat instabilities and landslides, is required and must be regularly communicated to all site staff. An observational approach by all site staff to the ground conditions and the risks will be promoted, and any changes in the ground or site conditions will be reported and the risk dynamically assessed. The RAMS will be reviewed for compliance with the PSRA, prior to acceptance by the developer; • Set up, maintain and report findings from monitoring systems, including sightline monitoring; • Maintain vigilance and awareness through Tool-Box-Talks (TBTs) on peat stability. Regular briefing of all site staff (e.g. toolbox talks) to provide feedback on construction and ground performance and to promote reporting any observed change in ground conditions. • Frequent monitoring of slopes associated with the proposed wind farm shall be undertaken during the construction phase, and where required, additional monitoring undertaken following heavy and/or prolonged rainfall events; • Installing movement monitoring posts is recommended for areas where works occur on or adjacent to identified peat depths greater than 2m and existing slope angles exceeding 5°. At those locations, monitoring posts are recommended to be installed upslope and downslope of the works areas; • Movement monitoring posts shall be observed at least once daily during the construction phase, with more frequent inspections where adjacent works are ongoing. Should movements be recorded, the frequency of these inspections will be increased. A record of all monitor post inspections will be kept with reference to date, time and relative movement between posts, if any. Any movement identified in the posts shall be recorded with reference to the post numbering system. The monitoring regime will be further developed and assessed during the detailed design phase; and, • The Contractor shall also develop a routine inspection of all areas surrounding work in peat, not just exclusively on the monitoring posts. These inspections shall include an assessment of ground stability and drainage conditions. These

			inspections will identify any cracking or deformation on the peat surface, an excessive settlement on structures, drain blockages or springs etc..

MM44	Peat & Spoil Management – General Construction Practice	EIAR Appendix 9-2	• Care will be taken during peat excavation to ensure it is segregated from other soil types; therefore, particular care will be taken to review recorded peat depths. Peat will be separated and stored by type, namely the acrotelmic and catotelmic layers, where acrotelm is encountered. Given the nature of the historic peat extraction at the site, it is anticipated that nearly all of the peat excavation will consist of catotelmic peat:
			  ○ Acrotelm (defined in Section 2.1) is generally required for landscaping and will be stripped and temporarily stockpiled for re-use as required. Acrotelm stripping will be undertaken before the main excavations;
			  ○ Where possible, the acrotelm will be placed with the vegetation part of the sod facing the right way up to encourage the growth of plants and vegetation;
			  ○ All catotelm peat (defined in Section 2.1) will be transported immediately on excavation to the designated Peat Deposition Area or borrow pit reinstatement area;
			  ○ The careful handling and segregation of peat types will help to optimise the re-use of peat, aiding in the retention of structure and integrity of the excavated peat material;
			  ○ Uncontrolled placement of peat or loading of peat material must be avoided.
			• Depending on what vegetation is found on site, more fibrous material may be placed on steeper angles, up to 10%. Unconsolidated peat, generally comprising of catotelmic material, is often not suitable for general dressing, and any unconsolidated peat excavated must only be used for reinstatement where such re-use poses no risk of polluting water courses and evidence can be provided that the required water table at the chosen location can be maintained;
			• Construction sequence planning will minimise the time peat is stockpiled before re-use; however, some temporary peat placement may be required to manage spoil and separate spoil horizons before it can be placed in its reinstatement location. The principles on which the temporary placement of excavated peat will be based upon the placement and handling methodologies set out within this section. Temporary placement must be safe as it protects the structure and integrity of the excavated peat subject to prevailing local conditions. The peat will be reinstated during the Construction Phase at the earliest possible opportunity to avoid prolonged placement;
			• Any temporary placement locations must be in suitably wet conditions or be irrigated to prevent the peat from desiccating, and precautions will be taken to ensure that turves are not allowed to dry out before reinstatement. The condition of turves will be monitored throughout the duration of placement. Irrigation of peat turves will be agreed upon in advance with the Ecological Clerk of Works (ECoW). Should wetting of turves be required to prevent desiccation, mitigation will be adopted to prevent runoff or discharge to any adjacent watercourses;
			• Plant movements and haul distances related to earthworks activity and peat excavation will be kept to a minimum;
			• Peat Deposition Areas will not be allowed to substantially erode or become dry;
			• Material repositories will be located at least 50m away from watercourses to reduce the potential for sediment to be transferred into the wider hydrological system;
			• If possible, excavation will be timed to avoid very wet weather;
			• Peat and spoil deposition locations have been selected to limit re-handling as far as reasonably possible;
			• Excavated peat and spoil will be placed and re-used as close to the immediate area as possible;
			• The disruption of flow pathways will be minimised, and drainage will be designed to limit the risk of changing flow pathways and subsequently increasing peat slide risk;

			• All construction requiring cut and fill earthworks requires a robust monitoring and inspection programme. The details of this inspection programme will depend on the purpose and methodologies of the works and the ground conditions; • A method statement and risk assessment (RAMS), which considers the potential causes and mitigations of peat instabilities and landslides, is required and must be regularly communicated to all site staff. An observational approach by all site staff to the ground conditions and the risks should be promoted, and any changes in the ground or site conditions should be reported and the risk dynamically assessed; • Regular briefing of all site staff (e.g. toolbox talks) to provide feedback on construction and ground performance and to promote reporting any observed change in ground conditions; • If peat pipes are encountered in excavations, mitigation works (e.g. backfilling with free-draining fill) will be developed so that lateral groundwater movement is not impeded; • The Contractor will consult the ECoW to agree on locations for material stockpiles and consider minimising impacting sensitive ecological receptors; • All works will be supervised by a competent Geotechnical Engineer. The Contractor will consult the site Geotechnical Engineer and review and take into account the Peat Stability Risk Assessment (GDG, 2025) to avoid the risk of peat instability in peat excavations, peat stockpiling and all material stockpiling in areas underlain by peat; • Runoff from Peat Deposition Areas will be directed through the site drainage system, including silt fences, settlement ponds and other drainage measures as appropriate; The following particular recommendations/best practice guidelines for the placement of peat with respect to specific aspects of the wind farm will be considered and taken into account during construction. Excavated peat will be managed and placed in the following locations only: • Side-casting/reinstatement alongside access tracks and other infrastructure (See Section 3.2 of the PSMP); • One permanent Peat Deposition Area (1) (See Section 3.3 of the PSMP); • One temporary Peat Deposition Area (2) is to be used while BP1 is being excavated (See Section 7 of the PSMP); and • Reinstatement of borrow pits (See Section 6 of the PSMP).
MM45	Peat & Spoil Management – Access Roads, Hardstands and Other Infrastructure	EIAR Appendix 9-2	**Access Roads, Hardstands and Other Infrastructure** • Controlled quantities of peat and spoil will be side-cast adjacent to access roads and other infrastructure only where it can be placed in a stable formation, i.e. where the topography and ground conditions allow; • Side cast peat material will consist of the acrotelm (upper layer) only, and it will be landscaped and shaped to aid in reinstating the construction into the surrounding environment; • Peat and spoil will only be cast to safe heights and slope angles, considering the topography and the ground conditions. This height will be no more than 1m, and the slopes will be not greater than 1 (V): 3 (H) unless a site-specific assessment during detailed design indicates a greater height and angle is safe; • The effect of drainage or water runoff will be considered when placing landscaping rising adjacent to access roads. Landscaping material will not interfere with drainage, risk blocking of drainage systems or runoff into drainage systems.
MM46	Peat & Spoil Management Plan (PSMP)	EIAR Appendix 9-2	**Permanent Peat Deposition Area** • The permanent Peat Deposition Area (1) location has been designed by Tobin (Appendix D of the PSMP). The proposed location has been identified in an area where the topography (slope angle <5°), peat depth, resulting stability assessment

	– Permanent Peat Deposition Area		(FoS of >1.3 for 1.0m peat surcharge) and other environmental constraints (including 50m buffer from all watercourses) have allowed. The area is free of existing peat and drainage cuttings within the internal structure and is designated for the permanent placement of up to 1m of peat material. However, the Contractor will be required to conduct their own local and global stability assessment considering the influence of the existing drainage excavations outside of the stricture and any influence these could have on the proposed construction; • A cell berm will be constructed similarly to the Peat Deposition Area details outlined in Appendix D of the PSMP. This cell berm will help to prevent the flow of saturated peat material. The stone berm will be constructed with a sufficiently coarse granular material or rock to enable the drainage of the placed peat material and prevent any instabilities within the Peat Deposition Area; • The stone cell berm will require a geotextile separator. The stone cell berm should be constructed using low-ground pressure machinery working from bog mats where necessary. A competent engineer should inspect and approve the founding stratum for each stone buttress; • The height of the cell berm constructed will be greater than the height of the placed peat & spoil to prevent any surface peat runoff. Berms up to 1.25m in height will be required, subject to detailed design; • The cell berm is subject to the detail designer's specification; however, some peat excavation or installation of a shear key may be required to prevent global instabilities within the stored material. The shear key will comprise an excavation below existing ground level beneath the cell berm to provide resistance against lateral forces; • Where possible, the surface of the placed peat and spoil will be shaped to allow efficient runoff of surface water from the peat and spoil deposition areas; • Silting ponds will be required at the lower side/outfall location of the Peat Deposition Areas (see drainage drawing 20852-NOD-01-XX-DR-C-080). Intermediate berms or buttresses of spoil material may be installed within the Peat Deposition Area to aid in the placement and stability of the peat material. These berms will be shaped to align with the contours of the deposition area; • The Contractor will make every reasonable effort to promote growth in the Peat Deposition Areas following the placement of peat and completion of construction stage activities. Upper acrotelm layers will be placed on the surface the right way up to promote vegetation growth. This growth will aid in stabilising the placed peat material and help in preventing it from becoming saturated following heavy periods of rain.
MM47	TDR	EIAR Chapter 9	Any temporary accommodation works required along the turbine delivery route such as hedge or tree cutting, temporary relocation of powerlines/poles, lampposts, signage and local road widening (See Chapter 15 (Traffic and Transport) of the EIAR) will be carried out in advance of turbine deliveries and following consultation and agreement with Longford County Council. All temporary accommodation works will be designed by and monitored by suitably qualified and experienced geotechnical engineer or engineering geologist.
Water Quality Management			
MM48	Groundwater Management	EIAR Chapter 3	Dewatering will be required intermittently during the 2-year construction period. The anticipated dewatering for borrow pits is 1 year and 2-3 months for turbine bases. Groundwater inflows to excavations will need to be pumped out, resulting in short term localised drawdown of the water table and potential discharges to the surface water.

			Interceptor cut-off drains around the borrow pits will be provided to divert overland flows and prevent these flows from entering the borrow pits. These flows will discharge diffusely overland, creating a buffer before entering the existing surface water management infrastructure
MM49	Surface Water Management	EIAR Chapter 3	The surface water drainage system will require regular inspection during construction works and during operations to ensure that it is working optimally. The surface water management plan (Appendix 10-3 of the EIAR) details the monitoring procedures to be followed during the construction phase. Where issues arise, the works should be stopped immediately and the source of potential impacts on the surface water quality investigated. Records of all maintenance and monitoring activities associated with the construction site will be retained by the Contractor on-site.
MM50	Surface Water Quality: Hydrocarbon and Concrete	EIAR Chapter 10	**Hydrocarbon and Concrete:** Concrete is required for the construction of the turbine bases, met masts and substation foundations. After concrete is poured at a construction site, the chutes of ready mixed concrete trucks must be washed out to remove the remaining concrete before it hardens. Wash out of the main concrete bottle will not be permitted on site; wash out is restricted only to chute wash out. Wash down and washout of the concrete transporting vehicles will take place at an appropriate facility offsite i.e., at the premises of the concrete supplier. The best management practice objectives for concrete chute washout are to collect and retain all the concrete washout water and solids in leakproof containers or impermeable lined washout pits so that the wash material does not reach the soil surface and then migrate to surface waters or into the groundwater. The collected concrete washout water and solids will be emptied on a regular basis at a waste licence facility. With regard to on-site storage and handling of potentially pollutant materials: • All on-site refuelling will be carried out by a trained competent operative; • Mobile measures such as drip trays and fuel absorbent mats will be used during all refuelling operations; • The contractor will have a dedicated area within the compound for refuelling plant or any other equipment that is bunded and has the necessary spill kit equipment available; • The production, transport and placement of all cementitious materials will be strictly planned and supervised. Site batching/production of concrete will not be carried out onsite and therefore these aspects will not pose a risk to the waterbodies or sensitive receptors present, namely any exposed groundwater, the onsite surface water settlement ponds or onsite groundwater monitoring wells; • Mixer washings and excess concrete will not be discharged directly into the drainage network, or any drainage ditches, surface water bodies, the onsite surface water settlement pond or onsite groundwater monitoring well; • Surplus concrete will be returned to batch plant after completion of a pour; • No refuelling will take place within 50 m of any water body. Refuelling of machinery will be carried out using a mobile double skinned fuel bowser to allow for ease of work. The fuel bowser will be re-filled off site or at the contractors site compound and will be towed around the site by a 4x4 jeep to where machinery is located. Spill kits (fuel absorbent material and pads) will be stored in the event of any accidental spillages. Mobile measures such as drip trays and fuel absorbent mats will be used during all refuelling operations. Only designated trained and competent operatives will be authorised to refuel plant on site. • All equipment and machinery will have regular checks for leakages and quality of performance, and will carry spill kits; • Any servicing of vehicles will be confined to designated and suitably protected areas such as construction compounds;

			• Additional drip trays and spill kits will be kept available on site, to ensure that any spills from vehicles are contained and removed off site; • Fuels, lubricants, and hydraulic fluids for equipment used on the construction site, as well as any solvents, oils, and paints will be carefully handled to avoid spillage, properly secured against unauthorised access or vandalism, and provided with spill containment according to best codes of practice; • Waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the proposed development for disposal or re-cycling; • All fuel /oil deliveries to the onsite storage tanks will be supervised with records of delivery dates and volumes retained on site; and • Strict supervision of contractors will be adhered to in order to ensure that all plant and equipment utilised on-site is in good working condition. Any equipment not meeting the required standard will not be permitted for use within the site. This will minimise the risk of groundwater becoming contaminated through site activity. Generators and associated fuel tanks to be used at the site will either be placed within bunds as per fuel storage tanks or will be integrated units (i.e., fuel tank and generator in one unit) that are intrinsically bunded. No external tanks and associated fuel lines will be permitted on the proposed wind farm site unless these are housed within a fixed bund with the generator. The temporary contractor's compounds will incorporate a bund for the storage of small vehicles and oil filled equipment, such as hand portable generators, pumps, etc. Storage of small volume oils or chemicals, in barrels, IBCs, etc, will be stored in a covered bunded area. Where barrels or other containers are required at work locations these shall be stored in enclosed bunded cabinets, and drip trays shall be used where distribution of the material is required. The main storage areas for oil filled equipment, vehicles, plant, etc, shall be impermeably surface and the discharge of surface water from these areas will be via oil interceptors. An oil spill response plan will be developed for the construction works and appropriate containment equipment will be available at work locations in the event of a spillage. Oil spill response will form part of site personnel induction and training at the site. A response procedure will be put in place by the Contractor to deal with any accidental pollution events. Any spillage of fuels, lubricants or hydraulic oils will be immediately contained and the contamination removed from the proposed development and disposed of in accordance with all relevant waste management legislation. Relevant Material Safety Data Sheets along with oil absorbent materials will be kept on site in close proximity to any fuel storage tanks or bowsers during proposed site development works. The works programme for the construction phase of the development will also take account of weather forecasts and predicted heavy rainfall events in particular. Large excavations and movements of peat/subsoil or peat stripping will be suspended or scaled back if heavy rain is forecast. The extent to which works will be scaled back or suspended will relate directly to the amount of rainfall forecast.
MM51	Surface Water Quality: Wastewater	EIAR Chapter 10	The presence of construction workers at the proposed wind farm site will lead to the generation of foul sewage from toilets and washing facilities. Welfare facilities will be provided at the temporary construction compounds during the construction phase. Wastewater will be contained in an alarmed and sealed wastewater tank.
MM52	Flow Alteration	EIAR Chapter 10	As required by the IPC Licence (P0504-01) there are existing IPC settlement / slit ponds upstream or downstream of the external pumping stations to allow sediment to settle out of the water before it is discharged to the external streams and rivers which ultimately flow into the River Shannon and Lough Ree. These will remain in operation during the proposed construction and

			operational phase. There are no streams within 50 m of proposed turbines or borrow pits. Interceptor drainage will be provided on the upgradient side of the road to collect the drains crossed by the proposed internal access site roads and amenity access tracks. All stockpiled material will be side cast, battered back and profiled to reduce the rainfall erosion potential. The stockpiling of materials will be carefully supervised as per the mitigation measures listed in Chapter 9 (Lands, Soils and Geology) of the EIAR. Traffic on site will be kept to a minimum. No haul roads will be used other than the proposed access tracks and roads. Where haul roads pass close to watercourses, silt fencing will be used to protect the streams. This will be utilised for the crossing of the Rappareehill and Derrygeel streams to the west and southwest of Derryadd Bog. As stated previously, to maximise the erosion and sediment control benefits of natural vegetation soil cover, stripping of peat is to be kept to a minimum and confined to construction areas only. Where practical, construction works will be staged to minimise the extent and duration of disturbance, e.g. plan for progressive site clearance, only disturbing areas when they are scheduled for construction work.
MM53	Dewatering	EIAR Chapter 10	Dewatering will be required intermittently during the 2-year construction period. The anticipated dewatering for borrow pits is <1 year and 3 months for turbine bases. Groundwater levels on the proposed wind farm site are between 1 and 5 mbgl based on the 2018, 2021 and 2022 and 2023 Site Investigations (see Appendix 9.1.1, 9.1.5 to 9.1.10 of the EIAR). Based on the ground investigation the proposed foundations will be a combination of piled, bored and gravity foundations. The mitigation strategies for the borrow pits follow similar procedures as the excavations for turbine and hardstanding areas. Interceptor cut-off drains around the borrow pits will be provided to divert overland flows and prevent these flows from entering the borrow pits. These flows will discharge diffusely overland, creating a buffer before entering the existing surface water management infrastructure. Dewatering of borrow pits and turbine bases will be required on site. Borrow pit areas for example, which are up to ca. 5.5 m deep, will encounter groundwater. Gravity, bored or piled turbine bases will be 3.6 – 4m bgl. Groundwater inflows to excavations will need to be pumped out, resulting in short term localised drawdown of the water table and potential discharges to the surface water. The water pumped by sumps will first pass through silt bags before being discharged into swales and settlement ponds ensuring no net loss of water from the hydrological system. The quantities that will be managed at turbine bases will generally be less than 10 m3/hr, although shorter term pumping can be higher, especially after significant rainfall events. Based on the above principles and a Transmissivity value of 20 to 50 m2/day, the upper rate of groundwater discharge rates of 1,800 m3/day to 2,300 m3/day are obtained for the borrow pits. Gravity turbine, bored foundation and piled foundation bases will be ca. 3.6 - 4 m bgl. Groundwater inflows to excavations will need to be pumped out, resulting in short term localised drawdown of the water table and potential discharges to the surface water. Based on a drawdown of 3.5 m, the empirical estimate calculates a 0m drawdown at 100 m. Where deep soils are present such as T03, T05, T06, T15-T21, the drawdown distance is <25 m. Average depth to bedrock on the site is ca. 5 m. There are no wells within 500 m of the turbines or the borrow pits. Therefore, the pre mitigation potential effect is localised, temporary, slight and likely. There are no significant effects of the proposed piling works. The overflow areas are self-contained basins and of sufficient cross-sectional area to minimise erosion. As foundations are excavated, water will enter the excavations by direct rainfall and via groundwater seepage once the groundwater level is reached/intercepted. The water inside the excavations will collect in sumps and the water will be pumped out using sump pumps.

			The pumped water will be directed to swales which will lead the water to settlement ponds before overland flow to the surface water ponds. The discharge water from sumps may contain suspended sediments and concentrations of ammonia will be elevated since the water originates from the surrounding peat and shallow groundwater environment. Groundwater quality monitoring indicated ammonium concentrations are <0.1 mg/l. The swales and settlement ponds will serve to significantly attenuate ammonium and suspended solids. A summary of the mitigation measures are included in Table 10-26 of Chapter 10 (Hydrology and Hydrogeology) of the EIAR.
MM54	Watercourse crossings	EIAR Chapter 10	Potential effects on surface water flow during the construction phase of the proposed wind farm site are mitigated by the proposed drainage design, which has been designed to minimise disturbance to the current hydrological regime, by maintaining diffuse flows. All access tracks will utilise the existing roads/culverts including the crossing of Derrygeel stream (26_593) to the east of T15. Culverts are to be of a size adequate to carry expected peak flows. Culverts will be installed to conform to the natural slope and alignment of the stream or drainage line. Where required, culverts will be buried at an appropriate depth below the channel bed and the original bed material placed in the bottom of the culvert. Embedded culverts should be buried to a depth of 0.3 m or 20% of their height (whichever is greatest) below the bed. No culverts are required on an EPA waterbody. No instream works are proposed. There will be no discharge of suspended solids or any other deleterious matter to watercourses. Water crossings are to be constructed in accordance with the requirements of the Office of Public Works (OPW) Section 50 Consent requirements (if required) and in accordance with the CEMP. Crossing construction will be carried out, in so far as is practical, with minimal disturbance to the drainage bed and banks. If they have to be disturbed, all practicable measures will be taken to prevent soils from entering the watercourse. Cement and raw concrete will not be spilt into watercourses. Where practicable, crossings should be adequately elevated with low approaches such that water drains away from the crossing point. Existing stream crossings must be protected against erosion e.g. by re-vegetation or rock surfacing etc.. Table 10-25 of Chapter 10 (Hydrology and Hydrogeology) of the EIAR details measures agreed to manage the hydrological environment associated with each component of the proposed development.
MM55	Concrete Management	EIAR Chapter 3 CEMP Section 3.10	Only ready-mixed concrete will be used during the construction phase, with all concrete being delivered from local batching plants in sealed concrete delivery trucks. The use of ready-mixed concrete deliveries will eliminate any potential environmental risks of on-site batching. When concrete is delivered to site, only the chute of the delivery truck will require cleaning, using the smallest volume of water necessary, before leaving the site. Concrete trucks will be washed out fully at the batching plant, where facilities are already in place. The small volume of water that will be generated from washing of the concrete lorry's chute will be directed into a temporary lined impermeable containment area, or a concrete wash unit. This type of unit catches the solid concrete and filters and holds wash liquid for pH adjustment and further solids separation. The residual liquids and solids can be disposed of off-site at an appropriate waste facility. Where temporary lined impermeable containment areas are used, such containment areas are excavated and lined with an impermeable membrane. The areas are generally covered when not in use to prevent infill of rainwater. In periods of dry weather, the areas can be uncovered to allow much of the water to be lost to evaporation. At the end of the concrete pours, any of the remaining liquid contents is tankered off-site. Any solid contents that will have been cleaned down from the chute will have solidified and can be broken up and disposed of along with other construction waste.

			Due to the volume of concrete required for each turbine foundation (approximately 950 m3), and the requirement for the concrete pours to be continuous, deliveries are often carried out outside normal working hours in order to limit the traffic impact on other road users, particularly peak period school and work commuter traffic. Such activities are limited to the day of turbine foundation concrete pours. The risks of pollution arising from concrete deliveries will be further reduced by the following: • Concrete trucks will not be washed out on the site but will be directed back to their batching plant for washout other than the delivery chutes; • Site roads will be constructed to a high standard to allow transport of the turbine components around the site, and hence, concrete delivery trucks will be able to access all areas where the concrete will be needed. No concrete will be transported around the site in open trailers or dumpers so as to avoid spillage while in transport. All concrete used in the construction of turbine bases will be pumped directly into the shuttered formwork from the delivery truck. If this is not practical, the concrete will be pumped from the delivery truck into a hydraulic concrete pump or into the bucket of an excavator, which will transfer the concrete to the location where it is needed; • The arrangements for concrete deliveries to the site will be discussed with suppliers before work starts, agreeing routes, prohibiting on-site full washout and discussing emergency procedures; • Clearly visible signage will be placed in prominent locations close to concrete pour areas specifically stating washout of concrete lorries is not permitted on the site.
MM56	Concrete Pouring	EIAR Chapter 3 CEMP Section 3.10	Because of the scale of the main concrete pours that will be required to construct the proposed wind farm, the main pours will be planned weeks in advance and refined in the days leading up to the pour. Special procedures will be adopted in advance of and during all concrete pours to minimise the risk of pollution. These may include: • Using weather forecasting to assist in planning large concrete pours and avoiding large pours where prolonged periods of heavy rain is forecast; • Restricting concrete pumps and machine buckets from slewing over watercourses while placing concrete; • Ensuring that excavations are sufficiently dewatered before concreting begins and that dewatering continues while concrete sets; • Ensuring that covers are available for freshly placed concrete to avoid the surface washing away in heavy rain; • Disposing of surplus concrete after completion of a pour will be off-site.
MM57	Refuelling	EIAR Chapter 3 and Chapter x / CEMP Section 3.10	Wherever possible, vehicles will be refuelled off-site. This will be the case for regular, road-going vehicles. However, for construction machinery that will be based on-site continuously, a limited amount of fuel will have to be stored on site. No refuelling of machinery will occur within 50 m of surface water features. Refuelling of machinery will be carried out using a mobile double skinned fuel bowser to allow for ease of work. The fuel bowser will be re-filled off site or at the contractors site compound and will be towed around the site by a 4x4 jeep to where machinery is located. Spill kits (fuel absorbent material and pads) will be stored in the event of any accidental spillages. Mobile measures such as drip trays and fuel absorbent mats will be used during all refuelling operations. Only designated trained and competent operatives will be authorised to refuel plant on site.
Noise & Vibration			

MM58	Noise	EIAR Chapter 12 / CEMP Section 3.1.9	The contract documents will specify that the Contractor undertaking the construction works will be obliged to adopt best practice noise abatement measures contained in British Standard BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise and BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Vibration.
Air Quality / Dust			
MM59	Dust Suppression and Exhaust Emissions Management	EIAR Chapter 3 / Chapter 11	Best practice (including industry recognised dust suppression techniques/equipment) will be used to minimise the potential for dust production during construction including, but not limited to, IAQM (2024) and the Good Practice Guide for Construction and Demolition (Dublin City Council, 2018).The main contractor will be responsible for the coordination, implementation and ongoing monitoring of dust management measures. In periods of extended dry weather, dust suppression may be necessary along haul roads and around the borrow pit area(s) to ensure dust does not cause a nuisance. If necessary, water will be taken from settlement ponds in the site's drainage system and will be pumped into a bowser or water spreader to dampen down haul roads and site compounds to prevent the generation of dust. Silty or oily water will not be used for dust suppression, because this would transfer the pollutants to the haul roads and generate polluted runoff or more dust. Water bowser movements will be carefully monitored, as the application of too much water may lead to increased runoff.
MM60	General Site Management	EIAR Chapter 11	Good site management will also include the ability to respond quickly to adverse weather conditions through effective control measures or restricting operations on-site before the potential for nuisance occurs. During periods of high wind (gales) particular care should be taken as these are conditions are where potential for significant dust emissions is most high. In general the prevailing meteorological conditions in the area of the proposed wind farm are favourable for dust suppression for significant part of the year. However, there will be times when care is needed to ensure no dust nuisance occurs. The Principal Contractor will be responsible for adherence to all dust control measures contained here and ensure that any other contractors working onsite demonstrate full compliance. The following measures shall be taken to ensure no dust nuisance at the site and site entrances: • Develop and implement a stakeholder communications plan that includes community engagement before works commence on site. Community engagement includes explaining the nature and duration of the works to local residents and businesses; • The name and contact details of a person to contact regarding air quality and dust issues shall be displayed on the site boundary, this notice board should also include head/regional office contact details; • A complaints register will be kept on site detailing all telephone calls and letters of complaint received in connection with dust nuisance or air quality concerns, together with details of any remedial actions carried out; • Daily inspections by site personnel to identify potential sources of dust generation along with implementation measures to remove causes where found; • Review of the measures across the site to ensure they are appropriate and working.
MM61	Site Activities	EIAR Chapter 11	The movement and storage of materials are important aspects to consider when managing site activities with regard to potential source of dust nuisance. The moisture content of materials stored and moved within the wind farm site should also be considered. The following measures shall be taken during construction within the proposed wind farm site:

			• Minimisation of the extent of working areas; • Stockpiling of excavated materials will be limited to the volumes required to practically meet the construction schedule; • Only ready-mix concrete will be used on site and all concrete will be delivered in enclosed trucks which will reduce the potential for dust emissions; • Soil and rock excavation and rock breaking during periods of high winds and dry weather conditions can be a significant source of dust. During dry and windy periods, and when there is a likelihood of dust nuisance, a bowser will operate to ensure moisture content is high enough to increase the stability of the soil and rock and thus suppress dust. During periods of very high winds (gales), construction activities likely to generate significant dust emissions should be postponed until the gale has subsided; • Drop heights of excavated materials into haulage vehicles will be minimised to a practicable level; • Provision of dust suppression measures (e.g., sweeps/covers/water bowsers) will be used on stockpiles and the road surface during periods of extended dry weather; • Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind. Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods; • Onsite borrow pits will be used to minimise quantities of stone material being brought to site; • Sporadic wetting of loose stone surface in the borrow pits will be carried out during the construction phase to minimise movement of dust particles to the air; • The transport of construction materials from the borrow pits around the site will be undertaken in tarpaulin or similar covered vehicles, where necessary; • Vehicles and plant will be routinely serviced to minimise the exhaust emissions during construction; • Machinery will be switched off when not in use; • Vehicles will not be left running unnecessarily and low emission fuels will be used where possible; and • Aggregate materials for the construction of site access tracks and all associated infrastructure will all be locally sourced, where possible, which will further reduce potential emissions.
MM62	Site Traffic on Public Road and Site Entrance	EIAR Chapter 11	Movement of vehicles along the road network to the proposed wind farm site and on the site roads are considered a potential source of dust nuisance and the following measures are to be take: • Hard surface roads will be swept to remove mud and aggregate materials from their surface while any unsurfaced roads will be restricted to essential site traffic; • Any road that has the potential to give rise to fugitive dust must be regularly watered, as appropriate, during dry and/or windy conditions; • Traffic coming to site will only use the specified haul routes; • Vehicles using site access tracks will have their speed restricted, and this speed restriction must be enforced rigidly. On any unsurfaced site access track, this will be 20 kph, and on hard surfaced access tracks as site management dictates; • The use of a wheelwash near the site entrance (will prevent the transfer of dust from the construction works onto public roads). Vehicles exiting the site shall make use of the wheel wash facility where appropriate, prior to entering public roads;

			• Public roads outside the site will be regularly inspected for cleanliness and cleaned as necessary; and • During movement of materials both on and off-site, trucks will be stringently covered with tarpaulin at all times. Before entrance onto public roads, trucks will be adequately inspected to ensure no potential for dust emissions. At all times, these procedures and those outlined within the CEMP will be strictly monitored and assessed. In the event of dust nuisance occurring outside the site boundary, movements of materials likely to raise dust will be curtailed and satisfactory procedures implemented to rectify the problem before the resumption of construction operations.
Traffic Management			
MM63	Haul Routes	EIAR Chapter 15	To mitigate the effects of the construction traffic, the proposed development will utilise all available resources within the existing site to reduce the requirement for importation of materials to site. Excavation of stone material from the borrow pits within the proposed wind farm site to provide construction material will reduce the HV volumes as described in the Chapter 3 (Description of the Proposed Development) of the EIAR. The largest traffic volume effect is associated with the haulage of the materials for the combined construction activities for Month 3 of the proposed construction programme. Key deliveries during this period are aggregate and stone. The internal site access roads have been designed to utilise existing access tracks where feasible, reducing the volume of materials required for importation to the proposed wind farm site. The second largest volume traffic effect is associated with the concrete pours for the turbine foundations. Other scheduled construction activities, per the proposed construction program will continue during these concrete pours, but only essential deliveries will be scheduled to occur on the same days as the concrete pours. To mitigate this effect, liaison with local authorities and the community in advance of the foundation pours will occur as well as minimising other works/deliveries as noted.
MM64	Post-Construction Pavement Surveys	EIAR Chapter 15	The proposed development will result in slight increase in traffic volume in particular HVs during the construction phase. The weighted loading of the HVs to the proposed wind farm site has the potential to impact on the road network surface (i.e. the N63) causing deterioration of the road pavement. To capture suitable mitigation works the developer will undertake post-construction visual pavement surveys on the N63. Where the surveys conclude that damage to the road surface is attributable to the construction phase of the proposed development, the developer will fund the appropriate reinstatement works to bring the road surface back to pre-construction condition as a minimum, details for which will be agreed with the Local Authorities Roads Department.
MM65	Traffic Management Plan (TMP)	EIAR Chapter 15 / TMP Appendix 15-2	The successful completion of the proposed development will require co-ordination and planning in order to minimise the effects of the additional traffic generated by the proposed development which are outlined in the Traffic Management Plan (TMP). The TMP is a comprehensive set of mitigation measures that will be put in place by the Contractor before and during the construction phase of the proposed development to minimise effects. The purpose of the TMP is to capture the mitigation measures in this EIAR as discussed with RCC and LCC during scoping and any future traffic mitigation as they may arise during the proposed development. The TMP proposed for the Derryadd Wind Farm is included as Appendix 15-2 of the EIAR. The following mitigation measures has been incorporated into the TMP: • Haul route selection to avoid sensitive receptors and preference for national road infrastructure over regional and local road. • The existing and widened internal access roads facilitate queuing of construction vehicles off the public road.

			• Traffic Management Operatives (TMOs) will be provided by the principal contractor in accordance with their Traffic Management Plan at the site access during peak construction traffic activities, refer to the TMP. • Traffic Management Operatives (TMOs) will be provided by the principal contractor in accordance with their Traffic Management Plan for the turbine delivery, refer to the TMP. • A wheel wash will be provided within the site. • Passing bays on the internal access roads and a loop layout within the proposed wind farm site to facilitate safe passing of vehicles, vehicles travelling in a forward direction (reducing higher risk reversing manoeuvres)
MM66	Road Opening Licenses and Agreements	EIAR Chapter 15	To avoid delays to the proposed programme all required road opening licenses and agreements with the Local Authorities and an Garda Síochána to facilitate movement of AILs will be sought by the appointed Contractor in a timely manner.
Cultural Heritage and Archaeology			
MM67	Protection of the Archaeological Heritage	EIAR Chapter 14	The current state policy as detailed in the Framework and Principles for the Protection of the Archaeological Heritage (1999), is that preservation in situ of archaeological material is the preferred option. Where this cannot be achieved then appropriate measures need to be adopted to ameliorate the impacts that the proposed development may have on features of archaeological, architectural and/or cultural heritage within the study area during both the construction and operational phases of the works. Following consultations with the National Monuments Service, DHLGH, it was recommended that a Post Consent Advance Stage Works be implemented.
MM68	Ground Disturbance / Encountering Archaeological Features, Finds Or Deposits	EIAR Chapter 14	The following mitigation measures will be implemented during the construction phase: • All ground disturbance associated with the construction of the proposed development will be monitored by a suitably qualified archaeologist working under licence as issued by the minister (DoHLGH) under section 26 of the National Monuments Acts (1994-2014). • In the event of archaeological features, finds and/or deposits been encountered during the course of the monitoring and/or testing, the relevant authorities should be notified immediately. Preservation by record (through archaeological excavation) will only occur if it is established that preservation in situ cannot be achieved and such excavations are agreed with National Monuments Service.
Waste Management			
MM69		EIAR Chapter 3	The Contractor will prepare a detailed Construction Resource and Waste Management Plan (RWMP) in accordance with the relevant following guidance 'Best Practice Guidelines for the preparation of resource & waste management plans for construction & demolition projects' (EPA, 2021). The Construction RWMP will provide a mechanism for monitoring and auditing waste management performance and compliance for the duration of the proposed development. The document will also provide a detailed overview of key waste management considerations for the proposed development and will be fully implemented onsite for the duration of the construction phase of the proposed development. The Waste Management Act 1996 and its subsequent amendments provide for measures to improve performance in relation to waste management, recycling and recovery. The Act also provides a regulatory framework for meeting higher environmental standards set out by other national and EU legislation.

			The Act requires that any waste related activity must have all necessary licenses and authorisations. It will be the duty of the Resource and Waste Manager on the site of the development to ensure that all contractors hired to remove waste from the site have valid Waste Collection Permits. It will then be necessary to ensure that the waste is delivered to a licensed or permitted waste facility. The hired waste contractors and subsequent receiving facilities must adhere to the conditions set out in their respective permits/licenses and authorisations. The RWMP will provide systems that will enable all arisings, movements and treatments of construction waste to be recorded. This system will enable the contractor to measure and record the quantity of waste being generated. It will highlight the areas from which most waste occurs and allows the measurement of arisings against performance targets. The RWMP can then be adapted with changes that are seen through record keeping
MM70	Waste Management	EIAR Chapter 9 / Chapter 16 16 / CEMP Section 3.1.21	The following mitigation measures will be implemented during the construction phase to manage effects on waste; • A specific PSMP (Appendix 9.2 of the EIAR) is in place for the site for the management of peat and spoil generated during excavations; • Excavated bedrock that will not be required will be stockpiled within the red line boundary and removed for offsite disposal to a suitably licenced / permitted waste facility and will be appropriately sampled and tested prior to offsite removal. This material will be classified in accordance with the EPA Guidance Document 'Waste Classification, List of Waste & Determining if Waste is Hazardous or Non-Hazardous' (2015). It will be the Contractors responsibility to ensure that all waste soils are classified correctly and managed, transported and disposed of offsite in accordance with the requirements of the Waste Management Act 1996, as amended, the Waste Framework Directive 2008/98/EC of the European Parliament and Council on waste and any relevant subsequent waste management legislation; • Prior to construction commencement, the appointed Contractor will prepare a detailed C&D Resource and Waste Management Plan (RWMP) in accordance with the relevant following guidance 'Best Practice Guidelines for the preparation of resource & waste management plans for construction & demolition projects' (EPA, 2021); • It will be the Contractors responsibility to ensure that a project specific Detailed Resource and Waste Management Plan (developed in accordance with relevant 2021 EPA Guidance) is fully implemented onsite for the duration of the project; • The Construction RWMP will provide a mechanism for monitoring and auditing waste management performance and compliance for the duration of the proposed development. The document will also provide a detailed overview of key waste management considerations for the proposed development and will be fully implemented onsite for the duration of the construction phase of the proposed development; • Segregation of waste will be carried out on site to maximise recycling potential and minimise potential effects on waste services. Waste streams (including material-related streams such as metals, paper and cardboard, plastics, wood, rubber, textiles, bio-waste and product-related streams such as packaging, electronic waste, batteries, accumulators and construction waste) will be managed, collected, segregated and stored in separate areas at the temporary compound and removed off site by a licensed waste management contractor at regular intervals during the works in line with condition 7 of the IPC Licence (P0504-01). Any waste generated from construction on site will be removed to the nearest appropriate licenced waste processing facility; • All waste management procedures implemented onsite during the construction phase will be in accordance with the CEMP submitted as part of this planning application, The RWMP to be prepared by the Contractor, will take account of

			the relevant requirements of the CEMP, the EIAR, NIS and any relevant planning conditions etc., and will be prepared by the Contractor in advance of the commencement of any construction works; • The contractor will supply all waste containers / skips, as required, for each of the identified waste streams. Waste will be segregated and removed to licenced facilities by licenced haulers and all containers will be emptied before they are full to avoid overflowing. The contractor is to provide a waste forecast for waste types and quantities expected to be generated. • Good working practices and take back schemes will be used to reduce the amount of waste generated, as an initial step, with waste management routes for each waste stream to be recorded in the site Waste Management Plan. In order to reduce waste generation as far as possible, off cuts, surplus materials and packaging is to be returned to suppliers for closed loop recycling, single used plastics are to be avoided where possible and all materials are to be stored correctly to avoid waste generation from damage and contamination of incorrectly stored materials. • All waste materials will be segregated onsite into the various waste streams, via. dedicated skips and storage areas. All waste will be removed from site by one or more waste haulage contractor(s) who hold a current valid waste collection permit issued by the National Waste Collection Permit Office (NWCPO). All waste materials generated during the construction phase will be removed offsite to an appropriately permitted or licenced waste disposal / recovery facility. All waste removed offsite will be appropriately characterised (under the correct LoW / EWC code), transported and disposed of in accordance with relevant waste management legislation (including but not limited to the Waste Management Act of 1996 and 2001, as amended and all subsequent waste management regulations). All waste management and disposal / recovery records will be maintained onsite throughout the proposed development and will be made available for viewing by the Client, Employer's Representative and statutory consultees (LCC, RCC, EPA) as required. • Scheduling and planning the delivery of materials will be carried out on an 'as needed' basis to limit any surplus materials; • Materials will be ordered in sufficient dimensions so as to optimise the use of these materials onsite, and will be carefully handled and stored so as to limit the potential for any damage; • Where feasible, sub-contractors will be responsible for the provision of any materials they require onsite in order to help reduce any surplus waste; • Secure lockable and controlled storage to be provided for the storage of chemicals and other hazardous materials; and • The construction compounds will include adequate temporary welfare facilities; • A wastewater holding tank (twin-hulled) will be used for the temporary welfare facilities and managed by a licensed contractor. Any introduced seminatural (road building materials) or artificial (PVC piping, cement materials, electrical wiring) materials will be taken off site at the end of the construction phase. Any accidental spillage of solid state introduced materials will be removed from the site by the appropriate means. In the unlikely event that soil material is unsuitable for use/ excess soil is generated, all waste soils (including made ground) will be appropriately sampled and tested prior to offsite removal and classified in accordance with the EPA Guidance Document 'Waste Classification, List of Waste & Determining if Waste is Hazardous or Non-Hazardous' (2015). It will be the Contractors responsibility to ensure that all waste soils are classified correctly and managed, transported and disposed of offsite in accordance with the requirements of the Waste Management Act 1996, as amended, the Waste Framework Directive 2008/98/EC of the European Parliament and Council on waste and any relevant subsequent waste management legislation.
Material Assets – Utilities			

MM71	Utilities	EIAR Chapter 16	The following mitigation measures will be implemented during the construction phase to manage effects on services (electrical/ESB, water/Uisce Éireann, gas/Gas Networks Ireland (GNI)); • Prior to construction, Ground Penetrating Radar (GPR) surveys will be undertaken to accurately locate existing utilities along the boundaries, within the proposed wind farm site and within the public road network. Bord na Móna Powergen Ltd., will liaise with the service provider where such services are identified. Digging around existing services, if present, will be carried out by hand to minimise the potential for accidental damage; • All proposed works being carried out on overhead or underground electricity cables will be done in consultation with ESB/EirGrid, as required, and will comply with their guidance and best practice; • Goal posts will be established under the overhead line for the entirety of the construction phase; • All staff will be trained in operating voltages of overhead electricity lines running within the proposed development. All staff will be trained to be aware of the risks associated with overhead lines. All contractors that may visit the sites are made aware of the location of lines before they come on to the proposed development; • Information on safe clearances will be provided to all staff and visitors; • Signage indicating locations and health and safety measures regarding overhead lines will be erected in canteens and on site; • All staff will be made aware of and adhere to the Health & Safety Authority's 'Guidelines on the Procurement, Design and Management Requirements of the Safety, Health and Welfare at Work (Construction) (Amendment) Regulations 2021'. This will encompass the use of all necessary Personal Protective Equipment and adherence to the site Health and Safety Plan; • All newly installed utilities/ services will be assessed, tested and certified as required prior to being fully commissioned; • A copy of all available existing, and as built utility plans will be maintained on site during the construction of the proposed wind farm. Any underground power lines and foul and water mains, located onsite will be clearly marked and all site personnel will be made aware of the known location of any onsite underground or over ground services during the construction phase.
Material Assets – Aviation and Telecommunications			
MM72	Aviation	EIAR Chapter 16	The findings from field and desktop surveys indicate that no significant mitigation measures would be required. The following construction phase mitigation measures will be implemented: Should the proposed development proceed, it would be a requirement to submit the as-constructed turbine locations (in WGS84 format) and height above ground level and sea level of each turbine (to blade tip) and met masts to the IAA so that they are added to the IAA Aeronautical Electronic Obstacle Data Set as soon as erected. The Applicant is also required to notify the Authority of intention to commence crane operations with at least 30 days prior notification of their erection. In addition, in the event of a grant of planning consent the IAA-ANSP (Irish Aviation Authority – Air Navigation Service Provider) would require to be made aware of the detail on the lighting of the proposed wind turbines in the interest of aviation safe-guarding as the proposed development may be considered as an en-route obstacle. The applicant would be required to implement suitable aeronautical obstacle warning lights in agreement with the IAA-ANSP.

			For civil aviation, it is recommended that lighting requirements should be in accordance with Chapter Q – Visual Aids for denoting Obstacles; CS ADR.DSN.Q.851 and GM.ADR.DSN.Q.851 (Pages 729/730) of the EASA Easy Access Rules for Aerodromes (Reg (EU) No. 139/2014). In addition to the civil aviation light scheme requirements, the Department of Defence (DoD) have made specific observations regarding an Aeronautical Obstacle Warning Light Scheme for the Irish Air Corps (IAC). The appropriate IAC Aeronautical Obstacle Warning Light Scheme is subject to a detailed technical assessment and further consultations with the DoD/IAC should the proposed development be consented.
MM73	Telecommunications	EIAR Chapter 16	No telecommunication effects are anticipated for the construction phase of the proposed development. Therefore, no specific mitigation measures related to telecommunications are proposed apart from the mitigation by avoidance which was carried out. In order to ensure there are no issues with construction, all telecom operators will be contacted in advance of construction to check that they have no new links in operation at that time. Prior to construction, Ground Penetrating Radar (GPR) surveys will be undertaken to accurately locate existing underground infrastructure. In the unlikely event that a communication underground cable or link is damaged or interfered with during construction, the operator will be contacted to agree to arrange a repair which will be carried out as soon as possible at the developers' cost. In addition, the developer will sign an agreement with 2RN prior to construction to commit to restoring service to any end users that may have their service disrupted as a result of the proposed development. This is standard industry practice and will eliminate any potential effects in this regard.

7.0 MONITORING PROPOSALS

All Monitoring proposals relating to the pre-construction phases of the proposed development were set out in various sections of the EIAR, and NIS prepared of the planning Application.

This section of the CEMP groups together all of the monitoring proposals presented in the EIAR and NIS. The monitoring proposals are presented in tabular format on the following pages. By presenting the monitoring proposals in this format, it is intended to provide an easy to audit list that can be checked and reported on during the course of the proposed development. This table can be further developed upon and used as a reporting template for site compliance audits across proposed development phases.

Table 6-1: Table of Monitoring Proposals

Ref No.	Related to	Location	Monitoring Measure
			Pre-construction Phase
MP1	Biodiversity: Badger Biodiversity: Badger	EIAR Chapter 7	**Pre-construction survey -** • No more than 10-12 months ahead of any construction works, a survey of Badger setts will be undertaken within 50 m of either side of the construction works area boundary to determine the current status of known badger setts (i.e. active or inactive), and/or to determine the establishment of any new setts; • Badger surveys are most effective when undertaken between November and April, although they can be carried out at any time of the year. However, until mid-January, Badger is less active (i.e. during colder weather) and setts can appear less well-used (NRA, 2009); The survey results will be kept on file, in the form of a summary report.
MP2	Invasive Alien Plant Species (IAPS): Pre-construction survey	EIAR Chapter 7	**All construction works in the proximity of the Rhododendron stand:** **Pre-construction survey -** A pre-construction dedicated IAPS survey at the proposed wind farm site will be undertaken by the appointed ECoW, particularly focused to the areas near the Mount Dillon Works, where the Rhododendron stand has been identified. All IAPS individual plants/stands present at the site will be identified, counted and georeferenced.
MP3	Ornithology: Pre-construction phase monitoring	EIAR Chapter 8	**Pre-Construction Phase Monitoring: Protecting Nesting Birds** Before any work begins, construction activities are scheduled to avoid the bird nesting season (from March 1st to August 31st) the most sensitive time of year for many species. However, if construction does overlap with this period in future seasons, a dedicated pre-construction survey will be triggered. This involves four site visits between April and July, where a qualified ornithologist will conduct breeding bird transects both on-site and within a 500-metre radius of the site boundary. If breeding activity is detected, nest locations will be mapped, and a 500-metre no-work buffer will be enforced. These areas will be physically marked and communicated to all staff through toolbox talks and on-site mapping to ensure strict compliance. This action ensures that no construction will proceed in areas where birds are nesting, reducing the risk of disturbance during critical breeding periods.
			Construction Phase
MP4	Biodiversity: Badger	EIAR Chapter 7	In case a Badger sett is found during the pre-construction survey (or at any time during the Construction Phase), confirmation of its activity will be carried out. Trial camera(s) pointing at the sett entrance(s) will be placed for a minimum of 7 days. For the setts recorded during the field surveys, or if a sett is recorded during the pre-construction survey, the methodology prescribed by the NRA (2009b) will be followed, in which: • If within the period between July to November (inclusive), and the sett recorded during the pre-construction survey is deemed inactive, the sett will then be 'soft-blocked', i.e. the sett entrance will be lightly blocked with vegetation and a light

			application of soil. If after a minimum of five days the vegetation and soil have not been moved, the sett will be destroyed using a mechanical digger; • If still in the period between July to November, but the sett recorded during the pre-construction survey is deemed active, the sett will need to be evacuated. One-way gates (system that allows individuals to exit, but not to get in) will be installed at any active entrances for three days, while inactive entrances will be soft (initially) and they hard-blocked (as above); • If a sett is recorded during the period of January to May, or deemed active (upon confirmation with the trial cameras) during this period, any construction works within 150m of the sett will be halted until the end of this period. In the following June, trial camera(s) will be installed to confirm the sett's activity, and one of the procedures detailed above will be followed. • All monitoring, exclusion and/or evacuation actions will be undertaken by the ECoW, who will report any actions and findings to the contractor, and file them in the form of a report.
MP5	Bird Monitoring Programme	EIAR Chapter 8 / NIS	In line with best practice, a Bird Monitoring Programme (detailed in Appendix N of the NIS) will be implemented. The Bird Monitoring Programme will be undertaken at the proposed wind farm site and results of the monitoring will be submitted to the competent authority and NPWS. Monitoring objectives will include the following: • Prevent disturbance to breeding birds during the construction phase; • To record usage of the site by birds and interaction with operating turbines during the post-construction phase of the development; • To monitor short-term and long-term effects on bird populations with a particular emphasis on wintering and breeding birds deemed to be of high conservation concern (Annex I; EU Birds Directive and BoCCI red list species); • To undertake collision monitoring and corpse searches for potential bird fatalities as a result of collision with turbine blades, and document any bird fatalities. • Report on findings of post construction monitoring at the end of each monitoring year (Year 1, 2, 3, 5, 10 and 15 of the lifetime of the proposed development), to inform mitigation and adaptive management over time.
MP6	Ornithology: Post-construction monitoring	EIAR Chapter 8	**Post-Construction Monitoring: Long-Term Environmental Monitoring** Once the wind farm becomes operational, a robust, long-term monitoring regime begins, continuing across the first 15 years of the wind farm's life (in years 1, 2, 3, 5, 10, and 15). A variety of complementary surveys will be carried out to monitor bird behaviour, assess potential turbine interactions, and evaluate any population changes or displacement effects. **1. Vantage Point (Flight Activity) Surveys** These surveys are conducted monthly in designated operational years. Observers stationed at key vantage points record bird flight paths, height, and behaviour near turbines. This helps determine if birds are avoiding or flying dangerously close to turbine blades — vital for understanding collision risk.

			2. Breeding Bird Surveys A suite of breeding bird surveys — including raptors, woodcock, waders, and the breeding bird census surveys — is carried out to track any shifts in nesting behaviour or territory usage caused by the wind farm and supporting infrastructure. These surveys help detect subtle displacement effects that may not be immediately obvious. **3. Winter Bird Surveys** To capture seasonal variation, winter surveys including I-WeBS counts, winter transects, and Hen Harrier roost monitoring (despite no records of roosting Hen Harrier during the field study – see Section 8.8.2.21 of Chapter 8 of the EIAR) are conducted during the same operational years. These are especially important for species like Whooper Swan and Hen Harrier, which are of European conservation concern and use the site outside the breeding season. **4. Fatality Monitoring** A detailed collision monitoring programme is also in place. Trained dogs are used to search for bird carcasses around turbines, increasing the likelihood of detection. Carcass removal trials are conducted to understand scavenger interference, and all findings are calibrated to estimate actual fatality rates. This ensures any bird deaths linked to turbine operation are documented and used to guide mitigation if necessary.
MP7	Ornithology: Reporting and Adaptive Management	EIAR Chapter 8	At the end of each monitoring year, a comprehensive report will be submitted to the NPWS and the planning authority, no later than March 31st. These reports include all survey data, analysis of bird-turbine interactions, flight maps created with GIS software, and recommendations for mitigation where needed. This transparent reporting structure supports accountability and allows for adaptive management over time, should changes be required.
MP8	Air Quality: Dust	EIAR Chapter 11	The German TA-Luft Air Quality standard sets a maximum permissible emission level for dust deposition of 350 mg/m2/day, averaged over a one-year period, at any receptors outside a project's boundary based on the Bergerhoff Method11 of measuring dust deposition with dust nuisance. Based on this, the 2004 Planning Guidelines (Quarries and Ancillary Activities - Guidelines for Planning Authorities) from the Department of the Environment, Heritage and Local Government (DEHLG 2004) recommend applying the Bergerhoff Method of measuring dust deposition and the limit of 350 mg/m2/day at site boundaries near quarry developments. The Bergerhoff Method uses dust deposition gauges to measure the total PM / dust that is deposited into a collection container. The total amount of dust deposited in the container during the monitoring period is determined by laboratory analysis. The average monthly deposition is expressed as the weight of dust that has been collected per unit area per day. The guidance value 350 mg/m2/day can be implemented with regard to dust impacts from the construction of the project. The main contractor will be responsible for the coordination, implementation and ongoing monitoring of dust management measures.

MP9	Surface Water Drainage	EIAR Chapter 10	The surface water drainage system will require regular inspection during construction works and during operations to ensure that it is working optimally. The surface water management plan (Appendix 10-3 of the EIAR) details the monitoring procedures to be followed during the construction phase. Where issues arise, the works should be stopped immediately and the source of potential impacts on the surface water quality investigated. Records of all maintenance and monitoring activities associated with the construction site will be retained by the Contractor on-site.
MP10	Surface Water Quality Monitoring	EIAR Chapter 10	A comprehensive monitoring and supervisory regime including visual monitoring of all excavations and any exposed groundwater as required will be put in place by the Contractor. In the event that dewatering works are required during the construction phase, a temporary works design including key details such as estimated volumes of water, onsite water treatment required, disposal arrangements and permit / licence requirements as well as water quality monitoring requirements will be prepared by the Contractor and agreed with in advance of commencement of dewatering works. Surface water features in the immediate vicinity of the proposed wind farm boundary are monitored pre-construction and during construction to take account of any variations in the quality of the local surface water and groundwater environment as a result of activities related to the proposed development. Inspections of silt traps are critical after prolonged or intense rainfall while maintenance will ensure maximum effectiveness of the proposed measures. Stockpiles will be evaluated and monitored and kept stable for safety and to minimise erosion. Inspections and maintenance are critical after prolonged or intense rainfall while maintenance will ensure maximum effectiveness of the proposed measures. A programme of inspection and maintenance will be designed and dedicated construction personnel assigned to manage this programme. A checklist of the inspection and maintenance control measures will be developed, and records kept of inspections, and maintenance. Regular checks and maintenance of the proposed surface water drainage system will be implemented. Monitoring requirements that are stipulated under the IPC licence (P0504-01) will continue to be fulfilled for the lifetime of the licence. During the construction phase, water sampling and laboratory analysis of a range of parameters will be undertaken at adjacent watercourses on a monthly basis, specifically following heavy rainfall events (i.e. weekly, monthly and event based). The monitoring will be completed at the locations and for the parameters already specified in the IPC Licence (P0504-01). Monitoring will be undertaken at 10 no. locations around the proposed wind farm site as detailed in the SWMP Figure 3-1 of Appendix 10-3 of the EIAR. Monitoring proposals are included in the SWMP (Appendix 10-3 of the EIAR). The proposed monitoring for the construction phase will be completed at the following streams: • SM1 – Shannon (Upper)_100; • SM2 –Ballynakill_010; • SM3 – Lough Bannow Stream_010; • SM4 – Ballynakill_010; • SM5 – Lough Bannow Stream_010; • SM6 – Lough Bannow Stream_010; • SM7 – Ballynakill_010; • SM8 - Ballynakill_010; • SM9 - Ledwithstown_010; • SM10 - Ballynakill_010.

			Monitoring records should include the date and time of the monitoring period and relate to the relevant consent conditions, where applicable. A written log of the environmental performance of the works will be maintained. A monthly monitoring report on the findings of the monitoring exercises will be prepared within two weeks of receipt of analytical results and submitted to the local authority. The monthly monitoring reports will cover the construction and post construction works.
MP11	Groundwater Monitoring	EIAR Chapter 10	The dewatering operations will be inspected once each day when dewatering water is ongoing to ensure that dewatering treatment controls are working correctly; to evaluate whether there are observable indicators of sediment discharges. Regular monitoring of groundwater (levels and quality) will take place using existing monitoring boreholes during the construction phase. The existing groundwater well on site will be monitored on site during construction and for a period following cessation of construction activities (to be agreed with the relevant authorities).
MP12	Archaeological Monitoring	EIAR Chapter 14	Works involving clearance of drains to allow for a full inspection of potential archaeology; archaeological monitoring of tree felling; archaeological resolution of archaeological feature identified in Lough Bannow Bog; and archaeological pre-development testing in areas where large excavations will be undertaken (turbine hardstands, construction compounds, substation, battery storage, entrances to the bogs and amenity carparks) with peat depths greater than 0.5 m (see Chapter 9 (Land, Soils and Geology) of the EIAR for details of peat depths) will require monitoring by a suitably qualified archaeologist working under licence as issued by the minister (DHLGH) under section 26 of the National Monuments Acts (1994-2014). In the event of archaeological features, finds and/or deposits been encountered during the course of the monitoring and/or testing, the relevant authorities should be notified immediately. Preservation by record (through archaeological excavation) will only occur if it is established that preservation in situ cannot be achieved, and such excavations are agreed with National Monuments Service.
MP13	Excavation Works	EIAR Chapter 9 and Chapter 16	Excavation works should be monitored and in the highly unlikely event that contaminants are encountered these will need to be segregated from all uncontaminated soils, temporarily stored (any stockpiles should be lined and covered by heavy duty 1000-gauge plastic), sampled and analysed for relevant parameters (Waste Acceptance Criteria suite e.g. Rilta Disposal Suite). Any contaminated soils must be characterised as per the requirements of the relevant Waste Acceptance Criteria (WAC) under the relevant European Communities Council Decision (EC) (92003/33/EC) and classified in accordance with the requirements of the EPA as set out in the following documents 'Waste Classification List of Waste & Determining if Waste is Hazardous or Non-hazardous' (EPA, 2018). Any contaminated soils must be transported by appropriately permitted hauliers and disposed of to an appropriate EPA licensed Waste Facility in accordance with all relevant waste management legislation.
MP14	Peat & Spoil Management	EIAR Chapter 9 / Peat & Spoil Management Plan (PSMP) EIAR Appendix 9-2	As stipulated in the PSMP (Appendix 9.2 of the EIAR), a monitoring regime for potential peat instability is recommended. Installing movement monitoring posts is recommended for areas where works occur on or adjacent to identified peat depths greater than 2 m and existing slope angles exceeding 5°. At those locations, monitoring posts are recommended to be installed upslope and downslope of the works areas and shall be as outlined: • Posts shall be 1m to 1.5m in length, installed at 5m intervals with no less than seven posts in each line of sight (~30m); • A string line shall in attached to the first and last post with all intermediate posts in contact with one side of the string line; • A numbering system shall be designs for the monitoring posts and a record shall be kept of this numbering system. Movement monitoring posts will be observed at least once daily during construction, with more frequent inspections where adjacent works are ongoing. Should movements be recorded, the frequency of these inspections is to be increased. A record of all

			monitor post inspections will be kept with reference to date, time and relative movement between posts, if any. Any movement identified in the posts will be recorded with reference to the post numbering system. The monitoring regime will be further developed and assessed during the detailed design phase. The Contractor will also develop a routine inspection of all areas surrounding work in peat, not just exclusively on the monitoring posts. These inspections will include an assessment of ground stability and drainage conditions. These inspections will identify any cracking or deformation on the peat surface, an excessive settlement on structures, drain blockages or springs, etc. Monitoring requirements that are stipulated under the IPC licence (P0504-01) for the peatlands will continue to be fulfilled for the lifetime of the licence. The monitoring will be completed at the locations and for the parameters already specified in the IPC Licence (P0504-01). The IPC Licence has been included as Appendix 7.1 of the EIAR.
MP15	Noise	EIAR Chapter 12	Commissioning noise surveys will be undertaken to ensure compliance with any noise conditions applied to the proposed development. It is common practice to commence surveys within six months of a proposed development being commissioned.

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